

Welfare effects of multinational trade agreements

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The article analyzes the welfare effects of three trade agreements signed by Norway in the 1990s: The EEA Agreement, the WTO Agreement, and an EFTA agreement that limit subsidies to fisheries. By applying a relatively detailed dynamic equilibrium model, we find a modest welfare gain as a result of the trade liberalizing reforms. Measured by the increase in private consumption and leisure, we estimate the gain at 0.8 per cent.

1. Introduction

During the last decade Norway has signed multinational agreements that involve reciprocal obligations concerning trade liberalization. The agreement resulting from the Uruguay Round (World Trade Organization Agreement), which came into force on 1 January 1995, and the EEA Agreement, which was implemented on 1 January 1994, are the two most comprehensive. The EEA agreement is dynamic in that new regulations carried by the EU commission also applies to Norway. In addition, an agreement between the EFTA countries on fisheries came into force from the beginning of 1994. The agreements involve substantial changes in the conditions for Norwegian industries and consumers over a short period. In Fæhn and Holmøy (2000) we focus on how and to what extent these changes can influence our national welfare in the longer term. The purpose of the present article is to communicate the main findings and the methodology in that paper in a less technical language to a broader public.

The conventional argument for not limiting trade is that of *comparative advantage*; under free trade each country can specialize in producing those goods and services they can supply most efficiently in relative terms. By exporting these products, each country can finance imports of goods that other countries produce most efficiently. Free trade is therefore of mutual benefit. Protective measures such as tariffs, import quotas, and subsidies to firms that compete with foreign producers create wedges between world market prices and domestic prices. The result is that scarce resources will be reallocated from industries

with a comparative advantage to industries with lower efficiency. The consequent reduction in efficiency in the economy's use of resources represents a deadweight loss in potential welfare for the country's inhabitants.

This classical free trade argument is based on stylized assumptions including, among other things, perfect competition. This means that consumers and producers face the same prices and that these prices perfectly reflect the marginal costs of higher production and the marginal utility of higher consumption of all goods and services. Taxes, subsidies and monopolistic pricing result in a distortion of relative prices so that producers and consumers do not face the same prices. When the economy is characterized by arbitrary price distortions, resources will not have the same marginal return for all uses. In this situation, there will be welfare effects from any policy, including trade liberalization, which influence the allocation of resources. Trade liberalization will increase welfare *if* the resources are reallocated in such a way that production increases (falls) in markets where the wedge between the consumer price and producer price is greatest (smallest). Little more can be said about the welfare effect on the basis of theoretical analysis alone. Such insight is of limited practical value when evaluating specific changes in policy. The existence of arbitrary price distortions in the economy therefore provides an argument for using numerical models when studying the effects of policy changes.

Theoretical analyses are nevertheless important for identifying and clarifying how and why certain policy effects lead to changes in welfare. In the 1980's, much theoretical literature focused on the effects of trade policy when the economy is not characterized by perfect competition. These theories emphasized, *inter alia*, the welfare implications associated with product differentiation, scale economies and imperfect competition¹. If trade policy reforms increase the number of

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1 See e.g. Helpman and Krugman (1985) for an introduction to this literature.

available product varieties, welfare will improve. To the extent that production is concentrated into fewer product lines, the policy may involve better exploitation of scale economies. Moreover, easier access to foreign products may result in increased competition in domestic markets, thereby improving the efficiency of the economy's use of resources.

If many countries liberalize foreign trade simultaneously, various types of efficiency improvements may lead to a fall in costs and prices. If a country's import prices decline in relation to export prices, that country records a terms-of-trade improvement. This results in real income growth, and the welfare of its inhabitants may increase.

Theoretical analyses of trade policy typically study one or just a few effects within very stylized models. Our attempt to quantify the potential welfare gain for Norway need to take into account *all* effects that are identified in the theoretical literature provided they are relevant to the Norwegian economy with its particular features. Applied general equilibrium (AGE) models are suitable tools for such analyses. This article presents the results of an analysis of the trade agreements, based on an AGE model developed by Statistics Norway, MSG-6. The model provides a relatively detailed and, at the same time, dynamic description of how prices and volumes in markets depend on consumers' preferences, firms' production technology, competitive conditions in markets, international market conditions, government use of resources and other policy instruments, including trade and industry policies.

