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The Canadian Labour Force Participation Rate Revisited: Cohort and Wealth Effects Take Hold

by

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This paper was completed while the two last authors were working at the Department of Finance. Usual caveats apply.

ABSTRACT

The objective of this paper is to explain the sharp decline in the labour force participation rate in the early 1990s, its modest recovery after 1996, and its recent surge since 2002. We construct a model that is able to explain the large movements observed in the participation rate over the last thirteen years by accounting for such factors as age, wealth, labour demand, unemployment insurance disincentives and birth cohort effects. The model is then used to estimate and project a trend labour force participation rate.

RÉSUMÉ

L'objectif de ce document est d'expliquer le déclin important du taux d'activité au début des années 1990, sa modeste reprise après 1996, et sa forte montée depuis 2002. Selon notre modèle, les grands mouvements observés dans le taux d'activité au cours des treize dernières années sont expliqués par les mouvements démographiques, les mouvements de richesse, de demande de travail, et les changements dans la générosité du régime de l'assurance-emploi. Le modèle est alors employé pour estimer et construire un taux d'activité de main-d'œuvre tendancielle.

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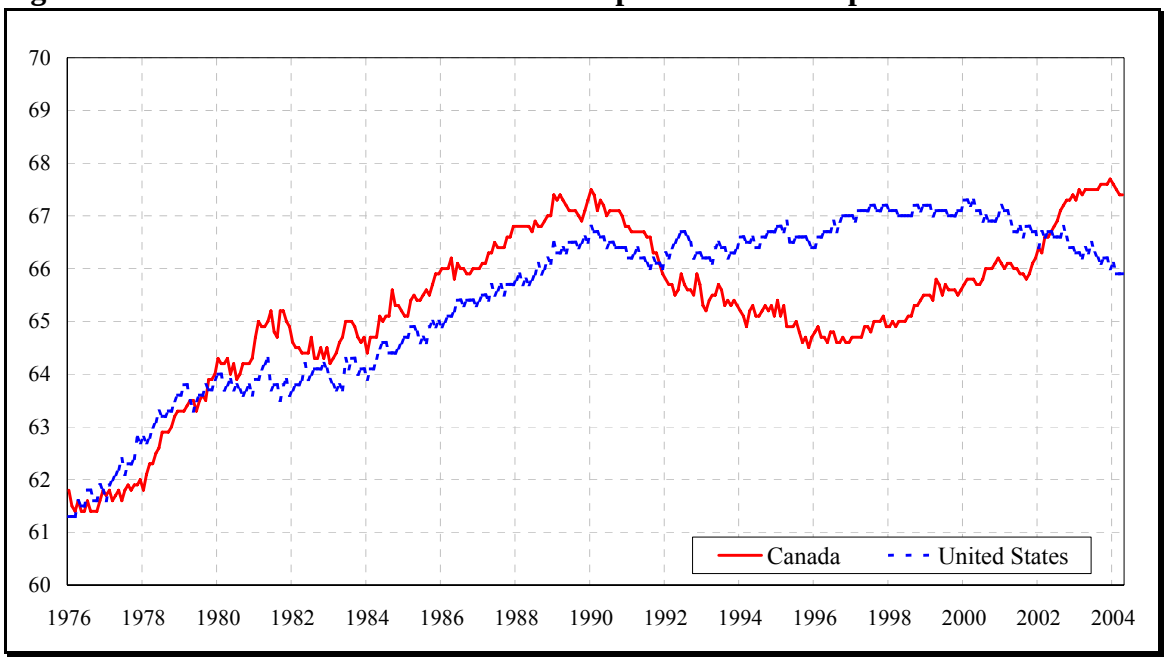
1. Introduction

After rising steadily for more than two decades, the Canadian labour force participation rate peaked in 1989 at 67.2 per cent, began to decline in the midst of the 1990-91 recession, and continued to fall until 1996 when it reached 64.7 per cent. The participation rate hovered around 65 per cent from 1993 to 1998, despite a recovery in the economy that saw the unemployment rate drop from 11.4 per cent to 8.3 per cent over the same period. In contrast, the U.S. labour force participation rate, which had tracked the Canadian rate fairly well from 1976 to 1992, levelled off following the recession and returned to its pre-recession level by 1994 (see Figure 1).

Figure 1 - Canada-U.S. Labour Force Participation Rate Comparison



This failure of the Canadian participation rate to return to its pre-recession level prompted some analysts to speculate that the decline had not simply been a result of the cyclical downturn in the economy. Archambault and Grignon (1999), Beaudry and Lemieux (1999), and Dugan and Robidoux (1999) suggested that structural factors, such as a trend toward early retirement and increased school enrolment were largely responsible for the fall in the participation rate and that there was no reason to expect that the participation rate would return to it pre-recession level.

However, the participation rate rose to 66 per cent in 2000 and 67.5 per cent in 2003 -- a record for Canada. This increase was remarkable in that it occurred both during the strong growth of the late 1990s and during the period of weaker growth over 2001-2003.

A satisfactory model of the Canadian participation rate should be able to explain the rising trend in the participation rate up to 1989, the drop and stagnation up to 1998, and the subsequent rise to its current peak. This paper attempts to do this using a birth cohort model based on Paquet *et al.* (2000). The model specification allows us to identify cyclical and structural influences on the participation rate, while also accounting for wealth and demographic effects.

This paper is organized as follows. After a brief literature survey in section 2, we outline our data set and the structure of the model in section 3. Section 4 discusses the model results. In section 5 we estimate and project trend participation rates out to 2030. Section 6 concludes.

2. Literature Survey

Ip (1998) and Sunter and Bowlby (1998), both conclude that much of the decline in the participation rate in the 1990s was structural, not cyclical. Ip argues that increased school enrolment was in large part responsible for the decline in participation by young adults from 1989 to 1997. However, her analysis does not identify whether increased enrolment was truly structural, or simply a result of young people choosing to stay in school because there were fewer opportunities for them in the labour market.

Two previous studies use, as we do, a methodology that focuses on birth cohorts. Beaudry and Lemieux (1999) adopt a cohort approach to examine female participation rates of 25 to 64 year olds using aggregated data from the Survey of Consumer Finances. They find that female cohort effect is the key factor explaining the increase in the female participation rate throughout the 1970s and 1980s, and its levelling off of the 1990s. In particular, Beaudry and Lemieux (1999) conclude that the levelling off of the female participation rate in the 1990s was a structural phenomenon stemming from the stabilization of the female cohort effect.

Paquet *et al.* (2000) also use a birth cohort approach; however, they examine the employment rate rather than the participation rate. Similar to Beaudry and Lemieux (1999), they find that female cohort effects have had a significant impact on the female employment rate although they do not find the same levelling-off in the 1990s. Paquet *et al.* (2000) also find that wealth effects, as measured by the consumer price index for housing and the real after-tax interest rate, have a significant impact on employment rates of older workers, and that current labour market conditions have a stronger influence on employment rates of younger workers than on their older counterparts.

3. Data and Model Specification

3.1. Cohort Participation Rate Data

We use a panel data set of single-year age (15 to 70 and over) and sex-specific annual participation rates from the Labour Force Survey (LFS) over the 1976 to 2002 period.[1] Our data set provides two distinct advantages over previous cohort analyses. First, as noted in Beaudry and Lemieux (1999) the LFS is available for every year back to 1976 and has a larger sample size than the Survey of Consumer Finance (SCF), which they use. Second, Paquet *et al.* (2000) use administrative data for Canada excluding Québec to link their forecast to the Canada Pension Plan; however they note that LFS and administrative data are not directly comparable due to conceptual differences. Therefore, using administrative data would make it impossible to draw conclusions about labour market outcomes from more popular indicators such as the LFS.

Using LFS data, we construct synthetic labour force participation rate profiles for males and female born between the years of 1906 (the oldest cohort observed, i.e. 70 years old in 1976) and 1987 (the youngest cohort observed, i.e. 15 years old in 2002). In total, we construct 82 synthetic cohorts for both males and females.

3.2. The Model

We estimate a fixed effects model of cohort-specific participation rates based on Paquet *et al.* (2000). The model captures the effects of age, sex, wealth, the current state of labour demand, the possible disincentives associated with the Employment Insurance (EI) system, year of birth and demography. Thus for specific age-sex cohorts we are able to analyze the "extent to which persons born in a given year tend to participate more or less in the labour market at a given age, in comparison to those born before or after" (Paquet *et al.* (2000)).

[1] The authors would like to thank the Labour Statistics Division of Statistics Canada for providing us with this data set.

In this paper "cohort" refers to people born in the ***same year***. Individuals that comprise an age group change from one year to the next, while individuals that comprise a cohort will always be members of the same cohort. This definition is identical to that used in Paquet, *et al.* (2000) and is similar to that of Beaudry and Lemieux (1999) who define their cohorts by individuals' year of entry into the labour force.

The dependent variable is the labour force participation rate of cohort *j* (the *j* is associated with the year of birth) at time *t* expressed in log-odds form to ensure that its predicted value lies between 0 and 100, following Beaudry and Lemieux (1999). Although we constructed 82 birth cohorts for each sex, in order to ensure a minimum number of observations for each cohort being estimated, our analysis was constrained to cohorts born between the years of 1912 to 1979. Thus, the minimum and maximum number of observations for any cohort estimated are 8 and 26 (the length of the current Labour Force Survey), respectively.

The explanatory variables are a lagged dependant variable, age, the job offer rate, net wealth (adjusted for market prices)-to-nominal GDP ratio, the real after-tax interest rate and an index of unemployment insurance disincentives. The model is estimated as a system of equations of the following log-linear form:

$$\overline{LFPR}_{j,t} = \alpha_c + \psi_c \times LFPR_{j,t-1} + \beta_k \times age_{k,j,t} + \vartheta_l \times Wealth_t \times age_{l,j,t} + \xi_l \times jor_t \times age_{l,j,t} + \gamma_l \times r_t \times age_{l,j,t} + \delta_l \times eiindex_t \times age_{l,j,t} \quad (1)$$

where: $j = 1, 2,\ldots, 68$; $k = 1, 2,\ldots, 12$; $l = 1, 2,\ldots, 13$; $t = 1976, 1977,\ldots, 2002$;

$$\overline{\text{LFPR}}_{c,t} = -\log\left(\frac{100}{LFPR_{c,t}} - 1\right)$$

The labour force participation rate (LFPR) is estimated for 68 different birth cohorts, with males and females estimated separately. The coefficients for all the explanatory variables are constrained to be equal across birth cohorts except for α_c (the fixed cohort effect). Net wealth, the job offer rate, the real-after tax interest rate and the EI index all interact with age.

3.3. Expected Influence of the Explanatory Variables

3.3.1. Cohort Effect

The cohort effect can be thought of as a feature of the labour force participation decision that is distinct to individuals born in the same year, abstracting from cyclical and other included structural factors. We expect succeeding female birth cohorts to have higher lifetime participation rates than their predecessors. As noted in Ip (1998) "each generation of women has had a stronger attachment to the labour force than the preceding one". A number of factors have likely driven this increase in female labour force attachment. First, society's views towards a woman's role in the household, and outside the home, have changed significantly over the past century. Second, the greater availability of contraception has allowed women to better control the outcome of their preferences towards work and child bearing. Third, increasing rates of family separation and rising divorce rates may induce more women not only to re-enter the labour force, but may increase their attachment permanently. Fourth, higher levels of education may have raised the opportunity cost of having children. Finally, the increasing availability of child-care services may have reduced the cost of returning to work.

For males, we expect that the recent trend towards higher education and the shift away from manually intensive labour may also have had a positive, but smaller, impact on the labour force attachment of men. The cohort effects of men and women may also be interrelated.

3.3.2. Age

Age enters into our analysis in two ways: 1) as eleven age dummy variables and 2) as interaction terms on the job offer rate, net-wealth to GDP ratio, the real after-tax interest rate and the EI index. We chose the twelve age groups to represent the different periods in an individual's life cycle: 15-17, 18-19, 20-24, 25-29, 30-44, 45-54, 55-59, 60-62, 63-64, 65-66, 67-69 and 70 and over. We expect age to affect participation through its impact on an individual's work-leisure preferences and through the impact that experience in the labour market has on participation. Younger workers are more likely to

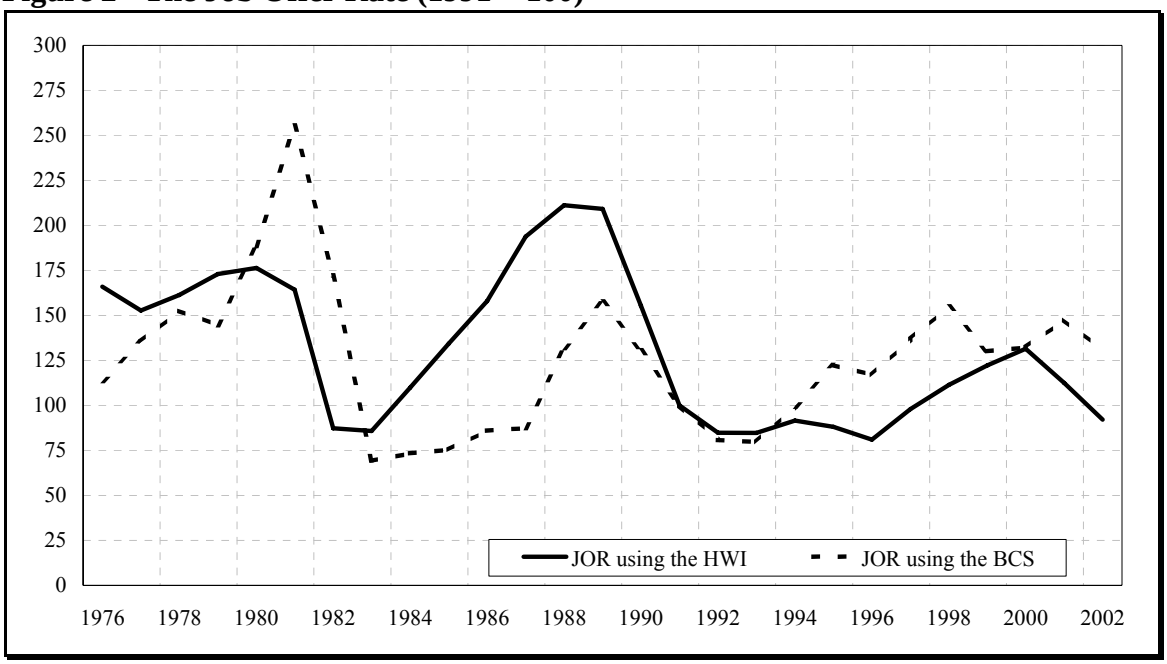
be enrolled in full-time education and thus less likely to participate in the labour market. Middle-aged workers will have more experience and likely more family responsibilities than their younger counterparts and will thus be more inclined to participate in the labour force. Older workers are more likely to have significant resources available for retirement and are less likely to participate as they approach the regular age of retirement. Age dummy variables are referenced to the prime 30 to 44 age group and are thus expected to have negative coefficients.

