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Economy-wide Costs of Food Trade Restrictions – the Case of Norway

by

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Using a partial equilibrium model, the economic cost of the Norwegian agricultural policy is estimated to 1.3% of GDP. General equilibrium calculations elevate the cost estimate to between 1.6% and 3.6%. Thus, the agricultural policy is costly and seems to have adverse effects on other sectors in the economy. Also, the high agricultural support complicates the Norwegian effort in trade talks to obtain better export market access for fish products. Based on present volumes of raw fish available to fish processing, the gain from a complete elimination of tariffs is estimated to be 3.6% of the seafood export value.

Key words: general equilibrium model, cost of agricultural policy, trade liberalisation, food industry, fisheries

JEL classification: C68, Q18

Introduction

Since Norway is a small country well off with natural resources like oil, fish and wood, trade is crucial for national welfare. Nevertheless, Norway is among the countries that impede the progress of the trade talks in the current Doha round of the World Trade Organisation (WTO) due to its reluctance to liberalise the farm sector.

The Norwegian farm support is substantial. Import tariffs in the range of 200-400% exclude foreign competition. Furthermore, to get rid of surplus production of milk (12% of total milk production) export subsidies are used. Total support amounts to 72% of the value of production in agriculture (OECD 2003), which places Norway, together with Switzerland (75%), Korea (66%) and Iceland (63%), among the biggest spenders of the OECD members.

Why wealthy countries like Norway are reluctant to cut agricultural support, is thoroughly discussed in the literature on the political economy of agricultural policy (see Gorter and Swinnen 2002), and will not be revisited in this paper. The aim of this paper is to consider the costs of holding on to this policy, when taking account of repercussions on the rest of the economy.

Naturally, a rich literature on the costs of agricultural policy already exists. Partial equilibrium (PE) models have been widely employed to study welfare effects, measures by Harberger triangles, of alternative agricultural policies in national economies (see e.g. Norton and Schiefer 1980 and McCarl and Spreen 1980). Also, welfare effects for different regions, e.g. developing countries, of a global farm liberalisation have been thoroughly analysed, using multi-region computational general equilibrium (GE) models (see e.g. Hertel 1997 and 1999).

One reason why agricultural policy in national economies most commonly are analysed by PE models, is that this model type is quite easy to set up and understand, and permits a detailed specification of the sector and support measures in question. The economic rationale has been that agriculture constitutes a marginal part of most developed national economies (often below 2% of the gross domestic product), and therefore is assumed to have negligible effects on the rest of the economy.

However, motivated by the tax-incidence literature Alson and Hurd (1990) demonstrate that the deadweight losses connected to the financing of farm programs can be substantial. This point is enforced by Chambers (1995) who applies a highly aggregated GE model to show that traditional, PE incidence calculations systematically overstate the benefits farmers receive from farm programs.

Gylfason (1995) considers the macroeconomic effects of European agriculture policy, and argues that freer farm trade could deliver a substantial supply-side boost to the European economy, by lowering costs and prices. Also, his survey of model analyses shows that short-run PE studies indicate deadweight losses due to farm support equivalent to about 1% of GDP on average, while long-run general equilibrium considerations are shown to raise the loss estimates to about 3% of GDP.

Further benefits of GE analysis of agricultural policies are emphasised by Hertel (1999). He points out that the modelling framework provides a valuable tool for putting things in an economy-wide perspective. Relying on social accounting matrices for their empirical structure, the models contain all the basic identities which must hold for the economy to be in equilibrium. It is also important that GE models catch inter-industry linkages, between different levels in the food chain and between agriculture and non-agriculture industries.

In this paper we apply a special purpose comparative static GE model to assess economy-wide costs for Norway of food trade restrictions. The model is highly disaggregated with regard to agriculture, fisheries, fish farming and food manufacturing, and special emphasis is put on the interdependence between different levels of the food chain. In addition to specific arrangements for the industries in question, the model includes more general taxes like value added tax, excise taxes, import levies, investment tax, pay roll tax and wage tax.

