Trade barriers and export potential: Gravity estimates for Norway's exports

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Paper written for the Ministry of Trade and Industry, Norway

Oslo, May 2009

Abstract
Using trade and tariff data for around 150 countries, we estimate the impact of tariffs on Norway's exports to these countries in 2007. Remaining tariffs have a significant and measurable impact on exports: on average a one percent tariff reduces exports by around 4 percent. Using these estimates to assess the trade potential from tariff elimination, we find that trade may increase by 4.2-12.9 billion NOK, equivalent to 1.2-3.7% of Norway's non-oil exports in 2007. The trade potential is largest for the BRICs and the USA, and for the sectors minerals, fish, machinery and chemicals. Some countries also have high non-tariff barriers; in some cases even higher than their tariff barriers.

Non-technical summary

The paper uses a gravity model to assess the impact of tariff barriers on Norway's exports, and thereafter uses these estimates in order to predict how trade would change if tariffs in export markets were eliminated. For this purpose, a large-scale database is constructed, including trade and tariffs facing Norway's exports in more than 150 countries. The analysis is based on Norwegian export data but there are generally huge gaps between Norway's reported exports and the imports from Norway reported by countries at the other end. Some of the gap can be caused by weaknesses in Norwegian data.

If Norway had faced regular tariffs in all export markets, the tariff burden for current exports in 2007 would have been 1.6 billion USD. Due to free trade agreements in many major markets, however, tariffs were lower so the actual tariff burden was only 54 million USD. This is however an underestimate of the true tariff burden since trade tends to be low when tariffs are high. For oil and gas exports, there were no tariffs at all. Taking simple country-level tariff averages for goods exported to all countries in the sample, we find that the mean as well as the median across countries is around 7%.

Through EFTA and the EEA (European Economic Area) Agreement, Norway currently has free trade agreements (FTAs) with 51 countries. In addition, negotiations aiming at new FTAs are currently going on with another 14 countries. If all these negotiations succeed, around 90% of Norway's foreign trade will be with FTA partners. The current share is around 85%.

We use a modified "gravity model" in order to measure how tariffs affect exports, along with geographical distance and the size of the destination markets (measured by GDP). Estimates vary across sectors and their absolute values are generally higher if we use aggregated trade data, as opposed to data at the detailed product level. Due to this variation, we indicate a range with lower and upper bounds for the "tariff elasticity" for each main sector. On average, we find that a 1% tariff reduces exports by around 4%. Hence tariffs have a relatively large and measurable trade-reducing effect.

Based on these estimates, we estimate how exports would change if tariffs were eliminated, for exports to more than 150 countries. Summed across all these countries, we find that exports may increase by 4.2-12.9 billion NOK, equivalent to 1.2-3.7% of Norway's non-oil exports in 2007. The trade potential is largest for the BRICs (Brazil, Russia, India and China) and the USA, and for the sectors minerals, fish, machinery and chemicals. Fish and machinery face higher tariffs, but minerals are more price-sensitive so even low tariffs can have a large impact.

We also report results from other studies on non-tariff barriers (NTBs). Some countries have high NTBs even if their tariffs are low, and this should be taken into account in free trade negotiations.