In section 2 we provide an overview of the changes in trade policy resulting from the agreements. We concentrate on quantifying the agreement points that are most likely to result in changes for Norway. In section 3 we discuss how we calculate welfare effects and provide a brief description of the model MSG-6. We then explain some key macroeconomic adjustments as a result of the policy changes and the factors that determine the size of the welfare effect of the reform. In section 4 we draw some conclusions. We refer to Fæhn and Holmøy (2000) for a more detailed description of the analysis.

2. Interpreting the content of the trade agreements

Reduction of Norwegian import protection

According to the WTO Agreement, tariffs on manufactured goods shall be reduced by nearly 40 per cent. Since tariffs have already been eliminated on imports from a number of countries, including EU and EFTA countries, this will only have consequences for less

Table 1. Long-run protection rates as a result of non-tariff barriers, measured as percentage increase in import prices before and after trade reforms

Commodity group	Reference path	Reform path
Agricultural products	40	36
Meat and dairy products	66	54
Other processed food	33	34
Beverages and tobacco	42	26
Textiles and clothing	1	0
Chemical and mineral products	7	0
Industrial chemicals	3	0
Hardware and machinery	4	0
Oil platforms	3	0

than 20 per cent of Norwegian imports. The initial rates were already low (unweighted average of 3.6 per cent). Only on textile and clothing imports the WTO Agreement will have a certain impact. In this case the initial unconcessional tariff rates averaged 17 per cent.

In addition, the new trade agreements prohibit *non-tariff barriers (NTBs)*. The agreements go a long way in specifying the prohibitions and pave the way for enforcing the rules. NTBs are more subtle forms of trade barriers that are more difficult to document and quantify. NTBs contribute to increasing import prices either through higher costs or margins for Norwegian imports or indirectly by limiting the volume of imports. Shortages, which then arise, normally result in higher prices, depending on supply and demand conditions. In table 2, NTBs are quantified by means of *protection rates*, which measure the relative increase in import prices as a result of NTBs. In the model-based calculations, we have taken into account that the agreements are implemented over time. The table shows the rates in pre-reform and post-reform long-run equilibria².

A common NTB measure has been to establish national product and packaging standards, which imply additional costs of marketing the products in Norway. With the EEA and WTO agreements these standards have generally been harmonized between countries. Previous protection effects are thus eliminated for pharmaceutical products (in the commodity group *chemical and mineral products*), fertilizer (in *industrial chemicals*), as well as machinery and electrical equipment (in *hardware and machinery*). Technical trade barriers still remain for food, beverages and tobacco.

NTBs in the form of trade quotas have been prohibited by the WTO Agreement. The prohibition applies to export quota agreements, which previously applied to some imported textile goods from low-cost countries. For some of the quotas prevailing before the Uruguay Round, the price effect is estimated to be

² *Long-run equilibria* in our analysis mean that we are so far forward in time that prices and volumes have found their range and no longer vary over time in response to the exogenous conditions that are assumed.

Main features of MSG-6

MSG-6 includes a number of mechanisms, which individually have been given considerable emphasis in the theoretical literature on welfare effects of trade policy. The model allows for classical specialization gains based on comparative advantage by providing a relatively disaggregate description of flows of goods and services in the Norwegian economy. The model specifies 60 commodity and service groups, of which 9 are non-competing import goods and 12 are government-produced goods. Products and factors can be moved at no cost between various uses.

Consumers are assumed to maximize the present value of the utility of leisure and consumer goods over an infinite horizon. Firms maximize the present after-tax value of the cash flow to owners. The model provides a fairly broad representation of policy instruments, such as indirect taxes and subsidies. In the choice of classification of commodities and industries, particular emphasis has been placed on homogeneity within groups when comes to trade policy.

The model is dynamic. The accumulation of real capital and financial wealth implies that the economy's resource constraints change over time. Forward looking dynamics is due to the assumption that consumers and firms make decisions based on perfect, i.e. model consistent, expectations concerning prices and income in the future. The economy obeys an intertemporal budget constraint, specified by the requirement that the net foreign debt shall not explode. Within this budget constraint, households can trade in time by borrowing and saving in international financial markets where the interest rate is exogenous.

