A Study of Cluster Impacts and the Future of the Shipping Industry in Åland Islands

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Abstract

Åland is small autonomous island territory within the Finnish realm with 28,000 inhabitants. In 2009 the shipping sector in the island employed - within and outside of Åland - about 6 100 people, onboard and ashore, with an annual gross salary volume of 243 million euros. It also generates capital income of 32 million euros. In the same year, gross sales of the shipping sector amounted to more than 870 million euros. These are impressive figures in relation to the total labor market and economy of Åland with a GDP totaling around one billion euros and a labor force of 14,000 persons.

The Åland islands, located in the northern part of the Baltic Sea, is one of the few places within EU, where tax-free sales onboard are still allowed. The right to sell tax-free was enabled by Åland's permanent exemption from the EU tax rules written in the Finland's EU-accession treaty. Another important factor for shipping is the EU-sanctioned system of subsidies for crewing costs that decreases the manning costs of domestic seafarers.

Apart from measuring the size and effects of the Åland shipping cluster, we analyze the outcome of different scenarios for the shipping industries and the society of Åland using a dynamic one-region computable general equilibrium model.

We show that the manning subsidies mainly benefit the seafarers, but seen from the point of the macro economy, shipping companies or of all households, abolition of manning subsidies could have positive impacts as well, depending on the manner of adjustment of shipping to new conditions.

Moreover, we show that from the point of view of the Åland economy and society, two scenarios are positive for almost everybody. The negative consequences of increased bunker costs are widespread, but the abolition of the Åland tax exemption would have disastrous consequences for the passenger ferry industry and for the economy as whole.

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1. An important shipping cluster in the Northern Baltic Sea area

Åland is small autonomous island territory within the Finnish realm with 28,000 inhabitants. In 2009 the shipping sector in the island employed - within and outside of Åland - about 6 100 people, onboard and ashore, with an annual gross salary volume of 243 million euros. It also generates capital income of 32 million euros . In the same year, gross sales of the shipping sector amounted to more than 870 million euros. These are impressive figures in relation to the total labor market and economy of Åland with a GDP of around one billion euros and labor force of 14,000 persons. They are made possible through massive commuting to Åland, around 2,000 persons, as the majority of seafarers employed by shipping companies live in continental Finland or in Sweden. Most of the ships are registered in Mariehamn, the capital of Åland. The shipping operation thus constitutes a major part of the island's economy. In addition, many Åland-owned ships are registered outside the island, which means that all the Åland based shipping is not included in the islands' national accounts.

The size and economic importance of the shipping industry in Åland is put into perspective by the fact that the total shipping industry under Swedish flag in 2009 employed about 12 000 to 18 000 people onboard (the numbers vary depending on definitions and sources). In the same year, the tonnage owned by or operated from Åland generated an employment of approximately 5 000 people onboard, of which slightly more than 3 600 on board passenger vessels and over 1 300 on board freight vessels.

Hence, the Åland-based maritime sector is the single largest shipping cluster in the northern Baltic Sea area. It has significant positive economic impacts not only in, but also outside Åland. The majority of the jobs generated by the cluster are occupied by people living outside Åland. And even more so, this applies to the shipping industry's purchases of goods and services, which to a very high extent are made outside Åland. Moreover, the markets are dominated by demand outside Åland. Almost 100 per cent of the income is, in the perspective of the Åland economy, pure export revenues (table 1 below).

Regarding employment and earnings, Finland and Sweden are the regions providing the largest share of employees, and thus also benefitting most from the labor earnings. This reflects the fact that the operations of these shipping companies, especially passenger ferries, are concentrated in the Baltic Sea.

Table 1. Sales by geographical area of the Åland shipping cluster in 2009

Type of shipping	Gross sales € m.	Geographical division of sales, per cent				
		Åland	Finland	Sweden	Rest of EU	Rest of world
Passenger	645	5	45	41	6	
Freight	227	1	28	3	48	20
Total	872	4	41	31	17	7

Source: survey and interviews with the leading shipping companies, see Lindström – Kinnunen (2010).

Table 2. Home region of employees, calculated in full-time employment

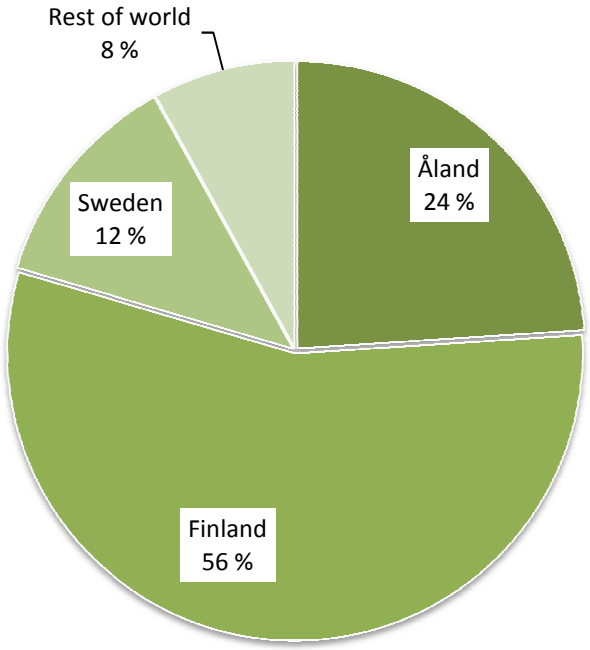
Employment category	Number of empoyees		Home region of the employees				Total
	Pass. Shipp.	Freight Shipp.	Åland	Finland	Sweden	Rest of world	
On shore	1,073	70	484	275	294	90	1,143
On board	3,640	1,330	1005	2,978	526	461	11,083
Total	4,713	1,400	1,489	3,253	820	551	6,113

Source: survey and interviews with the leading shipping companies, see Lindström – Kinnunen (2010).

A considerable share of the labor earning benefits Åland's households, as well as almost 50 million euros of earnings totaling 194 million euros accrued to seafarers from Åland in 2009 (figure 1). In intermediate consumption, the shares of Sweden and the rest of the world are considerable larger than for labor earnings (see figure 2). However, even here we can see a clear homeward bias as around one fifth of the recurrent purchases originated from Åland companies in 2009.

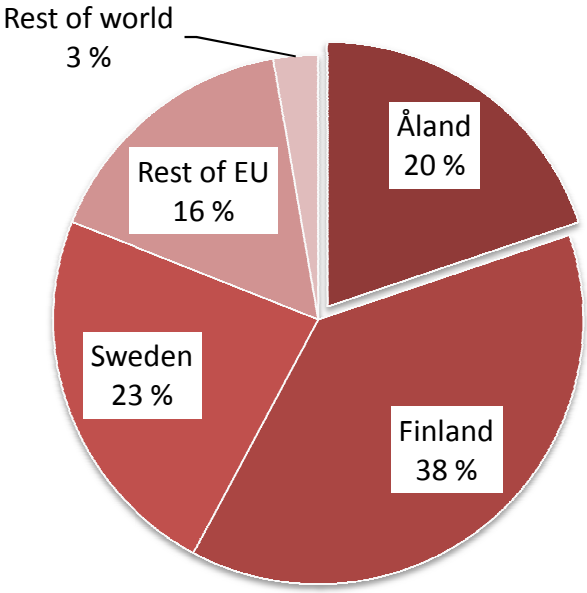
In recent years, the Åland shipping industry has become increasingly internationalized. One indication of this is the growing number of vessels under the management responsibility of companies in Åland as well as the additional tonnage owned by international ship-owners, the operation of which has been entrusted with the competent actors of the maritime industry in Mariehamn. At the same time, the use of alternative flag states has become increasingly frequent. This is true also for the passenger fleet, of which almost half the tonnage is entered in the Swedish ship register today.

Figure 1. Geographical division of labor earnings, per cent



Source: survey and interviews with the leading shipping companies, see Lindström – Kinnunen (2010).

Figure 2. Division of recurrent purchases in 2009



Source: survey and interviews with the leading shipping companies, see Lindström – Kinnunen (2010).

The decline in domestically registered tonnage is thus, to a great extent, compensated by high activity in the industry as a whole and the extensive economic effects this creates. We would like to highlight the fact that the passenger vessels registered in Sweden continue to be owned and controlled by ship-owners in Åland. Consequently, the development towards the use of several flag states can be seen as a strategy to maintain profitability while preserving and expanding the use of the shipping knowledge of Åland in an increasingly internationalized environment.

By using a regional input-output for Åland (Statistics Finland 2006), we have calculated a conservative estimate for the secondary effects of the shipping cluster. As Åland is a small economy, "leakages" from its activities and operations to its surroundings are high. This leads to low Leontief inverse matrix coefficients. The positive secondary effects outside Åland apply especially to the Finnish economy and labour market. Representing more than 50 per cent of the employees of the cluster, 55 per cent of the gross salaries and close to 40 per cent of the current purchases, coastal regions of mainland Finland are - in absolute figures - the largest beneficiaries of the shipping competence in Åland. The positive impact of shipping on the Finnish economy is further confirmed by the fact that Finland is one of the countries where the shipyard industry has been favoured by the demand for new-building and extensive ship repairs generated by the Åland shipping. In table 3, we call the more intangible consequences of sustained and strengthened maritime competence within the cluster "tertiary effects".

Table 3. Total effects of the Åland shipping cluster on the surrounding economy 2009

Cluster effects	*Primary effects*	*Secondary effects*	*Tertiary effects*
Households	Salary- and capital income paid in the cluster: approx. EUR 275m	Increased household income: approx. EUR 110m	Demand for specialized maritime professional competence with career possibilities
Industry	Purchases in other sectors: approx. EUR 595m	Indirectly generated turnover: approx. EUR 270m	Increased possibilities for specialisation in sectors related to shipping and logistics
Total effects	**Approx. EUR 870m**	**Approx. EUR 380m**	**Enhancement of maritime cluster effects and related industries**

Source: Lindström – Kinnunen (2010).

2. A turbulent international shipping policy milieu

Åland is one of the few places within EU, where tax-free sales onboard are still allowed. The right to sell tax-free was enabled by Åland's permanent derogation of the EU tax rules written in the Finland's EU-accession treaty in 1995. On board tax-free sales are the backbone of ferry traffic in the Baltic Sea, spurred by the high excise taxes on alcohol and tobacco in Sweden and Finland (Kinnunen, 2005).

Another important shipping policy measure is the EU-sanctioned system of subsidies for crewing costs that decreases the manning cost of domestic seafarers. These subsidies cover around a third of the manning cost. However, the Finnish shipping policy has been characterized as a latecomer in a Nordic comparison of shipping policies (Lindström – Lång, 2011).