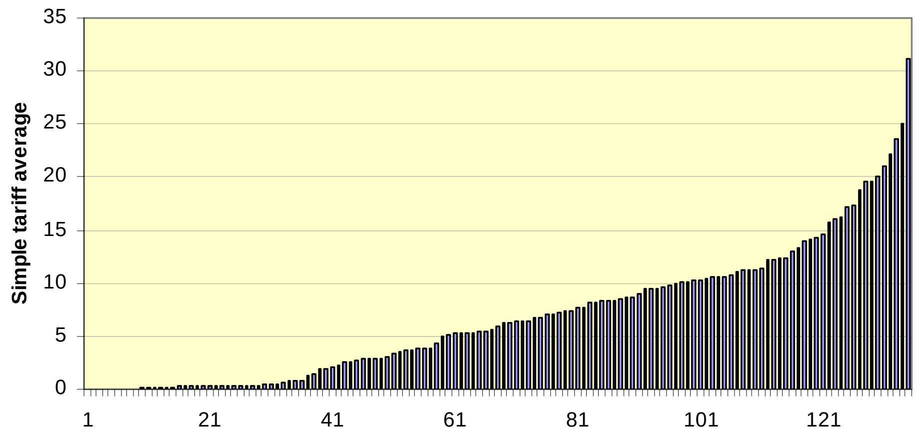
As a check of our estimates, we undertake retrospective trade potential estimates for some countries where Norway established FTAs earlier. We calculate trade potentials after the entry into force of the various agreements, also taking into account GDP growth. Comparing these predictions with actual trade growth, we find the predictions are in the right order of magnitude. There are however substantial deviations which demonstrate that trade is affected by a number of aspects that are not captured by the gravity model.

1. Introduction[*]

In spite of considerable trade liberalisation over time, Norway's exports of goods still face significant tariff and non-tariff barriers. Figure 1 shows simple tariff averages for 135 countries using data mainly for 2007, for goods actually exported to each market. While tariffs are zero in eight markets, the median as well as the average value was around 7%. This also takes into account preferential tariffs in Norway's free trade agreements.

Figure 1: Tariffs facing Norwegian exports in 135 countries

Data sources: See Appendix A.



It is generally the case that poor countries have higher tariffs than rich ones, and globalisation implies increased trade with developing countries across the globe. Norwegian firms therefore face significant tariffs in a number of markets.

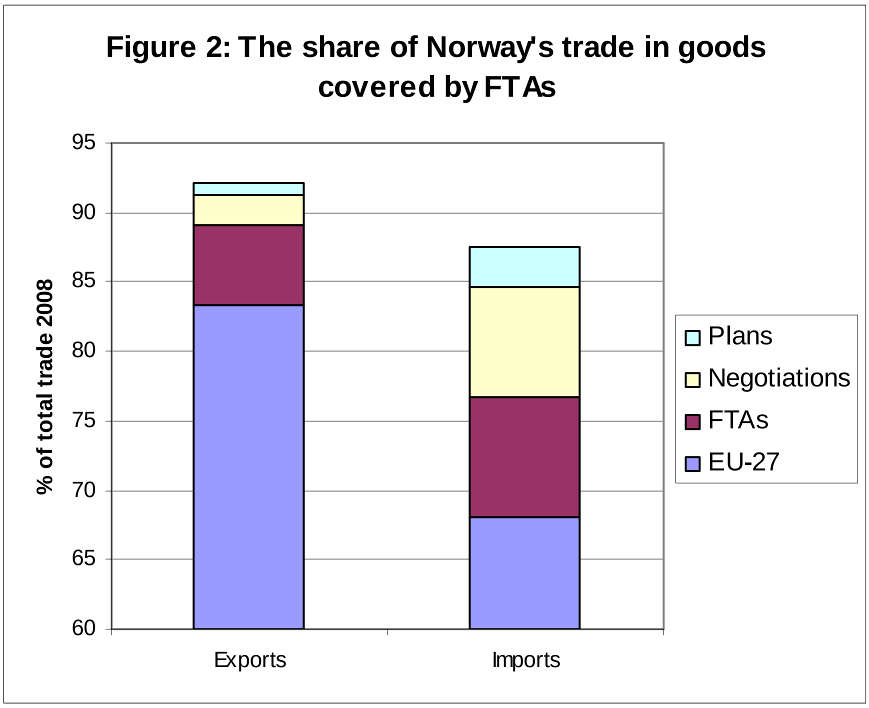
Tariffs may be reduced by means of WTO liberalisation, free trade agreements or unilateral tariff reductions by each country. In the current Doha Round negotiations of the WTO, there are proposals to cut tariffs but the failure of the round so far renders it uncertain when and even whether these reductions will be undertaken. This is one reason why a number of countries pursue free trade agreements (FTAs) in which tariff elimination or reduction is one important objective.