The utility function of the representative consumer is parameterized so that the model's labor supply function and demand functions for consumer goods shall be in line with the estimates from microeconomic studies. In the model, most goods are considered composites of imperfectly substitutable imported and domestic varieties. The Norwegian market share is reduced when the Norwegian price increases relative to the corresponding import price, which is equal to the exogenous world market price, including transport costs and other penetration costs caused by trade policy. Some relatively unprocessed goods, on the other hand, are assumed to be homogenous products. The prices of such tradables are equal to the exogenous world prices of equivalent imported goods.

In MSG-6, the production of most goods and services changes both through changes at the firm level and through endogenous entry or exit of firms. Each firm produces its own product variety that is a close but imperfect substitute for varieties produced by other firms in the same industry. The entry/exit of firms thereby gives rise to variations in the product range domestically. As pointed out in the trade theory developed in the 1980s, both producers and consumers benefit as a result of increased product variety per se. The model therefore captures what is often referred to as love-of-variety effects.

In keeping with empirical studies, the model takes into account that there are productivity and size differentials between firms within the same industry. In most industries the firms' product function is characterized by decreasing returns to scale, at the same time that production in itself requires a fixed cost. Variations in the number of firms will thus result in changes in total fixed costs and thereby potential rationalization effects on aggregate welfare. The substitutable production factors consist of labor, three types of real capital and five groups of intermediate goods.

In most industries the firms endogenously allocate their output between the domestic and the foreign market. This entails rising marginal costs for changing the composition of these deliveries. On the export market, Norwegian firms are assumed to face exogenously determined world market prices. This means that MSG-6 calculations do not produce endogenous terms-of-trade gains for individual goods by varying export volumes. On the domestic market, there are varying degrees of monopolistic competition between firms within the same industry, and firms make a (modest) monopoly profit here. This market imperfection contributes to two types of price distortions in the economy. First, the mark-up in prices that is due to monopoly power results in a relative use of resources in these industries that is too low. Second, the monopoly profit contributes to increasing the wedge between the private and social return to employment, which may result in suboptimal employment. It should be emphasized, however, that price distortions that are created by monopolistic pricing are small in the model compared with the distortions that are created by different taxes and subsidies.

on a par with that of tariffs, and come in addition to these (see Melchior (1993)). For *textiles and clothing* as a whole, however, the protection rate is small. The prohibition of quantitative trade restrictions also applies to agricultural products. Quota-type arrangements for imports largely applied within the commodity groups *agricultural products* and *meat and dairy products*. The protection rates that applied are derived from the size of the quotas, and vary over time depending on supply and demand conditions. With the WTO prohibition, quota arrangements have been replaced by tariffs. However, the rates for the most important products are set at prohibitive levels.

The measures therefore function much like quantitative restrictions. Certain minimum import requirements increase import volumes somewhat as a result of the reform, implying a slight decline in protection rates for *agricultural products* and *meat and dairy products*. This is achieved in part by setting lower tariffs on minor products in the Norwegian production and in part through lower tariffs on imports from the poorest developing countries.

The WTO Agreement also prohibits variable import levies, an NTB instrument that previously protected many products in the group *other processed food*.

Variable import levies were imposed on imports to the extent the good contained intermediate goods that competed with Norwegian agricultural products. These have now been replaced by fixed tariffs, and with the EEA Agreement's tariff reductions the level of protection has been reduced for many processed food products. The fact that the protection rate for *other processed food* nevertheless increases as a result of the agreements is due to the increased protection of flour. Formerly quantitative barriers on grains have been replaced by tariff rates of more than 300 per cent, a fact that has increased the costs and prices of sheltered flour production substantially.

