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Development of a behavioural framework for analyzing employment mobility decisions in island areas: the case of the Aegean Islands, Greece

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ABSTRACT: This paper proposes a theoretical framework to model employment mobility in island areas. It aims at identifying the critical factors affecting the decision of the employees to relocate their workplace to an island area, given a possible residential relocation. Emphasis is given to the role of transport and telecommunications systems on the region's connectivity and accessibility. Discrete choice models are developed, using both observed and latent variables for the workplace relocation decision to the Aegean island area in Greece. Data was collected in the year 2012 from 518 Greek employees. Findings indicate the importance of the role of transport and telecommunications systems for employment mobility in island areas. The estimated choice models identified profiles of the employees who are prone to: a) keep their current workplace; b) relocate their workplace to the island area; c) change occupation after residential relocation. Finally, the sample enumeration method integrates the models' results across all Greek employees.

Keywords: communication, island regions, Aegean Islands, Greece, employment mobility, discrete choice model, latent variables, sample enumeration, transport logistics.

Introduction

The islands of Greece constitute an economic, social, cultural and strategic space integral to the country's national fabric and heritage. Roughly 15% of the Greek population lives on the islands, which cover 19% of the country's land area; the mean density of population in the islands is about 100 residents per km^2. When trade flourished with Middle Eastern countries, the Aegean islands were geographically advantaged when compared to continental Greece. Particularities in transport related to the islands' character are attributed to the fact that access to and from the islands occurs mainly by sea.

This paper looks at the factors affecting the decision of Greek employees to relocate their workplace to an island area, given a possible residential relocation to that area (referred to, for the purposes of this paper, as an "employment mobility decision"). It is common place that, employment and residential mobility decisions are usually inter-related. In this case study, in order to separately analyse employment mobility decisions in island areas, it is considered that the choices in question (referring to the workplace relocation choices) follow residential relocation decisions to such areas. It is noted that, the current research follows -and thus has strongly considered - the findings of previous research regarding residential relocation choices in island areas, under the relevant theoretical background (Kitrinou, Polydoropoulou & Bolduc,

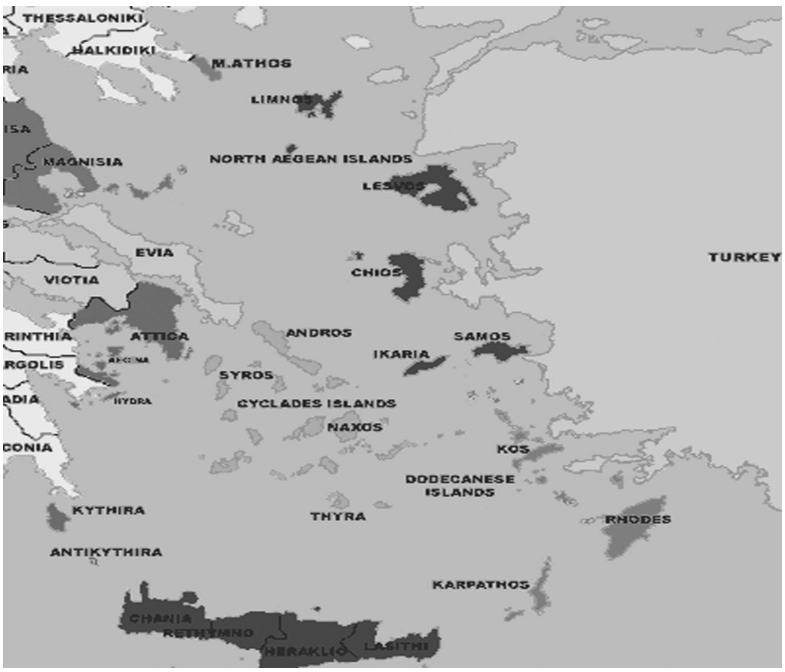
2010; Kitrinou & Polydoropoulou, 2009). Within this framework, the current paper seeks to analyze and forecast employment mobility decisions in island areas, by recognizing the impact of regions' accessibility (Spilanis, Kizos & Petsioti, 2012; Kitrinou & Polydoropoulou, 2009), together with the impact of psychological factors, such as perceptions and attitudes, of the decision makers (Kitrinou, et al., 2010). The decisions in question are analyzed and forecast via the development of Integrated Discrete Choice and Latent Variable models, based on Discrete Choice Analysis. An application of the model is made to the wider Aegean island area in Greece, based on a policy scenario referring to improved accessibility of the islands by means of transport and telecommunication systems in the area.

The paper is organized as follows: The next section presents the Aegean Island area in Greece, considering mainly the area's transport (accessibility) characteristics. A review of the relevant literature is then presented. A behavioural framework to model employment mobility in island areas is developed, taking into account both observed and latent characteristics of Greek employees. An application to the Aegean island area is then developed. The estimation results of the employment mobility choice models are then presented and aggregated over the Greek population. The final section concludes the paper.