In October 2008, the IMO adopted tighter limit values for the sulphur content of marine fuels. The new regulations mean that the limit value for sulphur in the Baltic Sea, the North Sea and the English Channel (so-called Sulphur Emission Control Areas [SECA]) is finally lowered to 0.1% by weight in 2015 and globally to 0.5% by weight in the year 2020 or, depending on fuel supply, at the latest by the year 2025 (Swedish Maritime Administration, 2009).

The European Commission announced the start of the revision of the maritime state aid guidelines in November 2010. The review has a special focus on operating aid such as reductions in seafarers' social security contributions and income tax exemptions. Although the revision of the state aid guidelines is a recurrent routine with three years frequency, the matter is more delicate than normally as the responsibility for maritime competition and state aid issues were transferred in 2010 from Directorate-General for Mobility and Transport (DG MOVE) to the Directorate-General for Competition (DG COMP).

3. A service-based island economy

In what follows, we set our focus on the part of the cluster that is part of the regional economy of Åland Islands. Below, we present a number of indicators on the production structure of Åland's economy, based on the Social Accounting Matrix for Åland 2007 (Statistics Åland, 2010). The matrix shows that Åland is a service-based economy with a very limited manufacturing sector, mainly focusing on foodstuff manufacturing, as well as on some niche products within non-bulk manufacturing of precision instruments and medical instruments (Table 4). As our production

structure is organized by product, the tax-free sales of passenger shipping are classified into Trade. There is also a land-based part of the economy benefitting from the special status of Åland as being outside EU VAT area, namely mail order and internet sales of commodities of minor value, which are not subject to VAT. Therefore, there are numerous companies distributing CDs, magazines etc. from Åland to neighbouring regions.

Tourism is also an important part of the economy in Åland. It is estimated that on-shore tourism represented 4.5 per cent of private sector's value added in Åland. If sea transport's part of tourism is included, the share of tourism of the total private sector value added was as high as 30.4 per cent in 2008 (Rundberg – Kinnunen, 2009).

Table 4.Production characteristics of Åland economy in base year 2007

		Share of value added	Share of production	Employment share	Share of exports	Export of output	Share of imports	Imports of demand
Primary sector	C-AGRI	2.5	3.1	4.3	6.0	85.9	5.7	85.4
Food industry	C-FINDU	1.7	3.2	1.8	5.7	76.9	6.4	79.7
Other manufacturing	C-INDU	4.2	3.8	3.7	5.6	64.4	38.4	92.6
Elect. Gas, Water	C-ELWA	1.2	1.3	0.7	0.0	0.4	0.4	10.9
Construction services	C-CONST	4.5	7.8	6.7	3.9	17.4	0.7	4.9
Trade	C-TRADE	11.3	10.2	12.0	15.1	65.0	7.2	47.7
Hotel and restaurants	C-HOTEL	4.0	4.7	5.6	4.2	40.7	0.0	0.0
Land transport, post, communications	C-OTRANSP	7.1	8.0	7.6	4.5	25.4	28.2	67.7
Passenger shipping*	C-WTRANPP	9.7	11.9	8.5	17.1	64.6	0.2	1.8
Freight shipping	C-WTRANPG	9.5	9.5	5.3	20.4	95.9	0.0	3.3
Business services	C-BSERV	20.8	14.3	11.8	1.3	4.0	5.1	14.2
Public administration	C-ADMIN	4.0	3.4	5.4	0.0	0.0	0.4	5.5
Education	C-EDUC	3.8	3.4	6.0	0.8	10.7	0.0	0.0
Health	C-HLTH	8.1	7.0	14.9	2.2	13.9	1.2	8.4
Other services	C-OSERV	7.9	8.3	5.8	13.0	70.3	2.2	28.4
Touristic services in continental Finland	C-FINSERV	0.0	0.0	0.0	0.0	0.0	1.4	100.0
Touristic services in Sweden	C-ROWSERV	0.0	0.0	0.0	0.0	0.0	2.5	100.0
Total		100.0	100.0	100.0	100.0	44.1	100.0	44.5

* Passenger shipping services sold to tourists coming to Åland are not treated here as exports; if they were, the share of exports within passenger shipping would be much higher. In addition, the classification here is organized by product, not by industry. Passenger traffic produces trade and hotel& restaurants services, and cargo services apart from passenger shipping. Source: model SAM 2007, ÅSUB 2010.

In 2010, 2.2 million persons visited the Åland Islands. However, only one in ten visitors stayed overnight, and thus the number of nights in accommodation was only 424,000 in 2010. The majority of visitors are only interested in the boat ride itself offering tax-free shopping and other recreational activities.

4. Dynamic CGE model for Åland

While the working environment of the shipping is turbulent by its nature with its ups and downs, the policy environment is contributing to even greater insecurity at the moment. In this situation, it is well-grounded to try to gauge the future development with the help of alternative scenarios. For this task, we use a recursive dynamic one-region CGE model for Åland, developed by Kinnunen (2005) on the basis of IFPRI Standard model (Lofgren et al, 2002) developed by the Washington-based International Food Policy Research Institute.

The current model version has 15 activities (industries) and 17 products (see appendix 1). Parts of the model closure are scenario- and year-specific, but consumer price index is always the numeraire.

In addition to dynamics, our Åland model differs from its static predecessor in several other respects. We have replaced the assumption of perfect competition with imperfect one with increasing returns to scale, caused by recurrent fixed costs (see Kinnunen, 2005 for more details). In addition, we have introduced full-fledged demographics in this model version so that population development is endogenous. We keep track of fertility, mortality and migration of every age cohort between zero and 95.

Migration reacts to the labor market conditions, which turns demographic development endogenous in the model (other demographic parameters are exogenous and thus insensitive to economic variables).

Apart from labor market development, the demographic development also partly dictates the public demand which is sensitive to the age structure. The estimations for the public demand follow the results of Honkatukia, Kinnunen and Marttila (2009). The public demand equations are for each public sector agent as follows:

$$\frac{G_{c,a}^{t}}{G_{c,a}^{t-1}} = g_c^G - f_{c,a}^G + popgrw_a^t * \varepsilon_{c,a}^P \qquad (1)$$

g_c^G	Exogenous growth trend in public consumption
$f_{c,a}^G$	Exogenous efficiency increase parameter
$popgrw_a^t$	Growth of population in age group a and year t
$\varepsilon_{c,a}^P$	Population elasticity of public demand
c	product
a	Age group

However, depending on the model closure, the demand may be curbed with a scaling factor if the tax rates and public saving are set to be exogenous.

The central labor market equation of the model describes the Phillips wage curve, which dictates the relationship with wage growth, inflation and unemployment rate. We have made an additional twist to the equation by adding parameter θ into it:

$$\frac{W_t}{W_{t-1}} = (1-\theta) * \frac{CPI_t}{CPI_{t-1}} + \left[\theta * \frac{CPI_t}{CPI_{t-1}} + g_w\right] * \left(\frac{U_0}{U_t}\right)^{\beta} \quad (2)$$

Where:

W_t	Wage rate in period t
θ	Wage flexibility parameter (= 0.11)
CPI_t	Consumer price index of period t
g_w	Exogenous wage growth parameter (= 0.019)
U_0	Base-year unemployment rate (= 0.025)
U_t	Unemployment in period t
β	Wage curve parameter, unemployment elasticity of wage growth (= 0.5)

The addition of wage flexibility parameter θ with a value between 0 and 1 sets the minimum wage rate towards which the wage of period t can approach in severe economic downturns. Without it, the real wage rate would not decrease in any case, which is too rigid an assumption even in Finland where labor union membership is widespread and common. What is more, more than ten per cent of the labor force in Åland is self-employed entrepreneurs whose earnings adjust according to the economic conditions.

In order to describe the institutional setting of the Åland Islands, the public sector is divided into four actors: state, regional government, municipalities and social security funds. The special financial arrangements between the state and the Åland government have been taken into account in the model. Åland receives an annual lump-sum transfer from the Finnish government that amounts to 0.45 per cent of the state budget revenues (net of borrowing). In the event that state income tax revenue in Åland exceeds 0.5 per cent of all income taxes in Finland, the state pays a recompense for the amount surpassing the 0.5 per cent limit (see Kinnunen, 2005 for details).

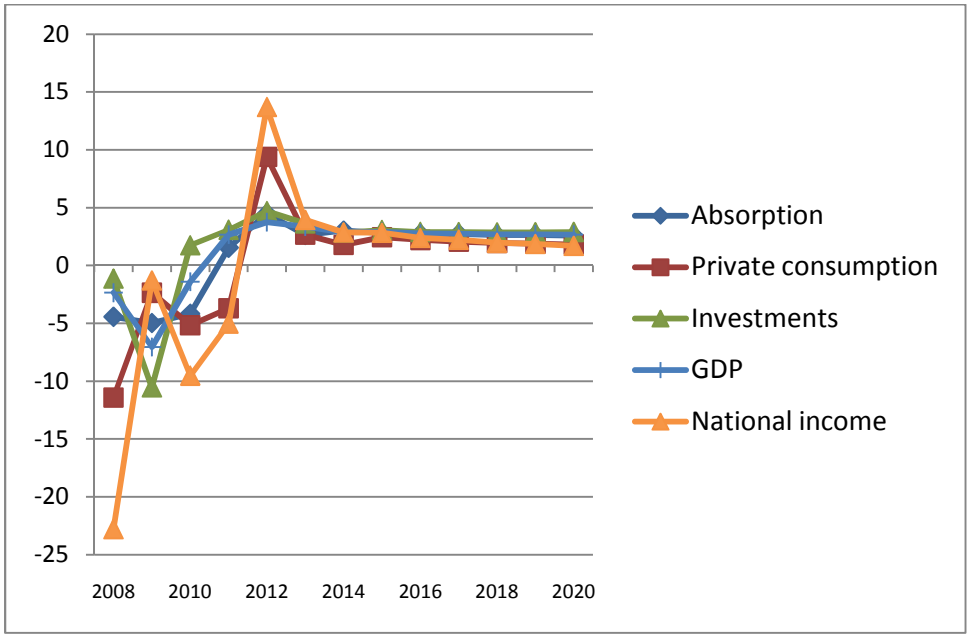
5. The baseline scenario

We solve the model for the years 2007-2020. We assume that Åland's shipping companies more or less keep their market shares in their respective market segments. We have included the financial crisis in our base scenario, which meant a dramatic downturn in the economy in 2008. We also take into account the accumulated surplus supply of freight shipping that will delay the upswing for the sea freight market (see e.g. Vergeland, 2010).