Norway participates in a number of FTAs as part of the EEA (European Economic Area) which currently covers EU-27 plus the EFTA countries Iceland, Norway and Liechtenstein (Switzerland does not participate in the EEA). In addition, Norway has 17 FTAs through EFTA; with Canada, Chile, Colombia, Croatia, Egypt, Israel, Jordan, Lebanon, Macedonia, Mexico, Morocco, Palestine Territory, Singapore, SACU (South African Customs Union, including Botswana, Lesotho, Namibia, Swaziland and South Africa), Korea, Tunisia and Turkey.[1] EFTA

[*] Funding from the Ministry of Trade and Industry is gratefully acknowledged and we thank the Ministry for comments to an earlier draft. In the project, Åshild Johnsen worked as research assistant responsible for data.

[1] As of May 2009, the agreements with some of these countries had not yet entered into force. This applies to Canada (expected to enter into force on 1 July 2009) and Colombia (signed November 2008, pending ratification).

negotiations are currently going on with 13 countries (Albania, Algeria, India, Peru, Serbia, Thailand, Ukraine and the Gulf Cooperation Council which comprises Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates). Norway is conducting negotiations bilaterally (not via EFTA) with China, and EFTA has a dialogue that may lead to future negotiations with three additional countries (Indonesia, Malaysia and Russia). Hence Norway currently has FTAs with 51 countries (with SACU=5), and have plans for, or negotiations with, another 17. If we consider Norway's total exports and imports of goods in 2008, these groups of countries represented the following shares of trade:



Hence if all current negotiations and plans for FTAs succeed, around 90% of Norway's imports and exports will be with FTA partners. Observe the asymmetry between exports and imports: Norway has a trade deficit for several actual and potential FTA partners outside the EU (e.g. China and South Korea) and therefore the share of non-EU actual or potential FTA partners is higher for imports.

As an illustration of the magnitude of tariffs, we calculate the actual tariff saving based on the data underlying Figure 1, covering 135 countries. According to this, Norway would in 2007 have paid tariffs worldwide of 1612 million USD, if ordinary MFN (Most Favoured Nation) tariffs had been applied. However, due to tariff preferences, the actual tariff burden was 54 million USD only. This estimates is based on the value of trade in 2007 and may change if the value of trade, or its composition across products or countries, change. In high-tariff countries, trade is limited because of the tariff, and such an estimate is therefore downward biased.

Hence even if current FTAs have eliminated a large part of the tariff burden, tariffs still remain and constitute an obstacle to trade in many markets. In which markets can tariff savings from FTA be significant, and where is the trade gain from tariff elimination potential largest? In order to shed light on this question, this paper analyses the impact of tariffs on Norway's current exports, and thereafter uses these estimates in order to predict how trade might change if tariffs in selected markets are eliminated.

Maurseth (2003) presented a similar analysis using tariff data for 1999. Using a modified gravity model, Maurseth estimated "tariff elasticities" for various product groups and used these to predict potential trade changes if tariffs were eliminated. In this paper, we start by replicating Maurseth's analysis as a benchmark, using more recent data for a larger sample of countries. While Maurseth had disaggregated tariff data for 41 countries, such data are now available for around 150 countries. We thereafter extend the analysis in various ways. Maurseth used general MFN tariffs, but our data reflect tariff preferences (FTAs). We also modify the analysis methodologically in some respects.