The Aegean Island Area

The Aegean archipelago consists of two regions: the Northern Aegean and the Southern Aegean. The Northern Aegean includes the prefectures of: Lesvos, Chios and Samos. With Mytilini as the capital city, the region holds 1.8% of the Greek population, and with a tendency to decrease. It produces 1.7% of Greece's GDP, 3.2% of its rural production, 0.2% of its manufacturing and 1.6% of its services. The Southern Aegean includes the prefectures of Dodekanisa and Kyklades. Its capital is Ermoupolis. It comprises 2.8% of the country's population, with a strong tendency to increase. It produces 3% of the country's GDP, 2.5% of its rural production, 0.4% of its manufacturing and 3.7% of its services (Eurostat, 2010). A map of the area in consideration is presented as Figure 1.

Figure 1: The Aegean Islands of Greece (Source: http://www.in2greece.com).



The main characteristics of the Aegean Island area's transport system are the following:

- Longer duration of marine travel
- Higher transport cost (especially in air travel)
- Problems regarding frequency, regularity and quality of transport services
- Problems regarding the infrastructure in ports and airports
- Problems concerning decentralization of services and regional development
- Significant differences between the islands, with regard to size, population, public services, transport and telecommunication infrastructure.

The coastal network consists of 141 nodes including 49 continental and 92 island ports. In the island Aegean, there are 47 basic ports, which are served globally by the coastal network. There is a total of 285 network routes (195 main lines and 90 local lines). Some 88-92% of the total travel demand is covered by these sea-based routes. Passenger movement to and from the region has increased over recent years, with a mean annual increase of about 5%.

The air network structure is simpler, regarding both the number of nodes (airports) and the number of itineraries. The air network includes 42 airports, of which 34 serve domestic destinations while 24 constitute destinations where the plane and the ferry compete for passengers. The central nodes of the air network are Athens and Thessalonica, from which almost all airline route radiate. Island-to-island connections are rare because of the limited demand. There are a total of 88 air network lines within Greece, 44 of which operate in the Aegean region. Air passenger movement in the Aegean islands increased by almost 50%. during the 15-year period 1995-2010.

Literature review

Over recent years, island research has shown an interest in analyzing the attractiveness of island regions as places for residence (Kitrinou et al., 2010; Kitrinou, 2009) and employment (Baldacchino & Hood, 2008; Baldacchino, 2006, 2007; Dominguez-Mujica, Gonzalez-Perez & Parreno-Castellano, 2011).

Baldacchino (2006) undertook a study of 320 recent immigrants / settlers to Prince Edward Island (PEI), Canada's smallest province. He found that the key "pull factors" for drawing immigrants to the region relate to "quality of life" issues, including: "hassle-free security, lower crime, slower tempo, shorter distances, lovely summers and more affordable housing". Accordingly, the "push factors" are associated with big city life and tempo, crime and instrumental human relations. The main obstacles or problems to attracting other settlers to the Prince Edward Island are claimed to relate to "the absence of (suitable) employment opportunities and the state of health care in the province" (Baldacchino, 2007, pp. 8-9)

Baldacchino and Hood (2008) developed a qualitative study of the challenges that are faced by internationally educated health professionals in coming and staying on PEI and in Atlantic Canada. They proposed that any employees working there are likely to stay longer if proactive and flexible steps to integrate and retain these and their families locally are taken. Such proactive steps could include improvements to local transport and communication costs, systems and options.

Dominguez-Mujica, et al. (2011) argue that economic development, tourism and demographic changes are closely related, especially in island areas. They analyzed the tourist

and residential developments and the migratory patterns of the Balearic islands and the Canary islands (Spain), by examining two areas in both archipelagos (Calvia` and Maspalomas), which allowed for a recognition of some differences in their economic specialization and social space.

Especially for Greek island areas, employment mobility issues have to consider accessibility and connectivity, together with social, economic, political and cultural characteristics (Spilanis et al., 2012). The transport and telecommunications systems of the island areas are significant issues (Kitrinou, 2009; Kitrinou et al., 2010).

It seems that information and communication technologies (ICTs) have a significant impact on regional accessibility: they encourage flexible working arrangements when access to work is no longer measured only in terms of travel time, distance or cost (Koenig, Henderson & Mokhtarian, 1996; Pendyala, Goulias & Kitamura, 1991). Related studies suggest that telecommunications infrastructure in island areas enhances economic activity and growth at the national level (Kitrinou, Kolokolov & Zaozerskaya, 2004; Smith, 1998). Kitrinou, et al. (2004) developed a theoretical framework for the e-economy and transport impacts on accessibility, decentralization of services and regional development, especially in island areas. A methodological framework for developing a set of teleworking centres in the Aegean Island region was also proposed.

The relevant literature that refers to the choice of job location has a clear urban bias. Mokhtarian & Bagley (2000) developed measures of job and workplace perceptions, and examined the importance of those and other measures on the desired proportions of work time at each of three locations: regular workplace, home, and telecommuting centre. Four job context perception factors were identified: productivity, job satisfaction, supervisor relationship, and co-worker interaction. Four generic workplace perception factors were identified (with measures for each of the work locations of interest): personal benefits, work effectiveness, autonomy, and supervisor comfort. A study by Saxena & Mokhtarian (1997) analyzed the spatial location, orientation and extent of the activity locations within the "activity space" of individuals in order to analyze the impacts of teleworking. They performed a spatial analysis of the activity space of teleworkers and their household members. Potential causal relationships between the influencing factors and the activity location choice were investigated. Additionally, Mokhtarian, Collantes & Geertz (2004) analyzed retrospective data on teleworking engagement and residential and job location changes over a ten-year period. They found that the distance between home and workplace increases as the frequency of teleworking practice increases. In addition, Ory and Mokhtarian (2004) suggested that people moving as a consequence of teleworking, relocate closer to their workplace, as opposed to those starting teleworking following residential relocation, who tend to live farther away from their workplace.

