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Some Policy Effects in Developing Economies with Dual Labor Markets

Vikram Kumar[1]

[1] Department of Economics, Davidson College, Davidson, NC, USA

Correspondence: Vikram Kumar, Department of Economics, Davidson College, Box 6975, Davidson NC 28035-6975, USA. Tel: 704-894-2265. E-mail: vikumar@davidson.edu

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Abstract

A central feature of developing economies is the existence of dual labor markets, with an organized formal sector usually subject to a binding wage floor, and an informal sector which pays lower wages and where entry is free. It has also been observed in the literature that the preponderance of tradable and non-tradable goods are produced in the formal and informal sectors, respectively. This paper highlights the role played by these stylized structural features in determining policy outcomes in developing economies. We consider an economy where workers employed in the informal sector face some probability of being offered a job in the high-wage formal sector but this probability increases if they do not work but actively search for such a job, i.e., there exists a job search premium. We show that the job search premium and relative size of the informal sector are key elements that affect the results of policy changes with regard to sectoral wage differentials, argue that devaluation reduces the trade balance and may be contractionary, and that policies to increase the efficiency of labor exchange have an independent effect on the real exchange rate.

Keywords: non-tradable goods, job search premium, dual labor markets, exchange rate, devaluation

1. Introduction

Among the common structural features of developing countries is the presence of dual labor markets. On the one hand, there exists a formal, organized sector of the economy, usually with a binding wage floor where jobs are eagerly sought and which produces the bulk of tradable goods, and on the other, an unorganized, informal sector where entry is free, wages are relatively low and which largely produces non-tradable goods. Meaningful open-economy analyses of shocks in developing countries therefore require careful consideration of the prevalence of dual labor markets with wage restrictions of partial coverage and the presence of non-traded goods.

Whatever the source of the barrier to wage arbitrage, in such an economy the persistence of a wage differential between the high-wage formal and low-wage informal sectors is consistent with a state of unemployment that is both voluntary and economically rational. Workers not employed in the formal sector may freely enter the informal sector and earn the going wage; at the same time they face some probability of obtaining a formal sector job by happenstance while employed in informal activity. Conversely, they may eschew informal employment altogether and devote their time exclusively seeking out a higher-paying formal sector job thereby increasing the probability of obtaining the formal sector job. They would do so if the opportunity cost of unemployment–the expected earnings obtainable in the informal sector–is offset by the gains resulting from the increased probability of obtaining the formal sector job. The increase in this probability reflects the existence of a 'job search premium' as articulated in Pinera and Selowsky (1978).

In this paper, such a labor market is nested in a product market framework where tradables are produced in the formal sector and non-tradables in the informal sector (See, for instance, Fiess et. al. 2010; Agénor & Aizenman, 1999). We examine how these structural factors shape the responses of a small open developing country to policy shocks. In doing so, we specifically highlight the role of the job search premium in determining their outcomes, and this particular focus provides a point of departure from the rich literature on both small open economies and dual labor markets. For instance, Brecher (1974) is an early study of the effects of wage restrictions which did not consider non-traded goods, whereas Helpman (1977) considers both tradable and non-tradable goods but in an economy with a wage floor across both sectors, which results in involuntary unemployment. The importance of search activity in segmented labor markets is exemplified in Harris and Todaro (1970), where the existence of an

informal labor market ensures that any unemployment is voluntary, but it does not disaggregate commodities into tradables and non-tradables.

Effective management of foreign exchange parities is a perennial challenge for many developing countries, often with political ramifications related to sectoral wage differentials. The findings that devaluation can appreciate the real exchange rate and worsen the trade balance (Helpman, 1977) and may be contractionary (Krugman & Taylor, 1978) have been examined extensively, for instance, by Mejı´a-Reyesab et. al. (2010), Shieh (2009), Frankel (2005), Agénor and Aizenman (1999), Kamin and Klau (1998) and Edwards (1986). This paper contributes to the existing literature by showing that the job search premium and the relative sizes of the informal and formal sectors play an important role in shaping the response of the economy to a devaluation of its currency. Since developing economies differ in respect to these structural elements, their consideration can account for differences in outcomes across economies.

It is well understood that real exchange rate changes are caused by real shocks often driven by productivity or other shocks. We show that a reduction in the job search premium itself has an independent effect on the real exchange rate, causing it to depreciate. Hence, efforts by governments and multilateral agencies to institute mechanisms to bring about reductions in the search premium by increasing the efficiency of labor exchange also serve to enhance international competitiveness. In any event, to the extent that the process of economic development is usually accompanied by such a reduction in the search premium, it will have a beneficial impact on the evolution of real exchange rates. To our knowledge this issue has not been investigated elsewhere.

A theoretical model embodying the specific characteristics mentioned above is provided in the next section. In section 3, the effects of a shock in the price of tradable goods caused by devaluation are analyzed. The consequences of a shock in the job search premium are the subject of section 4. Section 5 provides concluding comments.

2. A Model of a Small Open Economy with a Partial Real Wage Floor

A small, open, developing economy produces tradable (*t*) and non-tradable (*n*) goods. Following the scheme in Fiess (2010) and Agénor and Aizenman (1999), tradable goods are produced in the formal sector and non-tradable goods are produced in the informal sector. This output market-labor market assignment is notional, suggestive of developing country practices and an approximation that captures the broad realities and is, of course, not strictly true in practice (Note 1). In the formal sector, the wage in terms of a consumption basket is exogenously given and the demand for tradable goods is infinitely elastic at given world prices; any excess demand is met by changes in the trade balance. Given the binding real wage floor in the *t*-sector, employment is determined by labor demand. In contrast, the market for non-tradables clears domestically and the informal *n*-sector wage adjusts freely to clear the informal labor market.

2.1 The Output Market

If $e(\cdot)$ is the minimum expenditure required to attain utility $\hat{v}$ at prices p_i, then the wage restriction in the *t*-sector is:

$$W_t \geq e(p_t, p_n, \hat{v})$$

where W_i is the nominal wage in sector *i* and $P = p_t^{\alpha} p_n^{1-\alpha}$ is the aggregate price index, where α is the share of tradables in consumption. Assume the wage restriction is binding, excludes money illusion, and is of the form $W_t = \omega_t(\hat{v})\, p_t^{\alpha} p_n^{1-\alpha}$. Then real consumption wage floor in the formal sector that ensures minimum utility $\hat{v}$ is $\omega_t(\hat{v}) = \hat{\omega}_t = W_t / p_t^{\alpha} p_n^{1-\alpha}$. Define $\omega_n = W_n / p_t^{\alpha} p_n^{1-\alpha}$ as the *n*-sector consumption wage. Assume that the wage floor is binding.

Let the exchange rate x be fixed by policy; x is the domestic currency price of foreign currency. The home currency price of tradable goods is $p_t = x\bar{p}_t$ where $\bar{p}_t$ is the foreign currency price. Since for a small country the foreign currency price of tradable goods exogenous, choose units of the tradable good so that $\bar{p}_t = 1$. Then x is the domestic currency price of both the foreign currency and the tradable good. Define the real exchange rate–the relative price of traded goods–as $p = x / p_n$. An increase in p denotes a real depreciation of the domestic currency.

Employers in sector *i* choose labor L_i to maximize profits subject to the production function $S_i = L_i^{\beta_i}$. The first-order conditions are $S_n'(L_n) = \omega_n p^{\alpha}$ and $S_t'(L_t) = \hat{\omega}_t p^{\alpha-1}$. Commodity supply curves are given by:

$$S_n(p, \omega_n) = \left(\frac{\beta_n}{\omega_n p^{\alpha}} \right)^{\frac{\beta_n}{1-\beta_n}} \tag{1a}$$

$$S_t(p;\,\bar{\omega}_t) = \left(\frac{\beta_t p^{1-\alpha}}{\bar{\omega}_t}\right)^{\frac{\beta_t}{1-\beta_t}} \tag{1b}$$

The demand for good j ($j = n, t$) is $D_j = D_j^P(p_t, p_n, y) + D_j^G$, where D_j^P and D_j^G are private and government demands, respectively. With Y and T denoting the GDP and tax, respectively, the local currency disposable income is $y = Y - T = \sum_j p_j S_j(\cdot) - T$. Let $\bar{y} = y/x$ be the disposable income in foreign currency units. Then in view of (1a) and 1(b), being homogenous of degree zero, the demand function for good j ($j = n, t$) can be expressed as:

$$D_j(p, \omega_n) = D_j^P(p, \bar{y}(p, \omega_n)) + D_j^G \tag{2}$$

where

$$\bar{y}(p, \omega_n) = p^{-1}S_n(p, \omega_n) + S_t(p; \bar{\omega}_t) - x^{-1}T \tag{3}$$

Goods market equilibrium requires that the output market for n-goods clear domestically as given in (4a) below. For t-goods, however, any excess demand is met by reducing the domestic currency trade balance B. This condition is given by (4b), where x also represents the domestic currency price of tradable goods.

$$S_n(p, \omega_n) - D_n^P(p, \omega_n; x) - D_n^G = 0 \tag{4a}$$

$$S_t(p; \bar{\omega}_t) - D_t^P(p, \omega_n; x) - D_t^G = x^{-1}B \tag{4b}$$

Following Helpman (1977) we assume that there is no demand for financial assets in this economy and consequently we omit the wealth effects of the corresponding change in net foreign assets in the balance of payments accounts. In view of this assumption, Walras' Law and (4) imply that the trade balance denominated in the domestic and foreign currencies, respectively, are given by (5a) and (5b) below:

$$B = T - (p_n D_n^G + x D_t^G) \tag{5a}$$

$$\bar{B} = x^{-1}T - (p^{-1}D_n^G + D_t^G) \tag{5b}$$

2.2 The Labor Market

Labor demands in the two sectors are obtained by inverting the first-order conditions noted above:

$$L_n^d(p, \omega_n) = \left(\frac{\beta_n}{\omega_n p^{\alpha}}\right)^{\frac{1}{1-\beta_n}} \tag{6a}$$

$$L_t^d(p; \bar{\omega}_t) = \left(\frac{\beta_t p^{1-\alpha}}{\bar{\omega}_t}\right)^{\frac{1}{1-\beta_t}} = L_t(p) \tag{6b}$$

Note that in (6a) and (6b), $p = xp_n^{-1}$ is the real exchange rate; the demand for labor in each sector is an increasing function of the relative price of the output of that sector. Also note that with a binding wage restriction, employment in the t-sector L_t is determined by the demand side alone, but in the informal n-sector, it is a function of both labor demand and supply.

Labor supply to the informal sector is modeled after Pinera and Selowsky (1978) where informal sector workers have some probability of gaining coveted formal sector jobs, but if they opt not to work and devote the period to job search instead, the probability of getting a formal sector job increases. Given there exists this search premium– presumed to depend on custom, technology and policy – the marginal worker balances the benefit of the informal sector wage against the cost of facing a reduced probability of obtaining a formal sector job. Assume the economy's endowment of labor is $\bar{L}$. Each of $(\bar{L} - L_t)$ workers rationed out of the t-sector may follow one of two strategies:

(1) Accept an informal n-sector job in the current period and work there until a t-sector job is offered with probability π of generating this offer in any period. Let the expected payoff from this strategy be R_1.

(2) Devote the present period exclusively to searching for a t-sector job, increasing the probability of success from π to $\varphi\pi$, $\varphi > 1$ being the job search premium. In the next period, he will be employed in the t-sector if

successful or in the informal sector if unsuccessful. Let the expected payoff from this strategy be R_2.

As noted in Pinera and Selowsky (1978), if δ and T respectively denote the real rate of discount and time, then the expected payoffs from these two strategies, R_1 and R_2, are (Note 2):

$$R_1 = \omega_{n0} + \sum_{T=1}^{\infty} \frac{\bar{\omega}_{tT} - (\bar{\omega}_{tT} - \omega_{nT})(1-\pi)^T}{(1+\delta)^T} \tag{7a}$$

$$R_2 = \sum_{T=1}^{\infty} \frac{\bar{\omega}_{tT} - (\bar{\omega}_{tT} - \omega_{nT})(1-\varphi\pi)(1-\pi)^{T-1}}{(1+\delta)^T} \tag{7b}$$

The marginal worker in the *n*-sector is in equilibrium when the payoffs from these two strategies are equal, i.e., $R_1 = R_2$. Now, under the assumption that wages in both sectors are expected to grow at the same constant rate g, and further, that the discount rate $\delta > g$, (Note 3) the equality of payoffs (7a) and (7b) occurs when:

$$\pi = \frac{k\omega_n}{(\varphi-1)\bar{\omega}_t - \varphi\omega_n} \tag{8a}$$

It may be seen from equation (8a), where k is a positive constant, that since φ and $\bar{\omega}_t$ are exogenously determined, the informal worker's equilibrium ($R_1 = R_2$) stipulates an implicit relationship between π and the informal sector wage ω_n. Now, π itself depends upon labor market variables such as the number of vacancies in the *t*-sector, the number of aspiring potential *t*-sector workers, and their employment status. We assume that *t*-sector offers arise as firms strive to fill vacancies (V) caused by normal turnover and growth. Since employment in the *t*-sector is demand-determined, *t*-sector firms will successfully fill the V vacancies. They will do so by absorbing πL_n^s workers engaged in the *n*-sector production and $\varphi\pi U$ of the unemployed, but successful, searchers. Thus, $V = \pi L_n^s + \varphi\pi U = \pi(L_n^s + \varphi U)$, implying that in addition to (8a), π must also satisfy:

$$\pi = \frac{V}{L_n^s + \varphi U} \tag{8b}$$

Further note that the consistency condition in the labor markets requires that the $(\bar{L} - L_t)$ workers excluded from the *t*-sector be accounted for either as *n*-sector workers or as unemployed (U), i.e.:

$$\bar{L} - L_t = L_n^s + U \tag{9}$$

Equations (8a), (8b) and (9) can be used to obtain the informal or *n*-sector labor supply function. Eliminating π from (8a) and (8b), and using the resulting expression and (9) to then eliminate U yields the following *n*-sector labor supply function:

$$L_n^s(p, \omega_n) = a_0 - a_1\left(\frac{\bar{\omega}_t}{\omega_n}\right) + a_2\left(\bar{L} - L_t(p)\right) \tag{10}$$

In equation (10) $a_0 = a_1 a_2 > 0$, $a_1 = (V/k) > 0$ and $a_2 = \varphi/(\varphi-1) > 1$. This relationship specifies how many of the workers rationed out of the *t*-sector are willing to work in the *n*-sector at different wage rates. Note that $L_n^s(\cdot)$ is increasing in ω_n and decreasing in p (the real exchange rate is $p = xp_n^{-1}$). In this labor supply function, it is instructive to single out for consideration the coefficient a_2 which plays a significant role in analysis below. Note $a_2 = -\partial L_n^s / \partial L_t > 1$, implying that when the *t*-sector hires one worker, *more than one* worker leaves the *n*-sector. Let us call this effect, captured by a_2, the *magnification effect* of *t*-sector employment.

2.3 General Equilibrium and Stability

Define E_L and E_n as quantity imbalances in the informal labor market and non-tradable output market, respectively. The general equilibrium is given by the following market clearance conditions:

$$E_L(\omega_n, p) = L_n^d(\omega_n, p) - L_n^s(\omega_n, p) = 0 \tag{11}$$

$$E_n(\omega_n, p; x) = S_n(\omega_n, p) - D_n(p, \bar{y}(\omega_n, p; x)) = 0 \tag{12}$$

Equations (11) and (12) provide two independent equations in two unknowns, ω_n and p. Let the equilibrium be denoted by (ω_n^*, p^*). Then substitution in equations (1a;b), (3a;b) and (9) yield the equilibrium values of the relevant endogenous variables: S_n, S_t, L_n, L_t and U. The local asymptotic stability of the equilibrium is guaranteed if the pure substitution effect of a relative output price change on the private demand for non-traded goods dominates the effect of a change in disposable income caused by the same price change (Note 4), i.e., $\partial D_n^P / \partial p + \left(\partial D_n^P / \partial \bar{y}\right)\left(\partial \bar{y} / \partial p\right) > 0$. This condition ensures that the excess supply of n-goods is a negative function of p and it is assumed to hold for each of the propositions in the following sections. The parameter restrictions implied by this condition are derived in Appendix I.

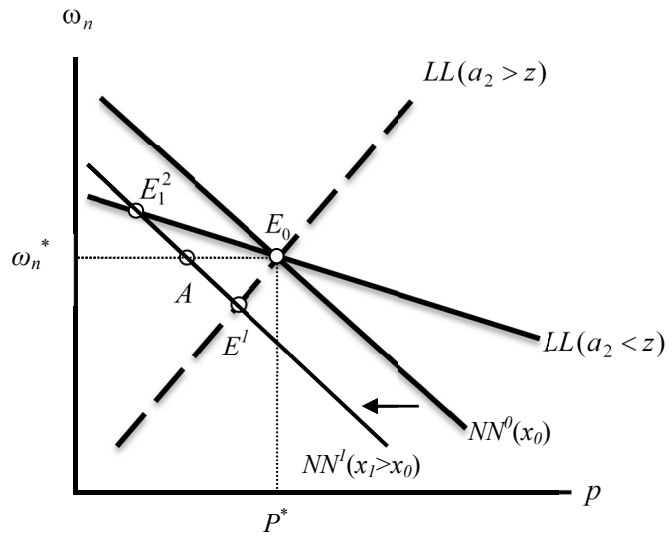

Figure 1. General equilibrium and the effects of devaluation

In Figure 1 the loci $E_L(p, \omega_n) = 0$ and $E_N(p, \omega_n; x_0) = 0$ are given by LL and NN^0 respectively. Graphically, stability boils down to the requirement that LL cross NN from below. The slope of the LL curve may be negative or positive depending upon the balance of two structural features of the economy. Firstly, consider the effect of a given reduction in the price of tradable goods, i.e., in the real exchange rate p, on the supply of labor in the n-sector. The increase in n-sector labor supply per unit reduction in t-sector employment is given by the magnification effect a_2. Thus, the larger is a_2, the larger will be the increase in n-sector labor supply. Secondly, consider the n-sector labor demand. Define the *effective size* of the informal sector relative to the formal sector as $z = (\eta_{np} L_n / \eta_{tp} L_t)$, where η_{ip} is the (absolute value of) i-sector labor demand elasticity with respect to the relative price. The magnitude of z determines the increase in the desired demand for labor by n-sector firms per unit layoff of workers by t-sector firms. If $a_2 > z$, the increase in labor supply dominates the increase in labor demand, ω_n decreases as p decreases, and LL is positively sloped. Conversely, if $a_2 < z$, then LL is negatively sloped. Hence the slope of LL is of $\text{sgn}(a_2 - z)$.

In the output market, a given decrease in the real exchange rate p increases $S_n(\cdot)$. Holding disposable income $\bar{y}$ constant, the demand for non-tradables $D_n^P(\cdot)$ decreases and creates an excess supply of n-sector output. But the decrease in p also affects income. Since $\bar{y} = p^{-1} S_n(\cdot) + S_t(\cdot)$, and $p^{-1} S_n(\cdot)$ increases while $S_t(\cdot)$ decreases as p decreases, $\bar{y}$ may decrease or increase. If $\bar{y}$ decreases then the direct effect of the reduction in p on the demand for n-goods is reinforced by its negative income effect. If $\bar{y}$ increases, the effect of income on $D_n^P(\cdot)$ is positive, but under parameter restrictions for stability discussed above, the total effect of a decrease in p is also to decrease the demand for non-tradables. Therefore, when p decreases, an increase in ω_n is required to reduce the excess supply of non-tradables and consequently NN is negatively sloped.

3. Effects of Devaluation

In this section we examine how this small open economic with dual labor markets and fixed exchange rate responds to a policy-induced change in the exchange rate. Findings of particular interest are that devaluation always leads to an appreciation of the real exchange rate, that the balance of the magnification effect arising from the job search premium and the relative effective sizes of the informal and formal sectors determine the direction of change in the sectoral wage differential, and that devaluation may cause the real output to contract. It should be noted that in this atemporal model, following the analysis in Helpman (1977), we have assumed there is no demand for financial assets and consequently ignore the effects of wealth changes pursuant to changes in net foreign assets resulting from the trade imbalance; nominal devaluation is assumed to have real effects through its impact on real wages.

Proposition 1: A devaluation results in the following changes:

(i) $dp/dx < 0$;

(ii) $\text{sgn}(d\omega_n/dx) = \text{sgn}(z - a_2)$;

(iii) $dL_n/dx > 0$;

(iv) $dL_t/dx < 0$;

(v) $dU/dx < 0$ if $z \geq 1$;

(vi) $dB/dx < 0$; $d\bar{B}/dx < 0$.

Proof: See Appendix II.

Discussion: Helpman (1977) has shown that in the presence of an economy-wide floor, the real exchange rate will appreciate in the face of a nominal devaluation if the effective size of the *n*-sector (though defined differently) exceeds the marginal propensity to consume *n*-goods. We find that with a partial wage floor, devaluation always causes the real exchange rate to appreciate (*p* decreases): the devaluation of the home currency is outweighed by the increase in the price of non-tradables so that the relative price of tradables decreases in equilibrium. As a point of reference, at the initial equilibrium (ω_n^*, p^*) let a_2=z so that in Figure 1 the *LL* curve is flat and the labor market clears at ω_n^* for any nominal exchange rate. The stability condition given above ensures that an increase in x reflecting the devaluation increases the demand for non-tradables. However, at (ω_n^*, p^*) the supply of non-tradables is unchanged and therefore, at the initial equilibrium, there exists an excess demand for *n*-goods. With a given ω_n^* (as implied by the assumption that a_2=z) the entire burden of adjustment in the output market falls on the real exchange rate *p*: it must appreciate. And as *p* decreases, $S_n(\omega_n^*, p)$ increases per (1a) to clear the market for non-tradables. In Figure 1, NN^0 shifts to NN^1 and the output market moves from initial equilibrium E_0 to *A*.

The real exchange rate appreciation affects both the supply and the demand for labor. The ensuing contraction of employment in the *t*-sector increases L_n^s, which is larger the larger is the magnification effect a_2. But the appreciation also increases L_n^d. Now, if the magnification effect of the change in *t*-sector employment (a_2) is larger than the effective labor absorption by informal sector firms (z) then the increase in labor supply L_n^s dominates the increase in labor demand L_n^d, and ω_n declines. Because the reduction in ω_n also increases the supply of *n*-goods relative to demand, the real exchange rate appreciation required for output market clearance is smaller than in the previous case: the equilibrium shifts from E_0 to E_1^1 rather than to *A*. Regardless of the effect on ω_n, informal (formal) sector employment and output will increase (decrease). Conversely, if a_2<z, then the equilibrium shifts to E_1^2.

Consequently the sectoral wage gap given by $\bar{\omega}_t/\omega_n$ can increase or decrease according as $a_2 >=< z$. All else constant, countries with smaller informal sectors (low z) are more likely to see an increase in the sectoral wage gap. The effect on unemployment is less clear. If $z > 1$, unemployment decreases; otherwise it may increase or decrease. It is clear, though, that if $z > a_2$ then $z > 1$ since $a_2 > 1$. An increase in ω_n is accompanied by a decrease in unemployment. The appreciation of the real exchange rate *p*, i.e., the decrease in the relative price of *t*-goods, causes an excess demand for *t*-goods that is met by a deteriorating balance of trade. Since *x* increases and *p* decreases, it can be seen by inspection of equations (5a) and 5(b) that without fiscal policy contraction the devaluation will worsen the trade balance.

The real exchange rate appreciates in response to the devaluation because the proportionate increase in the price of non-traded goods exceeds that of traded goods. So the aggregate price level increases to a larger proportionate extent than the extent of the devaluation. That the devaluation is inflationary in this sense is, therefore, confirmed. Consider now its effect on real output. We already know that the output of non-tradables increase and tradables decrease due to devaluation regardless of whether output is measured in units of one good or the other so the most meaningful concept of real output is to consider it in terms of the typical consumption basket. In this sense the change in real

output turns on both output and labor supply behavior. Define ε_{jp} as the absolute value of the elasticity of supply of good j ($j = n, t$) with respect to the real exchange rate p, and s_n as the share of non-tradables in total output.

Proposition 2: The devaluation will be contractionary if $z > a_2$ and $s_n \leq (1-\alpha+\varepsilon_{tp})(1+\varepsilon_{np}+\varepsilon_{tp})^{-1}$. It will be expansionary if $z < a_2$ and $s_n \geq (1-\alpha+\varepsilon_{tp})(1+\varepsilon_{np}+\varepsilon_{tp})^{-1}$.

Proof: See Appendix III.

Discussion: The results indicate that if the effective size of the informal sector (z) is larger than the magnification effect (a_2) but the share of non-tradables in GDP is smaller than the particular configuration of the price elasticities of output supply ε_{jp} (in absolute values) and the share of tradables in consumption α, then devaluation will be immiserizing. This analysis therefore provides new insights into the causes of the possible contractionary effects of devaluation in the developing country context by showing that the specific structural features of the devaluing country plays a determining role. It generally follows that the qualitative impacts of devaluation will vary across developing countries since they likely differ by these structural features along a spectrum.

4. Effects of a Change in the Job Search Premium

Since the job search premium $\varphi > 1$ reflects the efficiency of labor exchange, it is to be expected that developing countries at different stages of development or through time will see the search premium decline as labor market practices change to market norms and domestic labor markets become integrated. A policy-induced reduction in the cost of information through the creation of employment exchanges or penetration of information technology could lead to such changes. Stated differently, broader dispersion of information and exchange mechanisms are likely to reduce the relative attractiveness of unemployment as an equilibrium state for workers seeking formal sector jobs. What effects ensue from a decline in the search premium?

Proposition 3: A change in the job search premium φ has the following effects:

(i) $dp / d\varphi < 0$;

(ii) $d\omega_n / d\varphi > 0$;

(iii) $dL_n / d\varphi < 0$;

(iv) $dL_t / d\varphi < 0$;

(v) $dU / d\varphi > 0$;

(vi) $dB / d\varphi < 0$; $d\overline{B} / d\varphi < 0$.

Proof: See Appendix IV.

Discussion: Other things given, a reduction in φ reduces the expected returns from the strategy of searching for a formal sector job without working in the informal sector, and causes an excess supply of labor in the informal sector at the initial relative prices. In terms of (10) it increases the magnification effect a_2, and of those workers rationed out of the formal sector, fewer choose unemployment over informal sector employment; the new labor market equilibrium calls for a downward shift in the *LL* curve. Overall, ω_n falls and the real exchange rate depreciates. Employment and output in the *t*-sector rise.

Even though the relative price of *n*-goods declines, the reduction in the informal sector wage is sufficiently large to lead to an increase in employment and output of *n*-goods. A decrease in the search premium causes the output of *both* sectors to increase: the existing slack in the labor market allows both sectors to expand, and consequently, unemployment declines. It bears notice that this type of institutional change in the context of developing countries is in essence a benign supply shock which has an independent effect on the real exchange rate, and by inference, on the trade balance, which, in this model increases in terms of both currencies. Our conclusion is thus a reassuring one that as economies become internally integrated, development occurs and labor market dualism declines, output will increase throughout the economy.

5. Concluding Remarks

This paper presents a model of a small open developing economy with dual labor markets producing tradable and non-tradable goods. Wage arbitrage is prevented by the exogenous imposition of a floor on the real consumption wage in the formal sector; there are no barriers to entry in the informal sector. Unemployment in this economy is voluntary since unemployed workers can increase the probability of obtaining a high-wage formal sector job through search activity relative to the probability of obtaining one while employed in informal sector production; job search carries a probability premium and is a rewarding activity.

The results suggest differential responses among developing economies to adjustment policies such as a devaluation depending upon differences in structural factors such as the relative size of the non-traded goods sector and the job search premium. Devaluation, for instance, may be expansionary in some cases and contractionary in others. Likewise, unemployment and the sectoral wage differential may increase in some countries and decrease in others. These results offer an explanation of inter-country differences in economic performance and possibly of differences in political appetites and enthusiasm for undertaking policy reform. They also suggest that uniform adjustment policies for developing countries may not be warranted. We identify conditions under which such anomalous and divergent outcomes can occur.

We also find that the job search premium has an independent effect on the real exchange rate. As the job search premium declines, the real exchange rate depreciates and causes the tradable goods sector to expand. Hence, efforts by the government to institute mechanisms to bring about reductions in the search premium also serve to enhance international competitiveness. The increase in the output of traded goods does not come at the cost of non-traded goods: both sectors expand and unemployment declines, reflecting the effect of increased labor supply in the production of non-tradable goods due to the falling premium on search activity. Inevitably, this finding presents a case for policy action to hasten increased efficiency of labor exchange between segmented labor markets.

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Notes

Note 1. A counter-example to the proposed scheme may be non-plantation agriculture: overwhelmingly associated with the informal labor market, its output is also tradable. However, in view of agricultural commercial policies and tight government control of food prices in many developing countries, it is not

invariably true that the domestic price of agriculture is determined by world prices. Further, most production in the informal sector is otherwise thought to be in services, and services are non-tradable in general. Consequently, we believe that the assumption of the model is a reasonable first approximation to developing country realities. However, anecdotal counter-examples, such as the production of rugs in the informal sector in some developing countries, do exist; the goods may be tradable and produced in industry segments with informal labor markets in the sense that norms and practices render any legal minimum wage unenforceable.

Note 2. With respect to (7a), note that in the current period 0 the worker earns wage ω_{n0}, in period 1 he expects to earn $[\pi\bar{\omega}_{t1} + (1-\pi)\omega_{n1}]$, in period 2 $[\pi\bar{\omega}_{t2} + (1-\pi)[\pi\bar{\omega}_{t2} + (1-\pi)\omega_{n2}]]$ and so on. The expression for R_1 is obtained by appropriately discounting and summing this stream of expected payoffs. The expression for R_2 in (7b) is similarly derived by setting $\omega_{n0} = 0$ and using the probability $\varphi\pi$ instead of π to weight the formal *t*-sector earning in each period.

Note 3. This is an appropriate assumption for developing countries with high discount rates and low wage growth. Moreover, to the extent the discount factor is high the infinite horizon assumption is less strong and affords tractability.

Note 4. As shown in Appendix I, it requires that $c < \min(1, d_n\sigma_{np})$, where c is the marginal propensity to consume *n*-goods, $d_n = D_n^P / D_n$ and σ_{np} the elasticity of demand for *n*-goods with respect to p holding disposable income constant.

Appendix

Appendix I

Define the following terms:

$$\frac{\partial \ln L_n^d}{\partial \ln \omega_n} \equiv -\eta_{n\omega} = -\frac{1}{1-\beta_n} < 0$$

$$\frac{\partial \ln L_n^d}{\partial \ln p} \equiv -\eta_{np} = -\frac{\alpha}{1-\beta_n} < 0 \text{ . Note } \eta_{np} = \alpha\eta_{n\omega}$$

$$\frac{\partial \ln L_t^d}{\partial \ln p} \equiv \eta_{tp} = \frac{1-\alpha}{1-\beta_t} > 0$$

$$\frac{\partial \ln L_n^s}{\partial \ln \omega_n} = \frac{a_1(\bar{\omega}_t / \omega_n)}{L_n^s} > 0$$

$$\frac{\partial \ln L_n^s}{\partial \ln p} = -a_2\eta_{tp}\frac{L_t}{L_n^s} < 0$$

$s_n \equiv p^{-1}S_n / (p^{-1}S_n + S_t)$: share of n-goods in GDP.

$$\frac{\partial \ln S_n}{\partial \ln \omega_n} \equiv -\varepsilon_{n\omega} = -\frac{\beta_n}{1-\beta_n} < 0. \text{ . Note } \varepsilon_{n\omega} = \beta_n\eta_{n\omega}$$

$$\frac{\partial \ln S_n}{\partial \ln p} \equiv -\varepsilon_{np} = -\frac{\alpha\beta_n}{1-\beta_n} < 0 \text{ . Note } \varepsilon_{np} = \beta_n\eta_{np}$$

$$\frac{\partial \ln S_t}{\partial \ln p} \equiv \varepsilon_{tp} = \frac{(1-\alpha)\beta_t}{1-\beta_t} > 0 \text{ . Note } \varepsilon_{tp} = \beta_t\eta_{tp}$$

$$\left.\frac{\partial \ln D_n^P}{\partial \ln p}\right|_{\bar{y}=\bar{y}_0} \equiv \sigma_{np} > 0$$

$c = p^{-1}\partial D_n^P / \partial \bar{y} \equiv$ marginal propensity to consume *n*.

$d_n \equiv D_n^P / (D_n^P + D_n^G) = D_n^P / D_n$, the share of private demand in total demand for n goods.

Let $\dot{p} = a\{S_n(\cdot) - D_n(\cdot)\} = aE_N(p, \omega_n; x)$, $\dot{\omega}_n = b\{L_n^d(\cdot) - L_n^s(\cdot)\} = bE_L(p, \omega_n)$ where $a, b > 0$, and (p^*, ω_n^*) be the equilibrium. Let $J = \{j_{kl}\}$ be the Jacobian:

$$J = \begin{bmatrix} \dfrac{\partial E_L(p^*, \omega_n^*)}{\partial \omega_n} & \dfrac{\partial E_L(p^*, \omega_n^*)}{\partial p} \\ \dfrac{\partial E_N(p^*, \omega_n^*)}{\partial \omega_n} & \dfrac{\partial E_N(p^*, \omega_n^*)}{\partial p} \end{bmatrix} \tag{I.1}$$

where $j_{11} = -(\eta_{n\omega} L_n + a_1 \dfrac{\bar{\omega}_t}{\omega_n}) < 0$; $j_{12} = (a_2 - z)\eta_{tp} L_t$

$j_{21} = -(1-c)\varepsilon_{n\omega} < 0$; $j_{22} = -\left\{(1-c)\varepsilon_{np} + (d_n \sigma_{np} - c) + \dfrac{(1-s_n)}{s_n} c\varepsilon_{tp}\right\}$

By application of the Liapunov theorem, the system in (11)-(12) is locally asymptotically stable if tr(J) < 0 and $|J| > 0$. The trace condition is satisfied if $c < \min(1, d_n \sigma_{np})$. Under this parameter restriction, noting that $\varepsilon_{np} = \beta_n \eta_{np}$ and $\varepsilon_{n\omega} = \beta_n \eta_{n\omega}$, $|J| > 0$ as given in (I.2) below:

$$\begin{aligned} |J| = {} & \eta_{n\omega} L_n \left[(d_n \sigma_{np} - c) + \frac{(1-s_n)}{s_n} c\varepsilon_{tp} \right] + a_1 \frac{\bar{\omega}_t}{\omega_n} \left[(1-c)\varepsilon_{np} + (d_n \sigma_{np} - c) + \frac{(1-s_n)}{s_n} c\varepsilon_{tp} \right] \\ & + (1-c)\varepsilon_{n\omega} a_2 \eta_{tp} L_t > 0 \end{aligned} \tag{I.2}$$

Appendix II

Let $\hat{z} = dz / z$. Totally differentiating equations (11) and (12) with respect to the nominal exchange rate *x* yields:

$$\begin{bmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{bmatrix} \begin{bmatrix} \hat{\omega}_n \\ \hat{p} \end{bmatrix} = \begin{bmatrix} 0 \\ k \end{bmatrix} \hat{x} \tag{II.1}$$

where $k = cpT / x^2 > 0$. Cramer's Rule yields

$$\hat{\omega}_n = -k_1 j_{12} \hat{x} \tag{II.2}$$

where $k_1 = k|J|^{-1} > 0$. Since $j_{12} = (a_2 - z)\eta_{tp} L_t$, $\operatorname{sgn}(\hat{\omega}_n) = \operatorname{sgn}(z - a_2)$. Further

$$\hat{p} = k_1 j_{11} \hat{x} < 0 \tag{II.3}$$

Equation (6a) implies $\hat{L}_n = -[\eta_{n\omega} \hat{\omega}_n + \eta_{np} \hat{p}]$. Upon substitution of (II.2) and (II.3), given $z = \eta_{np} L_n / \eta_{tp} L_t$:

$$\hat{L}_n = k_1 [a_1 (\bar{\omega}_t / \omega_n) \eta_{np} + a_2 \eta_{n\omega} \eta_{tp} L_t] \hat{x} > 0 \tag{II.4}$$

Since $\hat{p} < 0$ by (II.3), from equation (6b) we obtain:

$$\hat{L}_t = \eta_{tp} \hat{p} < 0 \tag{II.5}$$

Equation (9) implies $U = \bar{L} - L_t - L_n$. Since $dU / dx = -(dL_t / dx + dL_n / dx)$, use (II.4) and (II.5) to obtain:

$$dU = -k_2 [(a_2 - 1) z \eta_{tp} L_t + (z-1)\alpha a_1 (\bar{\omega}_t / \omega_n)] \hat{x} < 0 \tag{II.6}$$

where $k_2 = \alpha^{-1} k_1 > 0$. Because $a_2 > 1$, $dU < 0$ if $z \geq 1$. Q.E.D.

Appendix III

The GDP is $Y = \sum_j p_j S_j(\cdot)$ and the price level is $P = p_t^{\alpha} p_n^{1-\alpha}$. Price deflated GDP can then be written as:

$$\tilde{y} = p^{-\alpha} S_n(\cdot) + p^{1-\alpha} S_t(\cdot) \tag{III.1}$$

Totally differentiating $\tilde{y}$ and collecting terms yields:

$$d\tilde{y} = p^{-\alpha} \left\{ \left[-\alpha p^{-1} S_n + \frac{\partial S_n}{\partial p} + (1-\alpha) S_t + p \frac{\partial S_t}{\partial p} \right] dp + \frac{\partial S_n}{\partial \omega_n} d\omega_n \right\} \tag{III.2}$$

Upon expressing terms in III.2 in elasticity form, after rearrangement, we obtain:

$$\hat{\hat{y}}=\frac{p^{2-\alpha}}{x}\left\{\left[[(1-\alpha)+\varepsilon_{tp}]-s_n[1+\varepsilon_{np}+\varepsilon_{tp}]\right]\hat{p}-s_n\varepsilon_{n\omega}\hat{\omega}_n\right\} \tag{III.3}$$

Upon substituting from (II.2) and (II.3) we obtain:

$$\hat{\hat{y}}=-\frac{k_1 p^{2-\alpha}}{\alpha x}\left\{\left[[(1-\alpha)+\varepsilon_{tp}]-s_n[1+\varepsilon_{np}+\varepsilon_{tp}]\right]\lambda+\left[\left(1-\frac{a_2}{z}\right)s_n\varepsilon_{np}\right]\right\}\eta_{np}L_n\hat{x} \tag{III.4}$$

where $\lambda=1+\frac{\alpha a_1(\hat{\omega}_t/\omega_n)}{\eta_{np}L_n}$. By inspection of (III.4), if $z>a_2$ and $s_n<\frac{1-\alpha+\varepsilon_{tp}}{1+\varepsilon_{np}+\varepsilon_{tp}}$, then $\hat{\hat{y}}<0$ and devaluation is contractionary. Q.E.D.

Appendix IV

Totally differentiating equation (11) and (12) with respect to φ yields:

$$\begin{bmatrix} j_{11} & j_{12} \\ j_{21} & j_{22} \end{bmatrix}\begin{bmatrix} \hat{\omega}_n \\ \hat{p} \end{bmatrix}=\begin{bmatrix} -(\bar{L}-L_t)a_2^2/\varphi \\ 0 \end{bmatrix}\hat{\varphi} \tag{IV.1}$$

The solutions are as follows:

$$\hat{\omega}_n=-\frac{j_{22}(\bar{L}-L_t)a_2^2}{|J|\varphi}\hat{\varphi}>0 \tag{IV.2}$$

since $j_{22}<0$ and

$$\hat{p}=\frac{j_{21}(\bar{L}-L_t)a_2^2}{|J|\varphi}\hat{\varphi}<0 \tag{IV.3}$$

since $j_{21}<0$. Because $\hat{L}_n=-[\eta_{n\omega}\hat{\omega}_n+\eta_{np}\hat{p}]$ by (6a), and $\eta_{np}=\alpha\eta_{n\omega}$, $\hat{L}_n=-\eta_{n\omega}[\hat{\omega}_n+\alpha\hat{p}]$, substitution of (IV.2) and (IV.3) yields, upon simplification:

$$\hat{L}_n=-k_3\left((d_n\sigma_{np}-c)+\frac{(1-s_n)}{s_n}c\varepsilon_{tp}\right)\hat{\varphi}<0 \tag{IV.4}$$

where $k_3=\frac{\eta_{n\omega}(\bar{L}-L_t)a_2^2}{|J|\varphi}>0$, and $(d_n\sigma_{np}-c)>0$ by assumption as discussed in Appendix I. Since $\hat{p}<0$ by (IV.3), from equation (6b) we obtain:

$$\hat{L}_t=\eta_{tp}\frac{j_{21}(\bar{L}-L_t)a_2^2}{|J|\varphi}\hat{\varphi}<0 \tag{IV.5}$$

since $j_{21}<0$. Moreover, since $U=\bar{L}-L_t-L_n$ by (9), and $\hat{L}_t<0$ and $\hat{L}_n<0$ from (IV.4) and (IV.5),

$$\frac{dU}{d\varphi}=-\left(\frac{dL_t}{d\varphi}+\frac{dL_n}{d\varphi}\right)>0 \tag{IV.6}$$

Finally, since $\hat{p}=\hat{x}-\hat{p}_n<0$ and $\hat{x}=0$, $\hat{p}_n>0$. Thus by inspection of (5a) and (5b):

$$\frac{dB}{d\varphi}<0 \tag{IV.7}$$

Q.E.D.

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An Investigation of the Business Performance and Manager Compensation of Taiwanese Non-Family-Controlled and Family-Controlled International Businesses

Yao-Hung Yang[1]

[1] Department of Business Administration, Chung Yuan Christian University, Taiwan

Correspondence: Yao-Hung Yang, Department of Business Administration, Chung Yuan Christian University, 200, Chung Pei Rd. Chung Li, 32023, Taiwan. Tel: 886-9-2055-4772. E-mail: yaohungyang@yahoo.com.tw

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Abstract

This study explores the problem of the communities of interest that form when management and ownership overlap. Samples were obtained from the Taiwan Economic Journal (TEJ) data bank from 2005 to 2011. The results of non-family-controlled international businesses show that business accounting performance is improved when directors serve as managers; however, if control rights exceed ownership rights to a great extent, business accounting performance declines. The results of family-controlled international businesses show that directors who serve as managers can monitor compensation effectively; however, if control rights exceed ownership rights to a great extent, communities of interest can pursue selfish interests. In this study, we suggest that directors serve as managers to improve business performance and supervise managers' compensation. Moreover, controlling shareholders should serve as board members with a certain proportion to prevent excessive interest assimilation.

Keywords: ownership business performance, manager compensation, non-family-controlled international business, family-controlled international business

1. Introduction

When management rights are greater than ownership rights, controlling shareholders may infringe on minority shareholders through their powerful management rights and lower firm value (Kao, Chen, & Li, 2006). Lee and Yeh (2004) showed that a large deviation in management rights and ownership of controlling shareholders likely leads to financial crisis. The empirical results verify that controlling shareholders with management rights have greater incentive to engage in self-serving behavior (Morck, Shleifer, & Vishny, 1988; Claessens, Djanlov, Fan, & Lang, 2002). Claessens, Djankov and Lang (2000) and Yeh, Lee and Woidtke (2001) found that Taiwanese companies belong to an ownership structure of family holding patterns, and the management is under the control of the controlling shareholders. In this situation, the agency problem is not between shareholders and managers, but between controlling shareholders and minority shareholders. Liao (2010) indicated that controlling shareholders own greater internal information. Because minority shareholders cannot participate in company decision-making, causing serious information asymmetry, controlling shareholders engage in the interests of external minority shareholders.

However, do controlling shareholders violate the rights of minority shareholders, resulting in lowering company value? In contrast to the mentioned studies, the Lee and Su (2009) study shows that family business research, development (R&D) commitment, and performance have a positive correlation. The empirical studies by Lins (2003) have shown that when the largest shareholder is in a position of absolute control, corporate value is enhanced over other companies, but large shareholders playing the managerial role reduce agency costs. Yen (1996) indicated that family businesses in Taiwan demonstrate a bipolar coexistence and dual-system organizational phenomena; the dual-system combines the family system and the professional manager, in which the family system controls the enterprise. However, the family system creates stable enterprise development and sustainable management. Asian societies operate under the family corporate governance structure, which differs from Western countries. The family business in the United States involves external talent, whereas in Chinese family businesses, family members control the management level (Fukuyama, 1995). Taiwanese family

businesses possess a special ownership structure and management style, linking the enterprise to its shareholders. The lack of extensive exploration in the literature on the overlap of management rights and ownership, and the failure to propose practical suggestions, thus leads to the motivation of this study.

In this study, listed companies in Taiwan are taken as a sample, using a composite hypothesis to provide more in-depth and rigorous study to compensate for the existing literature. This paper investigates the effect of external institutional investors in corporate governance, to understand the interest assimilation among directors, supervisors, and managers, and to explore the effect of deviant ownership and management on corporate value. To avoid unnecessary conflict of interest, the shareholding ratio of external institutional investors must be kept at a certain ratio. Companies should restrict directors to serve as managers. To avoid excessive interest assimilation leading to violating the rights and interests of minority shareholders, the ratio of controlling shareholders serving as board members should be limited.

2. Literature Review

According to Fan and Wong (2002), ownership is highly centralized in most East Asian enterprises, and the ownership of more than half of the companies is family controlled. Studies have indicated that controlling shareholders exist in most Taiwanese enterprises, and family-control is the most common type of ownership (Claessens et al., 2000; Yeh & Lee, 2001; Lin & Hsu, 2008). In addition, controlling shareholders usually control personnel designation rights, and family members directly or indirectly hold crucial positions and are in charge of corporate operation; therefore, the control rights and ownership rights of businesses are unified (Yeh, 2005). In this study, this is considered an overlap of control rights and ownership rights in Taiwanese firms.

In addition to maintaining a long-term corporate status and reputation, the controlling shareholders of a company understand that surplus manipulation yields only short-term benefits, and it even damages long-term corporate performance; therefore, when the shareholding of the controlling family of a company is high, the speculative psychology of manipulating surplus is reduced (Anderson & Reeb, 2004). Yeh (2005) discovered that when the cash-flow rights (ownership rights) of the controlling shareholders of a company in Taiwan increased 10%, the corporate value increased 8.8%.

Family members actively involved in management activities, ownership, and management are not completely separate; thus, controlling shareholders affect company operational decisions (Claessens et al., 2000; Faccio & Lang, 2002). Companies adopting a moderate concentration of the shareholding structure of governance mechanisms are benefited. However, the largest shareholder of companies with highly concentrated ownership patterns violates the interest of other shareholders based on self-interests (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2002; Claessens et al., 2002). When the board of directors, managers, and controlling shareholders form a community of interest, the board is unable to play a supervisory role (Yang, Ling, & Yen, 2012; Yen & Yang, 2012). This process is called interest assimilation. Therefore, the corporate governance problem in Taiwan is to improve efficient monitoring of the company by external forces, to prevent the community of interest from gaining excessive interest assimilation, and to understand how to prevent the interest infringement of controlling shareholders on minor shareholders.

2.1 Efficient Monitoring Power of External Shareholders

Pound (1988) focused on the correlation between corporate management performance and institutional investors, and raised three hypotheses: the efficient-monitoring hypothesis, the conflict-of-interest hypothesis, and the strategic-alignment hypothesis. According to the efficient monitoring hypothesis, institutional investors have more abundant capital than do small shareholders, they own professionalism and a magnificent scale as support, and they can monitor managers with lower cost. According to the conflict-of-interest hypothesis, agency problems highly likely exist among institutional investors. When investment target companies obstruct the profit-making of institutional investors, investors fight the companies with their votes and vote for corporate administrators who meet their benefits, in which monitoring is limited by the function of corporate administrators in the invested companies. Hence, this paper is based on the efficient-monitoring hypothesis (Pound, 1988), which infers that external institutional investors own professionalism and motivation to monitor the investment target company.

H1-1: The shareholding ratio of external institutional investors positively affects business performance.

Family business owners typically offer huge profits to in-group members, the board, and managers, to ensure that they not leave the family business. The incentive is higher than their contribution (Yen, 1996). Masulis, Wang and Xie (2012) determined that firms with foreign independent directors (FIDs) display poorer board meeting attendance records and higher CEO compensation, and exhibit significantly poorer performance, than

firms without FIDs. Efficiency monitoring from outside a community of interest affects manager compensation. Therefore, when the shareholding of external institutional investors increases, firm value and manager compensation increase.

H1-2: The shareholding ratio of external institutional investors positively affects the compensation of managers.

2.2 Interest Assimilation of the Community of Interest

Oesterle, Richta and Fisch (2013) presented significant cubic-stretched u-shaped relationships between the stake of the largest shareholder and a firm's internationalization. The study confirmed that the theoretical assumptions of agency are applicable to the influence of the ownership structure on a firm's behavior. Therefore, the ownership structure should be considered a crucial factor for a firm's performance. The empirical results of Cheng and Yu (2012) support the self-interest perspective of owner-managers provided in agency theory, and indicate a U-shaped relationship between managerial ownership and the level of diversification. In other words, when the level of managerial ownership exceeds the critical level of control, owner-managers can control the firm and reap greater private and family benefits.

Weng (2000) adopted the method by La Porta, Lopez-de-Silanes and Shleifer (1999) for tracing controlling shareholders and found that family members were employed as controlling shareholders and enthusiastically participated in management to enhance control. Therefore, controlling shareholders of Taiwanese listed companies operate the firms. Thus, the following hypothesis was proposed:

H2-1: The shareholding ratio of directors serving as managers positively affects business performance.

Brick, Palmon and Wald (2005) found that the board did not play a supervisory function well. When senior managers collude with each other or cronyism occurs, director compensation is significantly positively correlated with manager compensation. Based on the literature, the controlling shareholders combined with the board of directors and managers form a community of interest (Yen & Yang, 2012), and collusion occurs among controlling shareholders, managers, directors, and supervisors. Thus, the following hypotheses are established:

H2-2: The shareholding ratio of directors serving as managers positively affects manager compensation.

2.3 Excessive Interest Assimilation

Calabro, Torchia, Pukall and Mussolino (2013) showed that CEO ownership negatively impacts international sales in both family and non-family businesses. In other words, when managers concurrently own control rights and ownership rights, managers might engage in self-interested behavior.

Claessens, Djankov, Fan and Lang (1999) indicated that Taiwan is a country of collective ownership structure, in which a small number of controlling shareholders control most resources, making it more difficult for outside corporate mechanisms to fully function. When management right exceeds ownership right, controlling shareholders are more likely to infringe the interest of minor shareholders and reduce future firm value (Claessens et al., 2000; Fan & Wong, 2002; Kao et al., 2006). These findings confirm that when controlling shareholders grasp management rights, they have more incentive to engage in self-serving behavior (Morck et al., 1988; Claessens et al., 2002). Based on the literature, the following hypothesis was proposed:

H3-1: The deviation of management rights from ownership rights negatively affects business performance.

Yang et al. (2012) indicated that a community of interest is likely to cause excessive interest assimilation; directors are unable to monitor managers, leading to a violation of minority shareholder interests. The supervisory functions of the board of directors do not actually exist (Lee & Ma, 2006). This research indicates that members of a community of interest curry favor with each other. Based on the literature, a controlling shareholder holding greater management rights affects manager compensation. Thus, the following hypothesis is established:

H3-2: The deviation of management rights from ownership rights positively affects manager compensation.

2.4 Controlling Variables

External factors affect efficient monitoring, interest assimilation, and interest infringement. According to relevant literature, this study adds the following control variables to investigate the effective influence of each variable.

2.4.1 Corporate Age

Claessens, Djankov and Lang (1999) argued that the longer a company is established, the more easily it can be controlled by families and the more capable the controlling shareholders are of causing deviations between control rights and cash flow rights. It was thus inferred that the governance of a business is more effective when

it is first established. After a business becomes listed, the maximum interests of the controlling shareholdings are pursued because of self-interest, and the effects of corporate governance are altered. To effectively control the influence possibly caused by corporate age on management performance, corporate age was included among the control variables examined in this study.

2.4.2 Firm Size

Firm size advantage enables business operations, marketing, and finance to reach economies of scale, and corporate size and corporate value are positively correlated (Demsetz & Lehn, 1985). Gibrat (1931) defined Gibrat's law, which states that a firm's growth rate and a firm's scale are unrelated. The results of studies, such as Hart and Prais (1956) and Hymer and Pashigian (1962), have supported Gibrat's Law, but other empirical results have indicated a negative correlation, such as Evans (1987a) and Dunne and Hughes (1994), or a positive correlation, such as Singh and Whittington (1975). The larger a company is, the higher is its complexity, and managers need greater professional capacity to make higher-risk decision-making, and to pay a higher salary (Khanna & Palepu, 1997; Oxelheim & Randoy, 2005). Hence, firm size affects manager compensation. According to the literature, the possible effect of firm size should be given control to avoid affecting the empirical results.

2.4.3 The Ratio of Independent Directors on the Board of Directors

For enterprises seeking to improve the ratio of external independent directors to effectively reduce the company agency problem, the professionalism and knowledge of external independent directors can objectively monitor management performance. However, Crystal (1991) indicated that the board cannot effectively determine manager compensation because external independent directors may be assigned through senior managers, resulting in the decline of supervisory capacity, thereby affecting firm value. Therefore, the possible effect of external independent directors should be given control to avoid affecting the empirical results.

3. Research Methodology

3.1 Sampling Criteria and Data Sources

Companies listed in the Taiwan Stock Exchange Corporation were sampled in this study. The sample was obtained from the archive of the TEJ, and the research period was 2005 to 2011. The sample companies were selected based on the following criteria: (1) International business is based investment commission approved Taiwan listed companies to have direct foreign investment; these investment areas included the United States, Canada, France, Italy, the Netherlands, Mexico, Japan, Singapore, Thailand, Malaysia, and Vietnam. (2) The aforementioned international businesses are classified as family-controlled international businesses or non-family-controlled businesses (Siebels & Knyphausen-Aufseß, 2010). In a family-controlled international business, the shareholding ratio of the controlling shareholders of the company is higher than 5%, and more than 50% of the seats in the board of directors are occupied by family members (Berger, Ofek, & Yermack, 1997; Lin, 2010). (3) Companies that became full-cash delivery stocks because of bankruptcy, close-downs, or restructuring during the research period were excluded. (4) Companies without complete financial data were excluded. (5) Companies that were delisted between 2005 and 2011 were excluded.

According to Table 1, the sample included 2,864 listed companies that were considered non-family-controlled international business. Table 2 shows that 196 companies belonged to the family-controlled international business category. In addition, Tables 1 and 2 list the descriptive statistics of the variables, including the means, medians, and standard deviations of the observed values.

Table 1. Non-family-controlled international business

Variable	Unit	Obs	Mean	Std. Dev.	Min	Max
rt		2864	0.71976	0.755764	-0.62997	11.29822
roe	%	2864	0.034225	0.366278	-7.35	1.33
bmm	Thousand Dollars	2864	5251.357	5942.712	145	71276
och	%	2864	8.086236	8.209768	0	77.61
mbh	%	2864	5.473341	6.172743	0	38.98
bi	Multiple	2864	3.085761	3.263729	0.22	37.39
age	year	2864	25.87675	11.59895	2	64
ta	Dollars	2864	2.55E+07	1.19E+08	31436	2.08E+09
ind	%	2864	0.155234	0.165843	0	0.67

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

Table 2. Family-controlled international business

Variable		Obs	Mean	Std. Dev.	Min	Max
rt		196	0.692972	0.67051	-0.33799	4.35603
roe	%	196	0.173265	1.719295	-2.08	22.29
bmm	Thousand Dollars	196	4224.917	5178.779	111	50550
och	%	196	6.742296	8.169538	0	44.41
mbh	%	196	3.588929	4.272195	0	23.35
bi	Multiple	196	2.52352	1.984421	0.55	12.58
age	year	196	29.89286	11.58486	8	58
ta	Dollars	196	1.19E+07	1.98E+07	473414	1.43E+08
ind	%	196	0.096684	0.144902	0	0.43

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

Definitions of the research variables are shown Table 3.

Table 3. Definitions of the research variables

Research Variable	Code	Definition
Business performance	rt	According to Chung and Pruitt's (1994) research, the approximation reaches 96.6%. The formula is as follows: Tobin's Q = (the number of the common shares circulating outside × the price of the common shares+ the number of the preferred shares circulating outside × the price of the preferred shares - current assets + current liability + long-term liability) / the book value of total assets
Business accounting performance	roe	Net income / Stockholder's equity
Manager Compensation	bmm	The sum of the cash compensation and bonuses of high-level managers and directors / The total number of high-level managers and directors.
Shareholding ratio of external institutional investors	och	External institutional investors' shareholding is not controlled by ultimate controllers.
Shareholding ratio of directors serving as manager	mbh	Shares held by directors concurrently serving as managers in proportion to the total number of shares the company has issued.
Deviation of management right and ownership	bi	The board seat control-voting right divergence (bi) represents the deviation of management right and ownership. Bi means the board seat control of the ultimate controller divided by shareholding control. Board seat control means the ratio of director and supervisor seats under the control of the ultimate controller. Shareholding control means the ratio of shares directly and indirectly held by the ultimate controller.
Corporate age	age	2011-the found year of an enterprise
Fim size	ta	Size is measured by total company assets.
The ratio of independent directors in the board of directors	ind	Independent director seats are divided by the total seats of a board of directors

Source: TEJ (2011).

3.2 Statistical Methods and Procedures

This research employs panel data model to handle cross-sectional heterogeneity and time-series autocorrelation. According to the intercept characteristic, two panel data models are adopted: a model based on the presumption that the intercept varies with the analytic unit, but not with the change of time, called the fixed effects model, and a model that presumes that the intercept changes with different analytic units and times, called the random effects model. The following test results determine the appropriate model to apply.

For choosing the fixed or random effects model, Mundlak (1978) argued that if the intercept of the random effect model is correlated with the explanatory variable, errors can occur and the fixed effects model should be adopted. However, if the error of the intercept is not correlated with the explanatory variable, the random effects model can be used. Hausman (1978) proposed a test method to decide whether to apply the fixed or random effects model, as follows:

H0：$E(\mu, Xitk)=0$ H1：$E(\mu, Xitk)\neq 0$

The calculation is shown below.

$$\omega = (\hat{b} - \hat{B})[Var\ (\hat{b}) - Var\ (\hat{B})]^{-1}(\hat{b} - \hat{B}) \sim \chi^2(k) \quad (1)$$

In the calculation, $\hat{b}$ is the estimate obtained through the fixed effects model, and $\hat{B}$ is obtained through the random effects model. If the test result does not reject H0, the random effects model should be applied. If it does, the fixed effects model should be applied.

3.3 Correlation Coefficients

Pearson correlation analysis was used in this study to evaluate whether variables influenced one another and had collinearity. Tables 4 and 5 show that the correlation coefficients among the variables of the electronic industrial and traditional industrial companies were all lower than .75, indicating that a significant strong correlation did not exist among the variables (Portney & Watkins, 2000).

Table 4. Correlation coefficient analysis of non-family-controlled international business

	rt	roe	bmm	och	mbh	bi3	age	ta	ind
rt	1								
roe	0.116	1							
bmm	-0.010	0.002	1						
och	-0.008	0.004	0.164	1					
mbh	0.038	0.006	-0.096	-0.199	1				
bi	-0.014	0.008	0.249	0.171	-0.197	1			
age	-0.024	0.004	-0.056	-0.105	-0.059	-0.049	1		
ta	-0.035	0.033	0.002	0.021	-0.036	0.007	0.013	1	
ind	-0.043	-0.006	0.027	-0.041	0.156	-0.075	-0.394	-0.004	1

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

Table 5. Correlation coefficient analysis of family-controlled international business

	rt	roe	bmm	och	mbh	bi3	age	ta	ind
rt	1								
roe	0.104	1							
bmm	0.350	0.085	1						
och	-0.038	0.066	-0.073	1					
mbh	-0.072	0.192	0.023	-0.007	1				
bi	-0.060	-0.157	-0.072	0.245	-0.054	1			
age	0.093	0.032	0.104	-0.119	0.047	0.120	1		
ta	0.262	0.059	0.650	-0.057	0.028	-0.050	0.175	1	
ind	0.038	0.056	-0.012	0.132	-0.123	-0.179	-0.410	-0.150	1

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

4. Empirical Result

The Hausman test must be applied to examine the various hypotheses on the intercept to identify the appropriate

estimation mode. When the F-test value is greater than 0.05, the ols model is superior to the fixed-effects model. When the chi square of the Hausman test is smaller than .05, H0 is rejected and the fixed effects model is superior to the random effects model. Table 6 shows that the F-test value of 1b was 0.999; therefore, the ols model was applied in this study. Moreover, the chi square values were all greater than .05. Therefore, the random effects model was applied to analyze non-family-controlled international business. For family-controlled international business analysis, Table 7 shows that the chi square value of 1a was lower than .05. Therefore, the fixed effects model is applied. The chi square value of 1b was larger than .05; therefore, the random effects model was applied. Finally, the F-test result of 1c was greater than 0.05; therefore, the ols model was applied.

To prevent an endogenous problem, the study also used three-stage least squares (3SLS) estimation to analyze the hypotheses in Model 2. An additional robustness test, Stata robust command, was used to ensure that all variables were dependent, not heterogeneous. Moreover, roe, accounting performance, was used as a robustness measure.

Table 6. Empirical result of non-family-controlled international business

	model 1				model 2			
	rt(1a)	roe(1b)		bmm(1c)	rt(2a)	roe(2b)		bmm(2c)
och	-0.019	0.131		-0.002	-0.016	0.131		-0.042
mbh	-0.026	0.228	***	-0.005	-0.077	0.228	***	0.015
bi	-0.011	-0.224	**	-0.037	-0.046	-0.224	**	-0.014
age	0.088	0.096		0.005	0.103	0.096		0.029
ta	2.573	** 0.622		7.200	*** 2.841	*** 0.622		7.000 ***
ind	0.097	** 0.084		0.016	0.101	0.084		0.099 *
F - test	0	0.999		0				
Hausman test	0.998			0.146				
final model	random	ols		random	three stages least square, 3SLS			
R-squared	0.12	0.08		0.61	0.09	0.08		0.432
Endogenous variables					rt roe bmm			
Exogenous variables					och mbh bi3 age ta ind			

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

According to Table 6 above, the shareholding ratio of external institutional investors did not significantly positively affect the business performance of the non-family-controlled international businesses in Models 1 and 2 (β= -0.019, p> .01, 1a of Model 1; β= 0.131, p> .01, 1b of Model 1; β= -0.016, p> 0.01, 1a of Model 2), (β= 0.131, p> 0.01, 1b of Model 2). The shareholding ratio of external institutional investors did not significantly positively affect the compensation of managers (β= -0.002, p> 0.01, 1c of Model 1; β= -0.042, p> 0.01, 1c of Model 2). The empirical results did not support Hypotheses 1-1 and 1-2 in this study.

The shareholding ratio of directors serving as managers did not significantly positively affect business performance (β= -0.026, p> 0.01, 1a of Model 1). However, the shareholding ratio of directors serving as managers significantly positively affected business accounting performance (β= 0.228, p< 0.05, 1b of Model 1). The shareholding ratio of directors serving as managers did not significantly positively affect business performance (β= -0.077, p> 0.01, 1a of Model 2), but significantly positively affected business accounting performance (β= 0.228, p< 0.01, 1b of Model 2). The results partially supported Hypothesis 2-1. The shareholding ratio of directors serving as managers did not significantly positively affect the compensation of managers (β= -0.005, p> 0.01, 1c of Model 1; β= 0.015, p> 0.01, 1c of Model 2). The results did not support Hypothesis 2-2 in this study.

The deviation of management rights from ownership rights did not significantly negatively affect business

performance (β= -0.011, p> 0.01, 1a of Model 1). However, the deviation of management rights from ownership rights significantly negatively affected business accounting performance (β= -0.224, p< 0.05, 1b of Model 1). The deviation of management rights from ownership rights did not significantly negatively affect business performance (β= -0.046, p> 0.01, 1a of Model 2). However, the deviation of management rights from ownership rights significantly negatively affected business accounting performance (β= -0.224, p< 0.05, 1b of Model 2). The results partially supported Hypothesis 3-1. The deviation of management rights from ownership rights did not significantly positively affect the compensation of managers (β= -0.037, p> 0.01, 1c of Model 1; β= -0.014, p> 0.01, 1c of Model 2). The results did not support Hypothesis 3-2 in this study.

Table 7. Empirical result of family-controlled international business

	model 1					model 2				
	rt(1a)		roe(1b)	bmm(1c)		rt(2a)		roe(2b)	bmm(2c)	
och	-0.004		0.006	0.115	***	-0.004		0.003	0.115	***
mbh	0.011		0.013	-0.038	**	0.039	**	0.009	-0.038	**
bi	-0.009		0.015	0.217	***	-0.011		0.008	0.217	***
age	-0.019		-0.006	-0.015		-0.045	**	0.002	-0.015	
ta	-0.332	**	0.042	-0.006		-0.053	*	0.051	* -0.006	
ind	-0.049	***	-0.007	0.049	**	-0.064	***	-0.005	0.049	**
F - test	0		0	0.937						
Hausman test	0.035		0.688							
final model	fixed		random	ols		three stages least square, 3SLS				
R-squared	0.002		0.001	0.081		0.007			0.081	
Endogenous variables						rt roe bmm				
Exogenous variables						och mbh bi3 age ta ind				

Note: business performance (rt); business accounting performance (roe); the compensation of managers (bmm); the shareholding ratio of external institutional investors (och); Shareholding ratio of directors serving as manager (mbh); the deviation of management rights and ownership (bi); corporate age (age); firm size (ta); the ratio of independent directors in the board of directors (ind).

According to Table 7 above, the shareholding ratio of external institutional investors did not significantly positively affect the business performance of the family-controlled businesses in Models 1 and 2 (β= -0.004, p> 0.01, 1a of Model 1; β= 0.006, p> 0.01, 1b of Model 1; β= -0.004, p> 0.01, 1a of Model 2; β= 0.003, p> 0.01, 1b of Model 2). The results did not support Hypothesis 1-1. The shareholding ratio of external institutional investors significantly positively affected the compensation of managers (β= 0.115, p< 0.01, 1c of Model 1; β= 0.115, p< 0.01, 1c of Model 2). The empirical results supported Hypothesis 1-2 in this study.

The shareholding ratio of directors serving as managers did not significantly positively affect business performance and accounting performance (β= 0.011, p> 0.01, 1a of Model 1; β= 0.013, p> 0.01, 1b of Model 1). The shareholding ratio of directors serving as managers significantly positively affected business performance (β= 0.039, p< 0.05, 1a of Model 2), but did not significantly positively affect business accounting performance (β= 0.009, p> 0.01, 1b of Model 2). The results partially supported Hypothesis 2-1. The shareholding ratio of directors serving as managers significantly negatively affected the compensation of managers (β= -0.038, p< 0.05, 1c of Model 1; β= -0.038, p< 0.05, 1c of Model 2). Therefore, the results did not support Hypothesis 2-2 in this study.

The deviation of management rights from ownership rights did not significantly negatively affect business performance and accounting performance (β= -0.009, p> 0.01, 1a of Model 1; β= 0.015, p> 0.01, 1b of Model 1; β= -0.009, p> 0.01, 1a of Model 1; β= -0.011, p> 0.01, 1a of Model 2; β= 0.008, p> 0.01, 1b of Model 2). The empirical result did not support Hypothesis 3-1. The deviation of management rights from ownership rights significantly positively affected the compensation of managers (β= 0.217, p< 0.01, 1c of Model 1; β= 0.217, p< 0.01, 1c of Model 2). The results supported Hypothesis 3-2 in this study.

5. Conclusion and Suggestion

Unlike Western countries, management and ownership in Taiwan is an overlap phenomenon, resulting in the board losing its supervisory function. Corporate external monitoring is more difficult to fully operate (Claessens et al., 1999). The empirical results of the study show that the shareholding ratio of external institutional investors did not significantly positively affect business performance in non-family-controlled international business or family-controlled international business. The results show that the external monitoring forces of non-family-controlled and family-controlled international business are not effective, verifying the conclusion by Claessens et al. (1999). However, in contrast to non-family-controlled international businesses, the shareholding ratio of external institutional investors significantly positively affected electronic, industrial, and traditional industrial company managers' compensation in family-controlled international businesses. Controlling shareholders combined with the board of directors and managers, forming a community of interest (Yang et al., 2012) that operates the firm. The results of non-family-controlled international businesses show that the shareholding ratio of directors serving as managers significantly positively affected accounting performance, indicating that the directors of non-family-controlled international businesses should be encouraged to serve as managers.

An extensive interest assimilation of the community of interest, which leads to supervision, is not effective and reduces firm value. In this situation, company managers profit personally, confirming the view of interest assimilation by Yang et al. (2012). The results verified that the deviation of management rights from ownership rights significantly negatively affected the business accounting performance of non-family-controlled international businesses. In contrast, the deviation of management rights and from ownership rights significantly positively affected the business compensation of managers. The members of a community of interest enjoy more inside information, causing severe information asymmetry, which leads to the pursuit of self-interest. These behaviors may infringe on the interests of external minority shareholders, causing severe agency problems (Chong, 2010; Liao, 2010; Yang et al., 2012).

The results of this study show that non-family-controlled international business can improve business performance by expanding the scale of the firm (Singh & Whittington, 1975). The results of this study show that business performance declines and accounting performance improves when a family-controlled international business expands the scale of the firm (Evans, 1987; Dunne & Hughes, 1994).

5.1 Managerial Relevance

The results of non-family-controlled international businesses companies indicate that, when directors serve as managers, business accounting performance is enhanced; however, when control rights considerably exceed ownership rights, business accounting performance declines. The results of family-controlled international businesses indicate that directors who serve as managers can monitor the compensation of a manager effectively; however, if control rights exceed ownership rights to a great extent, communities of interest can pursue selfish interests.

This paper indicates that directors should serve as managers to enhance business performance and oversee managers' compensation. In addition, controlling shareholders should serve as board members with a certain proportion to prevent excessive interest assimilation.