The base scenario is constructed on a gradual adaptation of the Finnish tonnage tax within freight shipping during 2011-2017. This assumption seems with today's knowledge a bit optimistic, as the handling of the Finnish tonnage tax proposal waiting for the Commission's acceptance has come to a standstill within DG COMP (Maritime Watch, April 18 2011). The effect of the flat rate tonnage tax is that the income taxation of freight shipping is decoupled from its returns. This is modeled as a gradual move from taxing capital income to taxing the volume of the capital stock, which is the closest available proxy for the tonnage tax, which is determined at fixed rates by reference to the tonnage of the ships. The adaptation of the tonnage tax does not initially change the tax revenues almost at all due economic downturn, but towards the end of the simulation period it reduces the tax incomes of the state and the Åland government. Another set of policy changes included in the base scenario are the several changes in VAT rate in Finland. The latest change took place in July 2010, when the VAT rate for the restaurant services was reduced from 22 to 13 per cent.

We also include the out-flagging of ships that took place during 2008-2010. A couple of ships were registered under Swedish flag, which reduced manning costs and reduced exchange risks associated with the Swedish crowns (SEK). Thus, the number of Ålanders commuting to abroad, thus exporting their labor was increased, as well as profit returns from Rest-of-world.

Figure 1. Year-on-year growth of macro variable under base scenario



In figure 1, the year-on-year growth of some macro variables are depicted. The turbulence of the years 2008-2010 are clearly shown in the figure. In setting up the baseline, we have strived for maximum replication of the known macroeconomic (and public finance) facts of the years 2008-2010. However, many of the depicted variables are not yet available as statistics later than 2008. GDP growth settles to around 2.7 per cent towards the end of the study period.

As regards shipping, figures 2 and 3 show the assumed development of gross earnings, employment and value added within passenger and cargo shipping. Whereas income, employment and value added develop more or less at the same pace within cargo shipping, the employment in passenger shipping lags behind. Manning costs make up a much larger share of total costs for passenger shipping than for freight shipping.

Figure 2. Development of passenger shipping under base scenario

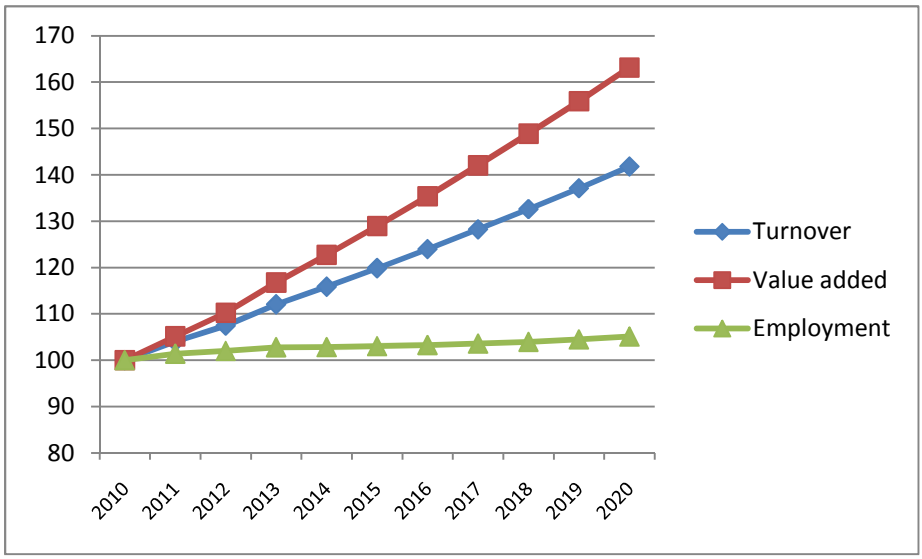
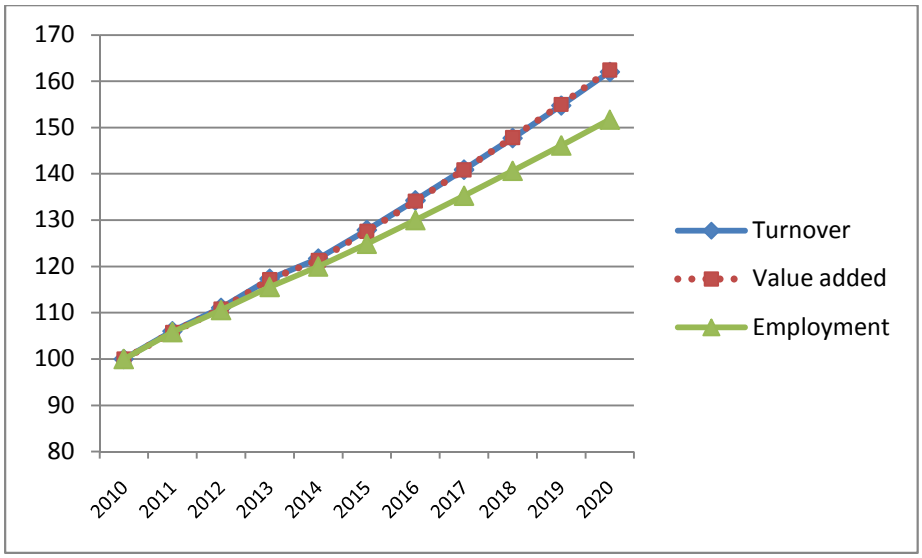


Figure 3. Development of freight shipping under base scenario



The base scenario is freed from any price shocks in world import prices meaning that e.g. bunker prices are assumed to be constant (i.e. no faster growth than CPI). Our assumptions result in a slight increase in the share of shipping of Åland's economy during 2010-2020, but seen over the whole period 2007-2020, shipping looses ground due to out-flagging in the early years of study period.

6. Scenarios with alternative shipping futures

Apart from the base scenario, we constructed five alternative scenarios for the coming decade's development:

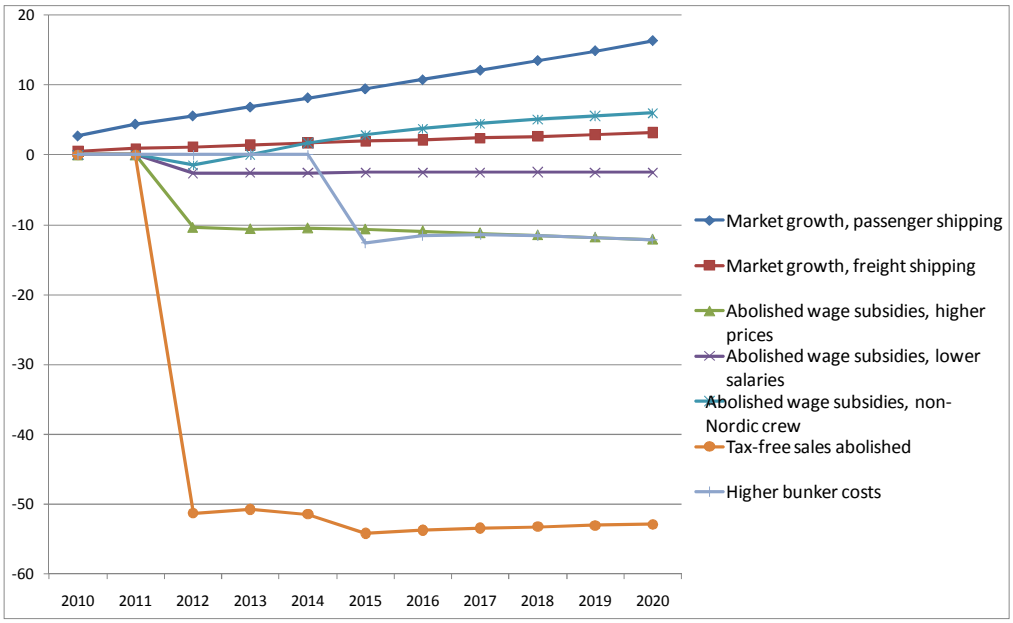
- Growth in demand of passenger shipping in the Baltic Sea
- Higher demand growth within freight shipping
- The EU-sanctioned system of subsidies for crewing costs is abolished
- Increased bunker costs (IMO-decision on low sulphur fuel from 2015 on)
- The tax exemption and, therefore, tax-free sales onboard are abolished

These five scenarios include assumptions on changes in the market conditions of the ship-owners as well as in the governmental policies regulating their fundamental business conditions. One of the scenarios - the abolition of on-board crew subsidies (EU-approved restitution of taxes and social fees) - is presented in three different versions; one where the raise in salary costs is compensated by higher prices paid by the market, one where the people employed onboard agree to compensate the abolition of subsidies by lowering their salaries, and one where the compensation is made by replacing the people employed onboard with low cost crews from outside the Nordic countries (more detailed information on the scenario-specific assumptions is available in the appendix 3).

Let us first focus on the effect of these scenarios on the two shipping industries (passenger and cargo) in our model. Figure 4 depicts the change of the earnings volume of passenger shipping under the different scenarios. The figure is presented as percentage deviations from the baseline value each year.

The market growth scenario of passenger shipping presents the results of roughly doubled rate of growth from year 2010 on for the exports of products related to passenger shipping. Although the growth does not look impressive as such, the sheer size of shipping in the Åland economy accentuates the effects. In addition, as has been explained above, only a part of the sales to customers outside Åland are considered as outright exports within the model (see appendix 3 for the detailed scenario assumptions).

Figure 4. Volume of gross earnings in passenger shipping, change from base, per cent

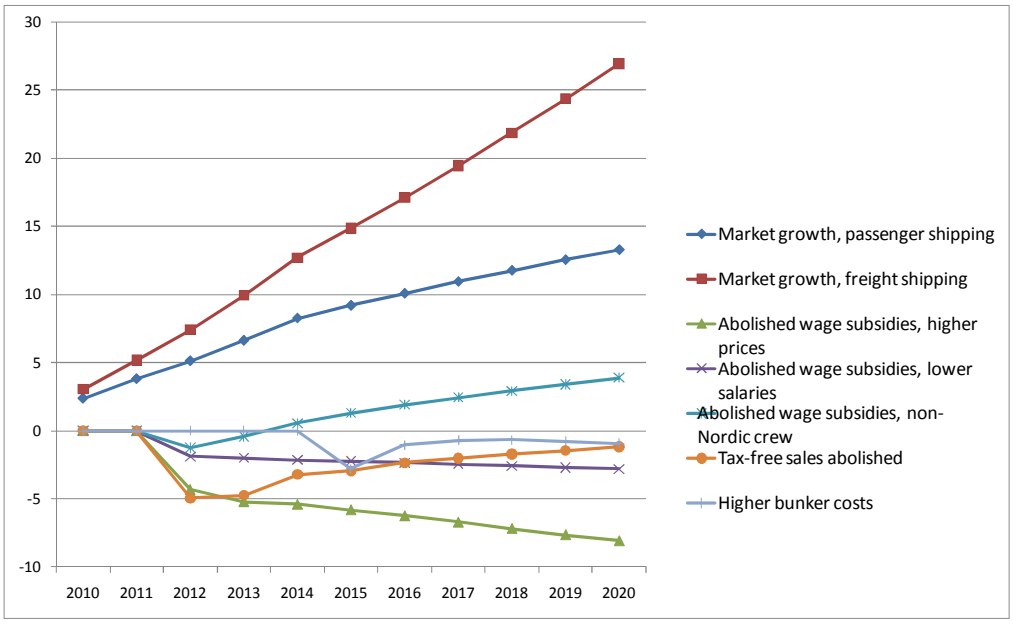


The scenario for abolished tax-free sales stands out as the most dramatic one with severe repercussions in the rest of the economy as well. The well-being of the Åland society is built upon on-board tax-free sales , which began with Åland-based shipping companies in 1959 (Lindström – Kinnunen, 2010). Understandably, it is impossible to imagine, what a total reversal of this situation would lead to. Our assumptions include a one-off drop in external demand for passenger shipping, as well as ending of the Åland exemption from the EU VAT rules. However, we do not assume an ever-worsening vicious circle of declining population and closure of industries, but a lengthy recovery period with necessary structural changes entailed with it (we will return to this below).