The paper proceeds as follows: In section 2 we present the data and some descriptive statistics. Section 3 addressed the gravity model and the forms used in the regression analysis. Section 4 presents regression results, and section 5 contains estimates of the trade potential if tariffs are eliminated for selected countries. Section 6 discusses the role of Non-Tariff Barriers (NTBs) compared to tariffs and uses some international estimation results in order to shed light on the magnitudes involved. In Section 7, we look back in time and examine ex post how trade predictions compare to real trade developments, for countries where Norway have agreed on FTAs after 1990. Section 8 concludes.

2. The data

A large database has been constructed for the project. In Appendix A, more information about classification and data is provided. The main sources of data are the following:

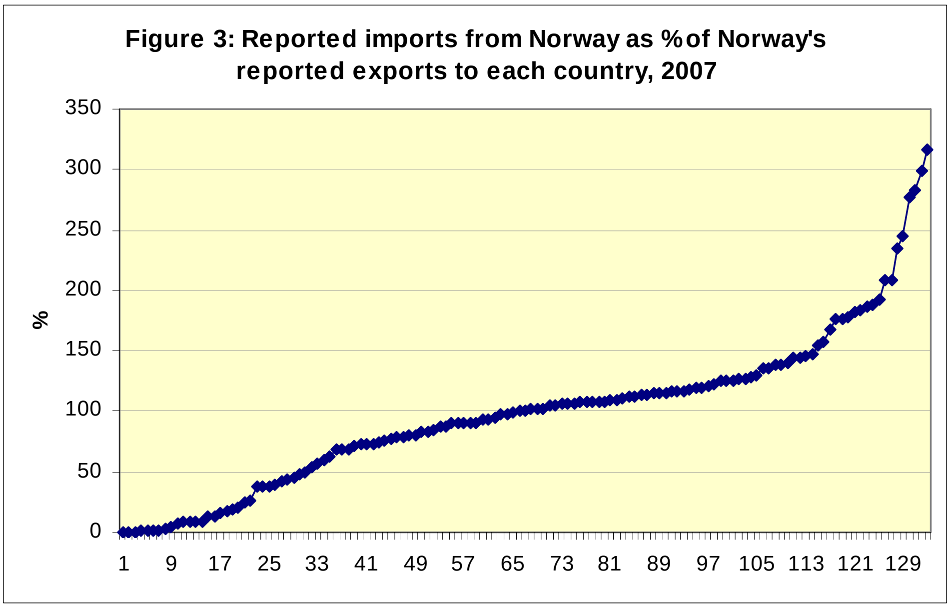
- Trade data are from the COMTRADE database of the United Nations, using the WITS (World Integrated Trade Solution) software provided by UNCTAD and the World Bank.
- Tariff data are mainly taken from UNCTAD's TRAINS database, also using WITS.
- Data on geographical distance are constructed from coordinates taken from the Global Cities database.
- Country data (GDP, GDP per capita etc.) are taken from the World Bank's WDI (World Development Indicators), online version 2009.

In general, the data set is constructed using the most detailed classification available for trade in goods at the international level; the 6-digit level of product classification. At this level, there are approximately 5000 products so a complete tariff data set for an individual country contains this number of observations.[2] Combining all countries in one large tariff data set we have 775 000 observations. There are however exports from Norway in a minority of cases, so using data with observed exports from Norway we

[2] Countries may have even more detailed classifications at the national level; e.g. Norway uses eight digits (see e.g. Melchior 2006 for information).

end up with 45 414 observations. This is the file used in the gravity regressions. We also run some regressions where trade is aggregated into one single observation for each country. The number of countries included in the regressions is maximum130 (due to some missing observations). In addition there are around 20 other countries for which tariff data are available and where it is possible to calculate the trade potential if tariffs are eliminated, using the parameter estimates obtained from regressions.

While the regressions are generally based on Norwegian export data, we use in some calculations Norway's market share as a parameter and for that purpose we have to use import data reported by the various export partners. In principle, Norway's exports of a product to some country should be similar to this country's imports of that product from Norway, save for the difference caused by transport and handling costs.[3] When comparing export and import data, however, we found huge gaps. This is illustrated in Figure 3, where we show each country's total imports from Norway as a percentage of Norway's total reported exports to that country in 2007.