Accordingly, the theories on modelling employment mobility decisions have focused on urban areas. They can be broadly divided into two categories: deterministic equilibrium models and behavioural models. The first set of models is based on urban areas' structure, while the modelling objective is to minimise the cost of transportation (Steiner, 1994). The second set of models incorporates behavioural insights and is based on the utility maximization axiom over a set of discrete alternatives. Shukla & Waddell (1991), Carlton (1979; 1983), Hansen (1987) and Hayashi, Tomohiko & Tomita (1986) have developed such models to explain various industries' location decisions. Most of these studies have considered factors such as land cost and availability, transportation accessibility to consumers and suppliers, labour availability, wages, taxes, and measures of agglomeration economies and quality of life

in their utility models. The findings have been taken into account when developing the behavioural and modelling framework of employment mobility decisions in island areas that is presented in the next section.

Modeling employment mobility decisions in island areas

To model employment mobility decisions in an island area, given residential relocation to that area, a behavioural framework is developed (Figure 2). It is based on Discrete Choice Analysis (DCA) theory (Ben-Akiva & Lerman, 1985; Train, 2003; Walker, 2001). In brief, DCA considers the following basic components:

- The decision maker;
- The set of discrete alternative choices available to the decision maker;
- The decision rule: selecting the alternative which allows maximum utility to the decision maker.

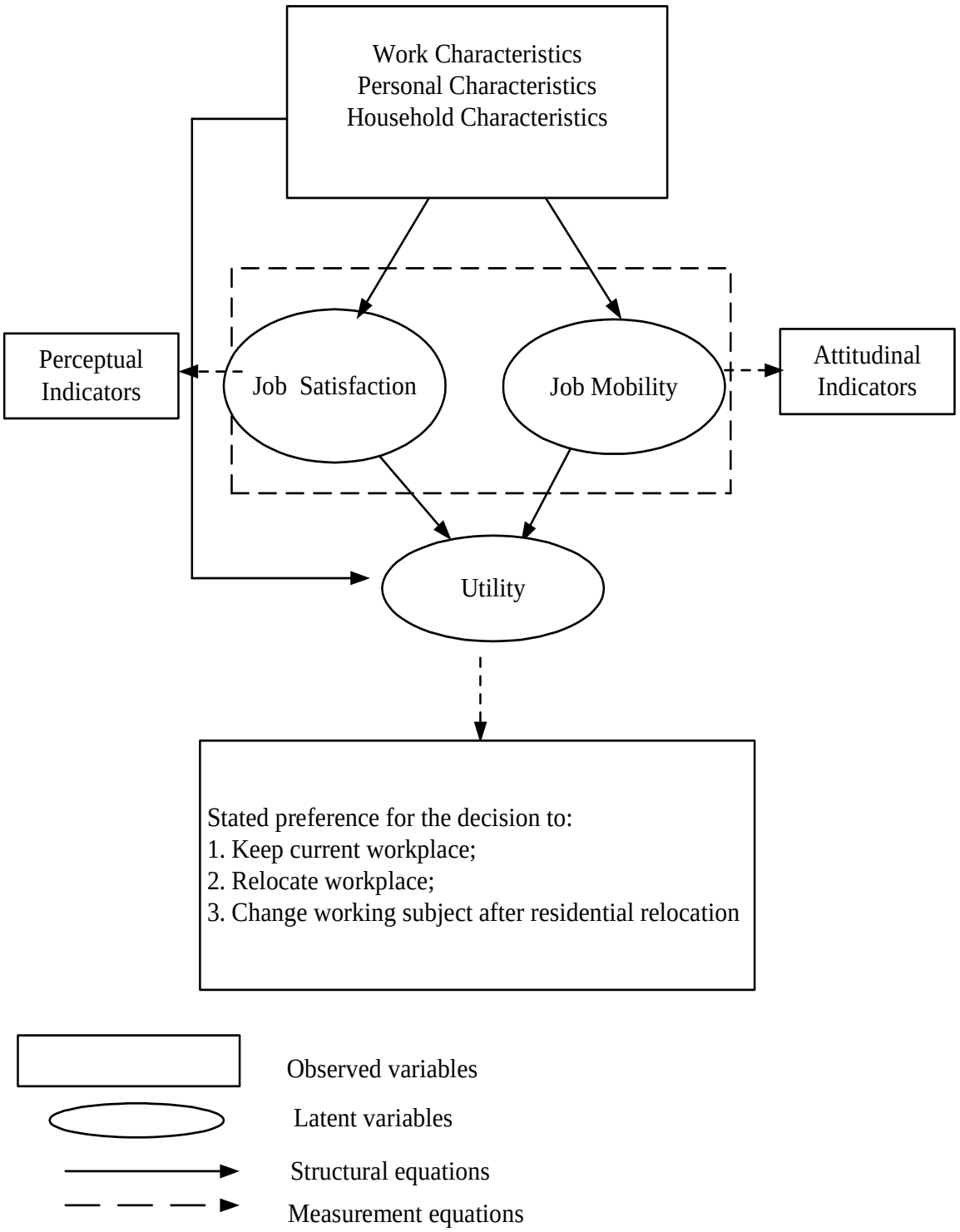
Discrete choice models are based on the economic Random Utility Theory. These Random Utility Models (RUM) have traditionally presented an individual's choice process as a black box, in which the inputs are the attributes of available alternatives and individual characteristics, and the output is the observed choice. Work in discrete choice models has also emphasized the importance of the explicit treatment of latent- psychological factors affecting decision-making (McFadden, 1986a; 1986b). A guiding philosophy in these developments is that the incorporation of latent factors leads to a more behaviourally realistic representation of the choice process, and consequently, better explanatory power (Ben-Akiva, McFadden, Gärling et al., 1999; Walker, 2001). Attitudes and perceptions of individuals are hypothesized to be key factors that portray underlying behaviour. *Perceptions* are individuals' beliefs or estimates of the levels of attributes of the alternatives. *Attitudes* are latent variables that equate to the features of the decision-maker. They are formed over time; are affected by experience and external factors; and reflect individuals' needs, values, tastes, and capabilities.