5.2 Research Limitations

The controlling shareholders of listed companies frequently own the stocks of their company using the names of other people, which indirectly causes the shareholding ratio to be inaccurate and possibly underestimated. If laws and decrees can be strictly enforced to eliminate this phenomenon in the future, efficiency monitoring and the convergence of interest of controlling shareholders may be seen to have a different influence on business performance or the compensation of manager.

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Leverage Risk. The Weight of Borrowed Capital Distinguishes the Solvency of Firms: An Empirical Analysis on a Sample of 4,500 Italian SMEs

Marco Muscettola[1]

[1] Indipendent researcher, Bari, Italy

Correspondence: Marco Muscettola, via Generale Scattaglia, 30/B, 70010 Adelfia (Ba), Italy. E-mail: marcomuscettola@hotmail.com

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Abstract

The analysis of the financial structure of firms is crucial in order to investigate their possibilities of profitable progress or, on the other hand, their probability of default. In this perspective, the aim of this work, which is supported by a large analysis sample, is to describe the structure of onerous debt in Italian SMEs and to decipher the possible links between it and the probability of default. We therefore intend to answer two questions: can insolvent firms be identified by analysing only the weight of financial debts? Is it possible to isolate a risk of leverage among the dangers leading companies to bankruptcy?

Keywords: financial indebtedness, default risk estimation, model accuracy

1. Introduction

The analysis of the financial structure of firms is crucial in order to investigate their possibilities of economic growth or, on the other hand, their probability of default. In this perspective, the aim of this work, which is supported by a large analysis sample, is to describe the structure of onerous debt of Italian SMEs and to decipher the possible links between it and the factors determining a firm's probability of default. This study only focusses on the interest payment burdens of non-financial corporations and on bank loans. Financial debt is defined here as bank loans and all borrowed funds. Intercompany loans, debt securities, bonds and trade credit are out of the leverage risk definition used in the present research.

With the aid of a large sample ensuring a wide representation of the universe of Italian SMEs, the present work offers a considerable contribution to the existing literature by emphasising the importance of financial sources as a durability variable of the same firms. In fact, this is the first paper which analyses onerous debt as the only dependent variable of bankruptcy. Moreover, unlike classic rating models, the present work regards an extended time horizon and, therefore, is more forward-looking. In this sense, the time frame is set at three years following rating attribution and, consequently, the explanatory variables refer to a previous three-year period. In such a phase of high tensions on the side of credit demand as the time period examined, this approach allows to cancel out part of the macroeconomic influences on the inherent risk of the firms within the sample.

The empirical research supporting the analysis investigates the firms' behaviour through the data examination of Italian commercial, manufacturing and service firms with revenues between 5 and 50 million euro. Thus, the final dataset lists the ordinary financial statements (not abbreviated) of 4,500 firms.

Using logistic regression, through the forward stepwise procedure, three rating scales will be created to estimate the firms' probability of default after three years. As previously mentioned, only five financial ratios calculated on borrowed capital or their financial burdens will be included within the set of indicators selected as explanatory variables.

As it will be shown, the analysis identifies significant connections between the structure of corporate debt and the crises of firms: in fact, regression functions are able to recognise the sample with a correct classification rate in spite of the fact that all profitability ratios, operating profit ratios, efficiency ratios and liquidity ratios are being excluded, as well as the ratios related to asset structure, cash flow statement or non-bank capital structure.

First of all, it is interesting to understand that the use of bank borrowing by Italian SMEs is a basic component of

the sources of support to investments. In some areas, financial debts account for even 40% of all the sources recognised in the balance sheet. One of the major problems of the financial indebtedness of the firms, i.e. the way Italian firms blend equity capital (capital risk) to borrowed capital in order to finance their investments, has always been the lack of alternatives to bank credit. For example, the bond market has always played a marginal role in Italy, because of both the entry costs and the trading of debt shares on secondary markets.

In order to prove the thesis that excessive bank indebtedness is a cause of insolvency and, therefore, to understand whether it is possible to isolate leverage risk as an additional danger that leads firms to bankruptcy, we studied the weight of borrowed capital in businesses during the year 2008 and we analysed which firms would be entering into default in 2011. While banks are not willing to disburse money (especially in large amounts) to companies facing a crisis, our model can define the bank indebtedness variable as a risk factor.

Following the global financial crisis which also involved the companies in our analysis sample, some market conditions have changed for the worse. The demand for industrial goods and services has declined, investments have reduced and the firms' production has lowered, thus causing a progressive decline in corporate profitability and the resulting self-financing. Furthermore, the problems related to the difficulties in collecting receivables or disposing of excess stocks have generated the need for the firms to meet growing financial requirements not dependent on productive investments. In this scenario, firms have increased their demand for bank loans, while banks have increased the spread between average and applied interest rate (Note 1) by increasing the criticality of creditworthiness, thus leaving out already over-indebted firms, with financial burdens that erode much of the EBITDA.

These firms are the ones that have not overcome the crisis, as this paper will show. In addition to all the other problems mentioned, these companies also present another risk factor: an excess of financial indebtedness, i.e. leverage risk. In this logic, and in the present paper, we only define "leverage risk" as the excess of bank borrowing to firms.

The paper is structured in six sections beyond the premise. In the second section, the major theories in the literature on the determinants of financing choice of the level of indebtedness will be quickly illustrated. In the third section, the sample used will be described. In the fourth one, the variables adopted in the analysis model will be presented. Section Five will pinpoint the construction of the model with the use of logistic regression and the resulting rating scales. The sixth section will set out the empirical analysis of the results and the model validation. Finally, the last section contains some concluding remarks.

2. Level of Corporate Indebtedness: Fundamentals of Literature Review

How and why firms combine equity to debts in order to finance their investments has been a key theme in literature for decades. Several theories have been elaborated in time, with the aim to explain how businesses should choose their optimal mix or indicate which factors are relevant for such choice. The main scholarly references on the subject are divided between three of the major theories on capital structure: The Trade-off theory (Note 2) (Modigliani & Miller, 1963; De Angelo & Masulis, 1980; Miller, 1977), the Pecking order theory (Note 3) (Myers, 1984; Myers & Majluf, 1984) and the Financial growth cycle theory (Note 4) (Berger & Udell, 1998).

The first real theory on the capital structure of firms is the leverage-indifference theorem by Modigliani and Miller (1958). These authors strongly demonstrated that firms choose their financial structure by counterbalancing tax benefits of debt with bankruptcy costs. A higher probability of insolvency is coupled with higher costs to be covered; consequently, riskier firms have an unbalanced financial leverage tending towards equity capital, unlike stronger firms and/or businesses with less failure costs to compensate for (Note 5).

Among the major obstacles within the system which prevent the choice of an optimal leverage ratio, the agency conflicts between management and shareholders and the opposing goals of shareholders and creditors are noteworthy (Note 6).

An alternative approach to trade-off theory originated with some studies by Myers (1984). He claimed that the implicit costs related to the expansion of the firm's assets overshadow the other costs associated with new debt or taxes by increasingly tipping the scales towards undercapitalisation. Myers also argues that a firm supports its investments by preferring cash flow at first, then envisioning indebtedness as a necessary form of further financial support. Its own assets are seen as a last resort.

This preamble is the forerunner of all the studies and empirical research based on hierarchical strategies of corporate decisions. In other words, the majority of economists (Note 7) are rather inclined to look at the problem of optimal capital structure as a series of choices that managers must make with an ordinal preference

which, at times, is unrelated to the costs and benefits resulting therefrom (Note 8).

In support of the thesis that the ownership structure of a firm can condition the composition of debt, a multitude of statistical analyses have followed. One of the most acclaimed in-depth studies on the issue is the one by Fama and French (2002). With the help of empirical evidence on a large sample of U.S. firms, these scholars partly denied both *trade-off* and *pecking order* theories (Note 9).

Using a more traditional methodology may lead to mistakenly associate a firm's probability of financial crisis to the historical frequency of business failures occurred in similar companies. Following this line first suggested by Taggart (1977) and later by Graham (2000), it is clear that crisis costs are undervalued. This is because the historical default rate is much lower than the probability of crisis and, as a result, firms will be considered insufficiently in debt.

What has just been stated is one of the main reasons for criticism of static models. Almeida and Philippon (2007) point out that the benefit of a loan to a firm in crisis is much higher than in normal situations and, therefore, a standard probability of default should not be used to define and quantify the risk of insolvency. A firm in financial straits faces higher bankruptcy costs than the ones that can be estimated by using static and traditional methods related to actual historical default trends.

Several features are still evident and commonly accepted in all previous empirical studies. In an analysis conducted by various authors on a large sample of large American firms between 1974 and 2008, some seemingly indisputable links with the capitalisation level of the firm can be deduced. First of all, some parameters show a curvilinear trend (Kisgen, 2006). Indeed, the debt load increases in parallel with firm size and profitability (Note 10) only up to a given point, then it decreases and levels off at lower average values in relation to an even higher level of liabilities.

The contribution of Rauh and Sufi (2010) on a sample of American publicly traded companies is also very useful in virtue of its the link with business profitability. The authors note that firms whose ratings are taken down a notch due to financial (external or market-related) difficulties are able to adjust to their new rating class within a few years by recovering similar structural compositions. In other words, after a worsening income, businesses adjust their financial and capital structure to their new income conditions (Note 11).

Some studies investigating the reasons that lead companies to the choice of funding have also focussed on corporate structural peculiarities regarding other typical non-financial stakeholders, such as the employees *in primis* (Berk et al., 2010; Matsa, 2010), but also the suppliers and the customers (Kale & Shahrur, 2007). It has been statistically noted that the capital structure is affected by them and can depend on the conflicting interests of these very subjects in the company.

Titman and Wessels (1988) showed that failure costs also have an indirect relationship with the sales performance, the amount of customers and the deferral of trade payments. Therefore, the firms that are more likely to be put in financial disarray find it more difficult to obtain credit by suppliers (Banerjee et al., 2008) and the monetary cycle is visibly and negatively influenced by this, with consequent imbalances towards bank lending.

Although several acclaimed studies have been conducted in the search for a unifying parameter allowing to identify financial leverage and to explain its dynamics, it is still difficult to reconcile the various arguments on the matter, as Welch (2004) states. In line with the results achieved by MacKay and Phillips (2005), Lemmon et al. (2008) summarise the scholars' assumptions by stating that the changes in indebtedness levels are more usual in a firm with respect to changes in industry averages, and they are more regular in a delimited market compared to the changes in terms of typology of firm.

In summary, no unifying theory of indebtedness has been developed to date, because the complexity of the matter (Marsh, 1982) has always led to a partial and systemic discussion. In fact, it is only recently that business theories considering both risk analysis of financial debts and the consequences in terms of value creation have been developed. Such analysis is defined as "contingent claim approach".

Borrowed capital, therefore, can either create or destroy wealth. In addition to economic doctrines, some theories of business economics have also been developed. These theories claim that the choice of indebtedness is not only an important decision for a firm, but it also increases the possibility of supporting investments by producing some prospects of profitability, if the returns of loans are higher than the financing costs. Moreover, such prospects of profitability mean development and wealth.

Although the decision to choose debt over equity may engender some significant possibilities of benefit, it also inevitably involves an increase in the financial risk of the specific firm, especially in certain bank-based areas

(Foglia et al., 1998), since it makes the cost structure stiffer and increases the financial outlays. In turn, this higher risk influences the basis on which the same external financiers judge the financial dynamics of firms (i.e., their creditworthiness) and the borrower's business.

"Relationship lending theories" (Rajan & Zingales, 2003) derive from these observations. Depending on the economic specificities of the local context, there will either be a bank-based financial system (Continental Europe) in which the close relationships between banks and companies predominate and creditors are better protected, or a market-based financial system (England and USA) where firms choose access to bank credit market only if the natural cash flow is no longer sufficient and there are no binding and lasting relationships between firms and lending institutions. Depending on the relationship between firms and moneylenders, the existing literature identifies two different types of financial support: *arm's length financing* (Note 12) or *informed financing* (Note 13).

In order to understand the dynamics of borrowed capital, therefore, it is appropriate to consider these theories as well, which are of great significance to the authors, as they believe that a close and lasting relationship between the bank and the firm further reduces asymmetric information and agency costs, thus increasing bank credit availability (Morellec & Schrhoff, 2010).

3. Sample Presentation: Dataset

The firms analysed are small and medium-sized enterprises (SMEs) with revenues from 5 million to 50 million euro, operating in Italy for at least 8 years. In order to equipoise the sample in the most balanced way, 4,500 firms were extracted from the bulk sample. Their characteristics are summarised in Table 1.

Table 1. Characteristics of the sample used in the research

	Whole Sample		Bad Firms		Good Firms	
	Nr	%	Nr	%	Nr	%
Manufactoring Firms	1,500	100.00	156	10.40	1,344	89.60
Commercial Firms	1,500	100.00	115	7.67	1,385	92.33
Service Firms	1,500	100.00	93	6.20	1,407	93.80
Northern Italy	2,629	100.00	158	6.01	2,471	93.99
Central Italy	1,091	100.00	110	10.08	981	89.92
Southern Italy	780	100.00	96	12.31	684	87.69
Whole Sample	4,500	100.00	364	8.09	4,136	91.91

The reference year for the analysis was 2008. All the firms which have not been insolvent at least until the year 2011 are considered "good firms". On the other hand, firms that have become insolvent before the three years following the year of analysis have been eliminated (Note 14). In this way the time frame has been set as three consecutive years.

All the firms that have shown significant shareholdings in other companies or, on the other hand, have depended on a parent company, as well as financial companies, farms, construction companies and all the companies that have revealed (as can be found by reading the performance of their financial statements) some fluctuations in sales revenues, in returns or in the main items of their balance sheet over the past four years have been excluded from the analysis.

As for the meaning of "bad firm", we refer to a standardised definition like the one formulated by the Basel Committee (Note 15). Those firms that have been reported by the Central Credit Register of the Bank of Italy as distressed and past-due, the firms that have initiated bankruptcy proceedings, and the firms that have a serious negative act report (judicial or legal mortgage ...) will therefore be defined insolvent. In other words, a firm is defined insolvent exclusively via objective sources.

The financial ratios, which formed the explanatory variables of our model, were determined by yearly statements belonging to 4,500 unique firms from 2008 to 2010 (Note 16), as mentioned above.

Before we start describing the impact of borrowed capital on the probability of default, however, it is necessary to highlight certain assumptions regarding the heterogeneity of the sample used. To be more specific, the level of

indebtedness is also a consequence of the type of business conducted by the firms, as will be seen in the tables below. It is sufficiently evident that a manufacturing firm generally needs a greater amount of investments and infrastructure in order to be able to follow its mission (production), especially if compared to service firms. On the other hand, a manufacturing firm will need more capital, thus using more financial funding to support its heaviest production cycle. For these reasons, we decided to distinguish three sub-samples within the analysis depending on the type of activity carried out primarily by the firm. The 4,500 firms are divided in 1,500 commercial firms, 1,500 service firms and 1,500 manufacturing firms.

By contrast, the following graph shows the incidence of financial debts on the balance sheet total (total assets) for the group of good firms and for those that have become insolvent after three years, in view of the geographical area in which the firm is operating and its macro sector.

The first observation concerns the impact of borrowings on firms in default after three years–an impact which already has a much higher value than that of good firms. In some parts of Italy, firms becoming insolvent in 2011 have financial debts over 40% of their total corporate sources (liabilities and shareholders' equity), in contrast with a significantly lower Italian average for firms remaining healthy during all the years of our examination.

The second interesting observation is related to an uncertain trend and a separation which is not so clear-cut between good and bad firms as regards Southern Italian companies. It is found that insolvent manufacturing firms located in Southern Italy have a lower portion of borrowed capital than good firms, as if in these areas the risk of default could be dependent on other factors than over-indebtedness or other causes that have generated a more rapid deterioration in financial ratios.

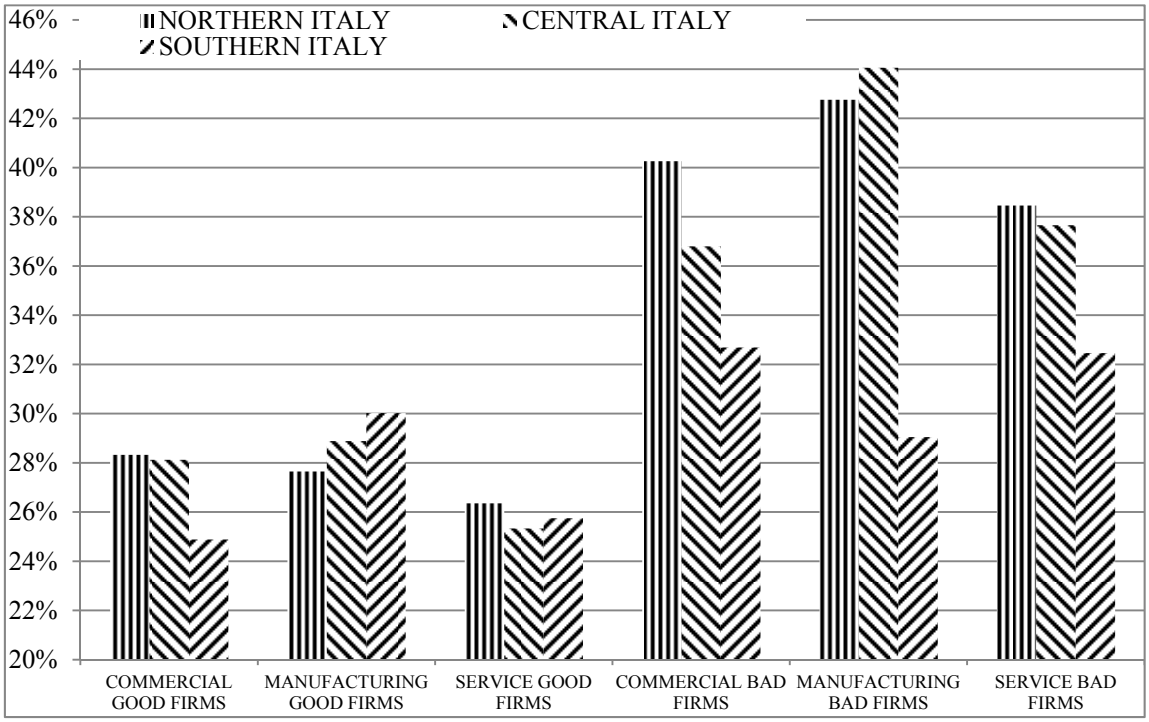

Figure 1. Graph showing the incidence of financial debts on total of the liabilities and shareholders' equity in consideration of the firms' status, geographical location and type of business

With regard to the capitalisation of the firms that will become insolvent, it is quite logical and generally accepted that companies in distress or, even worse, which will become insolvent have a lower strength of self-accumulation of income. After all, financial or economic losses do nothing but worsen financial relations by affecting risk capital (equity) above all.

In this sense, regardless of the cause or consequence (Note 17), apart from some exceptions, it would appear that firms facing *default* in 2011 were on average already more indebted back in 2008. A large percentage of bad firms tended to use external finance (borrowed capital) in order to develop at a rate that was higher than the one

determined by their internal capitals alone. An essential aspect for evaluating debt sustainability is the debt service burden of firms. It reproduces the combined burden of firms arising from their interest expenses and their debt reimbursement obligations.

4. Explanatory Variables

The financial ratios used as independent variables in the model are only 5 quotients taken from the financial statements from 2008 to 2010 (Note 18) identifying the weight of borrowed capital (Note 19). In order to obtain a working model, empirically verifiable all time long and transferable (in time and space (Note 20)), it is necessary to use clear and valid information sources and attainable data measurable in time (Gai, 2008).

The continuous variables are winsorized at the 1% and 99% levels to mitigate the influence of extreme values (*outliers*) and the missing values are replaced by averages relating to percentile of reference by a predetermined table (*winsorization method*).

The explanatory variables taken into account for the present study are the following five financial ratios:

1). Financial debts / Total assets (FDoA), i.e. the ratio between the total of the financial debts taken out by the company, with short-term and long-term maturity, and the total assets recorded in the financial statements;

2). Interest expense / Total debts (IEoD), i.e. the ratio between financial interests (financial expenses) and total debts of any type and with any deadline;

3). Interest expense / Financial debts (IEoFD), i.e. the ratio between interest expense and, this time, only financial liabilities as they have been already defined;

4). Interest expense / Sales (IEoS), i.e. the ratio between interest expense and sales revenue;

5). Financial debts / Shareholder's equity (FDoE), i.e. the ratio between financial liabilities and total equity entered in the accounts.

Although there is a strong correlation between the five variables adopted, as the table below shows, the small number of the parameters used excludes any distorting phenomena, such as overfitting.

Table 2. Matrix of correlations between the selected independent variables

	IEoD	IEoFD	IEoS	FDoE
FDoA	0.561	0.627	0.535	0.458
IEoD		0.168	0.660	0.193
IEoFD			0.196	0.248
IEoS				0.190

FDoA= financial debts on total assets, IEoD= interest expense on total debts, IEoFD= interest expense on total financial debts, IEoS= interest expense on total sales, FDoE= financial debts on Equity.

The following sets out the average data for the financial ratios used in the model by identifying the cluster sample by place of business, prevailing sector and status (good or bad firms).

As claimed by much of the literature on the statistical significance of financial ratios (Muscettola & Pietrovito, 2012a), one of the indicators that–taken individually–is able to better discriminate the sample of good firms from the ones that will become insolvent in 2011 is the ratio between the interest expense and sales (IEoS). In fact, the difference between the averages of the two sub-samples is fairly evident also in the sample of SMEs analysed.

All the other indicators show an equally fair ability to separate the two groups of firms, even three years before insolvency.

Table 3. Averages of financial data by sector, status and geographical location of business

			FDoA	IEoD	IEoFD	IEoS	FDoE
COMMERCIAL FIRMS	Whole Sample		27.98	2.50	14.00	1.25	3.80
	Good Firms	Northern Italy	28.33	2.39	14.04	1.18	3.82
		Central Italy	28.13	2.59	13.83	1.29	3.79
		Southern Italy	24.89	2.63	14.84	1.31	3.09
	Bad Firms	Northern Italy	40.26	3.62	8.65	2.32	7.44
		Central Italy	36.80	2.91	9.91	2.00	9.49
		Southern Italy	32.70	3.37	9.78	2.24	4.81
MANUFACTURING FIRMS	Whole Sample		2.59	12.58	1.61	2.90	2.59
	Good Firms	Northern Italy	27.65	2.44	13.13	1.46	2.78
		Central Italy	28.89	2.69	11.96	1.67	3.07
		Southern Italy	30.03	3.07	10.90	2.08	2.43
	Bad Firms	Northern Italy	42.77	3.84	8.00	3.03	4.84
		Central Italy	44.06	3.95	8.09	3.41	5.97
		Southern Italy	29.05	3.27	9.74	3.26	2.38
SERVICE FIRMS	Whole Sample		26.56	2.28	15.97	1.85	3.90
	Good Firms	Northern Italy	26.36	2.13	16.33	1.69	3.90
		Central Italy	25.34	2.33	16.13	1.93	3.61
		Southern Italy	25.75	2.66	15.57	2.02	3.08
	Bad Firms	Northern Italy	38.47	3.28	9.18	3.55	8.25
		Central Italy	37.67	3.27	10.94	3.73	6.34
		Southern Italy	32.47	4.74	12.08	3.56	6.69

FDoA= financial debts on total assets, IEoD= interest expense on total debts, IEoFD= interest expense on total financial debts, IEoS= interest expense on total sales, FDoE= financial debts on Equity.

In order to better examine the relative distances between the averages of the two samples, the analysis of normalised averages described below is used.

Standard scores enable scores from different tests to be compared on a common scale (Note 21). For this matter standard scores are used in our paper as a descriptive analysis aiming to compare the distributions of the sub-samples of the present study. They also help to compare the level of performance at different times. As such, each raw score may be given an equivalent "z-score". A score that is exactly on the mean of good firms corresponds to a z of 0.

The diagrammes below (*Figure 2*) clearly show how the standardised variables referred to bad firms are distant from the averages of good firms.

The other important aspect the graph highlights is that, quite unexpectably, there is no visible deterioration of the indicators as the year of default approaches, as it is usually the case with other types of financial indicators (Muscettola & Pietrovito, 2012b). If we exclude the trend of the relationship between interest expense and sales (especially with regard to samples of commercial and manufacturing firms), this can lead to the presumption that these indicators can be excellent predictive factors even three years before the insolvency (Muscettola & Naccarato, 2013), in contrast to other ratios which are good markers only for the year prior to the crisis, when it probably is too late.

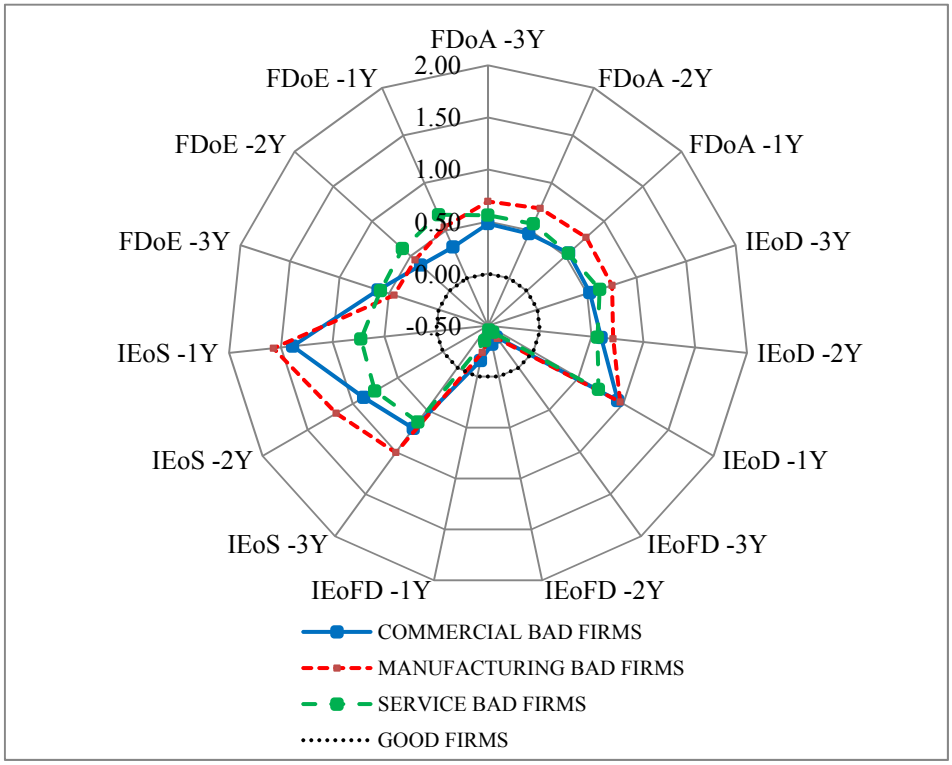

Figure 2. Graph showing the trend of the averages standardised of the bad firms in consideration of the type of business and the year prior to default

5. Analysis Model and Rating Scales

The technique of logistic regression used with the forward stepwise method allows us to build three regression functions, one for each macro-sector, capable of distinguishing good firms from bad firms. The logit regression is calculated by relying exclusively on the five ratios specified above (independent variables) and dividing the analysis sample by type of activity carried out by the firms. After that, we will have three rating scales to be associated with our test sample.

A logistic model is a binary choice model where the dependent variable may only assume two possible values. In our case, p_i is included in the range (0; 1) and represents the probability of default, which assumes the value "1" if the i-th firm is insolvent in 2011 and the value "0" for good firms.

To assess the unknown, therefore, and to prove the hypothesis of this paper, we employ logistic regression with a variable-reduction process known as "forward stepwise". This is a renowned heuristic method with low computational complexity. In this process, each of the five financial ratios is tried, one at a time, and 5 one-variable regression models are created (Note 22). The last step, instead, stands for detecting the best mixture of explanatory variables, presupposing a cause-effect relationship between the identified "x" inputs.

Indicating p_i as the probability that the i-th firm may join the group of the defaulting firms after three years, $x_{1\text{-}5}$ as the set of the five financial statement variables, k as constant and $\beta_{1\text{-}5}$ as the coefficients of the variables, it is possible to write the function of the logistic model, in which the probability is a linear function of the indicators and the model parameters ($\beta_{1\text{-}5}$) are designed via the maximum likelihood estimation, in the following manner:

$$p_i = f(k + \beta_1 x_1^i + \beta_2 x_2^i + \ldots + \beta_5 x_5^i) = \frac{1}{1 + e^{-(\alpha + \beta_1 x_1^i + \beta_2 x_2^i + \ldots + \beta_5 x_5^i)}} \quad (1)$$

Table 4, 5 and 6 report the results of the stepwise logistic regression that counts the five explanatory variables which fix the probability of default.

The tables expose the coefficients (β) of the factors with a significance level comprised between 1% and 5% where "β" is the estimated coefficient of the logistic regression, "S.E." denotes the standard error of the estimated coefficients (Note 23), "wald" is the Wald chi-square test (Note 24), "sig." specifies the *p-value* of the

estimated coefficient (Note 25), "Exp(β)" is the change in the odds ratio associated with a 1 unit change in the predictor variable.

Table 4. Stepwise logistic regression. Functions calculated on commercial firms in 2008

	β	E.S.	Wald	Sig.	Exp(β)	95% CI for EXP(β)	
						Lower	Upper
FDoA	0.0307	0.0053	33.7719	0.0000	1.0311	1.0205	1.0419
IEoD	0.1357	0.0667	4.1382	0.0419	1.1453	1.0050	1.3052
IEoS	0.2101	0.0520	16.3529	0.0001	1.2338	1.1144	1.3661
Constant	-5.1200	0.2445	438.5563	0.0000	0.0060		

FDoA= financial debts on total assets, IEoD= interest expense on total debts, IEoS= interest expense on total sales.

Table 5. Stepwise logistic regression. Functions calculated on manufacturing firms in 2008

	β	E.S.	Wald	Sig.	Exp(β)	95% CI for EXP(β)	
						Lower	Upper
IEoFD	-0.0270	0.0126	4.5920	0.0321	0.9734	0.9497	0.9977
IEoS	0.2939	0.0491	35.8942	0.0000	1.3417	1.2187	1.4771
FDoE	0.0536	0.0112	22.8591	0.0000	1.0551	1.0321	1.0785
Constant	-3.9711	0.2104	356.3794	0.0000	0.0189		

IEoFD= interest expense on total financial debts, IEoS= interest expense on total sales, FDoE= financial debts on Equity.

Table 6. Stepwise logistic regression. Functions calculated on service firms in 2008

	β	E.S.	Wald	Sig.	Exp(β)	95% CI for EXP(β)	
						Lower	Upper
FDoA	0.0254	0.0067	14.6340	0.0001	1.0258	1.0125	1.0392
FDoE	0.0369	0.0155	5.6683	0.0173	1.0376	1.0065	1.0696
Constant	-4.1187	0.2412	291.5145	0.0000	0.0163		

FDoA= financial debts on total assets, FDoE= financial debts on Equity.

Each of the five indices contributed at least once to forming the regression function. The relationship between interest expense and financial debts (IEoFD) is the only parameter that showed an opposite sign (negative coefficient), thus demonstrating that as the variable increases, the factor value decreases and, presumably, the probability of default of the firm decreases as well. This phenomenon stresses once again the statistical significance in order to predict both insolvency and the burden of borrowed capital, which in this particular index is placed in the denominator.

Equally noteworthy is the relevance in the functions of the variable formed by the ratio between interest expense and sales (IEoS).

The construction of the rating scales occurs in connection with the type of sample used (Muscettola, 2010). In that way there will be three rating scales considering the three logistic functions remarked.

Given the values for a set of predictors, we can foresee the probability that each observation may belong to a class of ranking. Through a binary response, the logistic model determines the subdivision of the test sample into ten equally numerous classes (Note 26). There is a 10% probability that each observation may belong to each of the ten ordinal classes (Note 27). In order to shape the optimal cut-off between each class, we have been making use of the technique of the median (Muscettola & Gallo, 2007): cut-off value for a two-class case is 0.5. This is done by setting a cut-off value, so that observations with probabilities above the average of the individual decile can be categorised as belonging to upper class, and moreover observations with probabilities below this average

are classified as belonging to lower class (Note 28).

6. Results and Model Validation

Firms with high levels of financial indebtedness have denoted a greater vulnerability which, in changing (or worsening, as in these years of financial crisis) market conditions, led them to a greater probability of bankruptcy.

As seen in the previous sections of the study and as will be stated in this paragraph, the accounting items placed in the denominator of three variables (assets, sales and total equity) have undergone a parallel change because of both the global economic crisis and the specific individual decline of bad firms by bringing the value of these factors to values higher than good firms, however not so evidently, as can be seen in table 7. Even within a reasonable period prior to default (3 years earlier), in a period in which supposedly the firm had not fallen into a crisis yet, the ratios between total borrowings and equity or between interest expense and sales were already leaning visibly towards borrowed capitals and its relative costs (financial expenses).

By now, it is possible to suppose that the excessive bank debt of firms may be a causal factor of individual business disruptions rather than a consequence of the current economic events or other internal accounting factors.

Table 7. Trend analysis of the averages of bad firms taking into account the year prior to default

Bad Firms in 2011		2008	2009	2010
FDoA	Commercial Firms	37.33	37.41	38.51
	Manufactoring Firms	42.02	42.48	43.04
	Service Firms	37.81	37.01	36.90
IEoD	Commercial Firms	3.39	3.86	3.71
	Manufactoring Firms	3.83	4.10	3.74
	Service Firms	3.40	3.51	3.31
IEoFD	Commercial Firms	9.24	9.98	11.07
	Manufactoring Firms	8.25	8.27	9.23
	Service Firms	9.77	9.13	10.12
IEoS	Commercial Firms	2.19	2.62	3.05
	Manufactoring Firms	3.12	3.65	3.94
	Service Firms	3.48	3.78	3.56
FDoE	Commercial Firms	7.30	5.43	5.01
	Manufactoring Firms	4.92	4.45	4.73
	Service Firms	7.41	6.57	7.33

Year 2008= 3 years earlier, year 2009= two years earlier, year 2010= one year earlier. FDoA = financial debts on total assets, IEoD= interest expense on total debts, IEoFD= interest expense on total financial debts, IEoS= interest expense on total sales, FDoE= financial debts on Equity.

In our model, accuracy is used as a statistical measure of how well a binary classification test correctly detects or rejects a condition. The accuracy of a measurement system is the degree of closeness of dimensions of a quantity to that quantity's actual (true) value. As for the model validation, most of the accuracies discussed in literature are the accuracy rates obtained one year prior to failure. Our models consider the possibility to predict bankruptcy much sooner: three years before default (Note 29).

There are various performance measures of model accuracy. The most widely-used tool for assessing a model's ability to correctly rank-order ex-post default risk is a methods based on the confusion matrix (contingency table). In order to validate the predictive performance of statistical models, we rely on standard accuracy measures. In this way the model validation is established on the accuracy level. In our study the accuracy, in fact, is the percentage of true results (both true positives and true negatives) in the population. It is a parameter of the test.

$$\text{accuracy} = \frac{\text{number of true positives} + \text{number of true negatives}}{\text{number of true positives} + \text{false positives} + \text{false negatives} + \text{true negatives}} \quad (2)$$

The bankruptcy prediction literature continually refers also to Type I and Type II errors. Type I errors are the misclassification of bankrupt firms as good firms (false positive). Vice versa, Type II errors are the misclassification of good firms as bad firms (false negative) (Note 30).

As of the false positive (Type I Error) or the false negative (Type II Error), they relate to default/excellence cases situated into the best/worst three classes of rating. After splitting the sample into classes of membership we take a survey on the distribution of the cases default, in connection with the rating scale and the sample used.

Table 8 shows that the greatest number of accurate classifications concerns Northern Italian firms, followed by those in Central Italy. However, more misclassifications occurred within the sample of Southern Italian firms, especially in the service sector, although this phenomenon is mainly due to the scarcity of the sample analysed (only 25 bad firms) (Note 31).

Table 8. Model validation. Model accuracy based on logistic regression models

Rating	**Commercial Firms**			**Manufactoring Firms**			**Service Firms**		
Scales	North	Centre	South	North	Centre	South	North	Centre	South
1	0	1	1	0	0	1	0	0	0
2	0	0	0	0	1	1	0	1	2
3	1	2	4	1	0	2	1	1	1
4	2	0	1	0	1	2	3	2	2
5	3	2	1	4	2	3	3	2	2
6	3	5	2	5	4	6	5	1	3
7	5	5	2	8	4	6	4	2	5
8	4	4	9	7	7	6	8	5	4
9	11	8	6	8	11	4	7	5	4
10	16	13	4	37	16	10	12	6	2
Error Type I	26.76	27.23	34.57	29.99	30.22	46.53	29.12	27.40	51.47
Error Type II	31.11	37.50	36.67	25.71	26.09	51.22	37.21	36.00	60.00
Accuracy	**73.13**	**72.38**	**65.33**	**70.13**	**70.02**	**52.91**	**70.49**	**72.20**	**47.60**

With regard to manufacturing and commercial firms operating in Central and Northern Italy, the higher frequency of insolvencies can always be identified within the worst class of rating. In the last decile of the total population, in fact, more than 32% of bad firms are found. If we sum the last two rating classes, then, the above percentage rises to 50% of bad firms on the total number of insolvent companies. If we exclude Southern Italy firms, mixing our data with other aspects that are not purely commercial or financial (Muscettola & Modina, 2013), figures become even more significant (37% in the last class and 56% in the last two classes), with only 3 cases of insolvent firms ranked in the first two rating classes.

In conclusion, our model shows preciseness with an accuracy level of over 70% which confirms the statistical implication of the variables engaged to properly predict the default (Ohlson, 1980; Barontini, 2000).

7. Conclusion

Banks generally play a crucial role in the economic development of every country. The capital structure decision, on the other side, is decisive for any business organisation. The findings of this study reveal a significantly positive relation between borrowed capital and the probability of default of firms. These results imply that an increase in financial debt position is associated with a decrease in solvency (Note 32).

Although financial leverage provides the firms with more opportunities for productive investments, it increases their probability of default more than proportionally, with all the imaginable negative consequences for business management or the pricing of the borrowings, for example. The substantial level of debt of non-financial firms

by historical canons entails that it remains an important source of vulnerability for the outlook of SMEs, in particular with respect to risks associated with increased costs of debt financing or to variability of the market. The firms that have not overcome the economic crisis, in fact, are those which already had a strong financial indebtedness back in 2008 and, more importantly, which had an onerousness of debts that burdened the income produced.

Taking a look back at the two research questions in the introduction of this study:

1) Can insolvent firms be identified by analysing their weight of financial debt only?

The analysis has demonstrated that a model for selecting firms which is built solely with financial indebtedness of said firms actually works. The results exposed in the tables prove the model's appreciable ability in the year 2008 to select firms which would become insolvent in 2011. The large number of accurate classifications is indeed remarkable, even in spite of the fact that the analysis was carried out with three years in advance, in a period prior to the global economic crisis and, most importantly, excluding all the ratios and variables which do not strictly concern the financial debts of the firms.

2) Is it possible to identify a "leverage risk" among the dangers that can lead a firm to default?

The empirical evidence of our essay on a sample of 4,500 firms has demonstrated the logical (cause-effect) and statistically significant relationship between the structure of onerous debts of firms and the series of corporate failures. Due to a worsening macroeconomic trend, firms already too financially exposed to the banking system could not access the external financing needed to further support their financial requirements, thus making their internal financial equilibrium and their debt sustainability even more unstable. Leverage risk should be restricted, defined and analysed according to this specific condition.

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Notes

Note 1. As a confirmation of the necessity of a higher risk premium and the sensitivity of pricing to creditworthiness.

Note 2. This theory states that firms look for an optimal capital structure for each type of business, based on the quantification of the costs and the benefits of debt.

Note 3. The theory is based on the removal of the hypothesis of perfect information. Since corporate management knows the true value of the asset, it considers financing one's investments primarily through cash flow and then through debt as a more cost-effective solution. The firms applying this theory see equity only as a last resort.

Note 4. As their size and years of business increase, firms show an ever-growing tendency to rely on differentiated funding arrangements. The interest in various financing channels is therefore closely related to the age and the category of businesses. The traditional hierarchy, therefore, is to be amended not only in the light of a firm's size, but also of the degree of development of a productive project, to which different levels of information opacity and financial need may correspond.

Note 5. The theory also applies to "traditional firms" that have a higher incidence of tangible fixed assets on intangibles. They denote, by definition, a greater recoverability after default than more innovative businesses. These firms consequently have lower bankruptcy costs and, therefore, can afford a higher leverage degree.

Note 6. Gibson and Graham (1996) show that the ratio between the financial leverage and the firm's market value tends to be negative. In terms of opportunities, low-growth firms are more exposed to conflicts between management and shareholders, while conflicts between management and creditors are more likely to occur in high-growth companies. In other words, the increase of the value of the shares of a company should correspond to a decrease in the power of management to contract new debts. On the other hand, in the light of the aforementioned conflicts between the powers that be, Mackie and Mason (1990) describe those firms with great profitability, and with a greater loss of added value caused by the payment of taxes, as firms with a prevalence of administrative power over the strength of their shareholders. By inference, their debt load is consequently heavier.

Note 7. However, empirical evidence derived from this method of analysis has shown several limitations in explaining the hierarchy of corporate financing choices, especially if referring to the most recent analyses. Frank and Goyal (2003), for instance, have raised several questions about the validity of the theory on a larger sample than Myers's.

Note 8. It is reasonable to think that in order to support their activities, firms resort to equity first, since it has no immediate costs, and to debts later. As regards external capital, it is plausible that firms choose trade payables first and financial debts and bond issue later, in a hierarchical order.

Note 9. Firstly, the authors proved that financial leverage tends to converge very slowly towards a fixed point from which it deviates only provisionally. Secondly, they described the most profitable firms as the least indebted ones as well, although they would have to compensate for higher returns with higher borrowing costs. Other well-known studies which denied the validity of a ranking in funding choices applying to every situation were performed by Chrinko and Singha (2000) and Leary and Roberts (2010).

Note 10. Among the most controversial points of the entire literature on optimal capital structure, however, there is the understanding of the link (and the direction) between leverage and business profitability. Despite many congenital deficiencies in several empirical studies, many authors have stressed the predominance of a negative relation between the two quantities: as indebtedness decreases, profitability decreases. This inverse proportion, however, is not consistent with the theory of debt as a tax benefit (Graham, 2000) to find a balance between the choice of leverage and a strategy of costs and benefits in a market of indifference.

Note 11. This could mean that capital structure is a direct consequence of business prospects.

Note 12. The bank acts mainly as an intermediary and intervenes to facilitate access to the market.

Note 13. The bank lends money and engages in a close, long-standing relationship with the firm mainly based on information not available to the public (*relationship-based systems*).

Note 14. The analysis does not cover all the firms which got insolvent in 2008, in 2009 and in 2010, but only the firms that became insolvent in 2011.

Note 15. This definition is narrower than the one generally applied in bank rating models, as these consider default to be the onset of serious financial distress which borrowers cannot solve if unaided, and through which the credit and loans granted may be lost. In our model, a firm was considered as default-grade during year 2011 if in that year the Central Credit Register reports the existence of credit overdue for more than three months.

Note 16. The yearly statements are provided by FourFinance Sas, which assembled, cleaned, regulated and reclassified financial statements collected from multiple databases as, above all, Cerved Group Spa and Crif Spa. As for the creation of the statistical model, the preliminary operations on the data, the choice of the outliers and the creation of financial ratios, the reader ought to refer exclusively to the authors.

Note 17. It is not easy to say whether the excess of financial indebtedness may be the cause or the effect of a poor corporate capitalization.

Note 18. The financial statements from 2008 to 2010 were provided by FourFinance SAS.

Note 19. Financial debt is defined here as bank loans and all borrowed funds not including inter-company loans, debt securities, bonds and trade credits.

Note 20. To that aim, the distinction of the segments of the sample was simplified and the model was built with a non-excessive series of variables linkable to a large and available data collection.

Note 21. A standard score is a consequential point that expresses how far a raw score is from some reference point such as the mean in terms of standard deviation units. In other words, it is a measure of relative position that is applicable when the data for the test are in the interval or ratio scale of measurement. Such modelling technique allows us to compare the averages of financial ratios referred to the different area sectors in a unique chart displaying an overview of the peculiarities of firms.

Note 22. The progression is repeated until no new variables make any significant contribution to the model. In this way, the model allows a massive use of all the five financial variables starting from the financial ratios which can demonstrate the most predictive strength.

Note 23. It indicates the standard deviation of the difference between the estimated values and true values.

Note 24. It tests the null hypothesis that the constant equals 0. This hypothesis is rejected when the *p-value* (called "sig.") is smaller than the critical *p-value*.

Note 25. P-value indicates, therefore, how likely (high values) or improbable (low values) is the possibility to observe exactly the "x value" of the test statistic x under the null hypothesis. The *p-value* indicates the minimum level of significance for which the null hypothesis is rejected.

Note 26. A rating on a scale of 1 to 10 where 1 is best, 10 is worst, and each number corresponds to an increment of 10 percentage points.

Note 27. Ordinal classes are sessions that have a consequential order. There are several ways to extend the binary-class case. In this paper we define the cumulative logistic method. Here, in fact, we look at cumulative probabilities of class membership. For other methods see (Hosmer & Lemeshow, 2000).

Note 28. The motivation is to observe the class in which its probability of membership is highest. The overall precision is designed for many values of the cut-off value, and the cut-off value that obtains maximum accuracy is chosen.

Note 29. The effective accuracy of the model estimation increases as rapidly as the timeframe of the analysis is shortened and it is also clear that the estimated coefficients of the logistic regression change markedly when the time horizon is lengthened.

Note 30. It is generally agreed upon that Type I errors are more costly than Type II errors. That is calculated in an expense twenty times higher than Type II errors.

Note 31. As for Southern Italian firms, in fact, there are more data to be considered. The demand of credit bank exceeds supply, but banks are not willing to either loan more funds or raise the interest rate charged, as they are

already maximizing profits with a situation of increased risk aversion. All this leads to a more selective credit market (Ferri & Bongini, 2005) where the conditions of access to credit are more complex. We ultimately see how firms with a higher cash flow level are–quite unjustifiably on the level of corporate demand–also the most indebted with the banks which, on the other hand, prefer to employ their assets in firms with higher income standing.

Note 32. The higher the incidence on assets of borrowing, the lower the profitability for a firm to have a long-lasting life.

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Capital Account Liberalization and Growth in the WAMZ: An Empirical Analysis

Ngozi E. Egbuna[1], Emmanuel Oniwoduokit[1], Kemoh Mansaray[1], Marshall Umo[1] & Adedapo Adenekan[1]

[1] Financial Integration Department, West African Monetary Institute, Accra, Ghana

Correspondence: Ngozi E. Egbuna, Financial Integration Department, West African Monetary Institute, Accra, Ghana. E-mail: ngegbuna@yahoo.com

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Abstract

The paper employed recent time series econometrics to analyze and determine relationships between capital account liberalization and economic growth in the West African Monetary Zone[2] (WAMZ) for the period 1980–2012. For the purpose of clearly ascertaining the impact of the variables of interest on economic growth, a country by country estimation was carried out. The short-run and long-run relationships between capital account openness and economic growth were investigated by applying the autoregressive distributive lag (ARDL) bounds testing approach suggested by Pesaran et al. (2001). The empirical results of the ARDL models showed a significant positive relationship between capital account liberalization and growth in Ghana and Sierra Leone. This suggests that the removal of restrictions on capital accounts in Ghana and Sierra Leone would promote economic growth in these countries in the long-run. Liberalization had positive and significant impact on growth in Ghana even in the short-run. However, there was no significant long-run relationship between liberalization and growth in The Gambia, Guinea, Liberia and Nigeria, implying that opening of the capital account should be gradual and complemented with sound macroeconomic and financial policy. Overall, the diagnostic tests indicated that our ARDL models were stable.

Keywords: West African Monetary Zone (WAMZ), capital account, economic growth

1. Introduction

1.1 Problem Statement

Capital account liberalization has become an important policy choice in an increasingly integrated global economy. Theoretical and empirical evidence suggest that capital account liberalization promotes a more efficient global allocation of capital, as the flow of resources reduces cost of capital in the liberalizing/recipient countries, thereby increasing investment and raising economic output. Generally, capital account liberalization refers to the easing of restrictions on capital flows. The flow of resources into the liberalizing countries would reduce cost of capital, increase investment, and raise output (Fischer, 1998; Summers, 2000). In addition, access to capital enables countries to cushion fluctuations in national incomes and smoothen out consumption levels. Capital account liberalization may also signal a country's commitment to credible economic policies since a perceived deterioration in the policy environment of a country with an open capital account could potentially lead to capital flight. Capital account liberalization therefore provides a strong incentive for policymakers to adopt and maintain sound macroeconomic policies, with obvious benefits in terms of long-term growth. Inflows due to liberalization are expected to facilitate the transfer of technological and managerial know-how; encourage competition and financial development, thereby promoting growth.

Literature is awash with evidence that capital account liberalisation is a necessary but not sufficient condition for growth. While developing economies that have liberalized their capital accounts typically have had higher growth rates on the average, empirical analysis suggests that, after controlling for the effects of other factors, the causal effect of capital account liberalization on growth is not monotonic (Prasad et al., 2003). Evidence also show that developing and emerging economies have not been able to effectively leverage on international financial markets, as there seems to be an underlying pro-cyclical element to capital flows. This point is made even more pungent by international investors' willingness to lend to developing economies in 'good times' only to retreat in 'bad times', thereby exacerbating macroeconomic imbalances. Cross-country evidence further suggests that countries, including those which have open capital account, do retain some regulations on inward

and outward capital flows. While there is a tendency among countries to lift controls on capital movement, most countries retain a variety of controls with specific provisions relating to banks and credit institutions as well as institutional investors (IMF, 2005).

The West African Monetary Zone is a group of six (6) countries (Note 1) that plan to introduce a single currency in 2015, with the ultimate goal of merging with the West African Economic and Monetary Union (WAEMU). The WAMZ economy, with a combined GDP of $340 billion (PPP), represents 73.0 percent and 19.0 percent of ECOWAS and Africa, respectively. Nigeria is the dominant economy in the WAMZ, with over 78.0 percent of the population and 86 percent of the zone's GDP. While the zone is relatively large within the ECOWAS sub-region, it is still a small open economy globally, accounting for less than one percent of the global GDP. As a result, even after full integration of the economies, the zone will still be considered a small open economy, with a strong possibility of imported inflation, with implications for the conduct of monetary policy, the choice of targets and instruments within the Monetary Union.

The recent financial crisis, and the ensuing credit crunch, coupled with rising global inflation, and slowdown in demand in most advanced economies engendered significant uncertainty over the outlook for the WAMZ economies. Although the effects of the current financial crisis on the WAMZ economies are still unfolding, some adverse impacts have filtered through either directly or indirectly. The direct effects emanated from exposure to the international financial system, and affect countries like Nigeria and Ghana with relatively developed financial systems. Nigeria and Ghana were particularly vulnerable through their stock exchanges.

Given the foregoing it is therefore imperative to identify the policy instruments available to the WAMZ countries in mitigating contagion from the global economy. On the other hand, the decline in exports and the concomitant reduction in government tax revenue and foreign exchange earnings which exacerbated fiscal position and external balance in the WAMZ were clear indications that the global crisis was already affecting the WAMZ countries. This coupled with the decline in remittances and capital flows as well as aid flows adversely affected some WAMZ countries. This study reveals the policy response of WAMZ countries to these developments.

Ultimately, restricting the free flow of capital over an extended period might be counterproductive. The increasing openness to international trade has made it unattractive for countries to maintain closed capital accounts. Moreover, the increasing sophistication of investors and global financial markets makes it easier to move capital around under different pretexts. It is also argued that the predominance of extensive capital controls may create distortions during the transition to liberalization thereby making liberalization ineffective and unsustainable. Opening up the domestic economy by relaxing controls on capital account transactions in a gradual and orderly way appears to be the appropriate strategy for developing countries such those in the WAMZ. This gradualist approach encompasses the phasing and sequencing of capital account liberalization while retaining a robust 'capital account management framework' which underpins macroeconomic and financial stability.

The study therefore aims to determine, empirically, the impact of capital account liberalization on economic growth in member countries of the WAMZ. The results will help to inform policy makers on the requisite liberalisation strategy to be adopted by WAMZ countries.

1.2 Justification

Capital account liberalisation permits the free flow of capital from capital-abundant countries where marginal return of investment is low to capital-scare countries where marginal return on investment is high, thereby promoting growth and fostering convergence. Thus, it is clear that full capital account liberalisation within the WAMZ will enhance growth and convergence with the unfettered flow of capital and investment across the Zone. Indeed, the European Union still emphasizes full capital account liberalisation for accession countries that desire to join the euro zone.

Member countries of the WAMZ have, in recent times, not only been showcasing the abundant investment opportunities, but also pointing the rest of the world to the region's resolve to develop and implement policies that are in line with international best practices. This is consistent with the region's move towards a common monetary and economic union, with the ultimate aim of making West Africa the destination of choice for investors, the world over. This is being clearly demonstrated by on-going banking, financial, and fiscal reforms across the zone as the member countries strive to satisfy the prescribed macroeconomic convergence criteria for the establishment of a common central bank. These steps, which are capable of reinforcing investor confidence in the Zone, could be undermined if foreign investors are restricted from either bringing in capital or repatriating capital and interest.

The launch of the single currency has been postponed thrice. In order to increase the chances of success of the single currency programme, member countries of the WAMZ developed a comprehensive blueprint known as the "*Banjul Action Plan*" (BAP). The BAP expanded the WAMZ programme to include structural measures and benchmarks. Key elements of the structural measures are the liberalization of financial markets and capital accounts, as well as the establishment of a customs union by the WAMZ. As the 2015 deadline for the launch of the single currency approaches, it is an opportune time to evaluate the implementation of this important benchmark vis a vis growth in the zone. Full capital account liberalisation especially between WAMZ countries will enhance the effectiveness of the monetary policy of the envisaged West African Central Bank (WACB) by allowing all WAMZ citizen participate in the open market operations of the Bank.

1.3 Literature Review

In practice, the impact of liberalization on growth depends crucially on the initial conditions and policies in the country, including a supportive and consistent macroeconomic and institutional framework. The capital account liberalization is a complex process as its success requires proper sequencing and coordination with macroeconomic and structural policies to strengthen the domestic financial system. Choosing different approaches in addition to their initial conditions, some countries have been able to liberalize their capital accounts while successfully maintaining financial sector stability, whereas other countries have experienced financial crises. Thus, the experience with liberalization has been quite varied, raising difficulty in identifying "the impact" of capital account opening on growth. A plausible approach, however, is to examine the main channels through which liberalization affects the economy. Theoretical models have identified both a direct and an indirect channel through which financial openness can promote economic growth in developing countries.

Capital account liberalization can stimulate growth directly through risk sharing by raising savings, as well as by allowing better risk diversification and greater consumption smoothing. Furthermore, FDI flows in particular can provide technology spillovers via the transfer of knowledge. On the other hand, the indirect positive effects of financial openness on economic growth could come through its effect on the development of domestic financial markets via two channels (Brezigar-Masten et al., 2008). First, increased competition between foreign financial intermediaries can lead to reduced intermediation cost which in turn stimulates demand for funds thereby increasing the size of domestic financial markets. In addition, liberalization can affect domestic markets through the improvements of institutional framework; as a result of improved regulation and corporate governance that can enhance the overall stability of the financial system and reduce asymmetric information problems. Second, financial openness affect economic growth both positively and indirectly by allowing access to foreign financial markets in the form of direct lending by foreign financial intermediaries.

In sum, the theoretical literature suggests that financial development and capital flows liberalization are determining factors for economic growth because they provide a favorable support for financial integration between countries. This is echoed in the findings of Manganelli and Popov (2010), who posited that financial integration helps domestic financial systems to allocate resources optimally across industrial sectors in a way that improves the overall diversification of the economy and lowers its volatility. Notwithstanding the foregoing, excessive capital inflows facilitated by lax financial supervision, macroeconomic policy inconsistencies, or excessive enthusiasm by foreign investors can overwhelm the ability of the domestic financial system to allocate funds efficiently, leading to future financial instability and other macroeconomic difficulties. This point is buttressed by the model developed by Eicher and Turnovsky (1999), wherein capital market imperfections, in the form of debt subsidies, leads to an initial acceleration in investment and growth but a subsequent increase in debt service costs and slower growth.

A review of the empirical literature revealed that the majority of studies have explored the link between capital account liberalization and economic growth. Despite the existence of numerous studies, the results remain contentious about whether liberalization plays a positive or negative role in real economic growth. In most of the studies, the basic growth model which includes variables such as investment, population growth, level of schooling and the initial level of GDP is augmented with a measure of capital account liberalization.

A summary of the large and growing body of work on capital account liberalization and growth is provided in Appendix 1. The information presented in the annex shows a wide disparity in results across studies reflecting the country coverage (industrial versus developing countries), sample period (important for developing countries given the recent nature of financial openness) as well as the methodology and estimation technique. Moreover, there are some general shortcomings in the literature on capital account liberalization and growth. First, the rules-based measures of capital account controls and liberalization used in majority of the studies are relatively crude even though the various measures offer a broadly consistent evidence of the time-series and cross-sectional

behaviour of capital account liberalization. Second, while capital account liberalization is conceptually considered as exogenous to the growth process, in practice countries may be inclined to liberalise their capital accounts in line with their particular growth experiences or levels of development. This suggest the potential for reverse causality wherein a country experiencing weak economic performance will be persuaded to adopt capital controls and there is a danger in such a case to incorrectly interpret that the country's low growth is due to capital controls. However, many studies now recognise this potential weakness and attempt to mitigate it through the use of instrumental variable estimation.

Grrilli and Milesi-Ferretti (1995) was one of the first studies to examine whether capital account liberalization promotes growth using a cross-section of 61 countries over the period 1966–1989. Using instrumental variables regressions (IV) with lagged variable as instrument, five-year growth rates were regressed on three liberalization measures of share, current Account and multiple exchange rate system. In addition, they included other variable such as initial income, level of schooling and political variables. They found that capital account liberalization does not support economic growth. A similar result was found by Rodrik (1998) in a widely cited paper. He used a sample of 100 developed and developing countries to study the effect of capital account liberalization on growth and found no significant effect over the period 1975 to 1989. He also found no relationship between capital account liberalization and investment-to-income or between capital account liberalization and inflation. Eichengreen (2001) offers several possible reasons for differences in the findings of the Rodrik and Quinn studies, including that there were fewer developing countries in the Quinn's sample as well as the different liberalization measures employed. He also noted that various theoretical models implied inconsistent or weak effects from capital account liberalization.

On the other hand, Quinn (1997) found a positive relationship between capital account liberalization and growth using a standard growth regression augmented by Quinn's indicator of the change in financial openness or the change in broad measure openness. The empirical results indicated that the change in capital account liberalization has strong significant effect on the growth in real per capita GDP in a cross-section of 58 countries over the period 1960–1989. However, the finding of a significant effect of the change in capital account liberalization on growth may reflect the correlation of changes in restriction on the capital account and current account given that it was hard to disentangle the separate effects of financial openness and the broad measure of openness in Quinn's results as he did not include a regression with both of these indicators. Klein and Olivei (2000) also found positive relationship between liberalisation and growth by focusing on the role of capital account liberalization on financial development and then considering the effect of financial development on growth. Regressing the capital account liberalization indicator using share of change in financial depth over the period 1986-1995, they found that the effect of open capital accounts on financial depth in a cross-section of countries was statistically significant and economically relevant. This result was, however, largely driven by the developed countries included in the sample.

Bekaert, Harvey, and Lundblad (2001) identified the impact of stock market liberalization on economic growth by augmenting the standard growth model with an indicator of stock market liberalization using moving average panel data. They found that financial sector liberalization led to a 1 percent increase in annual per capital GDP growth over a five-year period and that the effect was statistically significant. They also validated the robustness of this result with respect to the various sets of liberalization dates, different country groupings, and different economic growth horizons. The results, in addition to those of Quinn, gave the strongest evidence of the positive effect of capital account liberalization on growth among developing countries.

Bailliu (2000) found that capital account liberalization is instrumental to growth by promoting financial development while Levine (2001) showed that financial sector liberalization can strengthen domestic financial systems leading to more investment, better efficiency in the allocation of capital and higher growth eventually.

Kraay (1998) examined the impact of capital account openness on economic growth through ordinary least squares (OLS) and instrumental variable (IV) estimations using cross-sections, with one observation per country (where the dependent variable is output growth), over the period 1985–1997 for a sample of 117 countries, and found no significant effect of the IMF's restrictions or Quinn's measure of liberalization on economic growth. However, when these indicators were interacted with the average balance of the financial account, some significant effects were found.

Edison et al. (2002) explored role of the differences between the Quinn and Rodrik papers. They estimated a dynamic panel by OLS, two-stage least squares (2SLS) and generalized method of moments (GMM) using a sample that included 57 countries with capital account liberalization measured by "Share" and Quinn over the period 1980–2000. They found that international financial liberalization does not significantly affect economic

growth. Ishii and Habermeier (2002) also found that an extensive public sector involvement in the financial sector in connection with capital account liberalization had been harmful in most, but not in all, instances.

Edwards (2001) found evidence similar to Klein and Olivei (2000) that the growth effects of capital account liberalization depended on the level of development of an economy. Using weighted least square (WLS) with national income as weights for a sample of 60 countries in the 1980s, Edwards found that capital account liberalization reduces growth for low income countries but promotes growth in industrial countries and in the richer emerging market countries. Arteta, Eichengreen and Wyplosz (2001) also found some supporting evidence that the differences in capital account liberalization across countries depended on the degree of macroeconomic stability. Using two capital account interaction terms and multiplying the Quinn openness measure by both the Sachs-Warner (1995) openness measure and the black-market premium, they found that the interaction term representing the product of capital account openness and the black market premium were significant while the other interaction term (the product of the Sach-Warner openness measure and capital account openness) was not significant. They argued that this implied that countries that open their capital account grow faster, but only if they first eliminate the black market premium.

Chinn and Ito (2002) also examined the link between capital account liberalization and financial development and economic growth using aggregate data on a large sample of countries over the period 1977–1997. They found that the magnitude of the effect of financial openness was quite different between the less developed countries and emerging market group. They conclude that both private credit and equity market variables were significantly associated with financial development and output growth in emerging markets but that only stock market value traded was significantly affected by financial openness in less developed countries. Baltagi et al. (2009) examined whether trade and capital account openness can help to explain the recent progress in financial development. Based on annual data from developing and industrialized countries, they estimated a dynamic panel and concluded that both types of openness (private credit and stock market capitalization) were statistically significant determinants of banking sector development. They also found that there was no evidence to affirm that opening up capital account without opening trade could have a negative impact on financial sector development.

O'Donnell (2001) applied a different approach to examine the impact of capital account liberalization on growth using both the IMF rules-based measure and a quantitative measure of financial openness. He found that the rules-based measure tended to be too crude an indicator of the degree of capital account liberalization as it did not take into consideration the nature of the different types of controls. Nonetheless, using the quantitative measure, he found that capital account liberalization promotes economic growth although the benefits are not evenly distributed across countries. Chanda (2001) also found similar evidence and suggested that the impact of capital account liberalization may vary with the level of ethnic and linguistic heterogeneity in the society, a proxy for the number of interest groups. He also showed that capital controls led to greater inefficiencies and lower growth among countries with high degree of ethnic and linguistic heterogeneity. Shahbaz et al. (2008) explored the relationship between capital account openness and economic growth in a small developing economy like Pakistan using an advanced Autoregressive Distributive Lag (ARDL) technique for long run relationship and error correction model (ECM) for short run dynamics. They found that capital account openness in addition to past economic policies promotes economic growth in the long-run.

1.4 Hypothesis

The main research hypotheses are stated as thus:

H1: There is a short-run positive relationship between capital account liberalisation and growth.

H2: There is a long-run positive relationship between capital account liberalisation and growth.

2. Methodology and Model

2.1 Methodology

The econometric approach employed recent developments in time series econometrics to analyze and determine relationships between capital account liberalization and economic growth in the WAMZ member countries (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone). The time series data used in the study cover the period 1980 to 2012. For the purpose of ascertaining clearly the impact of our variable of interest on economic growth, a country by country estimation was carried out. In this regard, both short-run and long-run relationships between capital account openness and economic growth were investigated by applying advanced econometric techniques, namely, the autoregressive distributive lag (ARDL) bounds testing approach suggested by Pesaran et al. (2001) for long run relationship and error-correction modelling (ECM) for short run dynamics. The ARDL

bounds testing approach is viewed as the most appropriate specification to carry out co-integration analysis due to its many advantages, The main advantage is that it can be applied irrespective of whether the variables are integrated of order I(0) or integrated of order I(1), unlike other widely used co-integration techniques (Pesaran & Pesaran 1997). Another advantage is that, it has better small sample properties than that of the Johansen and Juselius cointegration technique (Pesaran & Shin, 1999). Besides, a dynamic error correction model (ECM) can be derived from the modified ARDL model through a simple linear transformation (Banerrjee et al. 1993). In addition, ARDL method is free of any problem faced by traditional techniques in the literature such as problems resulting from non-stationary time series data. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. However, both analyses (ARDL and ECM) are preceded by an examination of the unit root properties of the data.

2.2 Model Formulation

The model adopted in this study draws heavily from Peter Blair Henry (2006) that illustrated the link between the fundamental prediction of Neo-Classical Growth (NCG) model and the capital account liberalization in developing economies. The contrivance formulated by assuming a Cobb-Douglas production function with a labor augmenting technological progress:

$$Y=F(K,AL)= K^{\propto} (AL)^{1-\propto} \quad (1)$$

Denoting the amount of capital per unit of effective labor as $k = \frac{K}{AL}$; amount of output per unit of effective labor, $y = \frac{Y}{AL}$; and following further assumption of a homogenous production function in equation (1), the output per unit of effective of labor can be stated as:

$$y = f(k) = k^{\propto} \quad (2)$$

To determine the evolution of capital within this framework, let *s* represents the proportion of national income that is saved in each period with accretion effect on national capital stock. With further assumption that capital depreciates at the rate, δ; labor grows at the rate, η; and total factor productivity grows at the rate, λ, such that these three structural parameter cause capital to become less abundant; hence, the evolution process for capital per unit of effective labor is specified thus:

$$\dot{k}(t)=s f[k(t)]- (\eta+\lambda+\delta)k(t) \quad (3)$$

Equation (3) summarizes the net effect of forces of the structural parameters. It indicates that national savings have positive effect on growth of capital by increasing capital stock. However, capital depreciation, population growth, as well as the total factor productivity, because of diminishing return effect, has a negative impact on capital. In the steady state, $\dot{k}(t) = 0$, that is, the growth rate of capital per unit of effective labor, (*k*), is constant. However, the level of capital (K) will grow at the rate, (η + λ), and output per worker, $\frac{Y}{AL}$, grows at λ.

Finally, the steady state general equilibrium condition for investment is assumed to hold, such that the marginal productivity of capital, $f'(k_{st,s})$, equals interest rate, *r,* plus the depreciation rate, that is:

$$f'(k_{st,s}) = r + \delta \quad (4)$$

Equation (4) represents the basis for the "allocative efficiency" view, inherent in the Neo Classical Growth model. It helps to understand the dynamics of the impact of capital account liberalization on investment and growth, given that such impact works through the cost of capital, *r*. According to this view, capital account liberalization leads to a more efficient international allocation of resources as resources flow from capital-abundant economies with low return on capital into capital-scarce countries having higher return on capital, resulting in increased investment and growth in these economies. The standard assumption is:

$$r^* < r \quad (5)$$

Where *r** is the world interest rate, exogenously determined outside of the country, and r is the domestic interest rate determined within the representative small open economy. To seek arbitrage opportunity from the interest rate differential, capital inflow is experienced in the country that liberalizes, causing a surge in post liberalization capital output ratio, i.e., $k^*_{s,st}$, and post liberalization steady state occurs with marginal productivity of capital equals to the world interest rates (*r**) plus the rate of depreciation (δ), that is:

$$f'(k^*_{s,st}.) = r^* + \delta \quad (6)$$

To account for the impact of capital account liberalization in the WAMZ countries' economies, we formulate a

capital-flow augmented output process within the NCG model, such that:

$$y = \left\{\frac{sf(k_t)}{(\delta+\eta+\lambda)}\right\}^{\alpha} \kappa_t^{\gamma}; \text{ where } \kappa = g(e, r') \tag{7}$$

Where all variables (*y, s, and k*) and the structural parameters (*α, δ, η, and λ*) are as previously defined. Here, *κ* enters into the model in a multiplicative form to capture any impact of capital flow. Such capital flow is, as specified, assumed to be simultaneously influenced by the prevailing exchange rate and interest rate differential ($r' = r - r^*$). The parameter *γ* measures the elasticity of such flow, which is assumed to take any value ranging from zero to unity, that is, ($0 < \gamma \leq 1$).

Notice that equation (7) also allows for the specification of the overall investment in the steady state terms of both domestic and foreign components, such that $k^*_{s,st.} = (k^d_{s,st}).(k^f_{s,st})$. In a simplistic manner of the assumption in equation (2), the analogous output per unit of effective labor in post liberalization regime becomes:

$$y = \{k^*\}^{\alpha} = \left\{(k^d_t).(k^f_t)\right\}^{\alpha} \tag{8}$$

Showing the joint-relevance and the interplay of both domestic and foreign components of capital in measuring the output per unit of effective labor, equation (8) also allows us to reformulate the capital flow augmented output process in equation (7) as:

$$y = \left\{\frac{sf\left((k^d_t)\right)}{(\delta+\eta+\lambda)}\right\}^{\alpha} * \left\{\frac{er'\left(k^f_t\right)}{(\delta+\eta+\lambda)}\right\}^{\alpha} \tag{9}$$

Taking the logarithm of equation (9) and differentiating with respect to time, the post liberalization output growth is derived thus:

$$\frac{\dot{y}}{y} = \alpha\, s\left(\frac{\dot{k^d}}{y}\right) + \alpha e r'\left(\frac{\dot{k^f}}{y}\right) \tag{10}$$

As equation (10) demonstrates, $\left(\frac{\dot{k^d}}{y}\right)$ represents the contribution of domestic capital-output ratio to growth, which is influenced by the rate of national savings. Similarly, the other term, $\left(\frac{\dot{k^f}}{y}\right)$ accounts for the contribution of foreign capital inflow to output ratio, also influenced by both exchange rate and interest rate differential.