The incorporation of agriculture and fisheries into the same modelling framework allows us to highlight the diverging trade interests of these industries. The agricultural sector depends on trade restrictions and support due its climatic related comparative disadvantage. Fisheries and fish farming, on the other hand, are profitable industries in spite of trade restrictions in the export markets. Both industries are major contributors to rural employment.

The objective of the paper is to consider national consequences of a *substantial* reduction in food sector subsidies and tariffs, e.g. in line with the long-term objective of the WTO. We illustrate this scenario by lowering subsidies and tariffs to 1/3 of the present level and by abolishing export subsidies. To assess adverse effects of the agricultural policy on the rest of the economy, the GE estimates are compared to similar computations with a PE model.

Issues that are raised are for example: What welfare gains can be realized, and to what extent are these gains attributable to the liberalisation of agriculture and fisheries, respectively? To what degree is the rest of the economy, e.g. production activity and factor prices, affected? How are the different levels in the food chain, e.g. farmers, fishermen and food processing, affected? How sensitive are the results with respect to different assumptions on elasticities and rules for budget balancing?

The Norwegian food industry

As can be seen from Table 1, gross product and employment in the food industry can be attributed to agricultural and fish related activities, respectively, with the shares 0.63 and 0.37 (gross product) and 0.75 and 0.25 (employment). Relative to the total economy, the food industries sum up to 3% and 6.6% of GDP and employment. However, each branch of the industry accounts for less than 1% of GDP.

[Table 1]

In spite of agriculture's low share of GDP, the farm support (21 billion NOK) is close to 2% of GDP. This high amount, financed by the consumers and taxpayers, indicates that the agricultural policy should be expected to have general equilibrium effects.

The prohibitive import tariffs make Norway self-sufficient in main agricultural products like milk, meat and eggs. For climatic reasons some grain is imported, as well as tropical products. For processed food, except for dairy and meat products, tariffs are lower and import shares higher. This applies for bakery products, chocolate, starch, prepared meals and other articles based on imported raw materials.

Fisheries and fish farming depend on export. About 90% of the production is exported, and the export value amounts to 6-7% of the total Norwegian export. Farmed salmon is the most important product, with nearly 30% of the seafood export value. Chilled or frozen mackerel, clip fish and fillet of cod follow, each with shares below 10%. The European Union is by far the most important market for Norwegian seafood.

Practically no subsidies is paid to the fish industries. The trade barriers in the export markets vary between products and markets. In general, tariffs for white fish increase with the processing level, while tariffs for pelagic fish are especially high for unprocessed fish. In the base year of the model, 1997, the tariffs in the important EU-market were highest for prawns (7.5-20%), smoked salmon (13%), chilled or frozen herring (15%) and chilled and frozen mackerel (20%). For cod there was no tariffs on whole fish or salted and dried fish, while fillet (0.9%) and clip fish (3.9%) met quite low tariffs. Chilled or frozen salmon faced a tariff of 5.5% (inclusive of export levy) in the EU. To Japan tariffs were especially high for salted and dried fish (10-15%). Russia and Ukraine imposed tariffs of 10% in general, while the rest of Eastern Europe was duty free. Norwegian salmon exported to the US met a tariff of up to 26%.

Also, the fish farm sector is vulnerable to non-tariff barriers. In the EU, the largest market for Norwegian salmon, a minimum import price is imposed on Norwegian salmon after allegations of dumping. In the US, an anti-dumping duty of 26 per cent introduced in 1991 has basically closed the market for Norwegian salmon. Recently, Russia, the fastest growing market for Norwegian farmed salmon, has adopted import restriction due to alleged health risk from eating Norwegian salmon.

The GE model

Disaggregated sectors for agriculture, fisheries, fish farming and food manufacturing are integrated in a comparative static GE model where the rest of the economy is on an aggregated form. The model is developed in order to perform food policy analyses in which linkages within the food industries and to the rest of the economy are taken into account. It reports figures like economic welfare, rents in fisheries, resource allocation, production, trade and relative prices.