The three scenarios for abolished wage subsidies differ greatly in their effects on the industries gross income (including the subsidies). We assume that passenger shipping companies would not be able to pass on the changes in their costs to the customers. Instead, their gross incomes would decrease by around ten per cent. If the majority of the shock would be allocated to the employees, the shock would be of totally different order of magnitude for the shipping companies. And finally, if the current restrictions on employing non-Nordic seafarers would be simultaneously given up, the industry would actually increase its returns from the base case. Our assumption of having 75 per cent higher fuel costs (see Ministry of Transport and Communication, 2009) due to more stringent emission regulations of IMO for sulphur oxides would lead to a downturn similar in order of magnitude as mere abolishing the crewing subsidies without other policy measures.

As for cargo shipping, increase in exports has a more direct effect on the returns of this activity, while we see that cargo shipping would also benefit considerably from increased passenger shipping due to inter-activity linkage between them. Manning costs do not represent as high a share of total costs as in passenger shipping. Hence the scenarios with abolished crewing subsidies are less dramatic for cargo traffic. It is also noteworthy that increased bunker costs do not too severely affect the income volume of the cargo traffic, as the cargo companies in Åland mainly operate under contracts according to which their customers pay the bunker costs. Only in case when the price rise would be high enough to induce a modal shift from sea to land transport, the Åland companies would be noticeably affected. Our reading of relevant impact studies implies that the sulphur oxide regulations do not cause such a shift to take place more than marginally within the Åland cluster, at least not in the transports from the Finnish mainland with long and often inconvenient land transport routes to the rest of Europe (Delhaye et al, 2010; Ministry of Transport and Communication, 2009). Thus, we assume a 5 per cent decrease in the export demand of freight shipping caused by modal shifts. Regarding transports to and from Åland islands, there is really no alternative to shipping either.

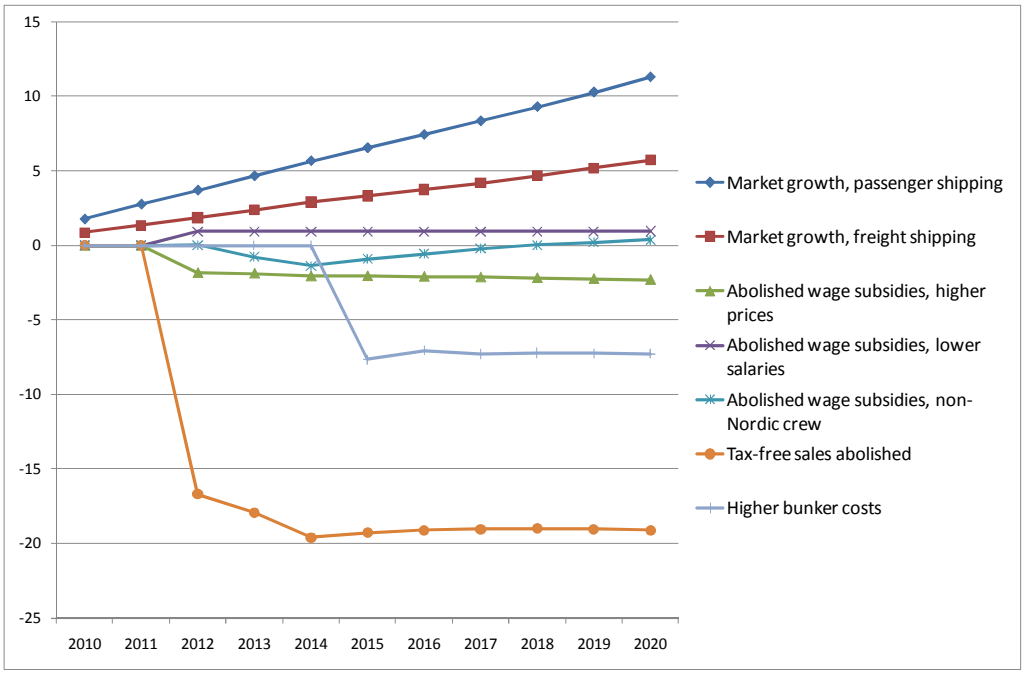
Figure 4. Volume of gross earnings in cargo shipping, change from base, per cent



In figure 5, the effects on GDP are depicted. The most positive and negative scenarios are very intuitive. The effects of higher bunker costs are more dramatic than one might expect. We saw above that the total income volume of passenger ferries are more affected by this, but the capital gains of the both shipping sectors are actually affected. Since our intermediate consumption is modeled by using Leontief assumptions, it may underestimate the adjustment possibilities, for example by

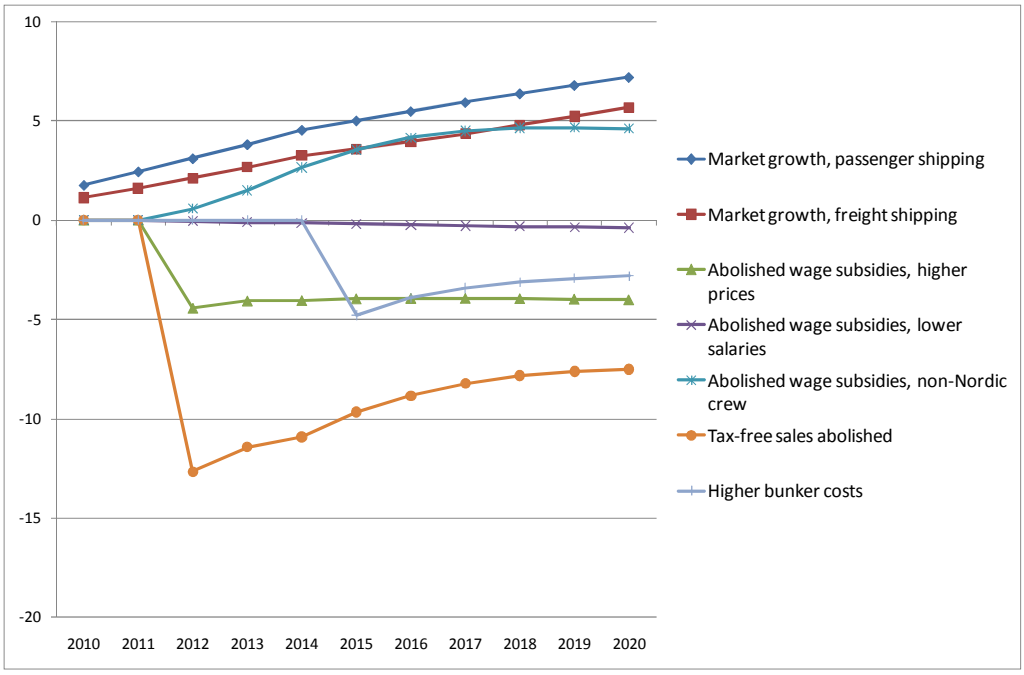
changing the operating speed that has a considerable effect on fuel consumption. What is more, we have not assumed any investments in cleaning technologies that actually may turn out to be very important in coping with the more stringent environmental requirements. Regarding different ways of coping with the abolished crewing subsidies, we see that both lower wages for domestic seafarers, as well as non-Nordic manning of the ships would be beneficial for the economic growth.

Figure 5. Change in GDP from base, per cent



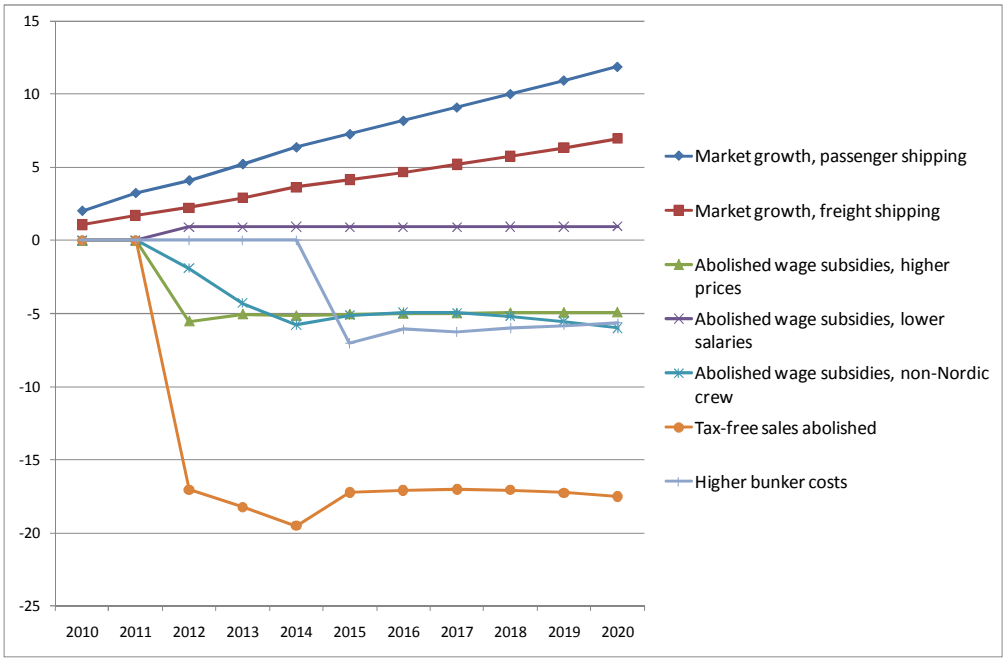
Investments reiterate more or less the same production-side story of the scenarios as GDP. However, we see that investments pick up as the seafarers' wages are lowered through non-Nordic manning of the ships. From investment point of view, we see that it is equal whether wage costs are lowered through manning subsidies or by lowering wages.

Figure 6. Change in investments from base, per cent



The macro effects are shown in a slightly different light when we look at the effects on private consumption in Åland. Higher bunker costs and abolished wage subsidies in shipping, when adjustment is left to market or by manning the vessels with foreigners would affect households more or less equally.