Finally, we specify the econometric representation of the behavioral relations in equation (10) as:

$$y = \beta_0 + \beta_1 INV + \beta_2 CA + \beta' CV + \varepsilon_t \tag{11}$$

Where:

y = real gross domestic product (Real GDP) growth;

INV= *dk* =$\left(\frac{DK}{GDP}\right)$; i.e., the growth rate of domestic capital formation to GDP;

CA= *fk* =$\left(\frac{FK}{GDP}\right)$; i.e., the growth rate of private capital flows to GDP, which is measured by the ratio private capital flows to GDP.

$CV =$ A row vector of other control variables that have been found in literatures as principal determinants of growth, such as Inflation (INF); and Trade Openness [(Import + Export)/GDP].

β' = A column vector of the associated coefficients for X.

ε = error term.

Taking logarithms equation (11) becomes:

$$\ln y = \beta_0 + \beta_1 lnINV + \beta_2 ln\text{CA} + \beta_3 lnCV \tag{12}$$

2.3 Estimation Technique

The ARDL framework for equation (12) is given as:

$$\Delta ln\, y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1l} \Delta ln y_{t-i} + \sum_{i=1}^{n} \beta_{2l} \Delta lnINV_{t-i} + \sum_{i=1}^{n} \beta_{3l} \Delta lnCA_{t-i} + \sum_{k=0}^{\rho} \beta'_{4l} \Delta lnCV_{t-k} + \beta_1 lny_{t-i} + \beta_2 lnINV_{t-i} + \beta_3 lnCA_{t-i} + \beta'_4 lnCV_{t-k} + \mu_i \tag{13}$$

Theoretically, the ARDL approach to cointegration does not require prior test of the series for unit roots. Nonetheless, some recent empirical studies have indicated that testing for unit root were necessary to avoid spurious results (Jalil et al., 2008; Shrestha & Chowdhury, 2005). In this regard, we start by investigating the time series properties of the data using Augmented Dickey Fuller test and Philip Peron tests. The ARDL model testing procedure begins with conducting the bounds test for the null hypothesis of no cointegration $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ against the alternative hypothesis $H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ using F-test. The null hypothesis implies no evidence of existence of long run relationship while alternative hypothesis is while the alternative hypothesis indicates the existence of long run relationship among relevant variables embodied in the model. Following Pesaran et al (2001) and Narayan (2004), two sets of asymptotic critical values are reported; the upper critical bound that assumes that all the series are I(1) and the lower critical bound values assume that the series are all I(0). The bounds provide a test for co-integration when the independent variables are *I(d)* (Where $0 \leq d \leq 1$).

If the F-statistic is higher than the upper critical value, we conclude that a long run relationship exists regardless of whether the underlying order of integration of the variables is I(0) or I(1), i.e., we reject the hypotheses of no long run relationship. If the F-statistic is below the lower critical values, we fail to reject the null hypothesis of no co-integration. However, if the F-statistic falls between these two bounds, inference would be inconclusive. Moreover, when the order of integration between the variables is known, and if all the variables are I(1), the decision is made based on the upper bound. Similarly, if all the variables are I(0), then the decision is made based on the lower bound.

After establishing the long-run relationships between the variables, i.e, if the variables are co-integrated, the conditional long run model can then be obtained from the reduced form solution of equation (13), when the variables in first difference jointly equal to zero.

These long run coefficients are estimated by the ARDL, model in equation (13) by OLS. The ADRL method obtains the optimal lag length of each variable using the model selection criteria like Schwartz-Bayesian Criteria (SBC) and Akaike's Information Criteria (AIC). SBC is known as the parsimonious model, selecting the smallest possible lag length, whereas AIC is known for selecting the maximum relevant lag length. When there is long relationship between variables, there exists an error correction representation. Therefore, the error correction model is estimated generally as represented in following reduced form equation:

$$\Delta \ln y_t = \sum_{i=1}^{\rho} \beta_i \Delta \ln y_{t-i} + \sum_{j=1}^{m} \beta_j \Delta lnINV_{t-j} + \sum_{s=1}^{n} \beta_s \Delta lnCA_{t-s} + \sum_{k=1}^{\rho} \beta'_k \Delta lnCV_{t-k} + \theta ECM_{t-1} + \omega_t \quad (14)$$

The error correction model result indicates the speed of adjustment to the long run equilibrium after a short run shock. To ascertain the goodness of fit of the ARDL model, the diagnostic and the stability tests were performed. The diagnostic test examined the serial correlation, functional form, misspecification normality and heteroscedisticity associated with the model. The stability test is conducted by employing the cumulative sum of recursive residuals (**CUSUM**) and the cumulative sum of squares of recursive residuals (**CUSUMsq**). Examining the prediction error of the model is another way of ascertaining the reliability of the **ARDL** model. If the error or the difference between the real observation and the forecast is infinitesimal, then the model can be regarded as having the best fit.

2.4 Data and Sources

The data are drawn from a number of sources, primarily the West African Monetary Institute's database, World Bank's World Development Indicators, and the IMF's International Financial Statistics. The study utilized annual data for the period 1980–2012 for all WAMZ countries. Economic growth is measured by changes in the log of real GDP per capita while investment is measured as national gross fixed capital formation as a percentage of GDP. The capital account liberalization indicator is measure by the ratio of private capital flows to GDP following Kraay (1998) and Lane and Milesi-Ferretti (2001). Inflation is the annual changes in the log of the consumer price index while trade openness is calculated as the sum of exports and imports as percentage of GDP.

3. Empirical Results

3.1 Unit Root Test

Even though the bounds test for cointegration does not depend on prior knowledge about the order integration, testing for unit root is necessary to avoid the possibility of spurious regression since Ouattara (2004) showed that the bounds test is based on the assumption that the variables are I(0) or I(1), thus, in the presence of I(2) variables the computed F-statistics provided by Pesaran et al. (2001) becomes invalid. To determine the order of the series

the ADF and Philip and Peron Tests were employed at level and first difference under the assumptions constant and no trend. The results reported in Table 1 A and B suggest that all the variables included in this study are integrated at level and order one, I(0) and I(1). The bounds test approach is therefore appropriate. It is worth mentioning that results are robust under assumption of constant and no trend as well as with trend.

Table 1A. Unit root test results

Variable	ADF test statistics (intercept with no trend)			Variable	PP statistics (intercept with no trend)	
	Lag	Level	First difference		Level	First difference
The Gambia						
Ln Y	2	1.56	6.50**	Ln Y	2.47	6.93**
ln INV	2	2.35	6.88**	ln INV	3.35*	7.89**
CAL	2	2.06	6.78**	CAL	1.87	
INF	2	2.57	7.02**	INF	2.49	8.70**
ln TO	2	2.55	8.07**	ln TO	3.50*	
Ghana						
Ln Y	2	0.03	3.89**	Ln Y	0.07	3.72**
ln INV	2	1.57	5.62**	ln INV	1.77	5.76**
CAL	2	2.21	5.42**	CAL	2.41	5.27**
INF	2	4.31**		INF	4.31**	
ln TO	2	7.40**	5.52**	ln TO	4.77**	
Guinea						
Ln Y	2	1.57	4.19**	Ln Y	1.74	4.32**
ln INV	2	2.13	5.86**	ln INV	2.91	10.86**
CAL	2	2.24	5.86**	CAL	2.89	10.81**
INF	2	2.32	6.36**	INF	3.31*	
ln TO	2	2.80	7.41**	ln TO	2.73	8.37**

Note: **indicate significance at the 1% level and hence stationarity while * indicate significance at the 5% level.

Table 1B. Unit root test results

Variable	ADF test statistics (intercept with no trend)			Variable	PP statistics (intercept with no trend)	
	Lag	Level	First difference		Level	First difference
Liberia						
Ln Y	2	1.30	3.21*	Ln Y	1.46	3.21*
ln INV	2	1.62	3.92**	ln INV	1.58	3.93**
CAL	2	2.54	6.21**	CAL	3.26*	
INF	2	6.51**		INF	6.42**	
ln TO	2	1.59	5.17**	ln TO	1.81	5.23**
Nigeria						
Ln Y	2	2	0.48	Ln Y	0.84	4.41**
ln INV	2	2	4.07**	ln INV	3.02*	
CAL	2	2	2.91	CAL	2.64	9.03**
INF	2	2	1.96	INF	1.91	3.93**
ln TO	2	2	2.01	ln TO	2.01	4.68**
Sierra Leone						
Ln Y	2	2	1.62	Ln Y	1.68	4.66**
ln INV	2	2	2.92	ln INV	2.80	8.44**
CAL	2	2	2.58	CAL	2.58	7.19**
INF	2	2	1.88	INF	1.88	14.21**
ln TO	2	2	2.13	ln TO	3.03*	
1% Critical Value		3.66	3.66	1% Critical Value	3.65	3.66
5% Critical Value		2.96	2.96	5% Critical Value	2.95	2.96

Note: **indicate significance at the 1% level and hence stationarity while * indicate significance at the 5% level.

3.2 The Cointegration Test

The causal relationship between macroeconomic variables was examined using the Autoregressive Distribution Lag (ARDL) approach proposed by Peseran and Shin (2001). Ideally the AIC or SBC is minimized to determine the number of lags. However, in this study the maximum lag length is taken as one since we are using annual data in addition to the small sample size of our series. Importantly, the estimation and identification of cointegration using the ARDL approach is based on the Ordinary Least Square (OLS). Results of the bound test are given in Table 2. The calculated F-statistics for each individual country reported in Table 2 are greater than the upper bound critical value at the 1% and 5% levels. This implies that the null hypothesis of no cointegration is rejected in all cases. There is indeed a cointegrating relationship among the variables (real per capita GDP growth, capital account liberalization, inflation, trade openness and investment) in equation (13) (Note 2). The existence of cointegration between real per capita GDP growth and its determinants in each country implies that there are error correction mechanisms and hence the need to obtain long-run and short-run coefficients.

Table 2. Bound test results based on equation (13)

Critical Value			
Lower Bounds [I(0)]		Upper Bounds [I(1)]	
5%	1%	5%	1%
2.846	4.057	4.091	5.636
F-Statistics			
The Gambia		5.89***	
Ghana		63.57***	
Guinea		46.32***	
Liberia		34.85***	
Nigeria		9.07***	
Sierra Leone		39.18**	

Notes: Critical values from the bounds test are obtained from Narayan (2004)-Case II: restricted intercept and no trend, page 26–27. *** means significant at 1%.

3.3 The Static Long-Run Equations of Member Countries

The long-run coefficients for each country are reported below. The static long run model was obtained from the reduced form solution of equation (13).We proceed by discussing the outcome for each country.

3.3.1 The Gambia

The results show that with exception of the constant all the other long-run coefficients are not significant. An apparent implication of the result is that an important variable explaining growth in the Gambia may be missing. Although not significant, capital account liberalization and inflation carry the correct signs. Liberalization has a positive relationship with growth in the long-run while inflation is negatively related to growth. Trade openness and investment are negatively related to growth but the coefficients are not significant.

Table 3. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	0.0012	0.0041	0.2906	0.774
lNF	-0.0424	0.4454	-0.2264	0.823
Ln to	-0.0914	0.0772	-1.1842	0.247
Ln INV	-0.0599	0.1068	-0.5616	0.579
C	9.9553***	0.1872	22.3528	0.000

*** means significant at the 1% level.

3.3.2 Ghana

Table 4 shows that there is a statistically significant relationship between per capita GDP growth and its determinants. In addition, all coefficients have the expected signs. There is positive and significant relationship between capital account liberalization and growth as well as between investment and growth. Trade openness also has a positive impact on growth but only significant at the 10 percent level. The result indicates that a unit increase in capital account openness will increase growth in real per capita GDP by 0.03 percent, while 1 percent increase in investment will raise growth by 0.12 percent. In particular, the positive long-run effect of capital account liberalization on economic growth has been supported by Quinn (1997), Klein and Olivei (2000), Edwards (2001) and several other authors. Similarly, a 1 percent rise in trade openness will result in a 0.04 percent increase in growth. On the other hand, inflation has a negative impact on growth in the long-rung as a unit increase in inflation decreases growth by 0.62 percent.

Table 4. Estimated long run coefficients using the select ARDL (1,1,0,1,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	0.0291***	0.0040	7.252	0.000
lNF	-0.6297***	0.1397	-4.508	0.000
Ln to	0.0491*	0.0273	1.796	0.086
Ln INV	0.1234***	0.0340	3.625	0.001
C	5.9329***	0.1314	45.142	0.000

*** means significant at the 1% level while * means significant at the 10% level.

3.3.3 Guinea

The long-run equation for Guinea shown in Table 5 indicates that only the coefficients of investment and the constant are significant. Nonetheless all coefficients carried their expected signs. The result showed that a 1 percent rise in investment will trigger a 5.4 percent rise in economic growth in the long-run. Capital account liberalization and trade openness have positive relationships with growth as expected but the coefficients are not significant. On the other hand, inflation is negatively related to growth but its coefficient is also not significant.

Table 5. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	1.4895	8.6807	0.562	0.579
lNF	-1.6511	1.7674	-0.934	0.359
Ln to	0.3699	1.4106	0.263	0.795
Ln INV	5.4082**	2.1046	2.569	0.017
C	23.0839***	2.6522	2.659	0.013

*** means significant at the 1% level while ** means significant at the 5% level.

3.3.4 Liberia

The long-run equation for Liberia shown in Table 6 revealed that the coefficients of the trade openness, investment and the constant were significant while the coefficient of capital account liberalization and inflation were not significant. While the coefficient of trade openness was significant it carried the wrong sign implying that a percentage rise in trade openness will reduce growth by 1.18 percent. Such results may reflect the weak internal capacity of Liberia to benefit from technological diffusion and knowledge transfers that usually accompany trade openness. Indeed, Bhagwati (1992) as well as Frankel et al. (1995) reported negative relationships between trade liberalization and economic growth. There was a positive and significant relationship between investment and growth wherein a percentage rise in investment will increase growth by 0.88 percent.

Table 6. Estimated long run coefficients using the select ARDL (0,1,0,1,1) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	-0.0026	0.0018	-1.482	0.152
lNF	0.8310	0.7994	1.039	0.309
Ln to	-1.1805***	0.0838	-14.079	0.000
Ln INV	0.8812***	0.1145	7.698	0.000
C	13.3923**	0.4574	29.279	0.000

*** means significant at the 1% level while ** means significant at the 5% level.

The coefficient of inflation and capital account liberalization had the wrong signs but were not significant. Inflation was positively related to growth while capital account liberalization had a negative relationship with growth.

3.3.5 Nigeria

The result in Table 7 revealed that only trade openness and the constant were significant in explaining long-run growth in per capita income in Nigeria. Essentially, a percentage increase in trade openness will raise economic growth by 1.58 percent. The wrong signs were reported for the coefficients of investment, inflation and capital account liberalization even though they were not significant. Inflation was positively related to growth while capital account liberalization and investment had a negative relationship with growth.

Table 7. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	-0.1378	.29706	-0.464	0.647
lNF	2.9737	5.9523	0.499	0.622
Ln to	1.5853***	0.6926	2.289	0.043
Ln INV	-0.2543	1.5658	-0.162	0.872
C	5.5170***	1.5910	3.467	0.029

*** means significant at the 1% level.

3.3.6 Sierra Leone

The results in Table 8 revealed that with exception of inflation, all the long-run coefficients of the determinants of growth were significant. Importantly, capital account liberalization has a positive and significant effect on economic growth in the long-run such that a unit change in liberalization will raise per capita income by 0.001 percent. O'Donnell (2001) found similar result by using a quantitative measure of liberalization. Investment also had a positive long-run effect on growth as predicted with a percentage rise in investment resulting in a 0.43 increase in per capita income. A surprising result was the positive long-run effect of inflation on the growth in real per capita income in Sierra Leone since demand theory suggests that inflation is harmful to growth in the long-run. Given the high inflation history of the country, the result may suggest the reallocation of portfolios from money to physical capital as purported by Tobin (1965) and Sidrauski (1967). On the other hand, trade openness had a negative relation with growth but its coefficient was not significant.

Table 8. Estimated long run coefficients using the select ARDL (1,0,0,1,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
CAL	0.0005***	0.0002	2.500	0.008
lNF	0.3860***	0.0946	4.083	0.000
Ln to	-0.0239	0.1075	-0.223	0.826
Ln INV	0.4322***	0.0757	5.706	0.000
C	9.0038***	0.3789	23.759	0.000

*** means significant at the 1% level.

3.4 The Short-Run Coefficient of Member Countries

The dynamic short-run equation was estimated for each country given the evidence of cointegration among the variables. The short-run coefficients were obtained by the estimating the error correction representation of the reduced form of equation (13). The results for each country are reported below.

3.4.1 The Gambia

The results The Gambia in Table 9 are similar to the long-run results whereby only the constant was significant. However, the error correction term (ECM) was significant and negative as expected. Nonetheless, the coefficient of ECM indicates that the speed of adjustment to long-run equilibrium is very slow, a mere 2.4 percent.

Table 9. Error correction representation for the selected ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	0.0005	0.0016	0.2871	0.776
Δ lNF	-0.0169	0.0736	-0.2305	0.820
Δ Ln to	-0.0366	0.0291	-1.2564	0.221
Δ Ln INV	-0.4004	0.0434	-0.5536	0.585
ΔC	3.9861***	1.3901	2.8676	0.008
Δ ECM (-1)	-0.0240***	0.1445	-2.7756	0.010
R^2			0.3058	
Adjusted R^2			0.2659	
AIC			61.45	
SBC			57.15	
F Statistics			1.811	
F Significance			0.147	
Durbin Watson Statistics			1.71	

Where ECM is the error correction term.

$$ECM = Ln\ Y - 0.0011774*CAL + 0.042383*INF + 0.091379*LnTO + 0.059980*LnINV - 9.9553*C \quad (15)$$

3.4.2 Ghana

The result in Table 10 shows that there is a significant dynamic relationship between economic growth and its determinants. Capital account liberalization, inflation and trade openness have positive impacts on short-run growth as predicted. A unit change in capital account liberalization will raise growth by 0.003 percent while a unit rise in inflation will increase short-run growth by 0.146 percent. In addition, a unit change in trade openness will raise growth by 0.02 percent. On the contrary, the result showed a negative relationship between investment and growth in the short-run. Such a result may reflect the crowding out of productive investment by the huge government borrowing requirement for deficit financing.

Table 10. Error correction representation for the selected ARDL (1,1,0,1,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	0.0025**	0.0013	1.888	0.071
Δ lNF	0.1459***	0.0287	5.0856	0.000
Δ Ln to	0.0193***	0.0085	2.271	0.032
Δ Ln INV	-0.0286***	0.0125	-2.282	0.031
ΔC	-1.3754***	0.3084	-4.459	0.000
Δ ECM (-1)	- 0.2318***	0.0514	-4.507	0.000
R^2			0.9242	
Adjusted R^2			0.9009	
AIC			80.528	
SBC			74.792	
F Statistics			55.94	
F Significance			0.000	
Durbin Watson Statistics			2.5	

$$ECM= LRGI - 0.029122*CAL + 0.62965*INF - 0.049100*LTO - 0.12340*LINV - 5.9329*C \quad (16)$$

The coefficient of the ECM was negative and significant as expected. The result indicated that the speed of adjustment to long-run equilibrium when there was shock was 23.2 percent.

3.4.3 Guinea

The short-run equation for Guinea reported in table 11 shows that investment and the constant have significant effects on economic growth. Importantly, a percentage increase in investment will raise economic growth by 1.07 percent. Capital account liberalization and trade openness had a positive relationship with growth as predicted but their coefficients were not significant. In addition, inflation had a negative short-run relationship with growth contrary to expectations but its coefficient was also not significant. However, the coefficient of the ECM was negative and significant as expected. The speed of adjustment to long-run equilibrium was estimated at 32.8 percent, implying that only 32.8 percent of the deviation in the long-run will be corrected annually.

Table 11. Error correction representation for the selected ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	0.2961	0.0690	0.549	0.588
Δ lNF	-0.1988	0.3437	-0.955	0.349
Δ Ln to	0.0735	0.2829	0.259	0.797
Δ Ln INV	1.0750***	0.3751	2.866	0.008
ΔC	4.5886***	1.7832	2.573	0.016
Δ ECM (-1)	-0.3282***	0.5391	-2.879	0.008
R^2			0.3431	
Adjusted R^2			0.2382	
AIC			-2.179	
SBC			-6.482	
F Statistics			2.612	
F Significance			0.049	
Durbin Watson Statistics			1.87	

$$ECM = LRGI - 1.4895*CAL + 1.6511*INF - 0.36995*LTO - 5.4082*LINV - 23.0839*C \quad (17)$$

3.4.4 Liberia

The short-run equation for Liberia which is depicted in Table 12 shows that the coefficients of the constant, trade openness and the ECM are significant. However, the sign of the coefficient of trade openness was negative contrary to expectation, implying that a percentage increase in trade openness will reduce growth by 0.36 percent. As mentioned earlier, the weak internal capacity particularly with regard to the poor state of the infrastructure as well as lack of favourable trade policies may explain such results. In addition, the coefficient of the ECM indicates that any deviation from long-run equilibrium is immediately corrected in the following (an automatic adjustment mechanism). Capital account liberalization, inflation and investment have positive short-run relationship with

growth but their coefficients are not significant.

Table 12. Error correction representation for the selected ARDL (0,1,0,1,1) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	0.0009	0.0015	0.5613	0.580
Δ lNF	0.8310	0.79935	1.039	0.308
Δ Ln to	-0.3672***	0.15858	-2.315	0.029
Δ Ln INV	0.4109	0.27650	1.486	0.150
ΔC	13.3923***	0.4574	29.279	0.000
Δ ECM (-1)	-1.0000***	0.000	None	None
R^2			0.6636	
Adjusted R^2			0.5612	
AIC			-3.544	
SBC			-9.279	
F Statistics			9.072	
F Significance			0.000	
Durbin Watson Statistics			1.803	

$$ECM = LRGI + 0.0026365*CAL - 0.83101*INF + 1.1805*LTO - 0.88119*LINV - 13.3923*C \quad (18)$$

3.4.5 Nigeria

The results in Table 13 show that inflation trade openness and the ECM are significant in the short-run. A percentage rise in trade openness leads to a 0.059 increase in growth while 1 percent rise in inflation will increase growth by 0.11 percent in the short-run. However, the speed of adjustment is very slow since only 6.58 percent of the deviation in long-run equilibrium is corrected annually. Capital account liberalization and investment have negative short-run relationship with growth contrary to expectations but their coefficients are not significant.

Table 13. Error correction representation for the selected ARDL (1,0,0,0,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	-0.0052	0.0056	-0.937	0.358
Δ lNF	0.1115**	0.0617	1.807	0.083
Δ Ln to	0.0595***	0.0293	2.030	0.053
Δ Ln INV	-0.0095	0.0561	-0.169	0.866
ΔC	0.2069	0.7015	0.295	0.770
Δ ECM (-1)	-0.0658***	0.0317	-2.075	0.048
R^2			0.2167	
Adjusted R^2			0.0599	
AIC			47.721	
SBC			43.419	
F Statistics			1.383	
F Significance			0.264	
Durbin Watson Statistics			1.79	

$$ECM = LRGI + 0.13780*CAL - 2.9737*INF - 1.5853*LTO + 0.25432*LINV - 5.5170*C \quad (19)$$

3.4.6 Sierra Leone

The results of the short-run equation depicted in Table 14 indicate that inflation and investment are significant determinants of short-run growth in Sierra Leone. Both inflation and investment have positive effects on growth in the short-run as was predicted by demand theory. Essentially, a percentage increase in inflation will raise growth by 0.18 percent while a percentage increase investment will increase growth by 0.20 percent. The coefficient of the ECM was negative and significant as expected. The result showed that 47.1 percent of the deviation in long-run equilibrium is corrected annually. Capital account liberalization and trade openness have positive short-run relationship with growth but their coefficients are significant.

Table 14. Error correction representation for the selected ARDL (1,0,0,1,0) model

Regressor	Coeeficient	Standard Error	T-Ratio	Probability
Δ CAL	0.0002	0.0009	0.259	0.798
Δ lNF	0.1818***	0.0551	3.298	0.003
Δ Ln to	0.0705	0.0434	1.623	0.117
Δ Ln INV	0.2035***	0.0407	5.004	0.000
ΔC	4.2405***	0.8486	4.997	0.000
Δ ECM (-1)	-0.4709***	0.0896	-5.255	0.000
R^2			0.6915	
Adjusted R^2			0.6144	
AIC			38.85	
SBC			33.83	
F Statistics			10.759	
F Significance			0.000	
Durbin Watson Statistics			2.41	

$$ECM = LRGI - 0.0005*CAL - 0.3861*INF + 0.02395*LTO - 0.4322*LINV - 9.0038*C \quad (20)$$

3.5 Diagnostic Test Results

The results of the diagnostic test of the ARDL model for each country are shown in appendix II. Generally, the results indicate that usual econometric problems such as autocorrelation, hetero-scedisticity as well as conflict to normal distribution were not observed expect for Guinea where the null hypothesis of homo-scedisticity was rejected. However, Shrestha (2005) states that presence of hetero-scedisticity does not affect ARDL estimates since time series in the equation may be of mixed order of integration and thus, it is natural to detect heteroscedisticity. Moreover, no model specification error exists with reference to Functional form in all cases. Finally, CUSUM and CUSUMSQ plots were drawn to check the stability of short-run and long-run coefficients in the ARDL error correction model. The results showed the plots of CUSUM and CUSUMSQ for all countries. The results indicate that both CUSUM and CUSUMSQ are within the critical bounds of 5% in all cases. This implies that our growth models that are structurally stable.

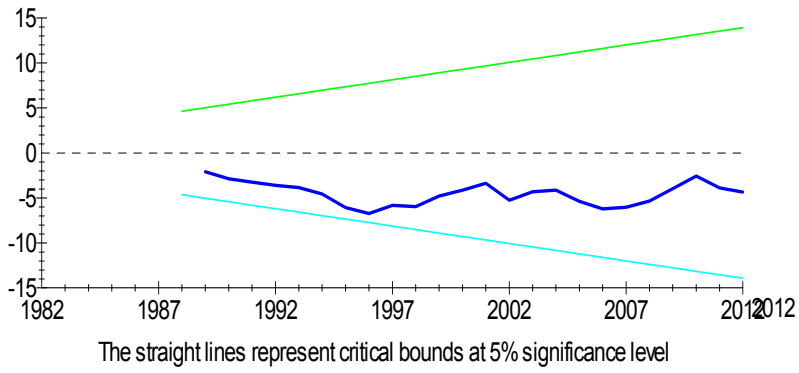

Figure 1a. The Gambia

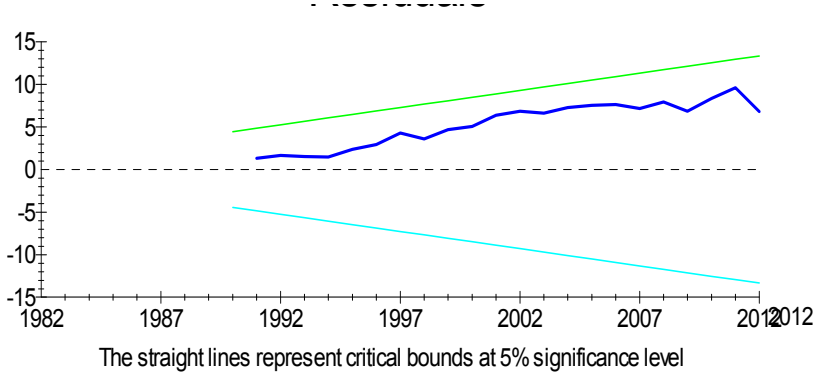

Figure 1b. Ghana

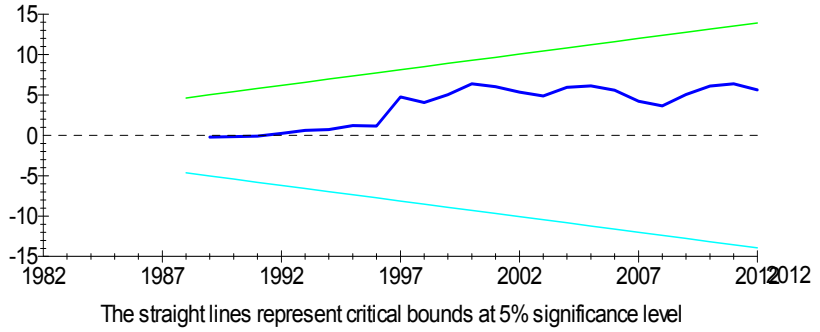

Figure 1c. Guinea

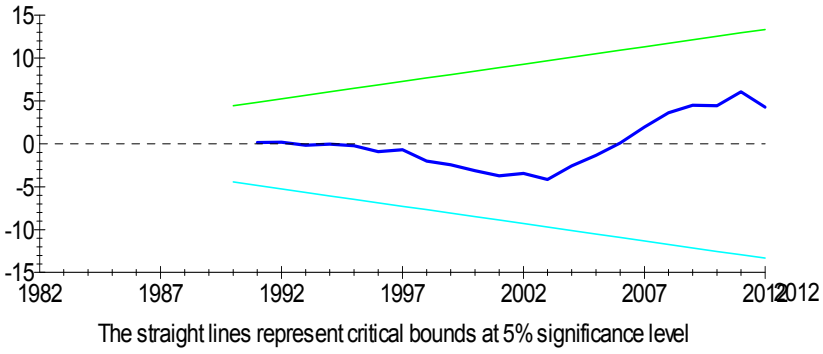

Figure 1d. Liberia

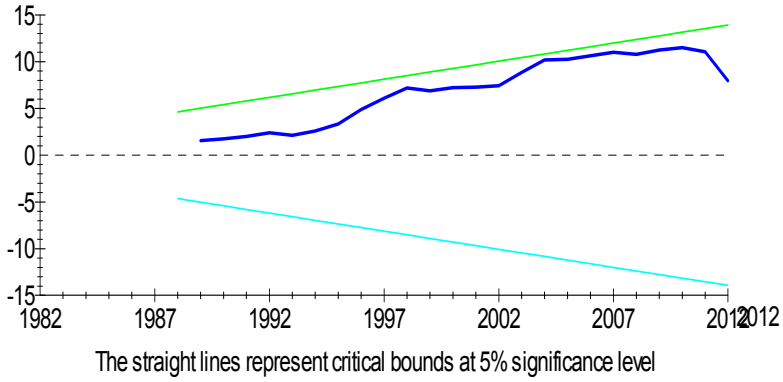

Figure 1e. Nigeria

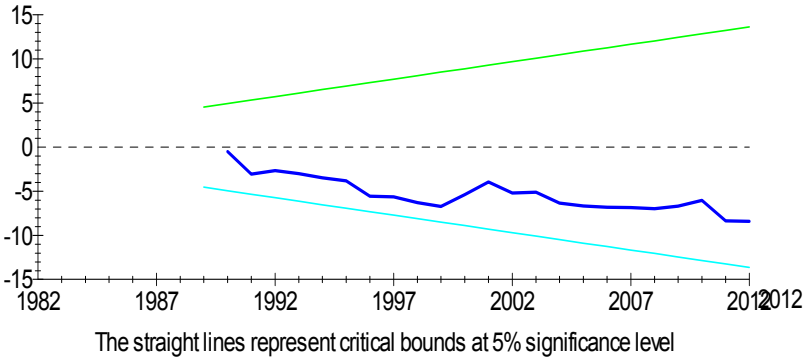

Figure 1f. Sierra Leone

Figure 1. Diagnostic test results. Plot cumulative sum of recursive residuals

4. Conclusion, Policy Implication and Recommendation

4.1 Conclusion and Policy Implication

This paper examined the relationship between liberalization and growth by employing the ARDL bounds testing approach suggested by Pesaran et al. (2001). Growth equations were estimated for each country using annual data for the period 1980–2012. The empirical results of long-run coefficients of the ARDL models showed a significant positive relationship between capital account liberalization and growth for Ghana and Sierra Leone. This suggests that further liberalisation in Ghana and Sierra Leone would promote economic growth in the long-run. Liberalization had positive and significant impact on growth in Ghana even in the short-run. However, there was no significant long-run relationship between liberalization and growth in The Gambia, Guinea, Liberia and Nigeria. The lack of a significant relationship between liberalization and growth it is an indication of the presence of policies inconsistent with liberalization that could adversely affect growth when the capital account is opened and hence, the opening of the capital accounts should be gradual and complemented with sound macroeconomic and financial policy.

Investment and trade openness were also found to be significant determinants of growth in member countries, with the exception of The Gambia. Investment had a positive significant relationship with growth in Ghana, Guinea, Liberia and Sierra Leone, while trade openness had positive and significant impact on growth in Ghana and Nigeria but negative and significant impact on growth in Liberia. Inflation had a negative long run relationship with growth in Ghana but positive and significant impact on growth in Sierra Leone. Overall, the short run and long run results were similar. However, capital account liberalization was not a significant determinant of short run growth in Sierra Leone while inflation had positive and significant impact on short run growth in Ghana, Nigeria and Sierra Leone. The error correction term was significant and negative in all cases, reinforcing the existence of cointegration among the variable. The speed of adjustment nonetheless deferred

from country to country with Liberia recording the fastest adjustment to long run equilibrium (100 percent) while The Gambia and Nigeria recorded the slowest. The speed of adjustment was below 50 percent for all countries with the exception of Liberia.

The robustness of the results was supported by standard diagnostic tests, namely, Serial Correlation LM test, Ramsey Reset test, Normality test, and White heteroscedasticity test. The results indicate that econometric problems like autocorrelation, heteroscedasticity, non-normal distribution were generally not observed. Similarly, no model specification error exists with reference to functional form while the CUSUM and CUSUMSQ plots indicated that the growth models are structurally stable.

Since implementing a major reform like capital account liberalization normally requires an assessment of the impact of such measures, the study will aid and inform policy makers in designing and adopting an appropriate approach to liberalization.

4.2 Recommendation

We proffer three distinct sets of recommendations reflecting the finding of the study. The first set of recommendations is for countries where there is a significant positive relationship between capital account liberalization and growth (Ghana and Sierra Leone), while the second set addresses countries where no significant relationship between liberalization and growth exists (The Gambia, Guinea, Liberia and Nigeria). Since The Gambia has already liberalised its capital account, we offer an additional set recommendation for the country. However, the recommendation should be viewed holistically. Generally, we recommend that WAMZ countries adopt an integrated approach to liberalization as suggested by the literature. Essentially, long-term flows should be liberalised before short-term flows.

4.2.1 Ghana and Sierra Leone

Both countries are encouraged to continue to pursue sound macroeconomic and trade policies to minimize the risks associated with capital account openness. In particular, trade policies should be complementary to capital account liberalization efforts. Additionally, the financial systems' architecture and managerial infrastructure should be reinforced to maximize the benefits of liberalisation. Finally, liberalization of the capital account is imperative given its beneficial impact on growth in these countries. Essentially, all obstacles to the free movement of capital particularly in the WAMZ should be minimised subsequent to the strengthening of the macroeconomic policy and regulatory environment.

4.2.2 Guinea, Liberia and Nigeria

Undertake reforms to tackle key macroeconomic problems like inflation and large public deficits through a sound macroeconomic policy framework. Second, there should be strict monitoring of external indebtedness to ensure that foreign liabilities are low prior to liberalization. In addition, countries should seek foreign investment with lower risks such as FDI and portfolio investment. Thirdly, strong antitrust policies should be developed to enhance competition in the corporate sector. This should be combined with strengthening institutional governance in regulatory institutions. Finally, minimizing restrictions on capital flows especially between WAMZ countries is critical to growth and convergence. It could also be a vital policy option in mitigating domestic macroeconomic distortions.

4.2.3 The Gambia

The macroeconomic and financial policy environment should be more supportive of the current capital account liberalization policy. Financial sector policies and regulations should be aimed at promoting financial market development and strengthening financial stability. In particular, a strong and vibrant money and capital market should be developed to maximize the benefits of liberalisation. The country should implement sound counter-cyclical macroeconomic policies to strengthen macro stability and support growth. Finally, a minimal tax on capital flows could limit the volume of outflows in periods of high outflows, contain the currency depreciation and support counter-cyclical fiscal policies. This is because under perfect capital mobility and a flexible exchange rate, fiscal policy of a small open economy is ineffective, and any decrease in public spending reduces interest rates and the currency depreciates.

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Notes

Note 1. The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone.

Note 2. WAMZ is a group of six countries (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone) aiming to form a monetary union.

Note 3. Contact authors for the results of the selected ARDL model for each country from which the Fstatistics were obtained. The ARDL model for each country was selected based on Schwarz Bayesian Criterion.

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Stock Prices and Consumption: Sub-Sahara African Experience

Lukman O. Oyelami[1], Ebenezer Y. Akinkoye[2] & Emmanuel O. Dunmade[1]

[1] Wesley University of Science and Technology, Ondo State, Nigeria

[2] Obafemi Awolowo University, Ile-ife Osun State, Nigeria

Correspondence: Lukman O. Oyelami, Wesley University of Science and Technology, Ondo State, Nigeria. E-mail: oyelamilukman@yahoo.com

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Abstact

This paper investigates the effect of stock market variables on consumption growth in 12 selected sub-Saharan African countries within the period 1988–2012 using dynamic panel estimation techniques. Specifically, we examine if consumption growth is in any way being influenced by stock returns and dividend yield. While the use of returns determines the existence of a wealth, dividend yield shows how consumption is affected by short-term disequilibrium of prices from fundamental value. Having critically examined the econometric properties of our data, the results from dynamic panel estimation support a significant direct relationship between stock price (returns) and consumption growth which implies the existence of wealth effect. Similarly, the results indicate insignificant positive relationship between the dividend yield and consumption growth which implies that bubbles in the market can increase consumption but with fear of future bust. Overall, we argue that consumption growth can be influenced by stock price (returns), thus policy-maker in the sub-region can leverage on this link to stimulate economic growth.

Keywords: consumption, dividend yield, stock price, growth

1. Introduction

Generally, given the importance of consumer spending on economic growth, it is imperative to investigate what drives this vital component of economic growth. To this end, several theories have been put forward in the literature regarding the determinants of consumer spending. Starting with the work of Keynes (1936) and Friedman (1957) which links consumption to absolute income and permanent income respectively, other theories of consumption have been well discussed in the literature.

Specifically, this paper set out to examine the relationship between stock price and consumption growth for developing economies of Sub-Sahara African countries (SSA). This is in an attempt to establishing or otherwise the existence of wealth effect for developing countries. It is of empirical importance because many monetary policies in the developing economies are predicated on similar assumptions in the developed countries. Based on this, it is imperative to investigate the existence of necessary mechanisms required for the efficacy of monetary policies in the developing countries of the world.

It has been argued in literature that stock prices affect consumption through different channels. Majorly through a direct wealth effect which is based on standard life-cycle model for consumption in the work of Modigliani and Brumberg (1954; 1980). According to this assertion, households will deplete accumulated assets in order to maintain consumption at a relatively steady level. It is also predicted by the model that despite the possible movement in wealth level during the entire existence of a household, consumption will relatively remain unchanged. However, shock to wealth level can still bring about revision in consumption level. If changes in stock prices can be seen as shock to investment via the asset value then it should be of consequential value for household consumption through altering households' wealth. This is not new as the relevance of wealth effects have long been acknowledged in the literature (Hall, 1978).

Also, it is discussed in the life-cycle model that a raise in the value of asset (investment or saving) will bring about an increase in its share of the households' portfolio of total saving. This may necessitate readjustment in the households' portfolio, in a manner that will reduce their holdings of other forms of saving, which in turn may increase consumption (McMillan, 2013).These two alternative approaches work have direct effects on the budget constraint of households. It can also be argued that asset prices and consumption are both driven by a common

macroeconomic factor rather than the former having a direct effect on the later. And this might be responsible for the linkage between stock market development and economic growth as discussed in many studies in the region (Gelbard & Leite, 1999; Levine, 2003; Beck, 2006).

In many Sub Sahara African countries, a stock market activity is at infancy stage. According to Yartey and Adjasi (2007) prior to 1989 there were just five stock markets in Sub-Saharan Africa and three in North Africa and as at 2007 there were 19 stock exchanges market in the continent. This includes starts ups like Uganda and Mozambique stock exchanges to the Nigeria and Johannesburg stock exchanges. With the exception of South Africa, most African stock markets doubled their market capitalization between 1992 and 2002. Total market capitalization for African markets increased from US$113,423 million to US$ 244,672 million between 1992 and 2002. Apart from this introductory part which is section one; the study is divided into four sections. Section two presents addition stylized fact of stock market in Sub-Sahara African countries and section three examines the extant literature on stock market and consumption and by extension economic performance. Also, section four discusses the data and methodology employed in the study while section five presents the results and discussion of our findings.

2. Stylized Fact of Stock Market in Sub-Saharan Africa

Fifteen SSA countries have stock markets, of which most of them established over the past decade and remained immature. Except in South Africa and Zimbabwe, average market capitalization is about 27 percent of GDP; it is as low as 1.4 percent in Uganda (Regional Economic Outlook, 2006). This contrasts with emerging markets like Malaysia, which has a capitalization ratio of about 161 percent (Regional Economic Outlook, 2006). Market liquidity is also very low: turnover ratios are as little as 0.02 percent in Swaziland compared with about 29 percent in Mexico. In most SSA stock markets, informational and disclosure deficiencies prevent trading in most listed stocks. Further, supervision by regulatory authorities is often inadequate (Regional Economic Outlook, 2006).

Also, corporate financing pattern in certain SSA countries suggests that stock markets are important sources of finance. In Ghana, the stock market financed about 28 percent of total asset growth of listed companies between 1995–2002, 16 percent in South Africa between 1996–2000, and 8 percent in Zimbabwe between 1995–1999 (Regional Economic Outlook, 2006). In all the three countries, the stock markets were the most important sources of long-term finance for listed companies. Empirically, Enisan and Olufisayo (2009) examined the long run and causal relationship between stock market development and economic growth for seven countries in sub-Saharan Africa and found that the stock market development is co-integrated with economic growth in Egypt and South Africa. The result was suggestive of the fact that stock market development has a significant positive long run impact on economic growth in some of the countries in the region.

3. Literature Review

Basically, there are two strands of literature regarding stock price and consumption both at theoretical level and empirical level. At theoretical level, the first strand of literature pioneered by the work of Ando and Modigliani (1963) which is based around a standard life-cycle model argues that wealth effect as a result of increase in the price of stock can spur more consumption. To the contrary, based on Friedman (1957) it can be argued that since households might not see a rise in stock price as an increase in permanent income therefore it might not be of any consequence to their consumption as the consumption is not based on transitory income. More recently, the work of Lettau and Ludvigson (2004) upholds this argument in a more assertive manner.

From empirical point of view, the results are mixed with the bulk of the findings emanated from US. Prior to financial deregulation, empirical work on the United States reported a marginal propensity to consume out of wealth within the range of 4 to 8 per cent (Ando & Modigliani, 1963; Modigliani, 1971; Bhatia, 1972). But this "consensus" was put into serious test with the 1987 crash when Cagan (1990) claimed wealth effect had no impact at all on consumption. Similarly, Deaton (1991), Carroll (1992), Wilhelm (1996) and Laitner and Juster (1996) also provided support for the argument in their works.

However, it was argued in the literature that the extensive financial deregulation might have weakened these specific criticisms and may indeed have swayed the argument in favour of wealth effects (Bayoumi, 1993; Caporale & Williams, 1997). The articles by M. Starr-McCluer (1998) of the US Federal Reserve Board of Governors reports concluded that marginal propensity to consume out of stock market wealth is 0.03 to 0.07, with the effect materialising over one to three years". Similarly, Brayton and Tinsley (1996), reported that, "In 1996, estimates from the FRB/US quarterly model placed the marginal propensity to consume at 0.03 for stock market wealth and 0.075 for other net wealth".

Also, cross-sectional, time series and panel studies within and outside the US have reported mixed results. Parker (1999) directly addressed the question of whether the rise in stock prices in the 1990s could have contributed to the fall in the saving rate over the same period. Starr-McCluer (2002) used cross-section survey data in an effort to disentangle Poterba and Samwick's two channels and found some support for the traditional wealth effect, particularly for households with substantial stockholdings. An early study based on panel data is the one by Mankiw and Zeldes (1991) which focusses on the equity-premium puzzle and in which they examine separately for stockholding and non-stockholding consumers. In similar manner Ludwig and Sløk (2002) and Case *et al.* (2001) use a combination of cross-section and time-series data and arrived at the same results. In conclusion, it is worthy of note that the bulk of studies were carried out in the developed economies with little focus on developing economies of the world. This neglect necessitates this study and it is important to also test whether the claims in developed economies will also hold in the developing economies characterised with fast growing stock markets. Thus this study empirically investigates stock price and consumption nexus for developing economies of Sub-Saharan Africa.

3.1 Theoretical Framework: Consumption and Dividend Yield

In line with the work of Mc Millian (2013), the theoretical framework of this study is based on the work of Campbell (2003). In the model, the relationship between consumption and the price dividend ratio is presented in log-linear value prices change according to changes in expected future dividends and the (constant) discount rate. Thus the fundamental prices are given by:

$$p_t = \sum_{t=1} \delta^i E_t D_{t+i}$$

Where $\delta^i = 1/(1+R)$ is the discount factor and R the discount rate. Where log returns are given by $r_t \equiv log(P_t+D_t) - log(P_{t-1})$ and where the time-varying log return is a non-linear function of log prices and dividends. With approximation around a first-order Taylor expansion of the mean price-dividend ratio:

$r_t \approx k+\rho P_t+(1-\rho)d_t-p_{t-1}$ Where k and ρ are linearization parameters.

4. Data and Methodology

4.1 Data

The data employed in this study consists of annual data for stock price, dividend yield and final consumption expenditure for twelve Sub-Saharan African countries based on data availability. The countries included in the study are: Botswana, Cote d'Ivoire, Ghana Kenya, Malawi, Mauritius, Namibia, Nigeria, South Africa, Swaziland, Uganda and Zimbabwe. Due to the fact that many stock markets in the region are at infancy stage, the data used only covers the period 1988–2012. In all, three hundred observations were made and used for each variable in our panel data analysis. All the data were sourced from World Development Indicators (WDI) .

Table 1 presents the descriptive statistical properties of the data employed in the study: Stock price, Dividend yield and consumption. The results obtained are not different from typical macroeconomic data properties whereby the mean of the series is generally smaller than the standard deviation. Also, Jarque-Bera Statistics show that the series are normally distributed as the probability is significant at 1% significant level for the three variables.

Table 1. Descriptive statistics of the data

	Stock Price	Consumption Growth	Dividend Yield
Mean	7.413687	85.96824	8.006083
Median	0.639397	86.58391	4.098086
Maximum	148.7733	121.4600	64.26132
Minimum	0.000000	49.82319	0.000000
Std. Dev.	22.54845	11.46949	11.76472
Skewness	4.279659	-0.447335	2.929426
Kurtosis	22.17086	3.843005	11.52389
Jarque-Bera	4205.812	16.62200	1016.338
Probability	0.000000	0.000246	0.000000

Sum	1697.734	22695.62	1825.387
Sum Sq. Dev.	115922.6	34597.43	31418.77
Observations	229	264	228

Notes: The panel comprises of all the data from twelve selected countries in the Sub Saharan African region and they were introduced at their natural log difference based on data obtained from World Bank Development Indicators.

Also, in an effort to determine the strength of the relationship among our variables, Pearson correlation test was also conducted and the results are reported in Table 2. From the results, it is indicated that there exists a strong relationship between dividend yield and stock market price while consumption growth has a weak negative relationship with dividend yield and stock market price.

Table 2. Correlation relationship of dividend yield, consumption and stock price

	Dividend Yield	Consumption	Stock Price
DY	1.000000		
CM	-0.059759	1.000000	
SP	0.937579	-0.024514	1.000000

4.1.1 Econometric Properties

Prior our estimation, econometric properties of the data were tested using different panel unit root tests as proposed by Pesaran and Shin (1997), Levin Lin and Chu (2002) and other forms of stationary tests. The results from all the tests support stationarity hypothesis for all the variables .This implies that all the variables: consumption growth, stock price and dividend yield are I(0) i.e. stationary at level. From these results, it is safe to conclude that dividend yield is an error-correction term in the context of price and dividend co-integration and thus deviation of prices from fundamentals represents transitory changes. This is in line with Cambell and shiller, (1987) and (1988a, b). The results of the tests are presented in Table 3.

Table 3. Panel unit tests

	Consumption growth	Stock Price	Dividend yield
LLU	-2.94 (0.00)	-8.44(0.00)	-4.30(0.00)
IPS	2.31 (0.010)	-6.13(0.00)	-4.01(0.00)
Fisher-ADF	41.61(0.1)	69.10(0.00)	72.18(0.00)
Fisher-PP	40.75(0.01)	69.43(0.00)	84.37(0.00)
Hadri	7.24(0.00)	10.48(0.00)	10.67(0.00)

Source: Author's computation based on WDI data.

Despite satisfactory results from our unit root tests, we also attempted co-integration analysis for our model to satisfy our statistical curiosity on one hand and to prevent misspecification problem on the other hand. To this end, Pedroni and Johansen Fisher Panel Cointegration test were employed. The results for Pedroni is presented in Table 4 and it shows that the null hypothesis of no co-integration is rejected for our model at 1% significant level thus suggesting long term relationship in the variables. Similarly, Johansen Fisher Panel Cointegration results presented in Table 5 also rejects the hypothesis of no co-integration for our model.

Table 4. Pedroni co-integration result

AR coefs.(within-dimention)				Individual AR. coef.(between dimention		
P.v-stat	P.rho-stat	P.pp-stat	P.ADF-stat.	G.rho-Stat	G.pp-stat	G.ADF.stat
-0.334897	-4.658523	-11.79968	-4.589637	-2.062915	-11.01809	-4.172123
(0.6311)	(0.0000)	(0.0000)	(0.0000)	(0.0196)	(0.0000)	(0.0000)

Table 5. Johansen fisher panel cointegration test: (trace and maximum eigenvalue)

Hypothesized	Fisher Stat.*	Prob.	Fisher Stat.*	Prob.
No. of CE(s)	(from trace test)		(from max-eigen test)	
None	68.32	0.0000	50.19	0.0001
At most 1	34.75	0.0102	27.04	0.0783
At most 2	38.31	0.0035	38.31	0.0035

Notes* Probabilities are computed using asymptotic Chi-square distribution.

4.1.2 Model Estimation

To estimate our model, dynamic generalized moment method (GMM) was employed and this is largely due to short time nature of the data used and the ability of the technique to give efficient result despite temporal autocorrelation in the residual and persistency in the dependent variables Franz (2009).

$$Cg_{it}=Sp_{it}+Dy_{it}+e_{it} \quad (1)$$

In equation above Cg represents consumption growth, Sp represents the stock price and inflation, Dy represents dividend yield. Also i stands for cross section which comprises of selected sub-Sahara African countries and t represents time

The results of our model estimation as presented in table 6 shows that the lag value of consumption has a significant positive effect on current consumption which is statistically significant at 1% and this helps to cater for likely autocorrelation threat in the model. Also, dividend yield demonstrates a positive effect on contemporaneous consumption and this indicates that an increase in dividend yield will spur increasing consumption. However, the result is not statistically significant as the p-value is less than 0.05 but it is in line with Cambell (2003) who argues that positive relationship between dividend yield and consumption can be linked to changes in discount rate. In a similar manner, contemporaneous stock price exhibits positive effect on consumption and this supports a standard wealth effect view where an increase in total wealth effect results in increased consumption. The result is significant at 1% significant level and it establishes the existent of wealth effect

Table 6. GMM estimate of consumption, dividend yield and stock price

Variable	Coefficient	t-statistic	Prob.
Consumption(-1)	0.176262	28.17243	0.0000
D(Dividend Yield)	0.024994	0.855346	0.3939
D(Stock Price)	0.205783	4.129148	0.0001
J-Statistic	6.6		
Instrument Rank	10		
No of Observations	300		
Cross Section Included	12		

5. Conclusion and Implication

Based on our findings, the study concludes that there is a strong existence of wealth effect in consumption in selected sub-Saharan African countries. Similarly, consumption in the region also responds positive to short-term

deviation of price (bubbles) though in weak manner. These findings imply that, since consumption has been identified as a key ingredient of economic growth thus it is safe to conclude an improved performance of firms which is capable of increasing their share valuation matters for economic growth in the region. This provides another channel for government in the sub-region to stimulate economic growth by providing enabling environment for firms to perform optimally rather than resorting to cosmetic approach of causing bubbles in the market. Also, the study establishes that dividend yield performs the role of error-correction mechanism since the variable is order of degree one and this is a typical behaviour of the variable in many advanced economies. This suggests that dividend yield can as well serve as an important signal to players in the stock exchange market in the sub-region.

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Are Remittances to Sub-Saharan Africa Altruistic or for Self-Interest? Evidence from Kenya

John Kagochi[1] & Chien-Ping Chen[1]

[1] School of Business Administration, University of Houston-Victoria, USA

Correspondence: Chien-Ping Chen, School of Business Administration, University of Houston-Victoria, 14000 University Blvd, Sugar Land, TX 77479, USA. Tel: 1-281-275-8811. E-mail: chenc@uhv.edu

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Abstract

International remittances comprise significant financial inflow for many Sub-Saharan African (SSA) countries and provide considerable disposable income for the receiving households. There has, however, been no consensus on the motivation in the part of sending migrants in which explanations are divided between altruism and self-interest. The study employs Autoregressive Distributed Lag (ARDL) model with co-integration approach to investigate whether international remittances to Kenya can be explained by either altruistic or self-interest motive. We process the World Bank annual data from 1970 to 2010 and find that self-interest, not altruism, as the dominant motivation to determine remittances. The analysis also indicates that demand on housing and exchange rates are the two strong drivers of international remittances to Kenya in both short-run and long-run. The Kenyan government is supposed to facilitate savings from remittances through financial institutions to invest more in the small business sector for economic growth.

Keywords: remittances, altruism, self-interest, Sub-Saharan Africa, Kenya

1. Introduction

The importance of remittances in a developing country's economic development has been raising attention and discussion among academics, private sectors and policy makers. World Bank (2011) shows that worldwide remittances construct nearly two-thirds of Foreign Direct Investment (FDI) to developing countries and the inflow amount is more than two times of the total official development funds. There has been a long debate on the motives affecting a migrant's decision making to remit. Prominent among those motivations are altruism and self-interest. According to Becker (1974), altruism is giving without regard to reward or the benefits of recognition and need. It can be an important factor in decision making for remittance especially when immigrants have to financially support families back home. On the other hand, self-interest motivation for remittance is considered when a migrant is unwilling or not able to find good investment opportunities in the host country and, therefore, decides to invest back home. Migrants remit because they benefit from household gratitude after they return back home which can appear as a reflection of household inheritance. To the government in developing countries, it has been significantly important to verify which motivation is more dominant in remittance, altruism or self-interest, to facilitate the inflow money as the driving force for economic growth.

There have been numerous studies on motivation for international remittances in Eastern Europe and Latin America. However, the findings may not fit the other developing countries, especially for those in Africa with a relatively lower share but a faster growing remittance flow. Among them, Sub Saharan Africa (SSA), constructing the lowest amount of remittances in Africa, more than doubled the inflow from $9.6 billion to $21.5 billion in the period of 2005 to 2010 (World Bank, 2011). Although the increase was remarkable, remittances to the region still counted less than 6 percent of global developing countries during the same period. Different from the other developing countries, the majority of SSA has the highest share of poverty population and the lowest share of immigrants to developed countries. In 2010, only 24.8% of the immigrants from SSA went to high-income OECD countries while 2.5% migrated to high-income non-OECD countries. The rest 63.0% were the intra-regional migration, often not depicted in the statistics (World Bank, 2011). Although there is still lack of empirical research for remittance motivation to SSA, it is commonly expected that altruism and charity are embedded into the culture of people who originate from this region and one would expect altruism to be the

dominant motivation for international remittances to this region.

Among SSA countries, Kenya raises our interest in exploring the motivation of remittances by the following rationales. First, Kenyan worldwide immigrants have grown fast and remittances have increased dramatically (e.g. $530 million in 2003 to $1.8 billion in 2010). Kenya is also ranked as the third largest remittance recipient in SSA (World Bank, 2011). Second, remittances count as the largest component in foreign income for Kenya and contribute 5.4% in its GDP. In addition, as Bendixen (2010) indicates, like most African countries, Kenya government does not implement or propose any policy to channel the remitting inflows for its economic growth. Only a miserable 4% of receiving remittances are kept as savings for investment. Finally, to our knowledge, there is still lack of investigation on the motivation for remittances subject to Kenya.

This paper seeks to fill the literature gap of remittance motivation and provides recommendation for Kenyan government policy making. We process the World Bank annual data from 1970 to 2010 to estimate the long-run determinants for international remittances to Kenya by employing the Autoregressive Distributed Lag (ARDL) model with co-generation approach renovated by Pesaran, Shin, & Smith (2001). We find that self-interest rather than altruism dominates as the motivation in international remittances to Kenya. Housing construction demand and exchange rate are the two strong drivers of international remittances to Kenya. Also, the economic status of immigrants' host country is strongly related to the amount of remittances. The rest of the paper is organized as follows. Section 2 discusses a brief literature review. The model specification and data are shown in Section 3. Section 4 presents econometric methodology and interprets the results. Concluding remarks and policy recommendations are in the last section.

2. Literature Review

Previous studies have provided quite mixed results for the impacts from remittances on a recipient country's economy, especially in developing countries. Opponents of remittances argue that remittances enlarge income inequality since rich families are more capable to send migrants oversea then they will remit more back home making their households even richer. Ratha (2004) indicated that large money inflows may weaken the receiving country's relative competitiveness in international trade due to an appreciation of real exchange rate. For small developing countries where remittance constructs a relatively higher share in their GDP, Catrinescua, Leon-Ledesmab, Pirachac, & Quillind (2009) confirmed the negative impact of remittances which not only restricts exports but also limits employment and output. Examining Eastern European countries, Leon-Ledesma and Piracha (2004) found that remittances lower the shadow price of market wage in recipient countries. Individuals who receive remittances are expected to reserve a higher wage to enter labor market.

On the other hand, several studies support remittances as a positive impact on relatively poor economy. In addition to improve the living standard of poor recipients, Roberts and Banaian (2004) claimed that remittances also serve as a vehicle to expand financial market in which recipient households tend to investment in education and healthcare. Furthermore, Woodruff and Zenteno (2004) found that remittances promote entrepreneurial activities by relaxing the financial constraints for small business especially in developing countries. Both productivity and employment are improved through the positive impact of remittances on investment. Leon-Ledesma and Piracha (2004) and Thanh (2009) also recognized a strong potential for remittances to promote community development and enhance gross national product (GNP) in developing countries.

Either altruism or self-interest plays the most important role in remittance decision making for those who migrate due to poverty in their home country. Altruism has been defined as the willingness to give part of one's time or resources for a good cause and the willingness to give has to be in the giver's utility function; otherwise, it will be considered as obligatory (Becker, 1974). According to Tchouassi (2010), the altruistic model assumes that sending remittances yields a satisfaction to the migrant out of a concern for the social welfare of his family, community, or country. If altruism is the most important motivation, the remittance flows are expected to be stable at national level for the receiving countries. As a result, it is more likely that families receiving money from oversea will routinely depend on such flows in the future. The inflows to the families are also expected to increase when the receiving countries experience economic downturn (Bouhga-Hagbe, 2006).

In contrast, self-interest motivation to remittance is considered especially when a migrant is unwilling or not able to find investment opportunities in the host country and, therefore, chooses to invest back home. Lucas and Stark (1985) indicated that remittances are actually on the purpose of insurance for migrants' own self-interest. They expect the receiving families will reciprocate when they fall into economic hardship in the host country. Brown (1997) defined the self-interest motivation as the expected return from investment back home and the possible changes in family inheritance affect migrants' decision making in remittances. When immigrants remit to the household paying for them in the past, especially in education, remittances are also viewed as return of

investment incurred to facilitate the transition abroad (Poirine, 1997).

Like most SSA counties, Kenya is too poor to provide sufficient social support for citizens who earn their living through subsistence agriculture. Tchouassi (2010) indicated that social security for the majority in those countries is provided by family members and clan, or the ethnic groups through giving and sharing. It is therefore expected that altruism and charity are embedded into the culture of people who originate from this region and one would expect altruism to be the largest motivation for international remittances to this region. However, none of the previous studies investigates empirically about the altruism motivation for Kenya.

3. Model Specification and Data Description

3.1 Model Specification

Following Lucas and Stark (1985) and Funkhouser (1995), we consider one migrant (m) and one recipient household (h) which may consist of one or more individuals. Similar to Funkhouser (1995), a separable total utility function for the migrant contains his or her own utility, U_m, and the value V of the recipient household utility, U_h, such that

$$U(U_m,U_h)=U_m(C_m)+V\{U_h(C_h),\ A\}, \tag{1}$$

where C_m and C_h denote the consumption of migrant and household respectively; A is the importance of utility of the household left behind in the migrant's own utility, or the degree of the migrant's attachment to home country. The utility functions satisfy the concave properties as $U_m' \succ 0, U_h' \succ 0, U_m'' \prec 0$, and $U_h'' \prec 0$. The migrant maximizes the separable lifetime utility function by choosing R_t, the nominal remittance expressed in home country currency in period t:

$$\max_{R_t} U_m = \sum U_m\{C_{mt}\}/(1+\delta_u)^t + V\{U_h(Y_{ht}+e_tR_t+N_{ht}e_t\overline{R}), A\}/(1+\delta_v)^t \tag{2}$$

subject to

$$C_{mt}= Y_{mt}\text{-}R_t \tag{3}$$

where C_{mt} is consumption of the migrant at time t; Y_{mt} is the income earned by the migrant in the host country at time t; Y_{ht} is the income of the recipient household; e_t is the real exchange rate between the host and home country; $\overline{R}$ is the average remittances received from other migrants who work in the same host country; N_{ht} is the total number of migrants from the home country to the host country. Finally, $(1+\delta_u)^{-t}$ and $(1+\delta_v)^{-t}$ are the time discount rates applied to the migrant's own utility and the value of recipient household utility, respectively. It is also assumed that migrant does not participate in the host country stock or debt market. Therefore, Y_{mt} is either consumed or remitted to the country of origin.

The first-order condition for a positive level of remittances in time t is given by

$$-[U_m'/(1+\delta_u)^t]dR + [\partial V/\partial U_h(U_h')]/(1+\delta_v)^t dR = 0\ . \tag{4}$$

Equation (4) shows that an incremental increase in utility from additional household income as a result of remittance offsets the decrease in the migrant's utility by his or her lower consumption in the host country due to the money transfer. As noted by Funkhouser (1995), a corner solution to the maximization problem leads to either a censored regression model or self-selection model. In both cases, the optimal solution can be derived as a reduced form equation for the determinants of remittances:

$$R_t=f(Y_{mt},\ Y_{ht},e_t,N_{ht},A); \tag{5}$$

the expected signs for Y_{mt}, e_t and N_{ht} are positive while the sign of Y_{ht} is expected to be negative.

There are several general implications from the model including that a migrant with higher income is supposed to remit more and a lower income household receives more. Remittances increase with both the degree of proximity between the migrant and the recipient household members, and the migrant's intentions to return. At macro level, more migrants will lead to a higher total remittance. Real exchange rate (e) appreciation in the home country is expected to reduce remittances from oversea and *vice versa*. We therefore expect a positive relationship between the real exchange rate and remittances which are expressed in the host country's currency. It is also expected that remittances will increase with the degree of migrant's attachment to his family in country of origin (A) which is consistent with the literature on trans-nationalism. As noted by Guarnizo (2003), transnational migration refers to immigrants that settle down and become well integrated in the host country but still maintain social, cultural, economic and political ties with their home country.

Given the derived properties in the above, we construct the following log-linear model to estimate the international remittances to Kenya as

$$lnRem_t=\alpha_0+\alpha_1 lnY_t+\alpha_2 US_t+\alpha_3 lnHD_t+\alpha_4 lnEX_t+\alpha_5 INFL_t+\alpha_6 Dt_t+\varepsilon_t \quad (6)$$

In (6), $lnRem$ denotes the log of the share of international remittances to the recipient country's real GDP. *Y* and *US* are the agricultural GDP *per capita* and the U.S. unemployment rate, respectively. According to more than 50% of Kenya's remittances are originated from the U.S., the *US* is considered as an appropriate proxy for estimation (Bendixen, 2010). The business cycles of the two countries are assumed to be independent since they are lowly intertwined geographically and economically. *HD* denotes the domestic cement consumption; *EX* denotes the real exchange rate; *INFL* measures of price inflation in the recipient home country. In addition, due to Kenyan agricultural economy, we add *Dt* as the dummy variable for drought years that takes the value of 1, when there is drought within the year.

3.2 Data Sources and Description

We investigate annual data for Kenya covering 1970–2010 from World Bank (2011). The dependent variable, remittance (*Rem*) is expressed in U.S. dollar and counts the transfers from migrants to recipient households including (1) cash or in kind, (2) employee compensation such as wages, salaries, and other remuneration, and (3) capital assets. There are two limitations about the World Bank remittance data. First, it counts the transfers made by immigrants who reside in the host countries longer than one year. The remittances from new immigrants are not included in the World Bank data (Bilsborrow, Hugo, Oberai, & Zlotnik, 1997). Second, the data only tallies remittances sent through official channels (e.g., commercial banks and money transfer operators). Given the extensive informal channels (e.g., cash in mail) for remittances in many developing countries, it is very likely to underestimate the total remittance flows (Ratha, 2004).

The model uses agricultural real GDP (*Y*) as a proxy for economic performance in Kenya and also as a proxy for "poverty". The data is obtained from the Food and Agriculture Organization of United Nations (FAO) database. The agricultural sector in Kenya employs about 75% of the country's labor force and accounts for 45% of government revenues. Poverty levels in Kenya, both urban and rural areas, are closely related to agricultural output as a major means of generating income (Gitu, 2004). We, therefore, assume that a fall in agricultural GDP will lead to a harsh economic downturn that translates into rising international remittances, if altruistic motivation dominates.

The host country income, measured by host country GDP *per capita*, is a significant determinant for remittances due to both increasing quantity demand for immigrant labor force and increasing wages (Straubhaar, 1986). However, as noted by Vargas-Silva and Huang (2006), the host country income can be approximated by the unemployment rate as a better indicator for economic downturn. The variable *US* denotes the U.S. annual unemployment rate in which a negative relationship is expected between *US* and international remittances, no matter the motivation is altruism or self-interest. We obtain the U.S. unemployment data from World Bank (i.e., World Development Indicators (WDI)).

Measured in metric tons, the variable of domestic cement consumption (*HD*) is a proxy to represent demand on housing construction. Kagochi and Kiambigi (2012) and Osili (2005) investigated Kenya and Nigeria respectively to conclude that migrants' savings in the host country are usually transformed to be assets in the home country in the form of housing and land. When those savings are invested in construction sector output, *HD* serves as an important indicator in our model to verify remittance motivation. If altruistic motive dominates, migrants will demand relatively less *HD* during economic downturn in their home country. In contrast, if self-interest motive leads, they will demand more housing as a great investment opportunity to cushion their families. Like Kagochi and Kiambigi (2012), we obtain the same data from Kenya National Bureau of Statistics.

The real exchange rate (*EX*), the price of home country's currency expressed in terms of the host country's currency, may influence the level of remittances in two directions. If domestic goods and services of home country become less expensive due to currency depreciation (i.e. $EX\downarrow$), then the migrants will remit less money to purchase the same consumption bundles as before. In contrast, currency depreciation in the home country may lead its citizens living abroad to feel wealthier. The "wealth effect" will boost their purchasing power back home and encourage more remittances buying more goods, including real estates. At macro level, currency depreciation of home country is assumed to hurt Kenya, which is a net importer. It will result in more economic hardships which translate into more international remittances if the migrant's motive is altruistic. So, the sign of *EX* in the estimated equation is more likely to be negative (positive), if the altruistic (self-interest) motivation dominates. *EX* Data is also obtained from the World Bank (WDI).

Inflation (*INFL*) is measured by the Consumer Price Index (CPI) and defined as declining purchasing power in the home country. In developing countries, the majority in rural area households depends significantly on remittances as the only source of income. Therefore, if migrants' motive of remittances is altruistic, a higher

inflation which declines household purchasing power is expected to encourage more remittances. CPI data is also obtained from World Bank.

Like the other countries in Sub-Saharan Africa, Kenya's agricultural production depends heavily on natural rainfalls. A drought not only harms farmers in rural areas but also damages income-generating behavior related to agricultural products in urban areas (Gitu, 2004). Davies (2007) indicated that households suffering from drought are expected to receive more remittances from distant areas. We assemble the historical data of drought occurrence in Kenya then define the dummy variable (*Dt*) to explore the relationship between drought and remittances, in which "1" is for years that are classified as "drought" and "0" otherwise. We also assume that onset of drought will lead more international remittances if migrants' motive is altruistic.

4. Methodology and Empirical Results

4.1 Methodology

Following the current financial development literatures, we employ the Autoregressive Distributed Lag (ARDL) model with co-generation approach renovated by Pesaran et al. (2001) to estimate both short-run and long-run elasticities for the determinants of remittances to Kenya. Several advantages of ARDL co-generation model enable us to explore the impacts of determinants in the case of Kenya. First, ARDL yields consistent estimates of long-run coefficients that are asymptotical and irrespective to the order of integration for the explanatory variables. With co-integration techniques which require the underlying series as the bound test, the model does not need to restrict that all the variables have to be integrated at the same order. Second, the ARDL approach provides unbiased estimates of long-run model and valid *t*-statistics even when some independent variables are endogenous as inclusion of dynamics. It may also correct the possible endogenous bias noted by Harris and Sollis (2003). Third, the ARDL model counts error corrections into its lagged periods. As a result, both error correction and autoregressive lag are fully covered for either long-run or short-run relationship among the tested variables. When the error correction is not restricted, the ARDL model automatically becomes an Unrestricted Error Correction (UEC) model. Finally, there are only 41 observations with 7 parameters (i.e., excluding the intercept) in our data set. Compared with the other co-integration techniques requiring large sample size, the ARDL approach works better in estimation for a restively small sample size (Blin & Quattara, 2009).