Over the lifecycle we expect that individuals respond differently to cyclical and structural shocks depending on their particular age. To account for these differences we interact the job offer rate, net wealth, interest rates and the EI index with our twelve age groups. This specification is more flexible than one that does not allow for interaction between the explanatory variables and the age of the individual.

3.3.3. Job Offer Rate

The job offer rate is defined as the ratio of the help-wanted index (HWI) to the total labour force source population (from the LFS) and is indexed to 100 in 1991 (see Figure 2). This follows the definition of Fortin and Fortin (1999). Although some argue that over time the help-wanted index has increasingly understated firms' hiring intentions due to their increasing reliance on newer mediums of advertising job postings, such as the Internet, we still believe that the index is useful. If firms have in fact increasingly relied on newer mediums to advertise job openings this has likely only taken place in the last few years. Other measures of vacancies, such as the shortage of skilled workers series reported in the Business Conditions Survey, suggest that the help-wanted index has accurately reflected firms' vacancies over the 1980s and 1990s (see Figure 2). Also, as noted in Fortin and Fortin (1999), Archambault and Fortin (1997) find that "the help-wanted index is a good instrument because it is highly correlated with the (demand side) probability of finding a job and appears to be insensitive to (supply side) participation shocks".

Figure 2 - The Job Offer Rate (1991 = 100)

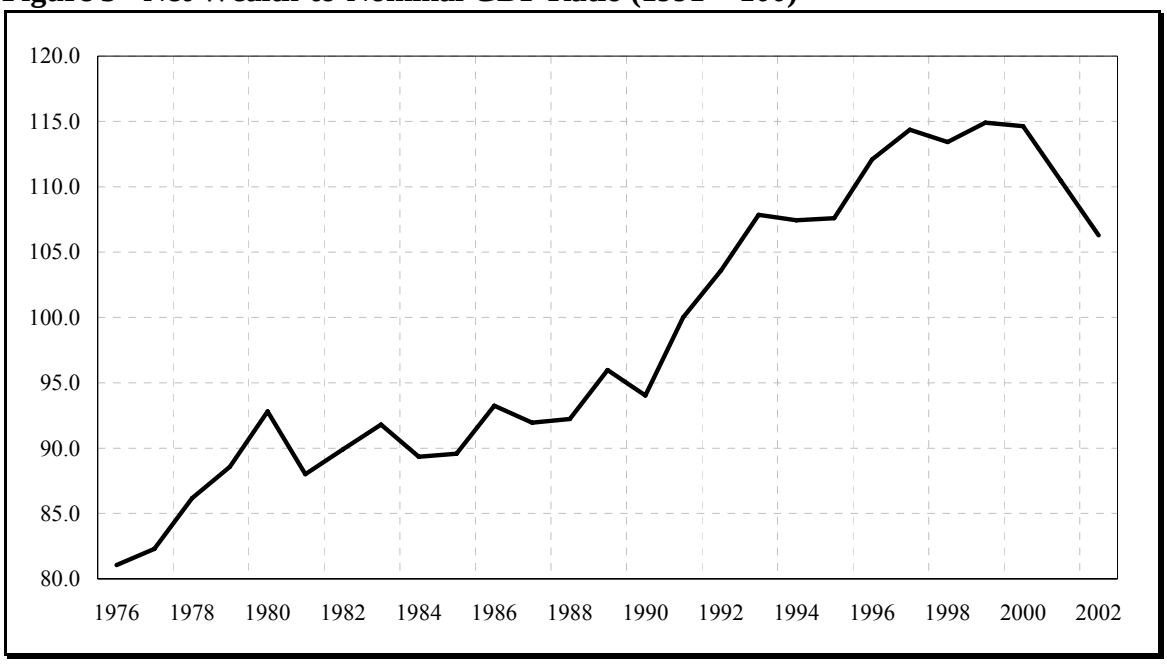


The job offer rate captures the impact that cyclical movements in labour demand and job vacancies have on the participation decision. We expect the job offer rate to have a positive impact on the participation decision, in particular for those who are marginally attached/unattached to the labour force (e.g., youth).

3.3.4. Net Wealth-to-Nominal GDP Ratio

The net wealth variable is computed using Statistics Canada's annual National Balance Sheet Accounts and quarterly Financial Flow data. The assets in the net wealth measure consist of total tangible assets (residential structures and land, consumer durable goods, and other tangible assets) and total financial assets (life insurance and pension assets, currency and deposits, bonds and short-term paper, equity assets, and other financial assets). Liabilities consist of mortgage debt and consumer and other debt.[2] We then divided the net wealth variable by nominal GDP and indexed it to 100 in 1991 (see Figure 3). Theory suggests that changes in non-labour income have a pure income effect that can affect participation. The coefficients on net wealth are thus expected to be negative and largest for those closest to the "normal" retirement age.

Figure 3 - Net Wealth-to-Nominal GDP Ratio (1991 = 100)



3.3.5. Real-After Tax Interest Rate

The real after-tax interest rate is defined as:

$$R = \alpha * \left(r_t^{ST} * (1-\tau) - \pi_{ST}^e\right) + (1-\alpha) * \left(r_t^{LT} * (1-\tau) - \pi_{LT}^e\right)$$

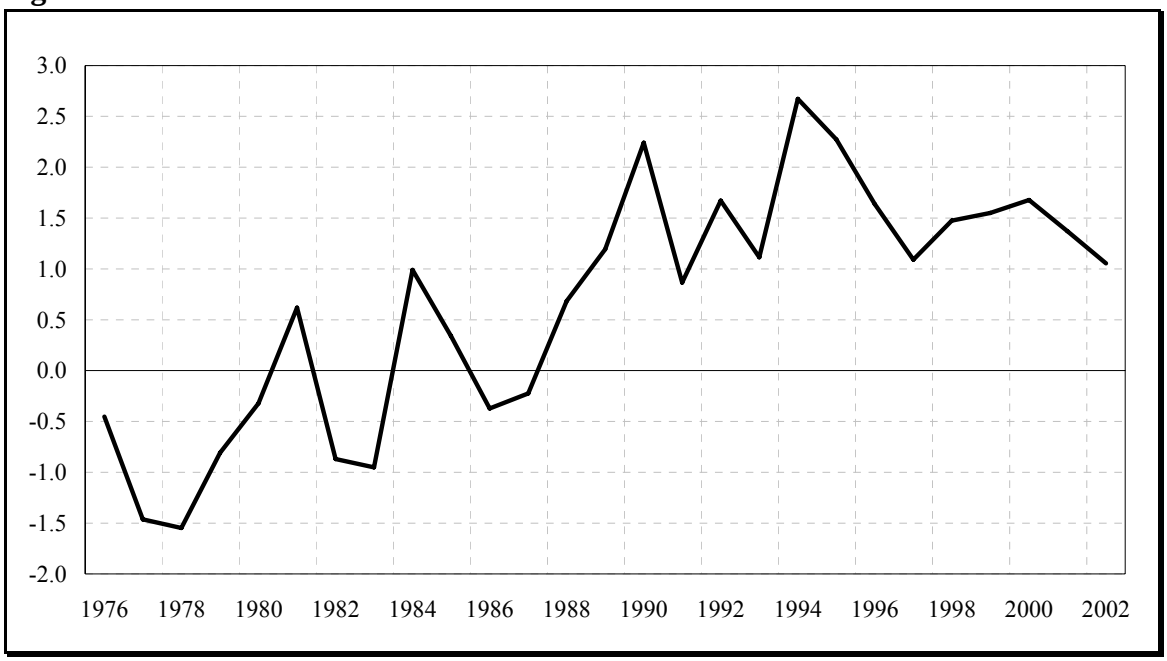
where: R is the real after-tax interest rate, α is the share of short-term bonds (assumed equal to 1/3, based on historical portfolio shares), r_t^{ST} and r_t^{LT} are the short-and long-term interest rates, which are the 3-month T-bill rate and the 10-year government benchmarked bond rate respectively, τ is an average historical average marginal tax rate (equal to 0.32 per cent), and π_{ST}^e and π_{LT}^e are short and long-term inflation rate expectations, which are assumed to equal 1-year and 10-year lagged moving averages of the CPI inflation rate, respectively (see Figure 4).

The impact of the real after-tax interest rate on the participation rate depends on the relative strength of income and substitution effects. If income effects dominate then the impact will be negative. On the other hand, if substitution effects dominate, then the impact will be positive. For example, an increase in the real after-tax interest rate raises

[2] See *Appendix I* for a more complete description of our net wealth measure.

the price of current consumption, including leisure, and leads individuals to increase their participation when young, as they substitute away from current to future consumption.

Figure 4 - Real-after tax interest rate



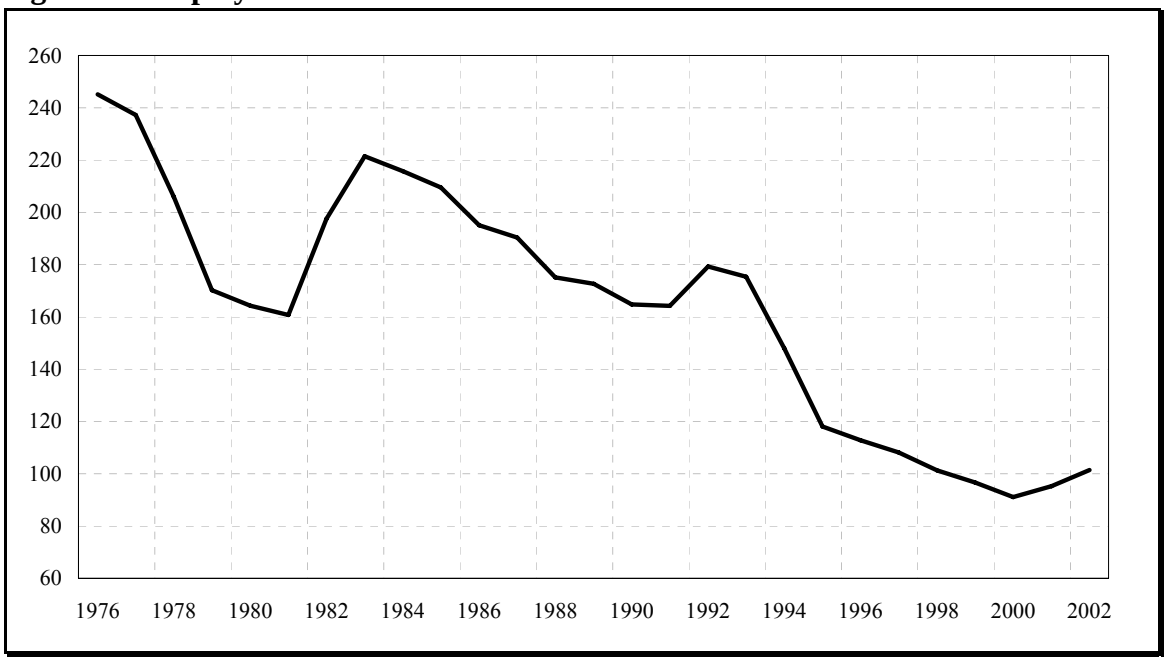
3.3.6. Employment Insurance Index

We include an index of Employment Insurance disincentives (EI index) based on Sargent (1995) to capture the structural impact of the EI system on labour force participation. This index incorporates a number of the EI parameters, including coverage, benefit levels, benefit duration, and regional differences and is designed to capture the impact of the EI system on unemployment. Figure 5 shows that the EI index has trended downward since the 1970s, with a large decrease associated with reforms to the EI system in the mid-1990s.