The flow diagram in Figure 1 shows the main components and interactions in the model. The dotted lines represent flows of money, while the solid lines represent flows of goods, services and factors between households, firms and the rest of the world. As a part of the solution process, prices and activity levels are found such that Walras' Law is satisfied; i.e. (a) all markets are in equilibrium, (b) all firms exhaust their revenues on intermediate goods, taxes, and rents to primary factors (like capital, labour, land and fish quotas and licences), and (c) all households satisfy their budget constraints.

Key macroeconomic actors and interactions are added in the outer part of the diagram: public sector, rest of the world (ROW), and the capital account. The public sector collects taxes, disburses transfers to firms and households, and purchases goods and services. Public consumption is exogenously given in the model, and the public budget is balanced by lump sum transfers or/and by scaling one or more tax or subsidy rates. As the model is static in nature, national savings and investments are exogenously given. Consequently, the net surplus on the trade balance is also fixed. The trade and capital account is balanced by an endogenous rate of exchange.

[Figure 1]

Agriculture is represented by 11 farm technologies, each with a region (6 production regions) and scale (1-3 different scales) dimension. Altogether the model has about 100 individual sectors in agriculture, producing 11 goods. For example, one sector is combined milk and beef production (technology), with 15-20 cows (scale), situated in south-west (region). Naturally, the regional classification is based on climatic and topographic conditions. In each region the agricultural activity is limited by given endowments of agricultural land, owned by farm households and rented by farm sectors. The scale dimension is an approach to allow different farm sizes, in a model where each sector is characterized by constant returns to scale. Note that Norwegian farms are relatively small which means that there are potential gains from exploiting economics of scale. The agricultural produce are processed into 24 food products for human consumption, as well as feed concentrates, in 17 food manufacturing sectors. National markets for food products are assumed, therefore, no regional dimension exists for processing.

22 vessel groups represent the Norwegian fishing fleet. The vessel groups span from small coastal vessels to factory trawlers, and include different technologies like hand-line, long line, seine, purse seine and trawling. The catch is aggregated into 11 different species, and most species are divided into two categories according to size and quality. With regard to fish farming, the model includes an aggregated sector producing salmon and trout, as well as a hatchery sector producing smolt as input for fish farming. There are single-output processing sectors for each of the model's 39 fish products for human consumption. In addition, there are processing sectors for fish meal and fish oil, as well as aqua feed concentrates. 12 aggregated sectors cover the rest of the economy.

The catch of fish is regulated by quotas for each species distributed on the different vessel groups. The quotas are modeled as vessel specific endowments owned by private households and rented by the different vessel groups. A potential quota rent is, thus, distributed to the private household sector. The same modeling strategy applies to potential rent in fish farming, where the rent is attached to licenses.

Capital and labor are, in general, assumed to be perfectly mobile between sectors, which means that the model has a long run perspective. The farmers' labor is, however, assumed to be partly sector specific. A constant elasticity of transformation (CET) function allocates the endowment of farm labor between agriculture and other industries. The transformation elasticity decides how easy labor is transferable between the farm and the labor market as relative wages change. An observed phenomenon may in this way be handled, namely that farmers, even in the long run, seem to accept sub-market return on own effort.

A representative household and the farm households represent private demand. The households maximize utility from input of goods, services and leisure. Revenues are received in the form of income from its own labor and capital, rents from fishing rights and fish farm licenses and transfers from public sector.

Norwegian and foreign goods are assumed to be imperfect substitutes (Armington assumption). This allows both export and import of the "same" good (cross-hauling). As will be demonstrated, the computed effects of farm liberalization are sensitive to the Armington elasticities. For fish produce 6 export markets are modeled (EU, USA, Japan, East-Europe, Russia/Ukraine and ROW), in addition to the domestic market. A CET function distributes each product between the different markets. This is an approach to handle the observed fact that product qualities, and also prices, vary between markets.

