Future Demand of Labour and the Need of Education in the Åland Islands

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Abstract

We use a regional, recursive dynamic, imperfect competition CGE model to analyse coming changes in the regional labour market of the Åland Islands. The development of labour supply is primarily determined by migration flows to and from the Islands. Thus, in- and out-migration are explicitly modelled. We assume that labour market conditions for the reference person of the household induce migration, thus causing "tied migration" of spouses and children. Labour supply is disaggregated by educational attainment (two levels) and by age (8 groups). Labour demand is disaggregated by educational level only. Therefore, the labour supply of different age groups are perfect substitutes. However, by using post-solve demand-shift matrices, the labour demand is disaggregated further by field of education. The analysis is further enriched by making use of a survey on the need of education among the population aged 17-60. The results of the study are uploaded as user-friendly PC-Axis matrices.

Keywords: Education, labour market, population dynamics, migration and commuting, CGE models

CONTENTS

1. Introduction

1.1. On labour market forecasting

In this article we analyse the future development of the labour market in a small island economy. The main goal is to quantify the demand of labour with different qualifications, as well as the number of persons leaving the labour market in order to guide educational decision-making. We conduct the analysis by using a sequentially dynamic (recursive) CGE model. CGE models have been earlier used in a similar context at least in Australia (Meagher et al, 2000). However, in the Nordic countries, other type of models have been used, mainly concentrating on the division of labour demand - obtained from macroeconomic long-term forecasts - into different categories. The forecast framework includes the population development, including the calculation of persons leaving the labour force (for Finland, see Hanhijoki et al., 2004; for Sweden, see Statistics Sweden, 2005). However, these estimates are not derived within a consistent model framework, which means that significant imbalances between supply and demand of labour are not solved within the model. While this procedure may have its advantages as a wake-up call to make changes in the number of students taken into different programmes, it fails to recognise that the economy adjusts according to the availability of labour. As we are conducting the most of our calculations inside our CGE model, we do not observe similar imbalances in the labour market. In our special case, as the modelled economy is a small island region, migration is an important complicating factor. In contrast with our neighbouring national economies, Åland cannot be thought as self-sufficient regarding education. For a modeller, migration poses some challenges, as we do not have a complete picture of the 'import' and 'export' flows of human capital by educational background.

As we approach the level of detail of single occupational groups, we are depicting flows in and out of the labour market that in many cases that consist of 30 persons or even less. It is understandable that random fluctuation in the variables is considerable in our case. Notwithstanding these problems, we think we can get useful - although by far not accurate - information on the development the labour market through our modelling effort.

1.2. Presentation of the Åland Islands

The Åland Islands with its nearly 27,000 inhabitants, populating around 65 of its 6,500 islands, is the smallest of the Finnish NUTS 3 regions. Apart from its small population, Åland differs from a normal Finnish region in numerous ways. Åland has also political autonomy within the realm of the Finnish state. The autonomy covers, among other things, legislation, administration and policy development concerning education as well as industrial policy.

One of the main characteristics of the Åland Islands is the clear linguistic border between Åland and Finland. Whereas 93 per cent of Ålanders speak Swedish, the same per cent of the population speaks Finnish on the mainland in Finland. Preserving the unilingual Swedish culture from encroachment by the majority Finnish population has been described as the very raison d'etre of Åland autonomy (Lindström, 2000).

When Finland and Åland joined the EU in 1995, Åland succeeded in acquiring a permanent exemption from the Community's indirect tax legislation for Åland, as a result of the accession negotiations with EC/EU, (Fagerlund, 1997). This derogation placed Åland outside EU's indirect tax union, and enabled the continuation of tax-free sales on the passenger ferries between Sweden and Finland[1], even after the June 30th 1999, when the era of tax-free sales within the Community was discontinued (Silverström, 2003).

The production structure of the Åland economy is dominated by shipping which accounts for approximately one third of the value added. Furthermore, in Åland the reliance is concentrated heavily on the shipping companies themselves, most of which is passenger related, with tax-free sales of alcohol, tobacco and cosmetics (Lindström, 2002). About 70 per cent of the turnover of the Finnish passenger vessels comes from the sale of tax-free products (see e.g. Granfelt, 1996). In the middle of 1990s, when intra-EU tax-free sales were still allowed, the sale of tax free products per capita in Åland was almost 1,000-fold that of the average EU economy (for EU figures, see Gebauer et al, 2004; for Åland figures, see Kinnunen, 1998; Statistics Finland 2004).

The financial relations between the Government of Åland and the Finnish state are very different from those between the central government and other regions in Finland. The latest, 1991 revision of Autonomy Act that came into effect in 1993, increased the budgetary autonomy of the Åland Government. Instead of a state grant based on itemized budgetary comparison of the regional government and the Finnish state administration, Åland currently receives a lump sum grant, called the "amount of equalisation", which is 0.45% of the state budget income excluding new loans. This amount is not an actual state subsidy, but rather is the reimbursement of taxes levied in Åland by the state (Palmgren, 1997). Consequently, the economic autonomy of Åland has increased considerably, as the provincial Government can decide its budget outlays independently, without having to submit every budgetary item for state approval (Turunen – Eriksson, 2004).

The system has proven to be quite favourable for Åland. Once Finland started to recover from the recession of the early 1990s, its tax revenues increased, while the state budgetary spending continued to be subjected to strict control. However, the amount of equalisation was by definition unobtainable with this budgetary control. While the state budgetary outlays grew quite modestly (state expenditure in total), budget expenditure during the late 1990s soared in Åland. The increased budgetary income from the equalisation amount, together with the changes brought by the EU membership, has been a major factor for the increased growth rate of public sector spending and employment. These clearly exceed those of the mainland Finland (for a more detailed account, see Turunen – Eriksson, 2004).

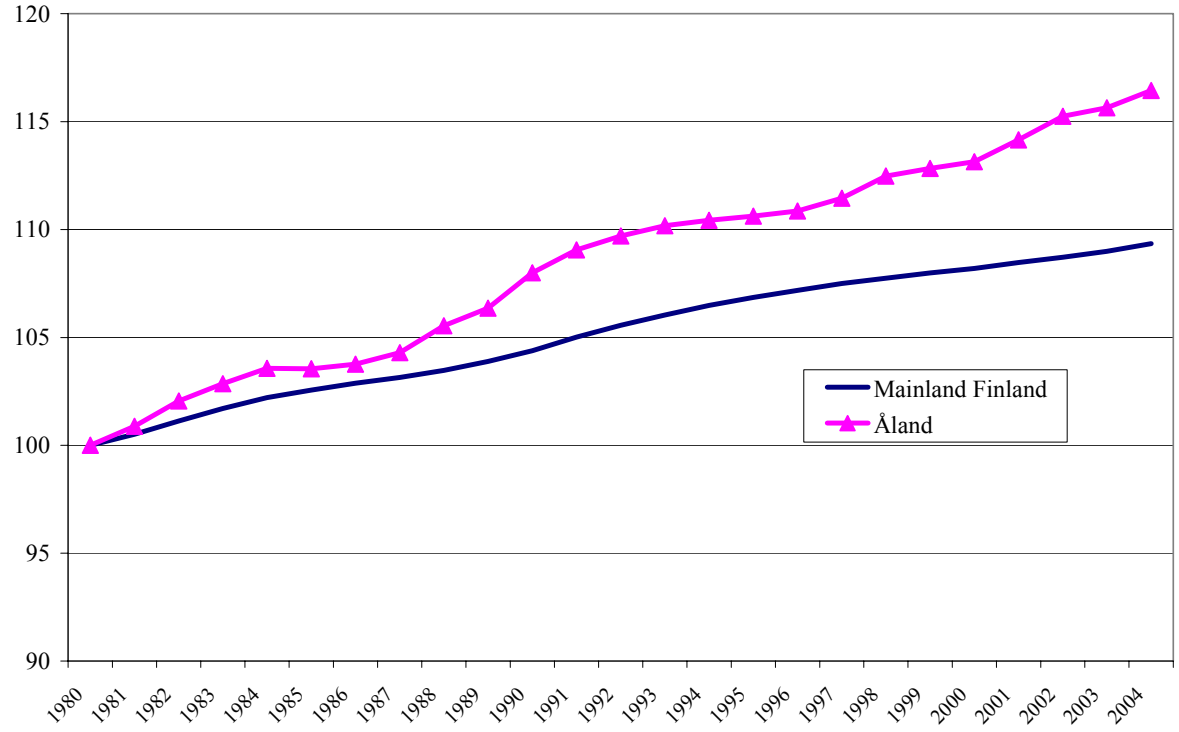
One of the subsectors of the public administration that has benefitted from new financial system is education that is administered by the autonomy itself. Therefore, the educational system is quite extensive and well-equipped to cover the local education needs up to upper secondary level. However, most local youths who go on to pursue university-level studies leave Åland for a while to attend a university in Sweden or Finland. Currently, the majority of the young Ålanders prefer attending Swedish universities. About 74% of the university level students studying outside Åland were enrolled at Swedish universities, whereas 23% were studying in Finland (Statistics and Research Åland, 2005a). Today Åland also has its own

[1] Ferries have to stop in Åland, i.e. exit the Union's VAT territory, in order to have a right to tax-free sales onboard.

college of higher education: the Åland Polytechnic that offers a considerably wide range of courses leading to vocational, lower tertiary level degrees.

Migration has become an increasingly important determinant of labour supply in Åland. During 1990-2002, net migration averaged 0.36 per cent of the population, a level corresponding to that of the fast-growing areas in the Southern Finland exception for the capital city region Uusimaa. In 2002, however, the highest net migration rate of all the Finnish NUTS 3 regions, was registered in Åland (0.84 per cent; Statistics Finland, 2005). During 1980-2004, net migration accounted for 65 per cent of the population growth in Åland, boosting the population growth of the Islands to a clearly higher level than in mainland Finland (see figure 1).