The impact of the EI system on participation rates is theoretically ambiguous. One might expect the EI system to positively affect participation by drawing marginally attached workers into the labour force; however, as discussed in Fortin and Fortin (1999), the EI system may also cause those already participating in the labour force to withdraw for a period of time owing to a reduction in the marginal cost of not working. For this negative

impact to occur, individuals who stopped working (returned to work) for a period of time due to an increase (decrease) in the level of EI benefits could not be considered actively seeking work. In general, to collect Employment Insurance benefits a person must be actively seeking work.[3]

Figure 5 - Employment Insurance Index



[3] There are exceptions to this rule, particularly for seasonal workers

4. Results

4.1. Estimation Results

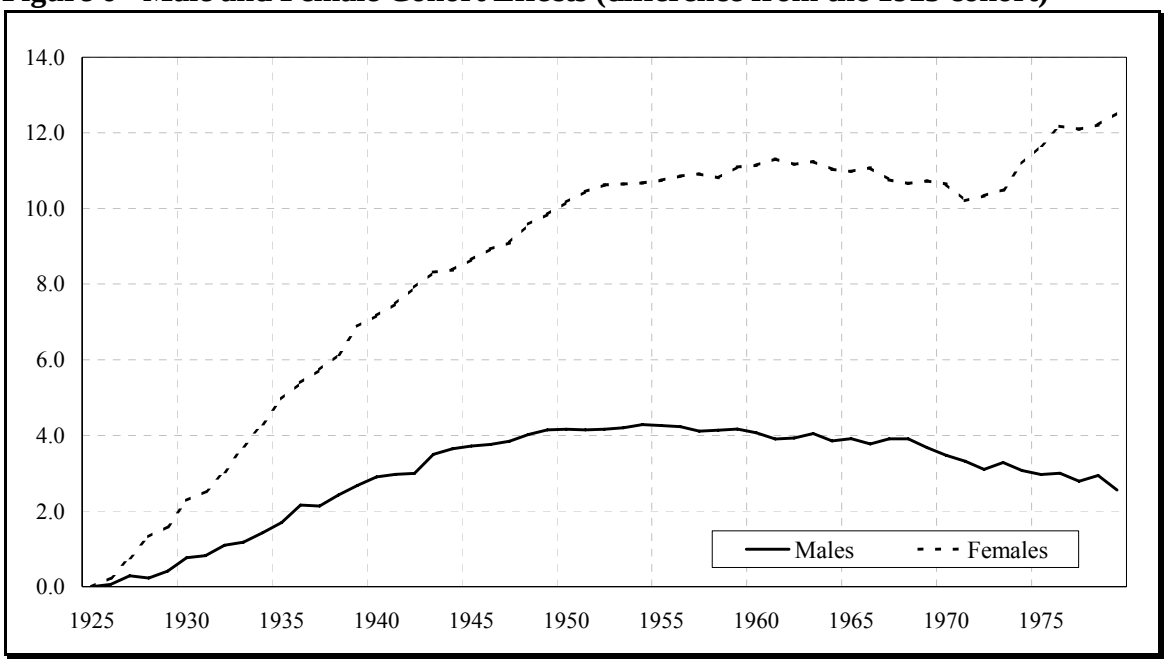
This section discusses the overall estimation results for each explanatory variable and then examines how well the model predicts changes in the participation rate over the following time periods: 1990 to 1996, 1996 to 2001 and 2001 to 2002. The model developed in Section 3 is estimated by ordinary least squares as a system of equations, where the coefficients for all the explanatory variables are constrained to be equal across birth cohorts except for the fixed cohort effect. The detailed coefficient estimates for males and females are reported in *Appendix II*. We also perform Wald tests on each of the explanatory variables for both males and females (see Table 7 in *Appendix III*). The results show that with the exception of the male age and EI index variables (which are significant at the 10% level), all of the other explanatory variables are jointly significant at the 5% level.

4.1.1. Cohort Effects

The estimated cohort effects relative to the 1925 cohort for females and males are shown in Figure 6. As expected, the cohort effects for females and males are positive, meaning that successive cohorts born after 1925 have a greater attachment to the labour force and thus higher participation rates throughout their lifetimes. The female cohort effect increases considerably for cohorts born through to the mid-1950s, before beginning to level off. This means that the impact of positive female cohort effects on aggregate participation will be exhausted once women born in the early 1950s have passed age 65 (i.e., after 2015).

The estimation results show that many of the individual female cohort effects are not individually statistically significant; however, results from a Wald test of joint significance (see Table 7 in *Appendix III*) shows that they are significant with a p-value of 0.0000. In contrast, all individual male cohort effects are statistically significant, but have a significantly lower Wald statistic of joint significance (chi-square) than their female counterparts, 95.6 versus 169.9, respectively.

Figure 6 - Male and Female Cohort Effects (difference from the 1925 cohort)



The male cohort effect (see Figure 6) also increases for successive cohorts born through to the 1950s, although less than for females. As noted earlier, this is likely the result of increasing education and a shift towards less physically-demanding jobs, which have enabled people to work longer than in the past. Overall, the male and female cohort effects have had a positive influence on the aggregate participation rate since the 1940s.

4.1.2. Net Wealth

For males, the coefficient estimates on the net wealth variable are negative and highly significant (at the 1% level) for the 30-44, 45-54, 55-59 and 60-62 age groups, and are not statistically significant for the remaining age groups. It is not surprising that this variable does not have a significant impact for younger male age groups, given that their shares of net wealth are likely smaller than those of older age groups. However, older males age groups (in this case 63 years of age and older), which likely have a larger share of net wealth also do not respond strongly to changes in net wealth.

The coefficient estimates of the female cohorts are very similar to those of their male counterparts. The net wealth variable is negative and statistically significant for the 45-54, 55-59, 60-62 and 63-64 age groups. Once again, the coefficient estimates for the

older age groups are not statistically significant, implying that changes in net wealth have little impact on the participation decision after, in this case, the age of 65. In reality, the retirement decision is likely a joint decision made between males and females in a single household, unfortunately our dataset does not enable us to model this type of joint retirement decision.

4.1.3. Job Offer Rate

Our results confirm that the job offer rate has a positive impact on the participation rate, in particular for younger age groups. The coefficient estimates are the largest for 15 to 17 year-olds. This likely stems from their higher school enrolment rates and their tendency to work part-time in jobs more likely to be eliminated during weaker labour market conditions. This result is consistent with a decline in the youth participation rate of 8.2 and 6.2 percentage points between 1990 and 1996 for males and females respectively, during which time the job offer rate fell 47.9 per cent.

Interestingly, we also find that both males 18-24 and females 18-19 are less affected by changes in labour demand than their younger and slightly older counterparts. This result may stem from the increase in post-secondary education enrolment observed since the late 1980s and conceivably reflects a structural shift towards higher education that was not simply a reaction to the weak labour market conditions of the early 1990s. The job offer rate coefficients become positive and statistically significant after prime post-secondary years of age (18-24) for both males and females. The results support our hypothesis that younger and early prime-age workers are most vulnerable to cyclical movements in the labour demand.

4.1.4. Real After-tax Interest Rate

As noted earlier, the impact of the real after-tax interest rate is ambiguous because of potentially offsetting income and substitution effects. However, it is interesting to note that of all the explanatory variables in our analysis, the coefficient estimates for this particular variable, with the exception of the fixed cohort effects, are markedly different across males and females. For females, seven of the twelve estimated coefficients are

positive, but only three are statistically significant (at the 10% level). The three age groups that are statistically significant are scattered among the twelve age groups and show no distinct pattern.

On the other hand, ten of the twelve estimated coefficients for their male counterparts are negative, of which only four are statistically significant. The four statistically significant age groups encompass males 25 to 59 years of age, which suggest that these age groups either exhibit a strong wealth effect from changes in the interest rate or tend to be employed in interest-sensitive industries.

4.1.5. Employment Insurance Index

The EI system could have a positive impact on the participation rate if it draws in marginally unattached workers into the labour force by raising the opportunity cost of not participating in the labour market. However for men, only three of the twelve coefficients on the EI index are positive, none of which are statistically significant. The only statistically significant male groups are the 25 to 29 and 30 to 44 year olds and the coefficient estimates are negative. These findings may reflect reporting issues associated with seasonal workers and a number of individuals choosing to work only part of the year as opposed to working year round. As noted earlier, this last effect could push the participation rate down depending on how individuals collecting EI benefits reported their labour market status when surveyed by Statistics Canada. For females, the coefficient estimates on the EI index are significant (10% level) and positive for three age groups: 20 to 24, 67 to 69 and 70 and over. The majority of the remaining coefficient estimates are negative and statistically insignificant.

4.1.6. Age

As expected, all the male age coefficient estimates are negative. The coefficient estimates are also statistically significant (12% level) and largest for the youngest (15 to 17) and the older age groups (63 and over).

For females, the sign on the age coefficient estimates are negative for the following five age groups: 20 to 24, 25 to 29, 65 to 66, 67 to 69 and 70 and over. This result likely stems

from the fact that our base case (30 to 44 years old) not only includes prime working years, but also includes part of women's childbearing years. For example, the coefficient estimates are negative and statistically significant (at 15% level) for younger females (20 to 24) and women in their early prime child bearing years (25 to 29); however the coefficient estimates are then positive for the 45 to 64 year-olds, as females move out of their childbearing years, but turn negative and statistically significant again for the older female age groups (67 and over).

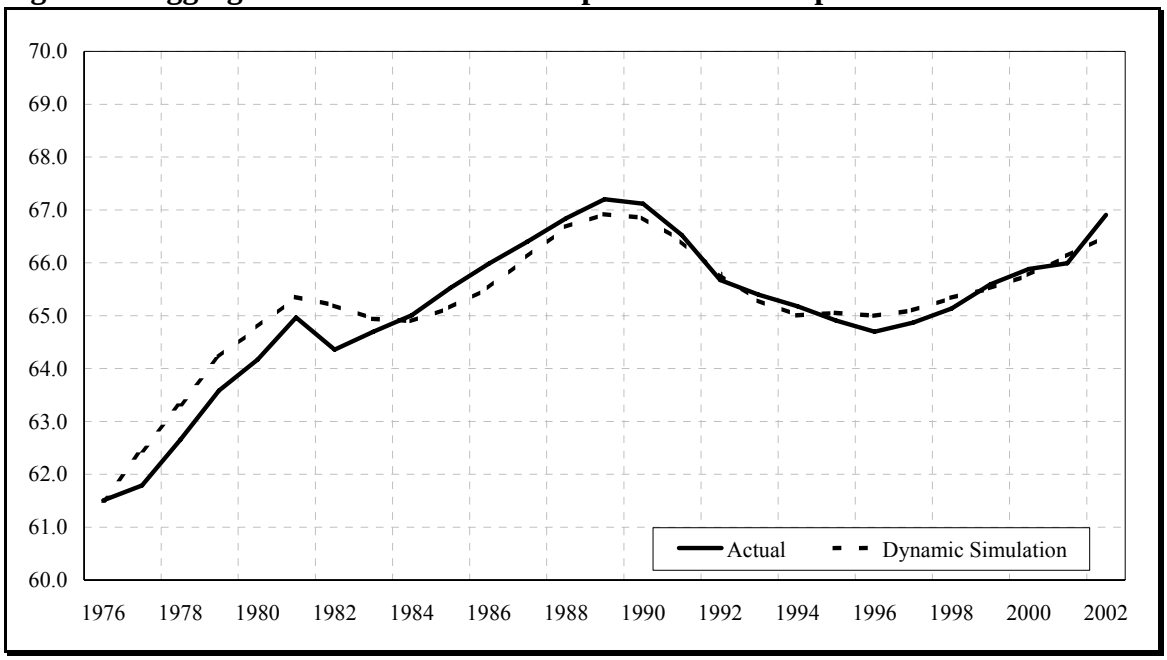
4.2. Dynamic Simulation Results

This section examines how well our model tracks the aggregate participation rate and whether it is able to capture the turning points throughout the business cycle. We also examine the model's ability to explain changes in the aggregate, male and female participation rates over the following time periods: 1990 to 1996, 1996 to 2001 and 2001 to 2002. Third, we assess the model's ability to track the labour force participation rates of older workers.

4.2.1. The Aggregate Participation Rate

At the aggregate level, our model tracks the aggregate labour force participation rate very closely and also catches the major turning points (see Figure 7). More specifically, our model captures the decline in the participation rate from 1990 to 1996, its stabilisation and gradual increase from 1996 to 2001 and the recently observed surge in 2002. Moreover, our dynamic simulation results capture the major turning points in the aggregate participation rate over the last twenty-five years.

Figure 7 - Aggregate Labour Force Participation Rate Comparison



4.2.2. Changes in the Aggregate, Male and Female Participation Rates

The actual and the model-based (dynamic simulation) changes in the aggregate, male and female participation rates over these three time periods are reported in Table 1. At the aggregate level, the model accounts for nearly four-fifths of the 2.4 percentage point decline in the participation rate from 1990 to 1996 (see Table 1). Although the model performs well at the aggregate level, this masks a somewhat mixed performance for males and female over the same period.[4] The model predicts almost the entire decline in the male participation rate over this period. However, the model predicts a fairly small increase in female participation over this period, whereas actual female participation fell by approximately 1 percentage point. The 1.2 percentage point over-estimation of the change in the female participation rate explains why our model under-predicts the decline in the aggregate participation rate from 1990 to 1996.

Table 1 - Change in the Labour Force Participation Rate

	1990 to 1996	1996 to 2001	2001 to 2002
Actual (Total)	**-2.42**	**1.30**	**0.91**
Model (Total)	-1.86	1.13	0.38
Actual (Males)	**-3.93**	**0.30**	**0.84**
Model (Males)	-4.04	0.72	0.51
Actual (Females)	**-0.97**	**2.24**	**0.98**
Model (Females)	0.24	1.51	0.24

During the 1996 to 2001 period, the model accounts for almost 90 per cent of the 1.3 percentage point increase in the aggregate participation rate (see Table 1). In contrast to the 1990 to 1996 period, the model slightly under-predicts the actual change in the aggregate participation rate. The difference between the actual and predicted change is attributable to a 0.7 percentage point under-prediction of the change in the female participation rate, which is somewhat offset by an over-prediction of the change in the male participation rate. The model attributes over three-quarters of the increase in the

[4] The actual, static and dynamic predicted participation rates of males and females are presented graphically in *Appendix IV* for the following age groups: 15 and over, 15 to 24, 25 to 54 and 55 and over.

participation rate over this period to increased participation by women, which is consistent with the observed data.[5]

In 2002, the aggregate participation rate recorded its second largest one-year increase in twenty-six years. While our model predicts a rather large increase in 2002, it is slightly less than half of the observed increase (see Table 1). The participation rates of males and females both increased substantially in 2002, rising by 0.8 and 1.0 percentage points respectively. The model accounts for three-fifths of the change in the male rate and only one-quarter of the increase in the female rate. The majority of the error (approximately 71 per cent) in the predicted female participation rates occurs in the 20 to 44 age group.