Based upon Equation (6), an ARDL representation of the determinants of remittances to Kenya is formulated as

$$\Delta lnRem_t = \beta_0 + \sum \beta_{1i} \Delta lnY_{t-i} + \sum \beta_{2i} \Delta US_{t-i} + \sum \beta_{3i} \Delta lnHD_{t-i} + \sum \beta_{4i} \Delta lnEX_{t-i} + \sum \beta_{5i} \Delta INF_{t-i} + \sum \beta_{6i} \Delta DT_{t-i} + \beta_7 lnRem_{t-1} + \beta_8 lnY_{t-1} + \beta_9 US_{t-1} + \beta_{10} lnHD_{t-1} + \beta_{11} lnEX_{t-1} + \beta_{12} INF_{t-1} + \beta_{13} DT_{t-1} + \varepsilon_t \quad (7)$$

where β_0 is a drift component and ε_t is white noise error. In equation (7), the terms with summation define the short-run dynamics. All the rest of terms represent the long-run relationship. Similar to the procedure in Pesaran *et al.* (2001), we start the ARDL process with a bound testing of the presence of a long-run relationship among the variables. The bound testing is determined by *F*-statistic with the null hypothesis of no co-integration in the long-run relationship (i.e. *Ho*: $\beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$). The decision rule is simple. If *F*-statistic exceeds the upper critical value (i.e. 5%), then we reject the null hypothesis of no long-run relationship regardless of the variables order of integration. On the other hand, if the test statistic is less than the lower critical bound, then no co-integration is confirmed in the long-run relationship. We may use information criteria, either Schwartz Bayesian Criteria (SBC) or Akaike Information Criteria (AIC), to construct both long-run and short-run models. However, in case the test statistic falls within the range of two bounds, then it becomes inconclusive.

4.2 Empirical Results

As Pesaran *et al.* (2001) indicated, the ARDL model in co-integration approach does not need to conduct unit root test in advance like the other techniques (e.g., Johansen approach). However, if the order of integration of any pair of variables is higher than one, then the critical bounds defined by Pesaran *et al.* (2001) will be invalid. As suggested by Blin and Ouattara (2009), before proceeding to the estimation stage, we have to conduct the unit root test to ensure that all variables are either I(0) or I(1) to satisfy the ARDL assumptions.

4.2.1 Unit Root Test

We employ the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) as the standard tests for unit root in Table 1. The result indicates that all the variables are stationary in Equation (7). In other words, the order of integration for all variables are confirmed at either I(0) or I(1). It is unnecessary to conduct dummy variable (D_t) in unit root test since it is binary at I(0). With confidence, we may keep on the ARDL methodology to the next stage.

Table 1. ADF and PP unit root tests (with constant no trend)

Variables	ADF	PP	Variables	ADF	PP	Decision
Rem	−0.654	−0.517	Δ*Rem*	−7.000***	−7.441***	I(1)
Y	−0.896	−0.938	Δ*Y*	−7.787***	−9.066***	I(1)
US	−1.849	−2.174	Δ*US*	−4.645***	−4.547***	I(1)
HD	0.266	−0.087	Δ*HD*	−5.705***	−5.733***	I(1)
EX	−0.562	−0.608	Δ*EX*	−4.764***	−4.760***	I(1)
INF	−3.682***	−3.633***	Δ*INF*	−7.002***	−7.340***	I(0)

***significance at 1% level. The critical values are based on the finite sample calculation in McKinnon (1991).

4.2.2 Long-Run Relationship

Before running the regression for Equation (6), we need one more step, a bound test, to confirm that a long-run relationship exists among variables. Table 2 shows the *F*-statistic is above 5% critical value defined in Pesaran *et al*. (2001). We can reject the null hypothesis of no co-integration and confirm a long-run relationship among variables in the period of 1970 to 2010 for remittances to Kenya.

Table 2. Bounds tests for the existence of co-integration

F-Statistic	*5% Critical Value*	
	I(0)	I(1)
199.95	2.22	3.39

After the long-run relationship is confirmed, the estimates of coefficients in Equation (6) are shown in Table 3 based on the Schwartz Bayesian Criteria (SBC). The long-run ARDL regression has an R^2 of 0.96 as a good fit. The selected ARDL with the order (1, 1, 1, 1, 1, 0, and 0) over variables also shows the significance in standard diagnostic tests, including normality, heteroscedasticity, functional form and serial correlation. The long-run ARDL regression has an adjusted R^2 of 0.96 as a good fit. A 5% significance of US unemployment rate indicates a negative relationship between *US* and international remittances, no matter the motivation is altruism or self-interest. It confirms that economic downturn in the host country lowers remittances to Kenya as predicted in Section 3. In the long run, 1% increase in US unemployment, *ceteris paribus*, will result in 0.09% drop in international remittances.

Table 3. Estimates of long-run coefficients

Variable	Coefficient	t-ratio
Intercept	−1.69	2.31**
Remittance (*Rem-1*)	0.56	4.16***
Agriculture GDP (*Y*)	−0.65	−0.78
US Unemployment (*US*)	−0.09	−2.41**
Housing Demand (*HD*)	0.61	2.99***
Exchange Rate (*EX*)	0.55	2.23**
Consumer price inflation (*INFL*)	−0.002	−0.41
Drought (*Dt*)	−0.01	−0.08

Results based on Akaike's Information Criteria (AIC) and Schwartz Bayesian Criteria (SBC) suggest that the process is an AR(1). **significance at 5% level; ***significance at 1% level. Adj. R^2 = 0.96; Wald *F*-Statistic = 169.76[0.00]***; DW Statistics =1.96.

Surprisingly, the signs of coefficients for all independent variables which verify remittance motivation show the opposite direction to against altruism, including agriculture GDP (*Y*), housing demand (*HD*), exchange rate (*EX*), inflation (*INFL*) and drought (*Dt*). Among them, housing demand and exchange rate are statistically significant

at 1% level and 5% level respectively to support the self-interest motivation of remittances. The coefficient of *HD* indicates that 1% increase in housing construction demand, *ceteris paribus,* will result in 0.61% increase in international remittances to Kenya in the long-run. With self-interest motivation, migrants who are working oversea will demand more housing in Kenya as a great investment opportunity. The result also confirms the finding in Kagochi and Kiambigi (2012) and Osili (2005) in which migrants' savings in the host country are transformed to be local assets (e.g. housing and land) in the home country. Given the positive sign of exchange rate, a depreciation ($EX\downarrow$) of the Kenya shilling against the US dollar leads a decrease in remittances which also violates the altruistic assumption. The result shows that migrants do not remit more back home when Kenya experiences economic harsh times due to currency depreciation as a net importer. Instead, 1% increase in exchange rate (appreciation) will result in 0.55% increase in international remittances to Kenya in the long-run. It is more likely to support self-interest motivation because migrants tend to remit a greater amount back home given more investment opportunities in a better home economy. Furthermore, the other three "altruistic" variables including agriculture GDP (*Y*), inflation (*INFL*) and drought (*Dt*), do not show statistical significance. The signs of coefficients are negative in opposition to the altruism motivation in Kenyan case.

4.2.3 Short-Run Dynamics

As all variables are co-integrated, it is suitable to apply the error correction mechanism (ECM) to examine the short-run dynamics for remittances to Kenya. Table 4 exhibits the ECM results associated with the SBC criteria. The negative sign of *ECM* coefficient shows significance at 1% level. A highly significant *ECM* not only confirms the existence of a stable long-run relationship but also indicates a fast adjustment speed to restore equilibrium in a dynamic model (Bannerjee, Dolado, & Mestre, 1998); that is, a −0.90 coefficient of *ECM* (1) implies that deviation from the long-term growth rate of remittances can be corrected by 90% in the next period.

All the statistics in Table 4 support the long-run findings in the short run dynamics. They indicate that none of altruistic motive variables, including agricultural GDP, inflation and drought, are significantly related to remittances in the short-run. Again, the housing demand, serving as a variable strongly revealing self-interest motivation, determines the remittances at a 10% significance level in the short-run. A positive short-run relationship between self-interest motivation and remittances are reconfirmed in the case of Kenya.

Table 4. Results of error correction model

Variable	Coefficient	t-ratio
Intercept	0.01	0.13
$\Delta Rem\ (1)$	0.69	2.67**
ΔY	−0.77	−0.94
ΔUS	−0.09	−1.90*
ΔHD	0.50	1.71*
ΔEX	0.40	0.77
$\Delta INFL$	−0.001	−0.04
ΔDt	−0.02	0.29
ECM (1)	−0.90	−3.50***

ARDL (1, 1, 1, 1, 1, 0, and 0) is based on Schwartz Bayesian Criteria (SBC).*significance at 10% level; **significance at 5% level; ***significance at 1% level. Adj. $R^2 = 0.38$; Wald *F*-Statistic = 2.63[0.02]***; DW Statistic = 2.01.

5. Concluding Remarks

The paper investigates whether international remittances to Kenya are motivated by altruism or self-interest by using an ARDL model. Contrary to the other studies in this field conducted for the SSA, our empirical findings suggest that self-interest rather than altruism plays a more important role in determining the amount of remittances to Kenya. The economic status of migrants' host country is also strongly related to the amount of remittances. Housing construction demand and exchange rates are the two strong drivers of international remittances to Kenya. The altruism measurements including agricultural GDP, inflation and drought do not seem to explain international remittances to Kenya.

The dominance of self-interest motivation for remittances to Kenya may be explained by its socioeconomic composition of international immigrants. Like most SSA countries, migration from Kenya to Western world, especially to the U.S., is relatively expensive given the local low income level. Only the relatively wealthy households are able to send migrants oversea then benefit from international remittances. As noted by Murrugarra, Larrison, & Sasin (2010), migration has both economic and social costs which require capable migrants to use resources that the poorest may not have access to. Those resources include financial assets (e.g. income, savings, credit), human capital (e.g., education, training, entrepreneurship), social networks and political strength. To the migrants from wealthier households in Kenya, altruism motivation is weaker because their families may not be affected by food shortage related to economic hardships. Among SSA countries, as summarized in Hoddinott (1994), wealthier parents in Kenya and Botswana received a larger share of migrant earnings through remittances. Studies elsewhere also indicate that only people coming from higher income families are able to migrate to the US. For example, in Nicaragua, migrants to the U.S. from higher income families are significantly more than those to Costa Roca. Our findings also debunk one of popular media's assertions that Kenyans in the Diaspora remit more during the hard time, especially in drought time, to cushion their relatives back home against inflated financial burden. Indeed, the rising remittances might be a reflection of Kenyans in the Diaspora taking advantage of the depressed market conditions such as lower priced property market, equity market and other investments. Kenyan migrants are also able to take advantage of favorable exchange rate during hard times which is occasioned by the need for the country to accumulate more foreign exchange reserves to pay for importation of basic commodities such as food.

Given the dominance of self-interest motivation for remittances, we recommend the Kenyan government to facilitate channeling of remittances into manufacturing and financial sectors to boost its economic growth. One way of doing so is to promote savings (e.g. a higher saving interest rate) from remittances into financial institutes where the money can be loans to small business for job creation. In addition, government should enact policies which encourage migrants to engage in transferring human capital and technology back to Kenya. Otherwise, the poor cannot benefit from increasing remittances in the long run. The government is also supposed to engage in bilateral immigration agreements with developed countries. A lower immigration cost will avail more people from poor families to participate in immigration with resultant increase in altruistic related remittances and poverty reduction.

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ETFs versus CEFs: Performance in International Equity Investing

C. Edward Chang[1], Kent P. Ragan[1] & H. Doug Witte[1]

[1] College of Business, Missouri State University, United States

Correspondence: C. Edward Chang, College of Business, Missouri State University, Springfield, MO 65897, USA. Tel: 1-417-836-5563. E-mail: EdwardChang@MissouriState.edu

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Abstract

Exchange-traded funds have experienced rapid growth in the last twenty years. We compare the performance of these funds to competing closed-end funds in the international equity investment setting. Expense ratios, turnover, risk, and return are examined over a ten year period ending in 2012. The expenses and turnover rates for exchange traded funds were significantly lower. However, closed-end fund returns after deducting expenses were significantly higher both unconditionally as well as on a risk-adjusted basis. Our findings suggest that unless the tax consequences of higher turnover are extreme, investors should forego the much hyped-lower expenses of exchange-traded funds and focus on the higher returns produced by closed-end funds.

Keywords: exchange-traded funds, closed-end funds, international investing, expense ratios, annual turnover, beta, risk-adjusted returns

1. Introduction

1.1 Exchange-Traded Funds versus Closed-End Funds

Introduced in the early 1990s, exchange-traded funds (ETFs) have become significant investment vehicles and today there exist more than 1,500 ETFs trading on U.S. exchanges. ETF assets under management in the U.S. have grown to nearly one trillion dollars. The merits of these funds are being increasingly extolled. Kennedy (2012) contends that one attractive feature of ETFs is that they make investing in foreign markets and countries easy. But are ETFs even a good way to invest internationally? Given that many closed-end funds offer a similar investment focus and can be viewed as substitutes for ETFs, a comparison of these funds is motivated. We compare the operational characteristics and investment performance of international equity ETFs relative to category-matched closed-end funds (CEFs).

ETF investments include stocks, bonds, commodities, and other assets. Similar to investment in a mutual fund, investors' gains or losses will be commensurate to the performance of the portfolio of assets in which the ETF has invested. These funds offer great liquidity because they trade throughout the day on a stock exchange. Additionally, ETFs typically trade at a price very close to their net asset values (NAVs) given their unique structure in which shares can be created or redeemed at any time with delivery of baskets of in-kind underlying securities. This means that material divergence between an ETF's share price and NAV is likely to be arbitraged away.

Similarly, CEF shares are bought and sold in a secondary market. However, the number of shares a particular CEF has outstanding remains constant over time because when a CEF is created it is very much like an initial public offering with no additional capital subsequently raised. Thus, all purchases and sales of CEF shares must be conducted with another investor in a secondary market transaction. In contrast, a traditional open-end mutual fund either creates new shares when new cash comes in or retires shares when disbursing cash.

ETFs are typically managed to mimic the returns of an index. In contrast, CEFs are actively managed in an attempt to beat the performance of an index benchmark. CEFs will therefore typically have higher expenses and higher turnover. Most ETFs, given their desire to track an index, have greater transparency regarding the composition of the underlying portfolio. Naturally, CEF managers in trying to beat index returns and charge a higher fee for their expertise, will minimize disclosure of their current portfolio composition. The greater transparency of ETF portfolios and the possibility of arbitrage cause ETF share prices to track more closely the net asset value of the underlying portfolio. In contrast, CEF share price and NAV can differ dramatically due to investor sentiment and impediments to arbitrage associated with these funds (see Lee, Shleifer, & Thaler, 1990).

1.2 Literature Review

Gastineau (2001; 2002) chronicles the history of ETFs and the structure of these financial securities. Charupat and Miu (2013) offer an excellent summary of the ETF literature to date. Because ETFs do not have to sell shares in order to meet investor redemptions, capital gains taxes can be better managed (Madlem & Edwards, 2002; Wiandt & McClatchy, 2002). Buetow and Henderson (2012) find that ETFs exhibit little tracking error with respect to their benchmark indexes, especially when the benchmark is comprised of highly liquid securities. Although CEFs have been examined extensively (Zweig, 1973; Anderson, 1986; Lee, Shleifer, & Thaler, 1990; Pontiff, 1997), most of the literature has focused on the apparent anomaly that CEFs often trade at a substantial discount to their NAV. Interestingly, Barnhart and Rosenstein (2010) find that CEF discounts widen considerably and trading volume drops significantly when a similar ETF is introduced. This finding suggests ETFs and CEFs are substitutes and further motivates a detailed comparison of the two investment vehicles.

Few papers have actually compared the performance of international equity ETFs and closed-end funds. This paper fills that gap. Articles related to ours include Harper, Madura and Schnusenberg (2006). They find that CEFs have lower returns and lower Sharpe ratios relative to comparable exchange-traded funds. Additionally, the closed-end funds in their sample had negative Jensen's alphas. However, the end of their sample predates the beginning of ours and so our results update the recent performance of ETFs and CEFs. Chang and Swales (2005) examine closed-end country funds and country-specific exchange traded funds using data from 11 countries. They find that ETFs had the advantage in terms of expenses and fund turnover but CEFs had better returns and less risk. Chang and Krueger (2012) confirm that country-specific ETFs low average market returns and inferior risk-adjusted returns. Our paper reports the performance of comparable international equity ETFs and CEFs in the most recent ten-year period ending in 2012. This era is of particular interest in light of the recent volatility in growth experienced by economies around the world. The global economy has grown by as much as 5% per year in recent years, but the expansion has had significant interruptions such as in 2009 in which a 2% contraction occurred.

2. Comparative Fund Performance

2.1 Data

We form our sample using all international equity ETFs and CEFs that have ten years of data. This affords us the opportunity to analyze longer-term fund performance from January 2003 thru December 2012. Additionally, recent performance tends to more influential to investors' decisions. For consistency, we obtain international equity ETF and CEF data from the same source, Morningstar's Principia website.

Table 1. Numbers of exchange-traded funds and closed-end funds for international equity investing with at least 10 years of data as of December 31, 2012

Morningstar Category	Exchange-Traded Funds	Closed-End Funds
China Region	2	3
Diversified Emerging Markets	1	3
Diversified Pacific/Asia	1	1
Europe Stock	15	7
Foreign Large Blend	2	
Foreign Large Value	1	
Foreign Small/Mid Value		1
Japan Stock	2	2
Latin America Stock	3	5
Pacific/Asia ex-Japan Stock	5	11
World Stock	2	1
Total funds of available categories	34	34
Total funds of matched categories	31	33

Note: For meaningful comparison, only category-matched funds are used for analysis.

Table 1 reports there are 34 ETFs in 10 Morningstar categories and 34 CEFs in 9 Morningstar categories from

2003 to 2012. For meaningful comparison, only ETFs and CEFs in the same category were used for analysis. As a result, this study uses 31 ETFs and 33 CEFs in the same 8 categories. In the smallest category of Diversified Pacific/Asia, data is available for one ETF and one CEF only. In the largest category of Europe Stock, there are 15 ETFs and 7 CEFs. In order to give equal weight to each of the fund categories, we use the average value of share turnover, for example, for all funds within each category. These averages are used in the aggregate comparison of ETFs and CEFs performance, tests of differences in means, and reporting of statistical significance.

2.2 Expense Ratios

Mutual funds charge investors an annual fee for operating the funds. This fee, known as the expense ratio, is a percentage of fund assets charged each year to cover fund expenses including 12b-1 fees, management fees, administrative fees, operating costs, and all other costs incurred by the fund.

Table 2 shows that ETFs and CEFs have remarkably different expense ratios. The average CEF expense ratio is at least twice as large as the average ETF expense ratio in every category. Category averages for ETF expense ratios range from 37 to 67 basis points with an overall average of 55 basis points. In contrast, CEFs charged investors from 129 to 169 basis points for expenses, with the average being 152 basis points. The 97 basis point difference in overall average expense ratio is statistically significant at the one percent level. The higher expenses associated with CEFs is to be expected since these funds are actively managed whereas ETFs typically attempt to mimic an index benchmark.

Table 2. Expense ratio (%), annual turnover (%), and 10-year average annual return (%)

	Expense Ratio		Annual Turnover		Average Annual Return	
Morningstar Category	ETFs	CEFs	ETFs	CEFs	ETFs	CEFs
China Region	0.67	1.69	19	65	10.43	17.44
Diversified Emerging Markets	0.61	1.52	29	37	15.20	19.11
Diversified Pacific/Asia	0.37	1.29	6	100	7.64	12.30
Europe Stock	0.52	1.54	14	35	8.38	12.41
Japan Stock	0.58	1.41	14	62	4.49	3.80
Latin America Stock	0.67	1.55	35	70	22.51	22.84
Pacific/Asia ex-Japan Stock	0.60	1.60	22	63	15.21	17.09
World Stock	0.40	1.59	14	111	4.87	13.62
Average of all categories	0.55	1.52	19.13	67.88	11.09	14.83
T-test (probability)	0.000***		0.002***		0.007***	

Note: ETFs: Exchange-traded Funds; CEFs: Closed-end Funds. ***, **, *: Significant at the 0.01, 0.05, and 0.10 level.

2.3 Annual Turnover

The turnover rate or ratio is a measure of the fund's trading activity. Turnover ratio is computed taking the lesser of purchases or sales (excluding all securities with maturities of less than one year) and dividing by average monthly net assets. A lower turnover rate would be consistent with a buy-and-hold strategy whereas higher turnover is indicative of a more active investment strategy involving considerable buying and selling of securities.

The two middle columns of Table 2 report the turnover rates for the funds. ETF mean turnover is about 19 percent while CEF mean turnover is nearly 68 percent. This turnover rate difference is significant at the one percent level. The lowest CEFs have the same annual turnover (35%) as the highest annual turnover among ETFs. These results are consistent with the more active management of CEF portfolios.

2.4 Comparative Performance: Average Annual Returns

Given the higher expenses and turnover of CEFs, the natural question is whether investors in these funds get what they pay for. We analyze annual average returns as measured by the investment funds' market returns, not

the NAV return. The third pair of columns in Table 2 reports average annual returns for the funds in our sample. CEFs have a 3.74 percent higher average annual return (i.e., 14.83 %–11.09 %) than do comparable ETFs and this difference is statistically significant at the one percent level. Furthermore, in seven of the eight categories, CEF average annual returns exceed those of ETF average annual returns. The lone exception is the Japan Stock category. Overall, our results suggest a big return advantage to CEFs over ETFs.

2.5 Comparative Performance: Standard Deviations and Systematic Risk

Obviously, most investors are concerned about return relative to risk. Standard deviation, a measure of the dispersion in returns around an average, indicates the variation in a fund's returns over a specified period of time. Investors often use the standard deviation of past returns to assess the possible range of returns going forward. The higher is the standard deviation of a fund's past returns, the wider is the range of possible future returns. In other words, the investor can expect greater volatility. Morningstar computes standard deviation from monthly total returns over a given time period and then annualizing this figure. The standard deviation pair of columns of Table 3 indicate that, on average, ETFs carried lower total risk than CEFs. The annualized difference is 1.94 percent and is statistically significant at the ten percent level.

Table 3. 10-year standard deviation (%) and beta

	Standard Deviation		Beta	
Morningstar Category	ETFs	CEFs	ETFs	CEFs
China Region	23.44	24.09	0.94	0.97
Diversified Emerging Markets	24.24	30.08	1.15	1.31
Diversified Pacific/Asia	19.79	19.14	0.97	0.95
Europe Stock	22.78	27.03	1.16	1.26
Japan Stock	16.71	17.25	0.70	0.62
Latin America Stock	27.94	25.39	1.24	1.11
Pacific/Asia ex-Japan Stock	23.03	25.52	1.04	1.07
World Stock	15.52	20.42	0.80	0.92
Average of all categories	21.68	23.62	1.00	1.03
T-test (probability)	0.052*		0.241	

Note: ETFs: Exchange-traded Funds; CEFs: Closed-end Funds. ***, **, *: Significant at the 0.01, 0.05, and 0.10 level.

In contrast to standard deviation which measures a fund's total risk, beta is a measure of a fund's sensitivity to market movements. Thus, beta measures only the portion of a fund's risk that is systematic and cannot be diversified away. Morningstar calculates beta using the correlation between a fund's excess return over Treasury bills and the market's excess return over Treasury bills. Table 3 reports that ETFs have an average beta of 1.00 and CEFs have a slightly higher average beta of 1.03. The p-value of .241 indicates that the difference is not statistically significant. The individual fund categories suggest material variation in betas and that CEFs had higher betas in five of the eight categories. Overall, it does not appear that ETFs have less systematic risk than CEFs. Consequently, differences in betas have little ability to explain the tremendous return advantage afforded by CEFs over ETFs we report above.

2.6 Comparative Performance: Sharpe Ratios, Treynor Measures, and Jensen's Alphas

We analyzed three risk-adjusted return measures in comparing international equity ETFs and CEFs. The Sharpe ratio divides a fund's excess return over a 90-day Treasury bill by the standard deviation of the fund's excess returns. The result is a measure of reward per unit of risk. The bigger is the Sharpe ratio, the more return an investor has achieved in relation to the risk undertaken. The Sharpe Ratio columns in Table 4 indicate that, on average, ETFs have a lower Sharpe ratio (0.48 vs. 0.59) than CEFs, and the difference is statistically significant at the five percent level.

Table 4. 10-year sharpe ratio, treynor measure (%), and alpha (%)

	Sharpe Ratio		Treynor Measure		Alpha	
Morningstar Category	ETFs	CEFs	ETFs	CEFs	ETFs	CEFs
China Region	0.48	0.68	9.31	14.88	3.52	8.45
Diversified Emerging Markets	0.64	0.67	11.82	12.70	6.50	9.81
Diversified Pacific/Asia	0.39	0.56	6.25	9.96	0.11	3.27
Europe Stock	0.39	0.48	5.62	7.65	-0.36	3.13
Japan Stock	0.23	0.24	3.62	4.82	-1.68	-0.68
Latin America Stock	0.81	0.83	16.55	17.74	12.78	12.17
Pacific/Asia ex-Japan Stock	0.66	0.64	13.29	13.48	6.74	7.88
World Stock	0.27	0.65	3.79	12.92	-2.16	5.96
Average of all categories	0.48	0.59	8.78	11.77	3.18	6.25
T-test (probability)	0.027**		0.014**		0.007***	

Note: ETFs: Exchange-traded Funds; CEFs: Closed-end Funds. ***, **, *: Significant at the 0.01, 0.05, and 0.10 level.

The Treynor measure is similar to the Sharpe ratio in that it gives average excess return per unit of risk incurred, but the Treynor index uses systematic risk (beta) rather than total risk (standard deviation). The ETFs have an average Treynor measure of 8.78 percent, which is nearly 3 percent less than the 11.77 percent average of CEFs. This difference is significant at the five percent level. In all eight fund categories, CEFs have an average Treynor measure which exceeds that of comparable ETFs.

Jensen's alpha measures the amount of fund return that is independent of the fund's systematic risk as measured by beta. It is sometimes called "abnormal return" because if 1) markets are efficient, 2) funds are diversified, and 3) return is compensation for bearing only market risk, Jensen's alpha should be 0. A positive (negative) alpha suggests the fund has delivered returns beyond (below) what was expected given the fund's beta and the Capital Asset Pricing Model (CAPM) of returns. Fund managers strive to deliver consistently positive alpha as it is indicative of superior stock-picking ability and/or superior ability to time the market. Investors seek out funds that can deliver positive alpha since it represents extra return that comes without having to take extra risk.

CEF alphas are 3.07 percent larger than those of ETFs and the difference is significant at the one percent level. In seven of eight categories, CEFs have average alpha larger than those of ETFs. The lone exception is the higher alpha of the Latin America Stock ETFs.

2.7 Comparative Performance: Sortino Ratios and Downside Capture Ratios

The Sortino ratio is similar to the Sharpe ratio in that it is a risk-adjusted measure of return, but rather than characterizing all volatility as risk, the Sortino ratio uses only downside deviation in assessing risk. The rationale is straightforward. Volatile returns to the upside benefit an investor whereas volatility from negative returns is harmful. The Sortino ratio is calculated by taking a fund's excess return over the risk-free rate and dividing by the downside semi-deviation. The denominator will most often be calculated using squared negative excess returns. Intuitively, the Sortino ratio is a measure of return relative to harmful volatility and provides the investor with a clearer assessment of the risk of a fund. The results in Table 5 indicate that ETFs have, on average, a lower Sortino ratio than CEFs (0.74 vs. 0.89), and the difference is statistically significant at the five percent level.

Table 5. 10-year sortino ratio and downside capture ratio (%)

	Sortino Ratio		Downside Capture Ratio	
Morningstar Category	ETFs	CEFs	ETFs	CEFs
China Region	0.73	1.02	113.45	82.20
Diversified Emerging Markets	0.98	1.03	117.38	114.71
Diversified Pacific/Asia	0.59	0.83	100.42	90.52
Europe Stock	0.56	0.68	121.11	120.03
Japan Stock	0.34	0.37	74.88	64.76
Latin America Stock	1.28	1.25	98.65	91.35
Pacific/Asia ex-Japan Stock	1.02	0.99	100.04	87.89
World Stock	0.38	0.96	92.78	74.81
Average of all categories	0.74	0.89	102.34	90.78
T-test (probability)	0.036**		0.006***	

Note: ETFs: Exchange-traded Funds; CEFs: Closed-end Funds. ***, **, *: Significant at the 0.01, 0.05, and 0.10 level.

Much like the Sortino ratio's focus on standard deviation below the mean, downside capture ratios have gained popularity because of their ability to provide important investment insights regarding risk that are easily understood by investors. Downside capture ratios compare a fund's performance to a benchmark during periods when the benchmark's performance is negative. A capture ratio greater than (less than) 100% indicates that a fund's return was worse (better) than the market return during declines. Thus, investors will fare better when a fund has a downside capture ratio less than 100%. The results from Table 5 indicate that the ETFs had a downside capture ratio of 102.34 percent. In contrast, the CEFs had a downside capture ratio of 90.78 percent. The p-value of .006 suggests this difference is unlikely due to chance. Consistent with the Sortino ratio results, CEFs appear to soften market losses by 9.22 percent (90.78%–100%) while ETFs magnified market losses by 2.34 percent (102.34%–100%).

3. Conclusion

At this time, mutual funds account for about one-quarter of household financial assets. First created in the early 1990s, exchange-traded funds now number over 1,500 in the U.S. Closed-end funds have been in existence for over 100 years and there are around 600 of these funds operating in the U.S. Given their more recent introduction, ETFs have naturally been heavily promoted by investment companies. The financial press as well as television and print advertising frequently tout the merits of ETFs. The emphasis is usually place on the cheap costs of owning an ETF as well as the tremendous liquidity they offer. However, most investors are just as likely to consider returns after expenses and risk.

We compared the performance of international equity ETFs and CEFs from 2003 to 2012. We examine the international equity setting because of growing awareness that investing internationally may offer higher returns as well as portfolio diversification. Our sample contains funds for which ten years of data can be obtained, funds that have a Morningstar category, and funds with at least one ETF and one CEF in that category. As expected, we find that international equity ETFs have lower expense ratios. They also have lower annual turnover rates and lower standard deviations. International equity CEFs, on the other hand, had significantly higher after-expenses returns and similar risk. The CEFs had higher risk-adjusted returns as measured by the Sharpe ratio, the Treynor measure, and Jensen's alpha. Furthermore, CEF investors appear to benefit from lower downside risk. An obvious question for future research is the nature and source of CEFs' better return performance. Possibilities include better market timing and/or better security selection. The Sortino and downside capture ratio results we report are consistent with CEFs holding more cash during market downturns, to the benefit of their investors. Additionally, there is widespread belief that international financial markets are less efficient than U.S. markets and actively managed funds can earn abnormal returns. Our results are also consistent with this proposition.

Our conclusion is that investors should give CEFs another look. Although these funds have been around for more than 100 years and have faded from prominence, CEF investment over the last decade would have given an investor a much higher portfolio value today and a smoother ride along the way. An interesting question for future research is whether or not data from longer periods will validate our findings over this most recent era of

ETF and CEF performance.

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Environmental Tax, Urban Minimal Wage and Welfare

Cheng-Te Lee[1], Kuo-Hsing Kuo[1] & Chen Fang[2]

[1] Department of International Trade, Chinese Culture University, Taiwan

[2] Department of International Trade, Takming University of Science and Technology, Taiwan

Correspondence: Cheng-Te Lee, Department of International Trade, Chinese Culture University, No. 55, Hwa-Kang Road, Yang-Ming-Shan, Taipei City 11114, Taiwan. Tel: 886-2-2861-0511 ext. 35135. E-mail: lzd4@faculty.pccu.edu.tw

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Abstract

This paper constructs a specific-factor model of a closed HT economy to examine the reasons for the government of China imposing on environmental tax and increasing the minimum wage simultaneously. We find that the government policies will decrease the pollution and increase the urban unemployment rate. In addition, we also prove that the impact on the welfare level will depend on the degree of disutility of pollution. If the degree of disutility of pollution is large enough, then the policies of China government will raise the welfare level.

Keywords: environmental tax, urban minimal wage, welfare

1. Introduction

Many developing countries like China, India, Mexico, and Chile, have attempted to promote the "industrialization" in order to reduce domestic poverty. As those countries not only progress but also increase employment through industrialization, the environment also deteriorates due to industrial pollution. As a result, they must suffer from downgrade of the quality of life. Therefore, it is quite well known that the issue of the traditional *job-environment tradeoff* is important in the developing country (Note 1).

In general, the industrialization is considered more important than environmental protection in the developing countries. However, a prominent example is that the world's biggest carbon emitter, China, has set the targets not only to reduce the amount of carbon dioxide by 20% by 2020, compared with 2005 levels (The Economist, 2009) (Note 2) but also to cut emissions of nitrogen oxides by 10% by 2015 (The Economist, 2011). To hit these targets, the government of China adopts some environmental preservation policies, for example, imposing on carbon tax. In addition, in the corresponding period, we also observe that the minimum wage rises continuously in China. In particular, since 2010, the government of China has increased the minimum wage by 25% (Common Wealth, 2011) (Note 3). Namely, the observation that the government of China imposes on environmental tax and increases the minimum wage simultaneously is observed. Therefore, the main purpose of this paper is to hope to explain why China would do that.

In the traditional literature of development economics, Harris and Todaro (HT) (1970) have provided a standard model to capture the economic phenomenon of a developing country with urban unemployment. However, in the HT model, the implement of minimum wage policy is an important reason for the existence of urban unemployment. Many studies extend the basic HT model to investigate the impact of the environmental preservation policy on the urban unemployment and the national welfare, including Dean and Gangopadhyay (1997), Chao et al. (2000), Daitoh (2003; 2008; 2012), Beladi and Chao (2006), Rapanos (2007), Tsakiris et al. (2008) and Daitoh and Omote (2011) (Note 4). However, these existing studies argue that the effects of environmental protection on urban unemployment and welfare are inconclusive.

Intuitively, a rise in the minimum wage rate would lead to a labor-migration from rural sector to urban sector and then the urban unemployment rate rises. Therefore, the impact of the minimum wage rate on welfare is ambiguous (Note 5). As mentioned earlier, the effects of environmental protection on urban unemployment and welfare are also inconclusive. Thus, the question posed in this paper is: How do the increases in environmental tax and minimum wage affect urban unemployment and welfare of an economy.

As a complement to the literature, this paper will construct a specific-factor model of a closed HT economy to examine why the government of China imposes on environmental tax and increases the minimum wage simultaneously. We find that when the government raises the environmental tax and the urban minimal wage rate simultaneously, the pollution would decrease and the urban unemployment rate would increase. In addition, we also prove that the impact on the welfare level will depend on the degree of disutility of pollution. If the degree of disutility of pollution is large enough, the policies of China government will raise the welfare level. Therefore, if China government's objective is to increase the welfare level, then it will do that.

The rest of this paper is organized as follows. Section 2 establishes a closed HT model. Section 3 considers the impact of the environmental policy on unemployment and pollution. The impact of the environmental policy on welfare is examined in Section 4. Section 5 provides concluding remarks.

2. The Model

Consider a specific-factor model of a closed HT economy comprising two sectors, said the rural and urban sectors. The rural sector hires labor L_x and sector-specific land T to produce the agricultural good x. Assume that there is perfect competition in the rural labor market and land market. The urban firm produces the manufactured good y using labor L_m and the "dirty input" z. Suppose that all the commodity markets are perfect competition and that all firms in each sector and all consumers in this economy are identical. The production functions which are assumed to be constant returns to scale technology in both sectors can be specified as follows:

$$x = f(L_x, T),$$

$$y = g(L_m, z).$$

In the rural sector, labor and land are fully utilized. In the urban sector, the institutionally minimal wage rate w_m prevails. The factor of production z will not only lower environmental quality but also reduce consumers' utility and hence it can be viewed as "pollution". For simplicity, we assume that the pollution market does not exist. At the same time, the government will impose an environmental tax τ on the manufacturing firm's use of z. (Note 6) Let the agricultural good x be *numéraire*. Hence, the zero profit conditions can be expressed as follows:

$$C^x(w_x, \eta) = 1 \tag{1}$$

$$C^y(w_m, \tau) = p \tag{2}$$

where $C^x(\cdot)$ and $C^y(\cdot)$ denote the unit cost functions of good x and y respectively. The variables w_x and η represent the rural wage rate and the rental rate of land respectively. The variable p is the relative price of good y.

Assume that L_u represents the unemployment population in urban sector. Let $\mu = L_u / L_m$ and thereby the unemployment rate is $\mu/(1+\mu)$ in urban sector which implies that the larger the variable μ is, the larger the unemployment rate will be. The labor migration between rural and urban sectors is determined by the HT migration condition (3) which indicates that the rural wage rate equals the expected urban wage rate $w_m/(1+\mu)$.

$$w_x = \frac{w_m}{1+\mu} \tag{3}$$

The equilibrium conditions for the factor market can be expressed as:

$$C_1^x(w_x, \eta)x + (1+\mu)C_1^y(w_m, \tau)y = L \tag{4}$$

$$C_2^x(w_x, \eta)x = T \tag{5}$$

where $C_j^i(\cdot)$ represents the derivative of the unit cost function of good i ($i \in \{x, y\}$) with respect to j^{th} argument. L and T are the total population and the land endowment respectively.

The utility function of the representative consumer can be specified as follows:

$$U(c_x, c_y, z) = \frac{1}{\gamma}(c_x^\gamma + c_y^\gamma)^{\frac{1}{\gamma}} z^{-\delta}, \quad 0 < \gamma < 1, \quad 0 < \delta.$$

The parameter $1/(1-\gamma)$ is the constant elasticity of substitution. The variable c_x (c_y) represents the consumption of good x (y). In the meanwhile, the utility function satisfies the following assumptions:

$$U_x > 0,\ U_y > 0,\ U_z > 0,\ U_{xx} < 0,\ U_{yy} < 0,$$
$$U_{xy} = U_{yx} > 0,\ U_{xz} = U_{zx} < 0,\ U_{yz} = U_{zy} < 0.$$

Let U_a be the derivative of the utility function with respect to the variable a and U_{ab} be the derivative of U_a w.r.t. the variable b, where $a, b = x, y, z$. The specifications in utility function imply that the marginal utility of each good is positive and decreasing. The pollution z exerts a negative externality on the level of utility, that is, the marginal utility from pollution is negative. Hence, δ could represent the degree of disutility of pollution. As customary, the assumption of $U_{xy} = U_{yx} > 0$ indicates that the greater consumption of good x will raises the marginal utility of consumption of good y, *vice versa*. Finally, the assumptions, i.e., $U_{xz} = U_{zx} < 0$ and $U_{yz} = U_{zy} < 0$, state that the larger amount of pollution will lower more environmental quality, and hence reduce the marginal utility of consumption of each good. In this case the relative demand function can be derived as follows:

$$\frac{c_x}{c_y} = p^{\frac{1}{1-\gamma}} \tag{6}$$

Suppose that the government transfers the environmental tax revenue to the consumers in a lump-sum fashion. Hence, we have

$$c_x + pc_y = x + py \tag{7}$$

The market equilibrium conditions of good x and y are given by c_x=x and c_y=y because of the assumption of a closed economy. By making use of the Walras' law, only Equation (8) is needed:

$$c_y = y \tag{8}$$

The general equilibrium satisfies eight simultaneous Equations (1)–(8) and then we can solve eight endogenous variables: w_x, η, p, μ, x, y, c_x, and c_y, given w_m, τ, L, and T.

3. Environmental Policy, Unemployment and Pollution

In this section, the impact of environmental tax τ and minimal wage rate w_m on unemployment rate will be explored. Without losing generality, we assume that L and T are constant, that is, this paper will consider the effects of w_m and τ. Next, following Jones (1965), we can express Equations (1)–(8) in terms of change. Denoting by ($\hat{k} = dk/k$) the percentage change, totally differentiating Equations (1)–(8), we can obtain the following matrix (see Appendix 1 for the mathematical derivation):

$$\begin{bmatrix} \theta_{xL} & \theta_{xT} & 0 & 0 & 0 \\ -\lambda_{xL}\theta_{xT}\sigma^x & \lambda_{xL}\theta_{xT}\sigma^x & \mu\lambda_{yL} & \lambda_{xL} & (1+\mu)\lambda_{yL} \\ \theta_{xL}\sigma^x & -\theta_{xL}\sigma^x & 0 & 1 & 0 \\ 1 & 0 & \mu/(1+\mu) & 0 & 0 \\ 0 & 0 & 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} \hat{w}_x \\ \hat{\eta} \\ \hat{\mu} \\ \hat{x} \\ \hat{y} \end{bmatrix}$$

$$= \begin{bmatrix} 0 \\ -(1+\mu)\lambda_{yL}\theta_{yz}\sigma^y \\ 0 \\ 0 \\ \theta_{yz}/(1-\gamma) \end{bmatrix} \hat{\tau} + \begin{bmatrix} 0 \\ (1+\mu)\lambda_{yL}\theta_{yz}\sigma^y \\ 0 \\ 1 \\ \theta_{yL}/(1-\gamma) \end{bmatrix} \hat{w}_m \tag{9}$$

where the variable θ_{ij} ($i = x, y; j = L, T, z$) represents the share of the jth factor in the value of the ith sector's output, and $\theta_{xL} + \theta_{xT} = \theta_{yL} + \theta_{yz} = 1$. The variable λ_{iL} denotes the allocation share of labor in sector i, i.e., $\lambda_{xL} = L_x / L$, $\lambda_{yL} = L_m / L$, and thereby the equilibrium condition for the labor market can be rewrote as $\lambda_{xL} + (1+\mu)\lambda_{yL} = 1$. (Note 7) The variable σ^i is the elasticity of substitution between factors of production in sector i. Let Δ be the determinant of the coefficient matrix in Equation (9), and $\Delta = [\mu\sigma^x(\lambda_{xL}\theta_{xT} + \theta_{xL})]/(1+\mu) > 0$. Therefore, the results of comparative-static analysis can be derived as follows (see Appendix 2 for the mathematical derivation):

$$\frac{\hat{w}_x}{\hat{\tau}} + \frac{\hat{w}_x}{\hat{w}_m} = \frac{-\gamma\mu\lambda_{yL}\theta_{xT}}{(1-\gamma)\Delta} < 0 \tag{10}$$

$$\frac{\hat{\eta}}{\hat{\tau}} + \frac{\hat{\eta}}{\hat{w}_m} = \frac{\gamma\mu\lambda_{yL}\theta_{xL}}{(1-\gamma)\Delta} > 0 \tag{11}$$

$$\frac{\hat{\mu}}{\hat{\tau}} + \frac{\hat{\mu}}{\hat{w}_m} = \frac{\sigma^x(\lambda_{xL}\theta_{xT} + \theta_{xL}) + (1+\mu)\lambda_{yL}\theta_{xT}/(1-\gamma)}{\Delta} > 0 \tag{12}$$

$$\frac{\hat{x}}{\hat{\tau}} + \frac{\hat{x}}{\hat{w}_m} = \frac{\gamma\mu\lambda_{yL}\theta_{xL}\sigma^x}{(1-\gamma)\Delta} > 0 \tag{13}$$

$$\frac{\hat{y}}{\hat{\tau}} + \frac{\hat{y}}{\hat{w}_m} = \frac{-\mu\{\lambda_{xL}\sigma^x/(1-\gamma) + (1+\mu)\lambda_{yL}[\theta_{xT}/(1-\gamma) + \theta_{xL}\sigma^x]\}}{(1+\mu)\Delta} < 0 \tag{14}$$

Equations (10)–(14) indicate how the increases not only in τ but also in w_m affect five endogenous variables, i.e., w_x, η, μ, x, y. Next, from Appendix 3 for the mathematical derivation, we get the relationship between the variables (i.e., τ and w_m) and pollution z as follows:

$$\frac{\hat{z}}{\hat{\tau}} + \frac{\hat{z}}{\hat{w}_m} = \frac{-\mu\{\lambda_{xL}\sigma^x/(1-\gamma) + (1+\mu)\lambda_{yL}[\theta_{xT}/(1-\gamma) + \theta_{xL}\sigma^x]\}}{(1+\mu)\Delta} < 0 \tag{15}$$

The economic intuition on Equations (10)–(15) should be stated as follows. If the government increases τ and w_m simultaneously, then the production cost of the urban firm will expand, which will reduce the output of the manufactured good y (Equation (14)). As the output of y decreases, the firm will employ less z and L_m. That is to say, pollution z unambiguously decreases (Equation (15)). The shrinkage of urban employment L_m implies that the urban unemployment rate rises (Equation (12)). The increases not only in μ but also in w_m will reduce the expected urban wage rate $w_m/(1+\mu)$, which will in turn lead to a migration from urban area to rural area. (Note 8) That is, in rural sector, the supply of labor will rise, which will raise the output of the agricultural good x (Equation (13)) and reduce w_x (Equation (10)). A rise in the output of x leads to an increase in the demand of land and thereby the rental rate of land η also rises (Equation (11)). Therefore, as analysis earlier, we can indicate the Proposition 1 as follows:

Proposition 1. *When the government raises the environmental tax and the urban minimal wage rate simultaneously*, *the pollution would decrease and the urban unemployment rate would increase*.

4. Environmental Policy and Welfare

In this section, we will study the welfare effect of the environmental policy. From the utility function $U(c_x, c_y, z) = (1/\gamma)(c_x^\gamma + c_y^\gamma)^{1/\gamma} z^{-\delta}$, the indirect utility function $V = (1/\gamma)[1 + p^{\gamma/(1-\gamma)}]^{1/\gamma} yz^{-\delta}$ can be obtained. Totally differentiating it yields:

$$\hat{V} = \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} \hat{p} + \hat{y} - \delta\hat{z} \tag{16}$$

Therefore, we have (see Appendix 4 for the mathematical derivation):

$$\frac{\hat{V}}{\hat{\tau}} + \frac{\hat{V}}{\hat{w}_m} = \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} + (1-\delta)\left(\frac{\hat{z}}{\hat{\tau}} + \frac{\hat{z}}{\hat{w}_m}\right) > 0, \text{ if } \delta \geq 1 \tag{17}$$

Equation (17) states that, if the degree of disutility of pollution is large enough (i.e., $\delta \geq 1$), the policy that the government raises τ and w_m simultaneously will encourage the welfare level. The economic intuition is quite obvious. Proposition 1 indicates that this policy will reduce pollution. Therefore, under the case of the more degree of disutility of pollution, a decrease in pollution will bring the more increase in welfare level. Proposition 2 can be addressed as follows:

Proposition 2. *When the government raises the environmental tax and the urban minimal wage rate simultaneously*, *the welfare level may rise*, *which depends on the degree of disutility of pollution*.

5. Concluding Remarks

In a specific-factor model of a closed HT economy, this paper explore why the government of China imposes on environmental tax and increases the minimum wage simultaneously. We find that the policies of China will lead to a decrease in the pollution and an increase in the urban unemployment rate. In addition, we also prove that the impact on the welfare level will depend on the degree of disutility of pollution. Namely, if the degree of disutility of pollution is large enough, the policies of China government will raise the welfare level. Some policy implications can be drawn from our results. That is, if China government's objective is to increase the welfare level, then it will impose on environmental tax and increase the minimum wage simultaneously.

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Notes

Note 1. The same notion, please see Beghin et al. (2002), Daitoh (2003) and Daitoh and Omote (2011).

Note 2. Please also see "The China carbon price", *The Economist*, Aug. 10, 2009, http://www.economist.com/node/20024590.

Note 3. Please see *CommonWealth*, Mar. 24, 2011, http://www.cw.com.tw/article/article.action?id=5006563.

Note 4. Dean and Gangopadhyay (1997) set up a three-sector model assuming that the production of intermediates causes environmental damage to explore the impact of an export ban on intermediate goods. They argue that the export ban increases urban unemployment in the short run, but decreases it in the long run. Chao et al. (2000) explore the relationship between environmental protection and urban unemployment. They prove that increasing environmental protection leads to an increase in urban unemployment in a closed economy, but it does not result in additional urban unemployment in a small open economy. In the standard model of a closed HT economy, Daitoh (2003) shows that the effects of the environmental policy on the manufacturing employment depend on the price elasticity of demand for manufactured goods. Daitoh (2008) extends Daitoh's (2003) model to an open economy and then proves that the former condition depends on the substitute or complementary relations among factors of production. Daitoh (2012) analyzes effects of wage subsidy policies on urban pollution in a dualistic economy. Beladi and Chao (2006) derive the optimal environmental tax rate under urban unemployment. Rapanos (2007) finds that the environmental tax may increase or decrease urban unemployment in the short run, while it decreases unemployment in the long run. Tsakiris et al. (2008) show that the optimal environmental tax is lower than the marginal damage of pollution. Daitoh and Omote (2011) find that a rise in the pollution tax rate would lead to an increase in the urban unemployment. In sum, the impact of environmental protection on urban unemployment and welfare is inconclusive.

Note 5. Please see Harris and Todaro (1970).

Note 6. The similar specification of treating pollution as a factor of production can also be seen in Pethig (1976), McGuire (1982), Copeland and Taylor (1994), Daitoh (2003; 2008) and Daitoh and Omote (2011). If pollution z is a factor of production, then environmental tax τ could be interpreted as its price.

Note 7. Using Equation (4), we have $L_x + (1+\mu)L_m = L$. Next, dividing each side of the equality by L can obtain $(L_x / L) + (1+\mu)(L_m / L) = 1$, that is, the result of $\lambda_{xL} + (1+\mu)\lambda_{yL} = 1$ can be found.

Note 8. Harris and Todaro (1970) argue that the impact of the minimal wage rate w_m on the expected urban wage rate is ambiguous. They address that a rise in w_m would lead to a migration from rural sector to urban sector and hence the urban unemployment rate rises, but the expected urban wage rate is inconclusive. Similarly, Daitoh (2003) claims that if the pollution tax τ rises then L_x may increase or decrease. However, in this paper, the case that τ and w_m are raised simultaneously is discussed, which means that the prices of all production factors rise in the urban firm, and hence the output of the manufactured goods in this case is less than in Harris and Todaro (1970). To understand it more clearly, one should pay attention to the fact that the less output of the manufactured good would lead to the more shrinkage of urban employment, that is, the more urban unemployment rate would happen. If the effects of the urban unemployment are large enough then the result of a migration from urban area to rural area would be obtained.

Appendix

Appendix 1

Totally differentiating Equations (1)–(5), we can find:

$$\theta_{xL}\hat{w}_x + \theta_{xT}\hat{\eta} = 0 \tag{A.1}$$

$$\theta_{yL}\hat{w}_m + \theta_{yz}\hat{\tau} = \hat{p} \tag{A.2}$$

$$\hat{w}_x = \hat{w}_m - \frac{\mu}{1+\mu}\hat{\mu} \tag{A.3}$$

$$-\lambda_{xL}\theta_{xT}\sigma^x\hat{w}_x + \lambda_{xL}\theta_{xT}\sigma^x\hat{\eta} + \lambda_{xL}\hat{x} + (1+\mu)\lambda_{yL}\hat{y} + \mu\lambda_{yL}\hat{\mu} - (1+\mu)\lambda_{yL}\theta_{yz}\sigma^y\hat{w}_m$$

$$+ (1+\mu)\lambda_{yL}\theta_{yz}\sigma^y\hat{\tau} = \hat{L} = 0 \tag{A.4}$$

$$\theta_{xL}\sigma^x\hat{w}_x - \theta_{xL}\sigma^x\hat{\eta} + \hat{x} = \hat{T} = 0 \tag{A.5}$$

Substituting Equations (7) and (8) into Equation (6) and then totally differentiating it can obtain:

$$\hat{x} - \hat{y} = \frac{1}{1-\gamma}\hat{p} \tag{A.6}$$

By substituting Equation (*A*.2) into (*A*.6), we can get:

$$\hat{x} - \hat{y} = \frac{\theta_{yL}}{1-\gamma}\hat{w}_m + \frac{\theta_{yz}}{1-\gamma}\hat{\tau} \tag{A.7}$$

Finally, Equation (9) can be obtained by making use of Equations (*A*.1), (*A*.4), (*A*.5), (*A*.3), and (*A*.7).

Appendix 2

By using the Cramer's rule, from Equation (9), we can derive the results of comparative–static analysis as follows:

$$\frac{\hat{w}_x}{\hat{\tau}} = \frac{\mu\lambda_{yL}\theta_{xT}\theta_{yz}[\sigma^y - 1/(1-\gamma)]}{\Delta} \tag{A.8}$$

$$\frac{\hat{\eta}}{\hat{\tau}} = \frac{-\mu\lambda_{yL}\theta_{xL}\theta_{yz}[\sigma^y - 1/(1-\gamma)]}{\Delta} \tag{A.9}$$

$$\frac{\hat{\mu}}{\hat{\tau}} = \frac{-(1+\mu)\lambda_{yL}\theta_{xT}\theta_{yz}[\sigma^y - 1/(1-\gamma)]}{\Delta} \tag{A.10}$$

$$\frac{\hat{x}}{\hat{\tau}} = \frac{-\mu\lambda_{yL}\theta_{xL}\theta_{yz}\sigma^x[\sigma^y - 1/(1-\gamma)]}{\Delta} \tag{A.11}$$

$$\frac{\hat{y}}{\hat{\tau}} = \frac{-\mu\theta_{yz}[\lambda_{xL}\sigma^x/(1-\gamma) + (1+\mu)\lambda_{yL}\theta_{xL}\sigma^x\sigma^y + (1+\mu)\lambda_{yL}\theta_{xT}/(1-\gamma)]}{(1+\mu)\Delta} < 0\,, \tag{A.12}$$

$$\frac{\hat{w}_x}{\hat{w}_m} = \frac{\mu\lambda_{yL}\theta_{xT}[1 - \theta_{yz}\sigma^y - \theta_{yL}/(1-\gamma)]}{\Delta} \tag{A.13}$$

$$\frac{\hat{\eta}}{\hat{w}_m} = \frac{-\mu\lambda_{yL}\theta_{xL}[1 - \theta_{yz}\sigma^y - \theta_{yL}/(1-\gamma)]}{\Delta} \tag{A.14}$$

$$\frac{\hat{\mu}}{\hat{w}_m} = \frac{\sigma^x(\lambda_{xL}\theta_{xT} + \theta_{xL}) + (1+\mu)\lambda_{yL}\theta_{xT}[\theta_{yz}\sigma^y + \theta_{yL}/(1-\gamma)]}{\Delta} > 0 \tag{A.15}$$

$$\frac{\hat{x}}{\hat{w}_m} = \frac{-\mu\lambda_{yL}\theta_{xL}\sigma^x[1 - \theta_{yz}\sigma^y - \theta_{yL}/(1-\gamma)]}{\Delta} \tag{A.16}$$

$$\frac{\hat{y}}{\hat{w}_m} = \frac{\mu}{(1+\mu)\Delta}\{-(1+\mu)\lambda_{yL}\theta_{xL}\sigma^x[1 - \theta_{yz}\sigma^y - \theta_{yL}/(1-\gamma)] +$$

$$[\theta_{yL}/(1-\gamma)]\{\sigma^x[(1+\mu)\lambda_{yL}\theta_{xT} - 1] - (1+\mu)\lambda_{yL}\theta_{xT}\}\}\,. \tag{A.17}$$

Appendix 3

Since $z = C_2^y(w_m, \tau)y$, totally differentiating this we get $\hat{z} = \theta_{yL}\sigma^y\hat{w}_m - \theta_{yL}\sigma^y\hat{\tau} + \hat{y}$. Therefore, the impact of environmental tax on pollution can be derived as follows:

$$\frac{\hat{z}}{\hat{\tau}} = -\theta_{yL}\sigma^y + \frac{\hat{y}}{\hat{\tau}} < 0 \tag{A.18}$$

Similarly, we can find the effect of minimal wage rate on pollution as follows:

$$\frac{\hat{z}}{\hat{w}_m} = \theta_{yL}\sigma^y + \frac{\hat{y}}{\hat{w}_m} \tag{A.19}$$

Appendix 4

From Equation (16), we have

$$\frac{\hat{V}}{\hat{\tau}} = \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} \frac{\hat{p}}{\hat{\tau}} + \frac{\hat{y}}{\hat{\tau}} - \delta \frac{\hat{z}}{\hat{\tau}} \tag{A.20}$$

and

$$\frac{\hat{V}}{\hat{w}_m} = \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} \frac{\hat{p}}{\hat{w}_m} + \frac{\hat{y}}{\hat{w}_m} - \delta \frac{\hat{z}}{\hat{w}_m} \tag{A.21}$$

Combining Equations (*A*.20) with (*A*.21) can obtain Equation (*A*.22) which is equal to Equation (17) as follows:

$$\begin{aligned} \frac{\hat{V}}{\hat{\tau}} + \frac{\hat{V}}{\hat{w}_m} &= \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} (\frac{\hat{p}}{\hat{\tau}} + \frac{\hat{p}}{\hat{w}_m}) + (\frac{\hat{y}}{\hat{\tau}} + \frac{\hat{y}}{\hat{w}_m}) - \delta(\frac{\hat{z}}{\hat{\tau}} + \frac{\hat{z}}{\hat{w}_m}) \\ &= \frac{1}{1-\gamma} p^{\frac{\gamma}{1-\gamma}} (1 + p^{\frac{\gamma}{1-\gamma}})^{-1} + (1-\delta)(\frac{\hat{z}}{\hat{\tau}} + \frac{\hat{z}}{\hat{w}_m}) \end{aligned} \tag{A.22}$$

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The Role of Banks in Small and Medium Enterprises Financing: A Case Study from Kosovo

Qazim Tmava[1], Florin Peci[2] & Gazmend Luboteni[1]

[1] Faculty of Economics, University of Prishtina, The Republic of Kosovo

[2] Faculty of Business Administration, University of Peja, The Republic of Kosovo

Correspondence: Florin Peci, Faculty of Business Administration, University of Peja, Peja, The Republic of Kosovo. Tel: 377-44-787-897. E-mail: florin.peci@unhz.eu

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Abstract

In this study we investigate the impact of firm and entrepreneurship characteristics in small and medium enterprises (SME-s) investment finance through debt (bank loan). Data are gathered from interviews based on a self-organized questionnaire with 150 SME-s in Kosovo. Based on the econometric model of linear regression, key factors are identified which influence the investment growth financed by debt. The results indicate that there is mutual correlation among the firm's age, size, business plan, sector, number of owners, sources of financing and the investment growth financed from banks in Kosovo. Therefore, findings in this work suggest that the access to external sources of financing through bank loan is an important factor that influences the investment growth. The paper provides some important conclusions and implications for policymakers and entrepreneurs.

Keywords: SME, entrepreneurship, financing through debt, investment, Kosovo

1. Introduction

It is explicitly accepted that SME-s present a pivotal element in the economic activity in both, developed and developing countries (Acs & Audretsch, 1990; Johnson & Loweman, 1995). Numerous authors from academic and professional world designate SME-s as generators of both, economic growth and overall social development (Audretsch & Klepper, 2000; World Bank Group, 2005; McMillan & Woodruff, 2002).

The discussion of the relevant literature related to the access of SME-s to finance, as well as to investment finance is of particular importance (Krasniqi, 2007). According to Beck et al. (2007), the SME-s access to, and cost of, finances is quite often characterized as a major difficulty, up to the extent of 35 percent. It should also be stressed that the small firms come with more difficulty to loans, since they encounter higher transaction costs and higher premium risks, for they are more fragile and they offer lower collaterals (Beck et al., 2006). Audretsch and Elston (2006) also stress that small firms confronted higher financial difficulties than large ones. Similar conclusions can be found among other authors who have worked in this direction (Beck et al., 2006; Oliveira & Fortunato, 2006).

Brinckmann et al. (2011) finds that small firms have higher limitations to access external sources of financing than bigger firms, and, thus, they become more dependent on internal funds for financing their investment needs. A major obstacle in financial markets to the access on finances by SME-s is also the asymmetry of information. Thus, based on Zhao et al. (2006), one from the major difficulties for accessing finance is the asymmetry of information among lenders and debtors; for instance, borrowers have private information on the firm that lenders do not possess. Because of their small size, short history and inconsistent accounting data, the issue of asymmetric information for SME-s becomes more serious (Deakins et al., 2008; EBRD, 1999; Pissardies et al., 2003; Klapper et al., 2002).

Difficulties of this kind are expressed also among SME-s of Kosovo, as one from the last countries in transition. In spite of the fact that the SME sector in Kosovo is relatively new, it constitutes 98% of all the firms, thus representing a huge potential for generation of new jobs and for economic development of the country. Based on data of the World Bank (2010), the major obstacle to the development of SME-s in Kosovo is access to bank loans. Only 10% of investments made by SME-s are financed through bank loans, and above 85% of investments are financed from private sources (World Bank, 2010).

Objective of this work is to empirically investigate the role and importance of the firms and entrepreneurship characteristics that influence the investment growth through debt finance (loans) in Kosovo. Therefore, the research question in this study is: How does the investment growth impact the performance of SME-s, by discussing the firm and entrepreneurship characteristics of the investment growth of SME-s in Kosovo?

The organization of the work is as following: Part one discusses the context of the research, part two the theoretical aspect and the summary of literature. In part three we provide the research methodology and model. Part four contains the results and empirical findings. And, part five deals with the conclusions.

2. Theory and Literature Review

Until now, there is no single and unique theoretical model that explains the financing of SME-s, which influences the performance of investments, their growth and development. The theoretical principles underlying capital structure can generally be describes in terms of the static trade off theory by Modigliani and Miller (1958), the pecking order theory (Myers & Majluf, 1984), managerial theory of investments (Marris, 1963; Baumol, 1967), agency theory by Jensen and Meckling (1976) and extended by Stiglitz and Weiss (1981).

According to neoclassical theory of investments (M-M), which affirms the attitude on the irrelevance of the capital structure for the value of the firm, internal and external sources of financing are perfect substitutes. In the world of the perfect functioning of the market, the choice between financing through capital or debt is irrelevant. Therefore, the cost of capital and the market value of the firm are independent from the value of the firm (Modigliani & Miller, 1958). The theory of M-M is based on the following premises: there are no taxes, there are no transaction costs, there are no bankruptcy costs, the equal cost of debt for companies and for investors, symmetrical information in the market, there is no influence of debt in the profit of the company before interest and taxation.

Modigliani and Miller (1958) modify their theory by introducing the tax on profit. In this case, the value of the firm is positively related to debt. After introducing the tax on profit in their analysis, they ascertain that the financial leverage increases the value of the firm, since the interest decreases the tax base (it is deduced from the business profit), and, therefore, we have savings which have the value of the interest. From this ascertainment, the value of the firm grows bigger, as the financial leverage increases, which means that the highest value of the firm is achieved if the burden of debt becomes 100%. In this way the firm attains absolute advantage, given that it is defended from taxes.

Scott (1972) emphasizes that 100% tax shield does not exist in reality, because of distress costs. Debt leads to legal obligation to pay interest and principal. If a firm cannot meet its debt obligation, it is forced in to bankruptcy an incurs associated costs (Fatoki & Asah, 2011). This theory, in fact, does not take into the consideration all the other factors, such as: the costs of the bankruptcy of the firm, the costs of the agency, the impact of debt in profit, the asymmetry of information, and, therefore, this theory is challenged by other theories (Harris & Raviv, 1991).

Thus, the static trade off theory, which is based on the M-M theory and is its complementary, except savings from the tax on profit, incorporates into the discussion also the cost of bankruptcy, such as: judicial taxes, attorney costs, administrative costs, and, also, the agency costs (the firms managers damage the interests of the creditors by working in the interest of shareholders), and this can reduce the value of the firm (Jensen and Meckling, 1976). This theory is, in fact, the dominant theory regarding the determination of the financial structure of the firm, and it is founded on the premise that it is the firm that chooses how much it will be financed from debt, and how much from the capital, by balancing the cost of profits. According to this theory, the optimal level of the structure of capital is the one which equates the profit and costs from debt.

According to pecking order theory, the firm initially prefers internal sources of financing to external ones, and, regarding external sources, they prefer debt to capital (Donaldson, 1961). Thus, initially we have the use of accumulated profit, amortization, debt, and, finally, the equity capital. According to this theory, the firms finance their investment requirements based on a hierarchic order. This can direct also to existence of the asymmetry of information between managers (insiders) and investors (outsiders). As a result of this, managers have more information then investors (Myers & Majluf, 1984).

Based on the agency theory, Stiglitz and Weiss (1981) present the problem that, as a consequence of asymmetrical information, occur between managers and shareholders, on one hand, and the problem among shareholders, managers and creditors, on the other. They argue that only SME-s knows the real financial structure of their own, the real strength of their investment projects and the tendencies for settling up the debt, and, therefore, the firm possesses superior private information (Mazanai & Fatoki, 2012).

3. Hypothesis

3.1 Business Plan

According to Guffey, the business plan is a necessary requirement at the beginning of business, and it is used as an important element to acquire financial support during application to banking institutions (Guffey, 2008). An increase in the level of skills of those who are looking for credits in the compilation of business plans, will increase their opportunities to have properly prepared documentation, and to have a clear idea on the course of their business. According to Maziku (2012), the asymmetric information between the debt-seeking SME-s and the bank, is reflected in the incapability of the majority of SME-s to provide consistent financial data and real business plans, which increases the operational cost during the decision making for permitting the loans by the a bank (Maziku, 2012). Thus, the business plan does not have an impact only in reduction of operational costs, but it is also a key instrument in the decision making regarding the use of banking loans by the firms (Zhang, 2008; Madura, 2007). This is valid particularly for start-up businesses.

Therefore, the following hypothesis is generated:

H1: SME-s which have business plans are more likely to use bank loans than SME-s without written business plans.

3.2 The Growth of the Firm

The growth of SME-s depends on the level of investments. The growth of SME-s can be measured in different ways, including the growth of sales, profits, or number of employees (McPerson, 1996). We measure this variable through the growth of the number of employees.

The ability of SME-s to grow depends on a large measure from their potential to invest in the restructuring and innovations. All these investments require capital, that is, they require access to finance (Mazanai & Fatoki, 2012). According to Ganbold (2008), in a research of the World Bank, one among the key difficulties in the growth of the firm is access to financial services, which reflects in economic growth, employment generation, and reduction of poverty in the developing countries (Ganbold, 2008). Based on the theory of firm growth (Jovanovic, 1982), new enterprises grow faster, which means that these have to invest more.

Therefore, the following hypothesis is generated:

H2: SME-s that grow faster invest more than those with low level of growth.

3.3 Gender

In the professional literature there are contradictory opinions regarding the impact that gender of the owner of the firm has into the access to finance. While a group of thinkers assert that gender of the owner has an impact into the capital structure of the firm, the other group denies this, ascertaining that gender doesn't have any impact into the determination of the capital structure.

On one hand, Abor (2008) argues that businesses owned by female owners use the debt (loans) less for different reasons, including discrimination and aversion to risk. Watson et al. (2009) emphasize that a key factor in determining the capital structure in businesses owned by female owners is their propensity towards not accepting risk from the desire to keep things under control. Female clients are more hesitant to seek loans, since they feel discriminated and discouraged (Kon & Storey, 2003).

On the other hand, Coleman (2000) find that there ar no important differences in the use of debt (banking loan) between female and male owners, and that gender is not an important predictor of the financial leverage of the firm. Whereas, Irving and Scott (2008), analyzing 400 SME-s, and based on the questionare prepared by Barclays Bank, in the most surprising way ascertain that female have easier access to finance then male. Therefore, based on the findings reported above, the following hypothesis is generated:

H3: The male owners of firms are more likely to use bank loans then the female owners of firms.

3.4 Sources of Financing

The larger participation of investment finance from internal sources of SME-s increases the probability for acquiring of bank loans, since the internal sources carry the opportunity cost of financing of the project. Thus, SME-s provide higher level of trust to banks, since, in the case of failure, the unexpected burden falls on SME-s themselves. In their research conducted in 16 countries of OECD, Japelli and Pagano (1994) ascertain that banks don't finance 100% of the property value in any of these countries, but they do that with a certain coeficient loan/property. This is not equal for all the countries, and it differs from country to country, starting from the minimum financing of 50% in Turkey and Greece, up to 95% in Denmark.

Thus, authors Lee and Ratti (2008) and Ahn et al. (2006) reports negative relationship between debt and investments. This relationship is stronger among smaller firms. As the debt (loans) grows, the cash flow is increasingly used for settling up the loan and its interest. Consequently, firms fulfill their obligations to creditors with more difficulties, and, on the other hand, the possibility for new investments is reduced.

Therefore the following hypothesis is generated:

H4: The higher the internal sources of SME-s, the higher probability to acquire bank loans for investment finance.

3.5 Education

Education is one of the important factors that influence the growth of the firm. Therefore, the high level of human capital (education and experience) has a positive impact in the growth of the firm. The owners of the firm who are of young age and low level of education are more active in using the external sources of financing, in spite of the fact that higher education reduces the fear for refusing the loans. In the meantime the owners of more mature age and with higher education, the so called "wiser" ones, can be found as less interested for external sources of financing (Vos et al., 2007). Therefore, the majorities of owners of SME-s prefer to keep the control and do not apply for external capital (Curran, 1986; Jarvis, 2000).

Thus, the internal capital is the major source of financing the SME-s (Ou & Haynes, 2003). Rand (2007) finds also negative influence between education of owners-managers and access to credit, arguing that owners-managers with higher education can understand easier that their requirements for credits can be refused. Therefore, these owners-managers are for this reason discouraged and hesitate to apply for loans. In their study on new firms, Hartarska and Gonzales Vega (2006) find that education does not have an important role in the decision-making of the banks for lending.

Therefore, the following hypothesis is generated:

H5: Owners/managers with high level of education use less bank loans for financing the investment requirements.

4. Methodology

4.1. Sources of Data

The organization of data gathering from the questionnaire was developed in the period March-July, 2012, and data processing based on the answers was conducted in November and December 2012. On this occasion, a database was developed, which includes characteristics of SME-s in general, and characteristics related to investments and their financing in particular. Data processing was conducted with the STATA software.

The questionnaire is specially designed for this scientific research with 150 SME-s in Kosovo, and it includes years 2010 and 2011. The sample selection is made randomly, from database at the Agency for Businesses Registration in the Ministry of Industry and Trade of Kosovo, and it is stratified in three basic sectors, in order to reflect eventual changes among the production, trade and service firms. Interviews were conducted directly (face to face) with owners/managers, or financial managers of the firms.