The model is based on national account data and input-output matrices from 1997. The industries in question are disaggregated by means of micro data. The data for the agricultural sector are based on the model farms included in the sector model JORDMOD (Gaasland et al. 2001). Sectors for fisheries and fish farming are constructed by data from the yearly profitability surveys of the Directorate of Fisheries in Bergen. Different sources are used to represent food manufacturing, as Manufacturing Statistics from Statistics Norway, profitability surveys in fish processing from Fiskeriforskning in Tromsø, and production coefficients in fish processing collected from the industry.

Technology and preferences are represented by (nested) constant elasticity of substitution (CES) functions whose distribution parameters are calibrated from the cost and budget shares following from the social accounting matrices. Inputs are nested and substitution parameters are added according to available empirical studies with regard to price and substitution elasticities, in combination with knowledge about technology and judgment.

The model is written in the Mathematical Programming System for General Equilibrium Analysis (MPSGE; Rutherford 1998) within the Generalized Algebraic Modelling System (GAMS; Brooke, Kendrick and Meeraus 1996), using PATH (Dirkse and Ferris 1996) as a solver for the Mixed Complementary Problem (MCP). A more detailed description of the model is found in Gaasland (2003).

Liberalisation of the food industries – assumptions and results

Assumptions

The objective of the paper is to consider national consequences of a *substantial* reduction in food sector subsidies and tariffs, e.g. in line with the long-term objective of the WTO. We illustrate this scenario by lowering subsidies and tariffs to 1/3 of the present level and by abolishing export subsidies.

The scenario implies fierce import competition for farm products, while seafood products gain easier access to export markets. The farm subsidies drop from 9.7 billion NOK to 3.2 billion NOK. The remaining subsidies could be paid out according to different criteria, dependent on prevailing policy objectives. In this model example production subsidies are applied, i.e. within the given ceiling on total subsidies, maximum production of each product is emphasized.

To eliminate the subsidized export of cheese and butter, it is assumed that the Norwegian milk price equalisation scheme enforced by the milk marketing board, is abolished. By law this scheme involves price discrimination and cross-subsidization between different dairy products. Especially, export of cheese and butter are subsidized by revenues from domestically sold drinking milk (Brunstad et al. 2005a).

How sensitive the agricultural activity is to lower import tariffs, depends largely on the Armington elasticities. Therefore, we apply alternative assumptions on these elasticities. It is reasonable to assume that the existence of national varieties and preferences would give some national production even when import tariffs are low. This kind of "natural" protection is probably stronger for processed products (e.g. bakery products and prepared meals) than for more standardized farm level products (e.g. meat, milk and eggs). However, in a medium to long term perspective it is reason to believe that this protection will be small, as varieties are adapted to different markets and preferences are harmonized.

In the absence of available empirical estimates, an Armington elasticity equal to 4 is used for processed food like bakery products, preserved fruit and vegetables, fat and oil, starch, sweets and prepared meals. This is a relatively high elasticity value which means that domestic and foreign produced goods are assumed to be close substitutes. For example, if the import share of a given good is 0.5, the own price- and cross price elasticity for the domestically produced good is –2.5 and 1.5, respectively.

With regard to farm level produce as well as meat, dairy products and flour, there is practically no import today due to the high import tariffs. Therefore, the Armington sectors for these products are inactive in the base solution (import shares are equal to zero). However, when tariffs are cut below a threshold level, import will take place. Two parameters specify the degree of homogeneity between domestic and imported good. First, an initial import share (θ) has to be specified, interpreted as the import that will take place immediately after penetration of the threshold level. The second parameter is the Armington elasticity (σ) that decides how easy domestic and imported goods are substitutable at the given initial import share. With respect to these parameters, two assumptions are used: 1) $\theta = 0.25$ and σ

= 4, and 2) $\theta = 0.5$ and $\sigma = 6$. In both cases tariffs are lowered to 1/3 of the threshold level. Import of live animals to slaughterhouses and production milk to dairies are excluded in the model simulations due to high transportation costs.