Figure 1. Population in Åland and the mainland Finland, 1980 = 100



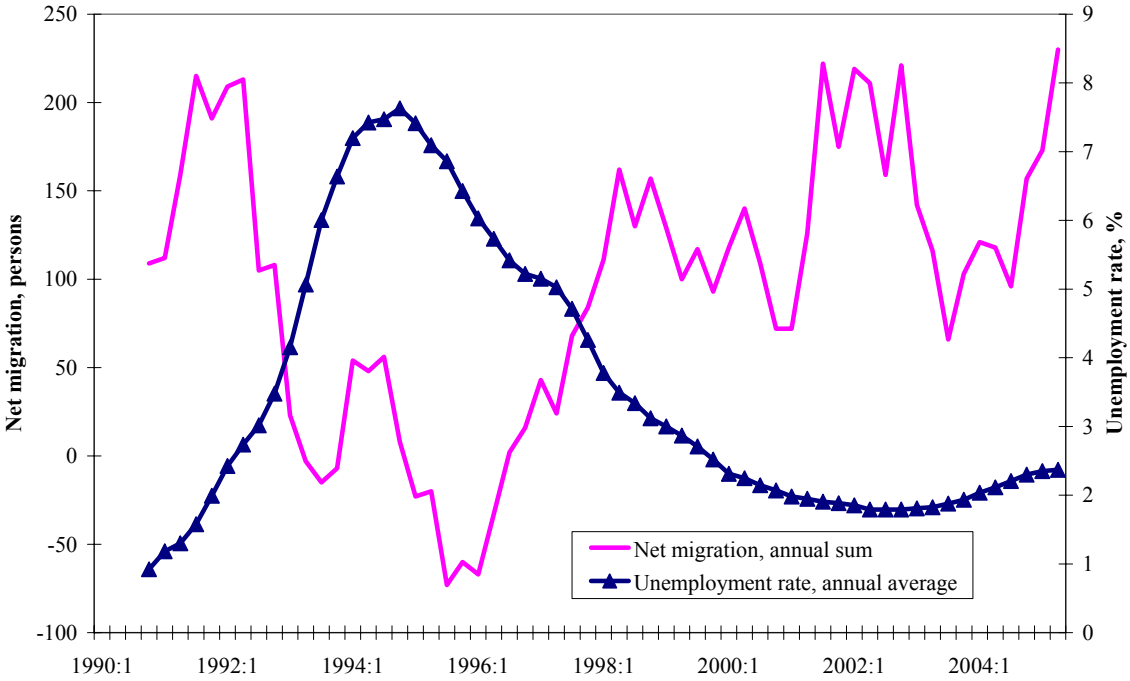
Source: Statistics Finland, 2005.

Being a small province in a small country, even minor absolute changes in of migrant flows may produce major shifts in the population structure in the long run. Thus, migration is of great importance as a determinant of the amount and quality of labour supply. Some 13,100 individuals of its 27,000 inhabitants are in the labour force, which makes the absolute number of jobs with similar qualifications very limited.

An important feature of the Åland economy is the comparatively low level of "creative destruction" or dynamics in the labour market. Böckerman and Maliranta (2001) characterize Åland as being "an island of sleepy life" in terms of reallocation within the local labour market. If job reallocation is not effective within the region, migration becomes more important a venue for career development.

Traditionally, unemployment rate has been clearly lower in Åland than in the rest of Finland, currently indicating almost full employment (2.6 per cent in 2003; versus 9 per cent for mainland Finland; Statistics Finland, 2005). The number of vacancies in ratio to the number unemployed has been very high for some time now, which witnesses of the extreme "tightness" of the Åland labour market (see figure 2).

Figure 2. Vacancies/unemployed ratio, Åland and Finland, 1991 - 2004



Sources: Statistics Finland, 2005, Statistics and Research Åland, 2005c.

Migration has been the way of escaping the limitations of the small local market, both in periods of high economic growth and recession. The unemployment rate and net migration are strongly correlated, as can be seen in figure 3 (correlation between the four-quarter moving average of unemployment and the four-quarter sum of net migration amounts to –0.79).

During the last three decades, the main source of migration inflows has been mainland Finland, whereas the main destination for out-migration has been Sweden (Statistics and Research Åland, 2005c). However, in-migration from non-Nordic countries has been on a steady increase in recent years, reflecting increased mobility of the citizens of the new EU member countries (Lindström, 2005).

Åland has an age structure similar to many European societies where an increasing share of population are aged 65 or more. In the coming years, the number of persons leaving labour force is bound to grow rapidly, as post-war generations are retiring. Currently, the labour participation rate surpasses 80 per cent, which is the highest rate among the Finnish provinces.

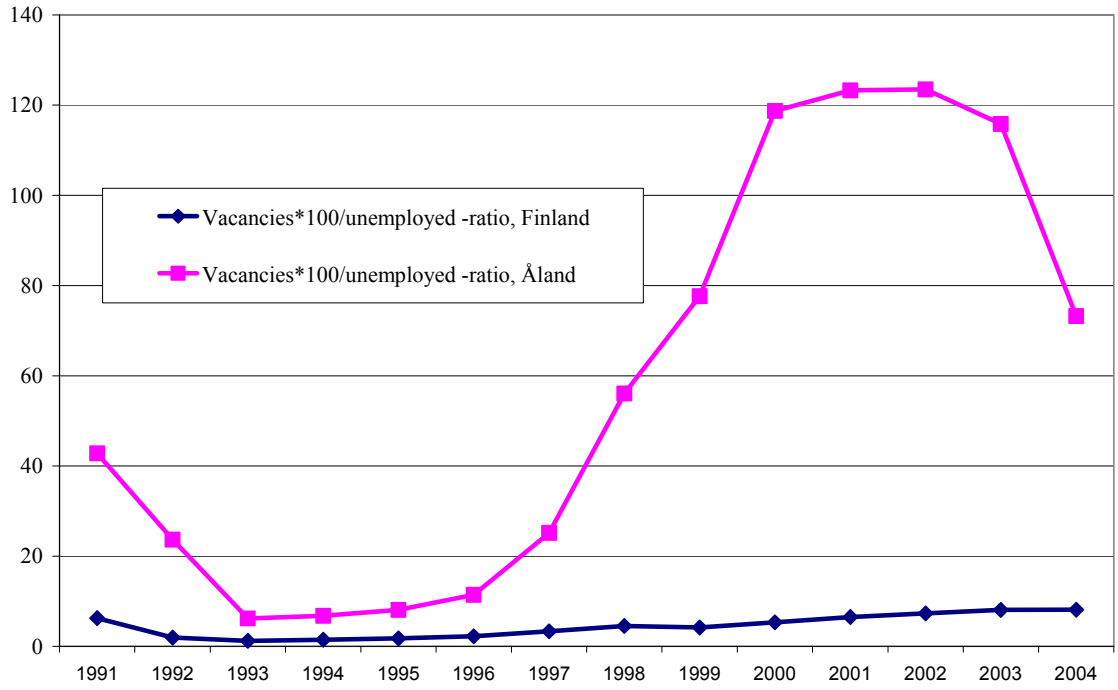
The educational system of Åland consists of primary, secondary and tertiary education, which in many respects coincides with the educational system of the mainland Finland. All the schools, however, use solely Swedish as the language of teaching (with the obvious

exemption of language education). Nine years of primary education is compulsory. For the moment, there are 26 primary schools in Åland.

Secondary education is provided by seven different schools, but there are plans to unite them into one umbrella organisation, thus providing greater flexibility for students to include courses from other curricula. In addition, enhanced efficiency in the educational administration is foreseen to result from the reform. The current secondary education both prepares for further studies and provides practical skills in fields like construction, industrial production, transport technology, sea transports, trade and commerce, hospitality, multi media and communication, information technology, social and health services etc.

The tertiary education is provided by the Åland Polytechnic, which offers schooling in seven of fields of education at the polytechnic (bachelor) level, with degree programmes in economics, maritime studies, technology, nursing & health care, and hospitality.

Figure 3. Unemployment and net migration, 1990:1 – 2005:2



Source: Statistics and Research Åland, 2005b, 2005c, Statistics Finland, 2005.

2. The Model

2.1. Origin of the model

The model used here, DALAGEM-EDU, is a further developed version of Kinnunen (2005), which in turn was built on the static version of the IFPRI standard model (Lofgren et al, 2002). The model is recursive dynamic, imperfect competition model. The most extensive changes to Kinnunen (2005) have been made to population and labour market modules. These will be presented below.

Apart from changes in the labour market, changes have been made to demand for exports. the RoW price faced by the exporters made dependent on the volume exported. The rationale with this change is to make the behaviour of the model more insensitive to changes in the costs. When the world export demand is perfectly elastic. i.e. the RoW price is not dependent on the volume exported from the Åland Islands, small changes can induce radical changes in export volumes, which seems to contradict with the empirical evidence. The way of doing this follows closely the example of McDonald (2005).

Another change from Kinnunen (2005) is made to the tourist household's demand function. The total consumption volume is now made dependent on the development of prices relevant for tourists' consumption. Earlier it was exogenously set (for tourism studies with CGE model, see e.g. Blake, 2000; Dwyer et al, 2000; or Narayan, 2004).

2.2. Population, migration and labour market

In order to capture the effect of ageing population into supply of labour with specific education, age cohorts are introduced in the model in two ways: in the core model, people have been divided into eight age cohorts. In addition, labour supply is divided into two educational levels: those with up to secondary education, and those with tertiary education.

Outside the core model, population is also divided into yearly cohorts so that labour supply - and exits from the labour force - can be calculated with more precision by education level and field of education

In order to capture the effect of migration to the age and educational structure of population, migration flows are divided into in-migration and out-migration as opposed to the earlier modelling solution with a net migration equation and homogenous labour in the earlier model version.

A central problem with this modelling effort has been lack of complete data. As we do not have statistical data neither on the education level nor the field of education of those migrating to and from the Islands, we have had to estimate matrices of in- and out-migration from partial data sources. Migration flows have been disaggregated by age and educational attainment. The row and column sums for the necessary matrices have been obtained from statistical sources, but the division inside the matrices is a result of a manual iteration.