Figure 7. Change in private consumption from base, per cent



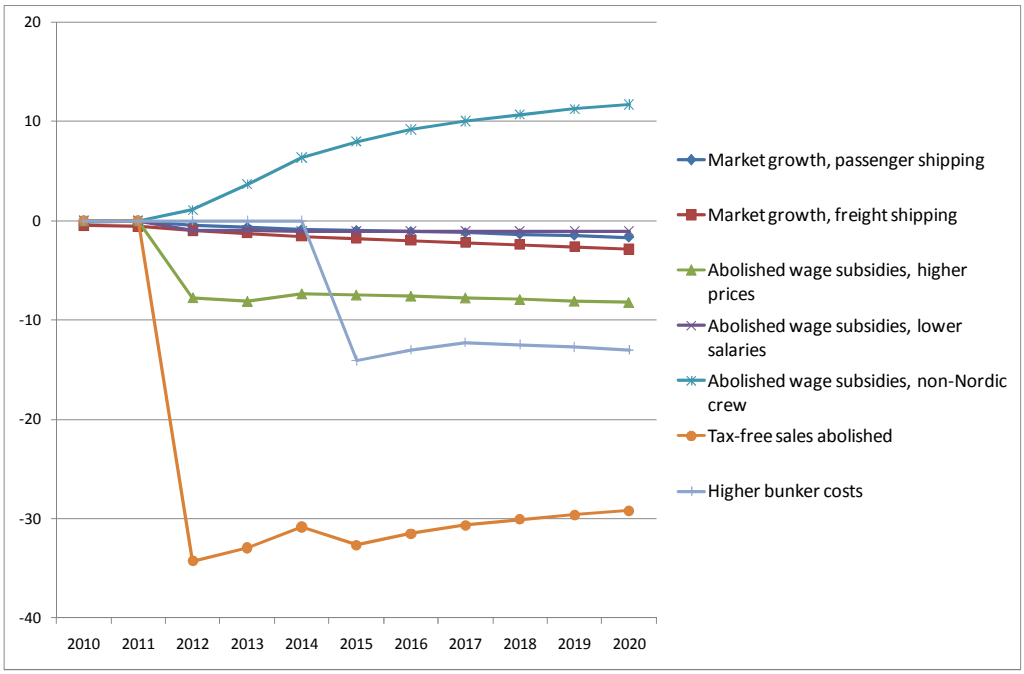
Having lower wages seems, in the aggregate, to bring about a small gain. This deserves a comment. Again, it is important to remember that while most of the capital gains are received by Åland

households, the bulk of the labor earnings are factor payments to the rest-of-World, mainly to mainland Finland. Thus, measures directed to laborers are felt mostly outside Åland.

In addition, the subsidies to seafarers also have a heightening effect on wages on shore, which affects the expansion possibilities within shipping-related activities like banking, insurances etc, which are partly competing for the same labor force. However, our model does not distinguish between different types of labor. Increasing the level of detail with different professions or types of labor would be an interesting way to expand the model.

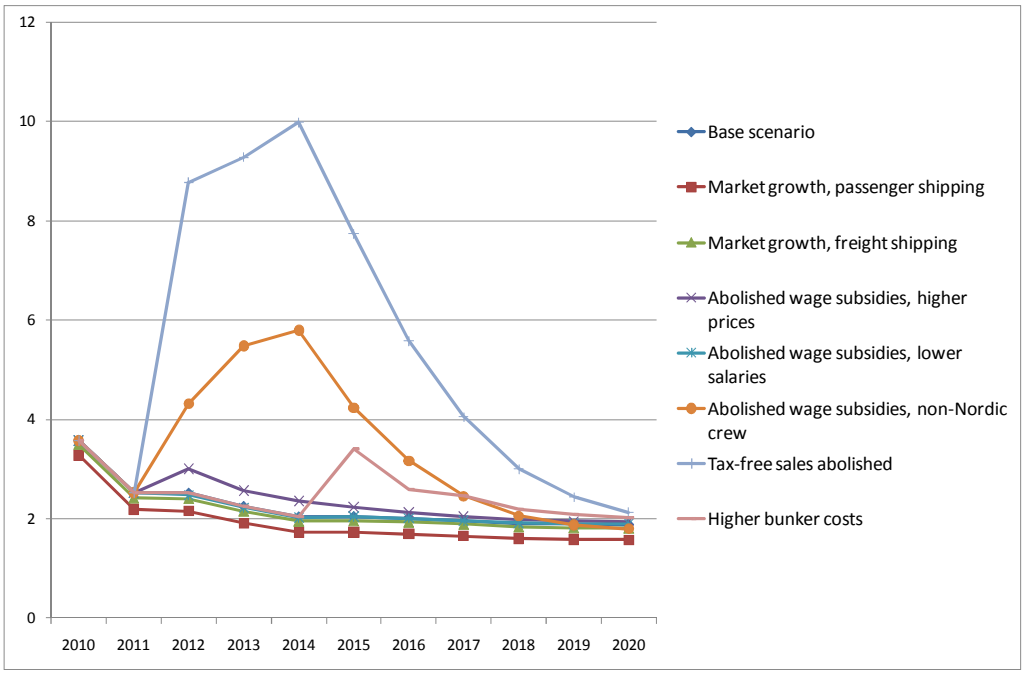
Tourism would obviously be adversely affected by our pessimistic scenarios. Noteworthy is that the assumed price-sensitivity of travel to Åland (price elasticity of -2,5) would bring about a 10 % increase in tourism when the wage costs of shipping would be lowered by non-Nordic manning onboard.[1]

Figure 8. Change in tourism income from base, per cent



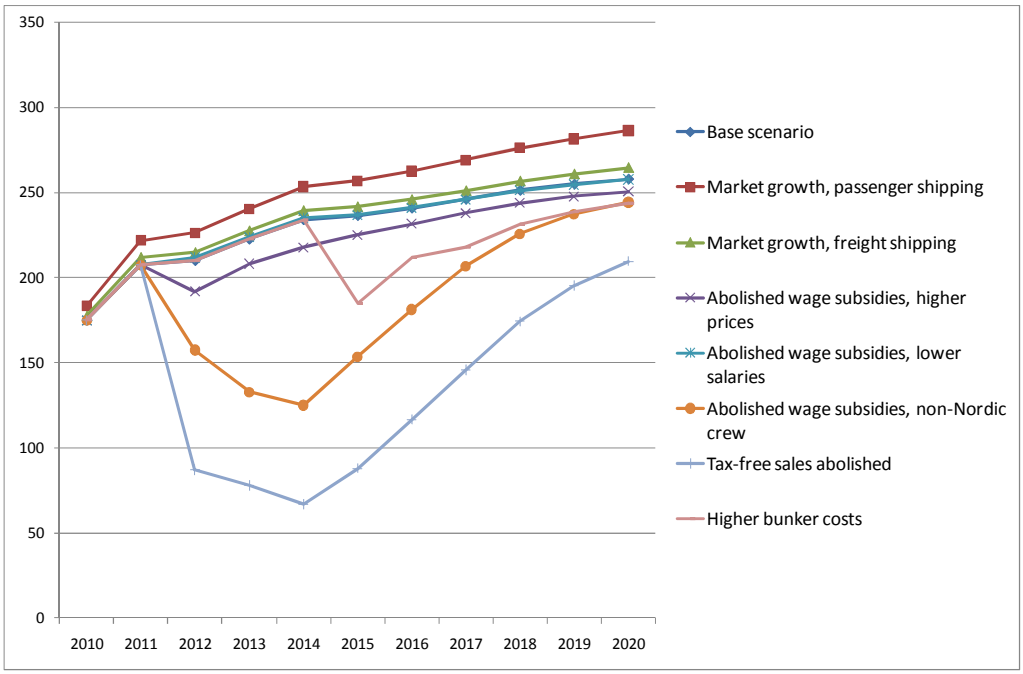
[1] Note that tourism is here defined as the outlays of the tourists visiting Åland islands, both onboard and on shore. The sales of passenger shipping services to tourists on other routes to other destinations are treated as exports.

Figure 9. Unemployment rate under different scenarios



The shocks in the labor market are illustrated by the unemployment rate. Figure 9 shows that loosing the possibility of tax-free sales onboard would lead to a tremendous shock in Åland's labor market. We assume that the regional wage level would adjust to changing conditions, and gradually the unemployment rate would return to its initial level (see figure 9).

Figure 10. Net migration to Åland, number of persons

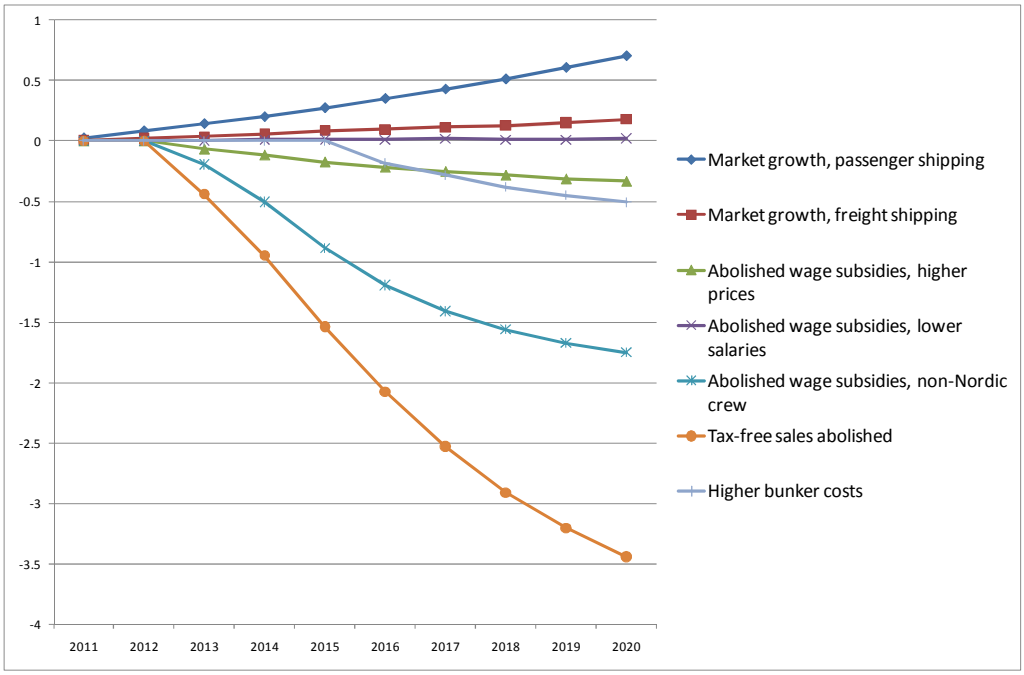


However, this would also mean decreased net migration and decreases total population compared with the base case, as we can see in figures 10 and 11.