There is reason to maintain that producers of cement (in the group *chemical and mineral products*) and fertilizer (in *industrial chemicals*) were previously sheltered against competition in the Norwegian market because collusive market sharing was not effectively prevented. According to the EEA Agreement, the EU's competition rules apply to Norwegian firms. The rules call for an *effective* prohibition of collusion and mergers that hamper international competition, as was demonstrated in 1995 when the EU Commission/EFTA's Surveillance Authority imposed substantial fines for the tacit collusion of European cement producers, including the Norwegian company Aker Norcem. The EEA Agreement also prohibits state-owned import monopolies. This has consequences for the level of protection of alcoholic beverages and pharmaceutical products. Public procurement schemes that favor domestic enterprises have been prohibited. Such protection has thereby been eliminated for deliveries of engineering products to government agencies (such as the Norwegian State Railways, power stations, Telenor and the Directorate of Public Roads), and for deliveries of oil platforms and modules to the large oil companies.

Reductions in subsidies

The role of subsidies in distorting competition has been in focus in recent years' international negotiations, with the result that several types have been prohibited. The WTO Agreement contains detailed rules on subsidies to *agriculture*, with many prohibitions. Many exemptions, however, make it possible, according to Skjeflo et al. (1994), to maintain the Norwegian subsidy level by rechanneling and redefining the support. We assume this to be the case and keep the subsidy rate of 26.4 per cent from 1992 unchanged³. About 40 per cent of the subsidy amount for *fishing* in 1992 stemmed from arrangements that have been prohibited according to the EFTA agreement on fisheries. We have reduced the subsidy rate, which was 7.2 per cent in 1992, by the same extent. Finally, subsidies for ordering new ships from the ship-

building industry will be removed with effect from the year 2001. The subsidy rate for *shipbuilding* was 6.2 per cent in 1992. We have not found that other subsidy regulations in the EEA and WTO agreements will limit Norwegian practices.

Changes in foreign prices

As a result of the EEA Agreement, protection rates in the EU for Norwegian fish are about 2 percentage points lower, thus raising Norwegian export prices⁴. The level of prices in Europe shows little change as a result of the EEA Agreement inasmuch as the EFTA countries' party to this agreement is relatively small. On the other hand, the implementation of the WTO Agreement in all member states has a potential for changing price levels in trading partner countries. We have based our estimates on simulations of the Uruguay Round's effects in a global model, carried out by Haaland and Tollefsen (1994). In most markets consumer prices fall less than the level implied by reductions in trade barriers and increased efficiency. Other production costs have thereby risen, by between a half and one per cent. This influences Norwegian import and export prices. In addition, Norwegian import prices are reduced by Norway's own removal of import barriers. It is important to note that with the removal of many types of NTBs, price reductions occur *before* the good has reached the Norwegian border. Technical barriers entail real costs in the production country linked to the adaptation of products to special Norwegian standards. Export quota arrangements often mean that part of the price increase accrues to agents in the exporting country. In such cases the scaling back of a country's own barriers results in reduced import prices and thereby terms-of-trade gains. On average, we find a fall in import prices at the border of about one per cent.

As a result of the EFTA resolution on subsidy reductions to fisheries, producers' marginal costs in all participating countries increase by approximately the same extent. This does not generate any impetus to Norwegian exports. The removal of shipbuilding subsidies within the EEA will not result in changed world market prices in the long run. On the basis of Hellesjø et al. (1994), we assume that the world market price will be determined by Japan's cost level, independent of EEA countries' subsidies.

3. Welfare effects of the reform

Method for calculating welfare effects

In order to shed light on the magnitude of the effects of trade liberalization, we compare two scenarios generated by the model MSG-6, in which one is

³ The subsidy rate is calculated as the subsidy amount as a per cent of the gross value of production.

⁴ In periods the EU has introduced minimum prices for Norwegian fish. Anti-dumping rules that applied prior to the EEA Agreement also permitted this, and we do not consider the practice of recent years to be a consequence of EEA rules.

characterized by a status quo policy from 1992 before the reforms, while the second includes the phasing in of the reforms in the three agreements. Box 1 provides a brief description of the model, emphasizing those features that presumably are important for the welfare effects presented in this article. A more detailed description is found in Fæhn and Holmøy (2000), Holmøy and Strøm (1997) and Bye, Holmøy and Strøm (1999).