These migration matrices take into account the phenomenon of tied migration. In other words, whole families are thought to migrate when the head of the family decides to move. Migration is thought to function in the following way. Firstly, the amount of in-migration of made dependent on the unemployment level in that part of the labour market where the household head belongs to.

$$INMIG_{H\,L} = \left[\frac{\sum_{H'L'} POPU_{H'L'}}{\sum_{H'L'} POPU^{0}_{H'L'}} \right]^{imgrw_{H,L}} \cdot \left[imconst_{H\,L} + \beta^{H\,L}_{IM} \cdot \ln\left(U_L \cdot 100 \cdot \frac{W_{MIG} \cdot (CPI / CPI0)}{W_L} \right) \right] \quad (1)$$

$$+ EXOGIM_{H\,L}$$

Where:

$INMIG_{H\,L}$	In-migration of persons belonging to household H with household head type L
$\sum_{H'L'} POPU_{H'L'}$	total population at current year, 0 referring to base year 2000
$imgrw_{H\,L}$	Growth parameter
$imconst_{H\,L}$	Constant in the migration equation
$\beta^{H,L}_{IM}$	coefficient
U_L	Unemployment rate for labour type L (1 % = 0.01)
W_{MIG}	Reference wage outside the region
W_L	Average wage rate for labour type L
$EXOGIM_{H\,L}$	Exogenous shift parameter for household H with household head type L
H	Household grouping set, based on other than labour type (latent in the current version of the model)

$INMIG_{H\,L}$ is then disaggregated into age groups and labour types.

The parameters for the equation were estimated from the available data series. However, the data were available for in-migration as a whole. However, additional panel data on migration was available, which was utilised in (see, Kinnunen, 2005). The exogenous parameter was added as we assume that the entrance of new member states in the EU and the gradually freed movement of labour will give an extra influx of migrants, probably mainly from the Baltic countries.

Out-migration did not react to changes in the labour market according to our econometric estimations. Instead it seemed to have a positive time trend higher than the mere population growth would assume. It did not correlate with the size of specific age groups, either. Therefore, the sum of out-migration grows over time irrespective the economic situation. However, the composition of the out-migration reacts to changes in the labour market, so that those with higher unemployment get a higher than the initial share of out-migration.

$$EMSPRE_L = EMSH0_L \cdot \left(\frac{U_L}{U^0_L} \right)^{\beta_{EM}} \quad (2)$$

$$EMSFIN_L = EMSHPRE_L \Big/ \sum_{L'} EMSHPRE_{L'} \quad (3)$$

Where

$EMSPRE_L$	Preliminary emigration share of households with household head of labour type L
$EMSH0_L$	Initial emigration share
$EMSFIN_L$	Final emigration share
β_{EM}	Emigration share elasticity parameter

The amount of labour supply as a share of economically active persons varies by age in our model. However, labour supply also reacts to economic incentives, although we assume that labour supply is rather inelastic. As the labour force participation rate is already very high, and we have not applied backward-bending labour supply curve derived from a utility function with leisure included (see e.g. in Blonigen et al., 1997), we opted for creating the possibility for the modeller to choose which age groups are sensitive to changes in the labour market, and which are not. However, we chose to let all the groups to adjust the labour supply, but our way of ad-hoc modelling would in principle allow the labour supply to surpass 100 % participation rate if all the groups are flexibly adjusting their labour participation rate.

The amount of labour supply is defined by the following equations:

$$QLST_{H\,L} = QLST^{*}_{H\,L} \cdot \left[\frac{WPART_{H\,L} \cdot CPI^{0}}{WPART^{0}_{H\,L} \cdot CPI}\right]^{\eta^{W}_{H\,L}}$$

$$\cdot \left[\frac{TINS_H + TMUNI_H + t^{state}_H + (YIF_{H\,L}/YI_H)\cdot s\sec_{H\,L}}{t^{ins}_H + t^{muni}_H + t0^{state}_H + (YIF0_{H\,L}/YI0_H)\cdot s\sec 0_{H\,L}}\right]^{\eta^{tax}_{H\,L}} \qquad (4)$$

$$\cdot \left[\frac{\sum_{INSDNG} TRII_{H\,INSDNG} + \sum_{INSDG} trnsfr_{H\,INSDG}\cdot CPI + UNBEN_{H\,L} + YIF_{H\,K}}{\sum_{INSDNG} TRII0_{H\,INSDNG} + \sum_{INSDG} trnsfr0_{H\,INSDG}\cdot CPI0 + UNBEN0_{H\,L} + YIF0_{H\,K}} \cdot \frac{CPI0}{CPI} \cdot \frac{POPU0_{H\,L}}{POPU_{H\,L}}\right]^{\eta^{TR}_H}$$

$$QLST_{H\,L} = \sum_G QLSTDIS^{G}_{H\,L} \qquad (5)$$

$$QLSTDIS^{G}_{H\,L} = partrate^{\;G}_{H\,L} \cdot \left[1 + prflex^{G}_{H\,L}\cdot PRADJ_{H\,L}\right] \cdot POPUDIS^{G}_{H\,L} \qquad (6)$$

where:

$QLST_{H\,L}$ Quantity of labour supply by household H L

$QLST^{*}_{H\,L}$ Quantity of labour supply by household H L according to initial participation rates but with current population

$WPART_{H\,L}$ Participation wage rate, see below

CPI Consumer price index
t^{ins}_{H} Initial direct tax rate of institution
t^{muni}_{H} Initial municipal income tax rate, exogenous
t^{state}_{H} State income tax rate
$TINS_{H}$ Direct tax rate of institution, includes others than income taxes detailed above
$TMUNI_{H}$ Municipal income tax rate
$YIF_{H\,F}$ Factor income (capital or labour) of household H
YI_{H} Total income of household H
$ssec_{H}$ Social security fees of household H
$TRII^{INSDNG}_{H}$ Transfers from non-government institutions to H
$trnsfr^{INSDG}_{H}$ Transfers from government institutions to H
η^{W}_{H} Wage elasticity of labour supply
η^{tax}_{H} Tax elasticity of labour supply
η^{TR}_{H} Transfer elasticity of labour supply

$QLSTDIS^{G}_{H\,L}$ Labour supply further disaggregated into age groups G
$partrate^{\ G}_{H\,L}$ Initial participation rate

$prflex^{G}_{H\,L}$ Parameter with valuers 0 or 1 stating whether participation rate is flexible or not
$PRADJ_{H\,L}$ Labour participation rate adjustment variable
$POPUDIS^{G}_{H\,L}$ Population of the age group G belonging to household H L

The demand of labour is modelled as a CES aggregate for the two educational attainment levels (up to higher secondary level and tertiary level education). In order to further disaggregate the demand according to field of education and by profession, post-solve share matrices are utilised. The shares of more knowledge-intensive cells in the matrices are increased over time, and shares of cells referring to low educational contents are reduced each year, according to trends similar to those used by the Finnish Ministry of Education. As the economy of the Åland Islands is quite reduced in size, field of education and profession are not used simultaneously in the division of labour. Instead, two separate divisions are made.

As we do know neither the exact educational contents nor the profession of the migrants, we also calculate a separate labour supply result parameter without migration. Effectively, this means that we make the population of the base year older, and use the labour participation rates of each model solution year to calculate the number of persons outside the labour force. Thus we can get a number of new retirees which does not account for migration or mortality. However, the bias in our figures should not be that great, as the number of elderly migrants is clearly lower. In addition, the number of deaths of working-aged persons is less than 30 individuals each year. Therefore, there is no statistical pattern to be found in mortality.

Education is modelled as a government activity that entails costs according to the number of graduated students. Fixed shares of age cohorts obtain new exams. Thus the amount and composition of exams is left for the modeller as a decision variable. We abstract away from the fact that there are a considerable amount of students coming to study from other regions. As these persons are not required to register as inhabitants of the archipelago, our records do not reveal any information on them other than exams they have taken. Only in case they have changed their place of residence to Åland they are included in our database and in our model. The costs belonging to education of these students are left allocated to other administration.

3. Scenarios

We apply three different scenarios in our simulations. We think that they comprise the essence of the different possible development paths of the economy. They are called 'Baseline', 'Gradual out-flagging' and 'Increased growth of services'.

Baseline resembles the development of the economy during the recent years. An important ingredient in this scenario is that we assume that current, temporary state aid to shipping companies are continued after they are due at the end of 2009. Productivity growth rates are based on econometric estimations, coupled with Finnish results as well as own judgements. We also assume a gradual shift in the labour demand towards higher education.

Gradual out-flagging we assume that the temporary state to shipping is discontinued after 2009. In addition, we assume that each year 10 per cent of the passenger shipping fleet is out-flagged each year so that in 2015, only 10 percent of the capital stock is left. We do not assume any automatic reemployment of the staff currently working aboard, but we left it for the labour market to adjust to the shock. In reality, there is shortage of officers and of seamen with technical qualifications, which could mean that our way of modelling the shock may be overly pessimistic. The labour market can adjust to the shock through higher unemployment, lower wage increases[2], increased commuting, lower participation rate in the labour market, and migration. In other respects this scenario follows the Baseline.

In *Increased growth in services* we assume that the two service industries of the model (the economy is divided into ten industries, see appendix) experience an increased growth in exports. This is quite realistic, as the IT sector of the Islands has recently manifested ability to a rapid expansion, e.g. in electronic banking and in Internet gaming. We also assume an increased rate of change in the structure of labour demand towards higher education. The scenario follows the assumptions of the Baseline in other respects.