If statistics were matching, the bulk of observations should be around 100% or slightly higher, but this is the case only for a small number of countries. For most countries there are considerable gaps. As an alternative, we considered to use the BACI database of harmonised international trade data, constructed by CEPII, France (www.cepii.fr). The latest year of trade in BACI is however 2005, and since a purpose of the analysis was to provide updated figures, we have chosen to use the COMTRADE export and import 2007 data simultaneously in some cases. Some caution should therefore be exercised with respect to the quality of the trade data. While the Norwegian instinct would be that Norwegian data are excellent and other countries' data poor, this is not fully supported by

[3] Technically, export values are f.o.b. (free on board) where as import values are c.i.f. (cost, insurance, freight included).

the evidence: According to CEPII, Norway is in the mid-range of the better group with respect to data quality (Gaulier and Zignago 2008).

In the TRAINS database, tariffs are reported in different forms:

- Bound tariffs (BND) are those negotiated in WTO and they constitute upper bounds for the applied tariffs.
- MFN applied tariffs are those actually applied to countries that have no special tariff preferences in a given market.
- Preferential tariffs (PRF) include tariffs in preferential trade agreements. The coverage of such tariffs in international databases has increased in recent years. In the regressions to be undertaken, we have data for most of the countries for which Norway has FTAs. Observe that PRF tariffs are reported only where such preferences exist and in order to obtain a full set of tariffs for all traded products, we have to fill in with MFN tariffs in cases where there are no preferences. The set of tariffs named PRF in the following is therefore a mixture of preferential and MFN tariffs.
- In addition, the TRAINS database reports an average (AHS) tariff which uses the tariff actually applied for each country. Hence if one asks for the AHS tariff for imports from the world for a certain product, one obtains an average of MFN and preferential tariffs.

In Figures 4 and 5 we report simple and weighted tariff averages for across products and countries, for 12 main sectors. The sector classification is provided in Appendix B, and Appendix A contains information on how averages are calculated.

Figure 4: Simple averages of tariffs facing Norway's exports in 2007, by main sectors