Public consumption is fixed, so lower net budgetary outlays (i.a. as a consequence of saved subsidies and higher revenues from import tariffs) have to be paid back to the representative household. Two alternative assumptions are used to balance the budget: I) lump sum transfers, and II) a reduction of the relatively high and distorting payroll tax.

Results

Not surprisingly, the farm sector will be heavily affected by the assumed liberalization. In the model simulations production is reduced to between 20 and 40% of the present level, dependent on the assumed Armington elasticities (see Table 2). The farmers' vulnerability is especially high when domestic and imported goods are considered to be close substitutes.

[Table 2]

The farm sectors in the model are based on data from existing Norwegian farms which in general are small compared to European standards. The average Norwegian milk farm has, for example, 13 cows while the EU average is twice as high. Therefore, compared to the model results the decline in production could be limited by exploiting economics of scale. Nevertheless, the effect on agricultural employment would still be substantial since bigger farms means less employment per unit of output.

In processing the meat industry and the dairies are most exposed. Since these industries depend heavily on deliveries of meat and milk from the domestic farm sector, they suffer from lower farm output. Due to the elimination of the milk price equalisation scheme, the remaining milk is used for drinking milk and cheese. The export of cheese and the production of milk powder, which today are heavily cross-subsidized, are abolished.

At higher processing levels the negative effects are less. Sectors producing bakery products, prepared meals, preserved fruit and vegetables and oil and fat are mostly unaffected. Today import tariffs are low for these products and the industries suffer from higher costs on raw materials than foreign competitors. Therefore, the decline in prices on raw materials can be more important than lower tariffs. For bakery products, e.g, the import price inclusive of tariff changes only marginally while the price on flour, that constitutes around 25% of the production costs, declines considerably. Industries with higher import protection, like ice cream, starch and flour, are, however, somewhat more seriously affected. Note also the production of feed concentrates declines in step with farm production due to lower demand.

Based on present production and export patterns, the decline in trade barriers on seafood implies a NOK 500 million gain in export value. A complete elimination of tariffs will elevate this figure to NOK 750 million, which is about 3 per cent of the base year export value. Thus, 3 per cent is the weighted average tariff on seafood export from Norway.

The gain will, however, be even higher because the processing industry can change the disposition of the catch between products and markets. Mainly two factors affect this adjustment: First, due to different initial tariff levels export prices change asymmetrically between products and markets. Second, raw fish prices rise (see Table 4), which disfavours products that are intensive in the use of raw fish, e.g. whole fish. When adjustments in production and between markets are taken into account, the computed rent from fishing rights and fish farm licences rises to NOK 600 million, or NOK 900 million if a complete liberalization is considered (3.6 per cent of export value).

[Table 3] [Table 4]

The model results show that slightly more of the white fish (cod, saithe and haddock) is processed to salted/dried fish or fillet at the expense of whole fish (see Table 3). This is both due to the fact that tariffs increase somewhat with the processing level and that whole fish is most exposed for higher raw fish prices. More of the pelagic species (herring and mackerel) are, however, exported as whole fish. With respect to farmed salmon, smoked fish, especially, but also whole fish expand, while fillet contracts. Remember that smoked salmon today has a 13% tariff in the important EU market. Relatively more of the fish produce end in markets with initial high tariffs. In general this applies for the markets in Russia/Ukraine (today 10% tariffs) and Japan. The important EU market increases its importance for farmed salmon, whole pelagic species and processed prawns.

The rest of the economy is stimulated by the liberalisation (see Table 5), in spite of the food sector's low share of GDP. Resources are redistributed from agriculture and processing to other sectors in the economy, and demand is stimulated since: 1) the reform opens for higher transfers to private households, or lower taxation, (NOK 6.4 billions are saved in farm subsides, and tariff revenues rise), 2) private households receive higher rents on fishing rights and fish farm licences (NOK 600 millions), and 3) food prices fall (up to 15%; see Table 6).