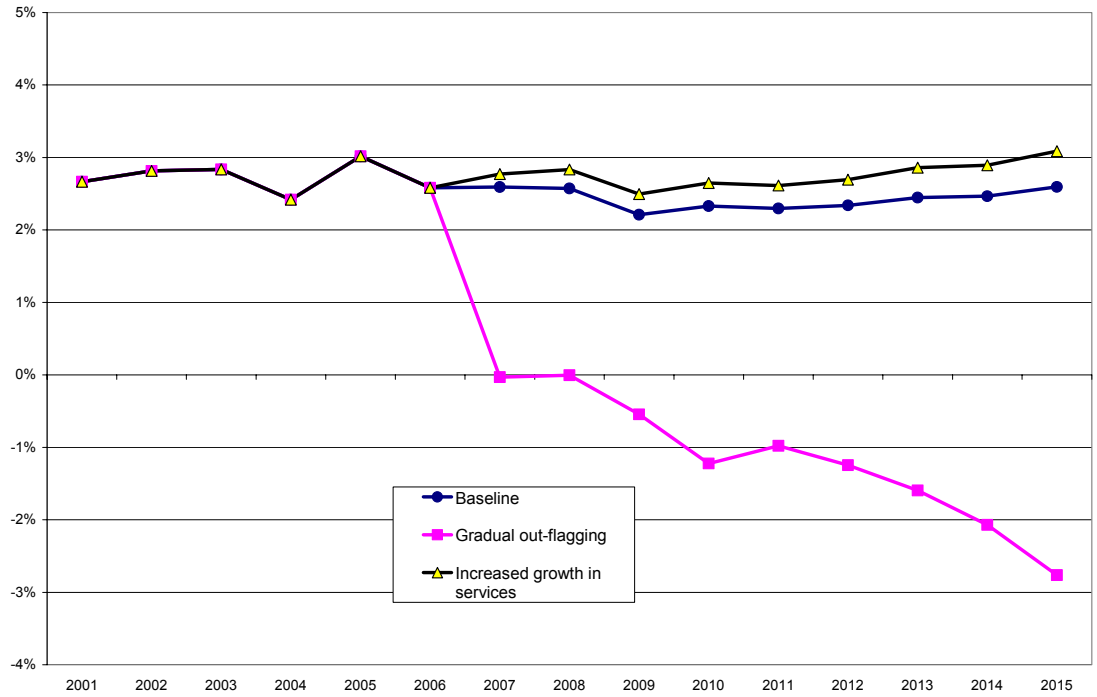
[2] Real wages are not allowed to decrease in the model. However, we have seen lately mutual agreements between labour unions and shipping companies that have lead to lower wages. However, this kind of one-off adjustments can be introduced exogenously to the model.

4. Results

4.1. CGE model results

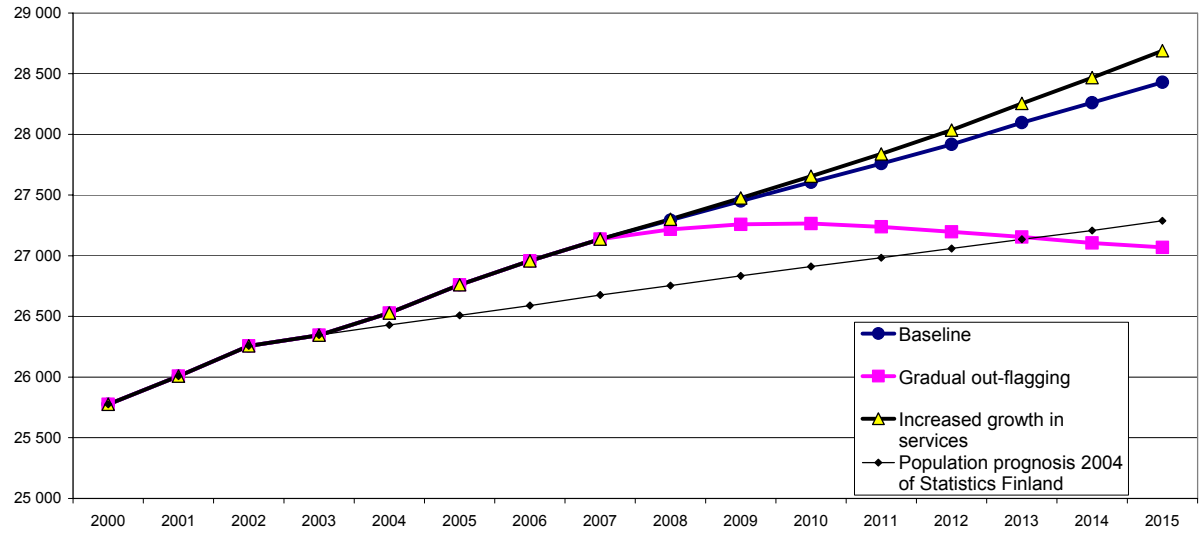
Construction of a CGE model for an economy so small as Åland's raises the question whether we are within the 'domain of applicability' of these models. However, as it is an autonomous political entity with its own policy-making institutions, relevant information needs to be produced. CGE models seem to be able to address the relevant questions, although we should not expect a model to capture the changes in economy with precision similar to bigger economies: stochastic variation in all the time series describing is by necessity higher, as individual firms and persons represent much higher a share of the society. We feel that our modelling effort has been insightful in many ways. In addition, we do not have to lean on the model only, as we have complemented it with our survey.
Let us start by reviewing the future GDP growth according to our scenarios. We see that our baseline assumption result in an annual GDP growth rate around 2.5 per cent during 2001-2015. As the initial share of service exports is rather low, the scenario Increased growth in services does not differ very much from the baseline; its growth rate averages 2.8 per cent. In the case of Gradual out-flagging , the average growth rate is just 0.3 per cent (see fig. 4)

Figure 4. GDP growth



Source: Palmer - Kinnunen, 2006.

Figure 5. Population 2000-2015 according to the model and Statistics Finland

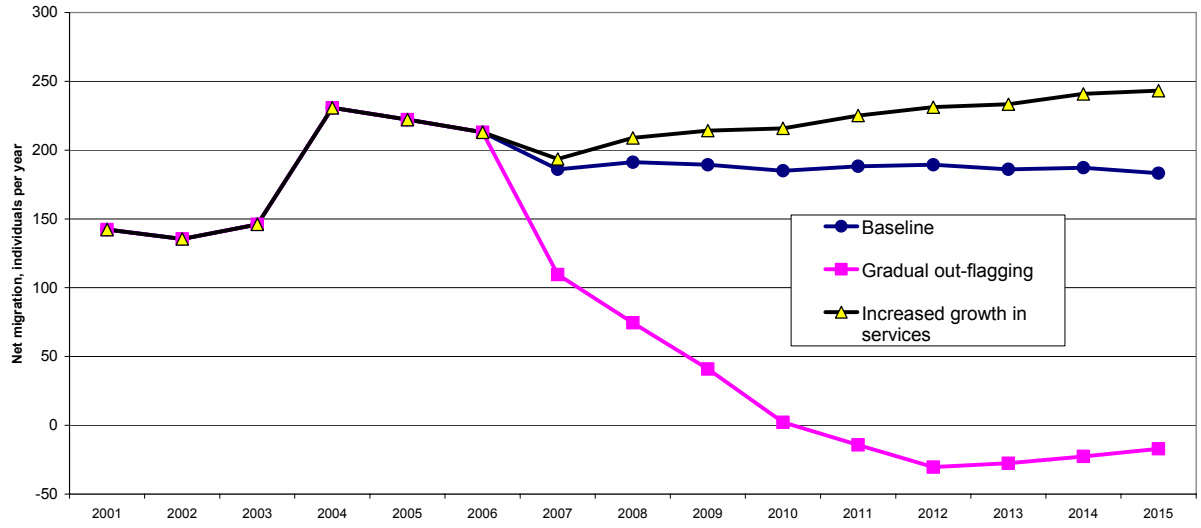


Source: Palmer - Kinnunen, 2006.

As explained above, population growth is assumed to respond through migration to changes in the labour market. We have included the population prognosis of Statistics Finland (SF) as a point of reference. We see SF's prognosis is more conservative as ours, and seems to build on the population growth rate of 2002-2003 (see figure 5 above) .

All our scenarios result initially in an higher population growth, but the Gradual out-flagging would result in such a dramatic changes in the economy that the population starts to decline after 2010. As previously stated, migration is the adjusting part of population dynamics. Figure 6 depicts how net migration will behave in our scenarios.

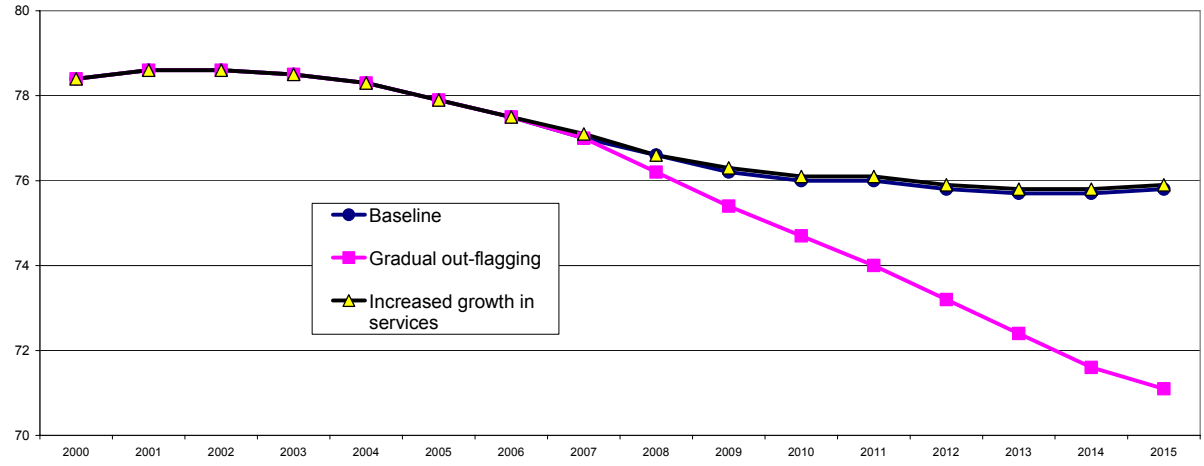
Figure 6. Net migration



Source: Palmer - Kinnunen, 2006.