4.2 Questionnaire

The questionnaire consisted of 4 major sections. The first section included data on the owner/manager of the firm, and general data about the firm (location, the year of establishment, type of activity, and qualification of owners/managers). Second section included the orientation regarding the development in the future as well as investments, and here are presented data regarding volume of investments, sources of investment, the use of bank loans in realization of investments, conditions of financing, activities that are conducted during the realization of investments, and investment plans for the future. The third section covers information regarding business activities of the firms inside and outside of the country, that is, whether a certain firm imports or exports merchandise. The fourth section includes data regarding the business plans of the firms: possession of the business plan, its impact on the decisions of the banks. Information gathered from the questionnaire was important for determining the variables in the econometric model of linear regression.

5. Research Model

The determination of the key variables enables us to definie the structure of the model with which we test the volume of investments and their growth in the Kosovan SME-s.

The structure of the econometric model is presented as following:

$$Y = \alpha_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \mu \quad (1)$$

$$Y = \alpha_0 + \beta_1 entre\_edu + \beta_2 inter\_exter + \beta_3 business\_plan + \beta_4 production + \beta_5 trade + \beta_6 firm\_age + \beta_7 + no\_own + \beta_8 size\_emp + \beta_9 gender + \mu \quad (2)$$

Dependent variable:

***Y*= invest_growth**

Thus, dependent variable is **invest_growth**, and it presents the growth of investment in 2011.

Independent variables are coded as following:

entre_edu–coded as 1 for entrepreneurs who have finished university education, and coded as zero for entrepreneurs who don't have university education.

inter_exter–is measured as a ratio between investments made from internal sources with those financed from external sources.

business_plan–is coded as 1 for the firms that have business plan, and 0 otherwise.

production–is coded as 1, for the firms in the sector of production, and 0 otherwise.

trade–is coded as 1 for the firms in the sector of trade, and 0 otherwise.

firm_age–expresses the number of years that the firm is in business activity.

no_own–indicates the number of owners.

size_emp–indicates the size of the firm expressed through the number of employees.

gender–indicates the gender of the owner/manager of the firm.

6. Survey Results

Based on the results, we conclude that the regression linear model mentioned above is specified good, given that Adj R-squared 0.36, which shows that the variation in independent variables explains the variation in dependent variable for more than 36%. In addition, the statistical F-test, shows that all the independent variables, jointly, which are statistically significant, are different from zero.

Also, the correlation analysis shows that the problem of correlation in independent variables is not present in our data, given that there no higher coefficients in our estimation. Also, the dependent variable has a normal distribution and does not represent a statistical problem that requires treatment.

Table 1. Correlation between coefficients at 5% level of significance

	Gender	production	trade	firm_age	no_own	entre_edu	inter_exter	size_emp	business_plan
Gender	1.0000								
production	0.1427	1.0000							
trade	-0.1585	-0.1005	1.0000						
firm_age	0.2418	0.1336	-0.1500	1.0000					
no_own	0.1718	0.0753	-0.0300	0.1491	1.0000				
entre_edu	-0.0738	-0.3259	0.3760	-0.1318	-0.1825	1.0000			
inter_exter	-0.1027	-0.1047	0.0870	-0.0308	-0.2472	0.0695	1.0000		
size_emp	0.0551	0.1967	-0.1400	0.084	0.4487	-0.0914	-0.2993	1.0000	
business_plan	-0.1677	0.1452	-0.1200	-0.3119	-0.0565	0.2140	-0.2636	0.1982	1.0000

Source: Own calculation.

Based on the table 2, in which the results of the linear regression are presented, from nine independent variables, six are statistically significant with impact on the dependent variable, or on the investment growth.

Table 2. Determinants of firm investments growth financing through external sources

	invest_growth	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
gender	-79.78481	64.51314	-1.24	0.218	-186.6064	27.03674
trade	-925.6895	185.564	-4.99	0	-1232.948	-618.4307
production	-538.7114	189.8072	-2.84	0.005	-852.996	-224.4267
firm_age	-6.685608	4.383491	-1.53	0.129	-13.94384	572.6224
entre_edu	-1.436477	48.20413	-0.03	0.976	-81.25338	78.38043
inter_exter	0.3603716	0.3966264	0.52	0.606	-0.7931098	1.513853
business_plan	84.96332	39.14907	2.17	0.032	7.56351	162.3631
size_emp	-25.66381	5.367756	-4.78	0	-34.5518	-16.77583
no_own	146.4654	35.83314	4.09	0	87.13255	205.7938
_cons	984.5017	214.7547	4.58	0	628.9086	1340.095

Source: Own calculation. N=150, Adj.R2=0.36%.

According to results, the variable **business_plan**, is statistically significant and with positive sign. This means that the firms that have business plans, on average have investment growths that are bigger than those of the firms that do not have business plans. Similar ascertainments can be found among other authors who emphasize that the business plan serves as a mean for increasing financing from external sources (Zhang, 2008).

The variable **trade** is statistically significant and with negative impact in the investment growth when compared with the firms that belong to the service sector. This has the meaning that services on average invest more than other sectors. In addition the variable **production** is also statistically significant and with negative impact on the increase of investments when compared with the firms that belong to the sector of services. This has the meaning that when compared with the services, the sector of production invests less than other sectors. Similar ascertainments for the case of Kosovo can be found in the work of the author Krasniqi (2010).

The next variable **no_own**, which indicates the number of owners, is statistically significant and with positive impact, which means that the greater the number of owners, the greater will be the investments. We have also **size_emp** as a variable that shows the size of the firm expressed by the number of employees, and is statistically significant and with inverse impact on the growth of investments. This means that smaller firms have larger investment growths. This finding clearly reflects that as the number of employee's grows, the firms grow slowlier. This is in full accordance with findings of other authors (Audretsch & Klepper, 2000; Caves, 1998). These results are the same with other studies that oppose the Gibrat Law (Krasniqi, 2006; Harris & Trainor, 2005).

The **firm_age** as an independent variable is statistically significant and with negative sign, which means that new firms grow faster than older firms. This ascertainment is in accordance with findings of many authors who ascertain that younger firms grow faster than the older ones, and, therefore, have higher investment growth (Woldie et al., 2008; Storey, 1994; Barkham et al., 1996).

The **gender** of the owner of the firm in the presented model, as a variable is not statistically significant, which means that the owners of the businesses of both genders have the same probability to obtain bank loans for SME-s investments. These results are in accordance with the studies conducted by Kalleberg and Leicht (1991), who, in a study conducted with 300 firms in three sectors, ascertain that female owners were as successful as male owners. We find similar ascertainment in the study of 298 businesses in United Kingdom, which emphasizes that gender, is not a determinant for financing the business (Johnson & Storey, 1993). Coleman (2000) emphasizes that there are no important differences in the use of debt (bank loans) between males and females, and that gender is not an important predictor for financial leverage of the firm.

Finally, **education** represents a variable which is not statistically significant and has negative sign, which means that the level of education of the managers/owners doesn't impact external sources of financing (bank loans) for SME-s investments. This is explained by the fact that Kosovan SME-s suffer from permanent lack of capital, and on average the time frame of establishment is short and the means that are accumulated from the profits are insufficient for financing the investments. Therefore, the only alternative that remains to them is financing from banking credits, taking into the consideration that the capital market does not function in Kosovo, which causes

that the possibility to use other forms of external financing is very difficult. Similar results can be found at Krasniqi (2010).

7. Conclusions

In this study we have investigated empirically the key factors of the firms and entrepreneurship which influence the increase of investment growth through bank loans. The data gathered by the self organized questionnaire with 150 SME-s in the entire territory of Kosovo for the years 2010 and 2011 are used to test the impact of certain factors in the increase of investments through the use of financial means from debt (bank loans). Based on the statistical analysis and the method of linear regression, key factors are identified as indicators that influence the growth of investments of SME-s in Kosovo.

The findings of this work stress that the business plan is a factor with statistical importance which has positive influence in the access to the bank loans for financing the SME-s investment. This means that the firms that posses business plan and use it for seeking bank loans necessary for financing investments, on average have higher growth of investments than the firms who do not have a business plan.

The variables trade and production are statistically significant, but they have negative influence in the growth of investments. This means that the firms that use bank loans for investment in the sector of trade and production, on average, have lower chance to grow, than firms in the service sector. This is an indicator that shows that the sector of services is more attractive in the aspect of investments of Kosovan firms, than other sectors of the economy, and this results from faster returns of investments and, consequently, faster settling up of the bank loans.

The next variable named as the number of owners also results positive and significant in the statistical aspect, which means that the larger the number of owners, the greater the investments. This is explained by the fact that in Kosovo firms have started to use other forms of organization that influence the growth of business and of firm, through larger number of owners who use investment as another opportunity for the growth and development of the firm.

The size of the firm expressed by the number of employees results with inverse influence in the growth of investments, and is statistically significant. The meaning of this is that smaller firms have bigger growth of investment on average than other firms. This result is in accordance with other studies that oppose the Gibrat's Law for the case of Kosovo (Krasniqi, 2010). Similar results are attained regarding the variable the age of the firm, which is statistically significant and has a negative sign, which means that the younger firms invest more on average than older firms.

Empirical evidence and findings in this work can be used as recommendations for a broad spectrum of users. The problems of asymmetric information between owners-managers and creditors (banks) are of particular importance. This represents a clear signal for policy makers to create conditions for favorable environment for stimulating the sources of external financing of SME-s in Kosovo, such as: the creation of the guarantee fund for SME-s, the increase of banking supply through licensing of new banks in the financial market, which will increase the competition between the existing banks, and which will, in turn, enable the improvement of the conditions of financing of SME-s, with the reduction of the interest, reduction of managerial costs, increase of the grace period, softening of the conditions for collateral, longer periods of use of financial means, particularly for SME-s that have longer investment plans. Also, in the institutional aspect, initiatives should be undertaken for the creation of conditions for development of entrepreneurial capabilities, and for other forms of cooperating networks of firms that will facilitate the growth of businesses in general, and investment growth in particular

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Determinants of Inward Foreign Direct Investment: A Dynamic Panel Study

Stephen G. Grubaugh[1]

[1] Department of Economics, Bentley University, USA

Correspondence: Stephen G. Grubaugh, Department of Economics, Bentley University, 175 Forest Street, Waltham, MA 02474, USA. Tel: 1-781-891-2539. E-mail: sgrubaugh@bentley.edu

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Abstract

Most recent studies of the factors that determine flows of foreign direct investment have focused on bilateral flows of FDI using a wide array of possible variables. Recent studies of the aggregate flows of FDI (flows from all sources) have been limited in the type and number of countries included. This study adds to these results by using a panel data set that includes 74 countries for the period 1980–2008 over a wide-range of countries. An important result of this study is that the relationship between FDI and measures of market size and income is non-linear. To study the effects of country specific characteristics this study looks at the relationship between the average country residual from the panel estimates and various measures of business climate.

Keywords: Foreign Direct Investment (FDI), dynamic panel estimation, business climate

1. Introduction

Foreign Direct Investment (FDI) has continued to be an ever increasing aspect of the world economy. For example, FDI as a percent of world GDP averaged 0.66% per year in the 1980s, 1.43% per year in the 1990s and 2.97% per year in the 2000s (World Bank, *World Development Indicators*). It is not surprising, then, that there have been a large number of studies that have attempted to model the determinants of the flows of FDI. Any insight into these flows will help us better understand the global economy. Many countries have policies in place to attract FDI. Without a firm understanding of what exactly does attract FDI and what does not, these policies may be at best wasteful or even counter-productive. With that goal in mind, this study looks at the aggregate flow of inward FDI in a broad range of countries. Specifically this study differs from previous analyzes by looking at (1) a large number of countries (74) at all levels of economic development; (2) a panel data set incorporating 20 years of data for each of the countries (1980–2008); (3) aggregate inward flows of FDI rather than focusing on bilateral flows; and (3) using a residual analysis similar to the Solow residual approach for measuring technological change as a way to measure the effect of country policies on attractiveness for inward FDI.

2. Previous Studies

A recent review of the literature by Blonigen (2005) concluded that "our theoretical hypotheses come out of modeling firm-level decisions. "Building on models of firm behavior, these empirical investigations have generally been cross-country studies of bilateral flows of FDI. These studies then look at how macroeconomic factors may influence a firm's decision concerning FDI. The results from such studies have been widely varying. Several recent attempts have been made to reconcile these widely varying results by using various modeling selection theories (Chakrabarti, 2001; Blonigen & Piger, 2005; Eicher, Helman, & Lenkoski, 2012).

A major problem with this theoretical approach is that many countries end up excluded from the sample because the information on bilateral flows is simply not available in sufficient detail. One approach to this problem is to see this as a possible sample selection bias (Eicher et al., 2012). This paper, instead, does not use bilateral flows but aggregate flows. Our emphasis from the beginning is the macroeconomic factors that influence the FDI decision.

Several recent studies have looked at aggregate flows using a panel data set. Recent examples include Aseidu (2002) that studied a sample of 71 developing countries for the period 1988–97; Mohamed and Sidiropoulos (2010) that studied 36 developing countries for the period 1975–2006; Fukumi and Nishijima (2010) that studied

19 countries in Latin America and the Caribbean for six 3 year sub-periods from 1983 to 2000; and Krifa-Schneider and Matei (2010) that studied 33 developing countries for the period 1996–2008. Of these studies, only Kirfa-Schneider and Matei (2010) used the Arellano and Bond (1991) dynamic panel model that has been found to be more appropriate for panels such as these with several countries over only a few years (see Holtz-Eakin, Newey, & Rosen, 1988) rather than the fixed-effects model used in the other studies.

This paper differs from these recent studies in several respects. First, this study is not limited to developing countries. The countries used in this study include very low-income developing countries, middle-income countries, and high-income countries. Second, the approach in this study is to develop a model of macroeconomic variables that attempt to measure the attractiveness of countries for inward FDI. Using an approach similar to the Solow growth model, the residuals of this model are then used as a measure of the extent specific policies of countries with regard to business formation and taxation are related to the flow of FDI being either above or below what would be expected from the purely macroeconomic characteristics of the country. Third, the dependent variable in this study will be the total aggregate flows of inward FDI measured in constant PPP adjusted US dollars. All of the previous studies have used FDI as a percent of current GDP. This study will instead use GDP (in a non-linear form) as one of the macroeconomic variables determining the flow of FDI rather than impose the (implied) functional form that FDI and GDP have a one-to-one linear relationship.

3. Data and Methodology

All the data used in this study are from the World Bank, *World Development Indicators*. There are 74 countries in the sample (see Table 2 for a list) for the years 1980–2008. The dependent variable is inward FDI measured in constant PPP adjusted US dollars. The macroeconomic variables of interest (all in PPP adjusted US dollars) are (1) GDP as a measure of market size; (2) per capita GDP as a measure of wealth and a proxy for wages; (3) growth rate of real GDP as a measure of the strength of the economy and the effectiveness of macroeconomic policies; (4) exports plus imports as a percent of GDP as a measure of the openness of the country; (5) total bank credit as a percent of GDP as a measure of the financial development of the country; (6) number of telephone lines per 100 people as a measure of the development of infrastructure in the economy; and (7) Natural resource rents as a percent of GDP as a measure of the importance of natural resources in the economy. Using the Arellano and Bond model the estimation also includes lagged values of the dependent variable. First differences of all of the independent variables are used as instruments to adjust for any simultaneity issues. To allow for non-linearity, the square of both real GDP and per capita real GDP are also used as independent variables.

The second step in the analysis is to take the residuals of this macroeconomic model as a measure of whether the country has attracted FDI at a rate greater or less than an average country with the same characteristics. Using the average value of the residual for the entire time period (1980–2008) as the dependent variable, a model is estimated to attempt to relate the attractiveness of the country for inward FDI to measures of economic policy. The variables used to measure policy are all indexes developed by the World Band (*World Development Indicators)*. The World Bank has only recently begun to measure these values and they have generally changed very little over this brief period so the values for 2009 were used. These measures are: (1) Disclosure Index (1-10), a measure of the extent to which investors are protected through disclosure of ownership and firm information; (2) Start-up cost (percent of GDP); (3) Depth of Information Index (1–6), the extent of rules effecting scope, accessibility and quality of credit information available; (4) Legal rights index (0–10); (5) Labor tax (percent of profit); (6) Profits tax (percent of profits); and (7) Other taxes (percent of profits). The World Bank uses these seven indicators to rank countries from best to worst for what it calls “Ease of Doing Business”.

Table 1. Coefficient estimates

Independent Variable	Coefficient	z-statistic
Real GDP	0.0096	118.26
Real GDP squared	$6.97x10^{-17}$	15.67
Real GDP per capita	$-2.28x10^{6}$	-131.86
Real GDP per capita squared	48.76	160.76
Growth (% change real GDP)	$1.61x10^{8}$	127.30
Openness (Exports+Imports/GDP)	$6.02x10^{7}$	164.00
Bank Credit	$-3.54x10^{6}$	-10.92
Telephone lines per 100	$4.11x10^{8}$	491.65
Natural Resource Rents (%GDP)	$3.41x10^{7}$	20.66
Lagged FDI	0.5144	18400
Wad test for overall fit	$\chi^2(9) = 2.74x10^{6}$	p-value = 0.000
Test for autocorrelation	z = 0.099	p-value = 0.922
Sargan test	$\chi^2(377) = 80.61$	p-value = 0.999

Table 1 shows the Arrellano-Bond Dynamic Panel estimates (GMM) of the model with FDI as the dependent variable. The z-statistic is based on robust standard error estimates.

4. Empirical Results

The results from the GMM estimation of the equation relating inward FDI to the seven macroeconomic variables (plus 2 second order terms) are reported in Table 1. Overall the estimation meets the basic criteria for a useful estimation. First, the model passes the Sargan test of the over-identifying restrictions implied by the use of the instrumental variables since the test statistic ($\chi^2(377)=80.612$) would not reject the null hypothesis that the over-identifying restrictions are valid at any significance level. Second, the test-suggested by Arellano and Bond for autocorrelation in the presence of first-differenced errors cannot reject the hypothesis of no autocorrelation ($z=0.098$) at any significance level. Finally, all of the variables are significant at a significance level of at least 0.01.

The results for using real GDP as an independent variable using a second-order non-linear model are of particular note. Data for inward FDI are generally reported as a percent of GDP. Previous studies have generally used this percentage measure of inward flows of FDI as the dependent variable in models of the determinants of FDI flows. The results, here, though indicate that this is a misspecification and that the relationship between FDI flows and the size of the market is non-linear. Specifically, these results show a positive relationship between size and FDI flows with the relationship growing at an increasing rate.

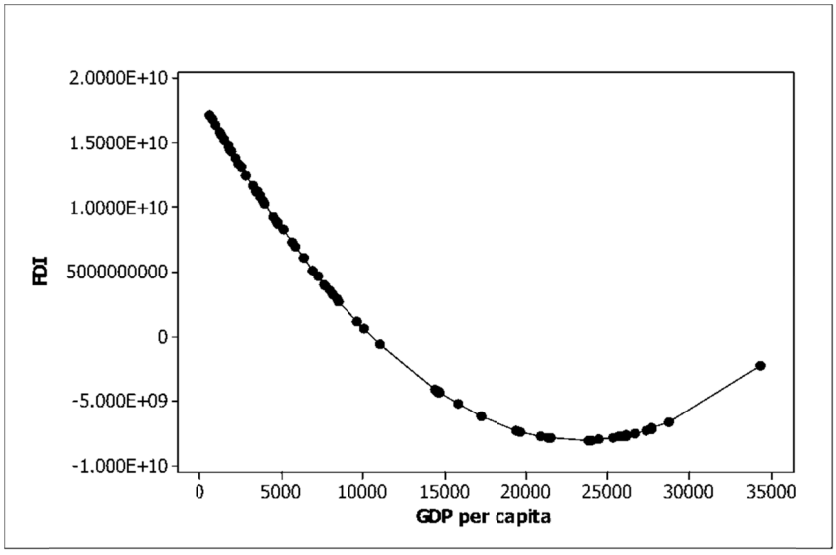

Figure 1. Scatterpolot of FDI and GDP per capita

This graph shows the estimated relationship between GDP per capita and the flows of FDI. All other variables are measured at their overall mean.

The results for real per capita GDP are also interesting. This variable is a proxy for two (conflicting) reasons for a firm to choose a country as a possible location for FDI. If the firm is looking for a location where production of a good would be at a low-cost, then a country with low wages would be preferable. While not perfect, per capita GDP is clearly a reasonable proxy for the level of wages. On the other hand, if a company is looking for a location to produce a good or service where there is a large demand for the product, real per capita GDP is a good proxy for higher-income countries where the demand for goods and services would be higher.

Figure 1 shows the relationship between real per capita GDP and FDI. Using the mean values of all other variables for the entire sample, the graph plots the relationship from the estimates. The estimates imply that real per capita GDP and FDI have a negative relationship until a real per capita GDP reaches a value of $23,394. After this level of income is reached, there is a positive relationship between real per capital GDP and FDI. The search for low wages and the country as a platform for exports would seem to dominate the choice of location by firms (holding the effect of natural resources constant) up to the development level of about Ireland (average real per capita GDP over the period of $23,873). After that level of development, the attraction of a larger market for goods sold in the country dominates the choice of firms.

All of the other results from the panel estimation shown in Table 1 are statistically significant at any level and consistent with expectations. Inward flows of FDI are positively related to economic growth, the level of openness of the economy, the level of infrastructure development (telephone lines per 100), and the importance of natural resources in the economy. Inward FDI is negatively associated with the level of (domestic) bank credit (a substitute for direct foreign investment).

The fitted values of this estimated equation can be viewed as the expected value of inward FDI for an economy in each particular year. The difference between these predicted values and the actual inward FDI (the residuals) can, therefore, be interpreted as showing the extent to which the country's policies make this location more or less attractive, holding constant the macroeconomic position of the country. In Table 2 we use the mean residual to rank each country's attractiveness for FDI. Countries are listed in order from those with the most negative mean residual to the highest positive residual. The countries are divided into three groups based on

Table 2. Countries by mean residual

Mean Residual negative	Residual mean zero	Mean Residual positive
United States	Syrian Arab Republic	Bolivia
Japan	Malaysia	Paraguay
India	France	Costa Rica
Lesotho	Ireland	Finland
Indonesia	Nicaragua	Turkey
Papua New Guinea	Sudan	Brazil
Swaziland	Thailand	Dominican Republic
St. Vincent and the Grenadines	Mauritius	El Salvador
Malawi	Egypt, Arab. Rep.	Guatemala
Korea, Republic	Panama	Austria
Fiji	Netherlands	Greece
Jordan	Tunisia	Australia
St. Kitts and Nevis		Ecuador
Italy		Colombia
Congo, Republic		Uruguay
Ghana		New Zealand
Denmark		Israel
Canada		South Africa
St. Lucia		Seychelles
Sweden		Botswana
Sierra Leone		Peru
Philippines		Chile
Senegal		Portugal
Kenya		Spain

Madagascar	Mexico
Honduras	Trinidad and Tobago
Sri Lanka	Venezuela
Central African Republic	United Kingdom
Iceland	Belgium
Pakistan	Saudi Arabia
Cote d'Ivoire	Gabon

whether the mean residual is significantly below zero, above zero, or statistically insignificantly different from zero.

Table 3 reports the results of trying to understand what, if any, policy differences among these countries might explain this relative difference in countries (average) attractiveness as a location for FDI. Using the ranking of countries from most negative (US) to most positive (Gabon) as the dependent variable, this regression uses the seven measures that the World Bank has generated to rank countries for their ease of doing business. Of the seven measures only the depth of information index is significant at the 5% level. In addition, start-up costs (as a percent of GDP) and Other taxes (as percent of profits) are significant at the 10% level.

Table 3. Coefficient estimates

Independent Variable	Coefficient	z-statistic	p-value
Disclosure Index	-0.0777	-0.63	0.534
Start-up costs	-0.2528	-1.88	0.065
Depth of Information index	0.2737	2.35	0.022
Legal rights index	-0.1542	-1.12	0.268
Labor tax	0.1020	0.79	0.431
Profits tax	-0.1353	-1.10	0.274
Other taxes	-0.2085	-1.87	0.066
Constant	54.4776	3.60	0.001
R2	0.252		
adj. R^2	0.172		
Overall significance test	F(7,66)	3.17	0.006
Test for heteroscedasticity	$\chi^2(1)$	0.18	0.676

Table 3 shows the OLS estimates of the model with mean residual (negative to positive) as the dependent variable.

5. Conclusions

This study adds to the current literature by using a panel of countries that include the entire range of economic development rather than simply focus on a select group of developing countries. This is possible, partly, because of the use of aggregate inward FDI as the variable of interest rather than bilateral flows of FDI, which places great restrictions on the countries that can be included in the study. In addition, this study used as a measure of FDI the amount of FDI rather than the more traditional FDI as a percent of GDP. The results from the estimation showing a non-linear relation between these flows of FDI and GDP imply that the traditional form is a mis-specification. In addition, allowing real per capita GDP to have a non-linear (second-order) relationship to inward flows of FDI better captures the dual role of per capita GDP as both a proxy for wages and for consumer income.

The results from using the (mean) residuals for each country as a measure of policy choices that make a country more or less attractive for inward FDI was less successful. The measures used for policy choices were taken from the World Bank, *World Development Indicators,* and have only a short history. This required that we use the average for each country rather than look at each country over time. In addition, these measures of attractiveness for business are mostly rough indexes generated by the World Bank or overall indicators (such as tax payments) that may miss many nuances that would be of importance to multinational firms as they decide where to invest. As these variables accumulate over time and (hopefully) improve, future research may be better able to determine which policies best explain the relative attractiveness of countries for FDI.

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Is Social Security Harmful to the Environmental Quality?

Ching-Yang Liang[1] & Tsaur-Chin Wu[2]

[1] Department of Finance and Taxation, Takming University of Science and Technology, Taiwan

[2] Department of Public Finance, Feng Chia University, Taiwan

Corresponding: Ching-Yang Liang, Department of Finance and Taxation, Takming University of Science and Technology, No.56, Sec. 1, Huanshan Rd., Neihu District, Taipei City 11451, Taiwan (Republic of China). Tel: 886-2-2658-5801 ext. 5274. E-mail: cyliang@takming.edu.tw

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Abstract

This paper utilizes the two-period overlapping generations model developed by John and Pecchenino (1994) to examine the impacts of the social security program on environment quality. The main findings are as follows. First, a higher social security benefit leads to a lower environmental quality. Second, the competitive equilibrium is dynamically inefficient in the presence of the consumption externalities. Finally, two kinds of tax scheme, one based on differential environmental taxes and the other based on uniform environmental taxes, are designed to put the economy into the optimal allocation.

Keywords: social security, environmental quality, optimal taxation

1. Introduction

Increasing longevity and declining population growth rates shift the age distribution in OECD countries toward older age groups. There are two of the most important debates in the population aging. The one is to investigate the effects of population aging on the social security program. Related literature on the social security program can be summarized in Feldstein and Liebman (2002). They showed that the social security benefits are increased rapidly in the population aging. According to Roseveare et al. (1996), in 1995, the social security benefits absorbed 4.1% of GDP in the US, 6.6% in Japan, 10.6% in France, and 11.8% in Sweden. In 2030, the social security benefits will absorb 6.6% of GDP in the US, 13.4% in Japan, 13.5% in France, and 15% in Sweden.

The other is to study the effects of population aging on environmental quality. The relationship between population aging and the environment was pioneered by Ono and Maeda (2001). They thought that if an individual expects to live longer, then she/he would be willing to engage in maintenance of the environment. In addition, lower rate of population growth would lessen the effects of environmental degradation produced by individual consumption. Focusing on those notions, they showed that whether aging is harmful to the environment depends on the curvature of utility function. Besides, Ono and Maeda (2002) further analyzed the effects of population aging on economic growth and the environment. They showed that the public annuity is a key factor in evaluating the effects of aging.

In addition to the literature on the effects of population aging on the social security program and environmental quality, the linkage between the social security program and environmental quality has recently attracted considerable attention. Felder and Nieuwkoop (2000), Wendner (2001), and Ono (2005; 2007) analyzed environmental tax-financed social security reform and showed that this reform improves environmental quality and welfare. Rangel's (2003) important paper considers the link between social security and environmental quality in the political economy. Rangel showed that social security's fate depends on the vote of the middle-aged group. Note that the middle-aged vote for social security not because they care about current retirees, but because they correctly believe that without social security, they will not be able to receive benefits in old age. As a result, social security is sustainable and generates a surplus that can sustain environmental investments. This is why social security can be good for the environment in the Rangel's framework.

Unlike Rangel (2003), the proposed model is based on the competitive equilibrium rather than the political equilibrium. Like Rangel, this study focuses on intergenerational environmental issues, but uses an overlapping generation model, in which pollution arises from consumption, to examine the effects of social security on environmental quality. This study incorporates social security into the John and Pecchenino's (1994) model to

determine the effects of the competitive mechanism on the relationship between social security and environmental quality. This paper finds that social security is harmful to environmental quality, contrary to the result of Rangel (2003).

The intuition is as follows. Since an increase in the pension benefits of the older generation, combined with a rise in the pension contribution of the young, effectively shifts income from the young to the old generations. As the old generation's propensity to consume is higher than the young generation's propensity, this increases the average propensity to consume. Thus, an increase in pension benefits decreases environmental quality through increases in consumption. This is why social security is harmful to environmental quality in this model.

The connection between the social security program and environmental quality may be unfamiliar at first sight. However, as reported by OECD (2001), since the early 1990s, numerous countries have introduced environmentally related tax reform, where new environmentally related taxes have offset reduction in existing taxes. In many cases, the revenue from environmentally related taxes will be entirely or partly allocated to a reduction in social security contributions. Finland was the forerunner in introducing taxes on CO_2 emissions in 1990. However, the revenues have been used to make cuts to labor income taxes. Belgium introduced a new tax on some energy products in 1993, with revenues allocated to a reduction in social security contributions. The United Kingdom introduced a landfill tax in 1996, with revenues allocated to a reduction in social security contributions. Italy adopted various environmentally related taxes in 1998, with revenues allocated to a reduction in social security contributions. Germany implemented an increase of mineral oil duties and electricity taxes in 1999, with revenues allocated to a reduction in pension insurance contributions. Sweden implemented an increase of taxes on diesel, heating oil, and electricity in 2001, with revenues allocated to a reduction in social security contributions and income taxes.

This paper examines the effects of the social security program on environmental quality with consumption externalities in a two-period overlapping generations model based on the work by John and Pecchenino (1994). The main findings are as follows. First, a higher social security benefit leads to a lower environmental quality. That is, the reduction of pollution and the social security program may be mutually conflicting rather than compatible objectives. Second, the competitive equilibrium is dynamically inefficient in the presence of the consumption externalities. Finally, two kinds of tax scheme, one based on differential environmental taxes and the other based on uniform environmental taxes, are designed to put the economy into the optimal allocation.

The rest of this paper is organized as follows. Section 2 sets up the model of the representative household. Section 3 considers the competitive equilibrium model. Section 4 presents social optimal allocations. Section 5 demonstrates optimal tax schemes and Section 6 concludes.

2. The Model

This study follows the framework of John and Pecchenino (1994), in which pollution arises from consumption, utilized the overlapping generation model developed by Samuelson (1958) and Diamond (1965).

To characterize the relation between the social security program and environmental quality, the proposed approach incorporates payroll tax rates and social security benefits into John and Pecchenino's model. Individual works in the first period of life and retires in the second. There is no altruism, meaning that if there were no uncertainty, each individual would leave a bequest of zero. Generation t is the set of individuals who are born in period t. The population grows at rate n, so that if generation t is of size N_t then $N_{t+1} = (1+n)N_t$. In the working period, individual supplies one unit of labor inelastically and receive a disposable income $(1-\tau_t)w_t$, where w_t and τ_t represent a wage rate and a payroll tax rate, respectively. Tax revenue is reserved exclusively for provision of social security program. Individual divides disposable income among consumption for the working period, c_t^1, saving for the retirement period, s_t, and payment for environmental maintenance, m_t (Note 1). The individual consumption during the working period is

$$c_t^1 + s_t + m_t = (1-\tau_t)w_t, \tag{1}$$

In the retirement period, individual receives social security benefits, b_{t+1}, and the return on saving, r_{t+1}. The individual consumption during retirement is thus

$$c_{t+1}^2 = (1+r_{t+1})s_t + b_{t+1}, \tag{2}$$

where c_{t+1}^2 is the consumption of an individual of generation t during retirement (Note 2).

Environmental quality is public goods, defined as

$$Q_{t+1} = Q_t - \beta(N_t c_t^1 + N_{t-1} c_t^2) + \delta N_t m_t, \tag{3}$$

where $Q_t(Q_{t+1})$ is the aggregate environmental quality in period $t(t+1)$, $\beta > 0$ is a parameter of consumption externalities, $N_t c_t^1 + N_{t-1} c_t^2$ is the aggregate consumption in period t, $\delta > 0$ is a parameter presenting the technology required for environmental maintenance, and $N_t m_t$ is the aggregate environmental maintenance in period t. The pollution caused by individuals' consumption is straightforward. For example, driving an automobile causes CO_2 emissions. In daily life, people inevitably generate waste products that damage the environment, regardless of what treatments are available.

Dividing equation (3) by N_t, per capita environmental quality can be obtained as

$$(1+n) q_{t+1} = q_t - \beta \left[c_t^1 + \frac{c_t^2}{1+n} \right] + \delta m_t, \tag{4}$$

where $q_t \equiv Q_t / N_t$ denotes per capita environmental quality in period t. The individual's utility, $\boldsymbol{U}$, is derived from consumption in the working and retirement period, and per capita environmental quality in the retirement period (Note 3), where $U' > 0$ and $U'' < 0$. For simplification, this study assumes that the individual's utility function is a log-linear function of the form

$$U = \ln c_t^1 + \ln c_{t+1}^2 + \ln q_{t+1}. \text{(Note 4)} \tag{5}$$

3. Competitive Equilibrium

Individual chooses c_t^1, c_{t+1}^2, m_t, and s_t to maximize utility (5) subject to the constraints (1), (2), and (4), taking w_t, τ_t, b_{t+1}, c_t^2, r_{t+1}, and q_t as given. This means that the private optimization problem has the first order conditions

$$\frac{1}{c_t^1} = \left[\frac{\beta + \delta}{1+n} \right] \frac{1}{q_{t+1}}, \tag{6}$$

$$(1 + r_{t+1}) \frac{1}{c_{t+1}^2} = \left[\frac{\delta}{1+n} \right] \frac{1}{q_{t+1}}. \tag{7}$$

Equation (6) indicates that individual chooses consumption when they are young, equating the marginal rate of substitution between consumption in youth and environmental quality in old age to the marginal rate of transformation, $(\beta + \delta)/(1+n)$. At the utility maximum, a decrease in utility due to an extra dollar of falling consumption among the young is equal to an increase in utility due to the sum of the extra utility from decreasing consumption externalities, $\beta/(1+n)$, and from increasing the environmental maintenance, $\delta/(1+n)$.Equation (7) shows that individual chooses savings to equate the marginal rate of substitution between consumption in old age and environmental quality in old age to the marginal rate of transformation, $\delta/(1+n)(1+r_{t+1})$. At the utility maximum, a decrease in utility due to an extra dollar of falling consumption in old age is equal to an increase in utility due to an increase environmental maintenance, $\delta/(1+n)(1+r_{t+1})$ (Note 5).

The productive sector of the economy is characterized by an aggregate production function

$$Y_t = F(K_t, N_t), \tag{8}$$

where K_t is the capital stock in period t. Assuming that $F(K_t, N_t)$ satisfies constant returns to scale, equation (8) then can be rewritten as

$$y_t = f(k_t). \tag{9}$$

The production function is neoclassical: $f(k_t)$ with $f' > 0$ and $f'' < 0$, where $y_t \equiv Y_t / N_t$ is output per labor and $k_t \equiv K_t / N_t$ is capital per labor. Assume that capital does not depreciate during the production process. As the labor market is competitive, profit maximization in the choice of labor by firms implies that factors used in production are compensated by their marginal products

$$w_t = f(k_t) - k_t f'(k_t), \tag{10}$$

$$r_t = f'(k_t). \tag{11}$$

The capital market clears when $N_t s_t = K_{t+1}$. It can be rewritten as

$$s_t = (1+n)k_{t+1}. \tag{12}$$

At equilibrium, it is necessary that consumers maximize utility, firms maximize profit and all markets clear. Another assumption is that the social security program operates on the pay-as-you-go system. Noting that benefits are only paid once an individual has retired, the government budget constraint in period $t+1$ is

$$N_{t+1} w_{t+1} \tau_{t+1} = N_t b_{t+1}, \tag{13}$$

where the left-hand side of equation represents the aggregate payroll tax revenues collected from workers born in period $t+1$ and the right-hand side represents the aggregate benefits paid to retired persons born in period t. Dividing equation (13) by N_t, equation (13) reduces to

$$w_{t+1}\tau_{t+1} = \frac{b_{t+1}}{1+n}. \tag{14}$$

Combining equations (1), (2), (4), (6), (7), (10), (11), (12) and (14), leads to

$$\begin{aligned}(1+n)q_{t+1} = q_t - \beta\left[\frac{1+n}{\beta+\delta}q_{t+1} + (1+f'(k_t))k_t + \frac{b_t}{1+n}\right] \\ + \delta\left[f(k_t) - k_t f'(k_t) - \frac{b_t}{1+n} - (1+n)k_{t+1} - \frac{1+n}{\beta+\delta}q_{t+1}\right],\end{aligned} \tag{15}$$

$$q_{t+1} = \delta k_{t+1} + \frac{\delta b_{t+1}}{(1+n)(1+f'(k_{t+1}))}. \tag{16}$$

3.1 The Steady State

Since all nominal variables and per-capita variables are constant in the steady state, time subscripts are eliminated. Let $\bar{k}$ and $\bar{q}$ denote steady state values. Equations (15) and (16) can be rewritten as

$$(1+2n)\bar{q} + (\beta+\delta)\bar{k}f'(\bar{k}) - \delta f(\bar{k}) + (\beta + (1+n)\delta)\bar{k} = -\frac{\beta+\delta}{1+n}b, \tag{17}$$

$$\bar{q} = \delta\bar{k} + \frac{\delta b}{(1+n)(1+f'(\bar{k}))}. \tag{18}$$

The following proposition characterizes the comparative static behavior of the steady state of this model.

Proposition 1: *Under the stable condition, economies with higher social security benefits have lower capital accumulation and lower environmental quality*.

Proof: Please see Appendix.

The result of this paper differs from those of Rangel (2003). This is possible because Rangel studied the effects of social security on environmental quality in the political economy. However, the proposed model is based on competitive equilibrium. The main mechanism in the present paper is as follows. An increase in the pension benefits of the older generation, combined with a rise in the pension contribution rate of the young, effectively shifts income from the young to the old generations. As the old generation's propensity to consume is higher than the young generation's propensity, this increases the average propensity to consume. Thus, an increase in pension benefits decreases environmental quality (Note 6). On the other hand, when the average propensity to consume rises, the average propensity to save falls. Consequently, the steady state level of capital falls. This is why social security is harmful to capital accumulation and environmental quality in our model.

To the best of our knowledge, there is little empirical evidence regarding the effects of social security on environmental quality in a competitive equilibrium model. However, Wilcox (1989) used data from the Social Security Bulletin in the United State during 1965–1985 and found that increases in social security have caused large increases in consumer lifetime spending. Based on Wilcox's finding, social security may affect environmental quality through consumption impacts in reality. A policy implication from this finding is that social security is not necessarily good for the environment, but depends on the particular equilibrium structure.

4. Social Optimal Allocation

Suppose that the social planner is an infinitely-lived government who treats all generations symmetrically. The infinitely-lived government chooses the steady-state consumption, capital stock and the environmental maintenance to maximize the utility of a representative generation. That is, the planner solves

$$\max_{\{c^1,c^2,m,k\}} \; u = \ln c^1 + \ln c^2 + \ln q$$

Subject to

$$f(k) + k = c^1 + \frac{c^2}{1+n} + (1+n)k + m, \tag{19}$$

$$q = -\frac{\beta}{n}\left[c^1 + \frac{c^2}{1+n}\right] + \frac{\delta}{n}m, \tag{20}$$

where equation (19) represents economic feasibility, it can be obtained by combining equation (1), (2), (10), (11) and (12) in the steady state. Equation (20) is steady-state environmental quality. Let $\tilde{k}$, $\tilde{q}$, $\tilde{c}^1$, and $\tilde{c}^2$ denote steady state values. The first-order conditions are

$$\frac{1}{\tilde{c}^1} = \left[\frac{\beta+\delta}{n}\right]\frac{1}{\tilde{q}}, \tag{21}$$

$$\frac{1}{\tilde{c}^2} = \left[\frac{\beta+\delta}{n(1+n)}\right]\frac{1}{\tilde{q}}, \tag{22}$$

$$f'(\tilde{k}) - n = 0 \tag{23}$$

The economic meanings of equation (21) and (22) are similar to (6) and (7). Equation (23) means that the optimal k should be chosen such that $f'(\tilde{k}) = n$. Comparing equation (6) and (7) in the steady state with (21) and (22), this paper derives the following proposition.

Proposition 2: *It is shown that the competitive equilibrium is dynamically inefficient in this economy.*

The difference between equation (7) and (22) is that the retired person ignores the negative effect of consumption on environmental quality, β, in a competitive equilibrium. The reason is that the retired person does not suffer from the degraded environment, since she/he does not survive in the next period. Thus, the competitive equilibrium is dynamically inefficient in this economy.

5. Optimal Tax Schemes

It can be found that the competitive equilibrium is dynamically inefficient in this model in which the social security program is introduced. This section analyzes how to implements tax schemes in order to achieve efficient allocations for this economy. That is to say, this paper finds the optimal tax schemes to place stationary competitive economy in the golden rule allocation. This section will explicitly implement two kinds of tax scheme in turn. The one is introduced differential environmental taxes on consumption to finance the social security program. The other is introduced uniform environmental taxes on consumption and capital gain taxes to finance the social security program.

It is not unusual to introduce environmentally related taxes on consumption. For example, OECD (2001) revealed that 25 OECD member countries applied taxes on unleaded petrol, diesel and light fuel oil used for heating purposes. Austria, Belgium, Demark, Finland, Germany, Italy, Japan, Norway, and Sweden applied taxes on electricity consumption. Almost all OECD member countries levied some kind of tax on the sale or use of motor vehicles. Austria, Czech Republic, Denmark, Finland, Norway, Sweden, and United Kingdom introduced taxes related to the final treatment of waste. Belgium, Denmark, Finland, and Norway introduced taxes on beverage containers to reduce packaging use and packaging waste.

5.1 Payroll Taxes Cum Differential Environmental Taxes

The first tax scheme introduces a payroll tax and differential environmental taxes to finance the social security program, where $\dot{\tau}_t$ is a payroll tax rate, ζ_t^1 is an environmental tax rate imposed in the working period, and ζ_{t+1}^2 is an environmental tax rate imposed in the retirement period. Under the tax scheme, the individual problem of generation t is

$$\underset{\{c_t^1,c_{t+1}^2,m_t,s_t\}}{Max} \; u = \ln c_t^1 + \ln c_{t+1}^2 + \ln q_{t+1} \tag{24}$$

Subject to

$$(1+\zeta_t^1)c_t^1 + s_t + m_t = (1-\dot{\tau}_t)w_t, \tag{25-1}$$

$$(1+\zeta_{t+1}^{2})c_{t+1}^{2} = (1+r_{t+1})s_t + \dot{b}_{t+1}, \tag{25-2}$$

$$(1+n)q_{t+1} = q_t - \beta\left[c_t^1 + \frac{c_t^2}{1+n}\right] + \delta m_t. \tag{25-3}$$

Given w_t, $\dot{\tau}_t$, $\dot{b}_{t+1}$, c_t^2, r_{t+1} and q_t, individual chooses c_t^1, c_{t+1}^2, m_t and s_t to maximize utility (24) subject to the budget constraints (25-1), (25-2) and the per capita environmental quality (25-3). The first-order conditions in a steady state can be obtained as

$$\frac{1}{c^1} = \left[\frac{\beta + (1+\zeta^1)\delta}{1+n}\right]\frac{1}{q}, \tag{26}$$

$$(1+r)\frac{1}{c^2} = \left[\frac{(1+\zeta^2)\delta}{1+n}\right]\frac{1}{q}. \tag{27}$$

From the social viewpoint, the government can compare equation (21) and (22) with (26) and (27) and specify

$$\zeta^1 = \frac{\beta+\delta}{\delta n}, \tag{28}$$

$$\zeta^2 = \frac{\delta + (1+n)\beta}{\delta n}. \tag{29}$$

Employing equation (10), (12), (25-1) and (28), payroll tax rate can be derived as

$$\dot{\tau} = \frac{1}{f(\tilde{k}) - n\tilde{k}}\left[f(\tilde{k}) - n\tilde{k} - \tilde{m} - (1+n)\tilde{k} - \frac{\beta + (1+n)\delta}{\delta n}\tilde{c}^1\right].$$

Assume that the government budget is financed from payroll tax revenues and environmental tax revenues. Social security benefits can be obtained as

$$\dot{b} = (1+n)\left(f(\tilde{k}) - n\tilde{k}\right)\dot{\tau} + (1+n)\tilde{c}^1\zeta^1 + \tilde{c}^2\zeta^2.$$

Thus, this paper derives the following proposition.

Proposition 3: *Dynamically inefficient economies can achieve the optimal allocation by the following combination of payroll taxes and environmental taxes.*

$$\zeta^1 = \frac{\beta+\delta}{\delta n}, \quad \zeta^2 = \frac{\delta + (1+n)\beta}{\delta n},$$

$$\dot{\tau} = \frac{1}{f(\tilde{k}) - n\tilde{k}}\left[f(\tilde{k}) - n\tilde{k} - \tilde{m} - (1+n)\tilde{k} - \frac{\beta + (1+n)\delta}{\delta n}\tilde{c}^1\right].$$

It is worth to note that the environmental tax of the old is higher than that of the young. This is because a person lives for two periods. When they are old, they do not take care of the negative effect of the consumption level on the environment. Thus, the government must levy the higher environmental taxes on the old (Note 7).

5.2 Payroll Taxes Cum Uniform Environmental Taxes and Capital Gain Taxes

The second tax scheme introduces a payroll tax, uniform environmental taxes and capital gain taxes to finance the social security program, where $\ddot{\tau}_t$ is a payroll tax rate imposed in the working period, ξ^c is a uniform environmental tax rate imposed in both periods and ν is a capital gain tax rate imposed in the retirement period. Under the tax scheme, the individual's problem of generation t is

$$\underset{\{c_t^1, c_{t+1}^2, m_t, s_t\}}{Max} \quad u = \ln c_t^1 + \ln c_{t+1}^2 + \ln q_{t+1} \tag{24}$$

Subject to

$$(1+\xi^c)c_t^1 + s_t + m_t = (1-\ddot{\tau}_t)w_t, \tag{30-1}$$

$$(1+\xi^c)c_{t+1}^2 = (1+(1-\nu)r_{t+1})s_t + \ddot{b}_{t+1}, \tag{30-2}$$

$$(1+n)q_{t+1} = q_t - \beta\left[c_t^1 + \frac{c_t^2}{1+n}\right] + \delta m_t. \tag{30-3}$$

Given w_t, $\ddot{\tau}_t$, $\ddot{b}_{t+1}$, ν, c_t^2, r_{t+1} and q_t, individual chooses c_t^1, c_{t+1}^2, m_t and s_t to maximize utility (24) subject to the budget constraints (30-1), (30-2) and the per capita environmental quality (30-3). The first-order conditions in a steady state can be obtained as

$$\frac{1}{c^1} = \left[\frac{\beta + (1+\xi^c)\delta}{1+n}\right]\frac{1}{q}, \tag{31}$$

$$\frac{1}{c^2} = \left[\frac{(1+\xi^c)\delta}{(1+n)[1+(1+\nu)r]}\right]\frac{1}{q}. \tag{32}$$

From the social viewpoint, the government can compare equation (21) and (22) with (31) and (32) and specify

$$\xi^c = \frac{\beta+\delta}{\delta n}, \tag{33}$$

$$\nu = \frac{\beta}{\beta+\delta}. \tag{34}$$

Employing equation (10), (12), (30-1) and (33), payroll tax rate can be derived as

$$\ddot{\tau} = \frac{1}{f(\tilde{k}) - n\tilde{k}}\left[f(\tilde{k}) - n\tilde{k} - \tilde{m} - (1+n)\tilde{k} - \frac{\beta+(1+n)\delta}{\delta n}\tilde{c}^1\right].$$

Assume that the government budget is financed from payroll tax revenues, environmental tax revenues and interest income tax revenues. Social security benefits can be obtained as

$$\dot{b} = (1+n)(f(\tilde{k}) - n\tilde{k})\dot{\tau} + (1+n)\tilde{c}^1\xi^c + \tilde{c}^2\xi^c + r\tilde{s}\nu.$$

Thus, this paper derives the following proposition.

Proposition 4: *Dynamically inefficient economies can achieve the optimal allocation by the following combination of payroll taxes, uniform environmental taxes and capital gain taxes.*

$$\xi^c = \frac{\beta+\delta}{\delta n}, \quad \nu = \frac{\beta}{\beta+\delta},$$

$$\ddot{\tau} = \frac{1}{f(\tilde{k}) - n\tilde{k}}\left[f(\tilde{k}) - n\tilde{k} - \tilde{m} - (1+n)\tilde{k} - \frac{\beta+(1+n)\delta}{\delta n}\tilde{c}^1\right].$$

Compare equation (33) with (28) and (29), it can be found that $\xi^c = \zeta^1$ and $\xi^c < \zeta^2$. That is, the consumption level of the old is higher than the optimal. Thus, the government can achieve the optimal consumption level by imposing additionally capital gain taxes on the old. It is worth noting that if $n < 2$, then $\nu < \xi^c$. This implies that the environmental tax rate levied by the government is a direct way to reduce consumption externalities, whereas the capital gain tax rate is an indirect way. Thus, the environmental tax rate is higher than capital gain tax rates on the old.

6. Conclusion

This paper provides a theoretical analysis of the relationship between the social security program and environmental quality, and discusses how to design tax schemes in order to put the economy into efficient allocations. It is shown that a higher social security benefit leads to a lower environmental quality. This result tends to reflect that the social security program will increase consumption and thus environmental degradation. This has a policy implication for the conflict between the social security program and environmental quality. On the other hand, it is demonstrated that the competitive equilibrium is dynamically inefficient in the presence of the consumption externality. Thus, it is shown how to design two tax schemes, one based on differential environmental taxes and the other based on uniform environmental taxes, to put the economy into the optimal allocation.

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Notes

Note 1. The superscript '1' denotes when an individual is young. The subscript 't' means period t.

Note 2. The superscript '2' denotes when an individual is old. The subscript '$t+1$' means period $t+1$.

Note 3. Aggregate environmental quality grows at rate n because of the specification of our model. If an individual obtains utility form aggregate environmental quality, then utility will increase over time. To permit a steady-state analysis, this study assumes that environmental quality is defined in per capita form.

Note 4. This formulation can be viewed in John et al. (1995), Pecchenino and Pollard (1997), Ono and Maeda (2002), and Ono(2002).

Note 5. Following John and Pecchenino (1994, p 1397), this study preclude the possibility that individual chooses not to engage in maintenance.

Note 6. The sources of affecting environmental quality include payments for environmental maintenance, m_t. A higher payroll tax rate leads to lower environmental maintenance and thus lower environmental quality.

Note 7. This analysis parallels the approach derived by Ono (1996) who highlights the optimal tax schemes in an overlapping generations model with the environmental externality.

Note 8. This condition can be hold if production function is a form of Cobb-Douglas function as can be seen in Pecchenino and Pollard (1997), Ono and Maeda (2002), and Ono(2002).

Appendix

First, to prove the stability of the steady-state equilibrium, equation (17) and (18) can be rewritten as

$$\bar{q} = \frac{1}{1+2n}\left[-\frac{\beta+\delta}{1+n}b - (\beta+(1+n)\delta)\bar{k} + (\delta-(\delta+\beta)\rho(\bar{k}))f(\bar{k})\right] \equiv \psi(\bar{k}), \tag{A.1}$$

$$\bar{q} = \delta\bar{k} + \frac{\delta b}{(1+n)(1+f'(\bar{k}))} \equiv \phi(k), \tag{A.2}$$

where $\rho(\bar{k}) \equiv \bar{k}f'(\bar{k})/f(\bar{k})$. We have

$$\psi'(\bar{k}) = \frac{1}{1+2n}\left[-(\beta+(1+n)\delta) - (\delta+\beta)\bar{k}f''(\bar{k})\right], \tag{A.3}$$

$$\phi'(\bar{k}) = \delta - \frac{bf''(\bar{k})}{(1+n)(1+f'(\bar{k}))^2} > 0. \tag{A.4}$$

Since the second order derivatives of $\psi(\bar{k})$ and $\phi(\bar{k})$ are ambiguous, the possible figure is illustrated in figure A1.1 to figure A1.4. There is a steady-state equilibrium in figure A1.1 and A1.2. When the capital stock is less than k_L, the equilibrium path converges to $k=0$. When the capital stock is larger than k_L, the equilibrium path converges to $k=k_H$. There is no steady-state equilibrium in figure A1.3 and A1.4. Thus, the condition of the steady-state equilibrium is satisfied by $\phi'(\bar{k}) > \psi'(\bar{k})$.

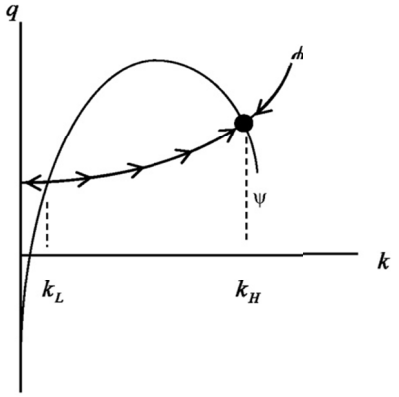

Figure A1.1

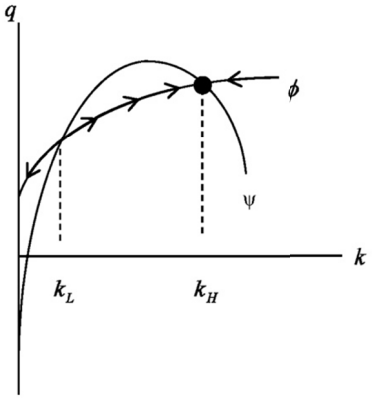

Figure A1.2

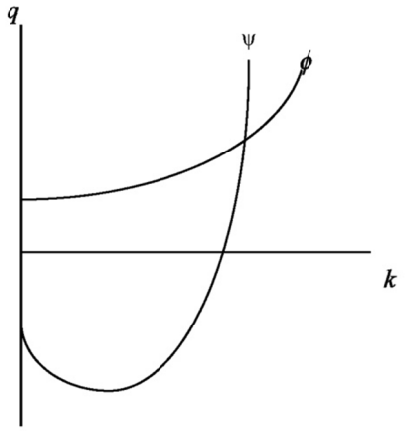

Figure A1.3

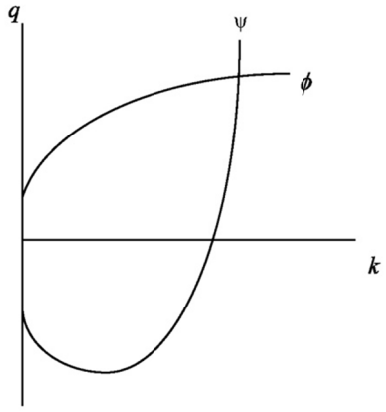

Figure A1.4

Second, totally differentiating equation (17) and (18), taking β, δ, and n as given, so that

$$\begin{bmatrix} 1+2n & \beta f'(\bar{k})+(\beta+\delta)\bar{k}f''(\bar{k})+\beta+(1+n)\delta \\ (1+n)(1+f'(\bar{k})) & (1+n)(\bar{q}-\delta\bar{k})f''(\bar{k})-(1+n)(1+f'(\bar{k}))\delta \end{bmatrix}\begin{bmatrix} d\bar{q} \\ d\bar{k} \end{bmatrix} = \begin{bmatrix} -\dfrac{\beta+\delta}{1+n} \\ \delta \end{bmatrix} db \cdot$$

The determinant of the left-hand-side matrix is

$$\begin{aligned} \Delta &\equiv \begin{vmatrix} 1+2n & \beta f'(\bar{k})+(\beta+\delta)\bar{k}f''(\bar{k})+\beta+(1+n)\delta \\ (1+n)(1+f'(\bar{k})) & (1+n)(\bar{q}-\delta\bar{k})f''(\bar{k})-(1+n)(1+f'(\bar{k}))\delta \end{vmatrix} \\ &= (1+n)\left\{\frac{(1+2n)f''(\bar{k})b\,\delta}{(1+n)(1+f'(\bar{k}))}-(1+f'(\bar{k}))\left[(1+f'(\bar{k})+\bar{k}f''(\bar{k}))\beta+(2+3n+\bar{k}f''(\bar{k})\delta)\right]\right\}. \end{aligned}$$

Assume that $f'(\bar{k})>n>-\bar{k}f''(\bar{k})-1$ and thus obtain $\Delta<0$ (Note 8). In the presence of the social security program, the effects of an increase in the social security benefit on capital accumulation and environmental quality can be written as

$$\frac{d\bar{q}}{db} = \frac{1}{\Delta}\left[-(\beta+\delta)f''(\bar{k})\bar{q} + (f'(\bar{k})-n)\delta^2\right] < 0,$$

$$\frac{d\bar{k}}{db} = \frac{1}{\Delta}\left[(1+2n)\delta + (\beta+\delta)(1+f'(\bar{k}))\right] < 0.$$

Q.E.D.

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Air Pollution, Economic Growth, and the European Union Enlargement

Ismail Onur Baycan[1]

[1] Department of Economics, Anadolu University, Turkey

Correspondence: Ismail Onur Baycan, Department of Economics, Faculty of Economics and Administrative Sciences, 26470 Eskisehir, Turkey. Tel: 90-222-335-0580. E-mail: iobaycan@anadolu.edu.tr

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Abstract

This study examines the Environmental Kuznets Curve (EKC) hypothesis between the levels of air pollution and per capita income growth, considering the largest enlargement of the European Union (EU). Four different measures of environmental quality, SPM, NO_X, SO_2, and CO_2, are employed for three different country groups: the core fifteen countries of the EU before its largest enlargement, the twenty five EU countries after the enlargement, and the new ten countries that became the members of the EU after this enlargement process. The results present a statistically significant U-shaped EKC relationship between each of the air pollutants and per capita income growth for the core fifteen EU member countries and the twenty-five countries after the enlargement. These findings imply that beyond a certain level of GDP, a further rise in income can only be reached at the cost of environmental degradation. For the third country group of the study, the countries that joined the EU after its largest enlargement, there is no statistically significant evidence for the existence of an EKC in any type.

Keywords: environmental kuznets curve, economic growth, air quality, EU enlargement

1. Introducation

The relationship between the environmental degradation and per capita income levels has been highly debated by the resource and environmental economists during the last two decades. Examination of the environmental Kuznets Curve (EKC) is widely utilized to analyze this relationship. According to the EKC argument, little weight is given to environmental concerns in a developing economy, which raises environmental pollution byproducts. As a country reaches higher income levels, people get more concerned about environment, and therefore environmental policies become more stringent. Therefore, the interests give greater weight to a clean environment by reducing and reversing the environmental pollution trend. This implies an inverted-U-shaped EKC relationship between the per capita emissions of pollution and per capita levels of income.

On the other hand, some studies, such as, Dinda et al. (2000), Kaufmann et al. (1998), Sengupta (1997), Shafik (1994), and Grossman and Krueger (1995) suggest a U-shaped EKC relationship, especially for more industrialized country groups. According to this view, the differences in economic growth dynamics of more developed countries compared to the developing ones, as well as the differences in their sectoral compositions causes this U-shaped EKC relationship. These studies argue that a threshold level is already passed for these industrialized countries and additional rise in per capita income cannot be reached without environmental degradation.

This study examines the EKC relationship between the levels of air pollution and per capita income growth considering the largest enlargement of the European Union (EU) in 2004. This enlargement increased the number of member countries from fifteen to twenty five, and as being the largest enlargement of the EU, this enlargement affects the environmental conditions both in the new and old members of the union. The study examines whether this enlargement process affects the EKC relationship between air quality and per capita income growth in the EU.

The remainder of the study is structured as follows. Section 2 reviews the empirical literature. Section describes the employed methodology. Section 4 introduces the data set used in the study. Section 5 and presents the empirical results. Section 6 concludes.

2. Literature Review

The previous empirical studies that focus on the existence of the EKC for different country groups provide mixed results. The first group of studies gives evidence for the existence of the EKC. Grossman and Krueger (1991) focus on the potential environmental impacts of North American Free Trade Agreement (NAFTA) and, for the first time, provide evidence for the existence of an EKC relationship. They use the pollutants of SO2, dark matter (fine smoke), and Suspended Particulate Matter (SPM). Selden and Song (1993), Shafik (1994), Grossman and Krueger (1995), Panayotou (1997), Torras and Boyce (1998), Kaufmann et al. (1998), and Stern and Common (2001) are other studies that give evidence for the existence of an EKC relationship.

A second group of studies document empirical evidence in favor of a U-shaped EKC. This is also known as reverse or inverse EKC. This group of studies suggests that more industrialized countries have already crossed a threshold point, and therefore an additional rise in per capita income cannot be achieved without environmental degradation. They emphasize that, different economic growth dynamics of more industrialized economies and differences in their sectoral compositions cause this U-shaped EKC relationship. Stern and Common (2001) investigate the EKC relationship for sulfur emissions from 1960 to 1990 for 73 countries. They run regressions for the OECD and non-OECD countries. They use fixed and random effects estimates together with time and country effects to estimate the model. Their findings document a U-shaped EKC relationship. Kaufmann et al. (1998) uses panel data for a group of 23 countries for the time period between 1974 and 1989. They show the existence of U-shaped EKC relationship between concentration of Sulfur Dioxide and income. Millimet, List, and Stengos (2003) use semi-parametric models that document U-shaped curves with lower turning points using U.S. state-level panel data on nitrogen oxide and sulfur dioxide emissions. Dinda et al. (2000) also finds a U-shaped EKC in the case of suspended particulate matter, using the World Bank cross-country panel data on environment. Shafik (1994), Sengupta (1997), Grossman and Krueger (1995) also suggest the existence of a reverse EKC relationship between per capita income and environmental degradation.

A last group of studies argue that emissions of the pollutants are an increasing monotonic function of income, and therefore either an original or inverse EKC relationship cannot exists. Harbaugh et al. (2002) investigate the EKC relationship using three common air pollutants, namely, sulfur dioxide, smoke, and suspended particulates. Their results show no empirical evidence for the existence of EKC in cities world-wide. Caviglia-Harris et al. (2008), and Harbaugh et al. (2002) also find no evidence that supports the existence of EKC between economic growth and environmental quality degradation.

3. Empirical Model

To examine the EKC relationship, the study analyzes the relationship between four different air pollutants and per capita income growth. the analyze rests on three different country groups. These country groups are the core fifteen countries of the EU before its largest enlargement, the twenty five EU countries after the enlargement, and the new ten countries that became the members of the EU after the enlargement process.

The estimated EKC specification is as follows:

$$m_{it} = \beta_0 + \beta_1 y_{it} + \beta_2 y_{it}^2 + \beta_3 d_{it} + \varepsilon_{it} \quad (1)$$

where i is the country index, t is a time index and ε is a disturbance term with zero mean and a finite variance. The dependent variable, mit stands for the measure of per capita emissions for each of the pollutants. The variable yit stands for per capita GDP. dit stands for the population density, which allows to distinguish the effects of urbanization.

The study excludes all explanatory variables other than per capita GDP and population density. The reason for doing that is to get rid of the endogenous consequences of growth and other factors. To deal with endogeneity, I omitted the factors such as the level of education, political structure, and composition of output. These factors are closely related with the emission of the pollutants. Because there would exist a systematic relationship among such kind of variables and per capita GDP growth, and as our objective is to assess both the direct and indirect consequences of growth, I exclude these variables from the equation.

The sign requirements for the existence of the EKC is obtained by taking the first order derivatives of per capita emissions (m_{it}) for each of the pollutants and each of the country groups with respect to real gross domestic product per capita (y_{it}). The threshold point where the first-order derivative of yit is equal to zero indicates a critical point, where there is either a minimum or a maximum, that is, whether the model estimation results in a U or an inverted-U shape. For the existence of a maximum or an original Environmental Kuznets Curve, β_1 must be positive while β_2 is negative, and for the existence of a minimum or a reverse Environmental Kuznets Curve, β_1 must be negative, while β_2 must be positive.

4. Data

Our data set consists of longitudinal data and consists of twenty five countries and three different country groups. The sample period starts from 1995 and ends in 2005. All data are drawn from the Eurostat database. Real income (GDP) per capita is constructed in purchasing power standards (PPS). Using the PPS eliminates the differences in price levels between countries. Besides, calculations on a per capita basis allows for a comparison of different economies that are significantly different in absolute sizes. Population density is in terms of inhabitants per km², where the ratio is the mid-year population of a territory to its size. Air pollutants employed in the study are Suspended Particulars (SPM), Oxides of Nitrogen (NO_x), Sulfur Dioxide (SO_2) and Carbon Monoxide (CO_2). The emission of each of those pollutants brings different environmental problems, and cause important adverse health problems.

The extracted data for emissions are in terms of 1000 tons. They are used in per capita measures, obtained by dividing emissions for each country to its population. Because per capita emissions in terms of 1000 tons yield very small numbers, they became problematic in the calculations. Therefore, I multiply them with a scalar value of one million to transfer the level of pollutants into kilograms.

5. Empirical Results

The EKC model is estimated for three country groups and four different pollutants. Descriptive statistics for each group of countries are reported in Table 1. We examine the relationship for the core fifteen countries of the EU before its largest enlargement, the twenty five EU countries after the enlargement, and the new ten countries that became the members of the EU after this enlargement process. First, a Breusch-Pagan/Cook-Weisberg test is employed to detect the existence of any linear form of heteroscedasticity. The results show strong evidence of heteroscedasticity. This result is not surprising considering that we work with different countries for each of the country groups, which means that we deal with different cluster of variances. Because the standard error variances are all a multiplicative function of different variables, standard errors are clustered and weighted for each group in order to deal with heteroscedasticity.

Table 1. Descriptive statistics for EU-15, EU-25, and NEW-10

	Mean			*Std.Dev.*		
	EU-15	EU-25	NEW-10	EU-15	EU-25	NEW-10
Popd	155.5176	173.4065	200.24	120.1977	238.1314	345.8298
Gdp	22927.88	18314.18	11393.64	7368.353	8394.362	3858.68
Gdpsq	5.80E+08	4.06E+08	1.45E+08	4.64E+08	4.22E+08	9.36E+07
Spm	48421.76	51688.37	56.58828	14745.4	17784.14	20.67662
No_x	29147.7	27129.85	24.10307	8989.84	8577.5	6.923919
so_2	18655	29341.47	45.37117	13730.98	23610.69	26.18164
co_2	1.01E+07	9287636	8019091	3823903	3726664	3194390

Both fixed and random effect estimates are obtained from the model. We know that there is a trade off between the fixed and random effect models. The estimates from the fixed effects always give consistent results, but they may not be the most efficient model to run. Random effects, on the other hand, are more efficient estimators. Hausman test is employed to decide for the best estimates. This test verifies a more efficient model against a less efficient but consistent one, to make sure that the more efficient model also gives us consistent results. The favored results are reported in the tables for each of the country groups.

Tables 2 to 5 report the estimation results for four different pollutants and three different country groups. As discussed earlier, the evidence for the original EKC requires the coefficient β_1 must have a positive and β2 has a negative sign. For the existence of a U-shaped EKC, β_1 must be negative, while β_2 must have a positive sign. The results for the core fifteen EU member countries and the total twenty-five countries after the enlargement show a statistically significant negative value of β_1 and a statistically significant positive value of β_2. The results for these country groups suggest a U-shaped relationship between the pollutants of SPM, NO_x, SO_2, and CO_2 and per capita income growth. This implies that beyond a certain level of GDP, a further rise in income can only be reached at the cost of environmental degradation. For the third country group of the study, the countries that

joined the EU after its largest enlargement, there is no statistically significant evidence for the existence of an EKC in any type.

Table 2. EKC model results for SPM

VARIABLES	EU-15 (RE)	EU-25 (FE)	NEW-10(RE)
gdp	-1.994***	-3.071***	-0.00169
	(0.241)	(0.277)	(0.00130)
gdpsq	1.17e-05***	2.68e-05***	-7.32e-08
	(3.84e-06)	(4.78e-06)	(5.30e-08)
popd	-38.70	-110.4**	0.0129
	(25.22)	(49.91)	(0.0184)
Constant	93,380***	116,195***	83.89***
	(5,804)	(8,593)	(10.74)
Conclusion	Reverse EKC	Reverse EKC	-

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Table 3. EKC model results for NO_X

VARIABLES	EU-15 (RE)	EU-25 (FE)	NEW- 10(RE)
gdp	-1.081***	-1.001***	0.000404
	(0.165)	(0.126)	(0.000477)
gdpsq	8.29e-06***	6.97e-06***	-4.60e-08**
	(2.62e-06)	(2.17e-06)	(1.94e-08)
popd	-12.57	6.677	0.00400
	(14.64)	(22.67)	(0.00492)
Constant	51,081***	41,472***	25.35***
	(3,581)	(3,904)	(3.423)
Conclusion	Reverse EKC	Reverse EKC	EKC (insignificant)

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Table 4. EKC model results for SO_2

VARIABLES	EU-15(RE)	EU-25 (FE)	NEW-10 (RE)
gdp	-2.062***	-3.936***	-0.00350*
	(0.220)	(0.360)	(0.00182)
gdpsq	1.68e-05***	4.34e-05***	-3.96e-08
	(3.50e-06)	(6.19e-06)	(7.42e-08)
popd	-16.91	-121.8*	0.0430**
	(22.31)	(64.68)	(0.0196)
Constant	58,814***	104,955***	82.31***
	(5,191)	(11,136)	(13.28)
Conclusion	Reverse EKC	Reverse EKC	-

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

Table 5. EKC model results for CO_2

VARIABLES	EU-15 (RE)	EU-25 (RE)	NEW-10 (RE)
gdp	-102.2**	-92.28***	-439.3***
	(49.53)	(30.69)	(71.34)
gdpsq	0.00339***	0.00323***	0.0182***
	(0.000788)	(0.000535)	(0.00292)
popd	5,491	789.7	1,091
	(4,394)	(2,099)	(2,402)
Constant	9.655e+06***	9.532e+06***	1.017e+07***
	(1.076e+06)	(731,218)	(1.252e+06)
Conclusion	Reverse EKC	Reverse EKC	Reverse EKC

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1.