Changes in population are more pronounced among those in working age and among young children, as people in fertile working age move away from the region. Under the abolished tax-free scenario, the number of children 0 to 6 years would decrease by 6.7 per cent by year 2020, and the number of people aged 16-64 would decrease by 4.2 per cent.[2]

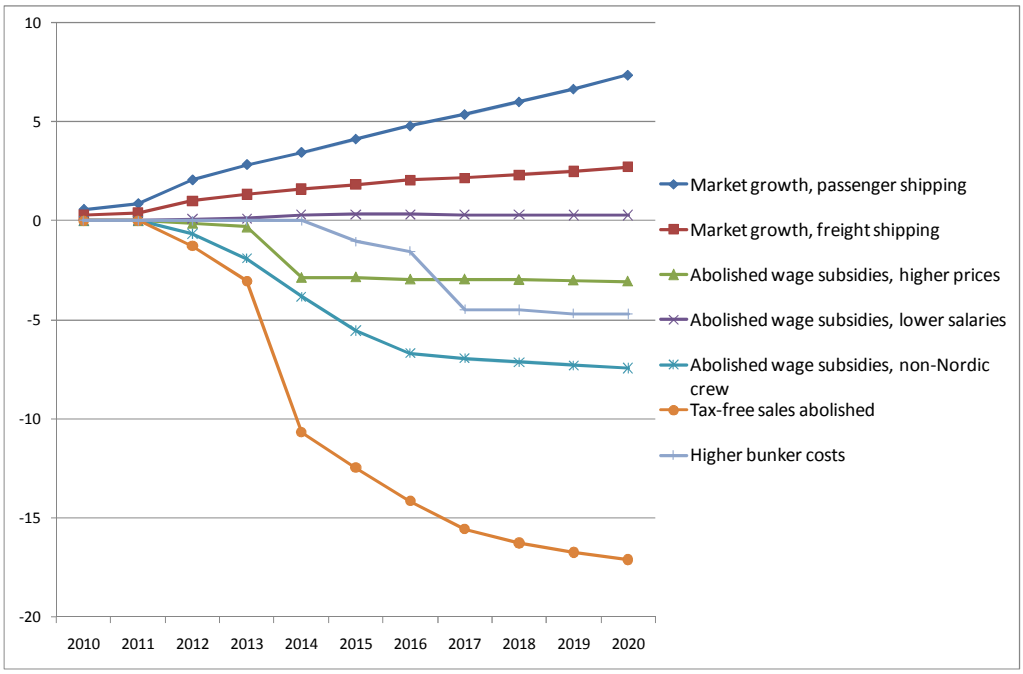
Regarding public sector, the closure applied in this study is such that Åland government savings were kept exogenous, and adjustments needed are channeled to consumption. Transfers from the Åland government to municipalities are based on the demographic development, with varying transfers by age group, mirroring to the current transfer system. Figure 12 presents the public consumption of the whole public sector, including state and social security funds. We see that without tax-free the public sector would need to make sizable spending cuts, much higher than the demographic changes. Especially the number of elderly would hardly change at all, since their migration tendencies are much lower than that of other age groups.

Figure 11. Change in total population, per cent from base level



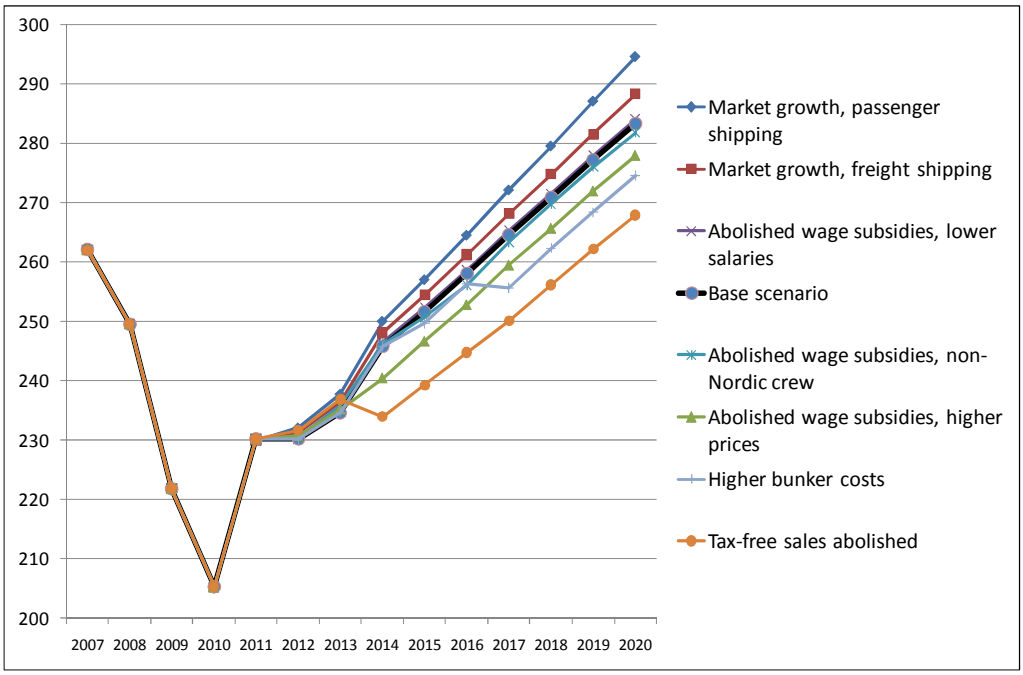
[2] More detailed results are available on the ÅSUB website in form of PC-Axis data matrices (in Swedish) : http://pxweb.asub.ax/Database/Utredning/Sjokluster/Sjokluster.asp

Figure 12. Change In public consumption, per cent from base level



As a final note on the results, let us focus on the revenues of the Åland government. Due to the special financing arrangement between the Åland autonomy and the Finnish state, the Åland government revenues are only partly dependent on the economic development in the home region, as explained earlier in the paper. Thus, the effects of our scenarios on regional government revenues seem to dwindle when we compare them to the effects of the financial crisis which hit the Finnish export revenues and state finances particularly hard (Figure 13). The fact that the volatility in the government finances have been more due to the ups and downs in the Finnish state budget than to region's own development has been used as an argument both for and against of increased fiscal autonomy in the Åland Islands.

Figure 13. Åland government revenues, euro m. in fixed 2007-year prices



7. Concluding remarks

Our analysis shows that Åland-based commercial shipping is an impressive cluster reaching both Sweden and mainland Finland, and also the rest of world. In reality, its activities create earnings and employment on a larger scale outside the Åland Islands than within the regional economy itself. In fact, mainland Finland seems to benefit most from the Åland shipping cluster.

However, we have also seen that policy decisions affecting shipping in the Åland islands have far-reaching consequences for its economy. On the other hand, the effects vary among the different agents and institutions[3]. The results of the above scenarios are summarized in qualitative terms by the two tables below. In table 5, we have collected the different institutions and industries into same table. We can see that increasing growth in shipping spills over to other industries as well. However, in the detailed information not presented here (see footnote below) it is revealed that there are two industries that would start growing if the shipping activities would be substantially reduced, namely primary production (with related agro-industry) and personal services.

[3] For sake of brevity, we have not presented the results for other, non-shipping industries on-shore. However, these results are available on our website in data matrix form (in Swedish): http://pxweb.asub.ax/Database/Utredning/Sjokluster/Sjokluster.asp.

The column for the metropolitan state in Åland deserves a clarifying comment. We have only taken into account the effects on the Finnish state finances that take place in Åland, given the scope of our model. Thus, it does not represent a comprehensive evaluation of all the pros and cons for the state. However, we see, from the regional point of view, the crewing subsidies represent a cost for the Finnish state. On the other hand, the positive and negative scenarios would contribute to the state finances with expected signs. Abolishing crewing subsidies would create differing effect on the regional public finances as well.

Some of Åland's 16 municipalities are very dependent on the income tax returns on seafarers. From the public finance point of view, the preferred way of coping with loss of manning subsidies would be to reach a consensus with lower earnings but with the same, domestic manning of the ships, whereas the shipping companies would prefer free manning onboard regardless of seafarers' home country. In our analysis, loss of tax free sales would be negative for all involved. However, its effect on state finances on the whole would be a more ambiguous issue.

In table 6, the macroeconomic results are summarized. Putting more emphasis on Åland's GDP than on the island's national income, one would come to different conclusions concerning what would be the preferred policy option in case crewing subsidies would be abolished. In a similar fashion, what is good for exports may not be the best option for the (domestic) employment.

Table 5. Scenario results for distinct part of the economy and society

	Passenger shipping	Freight shipping	Other industries	Households	Åland government	Municipalities	State (in Åland)
Market growth, passenger shipping	+++	++	++	++	+	++	+
Market growth, freight shipping	+	+++	+	++	+	+	+
Abolished wage subsidies, higher prices	- -	- -	- -	- -	-	-	++
Abolished wage subsidies, lower salaries	-	-	-	+	(+/-)	(+/-)	+++
Abolished wage subsidies, non-Nordic crew	++	+	(+/-)	- -	-	- - -	+++
Higher bunker costs	- -	(+/-)	- -	- -	-	- -	-
Tax-free sales abolished	- - - -	-	- - -	- - - -	- -	- - -	- - -

This analysis could be enriched by dividing households into different groups. We do have results according to socio-economic grouping, but as we cannot distinguish the seafarer households from other laborers, we do not present the results here. There are several interesting directions into which

develop further analysis and modeling: i) include several household types into the model core (we have applied such models before) ii) do distributional analysis with micro simulation iii) apply a multi-country CGE model for analyzing shipping from a Nordic-Baltic perspective.