4.2.3. Participation Rates of Older Workers

From 1996 to 2002, the participation rates of males and females 55 years of age and over increased by 3.9 and 4.4 percentage points respectively. Overall, our model captures the general upward trend observed in male and female participation rates since 1996.

The participation rate of older men continued to decline throughout the early 1990s before reaching a trough in 1996, at which point the rate began to gradually increase, and then suddenly surged in 2002. Almost 60 per cent of the increase in the participation rate of older men observed between 1996 and 2002 can be attributed to the surge in 2002. Figure 8 illustrates that our model predicts the decline in the labour force participation rate from 1990 to 1996 and its gradual increase from 1996 to 2001. Remarkably, the model also accounts for 93 per cent of the 2.2 percentage point surge in the participation rate observed in 2002. The majority of this increase is due to a reduction in net wealth, resulting from the large decline in equity prices.

[5] Women accounted for 87.7 per cent of the actual increase in the aggregate participation over the 1996 to 2001 period.

Figure 8 - Labour Force Participation Rate of Males 55 and over

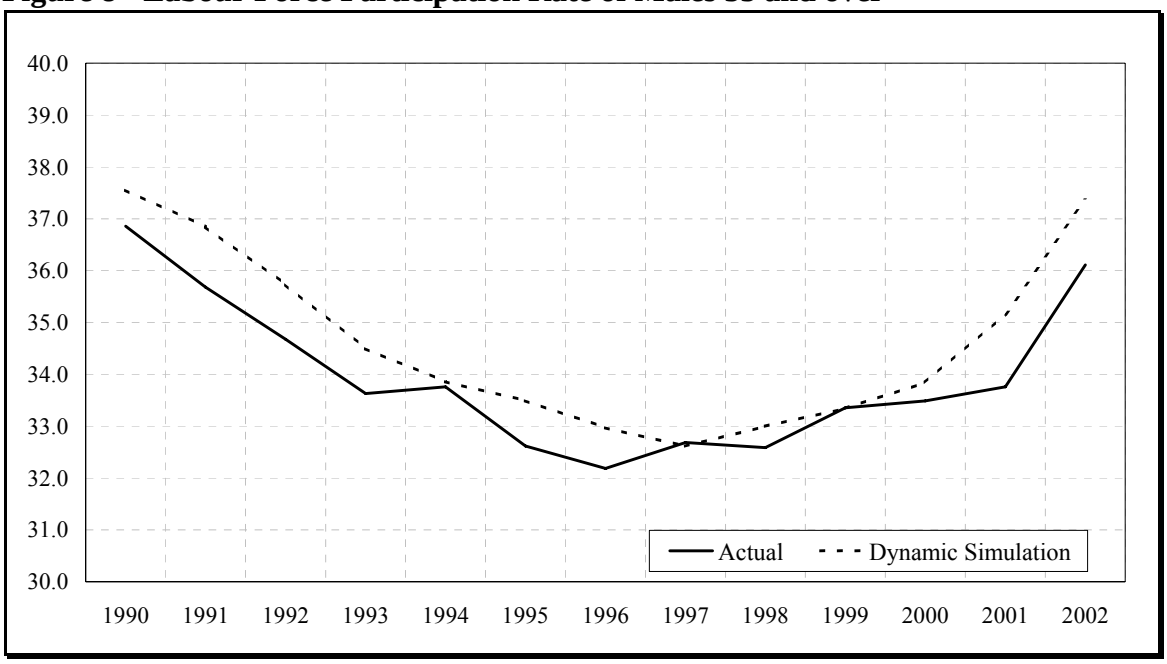
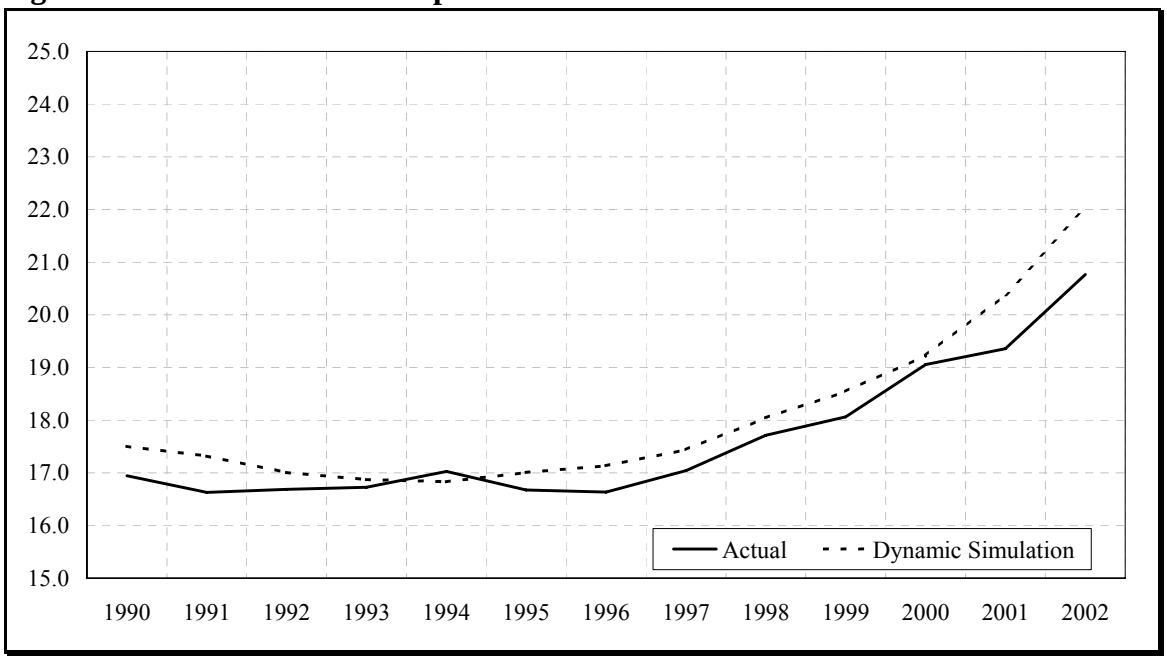


Figure 9 - Labour Force Participation Rate of Females 55 and over



Unlike their male counterparts, the 4.4 percentage point increase in the participation rate of older women between 1996 and 2002 is due largely to the increase experienced prior to 2002; only 30 per cent of the increase occurred in 2002 (see Figure 9). The model

adequately captures the increase in the labour force participation rate of older women observed between 1996 and 2002. The model suggests that the increase in the participation rate of older females reflects ongoing birth cohort effects, which have raised the labour force attachment of cohorts that are now entering the 55 and over age category.

4.3. Decomposing Changes in the Labour Force Participation Rate

In this section, we decompose the changes in the aggregate, male and female participation rates into cohort effects, the age composition of the workforce, changes in wealth, movements in labour demand (job offer rate), changes to the other explanatory variables, and a residual.

4.3.1. 1990 to 1996

During the jobless recovery following the 1990-91 recession, the participation rate in Canada fell to 64.5 per cent, its lowest level in over a decade. In total, the participation rate fell by an average of 0.4 percentage points per year over this period. Our model attributes the majority of this decline to increasing wealth levels (from rising equity assets, life insurance and pension assets and residential structure and land values) and a weak labour market, which more than offset the ongoing positive cohort effects (see Table 2).

Table 2 - Decomposing the Change in the Participation Rate from 1990 to 1996*

	Total	**Males**	**Females**
Total	**-0.4040**	**-0.6550**	**-0.1622**
Cohort Effect	0.2656	0.0456	0.4775
Age Composition	-0.0645	-0.0641	-0.0650
Wealth	-0.3396	-0.4411	-0.2418
Job Offer Rate	-0.2620	-0.2601	-0.2639
Other Variables	0.0911	0.0471	0.1335
Residual	-0.0946	0.0175	-0.2026

* Refers to average change over the period.

According to our model, rising wealth from 1990 to 1996 lowered the aggregate participation rate by 0.34 percentage points per year. In particular, increases in wealth exerted substantial downward pressure on the participation rates of older workers and in particular, males. At the same time, a substantial decline in the job offer rate put significant downward pressure on youth participation rates. Our results indicate that the weak labour market in the early 1990s was responsible for an average annual 0.26 percentage point reduction in the participation rates of males and females.

Despite identical responses to the decline in the job offer rate, and only a slightly stronger downward response to changes in wealth, the participation rates of males fell by an average of 0.66 percentage points per year, more than four times the 0.16 average percentage point decline of their female counterparts. The model attributes nearly 90 per cent of the difference in labour market outcomes of males and females over this period to rising female cohort effects.

4.3.2. 1996 to 2001

During this period, the aggregate participation rate rose on average by 0.26 percentage points per year. Our model accounts for nearly 90 per cent of the increase in the aggregate participation rate, and attributes the majority to ongoing cohort effects and a smaller portion to improving labour demand conditions. Increasing wealth levels throughout the late 1990s continued to put downward pressure on the aggregate participation rate (see Table 3).

For females, underlying cohort effects continued to be the dominant factor affecting participation rates, accounting for roughly 80 per cent of the increase observed during this period. Rising wealth levels continued to depress the participation rates of older females, while an increase in the job offer rate boosted the participation of younger workers. The age composition of the female source population also continued to have a slight negative impact on their overall participation rate.

The participation rate of men increased only marginally throughout this period. Cohort effects, improvements in the job offer rate, and a decline in the EI index all tended to

raise participation over this period. These increases were partially offset by increasing wealth levels and an ageing population.

Table 3 - Decomposing the Change in the Participation Rate from 1996 to 2001*

	Total	Males	Females
Total	**0.2594**	**0.0600**	**0.4480**
Cohort Effect	0.2399	0.1134	0.3618
Age Composition	-0.0355	-0.0519	-0.0244
Wealth	-0.2219	-0.2439	-0.2001
Job Offer Rate	0.0723	0.0685	0.0759
Other Variables	0.1712	0.2573	0.0884
Residual	0.0336	-0.0834	0.1465

* Refers to average change over the period.

4.3.3. 2001 to 2002

The Canadian participation rate rose by 0.9 percentage points in 2002, the second largest one-year increase since 1976. At the aggregate level, a decline in wealth stemming from a sharp drop in equity prices increased the labour force participation rate of older workers and accounted for one-quarter of the increase observed in 2002 (see Table 4). Cohort effects continued to have a positive impact on the aggregate participation rate, although to a lesser extent than in the 1990s.

For males, the increase in the participation rate in 2002 can be attributed to underlying cohort effects and strong wealth effects stemming from the 3.8 per cent and 30 basis point declines in net wealth and the real after-tax interest rate, respectively. These factors were partially offset by a decline in the job offer rate and a small increase in the EI index.

The model captures one-third of the 1 percentage point increase in female participation. Our estimates suggest that cohort effects continued to boost the participation rates of females, while declining net wealth levels also raised the participation rates of older women. The positive impact from the increase in the participation rates of older females stemming from the decline in wealth was more than offset by the negative impacts from

the decline in the job offer rate and the changing age composition of the source population.

Table 4 - Decomposing the Change in the Participation Rate from 2001 to 2002

	Total	Males	Females
Total	**0.9109**	**0.8395**	**0.9782**
Cohort Effect	0.2353	0.1250	0.3419
Age Composition	-0.0284	-0.0216	-0.0374
Wealth	0.2394	0.3756	0.1080
Job Offer Rate	-0.1218	-0.1093	-0.1338
Other Variables	0.0521	0.1446	-0.0371
Residual	0.5343	0.3253	0.7365

5. The Trend Participation Rate: Retrospect and Prospect

As discussed previously, the failure of the participation rate to return to its pre-recession level during the first half of the 1990s led some analysts to argue that the decline was not simply the result of a cyclical downturn, but that structural factors may also have been responsible. While the participation rate rose substantially, few (if any) studies have identified to what extent these movements (or for that matter movements in the participation rate since 1976) reflected changes in its underlying trend. Moreover, fewer studies have used empirical birth cohort models to calculate and project trend participation rates over the long term. Our work attempts to fill this gap. The following sub-sections briefly describe the approach and assumptions used to calculate our measure and long-term projection of the trend participation rate.

5.1 Constructing a Measure of the Trend Participation Rate

To calculate a measure of the trend participation rate for the 1976 to 2002 period, we dynamically forecast the participation rate using the estimated coefficients from our cohort model and trend values of our measures of net wealth-to-nominal GDP, the job offer rate and the real after-tax interest rate. Given assumptions about the future paths of the explanatory variables and using long-term population projections, we project the trend participation rate out to 2030.

The net wealth-to-nominal GDP ratio shows a strong upward trend from 1976 to 2002, which we approximate by using a linear trend for this series over the historical period (see Figure 10). Going forward the net wealth-to-nominal GDP ratio should stabilize, which we assume takes place at a level slightly above its 2001 value out to 2030. This reflects the assumption that the rising ratio of equity wealth to GDP over the past 20 years reflects a one-time decline in the equity risk premium as high and variable inflation was succeeded by low and stable inflation.