6. Conclusion

This study examines the EKC relationship between the levels of environmental degradation and per capita income growth, considering the largest enlargement of the EU. This enlargement increased the number of member countries from fifteen to twenty five, and as being the largest enlargement of the EU, it affects the environmental conditions both for the new and old members of the union. The study tests whether adding ten new members (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) in the 2004 enlargement process affects the relation between different kinds of air pollution and per capita income growth in the EU. The Eurostat cross-country panel data on air quality and per capita real GDP data are employed for the period 1995–2005. Four different measures of air pollutants, namely, SPM, NO_x, SO_2, and CO_2, are utilized. We examine the relationship for three different country groups: the core fifteen countries of the EU before its largest enlargement, the twenty five EU countries after the enlargement, and the new ten countries that became the members of the EU after this enlargement process.

The findings document a statistically significant U-shaped EKC relationship between each of the air pollutants employed in the study and per capita income growth for two of the country groups: The core fifteen EU member countries and the twenty-five countries after the enlargement. These results imply that beyond a certain level of GDP, a further rise in per capita income can only be reached at the cost of environmental degradation. The findings are consistent with the earlier studies that were conducted for different industrialized country groups, which argue that the differences in economic growth dynamics of more developed countries compared to the developing ones, as well as the differences in their sectoral compositions causes this U-shaped EKC relationship. There is no statistically significant evidence for the existence of an either original or inverse EKC relationship for the third country group of the study, which consists of the countries that joined the EU after the enlargement.

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Cluster Analysis: Is Turkey Far From European Union Members in Economic Perspective?

Çiğdem Özarı[1], Ülgen Köse[2] & Veysel Ulusoy[2]

[1] Economics and Finance, Istanbul Aydın University, Turkey

[2] Yeditepe University, Turkey

Correspondence: Veysel Ulusoy, Yeditepe University, İnönü Mah. Kayışdağı Cad. 26 Ağustos Yerleşimi, 34755 Ataşehir, İstanbul, Turkey. E-mail: vulusoy@yeditepe.edu.tr

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Abstract

EU member countries, candidate and potential candidate countries are clustered between the years 1996–2009 according to their import, export, gross domestic product, labor force and long term unemployment data. We find out that for the whole data set (1996:01–2009:12) Turkey is not far from existing European Union members in an economic manner. For the time sets 1996:01–2003:12; we see that Turkey is in the same cluster with Poland which is accepted to European Union in 2004, and for the time set 2004:01–2009:12 Turkey is in the same cluster with newly accepted EU members in 2004 and 2007.

Keywords: cluster analysis, EU membership process

1. Introduction

Since the application in 1987 and being the formal candidate for membership in 1999, Turkey's journey for EU membership; which is evaluated on various aspects annually; still seems a "never ending story".

Turkey, having become a candidate country in 1999 and been involved in accession negotiations since October 2005 has consistently fallen short of many of the additional criteria of the EU's vast body of laws and judicial decisions. Formally speaking, there are no cultural or religious requirements for membership to the EU, but there are political, legal and economic preconditions that candidate countries must meet. These "Copenhagen criteria", which are applicable to all aspiring EU members, were summarized as follows: Membership requires that the candidate country has achieved stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities, the existence of a functioning market economy as well as the capacity to cope with competitive pressure and market forces within the Union.

Setting aside all the subtle issues such as democracy, human rights, respect and protection of minority rights, where the boundaries between "general good for the Union" and internal affairs should be drawn within political and historical perspective of the existing and candidate EU members carefully, our aim in this paper is to understand the place of Turkey within the existing and applicant EU members in the light of the progress and existing economic perspective.

The latest EU progress report indicates that EU-Turkey Customs Union continues to boost bilateral trade between the EU and Turkey, which totaled € 103 billion in 2010. Turkey is the EU's seventh biggest trading partner while the EU is Turkey's biggest. Almost half of Turkey's total trade is with the EU and almost 80% of FDI in Turkey comes from the EU. The multilateral economic dialogue between the Commission, EU Member States and Candidate Countries in the context of the pre-accession fiscal surveillance continued, including a meeting at Ministerial level in May in Brussels. These meetings focused on the main challenges posed to Turkey by the Copenhagen economic criteria (Note 1).

We look the data for all member and candidate countries to EU between the years 1996–2009 and base our research on only economic indicators of these countries, namely import, export, GDP, labor force and long term unemployment. We find out that for the whole data set (1996:01–2009:12) Turkey is not far from Existing EU members in an economic manner. For the time sets 1996:01–2003:12; we see that Turkey is in the same cluster with Poland which is accepted to EU in 2004, and for the time set 2004:01–2009:12 Turkey is in the same cluster with newly accepted EU members in 2004 and 2007. Looking back to all results we can conclude that Turkey

non-acceptance to EU caused by political and social reasons rather than economic ones.

2. Cluster Analysis

Cluster analysis divides data into groups (clusters) such that similar data objects belong to the same cluster and dissimilar data objects to different clusters. The resulting data partition improves data understanding and reveals its internal structure. Partition clustering algorithms divide up a data set into clusters or classes, where similar data objects are assigned to the same cluster whereas dissimilar data objects should belong to different clusters. In other words, cluster analysis is an exploratory data analysis tool for organizing observed data such as people, brands, events, companies, countries, etc. into meaningful taxonomies, groups or clusters, which maximizes the similarity of cases within each cluster and maximizes the dissimilarity between clusters or groups that are initially unknown. The term similarity should be understood as mathematical similarity. The term cluster analysis is first used by Robert C. Tryon (Note 2). In the last few years, the science of cluster analysis has been discovered to be a valuable tool in the physical, economic, finance and biological sciences.

The clustering results depend on the choice of dissimilarity (similarity) so that the natural question is how we should measure the dissimilarity (similarity) between samples. A common choice of dissimilarity function between samples is the Euclidean distance. In metric spaces, similarity is often defined by a distance norm. The distance norm or similarity is usually not known beforehand. The distance between x and y (as data) as considered to be two dimension function satisfying the following properties.

For every x; $d(x, x) = 0$;

For every x and y; $d(x, y) \geq 0$;

For every x, y; $d(x, y) = d(y, x)$;

For every x, y and z; $d(x, y) + d(y, z) \geq d(x, z)$.

In the case of continuous variables, we have a long list of distance functions. Each of distance functions implies different view of data because of their geometry. The following table illustrates the different distance functions with definitions, which are usually measure dissimilarity in cluster analysis.

Table 1. Formulas of distance functions

Distance Function	Formula (Definition)
Minkowski Distance	$d(x, y) = \sqrt[p]{\sum_{i=1}^{n} (x_i - y_i)^p}$
Hamming Distance	$d(x, y) = \sum_{i=1}^{n} \lvert x_i - y_i \rvert$
Euclidean Distance	$d(x,y) = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$
Angular Separation	$d(x, y) = \frac{\sum_{i=1}^{n} x_i y_i}{\left[\sum_{i=1}^{n} x_i^2 \sum_{i=1}^{n} y_i^2\right]^{1/2}}$
Tchebyschev Distance	$d(x, y) = \max_{i=1,2,\ldots n} \lvert x_i - y_i \rvert$

The Minkowski norm provides a concise, parametric distance function that generalizes many of the distance functions used in the literature. The advantage is that mathematical results can be shown for a whole class of distance functions, and the user can adapt the distance function to suit the needs of the application by modifying the Minkowski parameter. There are several examples of the Minkowski distance, including Hamming distance (usually referred to as a city-block distance); the Euclidean distance and Tchebyschev distance. They are special case of Minkowski distance when p = 1, 2 and infinity.

Euclidean distance is the geometric distance between two objects or cases and it is most commonly used one. With Euclidean distances the smaller the distance, the more similar the cases. However, this measure is affected

by variables with large size. So, if objects are being compared across variables that have very different variances then the Euclidean distance is not accurate. To handle this problem, you can standardize (normalize) the clustering variables.

Hamming Distance is a number used to denote the difference between two binary strings. Hamming distance was originally conceived for detection and correction of errors in digital communication. In the context of prioritized model checking, the minimum Hamming distance between the state being explored and the set of error states is used as an evaluation function to guide the search. The Tchebyschev distance takes into consideration the maximal distance over the coordinates x and y.

Clustering techniques can be applied to data that is quantitative (numerical), qualitative (Categorical), or a mixture of both. However, having a mixture of different types of data will make the analysis more complicated. In this thesis, the clustering of quantitative data is considered.

Clustering algorithms can be applied to many fields such as marketing, insurance, earthquake studies and city planning. For instance, as application of the insurance; you can identify groups of motor insurance policy holders with a high average claim cost. For the city planning, by clustering you can identify groups of houses according to their house types, value and geographical location.

3. Data and Research Methodology

In a very large data set, if one needs a clustering procedure that can rapidly form clusters on the basis of either categorical or continuous data; neither Hierarchical clustering nor k-means cluster works. In this study, we use two step clustering method using SPSS. In two step clustering method in SPSS, we have an option to create a separate cluster for cases that do not well into any other clusters and defined as outlier cluster. We use Euclidean distance to measure the similarities and dissimilarities of the clustering variables and clusters.

We cluster our data set for all the EU members, candidate and the potential candidate countries (Note 3) which include Albania, Austria, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia FYR, Malta, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Turkey, UK, according to economic indicators namely import, export, GDP per capita, labor force and long term unemployment; which are all significant in clustering process.

Our cluster analysis consists of five different time sets, which are shaped according to the EU member acceptance years, namely 2004 and 2007. The time sets are between 1996:01–2003:12; 2004:01–2009:12; 1996:01–2006:12; 2007:01–2009:12 and to be able to observe the whole data set 1996:01–2009:12. Looking to our time sets we exclude year 2007 because it does not make any significant difference in our clustering. With three remaining time sets in our hand; 1996:01–2003:12; 2004:01–2009:12; 1996:01–2009:12, our cluster analysis results are in line with our expectations, there are not only three clusters which will differ according to already EU members, candidate countries and potential candidate countries for all the time sets. For all the time sets there exist five different clusters, which are created by the countries which share the most common features of all economic indicators mentioned (Note 4), not according to the ranking.

Our first time set between the years 1996:01–2003:12 (Note 5) contain five clusters, where Turkey is in the fifth cluster with Russia and Poland which is accepted to EU in 2004. Existing EU members also differ according to their economic indicators, namely they are dispersed among all remaining clusters. However it is curious to observe that among all EU members only Greece and Portugal are in the same cluster with candidate and potential candidate countries. Also, being in the same cluster with the newly accepted countries in 2004; Malta, Poland, Slovenia, Czech Republic, Estonia, Hungary, Slovakia, Latvia, Lithuania; Bulgaria, Romania and Croatia are not welcomed to EU in 2004, they have to wait till 2007 to be a EU member, except Croatia. Being in the same cluster with Austria, Denmark, Sweden, Finland, Luxembourg; Cyprus is accepted to EU; whereas Iceland is not.

Table 2. Cluster analysis results for time set (1996:01–2003:12)

1996–2003	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Austria	+				
Belgium				+	
Bulgaria		+			
Croatia		+			
Cyprus	+				
Czech Republic		+			
Denmark	+				
Estonia		+			
Finland	+				
France			+		
Germany			+		
Greece		+			
Hungary		+			
Iceland	+				
Ireland				+	
Italy				+	
Latvia		+			
Lithuania		+			
Luxembourg	+				
Macedonia,					
Malta		+			
Netherlands				+	
Poland					+
Portugal		+			
Romania		+			
Russian					+
Federation					
Slovak Republic		+			
Slovenia		+			
Spain				+	
Sweden	+				
Turkey					+
UK			+		

Our second time set between the years 2004:01–2009:12 (Note 6) contain five clusters, where Turkey is in cluster three with newly accepted EU members in 2004 and 2007, except Croatia.

Table 3. Cluster analysis results for time set (2004:01–2009:12)

2004–2009	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Austria	+				
Belgium		+			
Bulgaria			+		
Croatia			+		
Cyprus	+				
Czech Republic				+	
Denmark	+				
Estonia				+	
Finland	+				
France		+			
Germany					+
Greece				+	
Hungary				+	
Iceland	+				

Ireland	+					
Italy		+				
Latvia			+			
Lithuania			+			
Luxembourg	+					
Macedonia,			+			
Malta				+		
Netherlands		+				
Poland			+			
Portugal				+		
Romania				+		
Russian Federation						+
Slovak Republic			+			
Slovenia						+
Spain		+				
Sweden	+					
Turkey			+			
UK		+				

Our third time set between the years 1996:01–2009:12 (Note 7) contain five clusters and one outlier within the cluster one, where Turkey is located within the cluster one which contains UK, Spain, Poland, Russia and all the EU founding members except Luxembourg. Germany is outlier with its twenty-nine per cent due to its significantly higher means of GDP and Labor force then cluster one. In cluster four two candidate countries; Croatia and Macedonia are with existing EU members; Slovakia, Bulgaria, Hungry and Lithuania. Also Iceland which is also a candidate member of EU is in the cluster two with Sweden, Cyprus, Denmark, Finland, Ireland and Luxembourg.

Table 4. Cluster analysis results for time set (1996:01–2009:12)

1996–2009	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Outlier
Austria			+			
Belgium	+					
Bulgaria				+		
Croatia				+		
Cyprus		+				
Czech Republic					+	
Denmark		+				
Estonia			+			
Finland		+				
France	+					
Germany	71,4%					28,6%
Greece					+	
Hungary				+		
Iceland		+				
Ireland		75%			25%	
Italy	+					
Latvia			+			
Lithuania				+		
Luxembourg		+				
Macedonia				+		
Malta			+			
Netherlands	+					
Poland	+					
Portugal			+			
Romania					+	
Russian Federation	+					
Slovak Republic				+		
Slovenia					+	

Spain	42.9%	57.1%
Sweden		
Turkey	+	
UK	+	

To sum up, clustered according to economic indicators, one cannot exclude Turkey from the existing EU members for the time between1996–2009; Turkey is located within the same cluster with UK, Spain, Poland, Russia and all the EU founding members and for the time-sets 1996:01–2003:12 and 2004:01–2009:12 existing EU members have also clustered differently with each other.

4. Conclusion

European Union enlargement raises contentious issues both for member states and applicant states. There are strong opinions for and against admission of Turkey, and its candidacy has drawn the attention of many outside of Europe (Note 8). Due to its unique geopolitical position of Turkey, its membership to EU offers the possibility of better East/West relations, but raises concerns of increasing involvement of the EU in difficult political issues in the Middle East. Some argue Turkey would soon become the largest EU nation and would have the potential to alter the balance of power in the EU (Note 9). To those who are against Turkey's membership the existing cultural differences and a probable laborer flow into EU nations seem to be main points.

In our paper, we examine the data for all member and candidate countries to EU between the years 1996–2009 and base our research on only economic indicators of these countries, namely import, export, GDP, labor force and long term unemployment. We aimed to understand the place of Turkey compared to EU members from economical perspective, and clustered the data for all member and candidate countries to EU between the years 1996–2009.

Our findings indicate that Turkey is not different from the existing EU members in economic perspective and the non-acceptance process of Turkey to EU rests more on political and social issues pointed out in Copenhagen Criteria. But it should be not forgotten that the EU has had great success in making nations applying for EU membership democratize and conform to Western and European norms. This has been particularly true in Eastern Europe where the EU helped former Communist countries make the transition from authoritarian governments to more open, democratic societies. Turkey's membership process, however, has been unusually drawn-out and difficult (Note 10).

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Notes

Note 1. EU Progress Report, 2011.

Note 2. The most thorough treatment of cluster analysis can be found in Robert C. Tryon and Daniel E. Bailey, Cluster Analysis, New York: McGraw-Hill, 1970.

Note 3. See http://europa.eu/

Note 4. See Appendix for statistical cluster properties.

Note 5. See Table 2 Cluster Analysis Results for Time Set 1996:01–2003:12.

Note 6. Table 3 Cluster Analysis Results for Time Set 2004:01–2009:12.

Note 7. Table 4 Cluster Analysis Results for Time Set 1996:01–2009:12.

Note 8. http://readperiodicals.com/201107/2431498501.html

Note 9. Cohen, Matthew S., A.L.M, Turkey and the EU: European Soft Power and How It Has Impacted Turkey; Harvard University, 2011.

Note 10. Cohen, Matthew S., A.L.M Turkey and the EU: European Soft Power and How It Has Impacted Turkey; Harvard University, 2011.

Appendix

Table Ia. Statistical properties of clusters (1996:01–2003:12)

	Labor Force		GDP per capita		Exports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
1	2.24	1.72	3.10	9.71	5.66	4.00
2	3.60	2.95	6.57	4.05	1.80	1.36
3	3.22	5.94	2.52	2.63	4.86	1.42
4	1.17	8.44	2.30	5.56	2.10	8.00
5	3.73	2.53	3.53	1.16	7.01	3.17
Combined	1.11	1.56	1.63	1.24	1.11	1.56

Table Ib. Statistical properties of clusters (1996:01–2003:12)

	Longterm Unemployment		Imports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.
1	24.13	6.30	4.98	3.55
2	50.65	8.22	2.14	1.69
3	40.09	9.47	4.71	1.24
4	51.18	11.04	1.97	7.46
5	34.64	12.17	6.27	1.63
Combined	41.93	14.20	1.07	1.48

Table IIa. Statistical properties of clusters (1996:01–2009:12)

	Labor Force		GDP per capita		Exports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
1	2.69	1.86	2.23	1.35	3.42	2.27
2	1.56	1.36	4.31	2.04	7.11	6.63
3	2.68	2.05	1.76	1.16	5.25	6.01
4	4.35	4.79	8.04	4.96	4.27	5.24
5	5.27	3.56	1.25	7.93	4.18	3.37
Outlier	4.22	1.92	4.02	3.63	1.49	1.87
Combined	1.08	1.54	2.15	1.75	1.54	2.30

Table IIb. Statistical properties of clusters (1996:01–2009:12)

	Longterm Unemployment		Imports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.
1	40.65	12.09	3.33	2.26
2	22.16	7.77	6.21	5.81
3	38.81	11.61	5.17	5.39
4	54.61	11.64	4.55	5.47
5	49.58	8.24	4.83	3.49
Outlier	52.77	5.18	1.29	1.51
Combined	40.80	15.01	1.49	2.16

Table IIIa. Statistical properties of clusters (1996:01–2009:12)

	Labor Force		GDP per cap.		Exports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
1	2.13	1.64	5.20	2.09	1.14	7.89
2	2.00	1.00	3.76	6.52	5.05	1.47
3	6.91	8.50	9.43	3.84	5.46	5.72
4	3.99	3.12	1.65	6.45	5.28	4.00
5	5.69	1.73	2.41	1.63	8.99	5.65
Combined	1.05	1.53	2.79	2.05	2.06	2.90

Table IIIb. Statistical properties of clusters (1996:01–2009:12)

	Longterm Unemployment		Imports of Goods and Services	
Cluster	Mean	St. Dev.	Mean	St. Dev.
1	21.01	7.85	1.02	6.97
2	37.58	10.02	5.23	1.64
3	49.65	17.62	6.10	6.25
4	46.72	7.24	6.05	4.20
5	46.63	7.65	7.48	5.22
Combined	39.41	15.88	2.01	2.70

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Determinants of Non-Resident Deposits in Commercial Banks: Empirical Evidence from Lebanon

Olga Kanj[1] & Rim El Khoury[1]

[1] Department of Accounting, Economics and Finance, Notre Dame University, Lebanon

Correspondence: Olga Kanj, Department of Accounting, Economics and Finance, Notre Dame University, Zouk Mosbeh, Lebanon. Tel: 961-3-012-964. E-mail: omkanj@ndu.edu.lb

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Abstract

Given the fact that the government debt is financed by commercial banks in Lebanon, there is a need to uncover and study the determinants of commercial bank deposits. This paper investigates empirically the main determinants of non-residents deposits in Lebanese commercial banks using monthly time series data covering January 2002 to January 2013 (131 observations). The necessary tests were performed so that the ordinary least square regression can be safely applied. The estimated model had non-resident deposits as the dependent variables, and the explanatory variables as internal factors, external variables, and bank specific variables. The dependent variable was measured in three ways: in the local currency, in foreign currency, and total non-resident deposits. The results show that non-residents' deposits are shaped differently between domestic and foreign currency. For instance, bank assets, interest rates, and some adverse political situations affect non-resident deposits in all its measures. However, while total non-resident deposits and foreign non-residents deposits are roughly affected by the same factors, local resident deposits seem to be affected by other factors; this fact is attributed to the fact that local currency deposits account for a small percentage of total non-resident deposits. Based on the results, several policy implications were drawn that aim at increasing non-resident deposits. First, the stability of macroeconomic system should be maintained. Second, the government should maintain healthy rate differentials to support the deposit growth. Lastly, Lebanese banks should search for internalization to diversify their losses.

Keywords: banks, non-resident deposits, Lebanon

1. Introduction

Commercial banks, being the main players and the most active sector, have traditionally acted as a backbone of the Lebanese economy. They had played an essential and peculiar role in the progress of the Lebanese economy through supporting the private sector, backing the structural current account deficit, and financing the high government debt by attracting customers' deposits and investing them in sovereign securities.

Starting in 1992, the Lebanese banking sector has experienced a growth in its activities that exceeded the growth in domestic GDP (Hakim & Neaime, 2001). Its performance is dependent on the influx of deposits with the latter constituting 83.5% of total assets at the end of November 2012. At the end of year 2011, ratios of banks' assets/GDP and banks' deposits/GDP reached around 359.58% and 296% respectively, highlighting the important size of the banking sector relative to that of the local economy (Byblos Bank, report # 295).

Due to the high government debt financed by domestic commercial banks in Lebanon, their continued funding, from resident and non-resident deposits is of supreme importance to the financial system and to the economy. Non-resident deposits (NRD) are growing, having risen from only 4.93% in October 1983 to around 19.35% at the end of January 2013.

Despite the growth of NRD and the significance of deposits in Lebanese banks, little research has been done on analyzing the determinants of those deposits. Up to our knowledge, only Finger and Hesse (2009) studied the determinants of deposits in Lebanese commercial banks. However, they use total deposits as the dependent variable. This paper makes a number of distinct contributions that differentiate from Finger and Hesse's study. First, non-resident depositors can deposit their money in any country, and therefore, they might be affected by different factors than those affecting resident depositors. Therefore, this paper will use non-resident deposits as

the dependent variable instead of total deposits. Second, non-resident deposits are further divided into local currency and foreign currency to investigate whether factors affecting non-resident deposits depend on the currency of the deposits. Third, the study adds important variables not previously considered that might determine non-resident deposits. Fourth, the study uses monthly instead of quarterly observations, which might provide better insights. Our study fills the gap by analyzing the determinants of non-resident deposits in a simple ordinary least square (OLS) framework.

1.1 Overview of the Lebanese Banking System

The financial sector in Lebanon, and specifically banks, had a major role throughout the cycles of the Lebanese economy. As mentioned by Dibeh (2005) and Finger and Hesse (2009), Lebanese economy's major players are the government and the financial system. Commercial banks were the major lender to the government since 1990s and the high fiscal deficits "was often counterbalanced by loans granted by the Lebanese Central Bank" (Naïmy, 2004).

Elthony (2003) indicates that credit to private sector in Lebanon is about 50 to 60 percent; this is due to the impact of crowding out of the private sector by the public sector despite the well-developed banking sector and the liberalization of credit policies. Banks financed the government both in local and foreign currencies. This special relationship between the banks and the state mediated by the central bank was instrumental in the prevention of a state default or currency crisis (Dibeh, 2005). Banks reconstituted their deposit base, since the government showed continuous demand for bank assets to finance the large deficits (Finger & Hesse, 2009).

Measuring the banking activity growth by total assets, the sector grew by 8% in 2012, as compared to a growth rate of 9% in 2011 and 11.9% in 2010 (Figure 1). Activity growth of Lebanese banking sector remained mainly driven by deposits mainly from the private sector. The deposits increased by 8% from end 2011 despite internal political instability and regional turmoil, such an increase in deposits is deemed sufficient to finance the economy as it exceeds the threshold of 5% for private and public sector financing.

From the lending side, loans extended to the private sector curtailed by the slower economic activity that prevailed throughout most of 2012. Thus, the loans extended to the private sector grew in 2012 only by 10.4% from end 2011 as compared to 2011 and 2010 figure of 12.7% and 23.1% (Figure 1).

Moreover, the capitalization rate of Lebanese banks is increased by 17.9% from December 2011 to reach 12.6% in December 2012, higher than the Basel II requirements. (Lebanon this week, Byblos Bank, issue 295). In year 2011, the Lebanese banking sector maintained a capital adequacy level of 6.8% higher than emerging markets, MENA region, regional and worldwide figures (Figure 2).

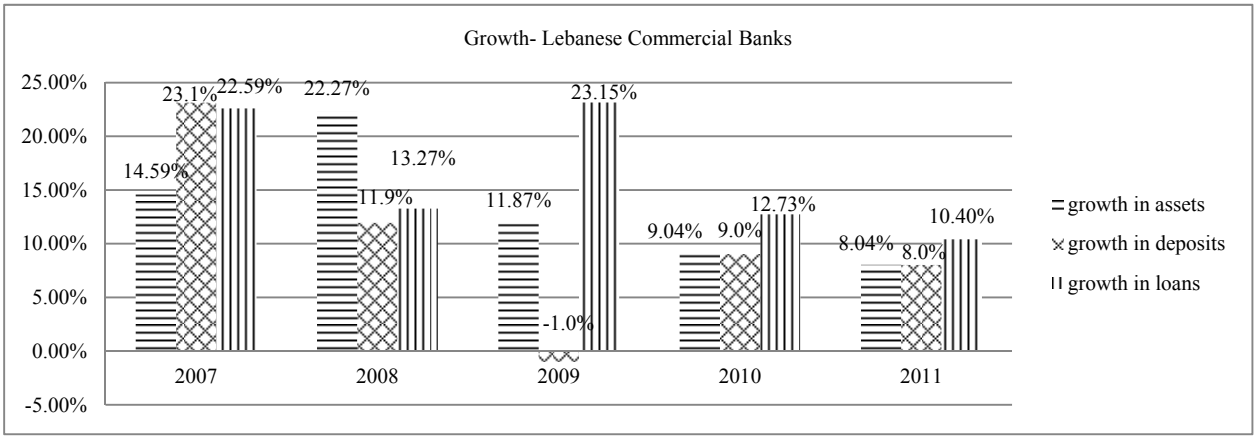

Figure 1. Growth of activity indicators

Source: Banque Du Liban (BDL) Data.

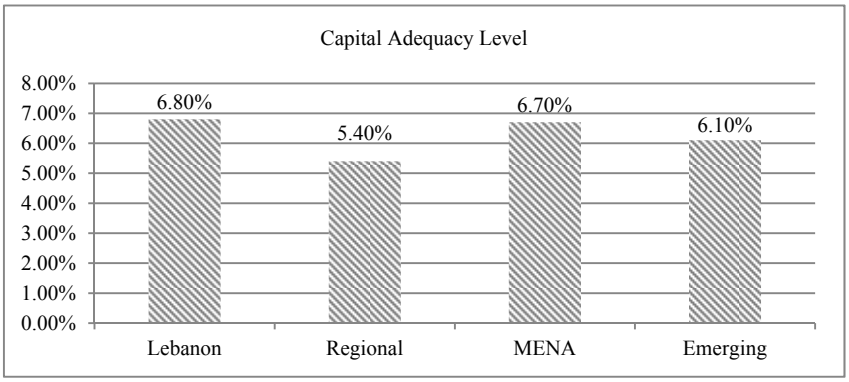

Figure 2. Capital adequacy level-year 2011

Source: BDL Data.

1.2 Overview of Lebanese Commercial Bank Non-Resident Deposits

The domestic banks' performance is dependent on the influx of deposits, both resident and non-resident. According to Assaly and Associates (2011), Lebanese banks attracted the largest share in bank deposits in the Middle East in 2010, over 30 percent of total deposits. Mostly, these are flowing from Arabs having high confidence in the Lebanese banking sector and Lebanese immigrants working in the region (Assaly and Associates, 2011).

Lebanese banks are generally characterized by a high deposit profile with 82.4% of deposits to assets ratio in 2011, being highest among the regional, MENA, emerging markets and world averages (Figure 3).

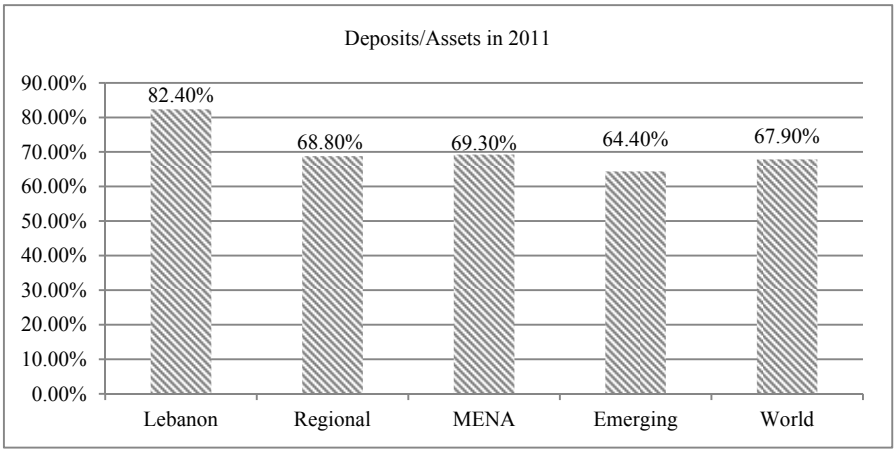

Figure 3. Deposits/assets ratio-year 2011

Source: BDL Data.

Bank deposits can be classified first based on their geographic origin and second based on the currency, so they can be divided into resident and non-resident deposits, and each category is subdivided into local currency deposits (LBP) and foreign currency deposits (FC). FC deposits account for a large part due the high dollarization rates in Lebanon where the US dollar is taking the place in the collection of deposits. Figure 4 shows the deposits dollarization trend from 2000 to 2012.

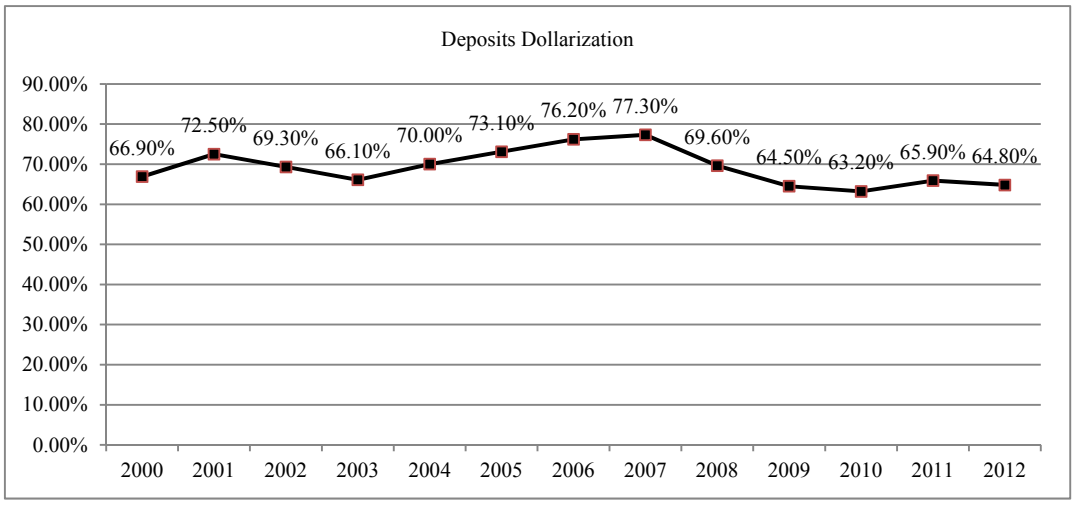

Figure 4. Deposits dollarization 2000–2012

Source: BDL Data.

Non-residents deposits according to articles 1 and 2 of Decree 29 of the Lebanese Law No. 9977, include (i) all deposits hold by all tourists and travelers passing by Lebanon, (ii) by all diplomats of other countries living in Lebanon, (iii) by all companies that are located outside Lebanon, even if they are related to resident persons or companies, and (vi) by all international organizations such as UN, World Bank, and IMF and all embassies (Lebanese Law No.9977, 1977).

Resident and non-resident banking deposits have been on a prolonged rising trend. Historically (from December 1971 till January 2013) the non-resident deposits constituted on average 11.60% of total deposits with an average annual growth of 2.94% (Figure 5) which is higher than that of the total deposits of 2.5%. As of January 2013, Non-resident deposits constitute 19.35% of total deposits. The majority of non-resident deposits are in foreign currency being 86.31% at the end of 2012. The foreign currency non-resident deposits (NRFC) represented a quarter of the total foreign currency deposits (25.79%) as of January 2013 growing at an average annual rate of 3.05%, as compared to an average annual growth rate of total foreign currency deposits of 2.83%.

The local currency non-resident deposits (NRLC) are also growing at a historical annual average rate greater than that of the total local currency deposits (2.86% for NRLC as compared to 2.38% for total local currency deposits). As of as of January 2013, these deposits are 7.54% of the total LBP deposits.

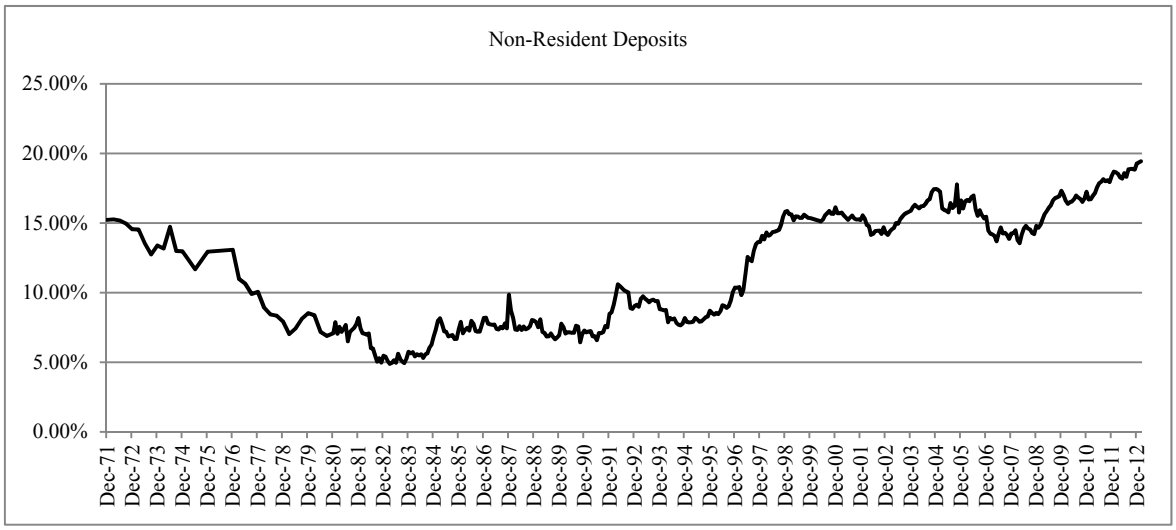

Figure 5. Variation of percentage of NRD of total deposits

Source: BDL Data.

In conclusion, most of the deposits are in foreign currency and held by residents. However, the positive growth rate of non-resident deposits and the increase in the rates of non-resident foreign currency deposits prove the reliance of the Lebanese bank deposits on those funds flowing from abroad. These deposits are of major importance to the Lebanese banks as source of funds, since non-resident deposits give a hint of the funds flowing from the Lebanese immigrants to their relatives in Lebanon (El Khoury & Kanj, 2013); such relatives that would also deposit the in-flowing money in the banks and constitute a deposit base.

2. Literature Review

There is an extensive literature on saving behavior, both at an individual level and cross- country level. Empirical studies on private savings behavior have categorized a number of potential determinants. Ozcan et al. (2003) outlined six groups of potential saving determinants, namely (i) Demographic determinants (ii) Financial determinants (iii) Income and growth determinants, (iv) external sector determinants (v) uncertainty determinant and (vi) fiscal determinants. Despite the substantial amount of theoretical and empirical work on saving behaviors, little has been done in analyzing the determinants of commercial bank deposits, specifically non-resident deposits.

Non-resident depositors' choice of banks may be affected by different factors than resident deposits. Country risk, economy and banking system soundness may be among additional factors in deciding whether to deposit their money in a specific country and bank. Non-resident deposits' determinants may be similar to those of foreign capital inflows' determinants. Fedderke et al. (2001) examined the determinants of capital flows in South Africa and they found that capital inflows are sensitive to real growth rate of the economy, the interest rate differential, differenced bilateral exchange rates, and political risk. Moreover, Ahmed et al. (2005) examined the capital flows in 81 developing countries between 1975 and 2002, and found that portfolio and equity investment is positively affected by GDP growth rate and negatively affected by the US Treasury bill rate.

Aron et al. (2010) investigated the determinants of non-resident capital flows in South Africa. While annual rates of change of real US GDP, the real US stock market index, improvements in the government surplus to GDP ratio for South Africa, and the change in an index based on the S&P credit rating positively affect non-resident capital flows, the annual change in the real Johannesburg Stock Exchange JSE index expressed in dollars, the inflation differential relative to the US and for a long-term bond differential with respect to the US, and changes in a US equity market volatility index, VXO, capturing risk aversion negatively affect the capital flows.

Gordon and Gupta (2003) analyzed the determinants of non-resident deposits flows in India and found that they respond positively to the difference between interest rates on these deposits and LIBOR. It is contended that migrants may be more likely to remit into savings account if they can have foreign currency denominated accounts, higher than normal interest rates, tax exemptions, and better exchange rate (Meyers, 1998). Furthermore, Jadhav (2003) found that non-resident deposits are significantly influenced by to interest rate differentials.

Concerning Lebanon, Finger and Hesse (2009) had empirically estimated a number of deposit demand functions, using quarterly data from 1993 to 2008. In their empirical work, they have found that, higher economic activity as measured by the coincident indicator, a higher interest differential, an increase in consumer prices, and a rise in advanced economy industrial production all tend to be associated with stronger deposit growth. Controlling for the external factors GCC, GDP growth or crude oil prices renders the coefficient of the coincident indicator insignificant. Among the variables measuring Lebanon-specific risk or international liquidity and risk aversion, they found a reasonable specification only for the Goldman Sachs Risk Aversion Index. They also attempted to explain bank deposit growth by using a number of bank specific variables; their results suggested that more stable and liquid banks as well as banks with a higher loan exposure are associated with higher deposit growth. In addition, it appeared that a higher net interest margin is also associated with a higher deposit growth. Atrissi (2004) sees that the challenges facing Lebanon in attracting foreign inflows revolve around four angles: Governance, public finance, perception and geopolitical conditions.

Furthermore, an analysis performed in Lebanon by The World Bank in 2012 shows a solid relation between foreign financial inflows and key exogenous and endogenous determinants**.** They found that oil price (exogenous), accumulation of foreign currency (endogenous), the spread between domestic creditor rates and international interest rates, the lagged dollarization, and the exchange rate regime contribute to the determination of foreign financial inflows to Lebanon (Poverty Reduction and Economic Management Department, 2012).

In summary, Lebanon has been attracting inflows almost throughout all of its history. These inflows are coming from the large Lebanese Diaspora, from neighboring oil exporting countries and investors who are attracted to the real estate and banking sector in Lebanon (El Khoury & Kanj, 2013). Because Lebanese economy is very

dependent on the foreign funds inflows, it is important to study most of the possible factors that could affect such deposits. Based on the results, recommendations regarding the economic policies will be developed. Although IMF's research and World Bank's research studied the factors affecting the foreign inflows and deposits in Lebanon from the historical point of view, the main dependent variable was total deposits without separating resident from non-resident deposits. The importance of this study lies in studying the factors affecting non-resident deposits in Lebanon. It will study the effect of internal factors, bank specific factors, and external factors on a monthly basis.

3. Data

3.1 Source of Data

The data used in this study is secondary monthly data taken from the Banque du Liban (BDL) official website and Political Risk Services (PRS) Group.

Although the data of the dependent variables are available since December 1971, only limited data are available for some of the explanatory variables, therefore, the time frame of the research will be limited to the period from January 2002 till January 2013, to fit the available data, resulting in 131 observations.

3.2 Variables Specification

3.2.1 Dependent Variable

The dependent variable used in this study is the non-resident deposits measured in three different ways: the non-resident deposits measured as the sum of local currency and foreign currency held by commercial banks in Lebanon (NRD), the non-resident deposits in the local currency (NRLC) and the non-resident deposits in foreign currency (NRFC).

3.2.2 Independent Variables

The independent variables that are expected to have an effect on the non-resident deposits are divided into three subgroups: banks specific factors, internal factors (factors related to the economy of the country of the bank), and external factors (factors related to the countries of the non-resident deposits).

3.2.2.1 Bank Related Factors

Bank-related factors may play an important role in explaining the demand for deposits at the bank level (Finger & Hesse, 2009). Thus, we choose to include:

1) *Commercial banks' balance sheet assets (ABNKS) in billions of LBP:* This variable would show the size of the commercial banks in Lebanon since the latter is often measured by the total assets (Rose & Hudgins, 2008). The size would enhance the soundness of the Lebanese commercial banks and increase the confidence in the Lebanese banking sector, thus attract deposits.

2) *Number of cards given to non-residents (NRC):* It is measured as the total of the non-resident prepaid, debit, credit, and charge cards. This factor is the only available tool for depositors to have access to their money from abroad due to the lack of the application of online banking. According to Mangla (2007), depositors need banking on the go.

3) *Dummy Variable (Dbasel):* This dummy variable is included to test whether the adoption of the Basel II regulations have affected the confidence of non-resident depositors. Since Basel II regulations lessen the risks of bank and regulate its operations. Basel II was implemented in Lebanon on April 2, 2004 (Banking Control Commission of Lebanon, 2004), this dummy variable will take a value of zero for months prior to April 2004, and one for months starting and including April 2004.

3.2.2.2 Internal Factors

Internal factors are those that are related to the internal Lebanon's conditions such as the economic growth, public debt, war and turmoil inside the country.

1) *Coincidence indicator (CI):* It is used as a proxy of the current state of the economy. It will replace the GDP since the latter is not available on a monthly basis. The index is computed from a number of data series that move systematically with overall economic conditions and has 1993 as a base year. It is constructed by BDL as an indication of the economic situation. This economic situation was rated as the seventh place in Seshaiah and Narender (2007) study about the criteria for depositors to choose a bank. Furthermore, Finger and Hesse (2009) and Gordon and Gupta (2004) found a positive relation between economic growth and the deposits.

2) *Sovereign debt (SD) in millions of US dollars:* This variable poses a sovereign risk on the country and hence deteriorates its economic standing. This is an important factor since the banks in Lebanon are the largest lenders of the government, and any rise in the Lebanese sovereign debt poses a risk on the banks and deposits as well. Thus, deterioration in the sovereign debt condition of Lebanon may pose repayment difficulties on banks specifically for the foreign currency denominated deposits.

3) *Interest rates:* the weighted average interest rate on deposits in LBP and on deposits in USD is obtained from the official BDL website. The average LIBOR calculated as the average of 1-month, 3-month, 6-month and 12-month LIBOR will be used to compare the difference between the interest rates given by Lebanese commercial banks on deposits and the international arena. The average LIBOR will be used since the dependent variables are a combination of deposits with maturities ranging from 1-month to 12-month. This variable was proven to be an important factor (Finger & Hesse, 2009; Gordon & Gupta, 2004) and it will take combinations as follows:

i) $I=i_{LBP}-i_{USD}$: It shows the effect of the spread between the rate on LBP (i_{LBP}) and USD (i_{USD}). This spread is always positive since the interest on LBP deposits through the entire period studied is greater than the interest on USD deposits. The impact of such a variable on NRD deposits depends on whether the deposits are in local or foreign currency. An increase in the interest rates on LBP will increase the spread and the NRLC. On the other hand, an increase in the interest rates on USD will decrease the spread and increase the NRFC. Therefore, a positive relationship is expected between NRLC and I, and a negative relationship is expected between NRFC and I.

ii) $I_1= i_{LBP}$-LIBOR and $I_2= i_{USD}$ − LIBOR. These two definitions might show the preference of non-resident depositors for the deposits in Lebanese commercial banks over the international banks that offer near LIBOR interest rates. A positive relationship between this variable and any category of deposits is expected since high interest rates offered by Lebanese commercial banks as compared to the international arena would attract more non-resident deposits. This variable was used by Finger and Hesse (2009).

4) *Ratings of International Country Risk Guide (ICRG)*: This is a rating offered by the Political Risk Services(PRS) Group. Two variables will be used to measure the country risk rating: the political risk rating and the composite risk rating of Lebanon. The political risk rating would show the effect of political turmoil whereas the composite risk rating would show the effect of the overall country rating. The latter might be better than the political rating due to good financial and economic factors which were intact by the political instability. These same ratings were used by Finger and Hesse (2009).

i) *The political risk rating (Polrisk):*According to ICRG, the calculation of this rating includes government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality (The PRS Group). Since Lebanon has a lot of political incidents, this might have a large effect on the decision of non-resident depositors to keep their money in the Lebanese banks. Thus, it is expected that this variable has a negative relationship with the non-resident deposits due to the negative picture that the political turmoil will set on the overall country condition and on the confidence in its institutions and economy.

ii) *Composite risk (risk):* This includes financial, political and economic risk (The PRS Group). Accorinding to PRS Group calculation of composite risk, a higher number of composite risks indicates a lower risk and a better rating. Thus, the overall risk rating for Lebanon will positively affect the investment decision of investors, especially foreign investors.

5) *2006 War (D1):* It is a dummy variable that accounts for the second Israeli war in July-September 2006. D1 takes a value of 1 for July, August, and September 2006 and zero elsewhere. D1 will test whether the Lebanese war affected the non-resident deposits.

6) *Prime Minister Assassination (D2):* it is a dummy variable that takes the value of 1 for the period after the assassination of the Prime Minister Mr. Hariri, from February 2005 till April 2005 when the Syrian troops left Lebanon. Hariri assassination created a huge political instability in the country and lead to lots of demonstrations. D2 will test the effect of such strong, acute and sudden political instability on the non-resident deposits. This dummy is different from the ratings of political risk since the ratings may not capture precisely the effect of one specific event that had created lots of media negative coverage and public opinion. Ratings may not be of large access to non-residents whereas the media coverage of demonstrations and the assassination would reach the entire world through the press.

3.2.2.3 External Factors

The external factors include factors that are related to the economic situation outside Lebanon such as oil prices and the economic situation of the rest of the world.

1) *Oil prices (Oil):* The wealth level of non-residents would affect their savings ability and hence affect the non-resident deposits in Lebanon. Since most flows of funds come from GCC countries (Finger & Hesse, 2009), the oil prices may be a rough representations of the GCC residents' well-being.

2) *Financial Crisis (D3):* It is a dummy variable that captures the 2008 financial crisis; it is equal to 1 between January 2008 till March 2009 and 0 elsewhere. The financial crisis period was chosen between January 2008 and March 2009, since the most indicative indexes such as S&P500, DOW, FTSE100 and NASDAQ in U.S markets, CAC40 and DAX in European markets; and Nikkei in Asian markets show a downturn during this period. This downturn had affected lots of non-residents; many jobs were lost and many businesses were bankrupted, thus the income of many non-residents had declined which may significantly affect their deposits in Lebanon.

4. Methodology

4.1 Model Specification

As concluded from the literature review, the non-residents deposits is determined by three types of factors: (1) factors related to the economy of the country of the banks (internal factors), (2) factors related to the economy of the non-resident deposits (external factors), and (3) bank related factors. Hence the study will investigate the effect of those factors on non-resident deposits through the use of historical secondary data collected from the central bank of Lebanon.

Similarly to previous studies, a linear regression model is used to capture the historical effect of various quantitative factors on banks' deposits. To be able to apply the linear regression, all the variables should be stationary and the residuals should be homoscedastic and not auto correlated. For building this model, the Hendry "general-to-specific" methodology was used. The tests necessary for the empirical study are performed using E-views.

The basic regression framework used in the analysis is as follows:

$$X_t = c + \alpha_1 ABNKS_t + \alpha_2 NRC_t + \alpha_3 Dbasel_t + \alpha_4 CI_t + \alpha_5 SD_t + \alpha_6 I_t + \alpha_7 I1_t + \alpha_8 I2_t + \alpha_9 risk_t + \alpha_{10} polrisk_t + \alpha_{11} D1_t + \alpha_{12} D2_t + \alpha_{13} oil_t + \alpha_{14} D3_t + \varepsilon_t \quad (1)$$

Where:

X: is one of the three categories of the non-resident deposits: Non-resident foreign currency ($NRFC_t$); Non-resident local currenc *($NRLC_t$)* y; and Non-resident total deposits *($NRD_t = NRFC_t + NRLC_t$)*;

ABNKS: Bank assets;

NRC: Non-resident cards;

Dbasel: Dummy of the Basel II adoption;

CI: Coincident indicator;

SD: Sovereign debt;

I: Spread between LBP interest rate and USD interest rate;

I1: Spread between the LBP interest rate and the LIBOR;

I2: Spread between the USD interest rate and the LIBOR;

Polrisk: Political risk rating;

Risk: Composite risk rating;

D1: The dummy that measures the effect of 2006 war;

D2: The dummy that measures the effect of Mr. Hariri assassination;

Oil: Oil prices;

D3: The dummy that measures the effect of the 2008 financial crisis;

$t = 1,2,\ldots$.

4.2 Stationarity of Variables

Nonstationarity can strongly influence the behavior and properties of the series; to test the stationarity of all the

variables, we use the Augmented Dickey Fuller test (ADF) to reveal if the data has a unit root; where a p-value greater than 5% indicates that the data has a unit root test and is non-stationary.

Results in table 1 indicate that the null hypothesis of unit root test cannot be rejected except for CI, risk, and oil, implying that only three variables are stationary at level while all other variables are non-stationary. However, the first-difference of the series rejects the hypothesis of a unit root which implies that each data series are integrated in the first order, i.e. I(1). Therefore, the non-stationary variables will be included in the regression as first difference.

If autocorrelation of residuals is present, then it can be removed by adding X lags of Y_t in the first difference. Using Ljung-Box test, autocorrelation of residuals exist for all of the variables at the month-on-month first difference. Hence, we include to the model a lag of X_t.

Table 1. ADF stationarity test results

Results of unit root test/ Stationarity test		
Variables	Level P-value	First Difference P-value
NRD	0.97	0.00
NRFC	0.95	0.00
NRLC	0.97	0.00
ABNKS	0.94	0.00
NRC	0.85	0.00
CI*	0.03	0.00
SD	0.11	0.00
I	0.47	0.00
I1	0.82	0.00
I2	0.89	0.00
RISK*	0.01	0.00
POLRISK	0.10	0.00
OIL*	0.03	0.00

*Stationary at level. Computed by authors using E-views 7.

4.3 Testing for Classical Linear Regression Model (CLRM) Assumptions

Classical Linear Regression Model (CLRM) assumptions are important to be tested to ensure the accurateness of results in the regression model.

First, to make the mean of the errors equals to zero, a constant will be included in the model. This constant , even if not significant, should be kept in the model, because upon removing the constant, biased slopes may appear, leading to inability to perform the tests of the residuals and all diagnostic tests.

Second, to test homoscedasticity, Goldfeld and Quandt test (1965) will be used, consisting of dividing the entire sample of data into two subsamples, by the period where high fluctuations appear to be. This test is possible only with NRD and NRFC. As for the NRLC, White's test will be used due to the inability to divide the sample into two subsamples. The results of the test are summarized in Table 2. The results conclude that there is homoscedasticity so no further corrections for the sample are required.

Third, in the presence of residuals autocorrelation, statistical inferences can be misleading; therefore, Breusch-Godfrey test as used by Dholakia and Saradhi (2000) is adopted in this study. Because data is monthly, we include 12 lags in the test, allowing a one year autocorrelation in the residuals. The P-value of the test for the three dependent variables is greater than 5% as shown in Table 3. Therefore, the null hypothesis of no autocorrelation is not rejected, suggesting the presence of no autocorrelation of errors.

Table 2. Homoscedasticity test results

Goldfeld and Quandt test results				
Variable	Period that divides the subsamples	S_1^2/S_2^2	F1-α/2(T1-n1-k, T-T1-n2-k)	Result
NRD	Oct.2005-Nov.2005	0.39	F(13.52)≈1.92	0.39<1.92=> do not reject H0
NRFC	Oct.2005-Nov.2005	0.68	F(13.52) ≈1.92	0.68<1.92=> do not reject H0
White test results				
Variable	F-statistic	P-value	Result	
NRLC	0.5054	0.95	P-value=95%>5%=>do not reject H0	

Computed by authors using E-views 7.

Table 3. Breusch-godfray

Breusch-Godfray serial correlation LM test	
Variables	P-value
NRD	0.1380
NRFC	0.0989
NRLC	0.4150

Computed by authors using E-views 7.

4.4 Mutlicollinearity

To test for multicollinearity, Table 4 shows the matrix of correlations of the variables used in the regressions at first level difference. As observed from the table, multicollinearity is not a serious problem since the majority of the correlation coefficients are not more than 0.8 (Cooper & Schindler, 2010), thus enhanced the reliability for regression analysis. However, risk and oil have high correlation with CI; which will be solved by either excluding CI from the model or excluding risk and oil from the model. Furthermore, DI1 and DI2 will be tested each at a time in the regression models to avoid multicollinearity. All other variables have low correlation posing no issue for the regression models.

In summary, in the empirical study, the secondary data consists of 131 observations. After testing for stationarity, homoscedasticity, autocorrelation, and multicollinearity, the ordinary least square regression can be safely applied.

Table 4. Correlations of variables at first difference

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	GNFC	-	.28	.98	.55	.07	.02	.11	.10	-.20	-.13	-.01	.03	.11	-.18	-.19	.04	.04
2.	GNRLC		-	.44	.34	-.07	-.03	.15	-.11	-.10	-.02	.06	.03	.43	-.19	-.33	.04	.25
3.	GNRD			-	.58	.05	.01	.13	.07	-.21	-.12	.00	.03	.17	-.19	-.24	.04	.07
4.	DABNKS				-	-.06	.16	.36	.00	-.07	.03	.10	.19	.15	-.23	-.20	.21	.10
5.	DNRC					-	.00	.02	.14	-.05	-.06	-.04	.06	-.08	-.03	-.06	.00	-.18
6.	DBASEL						-	.56	-.12	.15	.10	.01	.70	-.09	.08	.08	.65	.18
7.	CI							-	-.14	.05	.08	.07	.79	-.03	-.22	-.13	.76	.02
8.	DSD								-	-.15	-.16	-.08	-.08	.07	.03	-.02	-.12	-.09
9.	DI									-	.66	.05	.01	-.38	-.08	.43	.13	.21
10.	DI1										-	.79	.00	-.29	.03	.22	.10	.29
11.	DI2											-	-.01	-.07	.11	-.05	.02	.22
12.	RISK												-	.04	-.07	-.03	.71	-.04
13.	DPOLRISK													-	.04	-.32	-.06	.05
14.	D1														-	-.02	.01	-.05
15.	D2															-	-.09	-.05
16.	OIL																-	.21
17.	D3																	-

Computed by authors using E-views 7.

5. Empirical Findings and Result Discussion

5.1 Trends of the NRD

The total NRD moves very closely to the NRFC, due to the large percentage of NRD being in foreign currencies and not in local currencies. While the non-resident deposits in foreign currencies constitute, on average (Note 1), 90.25% of non-resident deposits in Lebanon, the non-resident deposits in local currencies are only 9.75% of the total deposits.

Despite the humble amounts of NRLC as compared to the NRFC, the NRLC deposits grow faster than the NRFC. More specifically, the NRFC and total NRD grow at a monthly average rate of 1.05% and 1.09% respectively with a total growth rate of 267.97% and 289.13% respectively from January2002 till January 2013. On the other hand, NRLC grows at a monthly average rate of 1.57% and a rate of 508.93% for the entire period. NRFC deposits as percentage of total deposits is decreasing with time, supporting the previous finding that NRLC deposits are growing at a faster rate as compared to NRFC.

5.2 Regression Analysis

After correcting for all CLRM assumptions, different dynamic models with the inclusion of the lagged dependent variables were used to find the determinants of foreign currency deposits.

A dynamic model is created by adding one lag of the dependent variable on the right hand side of the equation; this will account for the reactions of depositors to the changes in the Lebanese commercial banks' size growth, the interest rate spread change, the change in real estate transactions, the war, etc … which are not instantaneous reactions. Rather, these reactions of depositors are most likely to be distributed over time; this is due to time delays in the transmission and reception of the information regarding the changes in the explanatory variable upon which the depositors base their actions, hence creating a change in the growth of non-resident deposits.

Four econometric specifications are estimated. We start by including only bank specific variables, namely month on month difference in bank assets, number of non-resident cards, and dummy of the Basel II adoption (Model 1). We then add the internal variables in Model 2. Model 3 further add the external variables. Finally, Model 4 reports the regression results after removing all the insignificant variables and the variables that might create the problem of multicollinearity.

5.2.1 Determinants of Non-resident Foreign Currency Deposits

Regarding the bank specific variables, Table 5 shows that month on month difference in bank assets positively affect GNRFC and its effect remains significant at 1% in all models, in line with Finger and Hesse (2009). The result indicates that larger bank might be able to better attract deposits since larger banks are considered to be sounder, which will increase the non-resident depositors confidence in this bank, resulting in more deposits. In all models applied, we find no statistical significance impact of other bank specific variables on GNRFC.

Table 5. Results of regression for GNRFC

	Model 1		Model 2		Model 3		Model 4	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	-0.002348	0.9968	5.923005	0.4228	5.229341	0.5112	-0.170653	0.6848
D(ABNKS)	0.001492	0.0000***	0.001395	0.0000***	0.001396	0.0000***	0.001308	0.0000***
D(NRC)	0.000138	0.1568	0.000009	0.4003	0.000009	0.3742		
DBASEL	-0.684666	0.2367	0.418575	0.6011	0.198872	0.8157		
CI			-0.004972	0.6199	-0.00682	0.5599		
D(SD)			0.00043	0.4186	0.000427	0.4239		
D(I)			-3.172700	0.0103**	-3.46336	0.0087***	-3.121528	0.002***
D(I2)			-0.687926	0.4236	-0.79069	0.3633		
D(POLRISK)			-0.26113	0.4033	-0.28691	0.3666		
RISK			-0.097116	0.5232	-0.08195	0.6071		
D1			-3.427727	0.044**	-3.45859	0.0597*	-3.069178	0.0293**
D2			-2.215031	0.0412**	-1.99779	0.0846*	-1.720909	0.0456**

Oil					0.004249	0.7104		
D3					0.425479	0.4418		
GNRFC(-1)	-0.248463	0.0654*	-0.299321	0.0383**	-0.30037	0.038**	-0.305352	0.0354**
Adjusted R^2	35.78%		38.03%		37.22%		39.31%	
R^2	37.76%		43.75%		43.97%		41.64%	
N	131		131		131		131	

Computed by authors using E-views 7. ***significant at 1%; **significant at 5%; *significant at 10%.

As shown in Table 5, the regression shows higher explanatory power when internal variables are added to the estimation; the adjusted R-square improves from 37.76% to 43.75%, indicating that these variables are explaining part of NRFC. More specifically, there is evidence that Dummy 1 and Dummy 2 have a significant negative relationship as expected irrespective of the model applied, suggesting that the war and the assassination of the prime minister adversely affect the flow of foreign currency deposits in the Lebanese commercial banks. There is also evidence, although not robust in the model, indicating that the change in the spread between the LBP and USD interest rate affects the growth of non-resident deposits in foreign currency. Although this variable is significant in Model 2 only at 5%, it is significant at 1% in Model 3 when external variables are added, suggesting that depositors might be positively influenced by high interest rates.

However, when external variables are added to the regression in Model 3, the adjusted R-square slightly declines indicating that these variables do not affect the growth of non-resident foreign currency depositors. This is supported by the insignificance coefficient of all external variables.

The magnitude and significance of the coefficient on the lagged GNRFC confirm the dynamic nature of the model.

The final empirical model for the growth of NRFC would be:

$$GNRFC_t = c + \alpha_1 DABNKSG_t + \alpha_6 D(I)_t + \alpha_{11} D1_t + \alpha_{12} D2_t + \alpha_{15} GNRFC(-1)_t + \varepsilon_t \quad (2)$$

Where: *GNRFC* is the month-on-month growth of non-resident foreign currency deposits;

ABNKSG is the month-on-month difference in bank assets;

D(I) is the first difference of the difference between USD and LBP interest rates;

D1 is the dummy variable that measures the effect of 2006 war;

D2 ishe dummy that measures the effect of Mr. Hariri assassination;

GNRFC(-1) is the lag of *GNRFC*.

5.2.2 Determinants of Non-Resident Local Currency Deposits

Similar to the NRFC, Table 6 shows that bank asset size has a significant positive impact in all models. Furthermore, the regression shows the highest explanatory power when internal and external variables are added to the regression.

While Dummy 1 is not significant, Dummy 2 has a significant negative relationship irrespective of the model applied, suggesting that the assassination of the prime minister and not the war adversely affect the flow of foreign currency deposits in the Lebanese commercial banks. Furthermore, the positive and significant coefficient of political risk suggests that a higher political score, indicating low level of risk, will attract non-resident depositors to deposit more money in the local currency. Thus, a higher score will increase the safety of deposits and will increase the confidence in the banking sector in Lebanon. Furthermore, I_1 has a positive and significant coefficient, suggesting that higher interest rates offered by Lebanese commercial banks as compared to the international arena would attract more non-resident deposits.

Table 6. Results of regression for G (NRLC)

	Model 1		Model 2		Model 3		Model 4	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	0.549343	0.5685	25.51516	0.2471	10.77216	0.6134	0.021111	0.9736
D(ABNKS)	0.001454	0.002***	0.000918	0.0146**	0.000903	0.0084***	0.001135	0.0148**
D(NRC)	-0.000158	0.3121	-0.000005	0.8235	0.000003	0.8469		
DBASEL	-1.127992	0.3528	-0.01021	0.9951	-0.58977	0.7482		
CI			0.026111	0.2803	0.04448	0.0937*		
D(SD)			-0.00151	0.3532	-0.00156	0.3076		
D(I)			3.811279	0.4983	3.980446	0.4998		
D(I1)			0.85195	0.5643	-0.54254	0.744		
D(POLRISK)			3.158281	0.0042***	2.965584	0.0073***	2.646063	0.0066***
RISK			-0.51142	0.2676	-0.27311	0.5325		
D1			-2.32129	0.3246	-0.74247	0.7644		
D2			-7.72444	0.0551*	-7.71014	0.0534*	-6.71692	0.0697*
Oil			0.065284	0.6158	-0.04012	0.1583		
D3			25.51516	0.2471	4.166032	0.0151**	3.893509	0.0002***
GNRLC(-1)	0.176189	0.0843*	0.000918	0.0146**	0.010592	0.9356		
Adjusted R^2	12.97%		28.62%		31.12%		31.06%	
R^2	15.65%		35.21%		38.54%		33.69%	
N	131		131		131		132	

Computed by authors using E-views 7. ***significant at 1%; **significant at 5%; *significant at 1%.

Regarding the external variables, contrary to the results of NRFC, there is evidence that D3 has a positive and significant impact, indicating that the financial crisis has positively impacted non-resident deposits in local currency. This result suggests that Lebanese banking sector was considered as immune from the financial crisis, and Lebanese currency was considered as a safe place to deposit money. However, the dynamic nature is inconclusive since the coefficient of the lagged GNRLC is only significant in Model 1.

The final empirical model for the growth of NRFC would be:

$$GNRFC_t = c + \alpha_1 DABNKSG_t + \alpha_{10} Polrisk + \alpha_{12} D2_t + \alpha_{14} D3_t + \varepsilon_t \quad (3)$$

5.2.3 Determinants of Non-Resident Total Deposits

As mentioned earlier, NRFC deposits constitute on average of 86.32% of total non-resident deposits for the studied period, thus it is expected that the variables that are significant for NRFC would also be significant for total NRD. The results in Table 7 support this expectation; all the factors that are significant for NRFC are also significant for NRD.

The final empirical model for the growth of NRD would be:

$$GNRD_t = c + \alpha_1 ABNKSG_t + + \alpha_6 D(I)_t + \alpha_{11} D1_t + \alpha_{12} D2_t + \alpha_{16} GNRD(-1)_t + \varepsilon_t \quad (4)$$

Where: *GNRD* is is the month-on-month growth of non-resident deposits;

ABNKSG is the month-on-month growth of bank assets;

D1 is the dummy variable that measures the effect of 2006 war;

D2 The dummy that measures the effect of Mr. Hariri assassination;

GNRD(-1) is the lag of *GNRD.*

5.3 Discussion of Findings

The largest portion of the non-resident deposits in Lebanon is in foreign currency. Thus, all the factors have their effect on the general non-resident deposits are also affecting the foreign currency deposits which are very representative of the total non-resident deposits.

The first question was concerned with uncovering the internal factors that might affect the non-resident deposits. The empirical study showed the war and the assassination of prime minister negatively affect both the non-resident foreign currency deposits and the total non-resident deposits, whereas the composite risk rating and the political risk rating did not prove to be significant factors for those deposits. Non-resident depositors might

not be informed of the ratings but are informed of war and assassinations occurring in Lebanon, since these events are covered by the public media that reaches all the depositors through various means of information; whereas the ratings are usually of interest to specific category of people who intentionally monitor such factors. While internal factors affecting non-resident deposits are the same for foreign currency and for total deposits, they are different for local currency. More specifically, political risk and assassination of prime minister (political turmoil) negatively affect the non-resident local currency deposits.

Table 7. Results of regression for GNRD

	Model 1		Model 2		Model 3		Model 4	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	0.017085	0.9761	6.06428	0.3762	3.910718	0.6019	-0.04139	0.9227
D(ABNKS)	0.00154	0.0000***	0.001401	0.0000***	0.001396	0.0000***	0.001335	0.0000***
D(NRC)	0.000118	0.1838	0.000001	0.3928	0.000001	0.3269		
DBASEL	-0.766714	0.1808	0.288258	0.7222	0.085784	0.9204		
CI			-0.003511	0.6936	-0.00256	0.8205		
D(SD)			0.000161	0.7577	0.000162	0.7557		
D(I)			-2.122463	0.2238	-2.89715	0.0543*	-2.81434	0.0264**
D(I2)			-0.468817	0.5645	-0.70254	0.4111		
D(POLRISK)			0.019976	0.955	-0.01788	0.961		
RISK			-0.101163	0.4699	-0.06395	0.6694		
D1			-3.273127	0.0516*	-3.07624	0.087*	-3.1932	0.0241**
D2			-3.113055	0.0122**	-2.90427	0.0249**	-3.00285	0.0032***
Oil					-0.00198	0.8633		
D3					0.750978	0.1402		
GNRD(-1)	-0.202411	0.132	-0.272826	0.0602	-0.27548	0.0562*	-0.2805	0.0532*
Adjusted R^2	36.45%		39.14%		38.53%		41.34%	
R^2	38.40%		44.75%		45.15%		43.60%	
N	131		131		131		131	

Computed by authors using E-views 7. ***significant at 1%; **significant at 5%; *significant at 1%.

There is no supporting evidence that the state of Lebanese economy as measured by CI has an effect on any of the non-resident deposits. As for the interest rate differential, it has a negative significant effect on the non-resident foreign currency deposits and on the total non-resident deposits; thus, as the interest rate on the USD deposits increases, the spread (I) decreases, and deposits in foreign currency increase. However, this interest rate differential did not prove to have a significant effect on the non-resident local currency deposits. The interest rate differential between Lebanese banks' interest rates on LBP and LIBOR prove to be significant factors on only non-resident local currency deposits.

Concerning the external factors, the empirical study shows no significant external factors that might have an effect on the growth of non-resident deposits in foreign currency and in total deposits. However, the financial crisis in 2006 positively affects non-resident deposits in local currency. This conclusion supports El Khoury and Kanj (2013) findings that non-resident depositors are not affected by factors outside Lebanon and their deposits might even increase in Lebanese banks when the situation in the world deteriorates due to their trust in the Lebanese banking system.

For bank-related factors, the growth of bank size as measured by assets appeared to be a significant factor that affects the growth of non-resident deposits regardless of what it is measured.

6. Summary and Concluding Remarks

The purpose of this study was to determine the factors that affect the non-resident deposits in Lebanese banks by using 131 secondary monthly data (from January 2002 till January 2013). This study used an empirical model to research the effect of internal, external, and bank related factors on non-resident deposits. The majority of the deposits are in foreign currency which was previously mentioned by many other literatures like Peters et al. (2004).

As for the internal factors, the economic activity in Lebanon was not proved to be significant whereas this factor was significant in Finger and Hesse (2009) results. The interest rate appeared to be significant for foreign

currency and total non-resident deposits, similar to Finger and Hesse (2009). The higher interest rate offered on domestic currency as compared to LIBOR appeared to increase the non-resident deposits in local currency. As for the war and the assassination of prime minister, they appear to be significant, whereas the risk ratings and political situation did not have any significant result, as indicated by Finger and Hesse (2009). However, the political situation affected the local currency deposits because the political turmoil might shake the confidence of non-residents in the domestic currency.

Similar to the results of other studies, the external factors were not justified to be significant, except the financial crisis which positively affected non-resident deposits in local currencies. Whereas the bank size as measured by bank assets appeared to be significant, other variables such as cards given to non-residents and adoption of Basel II did not appear to significantly affect non-resident deposits.