In this paper, the *Framework for modeling employment mobility decisions in island areas* considers both observable and latent (attitudinal and perceptual) characteristics of decision makers. The dependent variable is the stated preference regarding employment mobility decisions after a residential relocation to an island area. For the purposes of this paper, the following discrete choices are considered: *1= keep current workplace after residential relocation; 2 = relocate workplace to the island area; 3= change occupation after residential relocation.* In Figure 2, ovals refer to latent variables, while rectangular boxes represent observable variables. The relationship between the actual attributes of alternatives and observed behaviour is represented by the utility of the alternative choices. The explanatory variables are linked to the individual's utility through causal mapping, shown by solid arrows (structural relationships); while the utility is linked to the observed stated preferences (measurement relationships), shown by broken arrows.

The explanatory variables considered to affect the relevant choices in island areas are:

- Work characteristics of respondent, such as if she/he works full or part time; is a public or private sector employee; occupation and work grade; and current teleworking status, if any.
- Personal characteristics of respondent, such as age, gender, and education.
- Household characteristics, such as the number of household members; number of workers in the household; number and ages of children in household; and household income.

Figure 2: Integrated behavioural framework for employment mobility, given residential relocation to island areas.



As shown in Figure 2, the model contains two types of latent variables and associated indicators. The first latent variable is called ‘‘job satisfaction” of the workers who are associated with the following indicators: *My job position is temporary; Relationships with my colleagues are not very good; I can influence decisions about my current job; I have great carreer opportunities; My salary is satisfactory; My current job benefits (health care, security) are satisfactory; My current job leaves me no free time.*

The second latent variable considered is called “job mobility” and its perceptual indicators are the following: *I would seriously consider changing my occupation; I would change my occupation if I had access to training programs; Frequent occupation changes could negatively affect my professional identity; Changing my occupation includes a lot of risk.*

The above latent variables are described by five-point Likert scales of the level of agreement, taking the values: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree.

The model presented above in Figure 2 is the combination of a latent variable model and a discrete choice model. In order for the model system to be estimated, a sequential estimation procedure based on Morikawa, Ben-Akiva & MacFadden (2002) is used. At first, a factor analysis of the indicators for each of the above-presented latent variables is performed, in order to identify correlations between these variables, via their grouping to factors. Each of the factors is then defined by the variables, via the factor loadings (correlations of the variables with the factors). The factor accounting for most of the variability of the latent variable is then considered. A linear regression model of this factor is then developed with explanatory variables characteristic of the respondent, and the fitted values are calculated. Then, the fitted values of the latent variables are used as explanatory variables in the discrete choice model.

Model Estimation Results for the Aegean island region in Greece

In this application, households from all over Greece were set in a hypothetical scenario with 2020 as a reference year. In this futuristic scenario, it was assumed that, in the year 2020, the proposed relocation area will have high coverage of telecommunications infrastructure and improved transport system (i.e. increased trip frequency to/from/ into the proposed area by all modes of transport, and reduced travel time and cost). In this scenario, the facilitators of teleworking adaptation suggested by Bernardino and Ben-Akiva (1996) were also considered. These facilitators include: teleworking from home; availability of flexible schedule; cost of teleworking covered by the employee; salaries not decreased. With this scenario in mind, the respondents (all employees, members of households) were then asked to choose whether to: a) relocate their place of work to the area; b) keep the current workplace; or c) change occupation, given a possible residential relocation to the proposed area.

The empirical survey considered as “survey population” all the households in Greece, having at least one worker. The “survey unit” was considered to be that worker. The size of the survey population was found to be about 2,302,000 workers (http://www.economics.gr).

The data collected involved 518 households in Greece contacted via telephone during the year 2012. The response rate was about 60%. The sampling method included two steps: (1) a stratified sampling per Greek prefecture, analogous to the prefectural population size (number of residents), based on the assumption that “the number of residents in a prefecture is analogous to both the number of households and the number of workers in that prefecture); and (2) a random sampling using telephone catalogues. The “sampling unit” was a working person from the household. Biases in the sampling could create the fact that, some of the respondent

were found two or more times at the telephone catalogues (those biases were somehow overcome, via the random sampling at the second sampling step), while some others were not included in the catalogues (so it was not possible to find them).