Figure 10 - Net Wealth-to-Nominal GDP Ratio (1991=100)

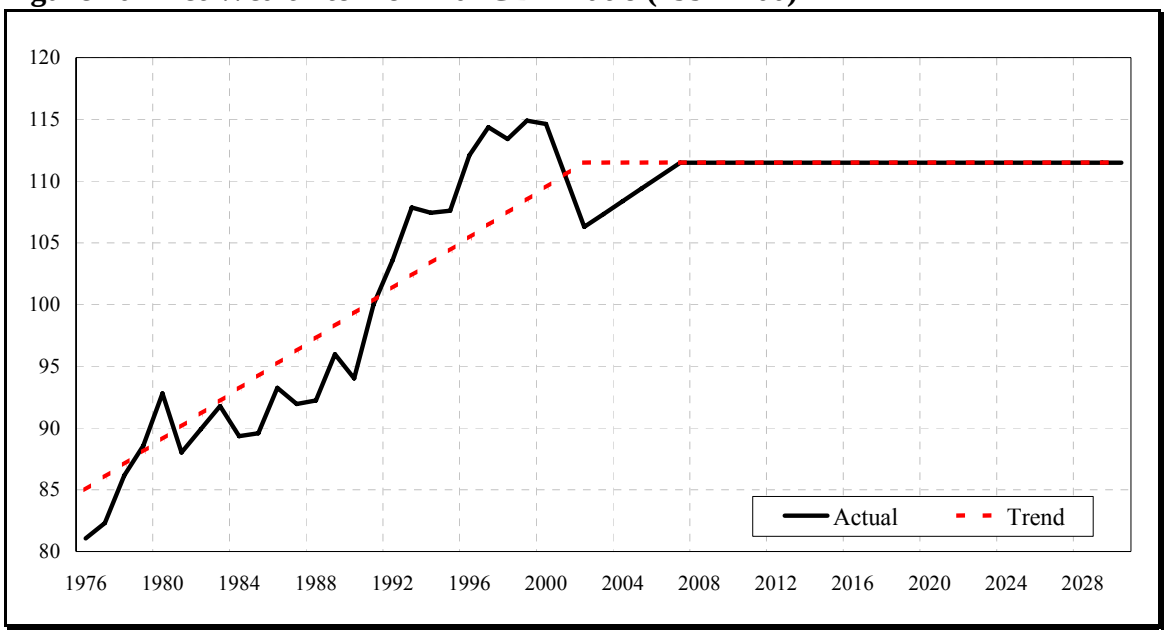
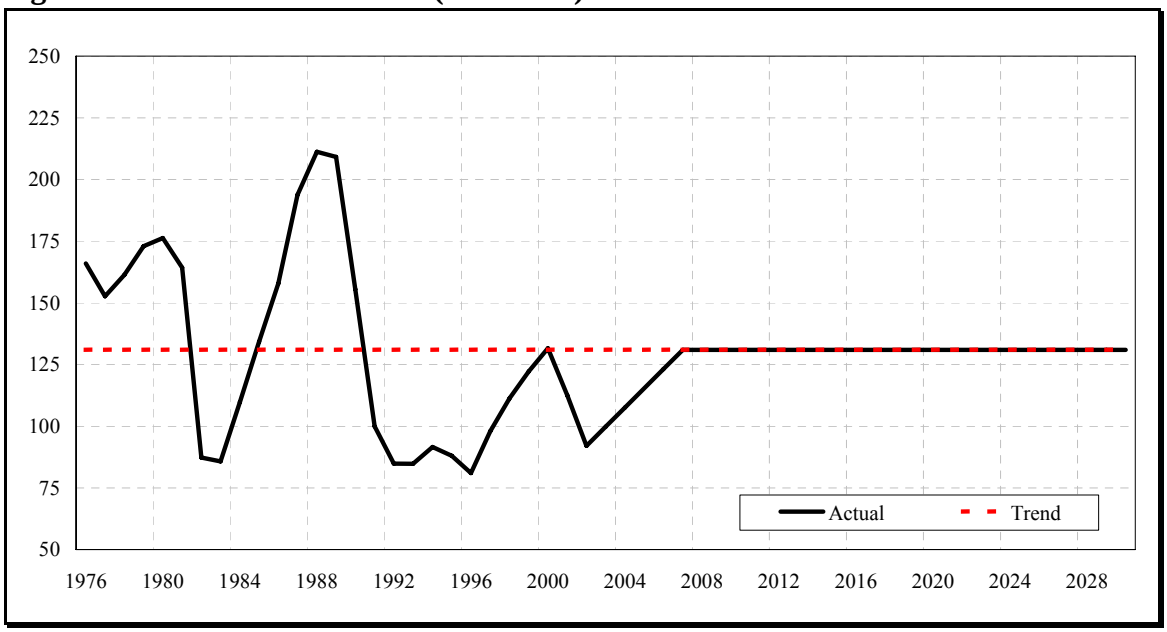


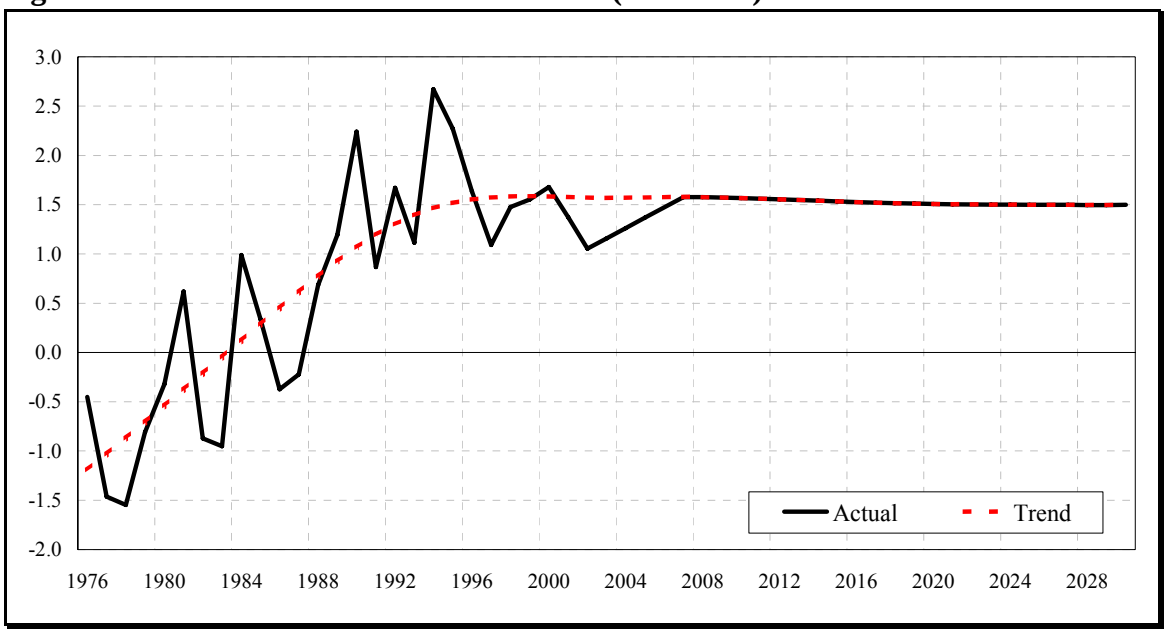
Figure 11 - The Job Offer Rate (1991=100)



The trend job offer rate is assumed equal to its historical average (see Figure 11). The real after-tax interest rate increased gradually from 1976 to 1996 and then levelled off (see Figure 12). The trend series is calculated using a Hodrick-Prescott filter. Short and long-term interest rates over the projection period are assumed to return to their historical

averages and annual CPI inflation rate is assumed to be 2 per cent. Based on these assumptions, the real after-tax interest rate stabilises at 1.5 per cent over the long term.

Figure 12 - The Real After-tax Interest Rate (1991=100)



Finally, the EI index is assumed to remain at its 2002 level out to 2030, the cohort effects of men and women are assumed equalled to the average of the respective 1970 to 1979 birth cohorts, and the single-year age and sex-specific populations are assumed to grow at the rates assumed in Statistics Canada's medium population projection.

5.2. The Trend Participation Rate and its Future Prospects

Figure 13 shows the actual and estimated trend participation rate. It suggests that the major higher frequency increases (decreases) in the participation rate observed in the 1980s (1990s) did not reflect movements in trend participation. While some have argued that the weak performance in the 1990s reflected structural factors, our estimate of trend participation rose throughout most of the 1990s primarily as a result of rising cohort effects, particularly for females.

Figure 13 - The Actual and Trend Participation Rate

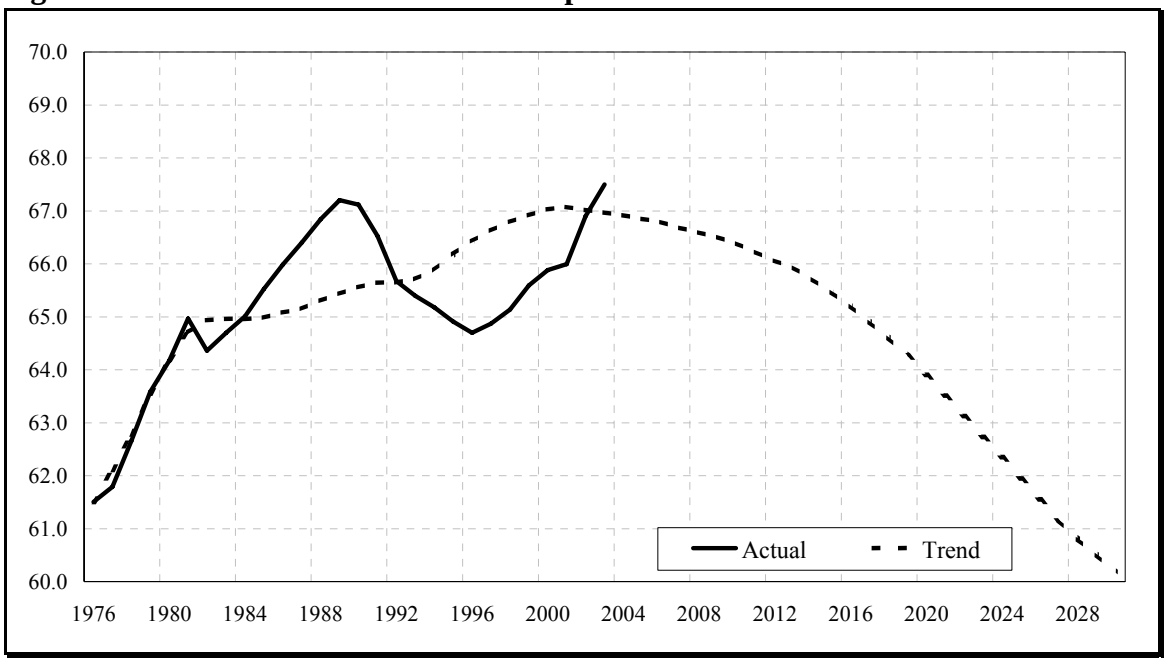
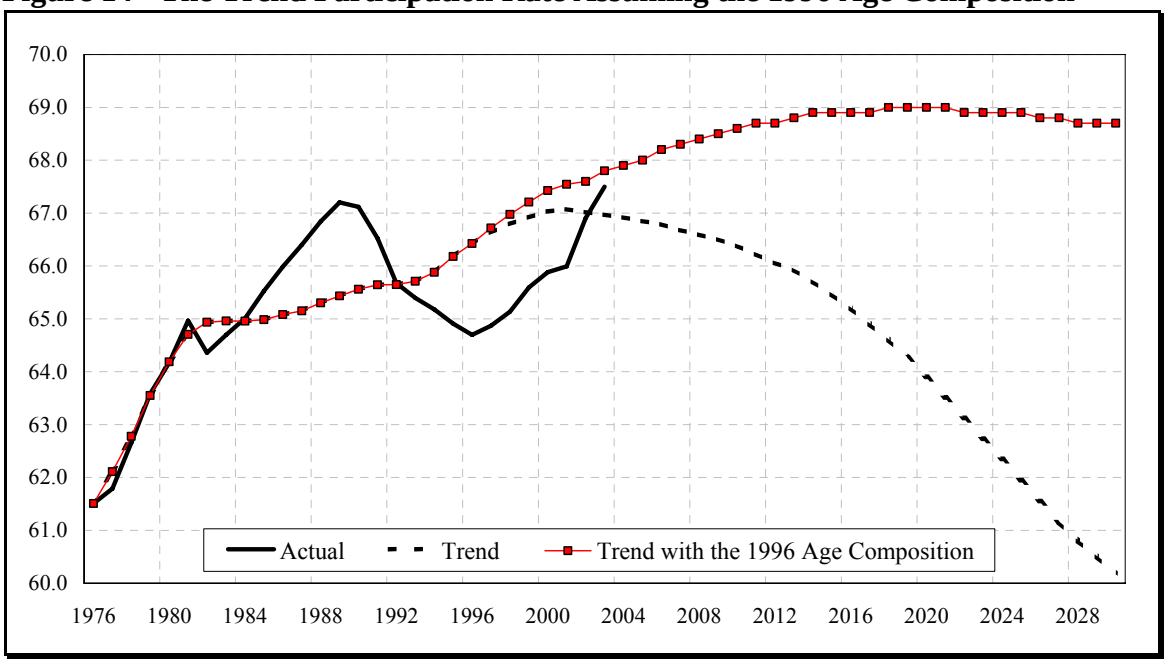


Figure 14 - The Trend Participation Rate Assuming the 1996 Age Composition



Population ageing is projected to gradually reduce the trend participation rate as baby boomers leave the labour market. As illustrated in Figure 14, if the age composition were to remain at its 1996 structure, the trend participation rate would rise to 67.8 per cent by

2003 and would continue to rise until levelling off at 69.0 per cent in 2015. In contrast, the trend participation rate calculated using the actual and projected age composition of the source population peaks at 67.0 per cent around 2003 and steadily declines over the next three decades, reaching 60.2 per cent in 2030.