The study concludes that some factors can be controlled either by banks or by the government to attract more of the non-resident deposits. For example, the growth of banks assets can be managed by the banking sectors to attract more deposits of non-residents. Furthermore, the government should try to maintain healthy rate differentials to support the deposit growth.

Since the non-resident deposits are negatively affected by war and adverse events such as the assassination of prime minister, Lebanese banks should diversify into international branches. This would reduce the adverse effect of any turmoil happening inside Lebanon on non-resident depositors and would also attract more non-residents for the convenience of banking with the Lebanese international branches as found by El-Khoury and Kanj (2013).

The limitations of the empirical study were the limited data for some variables available on a monthly basis. Some factors that might affect the deposits are not abundant as monthly data, and some others are for a very short period of time that is not enough to conduct an empirical study.

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Note

Note 1. The average for the period studied: January 2002 till January 2013.

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An Empirical Study on Effect of Productivity on Profitability in Some Selected Private Commercial Banks (PCBs) in Bangladesh

K. M. Anwarul Islam[1] & Mahbuba Zaman[2]

[1] The Millennium University, Dhaka, Bangladesh

[2] IIUC, Bangladesh

Correspondence: K. M. Kamal Uddin, Registrar's office, Room No-321, Dhaka University, Dhaka-1000, Bangladesh. Tel: 880-17-6834-3171. E-mail: ai419bankingdu@gmail.com

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Abstract

The study is based on a total number of 15 PCBs operating in Bangladesh. The study is the outcome of mainly secondary data. These data were collected from the annual reports of the selected banks. A few primary data regarding factors influencing productivity of the banks were collected on the basis of a structured questionnaire using direct interview method. For the empirical analysis, five financial years ranging from 2007–2011 was selected. The main objective of the study was to critically examine the impact of productivity on profitability covering the specific objects like determinants of productivity performance and analyzing productivity performances. The main findings of the study are: (i) the significant factors affecting productivity have been: change in deposit structure, change in liability structure, lack of skilled employee, policy of Bangladesh Bank, lack of accountability,lack of proper responsibility & accountability. (ii) It is seen that the productivity performances in terms of DPE, LAPE, EAPE, and BPE have been satisfactory in most of the banks during the study period. In case of other productivity measure, almost 50% of the banks have been good. (iii) There is a strong relationship between productivity and profitability which is proved from the analysis of correlation coefficient. (iv) It is further found that ROI of the selected banks has been influenced by EPE, DPE, LAPE, IPE, LAIPE, EAPE, BPE and EXPE to the extent of 81%. Therefore, it can be concluded that these variables need to be improved for the improvement of profitability of the selected banks.

Keywords: productivity, profitability, mean weighted score, responsibility and accountability, price recovery

1. Introduction

Productivity is a vital indicator of economic performance of an economic system. Productivity is not an end in itself. In fact, it is a mechanism for improving the material quality of life. Productivity is fundamental to progress throughout the world. It is at the heart of economic growth and development, improvements in standards of living and quality of life.

The concept and definition of productivity as applied in manufacturing industries cannot be applied as such in banking industry because it is primarily a service industry. In the field of banking, the various products are accounts, drafts, exchange remittances, cheques, traveler's cheques, credit cards, debit cards, services for guarantees, various kinds of loans like housing loan, education loan, car loan etc. Identification and measurement of output in banking is very difficult exercise as it is not possible to bring various services to measure output.

As in banking industry in India, volume of business became progressively imperative to secure more resources for meeting social objectives while maintaining viability of operations, business level may be preferred as being more representative of productivity (Singh & Jagwant, 1990) This statement is also true in case of banking industry in Bangladesh.

Productivity helps firms, industries and nations to achieve sustainable competitive advantage. Industry is a thrust area for countries in their quest for competitiveness. It must be noted that banks which have maintained the momentum of continuous growth, and profitability showed better ratio of manpower effectiveness. Each element has crucial sub-components which serve as building blocks for productivity. The Government policies effectively support competitiveness if they are structures around productivity driven reform mechanism, cost deflating tariff structure and technology and industry vision (Rao, 1994).

C. B. Rao has proposed a productivity competitiveness model particularly for Indian environment. The model comprises of three elements viz.

I. Government Policies.

II. Industry Strategies.

III. Management Methods.

Competitive market conditions and liberalized economic and industrial policies demand more strident attention to productivity improvement and restructuring of industries. Continuous up gradation of technical knowledge, discovery of new ways for productivity improvement and flexible redeployment of skills in new activities are vital for the competitive age. Similarly introduction of systems of employee participation such as quality circles and TQM system would be necessary to keep the employees on the leading edge of their skills and motivation.

Measuring the output of banks is the starting point of the empirical research on productivity measurement, as well as the estimation of cost and economies of scale and the study of the efficiency of banks. However, there is no consensus among researchers regarding the definition of bank output (Triplett, 1991; Berger & Humphrey, 1992). This fact is connected with the intangible, multiple and interdependent nature of the services that banks provide to their customers. In particular, banks provide a wide range of services which are often difficult to separate and price independently, while other services are provided without any explicit charge.

1.1 Statement of the Problem

The new millennium has witnessed its challenges and opportunities in variousfields of economic still the beginning of the 1990s, has been pushed into the choppy water of intense competition. The modern banking activity is marked by itineraries into un-chartered horizons mingled with risks and heavy competition. Immediately after nationalization, the Public Sector Banks spread their branches to remote areas at a rapid pace. Their main objective was to act on behalf of the government to fulfill economic obligations towards the common man. They acted over enthusiastically in penetrating into far-flung and remote corners of the country. On the other hand, private and foreign banks did not make such moves. Instead, they pursued profit making as the salient objective for their operations

A profitable banking sector is better able to withstand negative shocks and contributes to the stability of the financial system. Important changes in the operating environment, particularly after the Asian financial crisis, are likely to affect bank profitability. Empirical analysis finds that both bank-specific as well as macro-economic factors are important determinants in the profitability of banks. With regard to macro-economic factors, real GDP growth, inflation and real interest rates have a positive impact.

The banking sector of this country still has to go a long way in achieving productivity heights. From a comparative study of productivity situation in some countries (1988–1995), it has been revealed that Hong Kong registered the highest level of productivity followed by Korea & Taiwan while the trend in Bangladesh appeared much below as compared to the 16 countries. (Rab, 1997) In Bangladesh, productivity both in agriculture and industry sector appeared below the base year (1985) during the period from 1988–1989 to 1991–1992. In another study, it has been shown that the productivity of labor in Bangladesh is roughly one-fifth of the female workers employed in Japan. (Qureshi, 1970) This low level of productivity is a serious bottleneck to the rapid industrialization of Bangladesh. Low productivity has characterized investments in general and the industrial sector in particular. Poor productivity coupled with other problems resulted inseveral hundred sick industries. (Rab, 1993).

So the economy is trapped in the hand of vicious circle of poverty. This vicious circle of poverty can be broken at the productivity front. Achieving productivity gain has acquired a new sense of urgency in this period of timid economic growth in Bangladesh where rapid population growth, reduction in export prices of raw materials, growing indebtedness and inflation cloud the future. Therefore, it becomes a social obligation of the organization, both public and private and both business and non-business to increase productivity. (Habbibullah, 1991). Increased productivity can offset the impact of some of these problems and at the same time can help the process of economic development. Because, all the productivity gains or benefits ultimately results in the overall economic growth of a country. (Missir, 1990). The planners, policy makers and economists of the country have also recognized this fact. According to their opinions, banking sector can contribute a lot to the economic growth of the country by increasing productivity, national income and employment opportunity. Butunfortunately, productivity improvement has remained a low priority area in the economic planning of Bangladesh (Kabir, 1998).

In Bangladesh, private sector banks have emerged in the financial market with latest technology, skilled

manpower, new products and services. This has given birth a cut-throat competition in the banking sectors between PCBs, and NCBs. The productivity and hence profitability of PCBs in Bangladesh are specially the areas of series concern because of the significant role that the variables occupy in the economy of the country. These have been substantiated by review of literature made latter on. In view of these, the present study has been undertaken aiming at conducting a comparative study on the productivity and profitability of PCBs and NCBs in Bangladesh.

1.2 Objectives & Hypothesis of the Study

1.2.1 Objectives of the Study

i. To analyze the factors influencing productivity performances in the selected banks.

ii. To analyze the productivity performances in the selected banks during the study period 2007 to 2011.

iii. To examine the impact of productivity performance on the profitability performance.

1.2.2 Hypothesis

On the basis of the objectives of the study, the following two hypotheses have been developed:

Ho1: There is no relationship between productivity and profitability of the selected banks.

Ha1: There is relationship between productivity and profitability of the selected banks.

Ho2: Productivity measures have no positive impact on the profitability measures of the selected banks.

Ha2: Productivity measures have positive impact on the profitability measures of the selected banks.

2. Literature Review

The researchers have extensively gone through the available literature relating to productivity and profitability of banks published in and outside the country. This is done aiming at making theoretical framework for the study as well as finding the rationale of the study. The study reviews the existing literature on productivity and profitability of commercial Banks which are cited bellow:

Shakoor (1989) in his paper titled “Measurement of Productivity in Commercial Banks in Bangladesh” examined that productivity of NCBs in Bangladesh had a further improvement during 1072–1986. It declined a little during, 1978 to 1980 with an improvement during 1981–1982 but again deteriorated during 1983 to 1985 although there was an improvement during 1986. A total of 14 indicators of which six were related to employee productivity, six with reference to branch productivity and one was concerned with working fund and one with reference to ratio of deposits to cash.

Bhattacharjee (1990; 1991) in his article entitled `Productivity Measurement in the Nationalized Commercial Banks of Bangladesh: A Multivariate Analysis' examined various measures of Productivity under five broad heads viz., resource productivity, employee productivity, labor inputproductivity, business productivity and Net business productivity. The study uncovered that variations in growth rates in productivity measures were found to be associated with variations in policies pertaining to structure, process and leadership variables as well as variations in deposit mix, credit mix and service packages offered by Banks.

Sharker (1991), produced an article entitled. Productivity in Commercial Banks: Concepts and issues in the context of Bangladesh.The highlights of the paper included: (i) Concepts productivity in general and Suitability of application of productivity measurement technique to banking industry. (ii) Concepts of input and output in banks (iii) Measurement of banking inputand output (iv) Type of productivity measurement for commercial banks, (v) Requisite forproductivity computation in the banks.

Bhattacharjee and Saha (1991) conducted a study titled. An Evaluation of Performance of NCBs in 13angladesh’ with a principle objective of evaluating the profitability performance of NCBs made by the measurement of performances of NCBs on the basis of five set of indicators namely general banking business including net profit, social profitability measures. The study revealed that almost all the performance measures showed upward trends. Of course, there were inter-bank and intra-bank variations in performance measures during the period, 1973 to 1987.

Amandeep (1993) in her study, on profitability of commercial banks attempted to examine the trends in profits and profitability of twenty NCBs operating in India, with the help of trend analysis, ratio analysis and concentration indices of the selected parameters. The study aimed at identifying the various factors and empirical testing as to which of the identified factors had significantly contributed towards bank profitability in either direction.

Sarkar et al. (1998) found that the foreign banks were more profitable and efficient than Indian banks and amongst the Indian Banks; private banks were superior to the public sector banks. They also concluded that the non-traded private sector banks are not significantly different from the public sector banks with respect to profitability and efficiency, a result consistent with the property right hypothesis.

Chowdhury (1988) conducted a study entitled 'Impact of Denationalization and Privatization on the profitability and productivity of commercial Banks of Bangladesh' evaluating productivity and profitability of commercial banks. In this study, profitability (measured through Gross profit as a percentage of volume of working Fund) and two productivity dimensions (Total productivity andman power productivity) were analyzed. The study came up with the conclusion that though absolute profit level of the commercial banks increased after denationalized and privatization, but it could not help to improve the profitability and productivity of the commercial banks.

Choudhury (1990) studied the impact of denationalization and privatization on the profitability and productivity of the commercial banks in Bangladesh. He concluded that though absolute profitlevel of the commercial banks did increase after denationalization and privatization but it could not help improve the profitability and productivity of the commercial banks.

Loqman and Muhiuddin (1992) in their study entitled: "Performance Evaluation in Term of Profitability and Productivity of interest-free Banking System: A case study on Islami Bank Bangladesh Limited (IBBL)" revealed that the performance of Islamic Bank Bangladesh Ltd in tennis of productivity and profitability had not been satisfactory since its inception in comparison with those other commercial banks in Bangladesh. However, the financial performance of IBBL had been up to the mark during the last two years of the study period i.e., 1990 and 1991.

Azad (2000) conducted a study on 'Banking Structure in Bangladesh: Regulatory Framework and the Reforms'. This paper makes a review of the historical evolution, strength andcompetitive performance of the banking structure in Bangladesh. It analyses the impact of post-reform regulatory fame worker and the efficiency of the restructured banking sector in temis of institutional depending and financial intermediation , deposit mobilization and advance deployment , productivity and profitability , and the growth rate of the financial system.

Jahan and O'Neill (2003) in their study on Banking and Industrial Development: A case study of Bangladesh examined the difficulties hampering efficient functioning of the banking system in promoting economic and industrial development in Bangladesh. The findings include: a) legal environment in which banks function is relatively poor. b) Despite financial sector reform programmed of the government there is a lack of credit discipline. c) Loan sanctioning is dictated by political decisions and d) loan taking entrepreneurs are not genuinely serious in utilizing the loan for purposes for which these are granted. Banking system in Bangladesh is not properly equipped with trained manpower to perform its job.

Miyakawa, Inni& Shoji (2011) in their study entitled; Productivity of banks & its impact on capital investment of client firms; proposed some measures of banks productivity namely risk adjusted profit, operating cost per employee etc. They also explained the impact of productivity on ROA (Profitability) & found positive significant correlation between these two.

Batchelor (2005) in his PhD thesis, entitling; A comparable Cross System Bank Productivity Measure; found that Islamic Banking operations were more productive than conventional banking system.

3. Methodology and Research Design

The methodology followed in the present study has been discussed under the main points given below:

3.1 Selection of Sample

At present a total number of 47 Banks has been operating in Bangladesh out of which 4 are in the public sector and the remaining is in the private sector. Of the private commercial banks, 15 were selected for the study purpose all of which have been local banks. The foreign private banks and the public sector banks have been kept beyond the study sample because of different environment, rules & regulations of these banks than those of local private banks.

The study is based on a total number of 15 Private Commercial Banks (PCBs) operating in Bangladesh. These banks were selected on the basis of purposive sampling because of easy access to the requisite data. For primary data, an opinion survey was conducted on a total number of 30 respondents, taking 02 executives in the rank and status of Manager in Charge of Deposits and Accountant in Charge of Profitability of the banks. These respondents were also selected purposively keeping in mind the main objective of the study. The names of the selected banks are: i. AB Bank Ltd. (ABBL) ii. One Bank Ltd.(OBL) iii. Uttra Bank Ltd. (UBL) iv. National

Bank Ltd. (NBL) v. The City Bank Ltd. (CBL) vi. Islami Bank Bangladesh Ltd.(IBBL) vii. United Commercial Bank Ltd.(UCBL) viii. Eastern Bank Ltd.(EBL) ix. NCC Bank Ltd. (NCCBL) x. Prime Bank Ltd. (PBL) xi. Southest Bank Ltd.(SBL) xii. Dhaka Bank Ltd.(DBL) xiii. Al-ArafaIslami Bank Ltd.(AAIBL) xiv. ShahjalalIslami Bank Ltd. (SIBL)xv. Dutch Bangla Bank Ltd. (DBBL).

3.2 Data collection Methods

3.2.1 Secondary Data

The major secondary data used in the study have been total deposits, total number of employees, total loans and advances, total investments, total assets, total income, total expenditures, total equity capital, total loans and advances per employee, total investment per employee, total business per employee, total income per employee, total expenditure per employee, equity capital per employee, earning assets per employee, total deposits per employee, loans & advances and investment per employee and return on investment etc of the selected banks. These were collected by the researchers from the Annual Reports and Annual Accounts Statements and Websites of the banks. Again, the main measures of profitability of the banks have been ROI, ROTA, ROCE, and EPS etc. But in this study, only ROI has been used in order to examine the impact of productivity on profitability of the selected banks.

3.3 Primary Data

The main primary data used in the study have been the factors influencing productivity of the banks. These were collected by the researchers with the help of a structured questionnaire from the selected respondents on the basis of direct interview method.

3.4 Period of Study

For the empirical analysis of the study, a period of 05 financial years ranging from2007 to 2011 was selected. The secondary data of these 05 financial years have been easily available to the sources of data.

3.5 Methods of Data Analysis

Since primary data used in the study were few limiting to opinions of the respondents as to the factors influencing productivity performances; these data were processed and analyzed manually. In this case, frequency table, graphs and diagrams have been used. The secondary data were processed and analyzed using computer SPSS program. The Pearson Correlation technique and Multiple Correlation & Regression model have been used for the study in order to show the relationship between the dependent variable & independent variables, association of strength between these variables & to show the extent of the influence of the independent variables on the dependent variable. In order to test the hypothesis of the study, t test, F test and ANOVA have been applied in the study. For the study purpose, Return on Investment has been take as the dependent variable, while Deposits per employee, loans & advances per employee, Investment per employee, Business per employee, total expenditure per employee, equity capital per employee and ratio of loans & advances and investments to deposits, total assets per employee have been taken as the independent variables.

4. Analysis of Findings

4.1 Factors Influencing Productivity Performances of Selected Banks

Identification of Determinants that Influence the productivity of sample banks based on mean weighted scores:

The researchers have collected opinions of thirty bankers on 5 point Likert Scale in order to identify the factors that influence the productivity in the selected Banks. The study has identified the variables undertaken for the study as most significant and on the basis of mean score of opinions taken of 5 point Likert scale as follows:

Table 1. Identification of variables that influence the productivity of samplebanks based mean weighted scores

Variables	Factor Variables	Weighted Mean scores
More Significant		
X1	Change in deposit structure	4.6400
X2	Change in liability structure	4.4400
X6	Lack of skilled employee	4.2400
X 4	Policy of Bangladesh Bank	4.2000
X7	Lack of Accountability	4.2000
X11	Adverse environment factor	4.2000
X13	Lack of proper responsibility &accountability	4.2000

Less Significant		
X3	Burden	3.9200
X5	Inadequate remuneration of employees	3.9200
X9	Use of obsolete plan and technology	3.9200
X8	Shortage of adequate equity capital	3.8800
X10	Absenteeism of workers from jobs	3.8800
X12	Obstacle in introducing product diversification	3.8800
X14	Management inattention limited markets of products	3.5200

Note: Data Have Been Compiled By Researchers.

It is evident from the above table that seven variables have been found influencing the productivity of Bank more significantly on weight mean basis. These are change in deposit structure. Change in liability structure, Lack of skilled employees, policy of Bangladesh Bank, Lack of accountability, adverse environmental factor, Lack of proper responsibility & accountability. It has also identified seven other variables as less significant on the same basis.Burden, Inadequate remuneration of employees, Use of obsoleteplan andtechnology, Shortage of adequate equity capital, Absenteeism of worker from jobs, Obstacle in introducing product diversification, Management Intention limited markets of products are less significantly influencing the productivity. These findings are manifestation of reflecting the scenarios of banks productivity.

4.2 Average Productivity Performances

The following table 02 depicts average productivity performances in the selected banks during FY 2007–2011. In this study, we have analyzed eight (08) types of productivity performances as exhibited in the table.

Table 2. Average productivity performances measurement (PM) in the selected banks

PM	EPE	DPE	LAPE	IPE	LAIPE	EAPE	BPE	ExPE
ABL	1.24	43.67	36.73	7.47	1.02	55.35	6.28	3.86
OBL	1.67	37.56	28.93	5.51	1.09	41.86	4.82	3.34
UBL	0.47	16.99	27	4.42	2.19	20.47	1.99	1.32
NBL	0.95	18.81	18.37	5.13	1.34	30.69	3.79	2.28
CBL	0.78	25.32	19.51	4.39	0.94	31.31	3.13	2.12
IBBL	0.65	24.87	22.75	1.36	0.97	28.46	2.38	1.72
UCBL	0.7	33.85	28.25	4.49	0.97	39.63	3.75	2.47
EBL	2.65	54.93	54.48	9.39	2.91	76.89	8.62	5.47
NCCBL	7.17	37.04	34.25	6.32	1.1	45.01	5.14	3.33
PBL	2.25	55.8	48.32	10.99	1.06	67.36	3.55	1.25
SBL	3.16	62.05	52.72	11.39	1.03	73.4	22.58	5.35
DBL	5.46	62.99	55.22	7.99	1	79.47	8.86	6.54
AAIBL	1.96	31.76	28.11	0.76	0.91	40.39	3.56	2
SIBL	2.45	34.73	29.79	1.79	1.03	44.08	3.23	2.29
DBBL	0.64	38.28	29.25	5.24	0.91	45.64	4.98	3.52

Source: Annual Reports of SelectedBanks.

It is revealed from the table 02 that average EPE during 2007–2011 was the highest in case of NCCBL followed by DBL, SBL, EBL, SIBL, PBL, AIBL, OBL, ABL, NBL, CBL, UCBL, IBBL, DBBL & UBL. The average DPE was the highest in case of DBL followed by SBL, PBL, EBL, ABL, DBBL, OBL, NCCBL, SIBL, UCBL, AAIBL, CBL, IBBL, NBL and UBL. The average LAPE was the highest in case of DBL followed by EBL, SBL, PBL, ABL, NCCBL, SIBL, DBBL, OBL, UCBL, AAIBL, UBL, IBBL, CBL and NBL. The average IPE was the highest in case of SBL followed by PBL, EBL, DBL, ABL, NCCBL, OBL, DBBL, NBL, UCBL, UBL, CBL, SIBL, IBBL and AAIBL. The average LAIPE was the highest in case of EBL followed by UBL, NBL, NCCBL, OBL, PBL, SBL, SIBL, ABL, DBL, IBBL, UCBL, CBL, DBBL and AAIBL. The average EAPE was the highest in case of OBL followed by DBL, EBL, SBL, PBL, ABL, DBBL, NCCBL, SIBL, AAIBL, UCBL, CBL, NBL,

IBBL and UBL. The average BPE was the highest in case of SBL followed by DBL, EBL, ABL, NCCBL, DBBL, OBL, NBL, UCBL, AAIBL, PBL, SIBL, CBL, IBBL and UBL. Finally, the average ExPE was the highest in case of DBL followed by EBL, SBL, ABL, DBBL, OBL, NCCBL, UCBL, SIBL, NBL, CBL, AAIBL, IBBL, UBL and PBL. All these figures indicate that the average DPE, LAPE, EAPE, BPE has been satisfactory in case of most of the banks. In case of other productivity measures, almost 50% of the selected banks have been good. But in case of other banks, these measures were not remarkable during the study period.

4.3 Impact of Productivity Performances of Banks

Before examining the impact of productivity on profitability, firstly it is essential to examine the relationship between these two.

4.3.1 Productivity and Profitability Relationship

Profitability refers to profit earning capacity of an enterprise. It is one of the best measurements of evaluating of overall performance of an enterprise. But measurement of productivity alone cannot identify the causes of productivity changes. Profitability may be changed due to productivity or price cost movement. Therefore it is necessary to segregate profitability into productivity and price recovery. Considering the relationships among 3ps (Productivity, Profitability and Price recovery) profitability is defined as the product of productivity and price recovery. The following figure demonstrates this relationship:

Table 3. Productivity and profitability relationship

Output Value= Output Quantity x Unit Price
Profitability = Productivity x Price Recovery
Input Value= Quantity Used x Unit Cost

Where:

Profitability= Output Value, Productivity= Output Quantity, Price Recovery=Unit Price

Quantity used input value unit cost.

4.3.2 Relationship between Productivity and Profitability

The Relationship between productivity and profitability has also been examined using co-efficient of correlation.

Table 4.Correlation-coefficient

		ROI	EPE	DPE	LAPE	IPE	LAIPE	EAPE	BPE	ExPE
Pearson Correlation	ROI	1.000								
	EPE	-.016	1.000							
	DPE	.273	-.187	1.000						
	LAPE	.895	.053	.295	1.000					
	IPE	.206	.221	.601	.303	1.000				
	LAIPE	.100	.736	-.414	.163	.191	1.000			
	EAPE	.247	.125	.356	.160	.343	.077	1.000		
	BPE	.141	.037	.263	.111	.276	.020	.128	1.000	
	ExPE	.314	.157	.513	.329	.460	.124	.337	.414	1.000
Sig.(1-tailed)	ROI	.	.445	.009	.000	.038	.197	.016	.114	.003
	EPE	.445	.	.054	.325	.028	.000	.143	.376	.090
	DPE	.009	.054	.	.005	.000	.000	.001	.011	.000
	LAPE	.000	.325	.005	.	.004	.081	.085	.171	.002
	IPE	.038	.028	.000	.004	.	.051	.001	.008	.000
	LAIPE	.197	.000	.000	.081	.051	.	.256	.431	.145
	EAPE	.016	.143	.001	.085	.001	.256	.	.136	.002
	BPE	.114	.376	.011	.171	.008	.431	.136	.	.000
	ExPE	.003	.090	.000	.002	.000	.145	.002	.000	.
N	ROI	75	75	75	75	75	75	75	75	75

Table 4 shows that r between EPE and ROI, DPE and ROI, LAPE and ROI, IPE and ROI, LAIP and ROI, EAPE and ROI, BPE and ROI and ExPE and ROI has been–0.16, .273, .895, .206, .100, .247, .141 and .314respectively.Considering the significant values, it can be said that, r between DPE & ROI,LAPE & ROI, IPE & ROI, EAPE & ROI and ExPE& ROI have been significant at 0–10% level.Thus it is seen that null hypothesis: relationship between productivity and profitability oftheselected banks has been rejected. Therefore, there exists relationship between productivity and profitability of the selected banks.

4.3.3 Impact of Productivity Measures on ROI-Profitability Measure

Impact of productivity measures on ROI-Profitability measure has been examined on the basis of regression analysis.

Table 5. Exhibits the results of regression model

a. Model Summery

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df 1	df 2	Sig. F Change	Durbin-Watson
1	.911(a)	.830	.810	.90064	.830	40.388	8	66	.000	1.416

a Predictors: (Constant), EPE , DPE, LAPE, IPE, LAIPE, EAPE, BPE, ExPE.

b Dependent Variable: ROI.

b. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	262.084	8	32.761	40.388	.000(a)
	Residual	53.536	66	.811		
	Total	315.620	74			

a Predictors: (Constant), EPE , DPE, LAPE, IPE, LAIPE, EAPE, BPE, ExPE.

b Dependent Variable: ROI.

It is revealed from the table that adjusted R square equals to .810 which implies that all the eight independent variables (predictors) have influenced or explained the dependent variable ROI to the extent of 81%. These signify that the productivity measures have highest positive impact on profitability in terms of ROI in case of the selected banks during the study period 2007–2011.Thus it is seen that null hypotheses: productivity has no impact on profitability of the selected banks has been rejected. Therefore, productivity measures have positive impact on profitability of the selected banks.

5. Conclusion

Productivity is at the heart of growth and development of the organizations through improving their performances.Thisismoretrueincaseofbankingindustryin Bangladesh. The most significant factors influencing the productivity performance of the selected banks demand special attention of the bank authority. The measures of productivity as mentioned in the study should be of great concern for the bank management since they have positive impact on the bank profitability. Hence, the respective bank authority in particular should give due emphasis on productivity performances of the banks since they have direct influence on their profitability.

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Appendix

Appendix 1. Requisite data on selected banks (FY from 2007–2011)

Year/ Bank	Particular	2007	2008	2009	2010	2011	Average
ABBL	Equity capital per employee (EPE)	0.43	1.24	1.31	1.6	1.6	1.236
	Deposits per employee (DPE)	30.94	38	42.57	49.03	57.79	43.666
	Loan & Advance per employee (LAPE)	23.72	31.44	36.31	43.97	48.211	36.73029
	Investment per employee (IPE)	5.15	6.32	8.39	7.25	10.218	7.465559
	Loan & Advance and Investment to Deposits (LAID)	0.93	0.99	1.05	1.07	1.07	1.022
	Earning Assets per employee(EAPE)	36.84	46.59	54.77	66.23	72.337	55.35338
	Business per Employees (BPE)	4.92	6.37	7.38	8.59	4.1361	6.279224
	Total Expenditure per Employee (ExPE)	2.99	3.98	4.41	4.9	2.9985	3.855708
	ROI	13.86	12.42	13.49	12.35	12.98	13.02
OBL	EPE	1.32864	1.512224	1.4995	1.64956	2.3622	1.670434
	DPE	31.3095	32.06674	37.887	40.7971	45.756	37.56325
	LAPE	25.1228	24.98719	30.284	30.4034	33.874	28.93427
	IPE	4.58696	4.324796	6.5342	5.87991	6.2185	5.508869
	LAIPE	1.8	0.9	0.97	0.89	0.88	1.088
	EAPE	35.12	36.9546	43.468	47.077	46.7	41.86387
	BPE	4.58696	4.997672	5.6054	6.14354	2.7556	4.817824
	ExPE	3.39898	3.708964	3.9894	3.72173	1.8874	3.341299
	ROI	15.07	14.74	13.5	12.84	13.2	13.87
UBL	EPE	0.11479	0.229862	0.4853	0.73452	0.7986	0.472608
	DPE	12.5391	14.61939	18.045	20.1925	19.565	16.9922
	LAPE	83.0688	10.68498	11.988	14.9209	14.343	27.0011
	IPE	4.1588	0.341772	6.8374	5.69926	5.0833	4.424122
	LAIPE	6.95	0.95	1.04	1.02	0.99	2.19
	EAPE	15.2071	16.81358	21.861	24.9697	23.523	20.47492
	BPE	1.44419	1.816456	2.2473	2.68792	1.7386	1.986904
	ExPE	1.02244	1.153049	1.4834	1.7477	1.2178	1.324881
	ROI	11.37	11.72	11.59	11.56	11.95	11.638
NBL	EPE	0.49671	0.684326	0.9615	1.28181	1.3463	0.954132
	DPE	19.7208	21.99306	2.5946	29.7708	19.995	18.81491
	LAPE	14.9984	18.14578	2.2024	26.7295	29.77	18.36913
	IPE	3.19079	3.710997	4.1605	7.26119	7.3051	5.125719
	LAIPE	0.922	0.993	2.55	1.14	1.07	1.335
	EAPE	23.2434	19.0833	31.058	39.1435	40.908	30.68717
	BPE	2.95354	3.249178	3.7182	5.40732	3.6106	3.78777
	ExPE	2.04276	2.107782	2.5703	2.80941	1.8545	2.27694
	ROI	12.13	12.94	11.87	11.91	12.1	12.19
CBL	EPE	0.59669	0.65234	0.6481	0.14451	1.8382	0.775963
	DPE	20.3616	21.50621	25.736	25.1099	33.908	25.32434
	LAPE	13.4545	16.43792	17.94	22.4682	27.258	19.51171
	IPE	3.79257	4.361032	4.3672	4.64581	4.7913	4.391569
	LAIPE	0.84	0.97	0.87	1.07	0.93	0.936
	EAPE	24.4877	27.27555	31.546	33.854	39.38	31.30861

	BPE	2.91662	3.186724	3.3168	4.02905	2.2105	3.131955
	ExPE	2.28579	2.348615	2.3861	2.50168	1.0807	2.120589
	ROI	12.28	13.29	12.97	12.97	13	12.902
	EPE	0.47037	0.505693	0.6443	0.7163	0.9005	0.647439
	DPE	20.5771	21.31989	25.479	28.209	28.748	24.8665
	LAPE	17.9291	20.35011	22.384	25.4348	27.66	22.75153
	IPE	2.5159	0.801639	1.1647	1.18553	1.1241	1.358365
IBBL	LAIPE	0.993	0.992	0.924	0.943	1.001	0.9706
	EAPE	23.6746	24.56944	29.026	31.9438	33.107	28.46418
	BPE	2.18966	2.578482	2.6496	2.9113	1.5926	2.384317
	ExPE	1.72189	1.851229	1.9698	2.09431	0.9627	1.719985
	ROI	13.17	12.54	12.36	11.5	12.47	12.408
	EPE	0.14225	0.130454	0.1192	1.06245	2.0414	0.699155
	DPE	20.1218	23.77182	33.914	49.3329	42.105	33.84908
	LAPE	17.8716	19.3918	26.916	40.7766	36.311	28.25334
	IPE	2.62512	3.192408	4.0777	6.56545	5.9649	4.485109
UCBL	LAIPE	1.01863	0.950041	0.9139	0.95964	1.004	0.969253
	EAPE	23.873	28.32068	39.478	56.6649	49.825	39.63227
	BPE	2.87916	3.424956	4.1623	5.88438	2.3993	3.75002
	ExPE	1.91912	2.312827	2.7989	3.81981	1.52	2.474125
	ROI	12.72	12.58	12.92	12.95	13.5	12.934
	EPE	1.5	1.817824	2.8526	3.00206	4.083	2.651082
	DPE	43.6116	54.61	56.217	57.99	62.218	54.92939
	LAPE	44.8725	51.98165	54.511	60.2333	60.78	54.47568
	IPE	8.54493	6.97903	10.064	10.0997	11.271	9.391813
EBL	LAIPE	1.22	1.07	9.875	1.21	1.15	2.905
	EAPE	61.7087	71.55701	79.853	84.3299	87.015	76.8927
	BPE	7.72319	9.68021	9.8857	10.777	5.0496	8.623137
	ExPE	5.0058	6.554391	6.48	6.24563	3.0658	5.470329
	ROI	13	14.29	29.13	13	13.5	16.584
	EPE	1.42	1.63	1.52	27.77	3.51	7.17
	DPE	28.38	33.5	36.02	41.89	45.43	37.044
	LAPE	26.57	33.09	33.682	38.9827	38.938	34.25252
	IPE	5.09512	4.662143	6.4652	6.76942	8.6136	6.321099
NCCBL	LAIPE	1.1161	1.126937	1.1143	1.09195	1.0468	1.099205
	EAPE	34.5715	40.97571	44.076	51.5129	53.923	45.01181
	BPE	4.28374	5.298571	6.2386	6.26264	3.6118	5.139077
	ExPE	2.83659	3.61	4.141	3.7349	2.3127	3.327042
	ROI	14.3	14.17	11.97	13.02	12.63	13.218
	EPE	1.625	1.833656	1.9279	2.70033	3.1803	2.253424
	DPE	50.3657	56.75113	58.002	58.2132	55.669	55.80021
	LAPE	41.2029	48.45648	48.401	51.9715	51.559	48.31817
	IPE	9.07	14.89555	10.81	9.57644	10.593	10.98903
PBL	LAIPE	0.99816	1.116313	1.0208	1.05728	1.1151	1.061548
	EAPE	56.8486	71.20374	67.682	71.4338	69.614	67.35643
	BPE	2.94	3.725338	4.4447	4.52595	2.0922	3.545628
	ExPE	1.11357	1931/1551	1.5765	1.68443	0.624	1.249612
	ROI	14.16	14.03	13.6	12.47	13.5	13.552
	EPE	2.0448	2.316816	2.4408	4.29696	4.7229	3.164453
	DPE	49.7079	55.82047	68.951	66.7886	68.981	62.0498
	LAPE	43.1577	48.96913	55.276	57.3168	58.892	52.72236
	IPE	7.58333	9.991877	15.228	11.3627	12.777	11.38859
SBL	LAIPE	1.02078	1.056261	1.0225	1.02831	1.039	1.033385
	EAPE	57.6801	65.94801	80.368	81.7998	81.204	73.39996
	BPE	7.76882	83.26807	9.7732	6.61562	5.4753	22.5802
	ExPE	5.15591	5.879773	6.4815	5.77557	3.4537	5.349287
	ROI	14.47	14.23	13	12.08	13	13.356
	EPE	1.83948	2.153675	6.4935	9.01713	7.8125	5.463258
	DPE	57.9441	63.4588	65.929	61.0848	66.538	62.99091
	LAPE	47.5291	55.34298	57.262	57.3408	58.634	55.22169
	IPE	7.10107	8.061247	9.3723	7.61317	7.8125	7.992055
DBL	LAIPE	0.94281	0.99914	0.9815	1.06334	0.9986	0.997078
	EAPE	68.3032	79.21715	84.163	81.2804	84.364	79.46565
	BPE	8.58264	10.13363	10.434	9.46709	5.6719	8.857843
	ExPE	6.19263	7.312918	9.3409	6.00361	3.8688	6.543762
	ROI	13.19	13.84	13.41	13.19	13.5	13.426
	EPE	1.11293	1.285051	1.3881	2.73349	3.2922	1.962354
	DPE	22.2095	29.22006	29.363	34.2805	43.705	31.7557
	LAPE	18.5463	27.59796	27.881	31.3162	35.206	28.10945
AAIBL	IPE	0.08591	0.081708	1.159	1.27294	1.2168	0.763253
	LAIPE	0.83885	0.947283	0.989	0.95066	0.8334	0.911829
	EAPE	29.1332	36.3584	39.025	43.2525	54.166	40.3871
	BPE	2.85232	4.098422	4.0748	4.39626	2.3642	3.557218

	ExPE	1.11293	2.637883	2.7253	2.06429	1.4525	1.998586
	ROI	14.27	12.78	11.5	11.97	11.95	12.494
	EPE	0.87444	1.612392	2.7886	2.75046	4.2399	2.453156
	DPE	27.1689	32.69164	32.734	41.2983	39.744	34.72741
	LAPE	23.7205	26.98127	27.544	33.7753	36.906	29.78534
	IPE	0.74888	1.32853	1.3575	2.80755	2.6969	1.787884
SIBL	LAIPE	0.90064	0.865964	0.8829	0.88582	1.6071	1.028499
	EAPE	32.7653	42.16427	41.429	50.7993	53.229	44.07742
	BPE	1.78475	2.321326	3.9544	4.66667	3.4067	3.226764
	ExPE	1.45291	1.714697	2.8124	3.15746	2.2995	2.287402
	ROI	14.03	14	14.03	14.03	14.5	14.118
	EPE	0.25602	0.81367	0.8403	0.72385	0.5645	0.639674
	DPE	53.3714	41.96583	37.977	30.1285	27.942	38.27702
	LAPE	37.2662	33.9284	27.121	24.4872	23.426	29.24584
	IPE	7.48923	4.845403	5.4174	3.9819	4.4488	5.236535
DBBL	LAIPE	0.83857	0.923937	0.8568	0.94492	0.9976	0.912362
	EAPE	62.5741	49.3751	45.648	36.62	33.982	45.63981
	BPE	8.06971	5.92026	4.9955	3.83786	2.0725	4.979176
	ExPE	6.24715	4.344996	3.484	2.31886	1.1812	3.515247
	ROI	13.85	13.62	12.96	11.55	11.82	12.76

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Testing Cointegration and Market Power in the American Crude Oil Industry

Corti Eliab Paul Lakuma[1]

[1] Department of Economics, University of Essex, United Kingdom

Correspondence: Corti Eliab Paul Lakuma, Economic Policy Research Centre, Makerere University Kampala, P.O. Box 7841, Kampala, Uganda. Tel: 256-414-541-022. E-mail: cortipaul@hotmail.com

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Abstract

I hypothesize that the merger activities, in the American crude oil industry, in the period 1990–1999 explains the highly concentrated industry in the period 2000–2012. The resulting structural change raises concern about the competitive aspects of the industry. In this study we attempt to capture the extent of market power in the industry using the Steen and Salvanes (1997) dynamic reformulation of the Bresnahan–Lau (1982) oligopoly model in an Error correction Framework. This model solves the inference problems emanating from use of non-stationary time series data, and incorporates dynamic factors inherent in the market such as habit formation and repeated interactions. The results suggest that the industry exercised market power both in the short run and in the long run in the period 2000–2012.

Keywords: crude oil, monopoly, concentration, market power, cointegration, vector error correction model, Neo Empirical Industrial Organization

1. Introduction

Crude oil is an important source of energy for the United States of America with daily production and imports valued at 5,658 and 8939 thousand barrels respectively (Note 1). Since the discovery of oil in America in the mid–19th century the American oil industry structure, performance and conduct has been debated on several occasions. A case in point is the allegations and subsequent investigation into monopoly practice against Standard oil and Texas Rail Road Commission in the early 19th century.

Separately, in the period 1990–1999 the industry witnessed a shift, in the business paradigm, from vertical to horizontal consolidation; very many firms merged. Interestingly, many of the firms previously competed against each other. Consequently, tacit collusion explains the overly concentrated industry in 2000–2012; characterised by fewer stronger firms.

Policy makers' major concern is that, more often, rapid industry consolidation manifest into high concentration and exercise market power. In turn, when firms exercise market power they restrict output, set prices above marginal cost and engage in rent seeking activities, this practice affects consumers and society welfare. However, the welfare loss due to exercise of market power is often offset by certain benefits. For instance, the prospect of monopoly profits is an incentive to firms to engage in innovations and research and development of new products which are beneficial to consumers and society.

Killian and Murphy (2010) have identified three attributes of the crude oil industry which facilitate the exercises of market power; (a) Inelasticity of demand and supply of crude oil (b) crude oil has no close substitute at least in the short-run (c) existence of quasi- imperfect information in the industry which make the product sensitive to politics and macro- economic variables. These factors call for regulation by the American Government. However, justifications for government intervention come from concrete quantitative and qualitative evidence of market power. Unfortunately, not much is known about the competitive aspects of the industry; probably due to a lack of data and appropriate models of analysis. Therefore, our study's main purpose is to investigate the structure, conduct and performance of the American crude oil industry and contribute to the existing methodology of oil industry analysis.

The purpose of this study is to explore and test the various oligopoly model methodology of measuring market power using the American crude oil industry as a case study. Therefore, we estimate the indices on market power

using the Steen and Salvanes (2007) dynamic variant of the Bresnahan and Lau (1982) oligopoly model. The model hinges on the identification of demand function to estimate the short-run and long-run indices of market power on the supply relation.

That said; part 2 of this study reviews the literature on evidence of industry structural change, examines an example of the theoretical underpinnings of market power and briefly analyse the past attempts at empirical estimation of market power; part 3 describes the source of data used; Part 4 specify the econometric model in error correction form; part 5 performs the tests needed to validate the existence of an error correction representation; part 6 presents the specification tests and results of estimates of the demand function and the supply relation and compares these results with other empirical studies. Finally, part 7 concludes with lessons drawn from the study and makes recommendations for future research.

2. Literature Review

2.1 Industry Structure: A Literature Review

By 1900, the American oil business was virtually a monopoly, symbolised by John D. Rockefeller's Standard oil with investments in production, marketing and management. However, following litigations conducted under the *Sherman act of 1890*, Standard oil was broken down, in 1917, opening the industry up to potential entrants. Thereafter, technology, new prospects and the rise of the Texas Railroad Commission sparked a movement of oil industry structure from monopoly to oligopoly (Nash, 1968).

Prior to the 1970's, most Texan and Californian pioneer oil firms were vertically integrated. Evidence of free entry and low prices witnessed in the 1960's suggest vertical integration enhanced competition. However, evidence also suggest that a combination of vertical integration and public policies such as oil depletion allowance and foreign tax credit promoted anti–competitiveness. For instances, greater economies of scale acquired through vertical integration was abused to control basic infrastructure, such as pipeline and refineries in the 1960's (Vieotor, 1984; Chandler, 1990).

Driven by technological, economic and regulatory conditions, the 1970's witnessed several divestures which suggest loss of perceived gains from vertical integration in contrast to contractual alternatives. For instance, UNOCOL sold its' downstream interest to TOSCO; SUNOCO and ASHLAND left the upstream market; while BP, Exxon Mobil, Shell/Texaco, and Chevron left the refining business to focus on crude oil production (Federal Trade Commission (FTC), 2004).

Between 1990 and 1999, over 2600 mergers materialised in the industry. For example, Exxon, the largest oil firm in the Americas, acquired Mobil the second largest firm, renaming the new venture Exxon–Mobil with a joint share of 3% of world production and HHI (Note 2) index changing from 288 to 299 (Note 3). The defence given by the apologist of such mass industrial consolidation was that firms will become more efficient owing to economies of scale gained after the mergers. However, mergers eliminate aggressive, price sensitive firms, which effectively eliminate a cartel destabilising factor. Additionally, mergers may change concentration of the industry creating pressure on price and competition. For instance, the BP /ARCO acquisition of Alaska North slope (ANS) crude was reversed because it would have been expensive for west coast refineries to substitute away from ANS crude in the short run in the face of a price increase by BP /ARCO (Note 4).

Counter intuitively, concentration does not necessarily breed market power and thus should be interpreted in the context in which it occurs. For instance, concentration can strengthen a firm capacity to compete with other dominant rivals and it lessens the capacity of a firm to supply collusively with a rival (General Accounting Office, 2004).

In the past, there has been minimal scholarly research on market power in the American crude oil industry (Note 5). An exception is Bolch and Damon (1978) who used the Hay (1973) model to show that regulatory policies such as taxes and extraction quotas enhance collusion resulting into high prices and low production as witnessed in the 1970's. We cannot, however, discount OPEC's supply shock and its significance in explaining high crude prices in the 1970's.

Kilian and Murphy (2010) using a structural VAR show that inability to substitute crude oil in the short-run and Inelasticity of demand imply that a highly concentrated industry could enforce at least a little but noteworthy permanent price increase. However, Hamilton (2009), in a rebuttal, argues that demand for oil is not absolutely inelastic. Thus, the legitimate responses to short-run price increase are consumers to demand less and producers to supply more, which ensures market clearance in the long-run.

Bernanke (2004) and Greenberger (2010) suggest that the impact of concentration and collusion on the crude oil market structure is economically small in comparison to the effects of speculative demand. The International

Monetary Fund (2005) estimates that oil prices increased by 40% in the winter of 2004 to $44.95 in the winter of 2005; while 95% of 2004 WTI spot prices fed through into the 2006 NYMEX future prices. This is in complete agreement with Morana (2010) and Juvenal (2012) who use a FVAR on Macro-financial data for the USA to conclude that macro financial news and financial shocks (which speculators react to) had influenced oil prices since 2000.

However, Turner et al. (2011) argues that, "*the oil market is characterised by multiple equilibrium, with a wide range of indeterminacy within which the price can settle. Thus, the vulnerability to potential instability derives from the structural character of the market, not simply from the presence of speculative financial investors."* To reinforce this view, Verleger (2007) postulate that speculation is usually accompanied by an inventory accumulation, not the depletion we have witnessed since 2000. Thus implying, the 2008/09 high prices were not correlated with speculation.

Though the interest of this study is to capture the extent of market power in the American crude oil industry, the influence of OPEC cannot be discounted. However, notice that the literature on OPEC is wide and beyond the scope of this study. Thus, we shall only focus on OPEC's direct role in relation to crude oil business in America. First, OPEC controls 77% of world oil reserves and produces 35–40% of World's output (Kohl, 2002).

Second, several market conditions destabilise the OPEC cartel. For example, inability to enforce cooperation among members; discovery of oil in non–member countries such as Canada, China, Australia, The North sea and East and West Africa; privatization of national oil companies in member countries and Inability of Saudi Arabia (the biggest producer) to adjust supply in the short-run. However, OPEC's ability to influence prices is un-contestable; for example between autumn of 2003 and spring 2004 OPEC reduced production by 1.9 MMBD, by winter 2003 prices were between $28-$40 per barrel and remained up throughout summer 2004 (Note 6).

Unlike OPEC, American oil companies function autonomously and command a comparatively insignificant share of the total world output. For example, Exxon Mobil controls only 3% of world's production. However, American oil corporations do have some relationships such as supply contracts, joint business ventures etc. with OPEC members or the cartel itself. It has been argued that these relationships hamper the ability of American corporations to set low prices due to shared interest with OPEC (FTC, 2004) (Note 7).

In conclusion, most of the past literature suggests that the industry exercised market power in the short run owing to increased mergers, effects of speculation and influence of OPEC. However, it is not clear whether such behaviour is extended to the long-run as demand and supply clears. And, it is the intent of this study to provide evidence on whether the change in structure, performance and conduct made crude oil firms charge a price above the marginal cost.

2.2 Theoretical Foundations of Market Power-The Cournot Oligopoly Model

An Oligopoly is a market structure characterised by few firms producing homogenous goods and exercising collective market power. To understand the implication of oligopoly behaviour, we follow Tirole's (1988) analysis of the one period Cournot game.

The profit function is given by:

$$\Pi^{i}\left(q_{i,}q_{j}\right)=q_{i}P\left(q_{i}+q_{j}\right)-C_{i}\left(q_{i,}\right) \tag{1}$$

The first order condition is as shown in (2) (Note 8):

$$\Pi^{i}{}_{i}=q_{i}P\left(q_{i}+q_{j}\right)-C_{i}^{'}\left(q_{i,}\right)+q_{i}P^{'}\left(q_{i}+q_{j}\right)=0 \tag{2}$$

Where the best response functions for i is written as (Note 9);

$$q_{i}=R_{i}\left(q_{j}\right) \tag{3}$$

From (2) $q_{i}P\left(q_{i}+q_{j}\right)-C_{i}^{'}\left(q_{i,}\right)$ represents the profits from the infra-marginal unit of output. While $q_{i}P^{'}\left(q_{i}+q_{j}\right)$ is the impact of an additional unit of output on additional profit (Note 10). Equation (2) implies that an additional unit of q_i reduces price P'. This affects the initially produced units q_i. Thus, firms in an oligopoly consider rivals decisions in choosing output because an extra unit of output reduces price. Surprisingly, each firm tends to renege on the agreed production so as to make more profits; if the rival firm detects this it will respond in a way that is least generous (Carlton & Perlof, 2000).

We can rewrite equation (2) as;

$$L_i = \frac{\alpha_i}{\varepsilon} \tag{4}$$

Where;

$L_i = \frac{P - C_i'}{P}$ is firmi′sindex of market power or Lerner index/price cost margin, this parameter must be positive for a firm to have a bad conduct. $\alpha_i = \frac{q_i}{Q}$ is firm i′′s market share which is positively related to the Lerner index, thus the greater the mark up the larger the market share and ε=- $\frac{P^i}{P}Q$ is the elasticity of demand which is inversely related to the Lerner index, thus the greater the elasticity the lesser the mark up (Note 11).

Shapiro (1989) generalizes Tirole (1988) representation to include many firms and periods by rewriting (4) as (Note 12);

$$\frac{P - C'}{P} = \frac{1}{n\varepsilon} \tag{5}$$

Notice that the left hand side of (5) is inversely related the number of firms (n). If $n = 1$ we obtain the monopoly equilibrium indicating that concentration is high whenever the numbers of firms are closer to one and indeed the price cost margin and market shares are higher. Conversely, as more firms join the industry the price cost margin shrinks as we approach a somewhat competitive equilibrium. The implication is that the Cournot equilibrium is between competitive and monopoly equilibrium (Note 13).

2.3 Empirical Attempts at Estimation of Market Power

2.3.1 The Structural Conduct Performance Paradigm (SCPP)

Edward Mason argued that market structure determines conduct, while conduct determines performance. Market structure is defined by the number of firms and how sales are distributed among firms, entry condition, and substitutability of products and the level of product differentiation. While conduct is characterised by decisions on pricing, supply, advertising, research and development, capacity amongst others and can be measured by price cost margins. Thus implying, the SCCP approach gives a good performance ranking to competitive firms and downgrades monopolist (Viscusi, 2005).

Prior to 1951, the SCCP analyses were mainly defined by case studies. Thereafter, Bain (1951) proposed the use of data to investigate the systematic differences between the price-cost margin, sales, and the rate of returns on investments between dominant and fringe firms. Given that collusion is unobservable, investigation of a connection between the source of collusion (market structure) and its effects (high profits) is imperative (Geroski, 1988). If such a relationship exists and it is significant we conclude that collusive pricing exists.

However the SCPP has been criticised for several reasons such as, being descriptive and not analytical, over aggregation industry wide data, measurement error, misspecification of performance and structure, conceptualisation problems in distinguishing long run and short run measure of performance and perhaps the best of them all, Cowling and Waterson (1976) and Clarke and Davies (1982) found simultaneity between the measure of concentration and price cost margin. Thus, it is difficult to observationally distinguish the effects of the two parameters (Note 14).

Nevertheless, SCPP is a good place to start measuring market power and the estimates are a good description of market equilibrium.

2.3.2 The New Empirical Industrial Organization (NEIO)

The Bresnahan–Lau Model

SCP reliance on comparative static and use of accounting data to establish industry conduct led to the rise of the NEIO. The NEIO utilises econometrics to estimate market power and recognises that each industry is unique and should be studied separately (Bresnahan, 1995). Following Steen and Salvanes (1997) we illustrate a variant of the NEIO approach using the Bresnahan–Lau (1982) static oligopoly model.

We write the demand function as;

$$Q = D\ (P, Z, Y; \alpha) + \epsilon \tag{9}$$

Where Q is Quantity demanded; P is price; Z and Y are vectors of exogenous variables or demand shifters for example GDP and Substitute price, α is a vector of unknown parameters which capture the effect of Z, Y and P on Q, and ϵ is the error term.

The supply function for a perfectly competitive market is written as;

$$P = C(Q, W; \beta) + \eta \quad (10)$$

Where $C(.)$ is the unknown marginal cost to be estimated (Note 15); W is a vector of exogenous factors or supply curve shifters for example Wage, Exchange rate, Interest rate, taxes etc; β is a vector of unknown parameters to be estimated and η is the error term.

If the industry is not competitive, the perceived marginal revenue must equal marginal cost, we can rewrite (10) as;

$$P = C(Q, W; \beta) - \lambda.h(Q, Z, Y; \alpha) + \eta \quad (11)$$

Notice that $P+h(.)$ is marginal revenue (MR), while $P + \lambda.h(.)$ is perceived marginal revenue; $h(.)$ is the infinitesimal change (derivative) of the inverse demand function with respect to Q and $\lambda$is the market power index.

If $\lambda = 1$, we obtain a perfect cartel; $\lambda = 0$, the industry is competitive and if $0 < \lambda < 1$, we obtain a variation of Oligopolistic models (Note 16). Notice that we do not put a negative sign in front of$\lambda$for mathematical convenience. Otherwise, λ is empirically negative.

The market power index λ is identified if the demand function has shift and rotation elements on the right hand side of (9). Bresnahan (1982) suggest use of interaction terms between exogenous vectors Z and Y and endogenous vector P. To grasp how this works we rewrite demand function as (12) and Marginal cost function (MC) as (13);

$$Q = \alpha_0 + \alpha_P P + \alpha_Z Z + \alpha_Y Y + \alpha_{PZ} PZ + \alpha_{PY} PY + \varepsilon \quad (12)$$

$$MC = \beta_0 + \beta_Q Q + \beta_W W \quad (13)$$

We can show that the supply relation is (14);

$$P = \beta_0 + \beta_Q Q + \beta_W W - \lambda\left(\frac{Q}{\alpha_P + \alpha_{PZ} + \alpha_{PY}}\right) + \eta \quad (14)$$

Notice that α_P, α_{PY} and α_{PZ} are known/scalar; while $Q^*$and Q are endogenous. Therefore, for λ to be identified as a coefficient capturing the effect of Q^*, We must have two exogenous vectors i.e. Z and Y (Note 17). Suppose PZ and PY were excluded from the demand function, notice it is not clear whether we are estimating MR or MC because Q and $Q^*= \frac{-Q}{\alpha_p}$ are observationally equivalent (Note 18). Therefore, summary statistic on competitiveness is identified on industry data, if and only if the demand function is inseparable in exogenous vectors Z and Y (Lau 1982) (Note 19).

Despite its popularity the static NEIO price cost margin and supply relation estimates are dependent on functional form chosen and specification of the demand function. Thus, industry inconsistent specifications yield biased estimates Kadiyali et al. (2001). Other problems were identified by Azzam and Anderson (1996) who note that the NEIO methodology attempt to estimate market power indices is very involving mathematically.

Phlip (1983), Pollak and Wales (1992), Slade (1995), Carlton and Perlof (2000) observe that the Static NEIO model is well informed to capture deviations from the Nash equilibrium. However, firms interact repeatedly and repeated interactions yields adjustment cost and demand shift and rotation. In addition, adjustment cost affects future profit streams and demand is not static, as implied by the model, but is conditional on the past information (habit formation). Thus, profit maximizing firms account for past behaviour in setting strategies.

Lucas (1967) observes that short run errors are explained by sticky prices and firms contractual obligations. Thus implying firms dynamically stagger their responses to price and demand movements through supply adjustments. Therefore, a static model such as Brasnahan- Lau (1982) does not capture such behaviour.

Lastly, the static model suffers from non-stationarity and serial correlation; notice the right hand side variables in equation (12) and (14) are I(1) variables and are correlated with the error terms. Therefore, a dynamic model which is better equipped to capture complex behaviour is warranted (see 4(a).for a reformulation of the BL–model in a dynamic form).

3. Basic Data

All the data is quarterly from 1986–2012 (see table 1), seasonally adjusted and all prices are constant. WTI crude spot price(P) and Brent (European) crude oil spot prices (Z) data sets are from The US Department of Energy website; deflated using US Consumer Price Index (2005) for the former and Europe Price Index (2005) for the later. The price indices were obtained from IMF's International Financial Statistics Website.

Separately, US field production of crude oil in thousands of barrels (Q) is seasonally adjusted and was obtained

from The US department of Energy.

Meanwhile, US Gross Domestic Product (GDP) (Y) in billions of chained 2005 dollars is seasonally adjusted at an annual rate, collected by The United State Department of Commerce, Bureau of Economic Analysis retrieved from the FRED2 website of Federal Reserve Bank of St. Louis.

Indeed: ($W1$) is Imports of oil drilling, mining and construction material and equipment index (2000 =100) seasonally adjusted from the U. S. Department of Labour and ($W2$) is U.S. Dollars exchange rate index (1997 = 100) the two variables were retrieved from The Fred2 Website of the Federal Reserve Bank of St. Louis; notice that, we were seasonally adjusted and rebased ($W1$) and ($W2$) to reflect the pattern of expenditure, wages and output in 2005 (2005 = 100). The weights were obtained from the US Consumer price index 2005 from IMF's International Financial Statistics Website.

Lastly, wage and compensation of employees received ($W3$), i.e., wage and salary disbursement in the American private industry in billions of Dollars is seasonally adjusted and obtained from the U.S. Labour Department website.

Table 1. Statistical properties of the main variables

Variable	Units	Mean	Std. Dev	Min.	Max
Q: Quantity of crude oil	1000bl	192829.7	32508.4	117899	279413
P: WTI crude spot price	US$/bl	37.5	27.3	10.05	138.93
Z: Brent crude spot price	US$/bl	37.4	30.2	10.50	138.1
Y: US GDP	2005 US$ B	10452.3	2147.8	7016.8	13558
W1: Oil inputs imports	(2005 =100)	1006.9	23.2	60.5	160
W2: Exchange rates	(2005 = 100)	95.6	21.5	60.2	130.1
W3: wages	US$ B	3597.2	1256.2	1674.8	5613.7
PZ		2286.4	3334.8	106.5	14051.6
PY		448343	406851	71928.1	1862931

4. Methodology

4.1 Specification and Identification of the Econometric Model

The NEIO methodology utilises time series data, which has ramifications on inference ascribing from non–stationarity of data. Usually, first differencing renders the series stationary and validates estimation by Ordinary Least Square; the pitfall with this approach is that we lose a lot of long run information (Note 20). Engle (1987) suggest the use of the Error Correction Mechanism to adjust present disequilibrium in the next period (Note 21). Therefore, to account for the shortcomings of the Bresnahan and Lau (1982) model in 2(c).2, we follow Steen and Salvanes (1997) in rewriting the demand function in equation (12) in an Auto Regressive Distributed Lag (ADL) model with one lag and no intercept as (Note 22);

$$Q_t = \alpha_{P0} P_t + \alpha_{P1} P_{t-1} + \alpha_{Z0} Z_t + \alpha_{Z1} Z_{t-1} + \alpha_{Y0} Y_t + \alpha_{Y1} Y_{t-1} + \alpha_{(PZ)0} (PZ)_t + \alpha_{(PZ)1} (PZ)_{t-1} + \alpha_{(PY)0} (PY)_t + \alpha_{(PY)1} (PY)_{t-1} + \alpha_{Q1} Q_{t-1} + \epsilon_t \quad (15)$$

The long run stable coefficients are obtained if

$$Q_t = Q_{t-1}\ ; P_t = P_{t-1}\ ; Z_t = Z_{t-1}; Y_t = Y_{t-1};\ (PY)_t = (PY)_{t-1}; (PZ)_t = (PZ)_{t-1} \quad (16)$$

The long run demand function takes the form in (17);

$$Q = \left(\frac{\alpha_{P0} + \alpha_{P1}}{1-\alpha_{Q1}}\right)P + \left(\frac{\alpha_{z0} + \alpha_{Z1}}{1-\alpha_{Q1}}\right)Z + \left(\frac{\alpha_{Y0} + \alpha_{Y1}}{1-\alpha_{Q1}}\right)Y + \left(\frac{\alpha_{(Pz)0} + \alpha_{(Pz)1}}{1-\alpha_{Q1}}\right)PZ + \left(\frac{\alpha_{(PY)0} + \alpha_{(PY)1}}{1-\alpha_{Q1}}\right)PY$$
$$= \theta_P P + \theta_Z Z + \theta_Y Y + \theta_{PZ} PZ + \theta_{PY} PY \quad (17)$$

To incorporate short run coefficients we add and subtract

$$Q_{t-1},\ \alpha_{P0} P_{t-1},\ \alpha_{Z0} Z_{t-1},\ \alpha_{Y0} Y_{t-1},\ \alpha_{PZ0} (PZ)_{t-1},\ \alpha_{PY0} (PY)_{t-1}$$

from the independent variables of equation (17). Resulting to (18)

$$\Delta Q_t = \alpha_{P0}\Delta P_t + (\alpha_{P0} + \alpha_{P1})P_{t-1} + \alpha_{Z0}\Delta Z_t + (\alpha_{Z0} + \alpha_{Z1})Z_{t-1} + \alpha_{Y0}\Delta Y_t + +(\alpha_{Y0} + \alpha_{Y1})Y_{t-1}$$
$$+\alpha_{PZ0}\Delta(PZ)_t + (\alpha_{PZ0} + \alpha_{PZ1})(PZ)_{t-1} + \alpha_{PY0}\Delta(PY)_t + (\alpha_{PY0} + \alpha_{PY1})(PY)_{t-1} + (\alpha_{Q1} - 1)Q_{t-1} + \epsilon_t \quad (18)$$

From (18) the parameters of the differenced variables ($i.e., \alpha_{P0}, \alpha_{Z0} \ldots.$) are the short run effects on $\Delta Q_t$of an exogenous disturbance. Meanwhile, the parameters of the lagged levels are partial sums of increasing transitional effects.

We may generalize the American crude oil demand function (18) from ADL form to an Error Correction econometric model with K lags as shown in equation (19)

$$\Delta Q_t = \alpha_t + \sum_{i=1}^{3} D_{t,i} + \sum_{i=1}^{k-1} \alpha_{Q,i}\Delta Q_{t-i} + \sum_{i=0}^{k-1} \alpha_{P,i}\Delta P_{t-i} + \sum_{i=0}^{k-1} \alpha_{Z,i}\Delta Z_{t-i} +$$
$$\sum_{i=0}^{k-1} \alpha_{Y,i}\Delta Y_{t-i} + \sum_{i=0}^{k-1} \alpha_{PZ,i}\Delta(PZ)_{t-i} + \sum_{i=0}^{k-1} \alpha_{PY,i}\Delta(PY)_{t-i}$$
$$+ \gamma^*[Q_{t-k} - \theta_P P_{t-k} - \theta_Z Z_{t-k} - \theta_Y Y_{t-k} - \theta_{PZ}(PZ)_{t-k} - \theta_{PY}(PY)_{t-k}] + \epsilon_t \quad (19)$$

Where:

$$\theta_i = \frac{\alpha_j^*}{\gamma^*}, \; j = P, Z, PZ \quad (20)$$

From (19) stationary variables are in differences and they capture the contemporaneous effects on ΔQ_t of an exogenous disturbance; while non–stationary variables are in levels (in brackets), they represent error correction of deviations from the long-run equilibrium. Notice that the bracketed terms ensure cointegration and are residuals of equation (17). For instance, θ_Z is the unknown coefficient capturing the long run effect of Z_t on Q_t and each period errors are corrected at speed γ^*. Intuitively, γ^* is the rateof adjustment of past equilibrium errors corrected in subsequent periods. In other words, γ^* is the impact of deviations of ΔQ_t from the long run solution. Notice that the stability requirement $\alpha < 1$ must be satisfied such that $\gamma^* < 0$. Therefore, the stability condition shows the inverse relationship between the terms in differences and the terms in levels (in brackets) on the right hand side of (19).

To estimate the long-run parameters we need to convert the non linear bracketed terms in equation (19) to linear form. Bardsen transformation dictates that we divide the coefficient of the partial sums of short run effects α_j^* by the rate of error correction γ^*as illustrated in (20) (Note 23).

The variables in (19) are defined as;

Q_t = US Production of Crude oil in Thousands of barrels

D_t = Seasonal dummies

P_t = WTI Spot price of Crude oil per barrel

Z_t = Brent spot price of crude oil per barrel

Y_t = US GDP in billion of Dollar

PY_t, PZ_t= Interaction terms

Meanwhile, the static supply relation in (14) can be rewritten as:

$$P_t = \beta_{Q0}Q_t + \beta_{Q1}Q_{t-1} + \beta_{w0}W_t + \beta_{w1}W_{t-1} + \beta_{P1}P_{t-1} + \lambda_0\left(\frac{Q_t}{\theta_P + \theta_{(PZ)}Z_t + \theta_{(PY)}Y_t}\right)$$
$$+ \lambda_1\left(\frac{Q_{t-1}}{\theta_P + \theta_{(PZ)}Z_{t-1} + +\theta_{(PY)}Y_{t-1}}\right) + \eta_t$$
$$= \beta_{Q0}Q_t + \beta_{Q1}Q_{t-1} + \beta_{w0}W_t + \beta_{w1}W_{t-1} + \lambda_0 Q_t^* + \lambda_1 Q_{t-1}^* + \beta_{P1}P_{t-1} + \eta_t \quad (21)$$

The long run stable coefficients are obtained if;

$$P_t = P_{t-1}, \; Q_t = Q_{t-1}, \; W_t = W_{t-1}, \; Q_t^* = Q_{t-1}^* \quad (22)$$

The long run ADL supply relation then takes the following form;

$$P = \left(\frac{\beta_{Q0} + B_{Q1}}{1 - \beta_{P1}}\right)Q + \left(\frac{\beta_{W0} + \beta_{W1}}{1 - \beta_{P1}}\right)W + \left(\frac{\lambda_0 + \lambda_1}{1 - \beta_{P1}}\right)Q^* \quad (23)$$

We add and subtract P_{t-1}, $\beta_{Q0}\,Q_{t-1}$, $\beta_{W0}\,W_{t-1}$, $\lambda_0 Q_{t-1}^*$from the right hand side of (23) to incorporate the short

run effects and rearrange the equation to obtain the generalized Error Correction representation of the dynamic supply relation of the American Crude oil Industry with K lags in (24)

$$\Delta P_t = \beta_0 + \sum_{i=1}^{3} D_{t,i} + \sum_{i=1}^{k-1} \beta_{P,i}\, \Delta P_{t-i} + \sum_{i=0}^{k-1} \beta_{P,i}\, \Delta Q_{t-i} + \sum_{i=0}^{k-1} \beta_{W,1} \Delta W1_{t-i} + \sum_{i=0}^{k-1} \beta_{W,2} \Delta W2_{t-i} + \sum_{i=0}^{k-1} \beta_{W,3}\, \Delta W3_{t-i} + \sum_{i=0}^{k-1} \lambda_i\, \Delta Q^*_{t-i} + Tr + \psi^* \left[P_{t-k} - \xi_Q Q_{t-k} - \xi_{W1} W1_{t-k} - \xi_{W2} W2_{t-k} - \xi_{W3} W3_{t-k} - \Lambda Q^*_{t-k} + \eta_t \right] \quad (24)$$

Where

$$Q_i^* = \frac{Q_t}{(\theta_P + \theta_{(PZ)} Z_t + \theta_{(PY)} Y_t)} \text{ and } \Lambda = \frac{\lambda^*}{\psi^*}, \xi_Q = \frac{\beta Q^*}{\psi^*}, \xi_W = \frac{\beta W^*}{\psi^*} \quad (25)$$

Notice that the exogenous vector W is partitioned into 3 dimensions, denoted as; $W1_t$, $W2_t$ and $W3_t$=Import Price Index, Exchange rate index and Wage in billions of dollar respectively.

λ =Short run index of market power

Λ = Long run index of market power.

Tr = Time trend representing technological purchases/improvement.

From equation (19) the variables in differences are the stationary short run parameters, while the bracketed terms in levels are the non-stationary long run parameter. The bracketed terms ensure cointegration, they can be interpreted as residuals of equation (23) and are estimated using the Bardsen transformation as shown in (25).

Meanwhile, ψ^* is the rate of adjustment of past equilibrium errors corrected in subsequent periods. In other words, ψ^* is the effect of deviations of ΔP_t from the long run solution. Notice that the stability requirement $\beta < 1$ must be satisfied such that $\psi^* < 0$. Consequently, the stability condition shows the inverse relationship between the terms in differences and the terms in levels (in brackets) on the right hand side of (24).

Notice that we use long run parameter θ_P, θ_{PY} and θ_{PZ} also known as elements of demand curve vertical shift and rotation to identify the short run (λ and λ_0) and long run (Λ) indices of market power.

5. General Dynamic and Reduced Form Results

5.1 Test of Integration

A unit root test is justified by the setup of equations (19) and (24), the variables in differences are $I(0)$ (stationary) while variables in level are $I(1)$ (non- stationary). Usually, a combination of two variables not integrated of the same order invalidates inferences and complicates interpretation. However, if the two variables are cointegrated, familiar asymptotic inferences and interpretation of coefficients are valid (Note 24).