We confine the calculations to welfare changes for the economy as a whole – distributional effects between persons/households are not calculated. Our method is consistent with a tradition, which assumes that the authorities can eliminate undesirable distributional effects through separate policy instruments. Our welfare measure is based on the same preference structure as assumed for Norwegian consumers in the model. This welfare measure is defined as the present value of the utility that consumers derive from what they consume each year, including leisure. It may roughly be said that the annual utility is measured as the real consumption of goods, services and leisure. Leisure is valued at opportunity cost, which is wages less marginal tax. Our definitions imply that the welfare measure before the trade reform amounts to about 85 per cent of GDP.

Macroeconomic adjustments

In such a complex model like MSG-6 it will be impossible to provide a detailed explanation of all changes that take place when the economy is exposed to exogenous changes. In the following we confine our description to some of the most important macroeconomic adjustments. We refer to Fæhn and Holmøy (2000) for a more detailed explanation.

Trade reforms result in higher export prices, while import prices decline. This improvement in the terms of trade increases real income and thereby welfare for Norwegian consumers. The increase in utility, however, cannot be achieved without changes in relative prices and thereby in the allocation of resources. This is most easily understood when we look at the direct effects of the terms-of-trade gain on supply and demand in the labor market. Consumers will want to use the increase in income to buy more goods and services that are partly produced by Norwegian labor. At the same time, the increase in income implies that they want to work less. This negative income effect on the labor supply dominates the positive substitution effect driven by reduced import prices, which increases the real wage rate. The demand for labor is also amplified by an increase in net exports as a result of changes in export and import prices. In order to achieve labor market equilibrium, the wage rate must increase. In the long run the wage rate rises by 1.75 per

cent as a result of the reforms. Employment falls; the long-run decline is 0.58 per cent. We find that the utility of consumers in the long run increases by 0.81 per cent as a result of the reforms. This increase represents about 0.7 per cent of GDP. Due to price distortions created by taxes, subsidies and market power, the increase in utility is also influenced by the reallocations of resources that take place. We will revert to the gains from reallocations below.

Our measure of welfare consequences is changes in the *present value* of annual utility. This means that utility changes in all future years contribute to the change in welfare, with the greatest effect in the next few years. The calculations show that the increase in utility does not vary to any extent over time, but that in a transitional period it is slightly lower than in the long run. The present value of these changes yields a welfare increase of 0.77 per cent as a result of the international agreements.

The sources of the welfare gain

Several empirical studies of realistic, reciprocal trade reforms find welfare gains of about one per cent, see e.g. Francois et al. (1996) for a survey of welfare studies of the WTO Agreement, Haaland and Tollefsen (1994) for a study of EFTA countries' gains from the EEA Agreement and Krugman (1996) for a discussion of NAFTA. Our estimate of 0.77 per cent is, in other words, well within the bounds of the results of similar studies. Unanimity can nevertheless not be taken for granted, as the specific changes in trade policy are often quite different, and economic realities vary considerably between countries and between periods. Furthermore, different models can attach varying importance to economic relationships and mechanisms. We have therefore decomposed the total welfare gain so that we can see more clearly how the specific sources contribute to the result.

We find that the largest single contribution comes from an improvement in the terms of trade. As an approximation, we estimate this at 0.88 per cent. We emphasize that the improvement in the terms of trade is *not* because Norway has market power in any foreign market and can influence world market prices⁵. The most important reason for the improvement is that several of the Norwegian NTB measures which existed before the implementation of the trade agreements, entailed that import prices were given a mark-up before they reached the border. Important examples are, as noted, technical trade barriers and export quota arrangements. When the trade agreements make it possible to eliminate these mark-ups, the gain for Norway is equivalent to pure income transfers from abroad.

5 We find reason to emphasize this because other models developed in Statistics Norway, such as the forecasting model KVARTS and MODAG, assume that Norwegian behavior influences export and import prices..