6. Conclusions

In this paper, we construct a model that attempts to explain past movements in the participation rate by accounting for cyclical movement in the labour market, wealth effects, birth cohort effects, age, the EI system and demographic effects. Using a cohort approach based on Paquet *et al*. (2000), our model tracks the aggregate participation rate remarkably well, and is able to explain much of the decline in the participation rate following the 1990-91 recession, the gradual increase from 1996 to 2001, and the recent surge in 2002.

Our major findings can be summarised as follows. First, female cohort effects are responsible for the observed increase in the female participation rate over the last three decades, but this positive impact will likely be exhausted once the 1950 cohort reaches the age of 65 in 2015. Second, the decline in the participation rate in the early 1990s reflected a sharp cyclical decline in labour demand and a strong wealth effect stemming from equity and life insurance and pensions assets. Third, the decline in equity markets had a significant wealth effect on older persons, pushing their participation rates up in 2002. Finally, over the long term, our results suggest that the ageing of the population will put significant downward pressure on the aggregate participation rate as baby boomers make the transition from labour market activity and into retirement.

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Appendix I

Net Wealth Adjusted for Market Prices:

Our net wealth at market price measure was constructed using Statistics Canada's annual National Balance Sheet Accounts and quarterly Financial Flow data. Assets in the net wealth measure consist of total tangible assets (residential structures and land, consumer durable goods, and other tangible assets) and total financial assets (life insurance and pension assets, currency and deposits, bonds and short-term paper, equity assets, and other financial assets). Liabilities in the net wealth measure consist of mortgage, consumer, and other debt.

Two major adjustments were made to Statistics Canada's wealth measure from the National Balance Sheet Accounts for the Personal and Unincorporated Business Sector. First, in Statistics Canada's measure of wealth, an individual holding a mutual fund is considered to hold a "share" in the mutual fund as opposed to the asset the fund actually holds. Therefore, the total liability of the mutual fund sector was subtracted from Statistic Canada's measure of personal sector equity assets and was then added back to their respective categories based on their historical shares.

The second adjustment revalues equities at market value. This adjustment was made because financial assets are valued at book value or acquisition cost and thus will not reflect unrealized capital gains resulting from changes in the value of these financial assets, particularly with respect to equities. Statistics Canada deals with this issue by adding retained corporate earnings to the acquisition costs of equity assets and the corporate equity liabilities, as they feel that this measure more adequately represents the value of the asset. While this may be the case, given that this measure is not at market prices, it would not be well suited for analysis of individual's responses to short-term changes in equity prices. Thus the financial flows data was used to construct a permanent inventory stock series using the "real" value of net flows of equity into the personal sector.[6] The permanent inventory stock series was then multiplied by the current level of

[6] This is done by assuming that a flow of equities occurs at market values.

the TSX to convert the measure to current prices. We then chose 1980 as the starting point of our new series, which was set equal to the Statistics Canada measure, and was then extended backwards and forwards using the permanent stock series at current prices. This new measure gave us a series that was roughly comparable to the Statistics Canada series over the past twenty years, which is important if one believes that the market value of equity should equal acquisition costs and retained earnings over the long run. According to this new measure, equities have, on average since 1997, represented 26.2 per cent of financial assets and 15.5 per cent of total assets.

Appendix II

Table 5 - Coefficient Estimates for the Labour Force Participation Rate of Males 15 to 70 & over

Variable	Coef.	s.e.	t-stat	p-value	Variable	Coef.	s.e.	t-stat	p-value
1912 Cohort	1.6018	0.292	5.483	0.000	LFPR(t-1)	0.7073	0.017	42.512	0.000
1913 Cohort	1.6210	0.291	5.574	0.000	Age (15 to 17)	-1.6710	0.922	-1.813	0.070
1914 Cohort	1.5739	0.290	5.433	0.000	Age (18 to 19)	-0.8372	0.883	-0.948	0.343
1915 Cohort	1.5754	0.288	5.464	0.000	Age (20 to 24)	-0.7291	0.567	-1.286	0.199
1916 Cohort	1.5895	0.288	5.529	0.000	Age (25 to 29)	-0.7827	0.538	-1.454	0.146
1917 Cohort	1.5859	0.287	5.525	0.000	Age (45 to 54)	-0.1441	0.435	-0.332	0.740
1918 Cohort	1.5793	0.286	5.521	0.000	Age (55 to 59)	-0.2057	0.554	-0.371	0.711
1919 Cohort	1.5620	0.285	5.473	0.000	Age (60 to 62)	-0.0517	0.681	-0.076	0.940
1920 Cohort	1.5436	0.285	5.423	0.000	Age (63 to 64)	-1.2670	0.805	-1.575	0.116
1921 Cohort	1.5689	0.284	5.517	0.000	Age (65 to 66)	-1.9294	0.814	-2.371	0.018
1922 Cohort	1.5528	0.284	5.467	0.000	Age (67 to 69)	-2.1835	0.724	-3.018	0.003
1923 Cohort	1.5551	0.284	5.483	0.000	Age (70 & over)	-2.1236	1.294	-1.641	0.101
1924 Cohort	1.5468	0.283	5.466	0.000	Age (15 to 17)*wealth	0.0011	0.007	0.168	0.866
1925 Cohort	1.5331	0.283	5.424	0.000	Age (18 to 19)*wealth	-0.0032	0.006	-0.515	0.607
1926 Cohort	1.5371	0.282	5.442	0.000	Age (20 to 24)*wealth	-0.0032	0.004	-0.867	0.386
1927 Cohort	1.5526	0.282	5.501	0.000	Age (25 to 29)*wealth	-0.0018	0.003	-0.511	0.609
1928 Cohort	1.5487	0.282	5.487	0.000	Age (30 to 44)*wealth	-0.0084	0.002	-4.048	0.000
1929 Cohort	1.5613	0.282	5.530	0.000	Age (45 to 54)*wealth	-0.0093	0.003	-3.577	0.000
1930 Cohort	1.5861	0.282	5.617	0.000	Age (55 to 59)*wealth	-0.0125	0.004	-3.435	0.001
1931 Cohort	1.5903	0.282	5.635	0.000	Age (60 to 62)*wealth	-0.0147	0.005	-3.144	0.002
1932 Cohort	1.6101	0.282	5.700	0.000	Age (63 to 64)*wealth	-0.0047	0.006	-0.821	0.412
1933 Cohort	1.6158	0.282	5.720	0.000	Age (65 to 66)*wealth	-0.0035	0.006	-0.612	0.541
1934 Cohort	1.6339	0.282	5.785	0.000	Age (67 to 69)*wealth	-0.0001	0.005	-0.025	0.980
1935 Cohort	1.6539	0.282	5.858	0.000	Age (70 & over)*wealth	-0.0074	0.009	-0.787	0.431
1936 Cohort	1.6887	0.282	5.978	0.000	Age (15 to 17)*jor	0.0019	0.001	2.593	0.010
1937 Cohort	1.6864	0.282	5.979	0.000	Age (18 to 19)*jor	0.0007	0.001	0.959	0.338
1938 Cohort	1.7089	0.282	6.062	0.000	Age (20 to 24)*jor	0.0005	0.000	1.167	0.243
1939 Cohort	1.7285	0.282	6.124	0.000	Age (25 to 29)*jor	0.0013	0.000	3.118	0.002
1940 Cohort	1.7463	0.282	6.183	0.000	Age (30 to 44)*jor	0.0004	0.000	1.802	0.072
1941 Cohort	1.7516	0.283	6.193	0.000	Age (45 to 54)*jor	0.0004	0.000	1.597	0.111
1942 Cohort	1.7536	0.283	6.189	0.000	Age (55 to 59)*jor	0.0002	0.000	0.458	0.647
1943 Cohort	1.7941	0.284	6.310	0.000	Age (60 to 62)*jor	-0.0003	0.001	-0.655	0.513
1944 Cohort	1.8064	0.285	6.342	0.000	Age (63 to 64)*jor	0.0000	0.001	-0.051	0.959
1945 Cohort	1.8123	0.285	6.351	0.000	Age (65 to 66)*jor	-0.0004	0.001	-0.649	0.516
1946 Cohort	1.8161	0.285	6.365	0.000	Age (67 to 69)*jor	-0.0002	0.001	-0.307	0.759
1947 Cohort	1.8228	0.286	6.381	0.000	Age (70 & over)*jor	-0.0008	0.001	-0.866	0.387

Table 5 cont. - Coefficient Estimates for the Labour Force Participation Rate of Males 15 to 70 & over

Variable	Coef.	s.e.	t-stat	p-value	Variable	Coef.	s.e.	t-stat	p-value
1948 Cohort	1.8377	0.286	6.421	0.000	Age (15 to 17)*r	-0.0098	0.030	-0.329	0.742
1949 Cohort	1.8481	0.287	6.435	0.000	Age (18 to 19)*r	-0.0356	0.026	-1.343	0.179
1950 Cohort	1.8497	0.288	6.426	0.000	Age (20 to 24)*r	-0.0229	0.017	-1.388	0.165
1951 Cohort	1.8481	0.288	6.425	0.000	Age (25 to 29)*r	-0.0331	0.016	-2.044	0.041
1952 Cohort	1.8496	0.288	6.415	0.000	Age (30 to 44)*r	-0.0433	0.009	-4.628	0.000
1953 Cohort	1.8528	0.289	6.409	0.000	Age (45 to 54)*r	-0.0570	0.012	-4.815	0.000
1954 Cohort	1.8601	0.289	6.430	0.000	Age (55 to 59)*r	-0.0283	0.017	-1.678	0.094
1955 Cohort	1.8577	0.290	6.409	0.000	Age (60 to 62)*r	-0.0231	0.022	-1.067	0.286
1956 Cohort	1.8555	0.290	6.392	0.000	Age (63 to 64)*r	-0.0424	0.026	-1.625	0.105
1957 Cohort	1.8450	0.290	6.364	0.000	Age (65 to 66)*r	0.0513	0.027	1.931	0.054
1958 Cohort	1.8474	0.289	6.382	0.000	Age (67 to 69)*r	-0.0061	0.024	-0.260	0.795
1959 Cohort	1.8500	0.290	6.388	0.000	Age (70 & over)*r	0.0519	0.042	1.241	0.215
1960 Cohort	1.8420	0.289	6.368	0.000	Age (15 to 17)*eiindex	-0.0005	0.001	-0.359	0.720
1961 Cohort	1.8275	0.289	6.318	0.000	Age (18 to 19)*eiindex	-0.0011	0.001	-0.893	0.372
1962 Cohort	1.8301	0.289	6.324	0.000	Age (20 to 24)*eiindex	-0.0011	0.001	-1.456	0.146
1963 Cohort	1.8397	0.289	6.359	0.000	Age (25 to 29)*eiindex	-0.0013	0.001	-1.794	0.073
1964 Cohort	1.8235	0.289	6.317	0.000	Age (30 to 44)*eiindex	-0.0014	0.000	-3.497	0.001
1965 Cohort	1.8284	0.289	6.337	0.000	Age (45 to 54)*eiindex	-0.0005	0.000	-1.058	0.290
1966 Cohort	1.8165	0.289	6.293	0.000	Age (55 to 59)*eiindex	0.0001	0.001	0.114	0.909
1967 Cohort	1.8279	0.289	6.333	0.000	Age (60 to 62)*eiindex	-0.0007	0.001	-0.836	0.403
1968 Cohort	1.8281	0.288	6.346	0.000	Age (63 to 64)*eiindex	-0.0006	0.001	-0.537	0.592
1969 Cohort	1.8086	0.288	6.290	0.000	Age (65 to 66)*eiindex	-0.0003	0.001	-0.313	0.755
1970 Cohort	1.7920	0.287	6.243	0.000	Age (67 to 69)*eiindex	0.0003	0.001	0.280	0.780
1971 Cohort	1.7796	0.287	6.205	0.000	Age (70 & over)*eiindex	0.0001	0.002	0.049	0.961
1972 Cohort	1.7621	0.287	6.140	0.000					
1973 Cohort	1.7768	0.288	6.173	0.000					
1974 Cohort	1.7595	0.288	6.115	0.000					
1975 Cohort	1.7510	0.288	6.084	0.000					
1976 Cohort	1.7540	0.288	6.090	0.000					
1977 Cohort	1.7370	0.288	6.026	0.000					
1978 Cohort	1.7493	0.289	6.049	0.000					
1979 Cohort	1.7190	0.290	5.936	0.000					

Table 6 - Coefficient Estimates for the Labour Force Participation Rate of Females 15 to 70 & over