To validate whether the variables satisfy the$I(0)$ $I(1)$ (stationary/non- stationary) framework, we follow Green (2008) to write the Augmented Dickey Fuller (ADF) test (1979) as (Note 25);

$$\Delta Y_t = \theta Y_{t-1} + \sum_{i=1}^{k} \Delta Y_{t-1} + \epsilon_t \quad (26)$$

Where $\epsilon \sim \text{iid}\ (0, \delta_t^2)$. We test the null $\theta = 0$ against $\theta < 0$, failure to reject the null is evidence of a unit root. Lags were chosen using the Schwarz Criterion. We reject the null that the variable is non stationary in first differences (see results on table 2).

Table 2. Augmented dickey-fuller test for unit root (n= 101)

	Levels	Lag(s)	First Difference	Lag(s)
(*Q*) Quantity of crude oil	-2.49	4	-4.09***	4
(*P*) WTI Spot price of Crude oil	-0.90	3	-7.06***	2
(*Z*) Brent spot price of Crude oil	-0.35	3	-7.16***	2
(*Y*) USA GDP	-0.75	2	-4.24***	1
(*W1*) Oil Inputs imports	0.50	4	-5.71***	3
(*W2*) Exchange rates	-1.86	2	-6.70***	1
(*W3*) Wages	- 0.34	3	-3.81***	2
***(Significance) at 1%, **5%, *10%				
Critical values from Fuller (1976; pg 373)				

5.2 Test of Cointegration

From 5(a).1 we are satisfied that the variables are stationary in differences and non-stationary in levels. We proceed to implement a cointegration test by Johansen (1988) to verify the existence of a long- run relationship between the stationary variables in differences and the non- stationary variables in levels. If such a relationship exist and it is robust, then there exist an error correction representation for the demand function in (19) and the supply relation in (24).

Following Bentzen and Engsted (1993), a Vector Auto-Regression of non-stationary variables of order P can be represented as (27);

$$X_t = \zeta + \Pi_1 X_{t-1} + \cdots + \Pi_k X_{t-1} + \epsilon_t \quad (27)$$

Where ζ is a $(PX\ 1)$ constant term, Π_i is a (PXP) matrices of lagged variables. Notice equation (27) has an error correction representation in (28);

$$\Delta X_t = \zeta + \Pi_k X_{t-1} + \cdots + \sum_{i=1}^{P-1} \Gamma_i \Delta X_{t-1} + \epsilon_t \quad (28)$$

Where;

$X_t = (Q, P, Z, Y, PZ, PY)_t \quad for\ the\ demand\ function.$

$X_t = (P, Q, W1, W2, W3)_t \quad for\ the\ supply\ relation.$

$\Gamma_i = -I + \Pi_1 + \cdots + \Pi_i, \ i = 1, \ldots . (k-1),$

$\epsilon \sim iid\ (0, \Omega)$ and Π_k is long run lagged level coefficient

A long run relation exists if matrix Π has reduced rank $r < p$. Implying there exist $\Pi = -\alpha\beta'$ where α is a (pxr) matrix denoting the error correction rate and β is (pxr) matrix of cointegrating vectors (Note 26).

To account for simultaneity while estimating the cointegrating vectors, we include the exogenous vectors Z and Y and W among the right hand side variables of the supply relation and demand function respectively. The lag length was chosen using the Schwarz criterion.

We establish existence of four cointegrating vectors in both the demand function and supply relation using the trace test. While the conservative eigenvalue test confirms two cointegrating vectors for the demand functions and one cointegrating vector for the supply relation at 5% level of confidence (The result are reported on Table 3).

Table 3. Multivariate cointegration test for the VAR system in (28) maximum eigenvalue and trace statistics reported (n=101) Lag = 4

	Max. eigenvalue	Trace stat.
1 cointegrating vector r = 0	87.9**	276.2**
2 cointegrating vectors r = 1	57.9*	192.5**
3 cointegrating vectors r = 2	37.5	131.6*
4 cointegrating vectors r = 3	29.4	96.6*
5 cointegrating vectors r = 4	24.3	67.2
5 cointegrating vectors r = 6	19.9	47.5
Supply relation		
1 cointegrating vector r = 0	123.7*	277.1*
2 cointegrating vectors r = 1	52.4	158.2*
3 cointegrating vectors r = 2	36.3	103.9*
4 cointegrating vectors r = 3	36.1	69.3
5 cointegrating vectors r = 4	15.7	38.5

** Significant at 1% * Significant at 5% ; Critical values from Osterwald-Lenum (1992).

5.3 Test of Separabilty

From chapter 5(a).2 both the trace statistics and maximum eigenvalue tests confirmed that the $I(0)$ and $I(1)$ variables are cointegrated. Therefore, we now establish that the cointegrated demand function in (19) is not separable in its rotation and shift arguments.

Lau (1982) generalizes a formal result for this in the famous "impossibility" theorem, which states that for any continuous, twice differentiable industry demand and marginal cost function, summary statistic on market power is identified if and only if the demand function is inseparable in the shift and rotation variables (PZ and PY) regardless of the functional form selected (see part 2.3.2) (Note 27).

We use the Johansen and Juselius (1992) exclusion framework which is equivalent to a test of weak exogenity of the interaction arguments of the demand function. Notice that a test of $[PY, PZ] = 0$ is no different to the idea of Granger causality. Therefore, if we do not reject the null, then PZ and PY vectors are weakly exogenous. Thus implying the demand function is separable. Intuitively, the exclusion joint and individual test verifies the existence of cointegrating vectors in the restricted model. Note that we must identify all the meaningful cointegrating vectors (in Table 2) and test all the associated coefficients diagonal to the vectors (Note 28).

We strongly rejected the null hypothesis, implying that the demand curve is not separable, both in the joint test and the individual test. The results are shown on Table 4.

Table 4. Separability test: maximum eigenvalue and trace statistics reported

Joint separability test		Individual separability test			
$H_O: \hat{\beta}_{1,PZ} = \hat{\beta}_{2,PZ} = \hat{\beta}_{1,PY} = \hat{\beta}_{2,PY} = 0$		$H_O: \hat{\beta}_{1,PZ} = \hat{\beta}_{2,PZ} = 0$		$H_O: \hat{\beta}_{1,PY} = \hat{\beta}_{2,PY} = 0$	
Max	Trace	Max	Trace	Max	Trace
58.2**	130.9***	33.9*	86.1**	40.3**	80.1**

**Significance at 1%, * Significance at 5%.

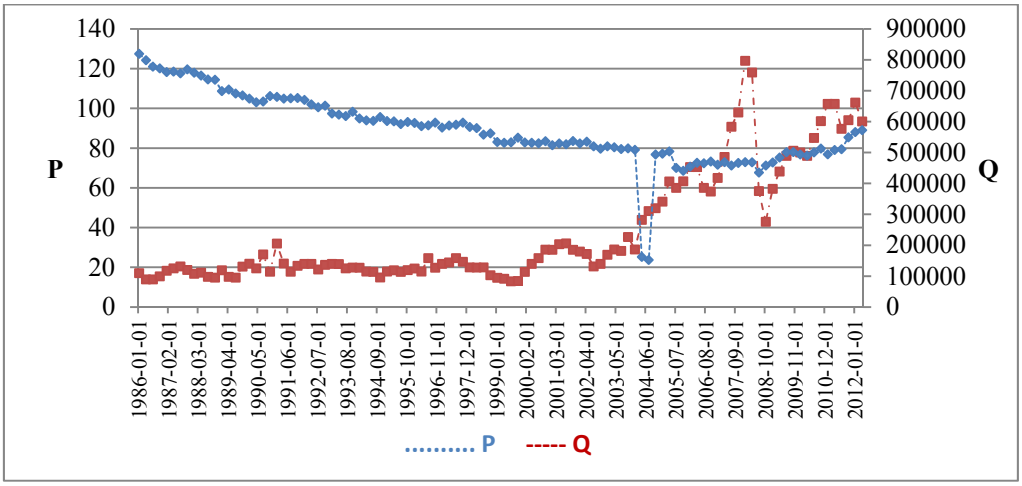
6. Result

6.1 Specification Tests and Structural Estimation

Based on the results of the general dynamic and reduced form representation, the model is identified; we may now proceed with estimation. We start by assuming that the residuals in equation (19) and (24) are $\epsilon \sim \text{iid}\ (0, \delta_t^2)$, $\eta \sim \text{iid}\ (0, \delta_t^2)$, $E(\epsilon, \eta) = 0$ and are uncorrelated with the exogenous vectors Y, Z and W.

The null hypothesis is perfect competition $H_O: [\Lambda, \lambda] = 0$, the alternative is exercise of market power $H_1: [\Lambda, \lambda] < 0$.

Notice that between 1990 and 1999 over 2600 mergers occurred in the US Crude oil Industry, leading to a overly concentrated industry in the period 2000 -2012 (Note 29). In the initial period, 1986–1999, prices and production were fairly constant and there were no dramatic jumps in prices apart from a brief stint in 1991 during the Iraq war; we believe that firms acted competitively in that period. In contrast, 2000–2010 was marked by high market concentration-, dramatic upward price movements and persistent production cuts. We suspect that such behaviour points to the exercise of market power (see figure1 below).



Figrue 1. WTI spot price (P) and quantity of crude oil (Q) from 1986 q1 to 2012

Based on this information, we will split the data set to reflect the three distinct periods i.e. 1986–2012, 1986–1999 and 2000–2012. We implement individual unit root tests in (26) and cointegration test in (28) for the demand and supply VAR systems of the split data set i.e. 1986–1999 and 2000–2012 (results not reported). The lag length is chosen according to sample size, where the sample is above 60 we use the Schwarz Criterion. Conversely, if the sample size is below sixty the Akaike Information Criteria is utilized (Note 30).

Three seasonal dummies were included in both equations to account for cyclical seasonal increase in demand of crude oil during the summer driving season and cold American winters (Note 31).

Visibly P and Q in the demand function (19) and supply relation (24) are simultaneously determined. Thus, two Stage Least Squares (2SLS) were used to estimate both equations. Notice all the elements in the exogenous vector W and the time trend are used as instruments for P, PZ and PY in equation (19). Equally, the exogenous Vectors Y and Z are used as instruments for endogenous variable Q in equation (24).

On a different note, to ensure inferences the standard errors of the long run parameters are constructed by approximating the joint probability distribution of the long-run parameters from prior knowledge of their variance and covariance matrices; popularly known as the Delta method (Note 32).

Several specification tests on the demand function were carried out. For instance, we failed to reject the null hypothesis at 1 % level of confidence after performing the Sargan over identification of instruments test $[nR_1{}^2 = 101(0.0407) = 4.1107]$. Thus, indicating that our instruments are exogenous. The Breusch–Godfrey test indicated that we may have a 4thorder serial correlation. However, this is nothing to worry about because serial correlation does not affect consistency of estimates of a dynamic model. Yet we should be concerned about ARCH effects (Note 33). We fail to reject the null of no ARCH effect $[nR_1{}^2 = 100(0.0356) = 3.56]$ at 1% level. Finally, the Ramsey (1969) RESET test indicated that our model is not misspecified (Note 34). Stata12 software is used for estimation and X-12 Arima was used to remove seasonality.

6.2 Structural Estimation Results

6.2.1 Demand Function

The R^2 for three period is between 80 and 86% indicating that the regressions fits well. Additionally, the demand function has at-least two cointegrating vectors (see table 2). Due to presence of interaction terms PZ and PY we only interpret the estimates of long-run elasticities and the speed of adjustment parameter (Note 35).

Following Steen and Salvanes (1997) the formulas for own price, cross price and Income elasticity are given by $\epsilon_{PP} = \left[\theta_p + \theta_{PZ}\bar{Z} + \theta_{PY}\bar{Y}\right]\frac{\bar{P}}{\bar{Q}}$,$\epsilon_{YY} = [\theta_Y + \theta_{PY}\bar{P}]\frac{\bar{Y}}{\bar{Q}}$ and $\epsilon_{PZ} = [\theta_Z + \theta_{PZ}\bar{P}]\frac{\bar{Z}}{\bar{Q}}$ respectively.

The estimates (see table 5) suggest that the American demand for crude oil was price elastic in 1986–2012 (-5.2), fairly elastic in 1986–1999 (-1.57) and inelastic in 2000–2012 (-0.81) .The jump in demand elasticities from elastic in 1986–1999 to inelastic in 2000–2012 suggests that the industry underwent a structural change from a competitive market structure in 1986–1999 to an oligopoly in 2000–2012.

The magnitude of demand inelasticity (-0.81) is consistent with the persistent price increases and supply cuts

witnessed in the period 2000–2012. Indeed, if a monopolist is facing an inelastic demand curve, it raises it price and reduces output to earn more profits.

In contrast, the elastic demand (-1.57) point to the ability of consumers to substitute away from highly priced American crude oil, in the long run, in the period 1986–1999. It also represents the progress made by Americans in research and development of efficient use and substitution of crude oil for alternative source of energy such as natural gas, coal, nuclear energy and shale gas. However, crude oil still accounts for 38% of the American energy mix and may not be absolutely substituted in the short run. Additionally, elastic demand suggests that there was little or no disruption to the American economic activity in the period 1986–1999; this is consistent with theory.

Table 5. 2SLS estimates of the demand function in (19) quarterly data from 1986 to 2012

	1986-2012 Lags = 2	1986-1999 Lag = 1	2000 -2012 Lags = 2
α_0	1150.2 (815.5)	-767.3 (3603.6)	-987.2 (4113.4)
$D_{t,1}$	-3503 (4743)	-2873.5** (2347)	1786.3 (4820)
$D_{t,2}$	-207.3 (5667.8)	-9863.7*** (1703)	310.6 (4291)
$D_{t,3}$	747.3 (5783.3)	-7658.3*** (1309)	-6019 (3631)
$\alpha_{Q,1}$	1.019 (0.19)		-0.21* (0.10)
$\alpha_{P,0}$	-56.4 (1475)	-4172.8* (24809.3)	1293.1 (2903.1)
$\alpha_{P,1}$	-1070 (1268)		-1571.3 (2800.9)
$\alpha_{Y,0}$	-14.3** (2.73)	-337 (10.3)	-11.79 (22.9)
$\alpha_{Y,1}$	-3.07 (7.02)		-2.47 (14.2)
$\alpha_{Z,0}$	352.9*** (68.2)	-255.2*** (83.6)	241.7*** (99.8)
$\alpha_{Z,1}$	-6.7 (77.9)		63.5 (124.3)
$\alpha_{PY,0}$	0.047 (0.34)	6.7* (3.3)	-0.98** (40)
$\alpha_{PY,1}$	0.24 (0.17)		0.21 (.36)
$\alpha_{PZ,0}$	-3.09 (2.06)	-13.1 (22.7)	3.76** (1.87)
$\alpha_{PZ,1}$	-2.8* (1.3)		-0.252 (1.37)
γ^*	-0.67*** (0.17)	-0.31*** (0.083)	-0.029*** (0.0083)
Long run parameters			
θ_P	-12983.7 (8893.3)	412.04 (4264.07)	1071.09 (4038.1)
θ_Y	53.2*** (8.992)	26.03** (11.17)	18.97*** (0.91)
θ_Z	2521.1 (3495.8)	24139.19 (15079.2)	105.3 (1053.0)
θ_{PY}	-1.28*** (0.409)	-1.19*** (0.32)	-0.24*** (0.081)
θ_{PZ}	-8.31 (43.2)	-331.21 (417.9)	13.04 (7.85)
Long run elasticities			
ϵ_{PP}	-5.3	-1.57	-0.81
ϵ_{YY}	0.22	0.20	0.31
ϵ_{PZ}	0.44	1.52	0.33
R^2	0.91	0.94	0.71
$Adj.R^2$	0.87	0.93	0.63

Standard errors calculated using the Delta Method see Green (2007); *** Significant 2.5%, **Significant at 5%, * Significant at 10%.

Crude oil is a normal and necessary good as predicted by positive and below unity income elasticities. The low values of income elasticities (< 1) suggest that American household incomes are growing at a faster rate than oil demand. This is consistent with Hamilton (2009) who shows that a slow growth in petroleum use as a country develops is a common trend in other OECD countries, where the percentage increase in energy consumption is less than the percentage increase in income. For instance, we could argue that for each 1986–1999 dollar of income, oil demand increased by 20 cents.

However, this evidence may reflect transitory adjustment unique to the sample period, notice that growth of oil intensive activities in the new emerging economies (India, Brazil, China etc.) since 2004 suggest that demand for oil will increase in the future (Note 36).

The jump in income elasticity from 0.20 in the period 1986–1999 to 0.31 in the period 2000–2012 suggest that demand for crude oil is positively correlated with economic growth. Notice that the US real GDP per capita has grown from $18,438 in 1986 to $48,388 in mid 2012. Equally, oil consumption per capita has remained constant at 0.68% for the same period (Note 37).

Cross price elasticity indicate that Brent Spot Market and WTI spot market are substitute markets, notice the value for the period 1986–1999 (1.52) is economically large.

The adjustment parameters are -0.67, -0.31 and -0.029 for the period 1986–2012,1986–1999 and 2000–2012 respectively. All these values are negative and signify a positive short run deviation in demand from the long run

equilibrium. The adjustment parameter is comparatively larger in the period 1986–1999, suggesting larger short run demand deviations probably in response to consumer price sensitivity (demand elasticity) in 1986–2012 (Note 38). In the end, error adjustments are not done instantly but with a lag. For example, in the period 1986–1999, we have one lag on quarterly data; therefore, short run errors were corrected in 3 month.

The estimates of the static demand function are shown on table 6. The R^2 are between 0.73 and 0.93, which points to multicolinearity and correlation problems. The elasticity of demand is within theoretical predictions. However, the estimates for income elasticities, suggest crude oil is an inferior good. This contradicts other empirical studies and economic theory and raises doubts about the validity of the static model.

Table 6. 2sls estimate of the static demand function in (12).

	1986–2012	1986–1999	2000–2012
α_0	447588.4*** (29892.1)	594331.2*** (50712.1)	577781.2*** 99307.6)
$D_{t,1}$	-9656.0*** (2479.3)	817.9 (2288.4)	1941.6 (32887.9)
$D_{t,2}$	-14182.6*** (2503.4)	-8407.3*** (2273.1)	-5252.5 (3352.3)
$D_{t,3}$	-2291 (2477.8)	-10061.5*** (2197.6)	-12265.9 (3401.60)
α_P	-3909.4*** (1017.1)	-16877.8*** (3008.3)	-709.9 (3364.6)
α_Y	-36.4*** (7.6)	-31.4 (6.7)	-35.1*** (8.2)
α_Z	128.9 (91.4)	-427.2** (184.2)	241.5** (95.3)
α_{PY}	0.44** (0.17)	0.55 (0.34)	0.18 0.256)
α_{PZ}	-77.1*** (21.7)	373.1*** (54.6)	7.91** (3.41)
Static elasticities			
ϵ_{PP}	-0.77	-0.49	0.79
ϵ_{YY}	-1.97	-0.86	-3.8
ϵ_{PZ}	0.007	0.008	0.05
R^2	0.93	0.95	0.73
$Adj.R^2$	.92	0.94	0.66

*** Significant at 2.5% level, ** Significant at 5%, 8 Significant at 10%.

6.2.2 Supply Relation

The supply relation has at least one cointegrating vector (see table 3). All the adjustment parameters (ψ^*) are significant and the positive values indicate that there was a negative short run deviation in supply from the long run equilibrium this suggest a production cut in all periods (see table 7).The jump in the adjustment parameter from 0.0000607 in the period 1986–1999 to 0.15 in the period 2000–2012 suggest a lead–lag relationship in production. We could argue that, given that crude oil has no close substitute, producers intentional cut supplies in the 1986–1999 to pave the way for a price increase in 2000–2012. This is analogous to the Cournot oligopoly model in 2(b). Alternatively, we may argue that on detecting that demand was increasingly inelastic in the period 2000–2012, producers decided to preserve the persistence in high prices by adjusting the deviations in short-run supply by 15% to avoid any dramatic fall in prices in the long-run (Note 39).

The test of joint significance of the adjustment parameters in the periods 1986–2000 and 2000–2012 is constructed in (22). We state the hypotheses as;

$H_0 : {\psi^*}_{2000-2012} = {\psi^*}_{1986-1999}$,

$H_1 : {\psi^*}_{2000-2012} < {\psi^*}_{1986-1999}$.

$$t_{50} = \frac{{\psi^*}_{2000-2012} - {\psi^*}_{1986-1999}}{\sqrt{[se({\psi^*}_{2000-2012})^2 + se({\psi^*}_{1986-1999})^2]}} \sim N(0,1) \quad (22)$$

We obtained a *t* value of 47.81, Thus we reject the null hypotheses is in favour of the alternative at 5 % level of significance. This suggests the industry was competitive in 2000–2012.

On one hand, our results suggest the industry exercised a statistically significant degree of market power both in the short run (λ_1=33% and λ_2=19%) and the long run (Λ =37 %) in the period 2000–2012. The 95% and 97.5% confidence interval of (Λ= 37 %) are (-0.28, -0.39) and (-0.27, -0.41) respectively. Notice these intervals are between 0 and -1 as predicted by theory. On the other hand, notice that the short run market power indices are insignificant for the period 1986–2012 and 1986–1999.

More profound, in the period 2000–2012, the supply relation has 3 lags on quarterly data; arguably, the short run last for 9 months. And, given that the merger activities eliminated potential competitors, the existing firms exercised seasonal market power for 9 months. Consequently, owing to increased market shares and higher

concentration, the existing firms continued to charge a price above the marginal cost in the long run (after 9 months). This result is consistent with the explanation of equation (5) (Note 40).

The test of joint significance of market power for the period 1986 -1999 and 2000–2012 (see equation 22) yield a t statistics of 2.02 leading to rejection of the null hypothesis for the alternative at 5% level of significance, suggesting that the industry was competitive in the period 1986–1999.

To convert the price cost margin into a Lerner index we follow Buschena and Perlof (1991) in rewriting equation (4) as $\frac{-\Lambda}{\epsilon} = \frac{P-C_i^{'}}{P}$ where $\epsilon = |\epsilon_{PP}|$ and we conclude that the industry charged a long run mark up of 0.46 in the period 2000–2012.

Meanwhile, the static supply relation (see table 8) predicts that the industry was competitive in the period 2000–2012, a contradiction of the dynamic estimates. However, the static model variables are not stationary and thus the estimates are necessarily spurious.

Table 7. 2sls estimates of the supply relation in (24), quarterly data from 1986–2012

	1986–2012 Lags = 2	1986–1999 Lag = 1	2000–2012 Lags = 3
β_0	0.68 (0.46)	-0.83 (1.65)	3.94 (2.39)
$D_{t,1}$	102.1 (1093.7))	0.44 (0.577)	-4.23 (2.77)
$D_{t,2}$	-2168.7** (1009.2)	0.045 (0.83)	0.38 (2.65)
$D_{t,3}$	-7.71 (1133.2)	-0.39 (0.71)	3.03 (2.65)
$\beta_{P,1}$	0.09 (0.040)		0.0009 (0.172)
$\beta_{P,2}$			-0.239* (0.13)
$\beta_{Q,0}$	-0.0006*** (0.00008)	0.0019*** (0.00008)	0.0003 (0.00002)
$\beta_{Q,1}$	-0.00035 (0.00005)		0.0003*** (0.00003)
$\beta_{Q,2}$			0.0003*** (0.0001)
$\beta_{W1,0}$	0.018 (0.101)	-0.136 (0.144)	0.59 (0.9)
$\beta_{W1,1}$	-0.206* (0.10)		-0.95 (0.55)
$\beta_{W2,0}$	-0.79*** (0.11)	0.039 (0.103)	0.36 (0.41)
$\beta_{W2,1}$	0.213* (0.13)		-038 (0.39)
$\beta_{W2,2}$			-0.029 (0.017)
$\beta_{W3,0}$	-0.006 (0.0043)	-0.005 (0.0057)	0.013 (0.011)
$\beta_{W3,1}$	0.028*** (0.0046)		0.029** (0.017)
λ_0	-0.00024 (0.00017)	-0.0061 (0.476)	-0.04* (0.027)
λ_1	0.00016 (0.00023)		0.33** (0.029)
λ_2			0.19** (0.062)
ψ^*	0.13*** (0.0043)	0.0000607* (0.00000)	0.15*** (0.056)
Long run parameters			
ξ_Q	0.039** (0.08)	0.00043*** (0.0000)	-6.53*** (1.87)
ξ_{W1}	0.133*** (0.0206)	-0.087*** (0.0042)	0.010** (0.19)
ξ_{W2}	-0.889*** (0.062)	-0.056*** (0.001)	-0.009*** (0.002)
ξ_{W3}	0.033*** (0.0000)	-0.085*** (0.0057)	0.009*** (0.0000)
Λ	-0.047*** (8893.3)	0.49 (0.40)	-0.37*** (0.020)
R^2	0.92	0.57	0.88
$Adj.R^2$	0.91	0.53	0.85

Standard errors estimated using delta method, see Green (2007).

Table 8. 2sls estimates of the static supply relation (in 14)

	1986–2012	1986–1999	2000–2012
β_0	-99.9 (59.45)	111.9*** (29.7)	113 (126.3)
$D_{t,1}$	2.221 (3.7)	0.0093 (1.38)	3.8 (4.5)
$D_{t,2}$	3.45 (2.7)	-0.295 (1.27)	6.19 (4.73)
$D_{t,3}$	2.93 (2.38)	1.09 (1.25)	2.57 (5.23)
$\beta_{Q,}$	-0.0004*** (0.0001)	0.0003*** (0.00008)	0.00016 (0.00002)
β_{W1}	-0.27 (0.18)	0.0028 (0.149)	-0.429 (0.53)
β_{W2}	-0.88*** (0.17)	-0.4239 (0.150)	-1.87 (0.49)
β_{W3}	0.007 (0.018)	-0.103*** (0.08)	0.043 (0.44)
λ_{Static}	-0.007 (0.013)	-0.081*** (0.02)	-0.044 (0.27)
R^2	0.97	0.81	0.85
$Adj.R^2$	0.94	0.75	0.83

*** Significant at 2.5%, **Significant at 5%, *significant at 10%.

6.3 Comparison with Other Studies

Estimates of this study are consistent with other studies that realised inelastic long run price elasticity, positive but lesser than unity long-run income elasticity and a significant degree of market power. Discrepancy between our study and other scholars could emanate from misspecification of the model; properties of the residuals and differences in econometric model; country being studied; methodology; data and periods estimated.

Cooper (2003) obtained long run price elasticity estimate of -0.45 using a variant of Nerlove partial adjustment model on American time series data for the period between 1979–2000. Moreover, Brown and Phillip (1989) obtained -0.56 using the same model and country (Note 41). These results are in the neighbourhood of our 2000–2012 estimate (-0.81). In contrast, Tsirimokos (2011) using the same model and country on time series data from 1980–2009 obtained a price elasticity value of -0.066, a very high value of inelasticity.

Meanwhile, Ghouri (2001) estimated a polynomial distributed lagged model on time series data for the period 1980–1999 for America, Canada and Mexico. His results yielded a long run income elasticity close to unity (0.98) which is similar to that obtained by Tsirimokos (2011). These estimates are not close to any of our results. However, our results are comparable to Gately and Huntington (2001) and Ziramba (2010) who predicted 0.56 and 0.429 respectively, for OECD countries by the former and South Africa by the later.

Finally, there has been very little disclosure or study on competition in the US crude oil industry. Regardless of this, Slade (1987) used a static version of the NEIO models in studying market power in the American retail gasoline sector and obtained a Lerner index of 0.10. Shapiro (1987) predicted the same index too, albeit insignificant, using Hall's model on panel data for US crude oil companies from 1945–1989. These estimates are not close to our 2000–2012 Lerner index estimate of 0.59.

7. Conclusion

The intention of this study is to study the degree of concentration in the American crude oil industry in the period 2000–2012explained by collusion, merger and acquisition activity witnessed between 1999–2000; we used the Steen and Salvanes (1997) dynamic variant of the Bresnahan and Lau (1982) model. This approach has limited data requirements and parsimonious functional form for the demand function and supply relation, which enable us not only to adjust for short run errors from the long run solution, but also to validate the standard error through the error correction framework, ensuring inference and hypothesis testing. Our results suggest that between 2000–2012 the industry exercised market power both in the short run and long run and the long run mark up was 37%.The static model was found to produce conflicting results, probably due to autocorrelation of the independent variables and presence of unit root.

However, the Steen and Salvanes (2007) model has weaknesses too. For instance, its' reliance on the stationary/non stationary frame work is problematic. Precisely, the error correction representation requires that variables be integrated of the same order. For our case the variable had to be $I(1)$ in levels and $I(0)$ in first differences. A possible solution is to relax the Unit root/ stationary constraint by using mean reverting variables i.e. fractional integration in designing the error correction representation (Note 42).

Separately, multicollinearity is seemingly ubiquitous in the model. Perlof and Shen (2001) propose the use of log transformation to deal with such linear relationships. We, however, doubt whether linearization preserves the statistical properties of the marginal cost function; given that the model is sensitive to functional forms (Note 43).

Ostensibly, the model is partially dynamic and hinges on discrete maximization of profits each period, there is need to improve on this approach in order to capture the dynamism in the market. A possible solution is the use of continuous time series as expounded in differential equations and Hamiltonian maximization methods.

Perhaps best of them all, it would be interesting to interpret the individual short run parameters of the demand function and supply relation by performing an impulse response analysis. We recognise this would be a difficult process given that the model is non–linear, we propose further research into this area.

More importantly, our results should not be regarded as conclusive evidence of existence of market power in the American crude oil industry.

Notice that the demand function did not explicitly capture all factors that affect oil consumption; such as interest rates, exchange rates and taxes. It is likely that GDP as a proxy for demand shift does not approximate these variables robustly. Also, notice that two quarters of 2012 are missing from our data set. This could translate into bias in the estimates.

Additionally, the market power indices could be capturing other factors such as the impact of limited

infrastructural and skills investment in the sector; effects of hurricane Katrina in 2005; OPEC's supply cuts; depleted American oil wells; tightening demand due to economic expansion in China, India, Brazil etc.; inability of refineries to adjust in the short run to increased demand for *lightsweet crude,* required by low sulphur composition crude oil legislations in California and other south western states; depreciation of the dollar in 2004 and the effects of speculation (Note 44).

It is possible that, rents, probably, exist in the industry for legitimate reasons and are a reflection of production cost, location and geology of the oil wells and difference in quality, which does not necessarily imply exercise of market power (Montgomery, 2002).

Also, it is possible that anti–competitiveness in the American Crude oil industry is not unique to 2000–2012. This could imply that the industry has been anti- competitive all along. Producers may have deliberately steered clear of increasing prices in the period 1986–1999 in anticipation for prices to rise in the long run owing to labour cost and adjustment cost (Note 45).

In conclusion, we suppose that our study gives an accurate picture of the nature of competition in the American crude oil industry given the high number of acquisition in 1986–1999 our results suggest that between 2000–2012 the industry mark-up was 37% above the marginal cost.

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Notes

Note 1. http://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbblpd_a_cur.htm

Note 2. Herfindarl Hirschman Index (HHI) = sum of squared market share of all firms in the market.

Note 3. Several other dominant firm mergers materialised see FTC (2004) pp. 136.

Note 4. See FTC (2004).

Note 5. Most market power models have extensively studied the agricultural industryor OPEC behaviour, see perlof et al (2007) and Ayed Al Qahtani et al (2008).

Note 6. See GAO (2004).

Note 7. Exxon Mobil has investments in Nigeria, an OPEC member and in 1997; Saudi's ARAMCO bought a stake in MOTIVA which acquired the downstream business of Shell and Star Enterprise.

Note 8. For sufficiency theorem, uniqueness and existence of a solution, see Shapiro (1989) and Tirole (1988).

Note 9. Firms produce the same output in the symmetric game.

Note 10. $q_i P'(q_i + q_j) = 0$implies perfect competition and q_i =Industry output for a monopolist.

Note 11. $Q = (q_i + q_j)$.

Note 12. Repeated games generate multiple equilibria, the folk theorem validates the solution to this game, see Krep, (1990) and Sexton (1994).

Note 13. See Shapiro (1989).

Note 14. See Sperling (2002).

Note 15. Because marginal cost is an industry estimate, the BL model does not suffer from multiple equilibrias see Perlof et al (2007), see Fisher and McGowan, (1983).

Note 16. There are several interpretation of λ see Deodhar and Sheldon (1995) and Corts (1998).

Note 17. See Perlof et al (2007) for a graphical exposition.

Note 18. $Q^* = \frac{-Q}{\alpha_P + \alpha_{PZ} + \alpha_{PY}}$.

Note 19. See Lau (1982), Goldman and Uzawa (1964) for a formal proof on separability.

Note 20. Davidson and McKinnon (1993) show that OLS estimator are super consistent, asymptotic inference apply, when used with cointegrated variables.

Note 21. see Sargan (1964) use of ECM.

Note 22. We suppress the intercept because we assume that if all other variables are zero the price and production of oil would be zero and vice versa.

Note 23. See Steen and Salvanes (1997) and Bardsen (1989).

Note 24. See Hualde (2008).

Note 25. The augmentation is to account for serial-correlation.

Note 26. See Hamilton(1994) for an exposition of canonical relationships and FIML estimation of β.

Note 27. See Goldman and Uzawa (2010).

Note 28. SeeHall and Milne (1994).

Note 29. See (GAO, 2004).

Note 30. See Liew (2004).

Note 31. Structural dummies were rejected by data, hence were dropped.

Note 32. See Green(2007).

Note 33. See Green(2007).

Note 34. The suppy relation is constructed with elements from the demand function. Thus if the demand function is well specified so is the supply relation.

Note 35. Interaction terms renders interpretation of individual coefficient meaningless See Wooldridge (2009).

Note 36. See Krichene (2005) and ITF (2008).

Note 37. See Tsirimokos (2011).

Note 38. Adjustment parameter should between 0 and -1.

Note 39. See Krichene (2005).

Note 40. Steen and Salvanes (1997).

Note 41. Cited by Cooper (2003).

Note 42. See Sperling (2002); Sinclair (2011).

Note 43. We estimated the log version of the model, and it was rejected by data.

Note 44. Hamilton (2009).

Note 45. Krichene (2005).

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An Analysis of the LPCs' Returns in the Middle East Markets: The Search for the Efficient Frontier

Anas Al Bakri[1]

[1] Department of Management and Marketing, College of Business and Economics, Qatar University, Qatar

Correspondence: Anas Al Bakri, Department of Management and Marketing, College of Business and Economics, Qatar University, Doha, P.O.BOX 2713, Qatar. Tel: 974-4403-5047. E-mail: anasbakri@qu.edu.qa

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Abstract

This paper analysed the performance of selected property companies (PCs) stocks returns observed over the time period from Jan 2007 to June 2012. The analysis is based on the Markowitz Model and the Single Index Model (SIM). This paper focused on the results from the Markowitz Model in particular, as the SIM is a simplified approach. The selection of the assets for either portfolio was exhaustive relying on various reputable data sources reporting financial characteristics of each stock. The specific criteria for selecting an asset in all portfolios are volume, P/E ratio, return on equity, positive returns and data sufficiency. Thus, the current study considered PCs stocks with large trading volume to avoid daily swings in security prices. The study compared the return on equity (ROE) of each stock with the ROE of its real estate sector, selecting only those stocks that historically outperformed the sector. PCs with unusually high P/E ratios and those with missing P/E data were excluded. Monthly returns were used for the calculations. The analysis of the results clearly indicated the significance of selecting an appropriate time span for the historical stocks returns used for calculating the efficient frontier. It was shown in this paper that the estimated parameters of the models differ considerably when different time frames are chosen for the analysis. In addition the number of observations used for the calculations has great ramifications on the accuracy of the estimates. As long time spans do not reflect the current character of stocks it becomes important to keep the intervals between observations as narrow as possible. The efficient frontiers for both models were analysed and justifications for the inclusion and exclusion of certain stocks were discussed. Certainly, it is important to note that the outcome of this paper is specific to the PCs stocks that were included in each portfolio and during the period in which this paper was conducted. Also this study concluded that as Real Estate market becomes more volatile, such results may not hold due to greater imbalances and global market inefficiency.

Keywords: efficient frontier, property companies, Markowitz model, Single Index model, portfolio, real estate market

1. Introduction

1.1 The Objective of the Study

The main purpose of this paper is to analyse the performance of selected property companies (PCs) stocks returns observed over the time period from Jan 2007 to June 2012. The analysis is based on the Markowitz Model and the Single Index Model (SIM). The Markowitz Model and the SIM are factor models that can be used to predict portfolio volatility and expected returns. The Markowitz model, which was introduced in 1952, allows investors to calculate the single combination of securities from a given population that offer the lowest volatility of returns over the preceding period. The model shows a simple geometric graph of the trade-off between risk and return, the frontier itself is a composition of many portfolios; more specifically the efficient portfolios are a subset of minimum variance portfolios offering the highest return for each level of risk (Frino et al., 2001). The Single Index Model was introduced by Sharpe in 1963 which replaced the exact but cumbersome Markowitz formula for portfolio volatility with a simplified approximation that assumed that all the interrelationships among securities returns could be attributed to the fact that they respond differently to the pull of a single factor, which are the returns to the market itself. The aim of applying these models to the selected PCs stocks is to find efficient portfolios of shares. An efficient set is defined as a group of portfolios for which a higher return cannot be obtained for the same variance, or a lower variance is not possible for the same return (Marashdeh, 2007). The

investment opportunity set has a minimum variance, which is a group of portfolios that have the lowest possible variance achievable for the population of property stocks, given their expected rates of return. Finding the efficient frontier allows for minimizing risk given a certain required expected rate of return.

This paper focuses on the results from the Markowitz Model in particular, as the SIM is a simplified approach. The SIM assumes that stocks returns are correlated for one reason only, which is that stocks respond to the pull of a single force, usually the market portfolio (Lintner, 1965). This implies that as the market moves in a certain direction stocks will follow it. However, this simplified analysis has its drawbacks. When using this model the actual variances of portfolios are not calculated, but only estimated. Due to the limitations of the SIM this study laid more emphasis on the Markowitz model.

2. Method

2.1 Data and Selection Criteria

The data consist of a selection of the Middle Eastern PCs stocks observed over time period from Jan 2007 to June 2012. The selection of the assets for either portfolio was exhaustive relying on various reputable data sources reporting financial characteristics of each stock. The specific criteria for selecting an asset in all portfolios are volume, P/E ratio, return on equity, positive returns and data sufficiency. Thus, this research considered PCs stocks with large trading volume to avoid daily swings in security prices. We compared the return on equity (ROE) of each stock with the ROE of its real estate sector, selecting only those stocks that historically outperformed the sector. PCs with unusually high P/E ratios and those with missing P/E data were excluded. Monthly returns were used for the calculations. However, in order not to encompass the weekly data, the monthly observations were derived be averaging the weekly prices before calculating the monthly returns. The average is arguably a better representation of the month's prices than randomly selecting one observation that would represent the month. Table 1 shows the selected PCs in this study, which includes PC name, used symbol, country and stock markets names.

Table 1. Selected PCs from Middle East property markets

Name	Symbol	Country	Industry	Stock Exchange
Saudi Real Estate	SRECO	KSA	Real Estate	(KSA) Tadawul Stock Ex
Emaar Properties	EMAR	UAE	Real Estate	Dubai Stock Ex
Deyaar Development	DEYR	UAE	Real Estate	Dubai Stock Ex
Sorouh Real Estate	SOROUH	UAE	Real Estate	Abu Dhabi Securities Ex
Kuwait Real Estate	KRE	Kuwait	Real Estate	Kuwait Stock Ex
Abyaar Real Estate Development	ABYAAR	Kuwait	Real Estate	Kuwait Stock Ex
Barwa Real Estate	BRES	Qatar	Real Estate	Doha Securities Market
Qatar Real Estate Investment	QRES	Qatar	Real Estate	Doha Securities Market
Arab Real Estate Development	ARED	Jordan	Real Estate	Amman Stock Exchange
Egyptian Real Estate Group	AREG	Egypt	Real Estate	Cairo & Alexandria Stock Ex

Source: Developed for this Study, Arabian Business (2012); MCSI (2011); Local Stock Exchange Markets (2012).

Based on Markowitz's work, and in the context of domestic market, Sharpe (1964), Lintner (1965) and Mosin (1966) independently develop one of the most famous financial equilibrium models, the Capital Asset Pricing Model, which is referred to as the CAPM. In their model they assume that markets are segmented. The development of this model played a very important role in establishing the foundation of the modern portfolio theory. Errunza et al, (1992) mentioned that CAPM is an equilibrium economic model for valuing stocks by relating risk and expected return. It provides a precise prediction on this relationship (Errunza et al, 1985; Errunza et al., 1992). The model is graphically represented by the capital market line and Single Index Model which is implied by the following relationship:

$$\mathrm{E}(r_i) = r_f + \beta_i \left[\mathrm{E}(r_m) - r_f\right] \tag{1}$$

Where $\mathrm{E}(r_i)$ and $\mathrm{E}(r_m)$ denote the expected return on security i and the market portfolio, r_f is the return on risk-

free security and β_i (beta) measures the sensitivity of security i to the market risk factor- the slope of the line-, and it is quantified by:

$$\beta = \frac{\text{cov}(r_m, r_i)}{\text{var}(r_m)} \tag{2}$$

Where cov (r_m, r_i) is the covariance of returns of the i th asset with the market var(r_m) is the total risk of the i th asset. This total risk can be partitioned into two parts by using ordinary least squares as follow:

$$\text{var}(R_i) = \beta_i^2 \text{ var}(R_m) + \text{var}(e) \tag{3}$$

Where β_i^2var (R_m) is the market risk (systematic risk) or the diversifiable risk, which is the portion of an asset's risk that cannot be eliminated via diversification? This risk indicates how including a particular asset in a diversified portfolio will contribute to the riskiness of the portfolio, in other words this sort of risk relates to general market movements. var(e) is the firm- specific risk or (unsystematic risk) that can be diversified or eliminated away (cancel out) by including the security as part of diversifiable portfolio (Marashdeh, 2007). According to the Cho et al., (1986); Mittoo, Usha (1992), when using CAPM framework, the stock returns follow a SIM and multi–factor model:

$$R_{it}^J = E_{it} + \sum_{k=1}^{S} \beta_{ik} \delta_{kt} + u_{it} \tag{4}$$

where R_{it} and E_{it} are the actual and expected returns on stock i respectively in period t, δ_{kt} is the k th risk factor, β_{kt} is the sensitivity of stock i to the k th factor, and u_{it} is a normally distributed error term with mean zero. By assuming no arbitrage opportunities the expected returns on stock i becomes:

$$E_{it} = R_{Ft} + \sum_{k=1}^{s} \lambda_k \beta_{ik} \tag{5}$$

Where R_{Ft} is the risk free rate, and λ_k is the risk premium associated with the k th factor.

3. Emerging Property Markets in the Middle East

Global property investors are aware that the growth in the purchasing power of the domestic market is fantastic for the long-term profitability of all investments in the ME property markets (Akhtar, 2011). Therefore, generally, the future predictions for the property market in the ME countries are positive (IMF, 2012). Tables 2 and 3 present statistics for selected property markets and top fifty of PCs in the Middle East.

Table 2. Emerging property markets in the Middle East top of 50 PCs (all prices are in USD) December 2012

Country	Ranging	Number of Companies	Total Market Capital*	Total Net Profit	Total Assets	Average Share Price	Average % Increase
KSA	1	19	64.51 B	21.98 B	71.41 B	11.87	27.68
UAE	2	10	30.66 B	28.42 B	63.18 B	0.75	33.42
Qatar	3	7	29.2 B	9.69 B	26.17 B	10.73	11.68
Kuwait	4	6	22.19 B	3.21 B	45.55 B	1.96	65.27
Oman	5	2	12.06 B	1.029 B	6.51 B	2.51	58.27
Jordan	6	2	11.55 B	0.812 B	5.47 B	8.53	17.05
Syria	7	1	4.08 B	938 M	4.60 B	N/A	6.90
Lebanon	8	1	2.43 B	224.19 M	2.57 B	19.70	19.11
Bahrain	9	1	3.24 B	94.3 M	N/A	N/A	37.0
Egypt	10	1	1.98 B	N/A	N/A	2.45	4.8
Total		50					

Source: Developed for this study. Arabian Business, (2012); CIA Fact (2011).

Market capital: Represents the aggregate value of company or a stock. It is obtained by multiplying the number of shares outstanding by their current price per share.

Table 3. Top fifty PCs in the Middle East

#	Company	Country	Market Capital	Net Profit	Total Assets	Share Price	% Increase
1	Emaar Properties - UAE	UAE	6.52 B	832.51 M	16.54 B	1.07	73.89
2	Dar Al Arkan Real Estate Development	KSA	4.95 B	628.32 M	5.38 B	6.88	15.44
3	Ezdan Real Estate	Qatar	3.50 B	373.12 M	1.90 B	7.67	3.33
4	Jabal Omar Development	KSA	3.46 B	12.01 M	1.79 B	5.15	-4.93
5	ALDAR Properties	UAE	3.37 B	939.15 M	13.56 B	1.31	23.08
7	Barwa Real Estate	Qatar	2.88 B	85.22 M	6.69 B	10.97	31.68
8	Emaar The Economic City	KSA	2.57 B	77.87 M	2.54 B	3.03	26.82
9	Sorouh Real Estate	UAE	2.40 B	506.31 M	4.62 B	0.96	10.31
10	Arkan Building Materials	UAE	2.39 B	79.47 M	697.25 M	1.37	-20.19
11	Southern Province Cement	KSA	2.24 B	210.95 M	732.97 M	16.00	28.76
12	Saudi Cement	KSA	1.58 B	165.68 M	1.21 B	15.47	2.65
13	Yamama Saudi Cement	KSA	1.41 B	162.90 M	957.07 M	10.43	15.34
14	Yanbu Cement	KSA	1.39 B	149.26 M	693.27 M	13.20	26.92
15	Qassim Cement	KSA	1.38 B	137.79 M	605.38 M	30.67	42.41
16	Deyaar Development	UAE	1.24 B	112.31 M	3.07 B	0.22	58.00
17	Mabanee	Kuwait	1.23 B	21.70 M	804.42 M	2.68	43.56
18	Makkah Construction &Development	KSA	1.22 B	59.19 M	1.10 B	7.41	18.80
19	Kuwait Cement	Kuwait	1.21 B	15.02 M	834.26 M	2.09	6.78
20	Mena Holding	Kuwait	1.13 B	92.37 M	983.20 M	1.88	211.54
21	Qatar National Cement	Qatar	1.11 B	113.73 M	784.48 M	24.77	12.96
22	Eastern Province Cement	KSA	1.07 B	115.79 M	586.80 M	12.48	17.0
23	Mohammad Al Mojil Group	KSA	1.07 B	152.11 M	978.30 M	8.53	-9.30
24	United Development	Qatar	1.06 B	160.43 M	2.04 B	9.93	2.27
25	Arabian Cement	KSA	1.01 B	86.44 M	977.32 M	12.64	52.41
26	IFA Hotels and Resorts	Kuwait	1.01 B	130.56 M	968.43 M	2.44	11.11
27	Qatar Shipping Company	Qatar	998.08 M	142.39 M	1.50 B	9.07	-12.00
28	Arabtec Holding	UAE	984.17 M	261.05 M	2.58 B	0.82	33.63
29	Gulf Cable and Electrical Industries	Kuwait	980.37 M	11.28 M	826.06 M	4.67	35.35
30	Union Properties	UAE	948.59 M	207.93 M	5.24 B	0.26	43.61
31	Saudi Real Estate	KSA	860.78 M	31.21 M	846.46 M	7.17	36.55
32	Commercial Bank International	UAE	784.85 M	35.23 M	3.06 B	0.63	49.15
33	The Commercial Real Estate	Kuwait	781.23 M	50.41 M	1.39 B	0.45	2.28
34	Saudi Arabian Amiantit	KSA	756.12 M	62.75 M	1.20 B	6.55	39.49
35	Saudi Ceramics	KSA	743.31 M	47.44 M	417.25 M	29.73	4.69
36	Taiba Holding Company	KSA	729.98 M	42.71 M	954.73 M	4.87	3.40
37	Raysut Cement	Oman	702.91 M	70.41 M	305.59 M	3.51	22.67
38	Qatar Real Estate Investment	Qatar	650.91 M	85.63 M	1.60 B	7.53	-5.8
39	Jordan Cement Factories	Jordan	646.21 M	69.80 M	403.05 M	10.69	17.05
40	Saudi Cable	KSA	624.20 M	56.55 M	911.88 M	8.21	16.23
41	Saudi Hotels and Resort Areas	KSA	585.16 M	32.80 M	520.66 M	8.48	39.1
42	Red Sea Housing Services	KSA	559.99 M	57.07 M	267.48 M	18.67	-6.35

43	Drake and Scull International	UAE	539.99 M	27.24 M	261.21 M	0.25	22.97
44	Ahli United Bank – Investment Funds	Bahrain	243 M	94.3 M	N/A	N/A	37
45	Gulf Cement	UAE	525.77 M	0.58 M	493.36 M	0.64	3.98
46	Afaq for Investment and RE Develop	Jordan	509.77 M	11.40 M	144.10 M	6.37	0.00
47	Oman Cement	Oman	503.65 M	32.57 M	345.45 M	1.52	94.68
48	Gulf Holding Company	Qatar	415.73 M	9.38 M	460.48 M	5.20	8.62
49	Gulf Holding Company–Syria Projects	Qatar	408.84 M	9.38 M	460.15 M	N/A	6.90
50	Egyptian Real Estate Group	Egypt	198.01 M	N/A	N/A	2.45	4.8

Sources: Developed for this study – Local Stock Exchange Markets; IMF (2012) ; AMF (2012).

4. Markowitz Model

The efficiency of portfolios has been a topic for debate over the last twenty years within the body of finance literature. Depending on time periods analysed and types of assets invested in, the answer to efficiency varies. However, the implications for investment opportunity abound if it can be demonstrated that funds either are or are not efficiently priced assets. If individual assets are less than efficiently priced then a strategy application of efficiently selecting these assets using modern portfolio and Minimum Mean-Variance Portfolio (MVP) analysis would tend to be financially rewarding (Wu, 2008).

4.1 Analysis of the Results

When analysing the calculated expected returns and standard deviations it can be observed that QRES has the highest expected return (1.96%) followed by ABYAAR (1.86%) and SRECO (1.2%). Their respective standard deviations are 6.32%, 7.1% and 5.04%. It can be presumed that these stocks will have a large weight in the high return portfolios, because compared to the other PC stock returns these are the most profitable. In building portfolios correlation coefficients negative ones, allow for effective risk diversification. However, QRES, ABYAAR and SRECO will probably constitute a relatively low weight in the low risk portfolios, due to their high standard deviations, but here again the correlation coefficients must be taken into account. A stock with high volatility of returns can be included in a low risk portfolio if its correlation with the stocks in the portfolio is low. On the other hand, DEYR has a negative expected return (-0.32%) and a relatively high standard deviation (6.33%). As it has a negative expected return it is highly unlikely it is going to be included in the high-return portfolios, but its correlation will determine it's in the low risk portfolios.

4.2 Analysis without Short Selling

The MVP strategy (Trust) seeks to maximize total return primarily through capital appreciation and dividend income. In this study the global MVP consists of nine PCs stocks. AREG is the only stock that is not included in the Global MVP. This can be explained by its high risk to expected return ratio and high correlation compared with the other stocks. Although ARED and KRE have lower expected returns (0.58% and 0.1% respectively) and approximately the same level of standard deviations, their weight allocation in the portfolios is larger than of AREG. This is due to the individual correlation of stocks. SRECO has the highest weight in the MVP (22.04%). However since it has a relatively low expected return (0.1%) its weight decreases as higher expected return portfolios are selected. It can also be observed that QRES has the highest expected return (1.96%) followed by ABYYAR (1.86%). These securities have a large weight in the high return portfolios, because of their high expected returns.

4.3 Analysis with Short Selling

Short selling is known as the selling of stocks that are not in the possession of the investor at the time of sale. The investor is hence selling a stock that is borrowed from someone else with intent of repurchasing it at a later date and returning it to the lender of the stock (Haugen, 1997). In real life, very few investors have the opportunity if unrestricted short selling. The global minimum variance portfolios are similar in the cases of short selling and no short selling in the sense that AREG is not included (1.38% sold short). The reason why the stock is short sold is the same why it was excluded from the MVP with no short selling; the combination of its expected return, standard deviation and its correlation coefficients. As portfolios with higher returns are analysed the pattern is that ARED, KRE, DEYR, and SOROUH are being short sold at an increasing rate while the rest of the stocks of the portfolio constitute higher weights. The reason for this is DEYR has a negative expected return (-0.32%), whish increases the overall expected return of the portfolio. In portfolio 1, which has the highest

expected return (9.88%), EMAR and QRES have the highest weights of 228.43% and 131.05% respectively. This is mainly due to KRE and DEYR being heavily short sold (324.13% and 250.67% respectively). ARED and SOROUH are also short sold (74.15% and 33.31% respectively). The extent to which KRE and DEYR are short sold can pose a problem as short selling induces risk, because if the price of the stock that is short sold is rising while the prices of the other stocks in the portfolio are falling the investor is losing at both ends. However, if the price of the short sold stock is falling it is profitable because the stock will be bought back at a lower price that it was purchased. Short selling can therefore be the case of "feast or famine" as it can be very profitable, but at the same very risky. Also, as the correlation coefficients are mainly positive, investors will prosper from one position, but suffer from the other.

5. Single Index Model (SIM)

The single index model implicitly assumes that two types of events produce variability in a stock's rate of return. We refer to the first type of event as a macro event. These events affect nearly all firms to a certain degree and may affect the general level of stock prices. They cause a change in the rate of return to the market portfolio, which dye to the pull of the market changes the rates of return on individual stocks. Micro events on the other hand influence specific firms with little impact on other stocks. The single index model is essentially used to estimate the betas of various stocks, which give the measure of the risk of shares. The beta factor of the stock is an indicator of the degree to which the stock responds to changes in the return produced be the market. If the market portfolio is efficient than a perfect linear relationship should exist between the beta factor of stocks and their expected rates of return.

5.1 Analysis with Short Selling

Considering Short Selling in the Single Index Model, stocks that have low return and comparatively higher risks than other stocks are short sold in order to take advantage of their "under-performance". Table 4 illustrates the analysis stocks with decreasing weights in the portfolios.

Table 4. Stocks with decreasing weight in portfolios on the efficient frontier

Stock	Risk (SD)	Volatility (BETA)	Expected Return	Risk/Return
ARED	4.57692	0.99395	0.59203	7.730892016
KRE	4.10774	0.81341	0.09827	41.80054951
DEYR	6.32993	0.92908	-0.31633	-20.01052698

The contribution of ARED, KRE and DEYR in portfolios along the efficient frontier is reduced because higher expected return is required. These stocks were short sold in order to allocate more funds in other stocks, which had higher expected return. Consider Table 5 where all the other stocks are analysed.

Table 5. Stocks with increasing weight in portfolios on the efficient frontier

Stock	Risk (SD)	BETA	Expected Return	Risk/Return
AREG	4.68706	1.22562	0.92802	5.050602358
QRES	6.315	0.74227	1.95641	3.227851013
ABYAAR	7.0857	0.9297	1.91685	3.3696533375
BRES	4.60249	0.7908	0.87675	5.249489592
SRECO	4.94321	0.97381	1.29475	3.817887623
EMAR	5.80332	0.97369	0.947	6.12810982
SOROUH	11.5492	1.01082	1.00292	11.51557452

Analysing the above table it can be seen that the risk to return ratio in the stocks is better than the stocks continuously sold short in the portfolios. SOROUH, EMAR, ABYAAR, and AREG returns are comparatively higher than the stock short sold in the portfolios. It can also be observed that as we move along the efficient frontier the weight of short selling stocks decreases and weight in other the stocks increases. The highest

allocations were made in QRES, ABYAAR and SRECO. Although QRES has a high risk-return ratio, the low beta value justifies the stability compared to the other stocks in the portfolio. Similarly, ABYAAR and SRECO both have a higher risk to return ratio but the weight allocated increase due to their low betas.

5.2 Analysis without Short Selling

In the case of no-short selling the possible selection of stocks becomes limited. The performance of various stocks in the portfolio is divided into following three tables. The stocks with increasing weight, the stocks with decreasing weight and the varying weight stocks. Table 6 includes stocks for which the weights increase as we move along the efficient frontier.

Table 6. Stocks with increasing weight in portfolios along the efficient frontier

Stock	Risk (SD)	BETA	Expected Return	Risk/Return
QRES	6.315	0.74227	1.95641	3.227851013
ABYAAR	7.0857	0.9297	1.91685	3.696533375
EMAR	5.80332	0.97369	0.947	6.12810982

The above table illustrates the stocks that have high weight allocation in the portfolios along the efficient frontier because of their expected return, risk-return ratio and correlation with respect to the market index. QRES has a comparatively lower risk-return trade off ratio and the lowest correlation to the market. That is the reason why it is heavily invested in various portfolios followed by ABYAAR and EMAR. The undiversified portfolio consists of QRES based on its high expected return as compared to other stocks. Table 7 presents the stocks with varying weight in portfolios along the efficient frontier.

Table 7. Stocks with varying weight in portfolios along the efficient frontier

Stock	Risk (SD)	Volatility (BETA)	Expected Return	Risk/Return
AREG	4.68706	1.22562	0.92802	5.050602358
BRES	4.60249	0.7908	0.87675	5.249489592
EMAR	5.80332	0.97369	0.947	6.12810982
SOROUH	11.5492	1.01082	1.00292	11.51557452

All of the stocks considered in this category had varied in weight in the efficient set. As we move along the efficient frontier the proportion invested in these stocks rises and then falls as we move closer to the undiversified portfolio. Table 8 shows the stocks with falling weights in the portfolios. As we move along the efficient frontier ARED, KRE and DEYR were eliminated because of their higher risk-return ratio and higher betas.

Table 8. Stocks with falling weight in portfolio along the efficient frontier

Stock	Risk (SD)	BETA	Expected Return	Risk/Return
ARED	4.57692	0.99395	0.59203	7.730892016
KRE	4.10774	0.81341	0.09827	41.80054951
DEYR	6.32993	0.92908	-0.31633	-20.01052698

6. Drawbacks of the Single Index Model

The Single Index Model in addition to the drawbacks of the Markowitz Model possesses additional limitations. The variance obtained in only an approximation of the true variance, because it assumes the residuals are uncorrelated across different companies.

6.1 Analysis of the Sub-Samples

The Markowitz and the Single Index Models compute the efficient set by estimating the expected return and covariance between the securities in the available population of stocks. In this paper these estimates were calculated by sampling from past returns. Whilst this is the most straightforward approach, its drawback is that the sample means of stock returns are unstable and unreliable as estimates of true rate of return. Sampling error can be reduced by estimating a lengthy history of past returns, however, the future return series of a company are significantly different from its past. The past returns of a company do not reflect the contemporary character of the company as disregard the current macro and micro events affecting the company. In order to provide better estimates of covariance expected returns and portfolio volatility, the data provided was spilt in two subgroups. Each subgroup comprised of 33 observations, with one set reflecting the data from Jan 2007 to Sept 2009 and the second set reflecting the data from Oct 2009 to June 2012, which will be referred to in the report as subgroup 1 and subgroup 2. Splitting the data into two sets of years provides a better estimation of the efficient frontiers and betas, which allows for a comparison between the portfolios in different subgroups.

6.2 Analysis without Short Selling

The global MVP of international portfolio for subgroup 1 has an expected return of 1.08% and a standard deviation of 2.80% and comprises of AREG (12.73%), QRES (14.89%), ABYAAR (13.98%), BRES (17.7%), SRECO (9.66%) and SOROUH (4.44%). The MVP for subgroup 2 has an expected return of 1.1575, standard deviation of 2.1126 and comprises of ARED (26.64%), QRES (12.66%), KRE (16.47%), BRES (5.14%), SRECO (21.10%) and EMAR (17.99%). It can be noticed that expected return and standard deviation for the higher expected return portfolios the differences between the expected returns and standard deviation of the portfolios between subgroup 1 and 2 become larger. This reiterates the belief that large samples of historical data do not reflect the current character of the company. Furthermore, the share composition of the global MVP for subgroup 1 is quite different from subgroup 2. For instance, AREG is included in the efficient frontier calculated in subgroup 1, but is excluded from the efficient portfolios in subgroup 2. Similarly ARED does not feature in the portfolios of subgroup 1 but in subgroup 2, which it is proposed that ARED should constitute 26.64% of the Global MVP. It is also interesting to note that in subgroup 1 ABYAAR is considered to provide the highest return with the highest risk whereas in subgroup 2 QRES is considered to be most efficient in an undiversified portfolio. This indicates that the expected rates of return for stocks vary according to the time span and their volatility changes significantly. In addition it is evident that neither one of the subgroups dominates the results obtained by evaluating 66 observations from Jan 2007 to June 2012, however they are an approximation of the results of the two subgroups. For instance, in most of the portfolios with the 3 years time span, AREG has no weight allocation. In the global MVP all stocks are included except for AREG with maximum weights being allocated to KRE and BRES. As we move along the efficient frontier the portfolios become less diversified, which leads to QRES and ABYAAR dominating the portfolios. This is quite similar to the results of the two subgroups as the portfolios in subgroup 1 had a large concentration in ABYYAR and the portfolios in subgroup 2 were weighted heavily in QRES. However, it is important to note that the weights being allocated to different stocks in the various portfolios of the main group and its two subgroups varied which can be attributed to the different expected returns and standard deviations of individual portfolios over different lengths of time.

6.3 Markowitz Model with Short Selling

In subgroup 1 the stock composition in the Global MVP is significantly different from that of subgroup 2, which is also true for all the other portfolios included in the two subgroups. In subgroup 1 KRE, ARED, DEYR and BRES are being sold short because of the negative or very low expected return. As we move along the efficient frontier the short selling in these stocks tends to become more extensive, which is apparent in the case of KRE due to its negative expected return. Furthermore, AREG has the highest weight in all the portfolios followed by ABYAAR which is, primarily due to the return these stocks offer in comparison to the level of risk involved. In subgroup 2 ARED, DEYR, KRE, and SOROUH are being sold short and a long position is taken in all other stocks with maximum weights being sold short and a long position is taken in all other stocks with maximum weights being allocated to BRES and EMAR. With regards to short selling both the subgroups have almost the same stocks, but their weights within the portfolios differ substantially, which is due to the varied correlation between stocks. In subgroup 1, ARED and EMAR are being short and long positions are being taken in all other stocks. On the other hand, in subgroup 2 AREG, DEYR and SOROUH are being sold short and long positions are taken in all the other stocks. This indicates that the risk and return estimates are not stable over long periods of time. However, evaluating results on the basic of limited data leads to imprecise estimates. The results obtained from 66 observations were an approximation of the results of the two subgroups as the concentration on short selling was on the same stocks namely: KRE, DEYR, ARED and SOROUH. However, the expected returns

on individual stock were considerably different from those achieved by splitting the data into two subgroups, which affected the weight allocation of the individual stocks within different portfolios. In addition, the correlation coefficients of the stocks between the subgroups and the main observation varied significantly.

6.4 Single Index Model with and without Short Selling

In the single index model the betas for the efficient set are the same for estimates calculated with or without short selling. However, they do not remain constant if the data is split into two subgroups. In the case of subgroup 1 ARED, SRECO, AREG and EMAR have betas above 1 whereas in subgroup 2 this is the case for AREG, DEYR, ABYAAR and SOROUH. This indicates that the betas for individual stock vary significantly with the time span used. Furthermore it is noted that while calculating the Single Index Model with 66 observations, the betas of AREG and SOROUH were over 1 and most of the other stocks had betas between 0.7 and 0.9. Since betas provide the estimation of risks of the stock, the inconsistency of the betas reflects the volatility of the stocks with the amount of data available and the time period over which the returns were calculated. In subgroups 1 and 2 with short selling, the expected returns in individual stock vary significantly. For instance, in subgroup 1 SOROUH has an expected return of 3.01% whereas, in subgroup 2 it's expected return is -1.00%. Whilst comparing this with the results from 66 observations, the expected return of SOROUH is 1.002%, this indicates the variability in returns caused by changing the size of the samples.

6.5 Analysis of the Sub-Samples

It is important to be aware of the drawbacks of the Markowitz model. Firstly, the calculations are based on historical data, which is not necessarily a good indicator of future prices. The analysis only shows the portfolios that would have been efficient during the period studied, but this does not necessarily indicate the efficient frontier for the future. Secondly, the calculations are subject to estimation risk, because the parameters used are estimates, not population values. Sample means of stock returns are unstable and unreliable as estimates of the true rate of return. In order to reduce sampling error, sample estimates also require a lengthy history of past returns. Unfortunately the further back of the data is recorded the more likely the chance that the series of stock returns doesn't reflect the contemporary character of the PCs. This can cause distortions in the results, because the efficient frontier is sensitive to the errors in these estimates. Thirdly, stocks returns are asymmetrically distributed, whereas the Markowitz model assumes normal distribution of returns with zero mean.

7. Conclusions and Recommendations

The analysis of the results clearly indicated the significance of selecting an appropriate time span for the historical stocks returns used for calculating the efficient frontier. It was shown in this paper that the estimated parameters of the models differ considerably when different time frames are chosen for the analysis. In addition the number of observations used for the calculations has great ramifications on the accuracy of the estimates. As long time spans do not reflect the current character of stocks it becomes important to keep the intervals between observations as narrow as possible. The efficient frontiers for both models were analysed and justifications for the inclusion and exclusion of certain stocks were discussed. This provided valuable insight into the importance of correlation between PCs' stocks in risk diversification. However, the presented approach has a number of limitations. The main weakness of the Markowitz model is that it selects the portfolios of stocks that were efficient in the period under observation. This does not necessarily provide investors with reliable forecast of the future. While makes the decision on the selection of an investment portfolio, the fundamental of stocks should be considered along with their past returns and volatilities. A way of incorporating the fundamental methodology with the Markowitz model is to use "classes" of commodities instead of single stocks in the calculations. An example of classes should be: (1) The common stocks of large property companies, (2) The common stocks of small property companies, (3) Venture capital investments, (4) Foreign common stocks, (5) Domestic fixed interest investments, (6) Foreign fixed interest investments, (7) Real estate investments, (8) Money market investments. In this approach the estimates of the expected return on each class of investments are based on historical of return of that class. The covariance matrix is estimated on the basis of sample estimates taken from historical returns associated with portfolios of securities in each investment class. This modified approach has the advantages of allowing the choice of securities that seem to presses sound fundamentals, but on the other hand are included in a class of investments that is part of the efficient frontier. A similar approach can also be used with index models. One of the weaknesses of the SIM is that the estimate of beta is based only on the stock's past relationship with the market, but doesn't take into account the characteristics of the company behind the stock. The use of "a fundamental" beta helps to overcome that obstacle. Fundamental beta takes into consideration numerous factors, such as variability in earnings per share (EPS), company size and financial leverage and relates these factors to company betas in the past to find the relationship between them. Although

the models are imperative in the selection of the efficient portfolios fundamentals of stocks remain the main determinant for portfolio selection. Thus, the past return and volatility alone should not be the only factors influencing investor's decisions. Certainly, it is important to note that the outcome of this paper is specific to the PCs stocks that were included in each portfolio and during the period in which this paper was conducted. Due to changing economic conditions in the Middle East between 2011 until now and throughout the world, the results may be different for future portfolios. In addition, as Real Estate market becomes more volatile, such results may not hold due to greater imbalances and global market inefficiency. Future studies need to re-examine the current paper purpose and repeat this work to confirm the consistency of this results over a longer time period. Additionally, I believe that there are many reputable Middle Eastern PCs listing can be included in future research. Thus, future studies need to include these companies in their portfolios.

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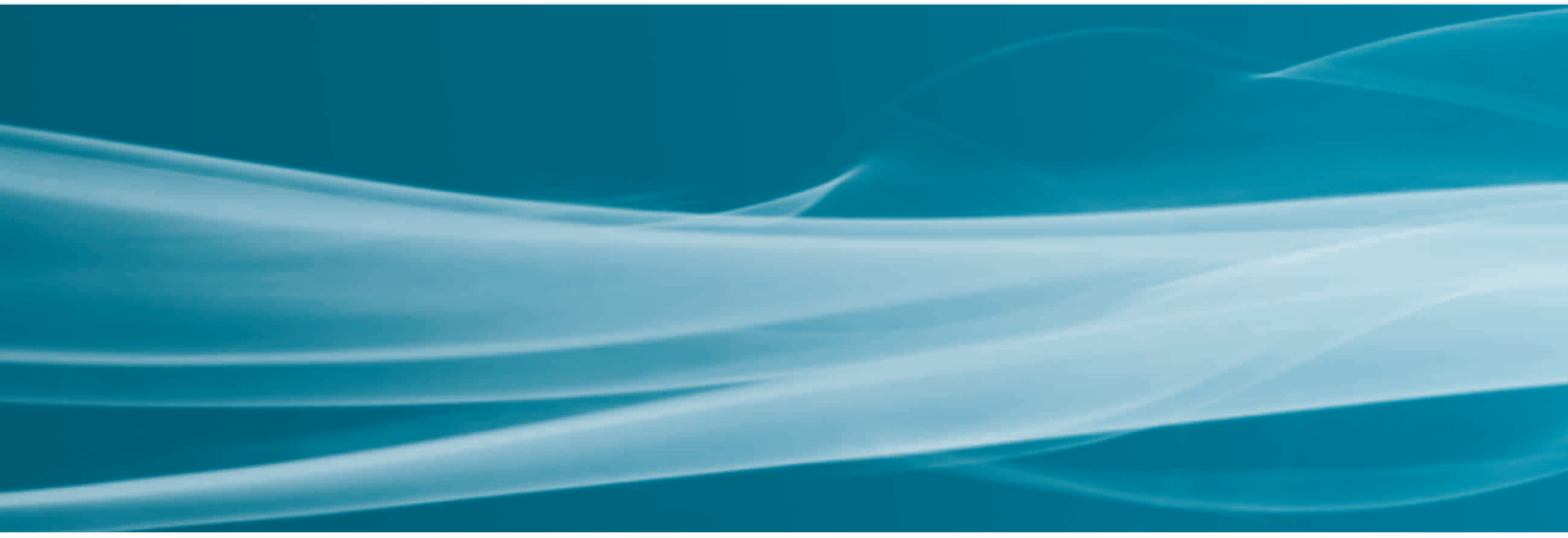

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E-mail ijef@ccsenet.org

Website www.ccsenet.org/ijef