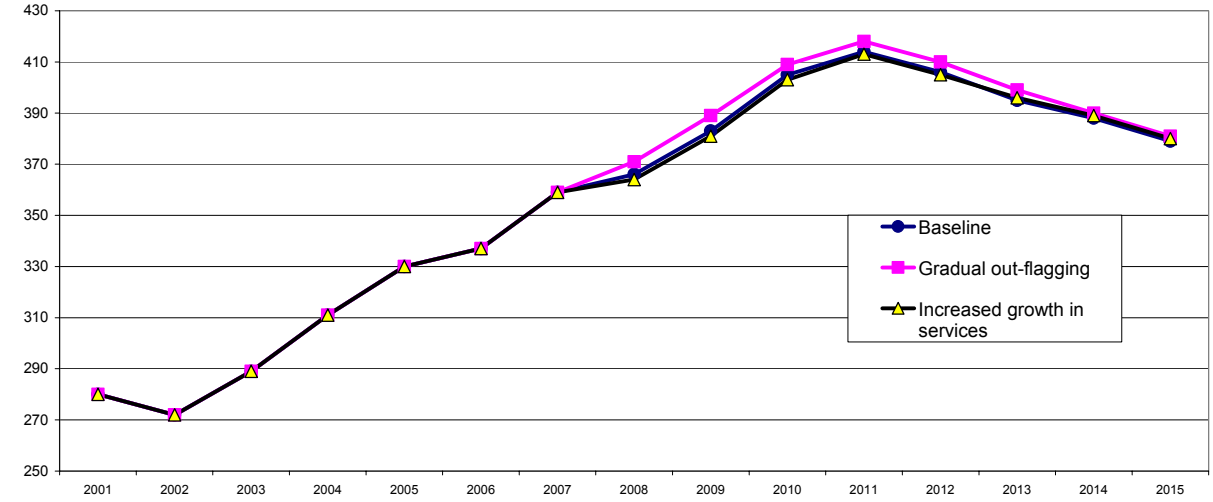
he ageing of the population is depicted below in two ways. Firstly, let us study the development of participation rate (amount of persons in labour force / population working age 15-64) until 2015 (figure 7). We see that the relatively high labour participation rate declines in all the scenarios as the labour force grows older. It is almost exclusively those with lower education level whose participation in the labour force declines. Participation rate for persons with higher education level hovers around 85 per cent during the whole simulation period. Another view to the phenomenon is provided by the change in the number of persons leaving labour force, which is dominated by the new pensioners (figure 8).

Figure 7. Participation rate as percentage of population in working age



Source: Palmer - Kinnunen, 2006.

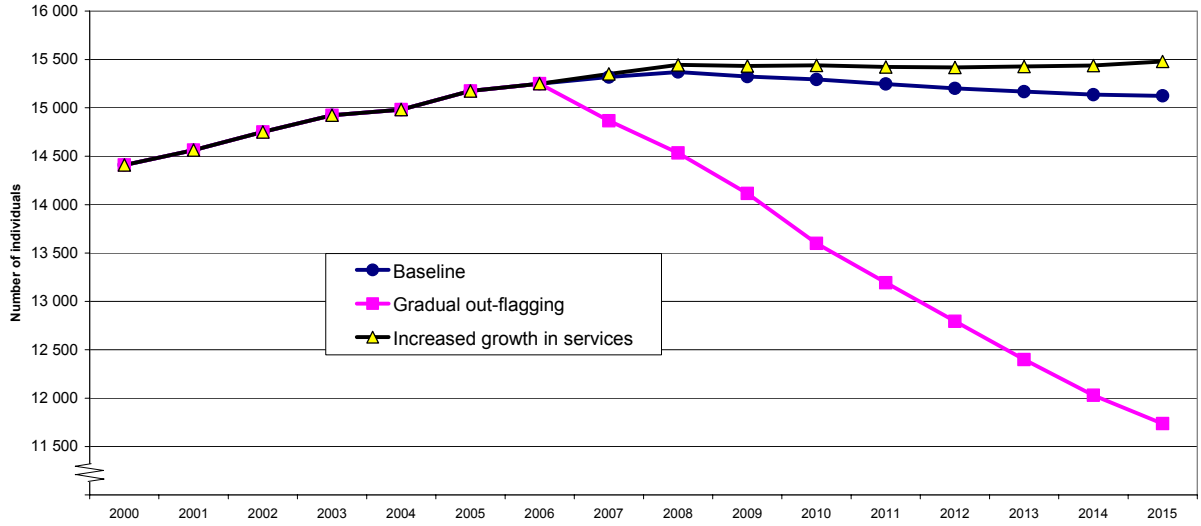
Figure 8. Number of persons leaving labour force



Source: Palmer - Kinnunen, 2006.

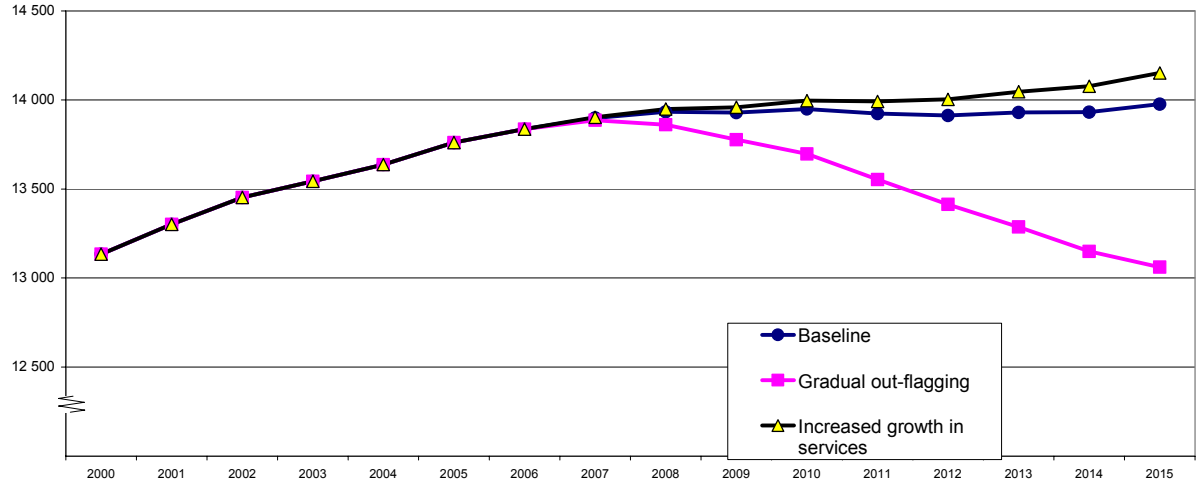
Demand for labour develops quite slowly, as the economy is adjusting to changes in the policy environment (lower alcohol taxation) and to increasing competition (globalisation, new EU members). However, the we see that the labour demand grows faster until the end of current decade, but stagnates thereafter (figure 9). Therefore, the reducing growth in labour demand is probably due to increasing scarcity of labour. Although Åland is a tiny labour market in the European context, the ageing of the labour force is going on simultaneously everywhere in the Europe, which may make it harder to cover the need of labour through migration. In this context the strength of CGE models is evident. In other models or time series analysis, where the supply side is not properly modelled, the result could well be that migration grows exponentially in order to compensate for declining participation rates. However, when increasing migration entails costs through higher wages (in order to induce higher migration to own region), and the exports face a downward-sloping demand curve, we get a more realistic picture of the trade-off situation between labour demand and migration.

Figure 9. Demand for labour



Source: Palmer - Kinnunen, 2006.

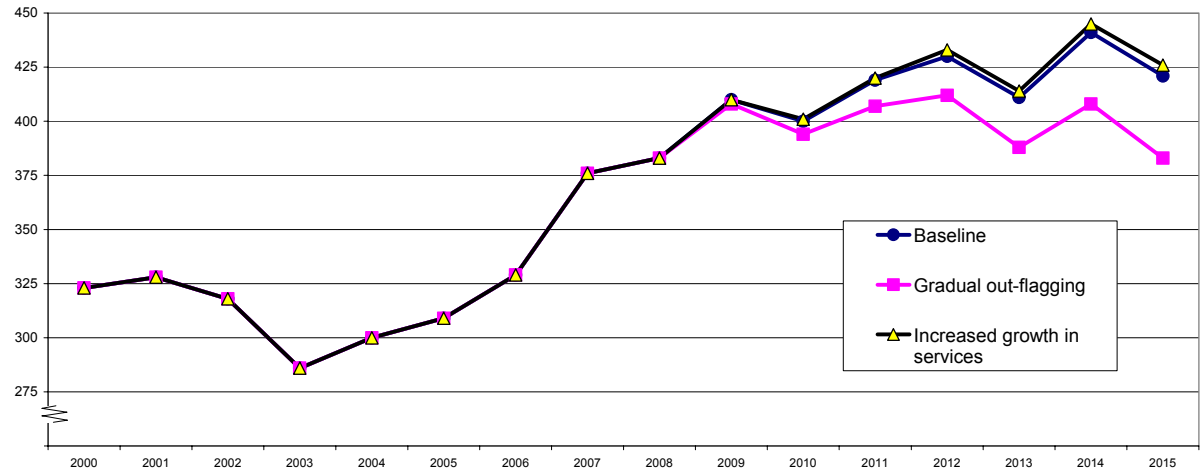
Figure 10. Resident supply of labour



Source: Palmer - Kinnunen, 2006.

We see that labour supply shows a similar development that the demand curve above. Please also note that the total demand exceeds supply, which is complemented with commuting from neighbouring regions. Commuters work mainly aboard the vessels registered in Åland. The number of commuters is modelled as a fixed share of labour demand in transport sector. Thus the supply depicted in figure 10 is the supply of labour provided by resident population. Number of new exams is allowed to vary here only due to changes in the underlying population. We see that the number of inhabitants in the age cohorts (mainly those aged 15-24) important for the number of getting new exams is growing during the coming years, which will probably require some additional resources in education.