Table 6. Scenario results on macroeconomic indicators

	GDP	National income	Total absorption	Exports	Imports	Investments	Employment
Market growth, passenger shipping	+++	+++	+++	+++	+++	+++	++
Market growth, freight shipping	++	++	++	++	++	++	+
Abolished wage subsidies, higher prices	-	(+/-)	- -	- -	- -	- -	-
Abolished wage subsidies, lower salaries	+	++	(+/-)	-	-	(+/-)	(+/-)
Abolished wage subsidies, non-Nordic crew	(+/-)	- -	(+/-)	+++	+	++	- -
Higher bunker costs	- -	- -	- -	- -	-	- -	- -
Tax-free sales abolished	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -

APPENDIX 1. Level of aggregation in the model database

The accounts used in the Åland SAM 2007 are listed below. Åland SAM 2007 has been published as a separate web statistics (in Swedish) and it can read and downloaded from ÅSUB's web page: http://www.asub.ax/archive.con?iPage=12&art_id=1056

The following accounts are used in Åland SAM 2007:

Code name	*Clarification*
Activities	
A-AGRI	Primary production
A-FINDU	Food stuff industry
A-INDU	Other industries
A-ELWA	Electricity, water and heat production and distribution
A-CONS	Construction
A-TRAD	Trade
A-RESH	Restaurants and hotels
A-OTRANS	Land and air transport, communications
A-STRANSP	Passenger shipping
A-STRANSG	Freight shipping
A-BSER	Business services
A-ADMIN	Public administration
A-EDUC	Education
A-HLTH	Health care and social services
A-OSERV	Other personal services (mainly private sector)
Products	
C-AGRI	Primary products
C-FINDU	Food stuffs
C-INDU	Other industrial products
C-ELWA	Electricity, water and heat

C-CONST	Construction services
C-TRADE	Trade services
C-HOTEL	Restaurant and lodging services
C-OTRANSP	Land and air transport, communications
C-WTRANPP	Passenger shipping
C-WTRANPG	Freight shipping
C-BSERV	Business services
C-ADMIN	Public administration
C-EDUC	Education services
C-HLTH	Health care and social services
C-OSERV	Other personal services (mainly private sector)
C-FINSERV	Service and products acquired by Ålanders in Finland
C-ROWSERV	Service and products acquired by Ålanders in rest-of-world

Transaction cost accounts (transport and trade margins)

TRNCSTDOM	Transaction costs in the local market
TRNCSTEXP	Transaction costs of exports
TRNCSTIMP	Transaction costs of imports

Production factors

LABOR	Labor income (even entrepreneurs' labor income)
CAPI	Capital income

Institution accounts

FIRMS	Firms
NPISH	NGOs
STATE	Finnish state
GOV	Åland government
MUNI	Municipalities
SOCSEC	Social security funds

HHD	Households
LEXP	Account for commuters' labor exports
FINHH	Account for Finnish tourist households
ROWHH	Account for tourist households from rest-of-world

Tax and subsidy accounts

COMTAX	Tariffs
PRODTAX	Indirect excise taxes, other than VAT
PRODTAXLR	Taxes and fees of Åland Government (pharmacy fee, lottery tax)
VAT	Value added tax
PRODSUB	Product and production subsidies of state
PRODSUBLR	Product and production subsidies of Åland government
CORPTAX	Corporate tax
SINCTAX	State income tax
MINCTAX	Municipal income tax
SECFEE	Social security fees (including pension fees)
OTAX	Other taxes and fees

Other accounts

S-I	Savings and investment account
ROW	Rest-of-world account
TOTAL	Column or row sum

APPENDIX 2. Behavioral parameters of the model

Substitution elasticity between labor and capital

A-AGRI	0.5
A-FINDU	0.5
A-INDU	0.5
A-ELWA	0.4
A-CONS	0.5
A-TRAD	0.5
A-RESH	0.5
A-OTRANS	0.5
A-STRANSP	0.15
A-STRANSG	0.15
A-BSER	0.446
A-ADMIN	0.5
A-EDUC	0.825
A-HLTH	0.5
A-OSERV	0.633

Substitution elasticity between value added and intermediate goods

A-AGRI	0.5
A-FINDU	0.5
A-INDU	0.5
A-ELWA	0.5
A-CONS	0.5
A-TRAD	0.5
A-RESH	0.5
A-OTRANS	0.5
A-STRANSP	0.15
A-STRANSG	0.15

A-BSER	0.82
A-ADMIN	0.67
A-EDUC	0.5
A-HLTH	0.5
A-OSERV	0.5

Returns to scale in base year 2007

A-AGRI	1.013
A-FINDU	1.057
A-INDU	1.095
A-ELWA	1.057
A-CONS	1.057
A-TRAD	1.053
A-RESH	1.057
A-OTRANS	1.057
A-STRANSP	1.057
A-STRANSG	1.057
A-BSER	1.057
A-ADMIN	1.057
A-EDUC	1.057
A-HLTH	1.057
A-OSERV	1.057

Annual growth rate of productivity

A-AGRI	0.0007
A-FINDU	0.0106
A-INDU	0.0060
A-ELWA	0.015
A-CONS	0.0037

A-TRAD	0.0056
A-RESH	0.00696
A-OTRANS	0.015
A-STRANSP	0.015
A-STRANSG	0.015
A-BSER	0.005
A-ADMIN	0
A-EDUC	0.0041
A-HLTH	0.0080
A-OSERV	0.0082

Herfindahl index of concentration

A-AGRI	24.84
A-FINDU	1.18
A-INDU	1.68
A-ELWA	2.48
A-CONS	17.26
A-TRAD	5.18
A-RESH	7.70
A-OTRANS	2.13
A-STRANSP	1.66
A-STRANSG	5.74
A-BSER	3.17
A-ADMIN	1.52
A-EDUC	10.08
A-HLTH	9.08
A-OSERV	2.99

Each industry's share of investments in base year 2007

A-AGRI	0.0473
A-FINDU	0.0203
A-INDU	0.0334
A-ELWA	0.0416
A-CONS	0.0234
A-TRAD	0.0301
A-RESH	0.0081
A-OTRANS	0.0335
A-STRANSP	0.1861
A-STRANSG	0.1247
A-BSER	0.2484
A-ADMIN	0.0740
A-EDUC	0.0338
A-HLTH	0.0353
A-OSERV	0.0600

Growth trend of investments

A-AGRI	2.24 %
A-FINDU	3.05 %
A-INDU	4.00 %
A-ELWA	4.00 %
A-CONS	4.00 %
A-TRAD	2.86 %
A-RESH	3.10 %
A-OTRANS	4.00 %
A-STRANSP	1.85 %

Depreciation coefficient, per cent of capital stock

A-AGRI	8.90 %
A-FINDU	8.77 %
A-INDU	9.68 %
A-ELWA	5.33 %
A-CONS	16.19 %
A-TRAD	10.73 %
A-RESH	8.90 %
A-OTRANS	6.94 %
A-STRANSP	7.93 %

A-STRANSG	4.00 %	A-STRANSG	7.93 %
A-BSER	4.44 %	A-BSER	4.48 %
A-ADMIN	7.16 %	A-ADMIN	5.92 %
A-EDUC	2.15 %	A-EDUC	5.63 %
A-HLTH	0.95 %	A-HLTH	5.95 %
A-OSERV	3.69 %	A-OSERV	6.69 %

Income elasticity of household demand

C-AGRI	0.787
C-FINDU	0.774
C-INDU	1.343
C-ELWA	0.712
C-CONST	0.000
C-TRADE	0.000
C-HOTEL	0.772
C-OTRANSP	1.060
C-WTRANPP	0.736
C-WTRANPG	0.000
C-BSERV	0.757
C-ADMIN	0.898
C-EDUC	1.734
C-HLTH	0.817
C-OSERV	1.014
C-FINSERV	1.898
C-ROWSERV	1.153

Frisch–parameter of LES consumption function:	-1.3791
Price elasticity of exports:	-2.5 for each product
Price elasticity of the total demand value of tourism:	-2.5
Price elasticity of single products:	-1 (Cobb-Douglas functional form)

Demographic parameters

Fertility: number of newborn per 1,000 women by gender of child and age of mother

	male	female
14	0.0987	0.0931
15	0.3547	0.3347
16	1.1204	1.0572
17	2.4845	2.3443
18	6.0611	5.7191
19	12.3860	11.6872
20	19.0983	18.0208
21	25.6704	24.2221
22	32.3410	30.5163
23	38.2392	36.0817
24	44.1765	41.6840
25	49.0242	46.2582
26	54.0094	50.9622
27	59.7157	56.3465
28	65.2559	61.5742
29	69.1139	65.2145
30	71.2782	67.2567
31	68.7753	64.8950
32	61.0206	57.5778
33	53.6156	50.5906
34	48.9903	46.2263
35	41.7326	39.3780

36	32.4167	30.5877
37	25.3498	23.9195
38	20.6099	19.4471
39	15.7881	14.8973
40	11.5463	10.8948
41	8.5183	8.0377
42	5.6013	5.2852
43	3.1888	3.0089
44	1.7575	1.6583
45	0.9022	0.8513
46	0.4888	0.4613
47	0.2204	0.2080
48	0.0609	0.0574
49	0.0274	0.0258
50	0.0051	0.0048

Note: Fertility is assumed to be constant under the whole study period.

Source: Population forecast of Statistics Finland 2009.

Tendency to out-migrate by age and gender (share of age cohort that moves away during the year).

	male	female
0	0.02819	0.03102
1	0.03221	0.02353
2	0.02030	0.02457
3	0.01519	0.01892
4	0.01736	0.01618
5	0.02397	0.01180
6	0.01018	0.00714
7	0.01005	0.01110
8	0.00615	0.01224
9	0.01195	0.00632

10	0.00484	0.01098
11	0.00361	0.00834
12	0.00698	0.00592
13	0.00573	0.00231
14	0.00340	0.00349
15	0.00323	0.01065
16	0.01183	0.02002
17	0.01228	0.02300
18	0.03820	0.08199
19	0.13704	0.22934
20	0.17098	0.32534
21	0.14809	0.16405
22	0.11179	0.18214
23	0.12059	0.13407
24	0.07418	0.14328
25	0.07022	0.12139
26	0.09427	0.09257
27	0.06598	0.10638
28	0.07455	0.07076
29	0.05019	0.05193
30	0.06105	0.04762
31	0.04556	0.03880
32	0.03341	0.04064
33	0.03341	0.03079
34	0.03704	0.02033
35	0.03588	0.02105
36	0.03044	0.01451
37	0.01395	0.01147
38	0.02766	0.02022
39	0.01328	0.01663
40	0.01189	0.01782

41	0.01700	0.01550
42	0.00995	0.00820
43	0.00912	0.00836
44	0.01146	0.01166
45	0.01264	0.01398
46	0.01149	0.01190
47	0.01095	0.00517
48	0.01876	0.00823
49	0.01344	0.01342
50	0.01316	0.00609
51	0.00727	0.00976
52	0.01121	0.00657
53	0.00304	0.00935
54	0.00604	0.00659
55	0.00714	0.00840
56	0.00508	0.00576
57	0.00297	0.00492
58	0.00578	0.00382
59	0.00563	0.00865
60	0.00761	0.00605
61	0.01128	0.00424
62	0.00438	0.00114
63	0.00572	0.00773
64	0.00122	0.01141
65	0.00132	0.01053
66	0.00139	0.00473
67	0.00296	0.00326
68	0.00325	0.00490
69	0.00534	0.00492
70	0.00545	0.00171
71	0.00388	0.00000

72	0.00794	0.00000
73	0.00000	0.00000
74	0.00000	0.00204
75	0.00714	0.00203
76	0.00243	0.00632
77	0.01285	0.00640
78	0.00279	0.00422
79	0.00000	0.00000
80	0.00000	0.00212
81	0.01262	0.00421
82	0.00000	0.00000
83	0.00000	0.00233
84	0.00000	0.00000
85	0.00000	0.00840
86	0.00676	0.00310
87	0.00000	0.00000
88	0.00000	0.00389
89	0.00000	0.00000
90	0.00049	0.00049
91	0.00049	0.00049
92	0.00049	0.00049
93	0.00049	0.00049
94	0.00049	0.00049
95+	0.00049	0.00049

Source: Statistics Finland.