[Table 5]   [Table 6]

The effect on the rest of the economy depends on how the public budget is balanced. A widely used method is to balance the budget by lump sum transfers to private households. However, a better result can normally be obtained if one or more distorting taxes are reduced. As an example we include one alternative where the pay roll tax is scaled down until the public budget is in balance. Lower pay roll tax means higher net wage payment for the employees, and since the elasticity of labour supply with respect to net wage is positive in the model, labour supply increases. Compared to lump sum transfers, this opens for higher activity in the economy, as can be seen from Table 5.

The welfare gain of the said liberalization, measured as change in Hicksian equivalent variation, is between 1.1 per cent and 2.4 per cent of GDP (Table 7). If extrapolated to a complete liberalization, the gain is between 1.6 per cent and 3.6 per cent (Table 7, parenthesis). The highest end of this interval is when domestic and foreign food products are considered to be close substitutes and when saved subsidies are paid back to households and production sectors in the form of lower taxes on labour.

The GE estimate of the gain from a full liberalization (1.6 per cent - 3.6 per cent) can be compared to similar PE computations. Using a PE model of the Norwegian agricultural sector[1], the gain is computed to be 1.3 per cent, thus below the GE interval.[2] This supports the suggestions of Alson and Hurd (*op. cit.*) and Gylfason (*op. cit.*) that the cost of the agricultural policy in high support countries, is not confined to Harberger triangles in agricultural markets, but also arise from adverse effects on other sectors of the economy.

[Table 7]

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[1] See Brunstad *et al.* (1995) for a documentation of the model.

[2] The farm sectors in the GE model are based on data from the same model farms that enter into the PE model, which facilitates a comparison of the results. However, the assumptions with respect to liberalization differ somewhat. The GE simulations include liberalization of fisheries and fish farming while the PE simulation do no. Also, the PE model assumes that domestic and imported goods are perfect substitutes.

Concluding remarks

The Norwegian agricultural policy is costly. Within a pure PE setting, the economic cost is estimated to 1.3 per cent of GDP. GE calculations elevate this cost estimate to between 1.6 per cent and 3.6 per cent, indicating that the agricultural policy has adverse effects on other sectors in the economy by raising costs and prices.

High agricultural support implies an obvious discrimination against other sectors in the economy that suffer from higher taxes and lower demand than otherwise. In addition, parts of the downstream food industry are discriminated against by higher prices on raw materials than their foreign competitors. Finally, the protective farm policy makes it difficult for Norway to achieve better market access for fish in trade talks. Based on present volumes of raw fish available to fish processing, the gain from a complete elimination of tariffs is estimated to be 3.6% of the seafood export value.

When evaluating farm programs, there is always the question whether there are social benefits to outweigh the substantial costs of the current policies. Economic arguments in favour of intervention are the existence of public goods related to agricultural activity, such as landscape and biodiversity preservation, and settlement in sensitive and scarcely populated areas. However, there is no evidence that the present high levels of support can be defended by the public goods argument (Brunstad et al. 2005b). Also, the present support, which is mainly price support, is badly targeted at the public goods in question.

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Tables

Table 1. Gross product and man-years in the food industries (1997)

	Gross product (million NOK)	Employment (1000 man-years)
Agriculture	8.808	62.9
Processing of agricultural commodities	11.617	31.8
Meat products	2.879	10.4
Fruit and vegetables	693	1.4
Dairies and ice cream	2.121	5.6
Grain products	426	0.9
Oils and fat (vegetable)	558	1.1
Other food products	4.262	11.1
Feed concentrates	678	1.3
Agriculture and processing	**20.425**	**94.7**
Fisheries	5.641	14.2
Fish farming	1.927	2.8
Fish processing	4.020	12.6
Aquafeeds	587	1.1
Fisheries, fish farming and processing	**12.175**	**30.7**
Total, food industries	**32.600**	**125.4**
Total, Norwegian economy	**1.096.170 (GDP)**	**1898.5**

Source: Disaggregated data from Statistics Norway.