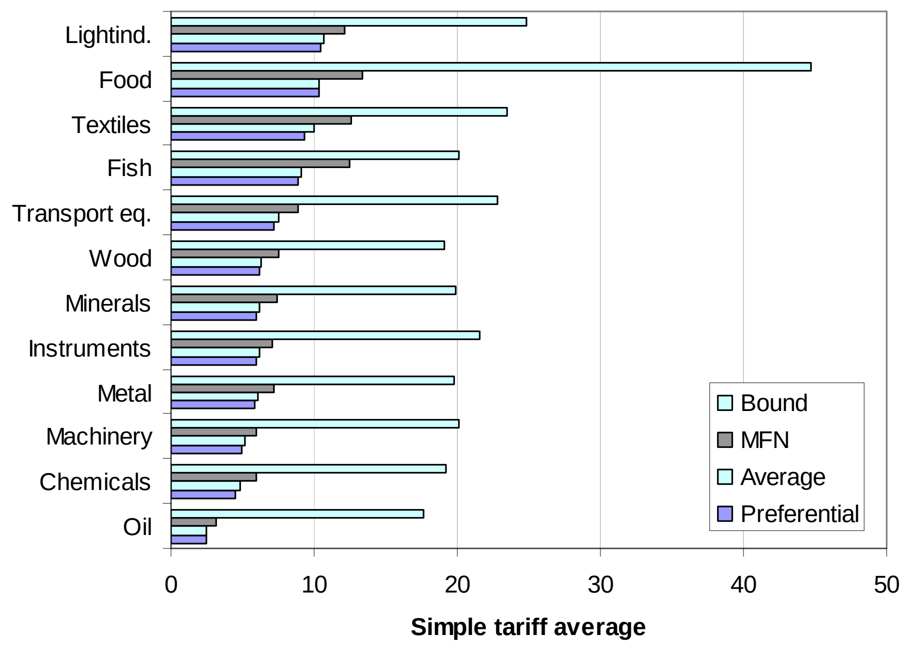
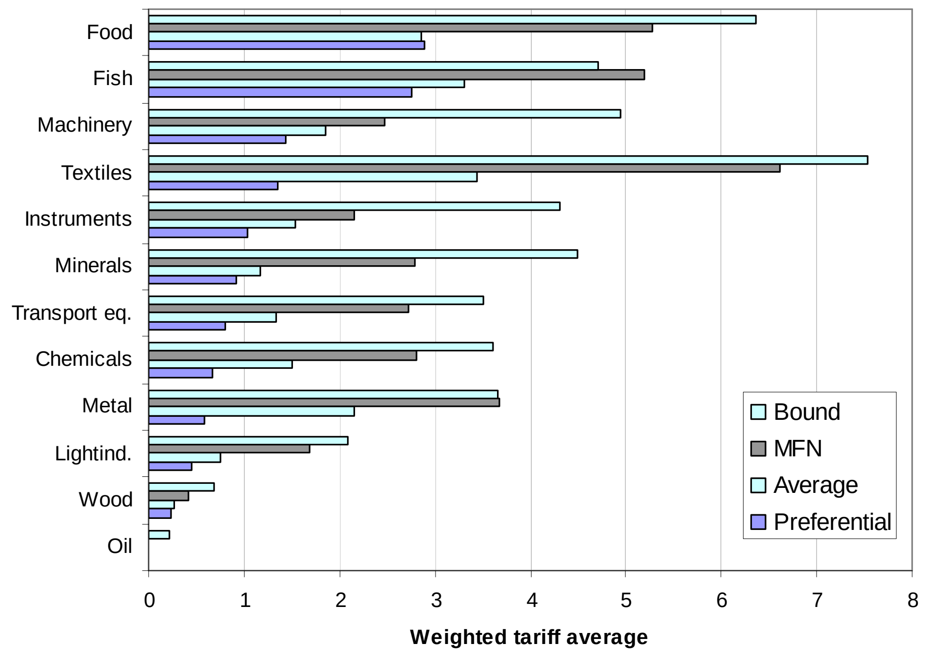


Figure 5: Weighted average of tariffs facing Norway's exports in 2007, by main sectors



According to the simple averages, bound tariffs are far higher than all other tariff types; illustrating that WTO negotiations are to a considerable extent about “water in the tariffs”. For many countries, large tariff cuts are required before bound tariffs get down to the MFN applied tariff level.

According to the simple averages, there is not much difference between MFN, average and Norway’s tariffs including preferences. This is because there are no preferences for the majority of product/country observations in the sample. When weighted by Norway’s exports, however, all tariff levels are substantially reduced and the relative difference between PRF, AHS and MFN increases. In most sectors, tariff preferences for existing trade are substantial. This is mainly driven by the preferences in the European markets. However, Figure 5 also shows that Norway is not the only country having preferences: In many cases, AHS is mid-way between MFN and PRF, suggesting that many other countries also have tariff preferences. For example, Norway has obtained substantial tariff cuts for “white fish” such as cod in the EU market, but a closer look reveals that almost all other significant suppliers have at least as good preferences in the EU market (Melchior 2007). Hence even when the MFN tariff is high and the PRF tariff is zero, the *relative* preference or discrimination effect may be limited. In some markets, it could also be the case that AHS is lower than PRF, if other countries have preferences but not Norway.

The ranking of sectors differs in Figures 4 and 5. According to weighted averages, food, fish and machinery are sectors facing higher tariffs. Since exports of food products are more limited, one may expect a larger trade potential for fish and machinery if tariffs are reduced. We will see later that this is indeed the case.