In that survey sample, 54.1% of the respondents were male; 45.9% were female. The average number of household members was 3.2, while the average number of workers per household was 1.54. Children were present in 58.1% of the households, while the average number of children in a household was 1.78. The average number of cars in a household was 1.38. The distribution of the respondents regarding the age group, the education level, the household income was about the same in the Greek population. Regarding work characteristics, 28% of the respondents worked in the public sector, and 72% in the private sector. 91% of the respondents were full time workers, while 9% were part time workers. 11% had managerial positions. Additionally, only 5% of the respondents were currently teleworkers and their mean number of teleworking days was 7.6 per month. Another 9.7% of the respondents usually "took work home", on an average of about 9 days per month.

For the model estimation, a factor analysis of the indicators for each of the two latent variables is first performed, as mentioned in the previous paragraph. In this empirical study, the indicators of each latent variable were factor analyzed using a Principal Component analysis (PCA) for factor extraction and by varimax rotation of the factors. The factor accounting for most of the variability of the latent variable was then considered. Then, a linear regression model of this factor was estimated using the characteristics of the respondent as explanatory variables. The fitted values are then calculated and included as explanatory variables in the discrete choice model. The results are summarized below.

For the latent variable models, the results of the measurement equations estimated via the development of the model presented in Figure 2 are as follows:

The seven perceptual indicators for the latent variable "job satisfaction" have a reliability coefficient (Cronbach's a) of 0.56 from the collected data. The factor analysis indicated two factors, which together explain 48.9% of the total variability of the latent variable. The first factor - satisfactory salary and career opportunities - explains 32.2% of the total variability. The resulted factors from the PCA model appear in Table 1.

In addition, the four perceptual indicators for the latent variable "job mobility" have a reliability coefficient (Cronbach's a) of 0.64 from the collected data. The factor analysis indicated two factors, which together explain 75.2% of the total variability of the latent variable. The first factor - desire to change occupation, especially after training – explains 36.6% of the total variability. The resulting factors from the PCA model appear in Table 2:

Table 1: PCA model results for the latent variable 'Job Satisfaction'.

Attitudinal Indicators	**Factors**	
	Satisfactory salary and career opportunities	**Free time**
My job position is temporary	0.460	0.408
Relationships with my colleagues are not very good	0.338	0.564
I can influence decisions about my current job	0.563	-0.219
I have great carreer opportunities	0.678	0.053
My salary is satisfactory	0.713	0.078
My current job benefits (health care, security) are satisfactory	0.679	0.203
My current job leaves me no free time	-0.273	0.790

Table 2: PCA model results for the latent variable 'Job Mobility'.

Attitudinal Indicators	**Factors**	
	Desire to change occupation, especially after training	**Concern about risk**
I would seriously consider changing my occupation	0.870	0.139
I would change my occupation if I had access to training programs	0.869	-0.134
Frequent occupation changes could negatively affect my professional identity	-0.050	0.826
Changing my occupation includes a lot of risk	0.054	0.831

As noted above, the structural equations of the latent variable models correspond to linear regression models of the above-first factors. The estimation results of the linear regression models are presented at Table 3 below:

Table 3: Linear regression models of the factors of the latent variables.

Depended variable: Satisfactory salary and career opportunities (corresponding to latent variable "job satisfaction")		***Depended variable: Desire to change occupation, especially after such training (corresponding to latent variable "job mobility")***	
Exploratory Variable	**Estimated coefficient (t-stat)**	**Exploratory Variable**	**Estimated coefficient (t-stat)**
Constant	-0.721 (-4.092)	Constant	0.614 (3.449)
Worker in private sector	-0.162 (-1.6)	Percentage of work the employee does via use of ICT	-0.005 (-3.586)
Full time worker	0.686 (4.886)	Higher education level (Bachelor degree or better)	-0.069 (-1.67)
Female	0.138 (1.979)	More than 45 years old	-0.092 (-2.243)
No. of cars in household	0.127 (2.108)		
Statistics		**Statistics**	
No. of observations	518	No. of observations	518
F-test (sig)	8.670 (0.00)	F-test (sig)	17.325 (0.00)
$\overline{R}^2$	0.359	$\overline{R}^2$	0.435

It is noted that, both non-linearity of the explanatory variables testing and multi-colinearity testing indicated linear regression method as appropriate in this case. The linear regression models' estimation results can be summarized as follows: Employees in the private sector are less satisfied with their jobs, compared with workers in the public sector. Full time workers are more satisfied from their job than part-time ones (as expected). Female workers appear to be more satisfied with their salary and their professional development in relation to men. Moreover, the more cars a household has, the more satisfied employees appear to work (It is noted that the number of cars included in the model acts as a proxy variable for income). Most workers responding to this survey wish to change their job, particularly after suitable training. It also suggests that, the greater the use of ICT for work purposes, the less the desire to change occupation; while employees with a higher educational level and people over 45 years are less likely to change occupation, probably because they may have a stable job.