We thus find that the estimated welfare gain of 0.77 per cent is smaller than the isolated contribution from the terms-of-trade gain. This means that the reallocation of resources as a consequence of the reform all in all results in an increase in the total deadweight loss. Lower employment is the main reason for this result. The negative contribution to welfare from lower employment is related to the fact that the payroll tax (averaging 17 per cent), the marginal tax on personal labor income (averaging about 40 per cent), and indirect taxes on consumption (averaging 19 per cent) entail high effective taxation of labor in Norway. The private return of working an extra hour appears far lower than the social return, which naturally includes all tax revenues generated by this employment and accompanying consumption. Initially, the labor supply is therefore too low in an economic sense. The positive effect of the trade reforms on income thus leads to a further decline in the labor supply. In the long run employment is 0.58 per cent lower when the reforms are included in the calculations. As an approximation, we estimate the welfare loss of this isolated change in the use of time at about 0.35 per cent of the baseline scenario's welfare level. Somewhat simplified we can say that the increase in income inherent in the terms-of-trade improvement cannot be absorbed in the distorted Norwegian economy without modifying the welfare effect.

The decline in employment also results in a fall in Norwegian production, measured by GDP, of 0.14 per cent. The fall particularly occurs in internationally exposed sectors, which experience a cut in subsidies and protection support. Lower production will contribute to a welfare loss in industries where there is a monopoly profit, scale economies or a utility gain from increased product variety. As noted, the model captures these mechanisms. However, they provide a very modest contribution to welfare in the calculations, both because the wedges they represent are small and because the level of activity shows little change.

Many international analyses find, contrary to our findings, that the level of domestic activity *increases* as a result of liberalization, see e.g. Harris (1984), Ho and Jorgenson (1994) and Keuschnigg and Kohler (1996). An important reason for this is probably that the negative income effect on the labor supply is smaller in these studies than in our study, while the substitution effect is more positive. The studies mentioned thus find that a higher level of activity makes a substantial contribution to welfare when the economy is characterized by high effective taxation of labor, monopoly profits, scale economies, and the utility of increased product variety.

4. Conclusions

Even though MSG-6 captures a number of effects, it provides, like all models, a simplified description of reality. Our model-based calculations can therefore

Table 2. Long-run macroeconomic changes as a result of the trade reform. Per cent

Annual utility (of consumption and leisure)	0,81
Private consumption	1.00
Leisure	0.62
Price index for consumption	0.20
Wage rate/price of leisure	1.75
Employment	-0.58
GDP	-0.14
Export prices	0.6
Import prices	-1.1

not provide a complete answer. There is, however, no alternative to numerical model-based calculations when quantitative assessments of the effects of economic policy is wanted. In the case with trade policy, such models make it possible to study systematically the implications of alternative assumptions, both with regard to the importance of trade agreements to the international market conditions facing the Norwegian economy, and with regard to how economic agents will adapt to changes in these conditions.

We find that the implementation of the three agreements provides an aggregate welfare gain of 0.77 per cent. Recalculated as the same annual NOK amount, the welfare gain amounts to about 0.65 per cent of GDP, i.e. a modest gain. The result does not differ substantially from similar studies of trade policy reforms in other well-developed market economies. The modest gain must be viewed in the light of one important factor: Norway and comparable economies were already very open even without the implementation of the three agreements studied here. The fact that the debate surrounding trade liberalization is so heated is probably due to the impact on individual industries and on distribution.

With regard to the sources of the estimated welfare effects, we will point to the following:

1. Norway's terms of trade improve, primarily because the removal of technical standards, etc. reduces the prices Norway pays to *foreigners* for imported goods. Terms-of-trade gains make an important contribution to the aggregate welfare gain (an estimated +0.88 per cent).
2. The total contribution to welfare from reallocations of resources is slightly negative. This is primarily because part of the increase in income is used to increase leisure. The shift in time spending from labor to leisure has a negative and relatively important welfare effect in the Norwegian economy because there is a high effective tax wedge between the social marginal value of the consumption permitted by labor efforts on the one hand, and leisure on the other. We estimate the welfare contribution from lower employment at a negative 0.35 per cent.

3. Potential sources of welfare gains through freer trade linked to the existence of market power, scale economies and love of variety appear to play a very small role in the Norwegian economy.

We would maintain that the last two conclusions above are of a type that cannot be drawn without applying empirical model tools. Nor is it possible to draw such conclusions unless the model is also supplemented by theoretical insight on the effects that appear as well as a decomposition of the aggregate welfare effect into contributions from various sources.

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