In-migration divided by age and gender, shares

	male	female
0	0.00758	0.00758
1	0.00829	0.00876
2	0.00545	0.00687
3	0.00663	0.00545
4	0.00852	0.00450
5	0.00592	0.00426
6	0.00426	0.00237
7	0.00284	0.00355
8	0.00426	0.00166
9	0.00355	0.00284
10	0.00355	0.00260
11	0.00213	0.00166
12	0.00166	0.00284
13	0.00331	0.00284
14	0.00189	0.00166
15	0.00166	0.00166
16	0.00355	0.00284
17	0.00308	0.00379
18	0.00829	0.01207
19	0.01065	0.02083
20	0.01586	0.02438
21	0.01799	0.02036
22	0.01894	0.02652
23	0.01965	0.02770
24	0.01894	0.02912
25	0.01989	0.02794
26	0.01870	0.02580
27	0.02131	0.01870
28	0.01468	0.01776

29	0.01823	0.01065
30	0.01302	0.01207
31	0.01113	0.01278
32	0.01349	0.00923
33	0.01278	0.00876
34	0.00923	0.00829
35	0.01018	0.00710
36	0.00734	0.00592
37	0.00805	0.00592
38	0.00710	0.00521
39	0.00592	0.00592
40	0.00450	0.00805
41	0.00663	0.00402
42	0.00473	0.00379
43	0.00497	0.00426
44	0.00592	0.00426
45	0.00402	0.00331
46	0.00308	0.00402
47	0.00331	0.00426
48	0.00402	0.00331
49	0.00308	0.00308
50	0.00308	0.00284
51	0.00260	0.00687
52	0.00308	0.00331
53	0.00260	0.00189
54	0.00331	0.00189
55	0.00379	0.00260
56	0.00308	0.00379
57	0.00331	0.00331
58	0.00189	0.00237
59	0.00379	0.00260

60	0.00237	0.00308
61	0.00284	0.00142
62	0.00331	0.00166
63	0.00308	0.00166
64	0.00189	0.00166
65	0.00331	0.00213
66	0.00284	0.00071
67	0.00095	0.00213
68	0.00308	0.00095
69	0.00166	0.00047
70	0.00142	0.00118
71	0.00047	0.00095
72	0.00047	0.00047
73	0.00047	0.00095
74	0.00047	0.00118
75	0.00095	0.00047
76	0.00071	0.00166
77	0.00047	0.00095
78	0.00024	0.00000
79	0.00071	0.00047
80	0.00047	0.00071
81	0.00000	0.00000
82	0.00000	0.00047
83	0.00000	0.00047
84	0.00047	0.00000
85	0.00000	0.00047
86	0.00024	0.00071
87	0.00024	0.00024
88	0.00000	0.00000
89	0.00000	0.00024
90	0.00000	0.00047

91	0.00000	0.00000
92	0.00000	0.00000
93	0.00000	0.00000
94	0.00000	0.00000
95+	0.00000	0.00000

Note: Summing over both age and gender adds up to one.

Source: Statistics Finland.

Assumed rate of shifting to apply tonnage tax within freight shipping during the simulation period, as percentage of freight shipping's capital stock

2010	0 %
2011	10 %
2012	20 %
2013	40 %
2014	60 %
2015	80 %
2016	90 %
2017	100 %
2018	100 %
2019	100 %
2020	100 %

Change coefficient for the average VAT rate by product after reduction of VAT for foodstuffs from 17 to 12 per cent year 2009.

C-AGRI	0.871
C-FINDU	0.787
C-INDU	0.999
C-ELWA	1
C-CONST	0.999
C-TRADE	0.948

C-HOTEL	0.989
C-OTRANSP	0.999
C-WTRANPP	0.999
C-WTRANPG	0.999
C-BSERV	0.998
C-ADMIN	1
C-EDUC	1
C-HLTH	0.996
C-OSERV	0.995

Source: Own calculations based on Åland SAM, Finnish input-output tables and VAT payment register of ÅSUB.

Change coefficient for the average VAT rate by product after general rise of VAT rate by one percentage point in 2010.

C-AGRI	1.0704
C-FINDU	1.0638
C-INDU	1.0142
C-ELWA	1.0452
C-CONST	1.0462
C-TRADE	1.0498
C-HOTEL	0.8472
C-OTRANSP	1.0073
C-WTRANPP	1.0073
C-WTRANPG	1.0073
C-BSERV	1.0455
C-ADMIN	1.0475
C-EDUC	1.0475
C-HLTH	1.0475
C-OSERV	1.0475

Source: Own calculations based on Åland SAM, Finnish input-output tables and VAT payment register of ÅSUB.

APPENDIX 3. Scenario-specific parameters

Scenarios

BASE	Base scenario
PASGRW	Growth in passenger shipping in the Baltic Sea
CARGRW	Higher growth within freight shipping
SUBVLOSS	Abolished crewing subsidies, higher prices
SUBVLOSD	Abolished crewing subsidies, lower wages, same personnel
SUBVLOSF	Abolished crewing subsidies, lower wages, non-Nordic crew
TAXFLOSS	The tax exemption and, therefore, tax-free sales onboard are abolished
SOXDIR	Increased bunker costs (IMO-decision on low-sulphur fuel)

Parameter assumptions for different scenarios

- *Growth in passenger shipping (PASGRW)*

5 per cent growth rate in export demand volume for products C-WTRANPP, C-WTRANPG, C-TRADE, C-OTRANSP and C-HOTEL from year 2010 onwards.

- *Higher growth within freight shipping (CARGRW)*

7 per cent growth rate in export demand volume for product C-WTRANPG from year 2010 onwards.

- *Abolished crewing subsidies, higher prices (SUBVLOSS)*

Crewing subsidies = 0 from year 2012 onwards.

10 per cent decline in tourism demand from its base value

10 per cent decline in export demand for their base value for products C-WTRANPP, C-TRADE and C-OTRANSP.

5 per cent decline in export demand from base level for C-WTRANPG.

- *Abolished crewing subsidies, lower wages, same personnel (SUBVLOSD)*

Crewing subsidies = 0 from year 2012 onwards.

23 and 25 per cent decrease for labor earnings within A-STRANSP and A-STRANSG, respectively.

- *Abolished crewing subsidies*, *lower wages, non-Nordic seafarers (SUBVLOSF)*

Crewing subsidies = 0 from year 2012 onwards.

23 and 25 per cent decrease for labor earnings within A-STRANSP and A-STRANSG, respectively.

Increased commuting from RoW to Åland (non-Nordic seafarers)

Drastically decreased commuting from Åland to RoW (Ålander seafarers on out flagged vessels lose their jobs).

- *Abolished tax exemption and tax-free sales onboard (TAXFLOSS)*

Drastic reduction in commuting from Åland to RoW

Increase commuting to Åland (33 %) RoW to Åland (non-Nordic seafarers)

25 % higher intermediate prices within passenger shipping (loss of tax free status)

25 % reduction in tourism demand

75 % reduction in export demand for products C-WTRANPP and C-OTRANSP

35 % reduction in export demand for product C-TRADE

25 % reduction in export demand for product for C-INDU

Gradual out-flagging of passenger vessels (in total 30 % of base year's capital stock).

Increase in capital factor income from RoW (profits of out-flagged vessels)

Reduced border formalities due to loss of VAT border

15 % increase in transport costs due to deteriorated transport network

- *Increased bunker costs (SOXDIR)*

75 % higher intermediate demand for product C-INDU within A-STRANSP and A-STRANSG

Exogenous development of export demand, index, 2007 = 100

	BASE	PASGRW	CARGRW	SUBVLOSS	SUBVLOSD	SUBVLOSF	TAXFLOSS	SOXDIR
2007	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2008	102.2	102.2	102.2	102.2	102.2	102.2	102.2	102.2
2009	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
2010	96.2	100.9	98.5	96.2	96.2	96.2	96.2	96.2
2011	97.1	104.4	100.6	97.1	97.1	97.1	97.1	97.1
2012	98.3	108.1	103.1	93.6	98.3	98.3	71.0	98.3
2013	99.4	111.9	105.7	94.7	99.4	99.4	71.7	99.4
2014	100.6	116.0	108.4	95.8	100.6	100.6	72.4	100.6
2015	102.4	120.2	111.3	97.5	102.4	102.4	73.5	102.4
2016	104.1	124.6	114.3	99.1	104.1	104.1	74.7	104.1
2017	105.9	129.2	117.4	100.8	105.9	105.9	75.9	105.9
2018	107.7	134.0	120.7	102.5	107.7	107.7	77.1	107.7
2019	109.6	139.1	124.2	104.3	109.6	109.6	78.3	109.6
2020	111.5	144.4	127.8	106.1	111.5	111.5	79.6	111.5

Development of export prices under base scenario, index, 2007 = 100

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
C-AGRI	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-BSERV	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-CONST	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-EDUC	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-ELWA	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-FINDU	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-HLTH	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-HOTEL	100.0	99.5	99.0	101.5	101.0	101.9	102.9	103.4	103.9	104.4	104.9	105.5	106.0	106.5
C-INDU	100.0	99.0	98.0	99.9	98.9	99.4	99.8	99.3	98.8	98.3	97.8	97.3	96.8	96.4
C-OSERV	100.0	99.5	99.0	101.5	101.0	101.9	102.9	102.3	101.8	101.3	100.8	100.3	99.8	99.3
C-OTRANSP	100.0	99.5	99.0	101.5	101.0	101.9	102.9	103.4	103.9	104.4	104.9	105.5	106.0	106.5
C-TRADE	100.0	99.5	99.0	101.5	101.0	101.9	102.9	103.4	103.9	104.4	104.9	105.5	106.0	106.5
C-WTRANPG	100.0	95.0	85.0	85.0	85.0	85.0	85.0	85.0	85.9	86.1	86.3	86.5	86.7	86.9
C-WTRANPP	100.0	99.5	99.0	101.5	101.0	101.9	102.9	103.4	103.9	104.4	104.9	105.5	106.0	106.5

Development of tourism demand (exogenous part), million euro in 2007 prices

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BASE	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7
PASGRW	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7
CARGRW	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7
SUBVLOSS	175.8	184.3	157.6	169.0	169.9	153.7	154.4	155.2	156.0	156.8	157.5	158.3	159.1	159.9
SUBVLOSD	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7
SUBVLOSF	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7
TAXFLOSS	175.8	184.3	157.6	169.0	169.9	128.1	128.7	129.3	130.0	130.6	131.3	131.9	132.6	133.3
SOXDIR	175.8	184.3	157.6	169.0	169.9	170.7	171.6	172.4	173.3	174.2	175.0	175.9	176.8	177.7

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