Finally, Integrated Choice and Latent Variable Models regarding employment mobility decisions (given residential relocation to the proposed Aegean Island area by 2020) have also been derived. In this empirical study, a Multinomial Logit - MNL choice model (Integrated via including the fitted values of the above mentioned structural equations of the latent variable models) is developed The model has been developed via the use of BIOGEME software (Bierlaire, 2003). A more detailed presentation of Multinomial Logit-MNL choice models is available in Ben-Akiva and Lerman (1985) and in Kitrinou and Polydoropoulou (2009).

In this choice model, the dependent variable was *employment mobility in island areas after a possible residential relocation,* by adopting the following choices:

1= keep current workplace (14.3% of sampled employees)
2 = relocate workplace to the island area (67.7% of sampled employees)
3= change occupation after relocation (18% of sampled employees)

It was additionally noted that, from those employees who are likely to change their occupation given relocation to the island area, 60.2% are likely to get employed in the tourism sector, 16.1% in administration, 6.5% in telecommunications, and the remaining 3.2% in agriculture or fishing.

The following observed independent variables were found to be statistically significant and included in the models:

1. family = number of members in the household;
2. kids = 1, if there are children in the household, 0 otherwise (o/w);
3. private = 1, if the respondent is employed at the private sector, 0 o/w;
4. employee = 1, if the respondent is a salaried employee, 0 o/w;
5. fam_enterprise = 1, if the respondent works at a family enterprise, 0 o/w;
6. manager = 1, if the working position of the respondent is managerial, 0 o/w;
7. arts = 1, if the occupation relates to arts, 0 o/w;
8. education = 1, if the occupation relates to education, 0 o/w;
9. IT = 1, if the occupation relates to telecommunications, 0 o/w
10. administration = 1, if the occupation relates to administration, 0 o/w;
11. tel = 1 if the respondent currently teleworks from home (some days per month); 0 o/w;

Table 4 below presents the MNL logit discrete choice models (with and without latent variables) for employment mobility in the island Aegean in the year 2020, under the proposed scenario referring to improvements in both transport and telecommunication systems of the area.

From a modeling point of view, the ICLV model is superior to the classical choice model, because the goodness of fit of the classical model increases considerably via the inclusion of the latent variables. Additionally, the latent variables are found to be statistically significant for the employment mobility choices, while they have the expected (positive) signs.

The estimation results of the ICLV model indicate that the latent variables are statistically significant for the employment mobility choices. Additionally, the estimation results regarding the observed variables of the model can be summarized as follows: employees having occupations related to telecommunications or arts, given a possible residential relocation to the proposed Aegean island area, were more likely to keep their current work location. Furthermore, those workers who have fewer members at their households or don't have kids were found more prone to keep their current work location. In addition, private sector employees as well as those who currently telework are more likely to prefer to relocate their workplace to the Aegean island area. Those working in family business are more likely to relocate their workplace to the proposed area, followed by salaried employees and by workers in managerial positions. Finally, more likely to change job, given a possible residential relocation to the Aegean Island area by the year 2020, are those employees engaged in education; while less likely to change job are employees engaged in administration.

Table 4: MNL-logit discrete choice models for employment mobility to the Aegean Islands.

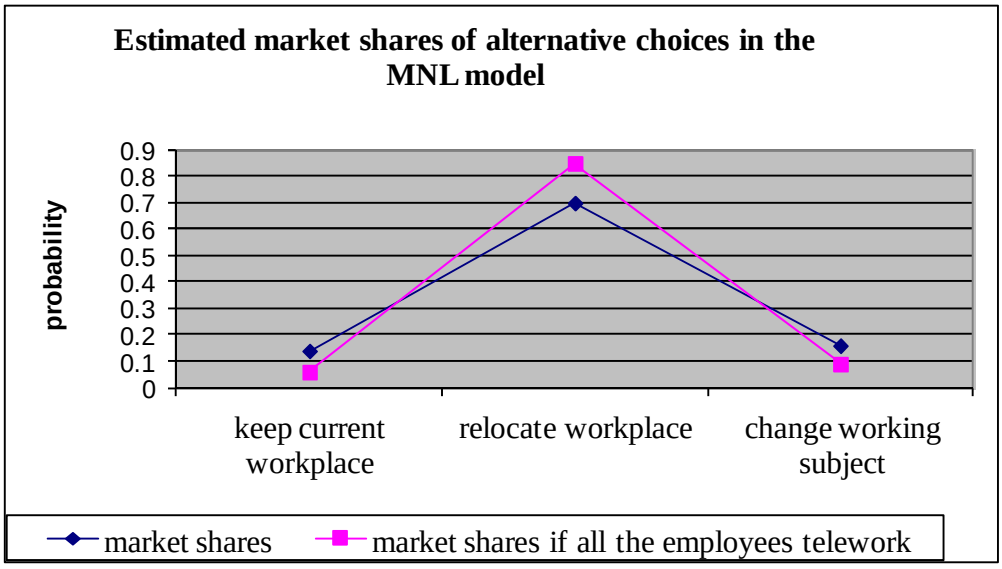
	Without latent variables	**Integrated Latent Variable and Choice (ICLV) model**
Variable name	**Coefficient Estimate (t-stat)**	**Coefficient Estimate (t-stat)**
Work_satisfaction		1.01 (2.01)
Work_mobility		0.964 (1.95)
Constant (specific to alternative choice 2)	-1.36 (-0.10)	-2.46 (-3.00)
Constant (specific to alternative choice 3)	1.84 (0.13)	2.42 (7.70)
family	-0.31 (-5.70)	0.263 (2.93)
kids	-0.708 (-3.19)	-0.805 (-3.47)
private	0.958 (2.69)	1.05 (2.93)
employee	1.96 (2.63)	2.04 (2.72)
Fam_enterprise	3.80 (4.38)	3.41 (3.88)
Free_prof	1.60 (2.07)	1.80 (2.32)
arts	1.674 (1.92)	1.54 (2.11)
education	2.56 (3.42)	2.19 (2.82)
IT	0.775 (1.76)	1.52(3.44)
administration	-0.279 (-1.29)	-0.902 (-3.81)
tel	0.676 (1.85)	0.739 (2.04)
Summary statistics		
Number of observations:	518	518
Initial log-likelihood	-569.081	-569.081
Final log-likelihood	-421.816	-388.162
$\overline{R}^2$	0.236	0.293