Table 2. Agriculture and processing (base solution = 1)

	Degree of heterogenity between domestic and imported good	
	θ = 0.25	θ = 0.5
	σ = 4	σ = 6
Activity level agriculture		
Milk and beef	0.36	0.18
Pork	0.36	0.18
Sheep	0.36	0.18
Chicken	0.36	0.18
Eggs	0.36	0.18
Grain	0.32	0.17
Potatoes	0.43	0.18
Activity level processing		
Meat industry	0.36	0.18
Dairy, drinking milk	0.55	0.30
Dairy, cheese domestic	0.41	0.19
Dairy, cheese export	-	-
Dairy, milk powder	0.01	-
Ice-cream	0.55	0.24
Flour and grain industry	0.73	0.32
Starch	0.69	0.75
Bakery products	1.08	1.09
Chocolate and sweets	0.85	0.85
Preserved fruit and vegetables	0.95	0.98
Oil and fat	0.96	0.96
Feed concentrates	0.36	0.18
Other food products, prepared meals aso.	0.99	0.99
Employment		
Agriculture	0.32	0.16
Processing	0.65	0.54

Table 3. Adjustments in fish processing (base solution = 1)

	Fillet	Whole	Salted	Clipfish	Stockfish	Smoked	Other
Cod	1.218	0.694	0.674	1.151	0.856		
Saithe	0.988	1.009	1.408	0.926	1.500		
Haddock	1.010	0.981	1.500				
Herring	0.254	1.433					
Mackerel	0.687	1.022					
Capelin		1.000					
Prawn		1.000					1.000
Mussel		1.000					
Farmed salmon	0.359	1.122				1.227	
Other	0.753	1.138	1.160	0.947	0.712		0.760

	Aggregate
Prepared fish meals	0.960
Fishmeal- and oil	0.927
Aquafeeds	1.008
Employment, total	1.003

Table 4. Raw fish prices (base solution = 1)

	Small fish	Large fish
Cod	1.001	1.032
Saithe	1.021	1.008
Haddock	1.009	1.010
Mackerel	1.088	1.073
Prawn	1.078	1.031

	Aggregate
Farmed salmon	1.042
Herring	1.083
Capelin	1.040
Mussel	1.037
Industry fish (for fishmeal)	1.007

Table 5. Rest of the economy (base solution = 1)

	Budget balancing	
Sector	Lump sum	Lower pay roll tax
Forestry	0.998	1.025
Oil	1.026	1.005
Energy	0.998	1.060
Light industries	1.003	1.032
Heavy industries	1.000	1.061
Transport	1.015	1.060
Commodity trade	1.016	1.059
Private services	1.010	1.045
Public services	1.005	1.020
Other	1.001	1.019

Table 6. Price indices (base solution = 1)

Sector	Degree of heterogenity between domestic and imported good	
	θ = 0.25 σ = 4	θ = 0.5 σ = 6
Consumer price index (numerairè)	1	1
Food and drink	0.931	0.898
Food	0.900	0.853
Meat	0.765	0.655
Fish	1.003	1.003
Drink	0.968	0.956
House and heating	1.006	1.009
Clothes and shoes	1.006	1.009
Transport	1.006	1.009
Other goods and services	1.006	1.009
Labour	1.008	1.012
Capital	1.005	1.008
Rate of exchange	1.006	1.009

Table 7. Welfare effects in per cent of GDP. Complete liberalization in parenthesis.