Variable	Coef.	s.e.	t-stat	p-value	Variable	Coef.	s.e.	t-stat	p-value
1912 Cohort	-0.1008	0.214	-0.470	0.638	LFPR(t-1)	0.7364	0.015	49.454	0.000
1913 Cohort	-0.1228	0.213	-0.575	0.565	Age (15 to 17)	0.7582	0.692	1.095	0.274
1914 Cohort	-0.1330	0.212	-0.626	0.531	Age (18 to 19)	1.2451	0.669	1.862	0.063
1915 Cohort	-0.1517	0.212	-0.717	0.473	Age (20 to 24)	-0.6666	0.432	-1.544	0.123
1916 Cohort	-0.2009	0.211	-0.952	0.342	Age (25 to 29)	-0.6015	0.410	-1.468	0.142
1917 Cohort	-0.2293	0.211	-1.088	0.277	Age (45 to 54)	0.5296	0.332	1.595	0.111
1918 Cohort	-0.2075	0.210	-0.988	0.323	Age (55 to 59)	0.5902	0.424	1.393	0.164
1919 Cohort	-0.2020	0.210	-0.963	0.336	Age (60 to 62)	0.5898	0.520	1.134	0.257
1920 Cohort	-0.1658	0.209	-0.793	0.428	Age (63 to 64)	0.8537	0.613	1.392	0.164
1921 Cohort	-0.1559	0.209	-0.746	0.456	Age (65 to 66)	-0.1898	0.617	-0.308	0.759
1922 Cohort	-0.1759	0.209	-0.843	0.400	Age (67 to 69)	-1.2938	0.544	-2.377	0.018
1923 Cohort	-0.1399	0.208	-0.673	0.501	Age (70 & over)	-2.0983	0.980	-2.141	0.033
1924 Cohort	-0.1405	0.208	-0.677	0.498	Age (15 to 17)*wealth	-0.0071	0.005	-1.392	0.164
1925 Cohort	-0.1377	0.207	-0.665	0.506	Age (18 to 19)*wealth	-0.0105	0.005	-2.212	0.027
1926 Cohort	-0.1285	0.207	-0.621	0.535	Age (20 to 24)*wealth	0.0041	0.003	1.439	0.150
1927 Cohort	-0.1070	0.207	-0.518	0.605	Age (25 to 29)*wealth	0.0059	0.003	2.234	0.026
1928 Cohort	-0.0848	0.206	-0.411	0.681	Age (30 to 44)*wealth	0.0005	0.002	0.342	0.732
1929 Cohort	-0.0740	0.206	-0.359	0.720	Age (45 to 54)*wealth	-0.0040	0.002	-2.086	0.037
1930 Cohort	-0.0463	0.206	-0.225	0.822	Age (55 to 59)*wealth	-0.0075	0.003	-2.739	0.006
1931 Cohort	-0.0369	0.206	-0.179	0.858	Age (60 to 62)*wealth	-0.0095	0.004	-2.680	0.008
1932 Cohort	-0.0159	0.205	-0.078	0.938	Age (63 to 64)*wealth	-0.0109	0.004	-2.523	0.012
1933 Cohort	0.0113	0.205	0.055	0.956	Age (65 to 66)*wealth	-0.0066	0.004	-1.518	0.129
1934 Cohort	0.0348	0.205	0.170	0.865	Age (67 to 69)*wealth	0.0018	0.004	0.471	0.638
1935 Cohort	0.0610	0.204	0.298	0.766	Age (70 & over)*wealth	-0.0014	0.007	-0.200	0.842
1936 Cohort	0.0783	0.204	0.383	0.702	Age (15 to 17)*jor	0.0012	0.001	2.250	0.025
1937 Cohort	0.0918	0.204	0.451	0.652	Age (18 to 19)*jor	0.0002	0.001	0.308	0.758
1938 Cohort	0.1080	0.203	0.531	0.595	Age (20 to 24)*jor	0.0008	0.000	2.498	0.013
1939 Cohort	0.1380	0.203	0.679	0.498	Age (25 to 29)*jor	0.0004	0.000	1.263	0.207
1940 Cohort	0.1494	0.203	0.735	0.463	Age (30 to 44)*jor	0.0004	0.000	2.073	0.038
1941 Cohort	0.1620	0.203	0.796	0.426	Age (45 to 54)*jor	0.0000	0.000	-0.102	0.919
1942 Cohort	0.1795	0.204	0.881	0.379	Age (55 to 59)*jor	0.0002	0.000	0.650	0.516
1943 Cohort	0.1957	0.204	0.959	0.338	Age (60 to 62)*jor	0.0002	0.000	0.459	0.646
1944 Cohort	0.1980	0.204	0.969	0.333	Age (63 to 64)*jor	-0.0003	0.000	-0.681	0.496
1945 Cohort	0.2091	0.205	1.021	0.308	Age (65 to 66)*jor	-0.0010	0.000	-2.082	0.038
1946 Cohort	0.2204	0.205	1.076	0.282	Age (67 to 69)*jor	0.0004	0.000	1.026	0.305
1947 Cohort	0.2272	0.205	1.109	0.268	Age (70 & over)*jor	0.0018	0.001	2.524	0.012

Table 6 cont. - Coefficient Estimates for the Labour Force Participation Rate of Females 15 to 70 & over

Variable	Coef.	s.e.	t-stat	p-value	Variable	Coef.	s.e.	t-stat	p-value
1948 Cohort	0.2471	0.205	1.203	0.229	Age (15 to 17)*r	0.0004	0.023	0.018	0.986
1949 Cohort	0.2575	0.206	1.251	0.211	Age (18 to 19)*r	-0.0176	0.020	-0.873	0.383
1950 Cohort	0.2706	0.206	1.311	0.190	Age (20 to 24)*r	0.0271	0.013	2.151	0.032
1951 Cohort	0.2822	0.206	1.367	0.172	Age (25 to 29)*r	0.0112	0.012	0.896	0.370
1952 Cohort	0.2894	0.207	1.398	0.162	Age (30 to 44)*r	0.0124	0.007	1.723	0.085
1953 Cohort	0.2905	0.208	1.399	0.162	Age (45 to 54)*r	-0.0107	0.009	-1.192	0.233
1954 Cohort	0.2913	0.208	1.402	0.161	Age (55 to 59)*r	-0.0158	0.013	-1.233	0.218
1955 Cohort	0.2943	0.208	1.413	0.158	Age (60 to 62)*r	-0.0196	0.016	-1.192	0.234
1956 Cohort	0.2989	0.209	1.433	0.152	Age (63 to 64)*r	-0.0308	0.020	-1.551	0.121
1957 Cohort	0.3013	0.209	1.445	0.149	Age (65 to 66)*r	0.0284	0.020	1.402	0.161
1958 Cohort	0.2970	0.208	1.427	0.154	Age (67 to 69)*r	0.0297	0.018	1.652	0.099
1959 Cohort	0.3087	0.208	1.483	0.138	Age (70 & over)*r	0.0298	0.032	0.936	0.350
1960 Cohort	0.3105	0.208	1.494	0.136	Age (15 to 17)*eiindex	-0.0010	0.001	-0.965	0.335
1961 Cohort	0.3175	0.208	1.525	0.127	Age (18 to 19)*eiindex	-0.0010	0.001	-1.032	0.302
1962 Cohort	0.3116	0.208	1.496	0.135	Age (20 to 24)*eiindex	0.0012	0.001	2.068	0.039
1963 Cohort	0.3147	0.208	1.511	0.131	Age (25 to 29)*eiindex	-0.0005	0.001	-0.843	0.400
1964 Cohort	0.3063	0.208	1.473	0.141	Age (30 to 44)*eiindex	-0.0004	0.000	-1.282	0.200
1965 Cohort	0.3039	0.208	1.462	0.144	Age (45 to 54)*eiindex	-0.0006	0.000	-1.617	0.106
1966 Cohort	0.3080	0.208	1.480	0.139	Age (55 to 59)*eiindex	-0.0001	0.001	-0.102	0.919
1967 Cohort	0.2949	0.208	1.417	0.157	Age (60 to 62)*eiindex	0.0000	0.001	0.055	0.956
1968 Cohort	0.2909	0.208	1.399	0.162	Age (63 to 64)*eiindex	-0.0010	0.001	-1.184	0.237
1969 Cohort	0.2938	0.208	1.415	0.157	Age (65 to 66)*eiindex	0.0009	0.001	1.099	0.272
1970 Cohort	0.2902	0.207	1.399	0.162	Age (67 to 69)*eiindex	0.0017	0.001	2.378	0.018
1971 Cohort	0.2724	0.207	1.314	0.189	Age (70 & over)*eiindex	0.0023	0.001	1.687	0.092
1972 Cohort	0.2776	0.208	1.337	0.182					
1973 Cohort	0.2840	0.209	1.362	0.174					
1974 Cohort	0.3125	0.209	1.496	0.135					
1975 Cohort	0.3322	0.209	1.586	0.113					
1976 Cohort	0.3531	0.210	1.681	0.093					
1977 Cohort	0.3498	0.211	1.659	0.097					
1978 Cohort	0.3546	0.212	1.675	0.094					
1979 Cohort	0.3677	0.212	1.731	0.084					

Appendix III

Table 7 - Wald Test of Joint Significance

Variables	Females	Males
Cohort Effects		
Chi-square	169.861	95.576
(p-value)	*0.0000*	*0.0154*
Age		
Chi-square	32.168	18.211
(p-value)	*0.0007*	*0.0768*
Job Offer Rate		
Chi-square	30.154	27.400
(p-value)	0.0026	0.0068
Wealth		
Chi-square	38.448	45.935
(p-value)	0.0001	0.0000
Real After-tax Interest Rate		
Chi-square	21.361	65.100
(p-value)	0.045	0.0000
E.I. Index		
Chi-square	22.756	20.999
(p-value)	0.0299	0.0504

Appendix IV

Figure 15 - Labour Force Participation Rate of Males

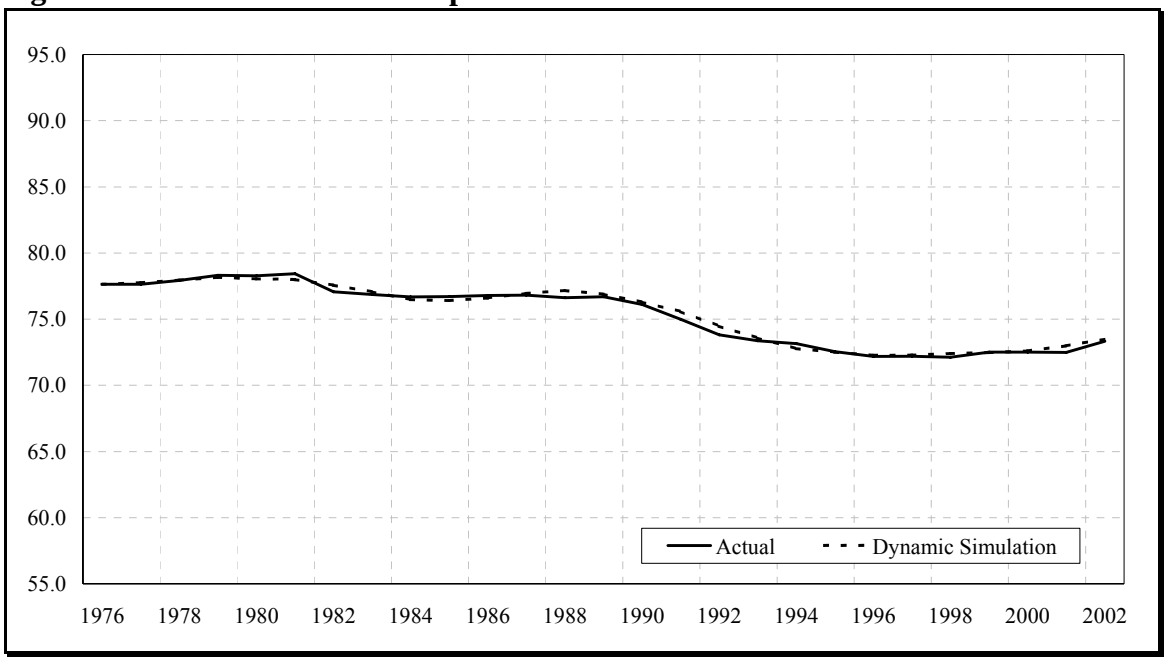
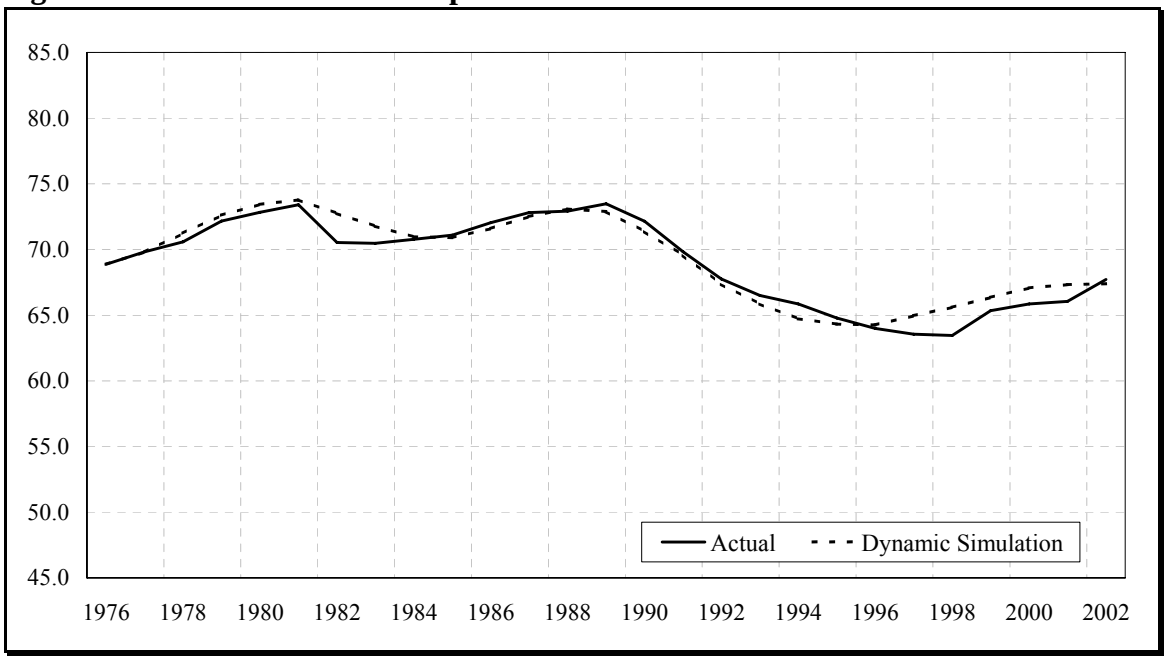