Model Aggregation

In order to aggregate the model developed, a sample enumeration method is used, by which the choice probabilities of each decision maker in the survey sample are summed up over the complete set of decision makers. Each sampled decision maker *n* has some weight $w_{n,}$ representing the number of decision makers similar to him/her in the population. For samples based on exogenous factors, this weight is the reciprocal of the probability that the decision maker has been selected into the sample. By assuming that all the sample units have the same weight, $w_{n,(}$representing the number of decision makers similar to them in the population), this weight is estimated as w_n= 2,302,000 / 518, where 2,302,000 is the number of Greek households with at least one worker and 518 is the sample size. A consistent estimate of the total number of decision makers in the population who choose the alternative i (i= 1, 2, 3) in the MNL model, let N_i, is the weighted sum of the individual probabilities: The average probability, which is the estimated market share, is N_i / N, where N represents the size of the survey population. Additionally, in order to further analyze the impact of ICT use and especially teleworking on the relevant choice probabilities, a sample enumeration method was

also used in this model, but, in this case, the variable tel (the dummy variable indicating if the respondent is currently a teleworker) takes the value of 1 for all the respondents. The estimated "market shares" of the decision makers in the population who choose alternatives i = 1, 2, 3, in the estimated MNL model, in both cases, are presented in Figure 3:

Figure 3: Model aggregation over Greek employees.



The results suggest that most of the employees (70%) are likely to switch their workplace to the area after residential relocation; 16% are going to change their job; and the remaining 14% are likely to keep their current workplace. In order to further examine the impact of ICT use to the attractiveness of the islands, the model was also aggregated under a hypothetical scenario where all the employees would telework from home (some days per month) in the year 2020. In such a situation, the above percentages become: 85%, 9% and 6% respectively, indicating that teleworking, and general ICT use, encourages more workers to relocate their job to the Aegean island area, which could trigger further economic development in that area.

These results are quite aspirational for the Aegean islands region and actually they are, due to the fact that, the empirical survey developed was based on a hypothetical scenario for year 2020, which assumed high ICT infrastructure at the area, together with teleworking opportunities. Actually, the results just indicate the critical role of ICT infrastructure and especially teleworking for the attractiveness of the Aegean Islands as a workplace location.

Conclusion

As the New Economic Geography (Krugman, 2001) proposes, in the liberalization of trade some regions present a particular 'threshold' of activity concentration; once they have gone beyond that threshold, however, concentration fuels a virtuous cycle, since businesses in these regions gain profitability, due to various centripetal forces. As a result, some regions continue to attract activities and some others keep losing them. This issue becomes significantly critical, especially for island areas, due to the fact that their overall economic activities are less

diversified and more specialized than large economies mainly due to their narrow range of human and non-human economic resources and markets (Kakazu, 2007; Rontos et al., 2011).

This paper offers a behavioural framework to model employment mobility decision in an island area, given a residential relocation to that area. Employment mobility in this case is considered to be a discrete variable, taking values from a set of alternative choices, and it is analyzed via Discrete Choice Analysis (DCA) methods. Employment mobility in island areas is additionally understood to be affected by islands' accessibility measures, e.g. improvements in transport and telecommunications' systems of the area, as well as teleworking opportunities for the islands' residents.

The case of the island Aegean in Greece is reviewed. The modeling framework proposed suggests the development of an integrated choice model with two latent variables – job satisfaction and job mobility – both indicated by employees' perceptions. A Multinomial Logit-MNL choice model is then developed, integrated via the inclusion of the two latent variables into an Integrated Choice and Latent Variable (ICLV) choice model. The modelling indicates that latent variables seriously affect decisions about job mobility in island areas.

The estimated choice models identify the profiles of Greek employees who are more likely to: a) keep their current workplace after a residential relocation to the island Aegean; b) relocate their workplace to the area; or c) change occupation after residential relocation to the proposed island area. These profiles, based on the observed characteristics of the employees, can be summarized as follows:

Employees having occupations related to telecommunications or arts, few household members, and no kids, are more likely to keep their current work location.

Private sector employees, current teleworkers, and workers of family-run companies, are more likely to relocate their workplace to the island area.