Figure 11. Number of exams taken by resident Ålanders



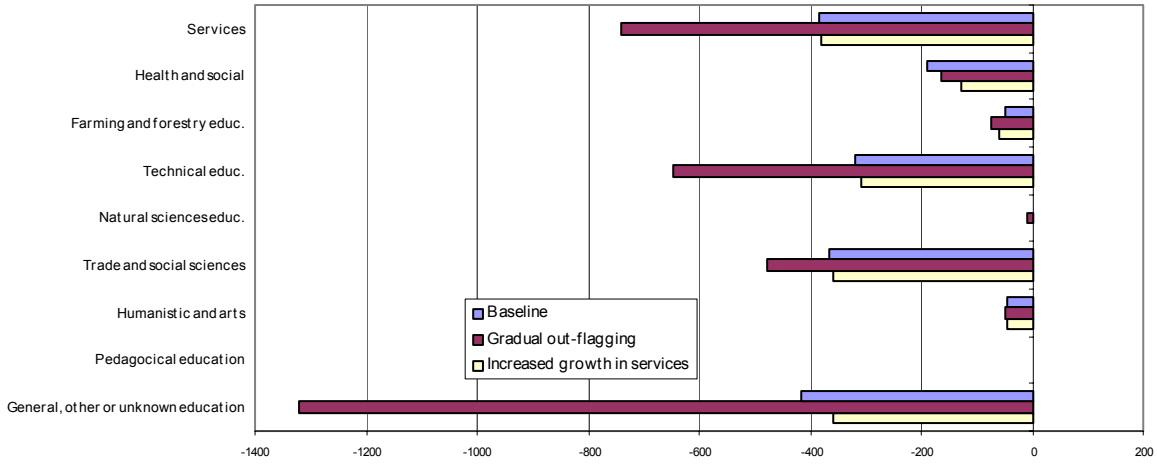
Source: Palmer - Kinnunen, 2006.

How do the educational activities match demand? Inside the model labour is divided only according to the level of education. However, we can follow what kind of educational competence is leaving the labour market with new pensioners, and we can apply same kind of post-solve matrices as e.g. Meagher et al. (2000) to divide labour demand into finer categories. However, this approach has its limitations, as our population is so small that even by applying major educational and professional categories, we are in many cases calculating flows of 0-30 persons a year.

Below we show with two graphs how the future need of education seems to develop. During the next ten years, 2006-2015, the difference between the need of recruiting persons with lower education is clearly lower than the number of new exams (see figure 12). The need of recruiting is calculated as the growth (decline) in labour demand added with number of persons leaving labour market. Therefore, for the majority of the students, the secondary exam should just be a stepping stone for further education. However, the own educational system does not provide such exams in such amounts and areas that are needed. Therefore, we see a totally positive difference between the need of recruiting and number of exams (figure 13).

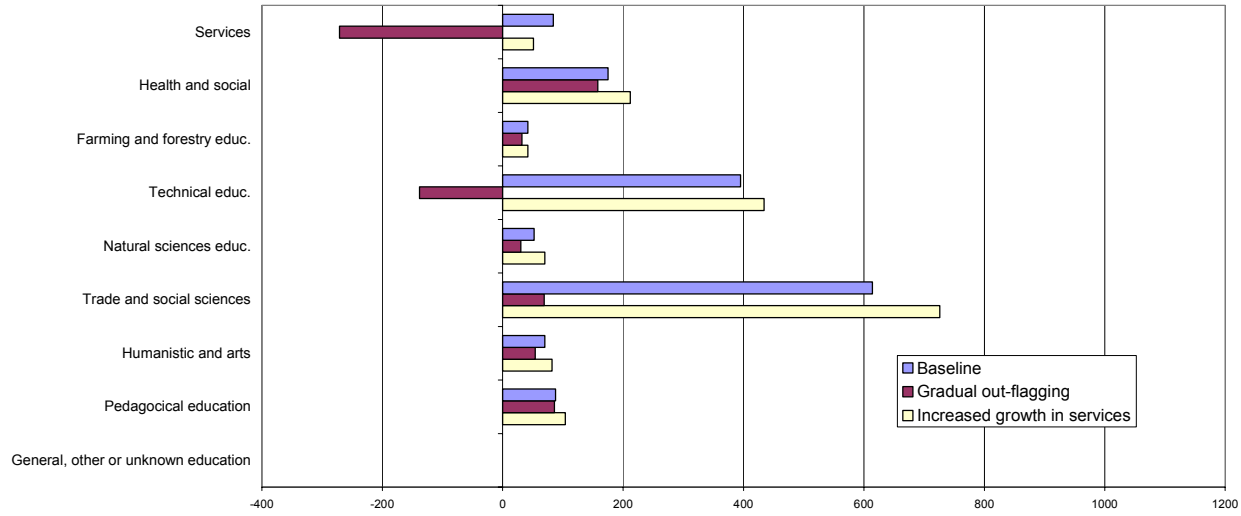
Naturally, this kind of educational systems requires that students move to neighbouring regions to complete their education. The preferred choice of Ålander students is Sweden, which provides a multitude of education programmes in the mother tongue of Ålanders, whereas the supply of education in Swedish is quite narrow in Finland (but existent). Currently, around three quarters percent of students studying outside Åland are located in Sweden, and the majority of the rest are studying in Finland (Statistics Åland, 2005). Other locations of study are still rare, but increasing.

Figure 12. Difference between the need of recruiting and number of exams 2006-2015, secondary education



Source: Palmer - Kinnunen, 2006.

Figure 13. Difference between the need of recruiting and number of exams 2006-2015, tertiary education



Source: Palmer - Kinnunen, 2006.

By combining our model results with population statistics, we produced for baseline scenario a table showing the flows of native and non-native persons to and from Åland during 2006-2015 (table 1). We see that around 2,000 natives are expected to out-migrate during the time period. This is around half of the number of exams to be taken in Åland 2006-2015. We can also conclude that in the long term, around 50% of the natives leaving the islands are coming back, probably higher educated than at the time of departure. In addition, we see that there is a considerable flow of non-native persons providing the economy with the competence it needs.

Table 1. Migration flows 2006-2015

Number of persons	In-migration	Out-migration	Net migration
Native	1 062	2 104	-1 042
Non-native	7 201	4 260	2 941
In total	8 263	6 364	1 899

Share of population 2005	In-migration	Out-migration	Net migration
Native	4,0 %	7,9 %	-3,9 %
Non-native	26,9 %	15,9 %	11,0 %
In total	30,9 %	23,8 %	7,1 %

Source: Palmer - Kinnunen, 2006.

4.2. Survey results

Our CGE model treats education as an exogenous policy variable. Furthermore, we do not observe the gender of the labour force in our model. However, decisions to commence with studies are made by individuals, and the labour market situation between men and women differ in many respects. In order to capture the viewpoint of individuals, we conducted a self-administered postal survey among the resident population aged 17-60. The questionnaire was sent to 909 individuals, of which 502 returned the questionnaire. Hence the response rate was about 55 per cent, which is a rather normal level in this type of surveys in Åland. In addition, the response rate among males was - typically - clearly lower, only 45 per cent, while two thirds of the females returned the questionnaire. The response rate was also higher among those with higher education level. The sample was post-stratified according to age, gender and education level and weights correcting for non-response in these strata were applied.

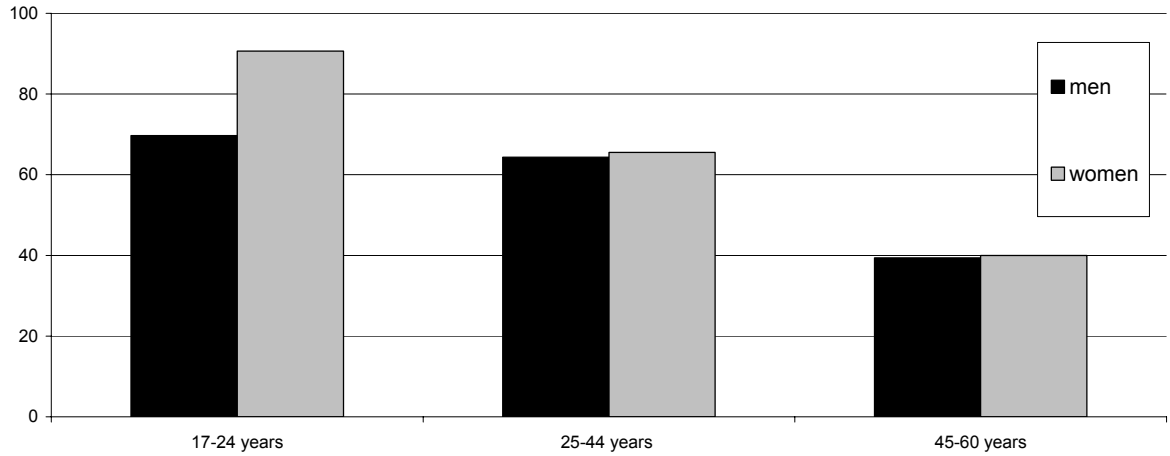
We will concentrate in our presentation of survey results to following aspects: gender differences, forms of education demanded, and reported educational activities of employers.

In our survey, we ask about the individual need for education, including shorter coursers and workshops, as well as longer educational packages, including those leading to exams.

The statement of a need for education varied by all our stratifying variables. The need for education declines with age, and the share of women needing education was higher than that of men. However, the variation between ages was higher than between men and women (see figure 14). The decline in the need of education with age is more drastic than the difference

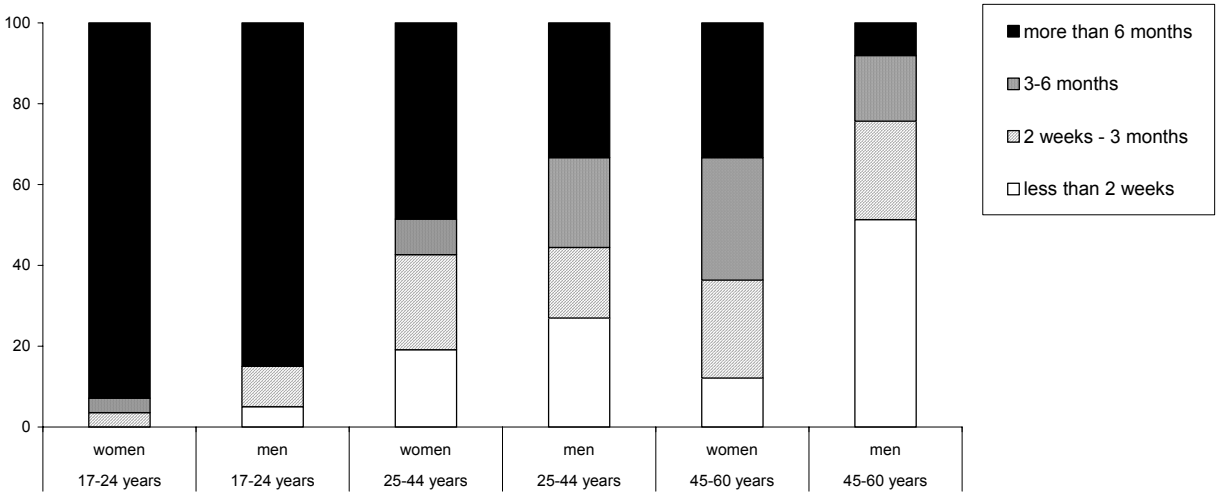
between men and women. In addition, an higher share of respondents with an university/ polytechnic exam had a need of further education. Thus former education seems to generate demand for further education. However, when the extent of education is compared (and age groups normally studying i.e. those under 25 years are excluded), there is no variation between persons with different educational background. The share of men in need of only shorter courses, lasting less than two weeks, rises more quickly with age than that of women (see figure 15).