Budget balancing	Degree of heterogeneity between domestic and imported good	
	θ = 0.25 and σ = 4	θ = 0.5 and σ = 6.
Lump sum	1.1% (1.6%)	1.5% (2.3%)
Lower pay roll tax	1.9% (2.9%)	2.4% (3.6%)

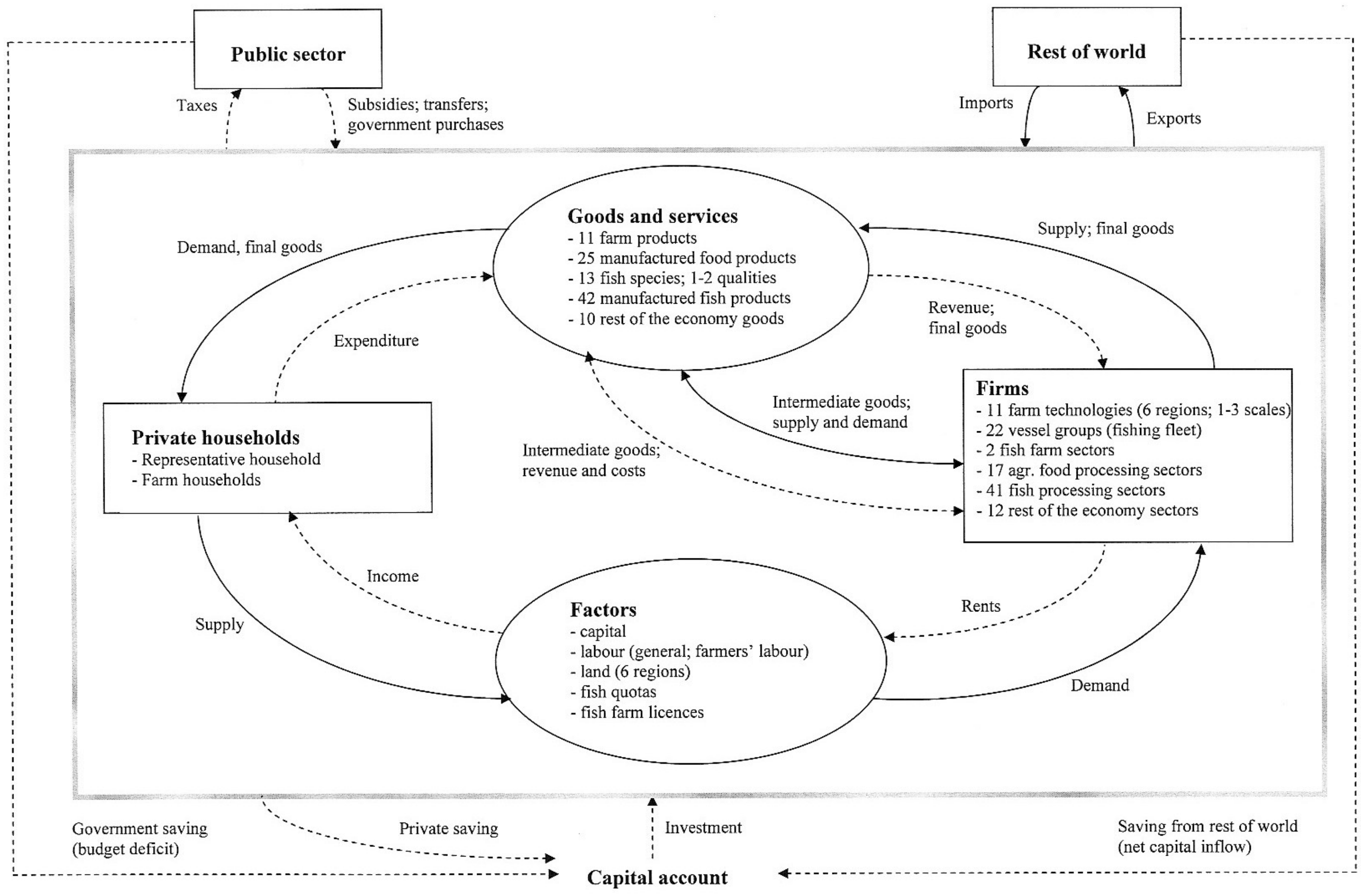

Figure 1. Main components and interactions in the model