Finally, employees in education are more likely to change occupation, given residential relocation, while employees in administration are less likely to change occupation.

The model aggregation over Greek employees suggests that the majority of the employees are likely to relocate their workplace to the Aegean island area after a residential relocation and on the assumption that the accessibility to and from the islands will increase. Moreover, ICT use, and especially teleworking, can further boost the number of employees and jobs in the island Aegean; this could bring further socioeconomic development to the islands.

Thus, one can reasonably conclude that advances in accessibility (referring mainly to telecommunications and transport systems) of the Greek islands, constitute prerequisites for the improvement of the regions' attractiveness as a work location, leading to increased regional development. Policy makers and regional planners have the ability to create specific strategies and measures in order to differently target the population groups (or market segments) that are willing to relocate their workplaces to the Greek islands, or to create new businesses there (mainly in tourism, transport, farming and fishing). Specific regional plans and their effective implementation would increase the productivity of the island Aegean; create more jobs; attract more workers, residents and investments; and generally sustain the Aegean Archipelago.

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Annex: Survey Questionnaire for Analyzing Employment Mobility Decisions in the Aegean Islands, Greece
Sample unit: One worker per household in Greece
Code: (phone number)

A. Personal characteristics

What is your gender?

0 Male
1 Female

What is the number of the members in your household? _____ members

What is your age bracket?

1 18-24 years old
2 25-34 years old
3 35-44 years old
4 45-54 years old
5 55-64 years old

What is the highest level of education you have completed?

1 First degree education
2 Secondary school
3 College
4 Post graduate degree
5 MSc
6 PhD

What is the annual income before taxes for your household?

1 Less than 10,000 €
2 10,001€ - 20,000€
3 20,001€ - 30,000€
4 30,001€ - 40,000€
5 More than 40,000 €

B. Work Characteristics

Where is your physical workplace?

Postcode ……
Municipality……
Prefecture ……

In which sector do you work?

1 Private sector
2 Public sector

Which is the type of your working contract?

1 Full time
2 Part time

Which is your working title? _____

Which is your working position?

1 Manager
2 Employee
3 Member of a close (family) corporation
4 Self-employed
5 Other (…….)

What proportion, on average, of your work do you currently perform via ICT-use? ____ %

B.1. Current status with regards teleworking

Teleworking is defined as: "work mainly from home (or from another place with the necessary equipment) via the use of ICTs. Teleworking substitutes partially (or totally) the trip to/from the physical workplace. The frequency of teleworking refers to some days per week or per month. Teleworking days are paid as the regular working days or more". In Greece, teleworking is not common. Nevertheless, many workers accomplish part of their work at home, using ICTs, over a few hours per day or per week. Even though these workers travel every working day to/from the physical workplace, we consider them as "teleworkers".

Does your company /organization encourage teleworking?

0 No
1 Yes
2 Not applicable

Are you currently a teleworker (by at least one of the above mentioned two teleworking types)?

0 No
1 Yes
2 Not applicable

Is there video-conferencing equipment at your physical workplace?

0 No
1 Yes
2 Don't know
3 Not applicable

C. Attitudes and Perceptions

Scale for "Job Satisfaction"

	Absolutely disagree	Disagree	Don't know	Agree	Absolutely agree
My work position is temporary; I am looking for another job	1	2	3	4	5
During work, I often face problems with my co-workers	1	2	3	4	5
I can impact the decisions that are related to my work	1	2	3	4	5
My work offers me a lot of career opportunities	1	2	3	4	5
My salary is satisfactory	1	2	3	4	5
I am satisfied with the allowances (hospitalization etc) of my work	1	2	3	4	5
My current work takes a lot of my time; I want more free time	1	2	3	4	5

Scale for "Job Mobility"

	Absolutely disagree	Disagree	Don't know	Agree	Absolutely agree
I seriously think of changing my work	1	2	3	4	5
I would change my work if another work offered me access to education programs	1	2	3	4	5
Frequent changes in my work impact negatively on my identity as a worker	1	2	3	4	5
The decision to change my work includes a lot of risk	1	2	3	4	5

D. Scenario Development

The Aegean islands include the regions of N. Aegean and S. Aegean, comprising about 50 inhabited islands. The region of N. Aegean contains the prefectures of Lesvos, Chios and Samos. The capital of the region is Mytilini city (the capital of Lesvos island). The population of this area constitutes 1.8% of the overall Greek population, with a decreasing trend. The GDP of the region constitutes 1.9% of the country's GDP. The region of S. Aegean contains the prefectures of Kyklades and Dodekanisa. The capital of the region is Ermoupoli city (the

capital of Syros island). The population of this area constitutes 2.7% of the Greek population, with an increasing trend. The GDP of the region is 3.2% of the country's GDP.

Let us suppose that in the year 2020 the area will have high ICT infrastructure. In addition, there will be teleworking opportunities from the area, as follows: teleworking from home; flexible schedule. The cost of teleworking is covered by the employee; and the salary will not decrease.

In case that you are prone to relocate your residence in the Aegean Islands area, what are you likely to do regarding the following employment mobility decisions?

Employment mobility choice:

1 keep current workplace
2 relocate workplace to the island area
3 change occupation after residential relocation

If "3": What is you most likely new occupation? _____