Figure 14. Individuals demanding education, by age and sex (percentages)



Source: Palmer - Kinnunen, 2006.

Figure 15 Length of education demanded by individuals (percentage shares of all individuals demanding education)

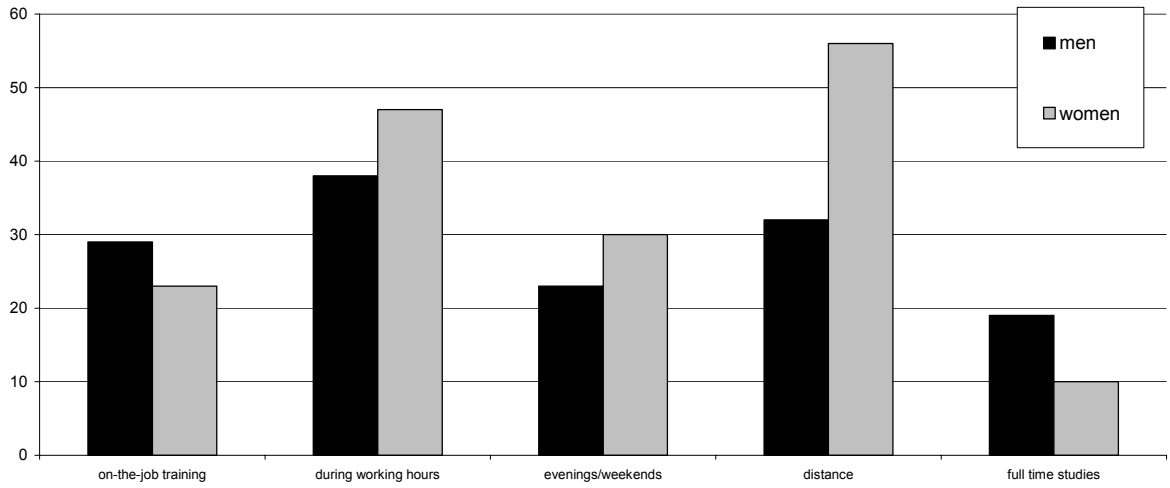


Source: Palmer - Kinnunen, 2006.

There are different forms of education available. Our respondents preferred studies during the working hours, and distance studies (see figure 16). The differences in preferences between men and women was greatest regarding distance studies. The new educational technologies

seem thus to be better suited for women, who may have such obligations at home that studies outside the home region are out of the question.

Figure 16 Individual preferences for different forms of studying by sex (percentages)



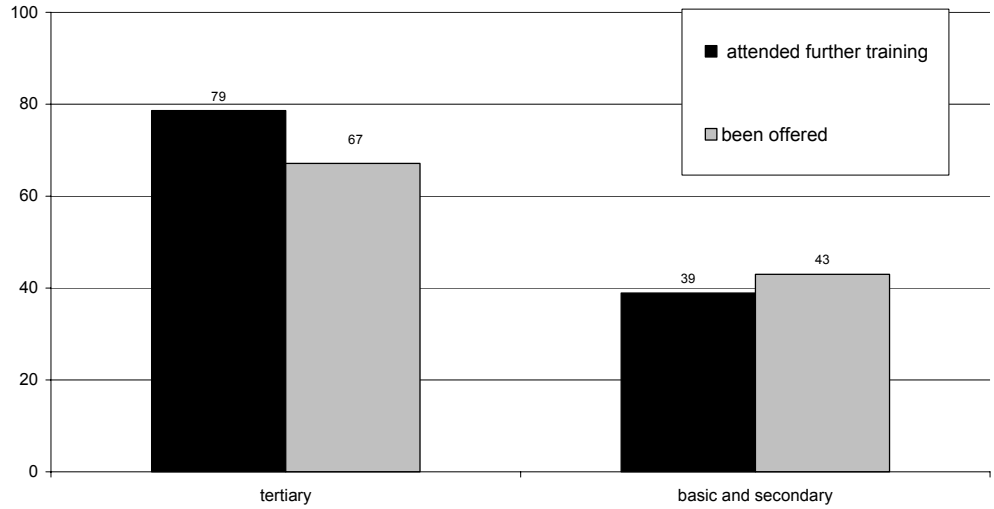
Source: Palmer - Kinnunen, 2006.

We also asked about informal education and training in working life. We asked those currently employed whether they have participated in further education during the last year and how extensive (nr of days) these educational activities have been, and whether the training was conducted during or outside the working hours.

Almost half of the employed - 50 per cent of men and 57 per cent of women - reported that they had participated in further training. However, there are differences between educational and age groups. Less than one third of the employees younger than 25 years had received further training, while about half of the older age groups had been offered training. About two thirds of persons with university exam had been offered training, while the corresponding figure for those without university exam was 40 per cent. Those with university exam also seem to take own initiatives to further training, as almost 80 per cent of them had participated in some training, which means that more than one in ten did it without their employer suggesting it (see figure 17). The most drastic gender difference is found among the younger employees aged 20-24, which is probably explained by the life cycle considerations.

Division of respondents by sector (public vs. private) and gender shows that in the public sector, the situation between the educational need and possibilities for training is quite well balanced, both among men and women, while in the private sector, women are less often offered training in relation to the reported need of it. The situation for men in the private sector is clearly better as women's, although it is not as good as among men in the public sector (see table 2)

Figure 17. Employees who have attended/been offered further education, by level of the individual's education (percentages)



Source: Palmer - Kinnunen, 2006.

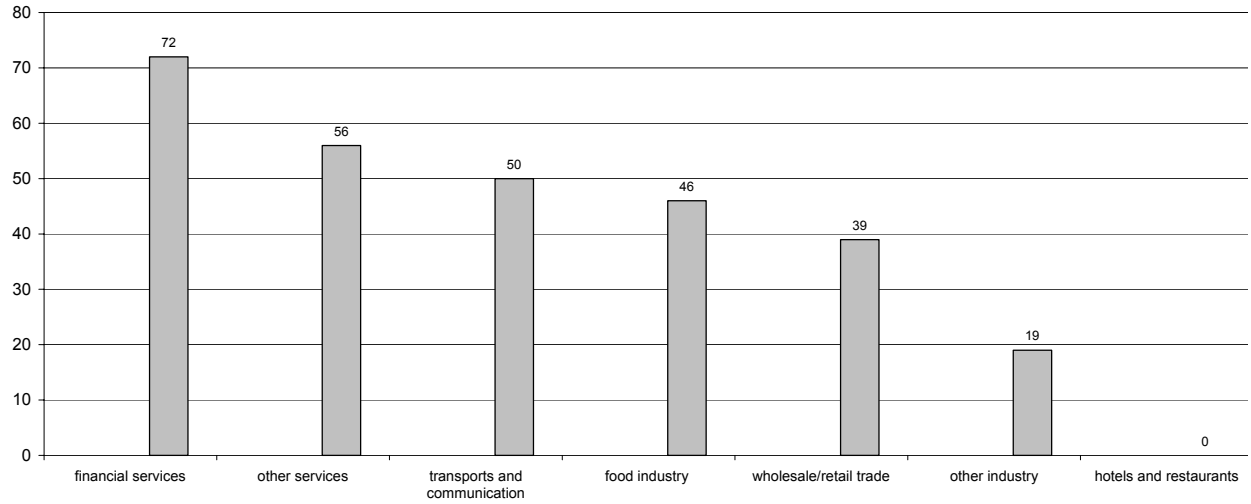
Table 2. Employees who have attended/been offered, and are in need of further education, by sector and gender (percentages)

	Public sector			***Private sector***		
	attended	*been offered*	*in need of*	*attended*	*been offered*	*in need of*
All	54,0	54,6	58,6	44,3	42,8	53,4
Women	53,0	56,0	58,0	37,9	34,8	50,0
Men	55,3	59,5	60,0	49,1	47,2	55,3

Source: Palmer - Kinnunen, 2006.

Drastic differences are also revealed by reviewing the share of those having participated in further training by industry (public sector excluded). Two thirds of persons working within service industries requiring high human capital input are being trained annually, while personnel working within Hotels & Restaurants (NACE code H) receive no training according to our respondents (see figure 18). From the employer's point of view, the question of probable job tenure has to taken into consideration: industries with high turnover of personnel may not be as interested in training their personnel. Similarly, the smaller the company is, the higher is the risk of loosing the training investment through personnel turnover, as each employee represents an higher share of the whole labour force.

Figure 18 (fig 12 s 48)). Share of employees who attended further training in 2004, by industry (percentages)



Source: Palmer - Kinnunen, 2006.