Figure 16 - Labour Force Participation Rate of Males 15 to 24



Appendix IV (continued)

Figure 17 - Labour Force Participation Rate of Males 25 to 54

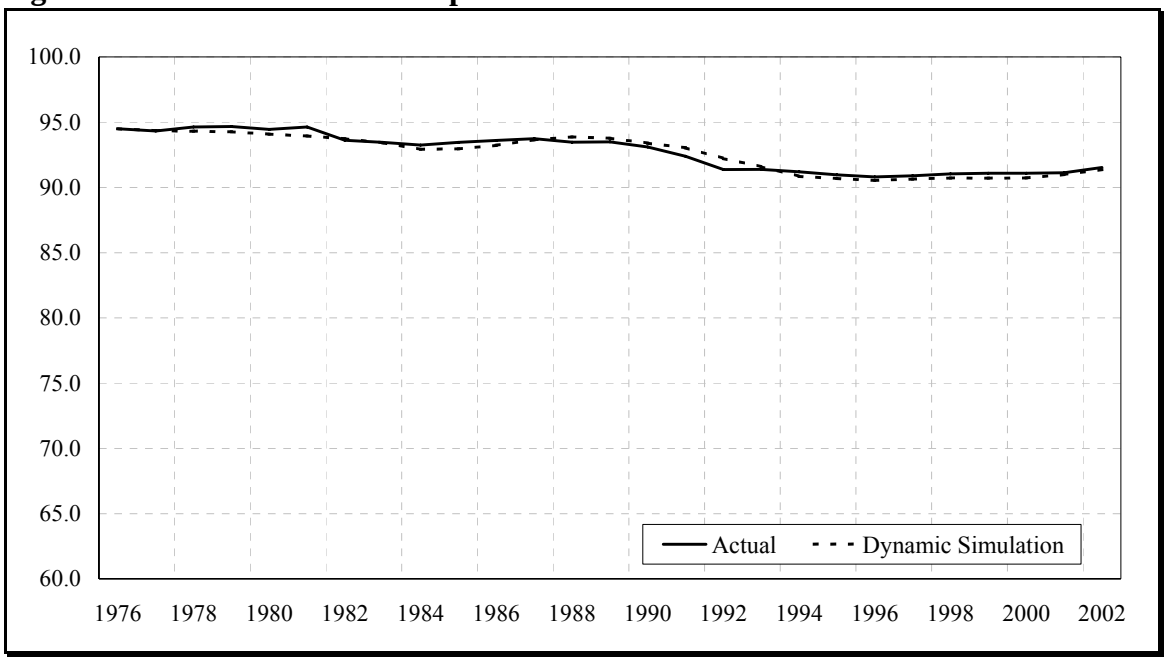
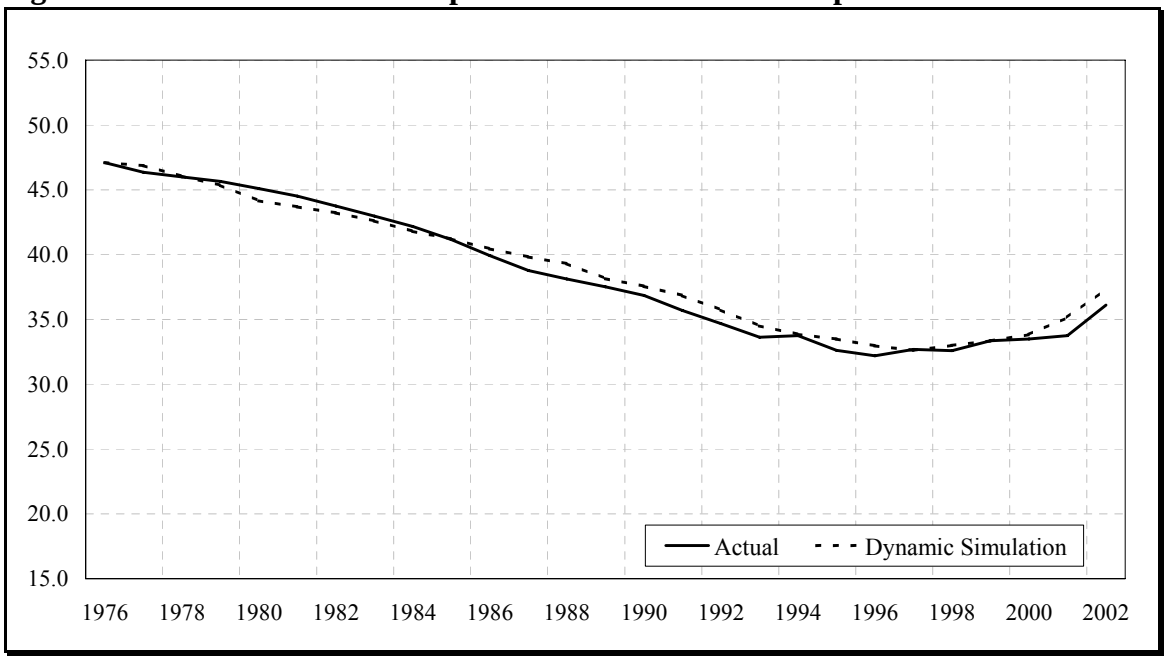


Figure 18 - Labour Force Participation Rate of Males 55 & up



Appendix IV (continued)

Figure 19 - Labour Force Participation Rate of Females

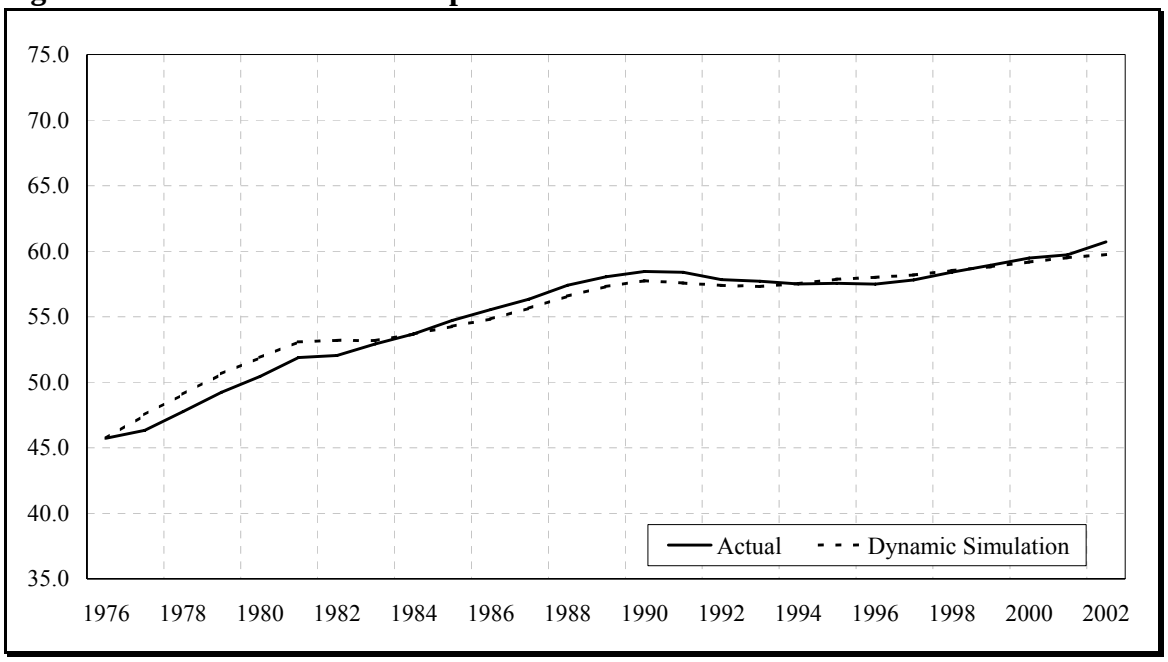
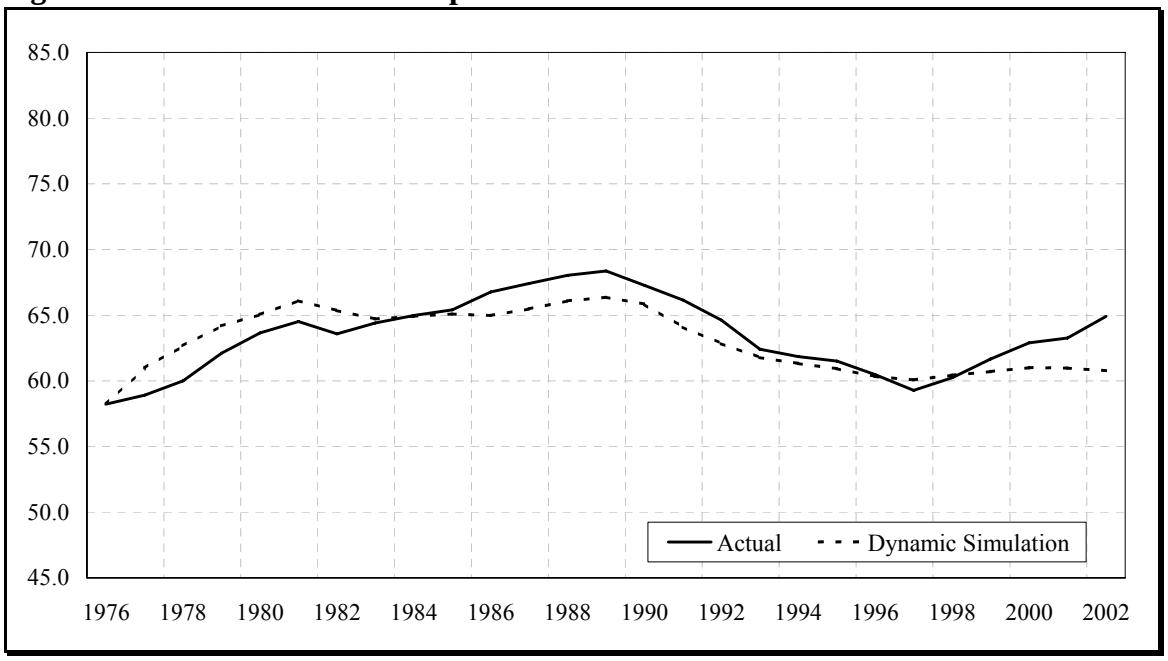


Figure 20 - Labour Force Participation Rate of Females 15 to 24



Appendix IV (continued)

Figure 21 - Labour Force Participation Rate of Females 25 to 54

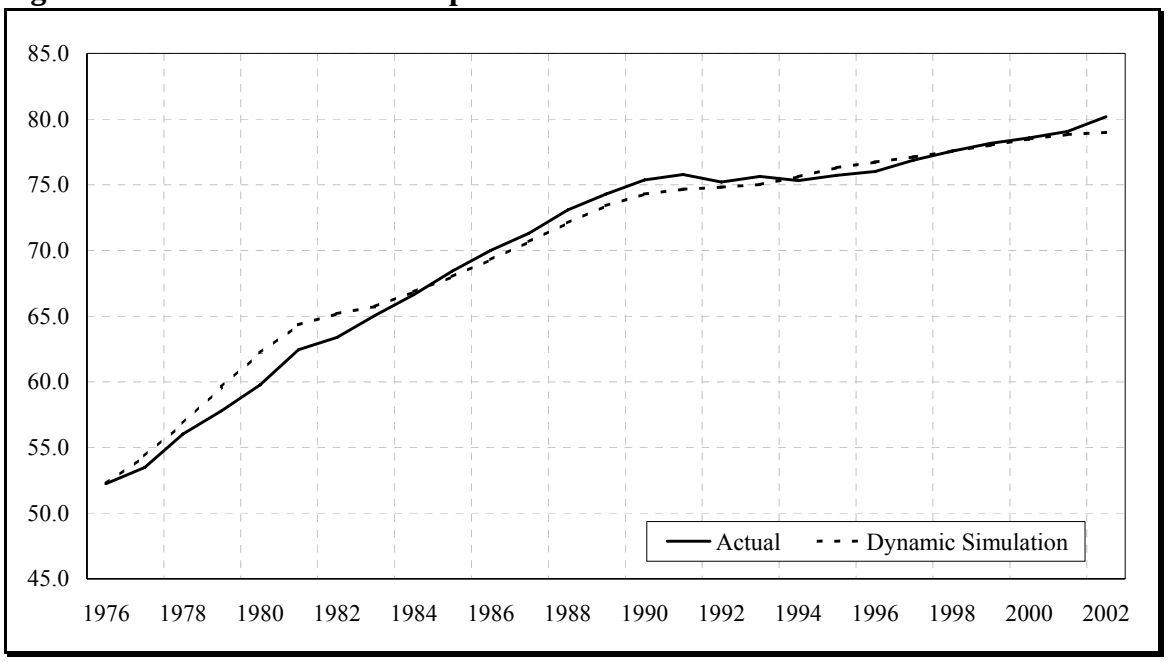


Figure 22 - Labour Force Participation Rate of Females 55 & up