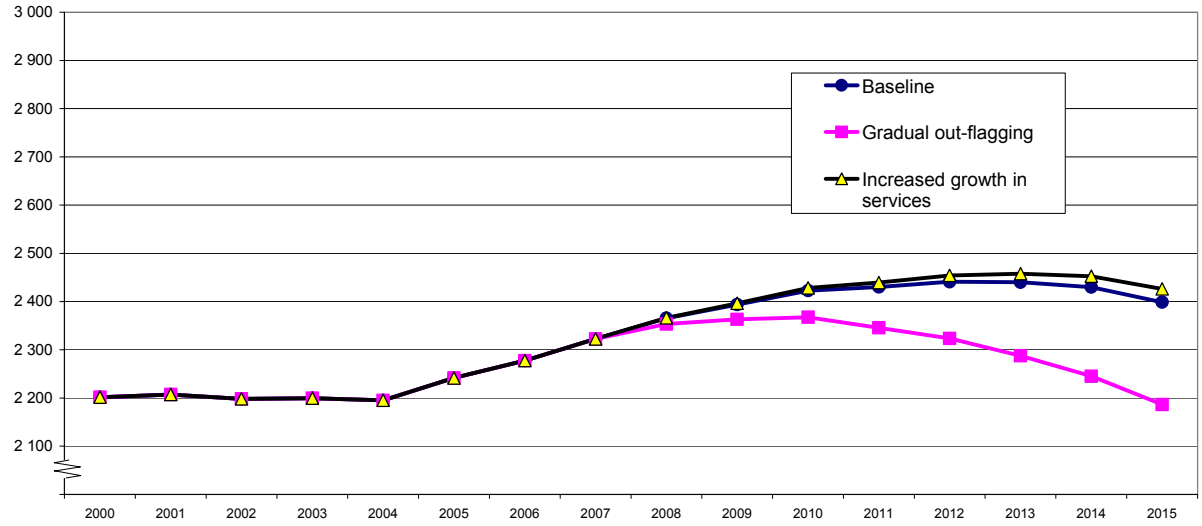
In the Åland Islands, the same pattern of in the earnings of men and women can be found as in many other European countries, which is sometimes described with a slogan "the euro of women is only 80 cents". Women in comparable tasks earn less than men. Either men find their ways more often to positions that lead to higher income than women, or men are just paid more for the exactly same task. Studies on the wage differences in Finland propose that the former factor is important - it explains roughly half of the observed differences in earnings (Korkeamäki - Kyyrä , 2005).

As we have seen, education is becoming more important in the labour market, and women seem to be keener to acquire more of it. In the future, this may lead to two things: the preferred position of men in the labour market may be eroding. Or the returns to education may decline, as the male networks continue to favour men, which in the future may be less educated than women. At any rate, the coming changes in the labour market that seem to enhance women's more equal footing in the labour market.

4.3. Combination of the survey and model results

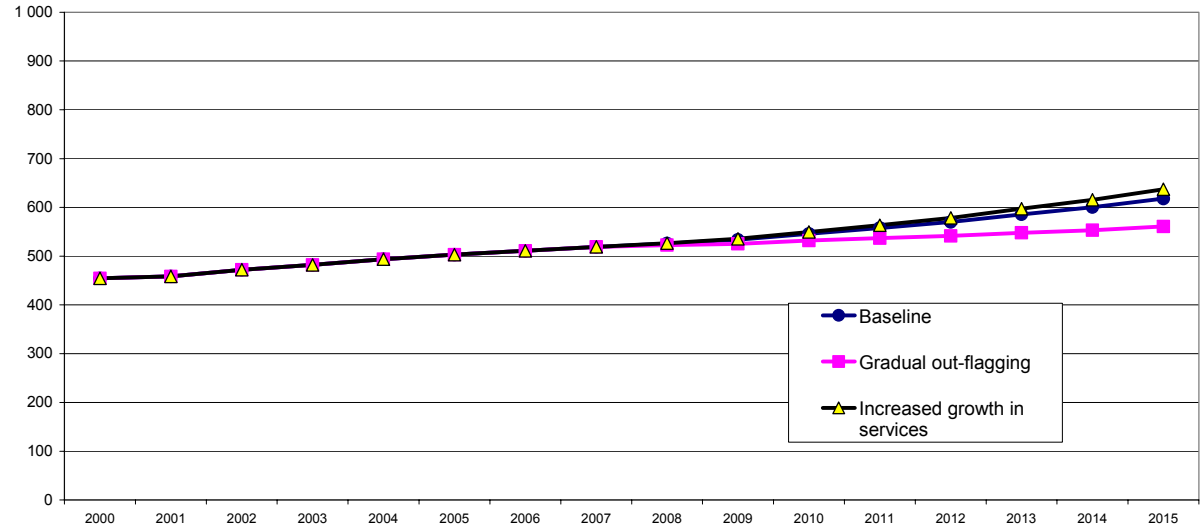
It is not an easy task to introduce the insights of our survey to the CGE model. First of all, CGE models that include gender in the labour market are still rare, at least in the context of developed economies. In case of developing countries, models dealing with gender issues have appeared recently (Fofana et al, 2003; Fontana, 2001; Raihan et al. 2005). This is certainly an area where rich results could be obtained in the future, as the European statistical offices develop their home production satellite accounts and time use studies (see e.g. European communities, 2003).

Figure 19. Need of a new exam among those with lower education (during the next five years), number of persons



Source: Palmer - Kinnunen, 2006.

Figure 20. Need of a new exam among those with higher education (during the next five years), number of persons



Source: Palmer - Kinnunen, 2006.

With the resources available for us at this moment, the only link between our survey and the model is established between several types of individual need of education and population changes. In order to illustrate this please see figures 19 and 20 below depicting the reported need of getting an exam during the coming five years. We see that the group with lower education dominate both in the amount and in the future growth in the educational need. However these seems to be considerable demand for updating the current knowledge even among persons with a university degree. However, the educational need is dominated by the

young persons in their 20s, which represent a higher share among those with currently lower educational level. As this group is expected to grow in the future, even educational need seems to grow. However, we are assuming here that the preferences are constant inside the age groups and educational levels. As a considerable share of the growth in population comes from migration, this assumption may be overly simplistic.

5. Distribution of results in a user-friendly format on the web

This article is a short summary of a more extensive report written in Swedish (Palmer - Kinnunen, 2006). Apart from the report, the project has a home page of its own including a result database. Model and survey results are available as downloadable PC-Axis files. PC-Axis (and other PX-programmes supporting it) is a programme developed by the Nordic Statistical Offices. For more information on PC-Axis and the ancillary PX-programmes and for **free downloads** of all the programmes, please visit http://www.pc-axis.scb.se/. These programmes can handle data matrices with up to sixteen dimensions (if anyone wants to build such!). The user can choose a part of the matrix, pivot it, and make calculations on the cells, and download it in many different formats, including excel. We believe this an extremely effective way of communicating results from a CGE model that can have hundreds of result tables.

In order to get an illustration of the possibilities of PC-Axis in the context of CGE modelling, we hope that our readership has a chance to visit the following home page (our pages are unfortunately in Swedish only).

http://pxweb.asub.aland.fi/Database/Utbildningsbehov/Utbildningsbehov.asp

6. Concluding remarks

In this study, we have utilised several tools and perspectives in order to study the future demand labour and the need of education in the Åland Islands. Our policy conclusion concerning region's own education is that is has a limited 'market share' in the build-up of new human capital for its labour market. In order to make sure that the supply of labour corresponds the needs of the employers, measures taken to enhance and ensure frictionless migration to and from the Islands may be as important as educational decisions.

However, public sector is not the only instance providing (and financing) education and training. We could corroborate that employers provide further training on an extensive scale to the employees. However, there are differences between sectors, and more worryingly, by gender. Whereas the educational needs of men are more often satisfied, females colleagues more often are denied training. Simultaneously, women tend to be more interested in education in general. We also assume that the future labour market will be demanding a higher human capital input from the employees, which should further enhance the position of women at the labour market.

As a question of methodology, we are promoting the use of various tools in studying a phenomenon like future labour market. Our survey could provide us with detailed insights that could not have been reached through modelling. Our future ideas of developing the modelling point to the direction already taken by some developing-world modellers, i.e. inclusion of gender into the CGE models.

As for presentation of the results, we believe that the share-ware tools developed by the Nordic statistical offices are extremely useful in sharing detailed results with the readership.

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Appendix 1. Aggregation in the Åland SAM 2000

Activities:	
A-AGRI	Primary production, NACE 01-14
A-FINDU	Food industry, NACE 15-16
A-INDU	Other manufacturing, NACE 17-36
A-ELWA	Water, gas, and electricity supply, NACE 40-41
A-CONS	Construction, NACE 45
A-TRAD	Trade, NACE 50-52
A-RESH	Restaurants and hotels, NACE 55
A-TRANS	Transport and communication, NACE 60-64
A-BSER	Business services, NACE 65-74
A-OSERV	Personal services, NACE 75-93
Products:	
C-AGRI	Primary products
C-FINDU	Food industry products
C-INDU	Other manufacturing commodities
C-ELWA	Water, gas, and electricity
C-CONST	Construction services
C-TRADE	Trade services
C-HOTEL	Restaurant and hotels services
C-TRANSP	Transport and communication services
C-BSERV	Business services
C-OSERV	Personal services
C-FINSERV	Ålanders' tourism on mainland Finland
C-ROWSERV	Ålanders' tourism in the RoW except Finland
Factors:	
LABOR	Labour income
CAPI	Capital income
Transaction costs	
TRNCSTDOM	Domestic transaction costs
TRNCSTEXP	Account for transaction costs in exports
TRNCSTIMP	Account for transaction costs in imports

Institutions/tax accounts

FIRMS	Firms
NGO	Non-profit organisations
STATE	Government of Finland
GOV	Government of Åland
MUNI	Municipalities
SOCSEC	Social security funds
PRODTAX	Product taxes
VAT	Value-added tax
PRODSUB	Product and production subsidies
TRANSSUB	Transport subsidy
CORPTAX	Corporate taxes
SINCTAX	State income tax
MINCTAX	Municipal income tax
SECFEE	Social security fees
OTAX	Other taxes and fees
S-I	Savings and investment account
HHD	Resident households
LEXP	Labour exports
ROWHH	Tourist household from the rest of the world
ROW	The rest-of-the-world account