Observe that trade-weighted tariff averages for oil products are zero, except for the bound tariffs. Hence there is no trade potential for oil if tariffs are reduced, and we obtain no estimates for "tariff elasticities" in the regressions to be undertaken.

3. The gravity model

Ever since its introduction by Linnemann (1966), the gravity model has been a workhorse for applied work on international trade. In spite of some ambiguity about the model's trade-theoretical foundation, it is an astonishingly robust empirical relationship that has prevailed in spite of changing focus in trade theory. The basic form of the gravity equation is as follows:

$$(1)\ \ln(Trade_{ij}) = \alpha + \beta_i * \ln(GDP_i) + \beta_j * \ln(GDP_j) + \gamma * \ln(Distance_{ij})$$

Depending on the specification, $Trade_{ij}$ can be exports from country i to country j, or total trade (exports + imports) between the two countries. In the former case, we use subscript i for the exporter and j for the importer. The β parameters then measure the impact of exporting and importing country size, and γ measures the impact of distance. The gravity model can be rationalised within different theoretical approaches. Total supply and demand tend to increase with country size and with suitable functional forms this may generate trade as a "multiplicative" function of the two GDPs. In the new trade theory, country size also affects comparative advantage due to "home market affects" and this adds another potential explanation of gravity. The new economic geography adds another layer since GDP levels may depend on location and distance. A next step in developing theoretical approaches to gravity may be to incorporate this perspective properly; which has been done only to a limited extent.

When the gravity equation is used for exports + imports, the estimates on GDP are usually symmetrical; of equal size, positive and normally somewhat below one. If the gravity model is applied for trade at the sector level, however, the estimates β_i and β_j on GDP may differ. If large countries have an advantage in the production of some goods due to scale economies, as predicted by the new trade theory, we will generally have $\beta_i > \beta_j$ (see e.g. Melchior 1996 or Feenstra, Markusen and Rose 2001).

The distance parameter γ is normally negative, with estimates ranging from -0.28 to -1.55 with a typical outcome around -0.9 (Disdier and Head 2008).Distance is just a proxy for various trade costs that depend on distance and if other trade cost variables are added, the absolute value of the distance parameter could be reduced. In principle, the distance parameter could become insignificant if we are able to measure all trade barriers correctly. When comparing gravity regressions from the 1950s and recent ones, the distance parameter estimates has not changed much and some have interpreted this as the "missing globalisation puzzle". However, γ measures the elasticity or relative effect, and not the level, so if all transport costs are reduced by half there is no reason to expect this parameter to change (see Buch et al. 2004 for a discussion).

A hidden problem in the gravity model is that GDP may depend on geography, for example if centrally located countries have higher GDP levels due to a better location. Hence GDP may be endogenous and depend indirectly on distance. A first step towards correction for such biases is to include a term in the gravity equation that captures location, for example a market potential variable measuring "remoteness" (see e.g. Anderson and Wincoop 2003). In recent years there has been vivid discussion also concerning other methodological issues related to gravity; see e.g. Baldwin and Taglioni (2006) for a useful contribution. One such issue is how to handle zero observations: In a bilateral trade matrix between many countries there are many zeros and unless one takes them into account, estimates could potentially be biased.

The problem of "remoteness" is more serious if we estimate the gravity equation with multilateral data for many countries. In our case, we will use data for Norway's exports only and the equation changes to:

(2) $\ln(\text{exports}_{kj}) = \alpha_k + \beta_k * \ln(\text{GDP}_j) + \gamma_k * \ln(\text{Distance}_j)$

Where the i subscripts have been dropped since they will be common to all observations, but we have added a subscript k since we will run regressions for different sectors k. Hence we can check whether the estimates β_k and γ_k vary across sectors.

We now follow Maurseth (2003) by adding a tariff term to the gravity equation, which becomes

(3) $\ln(\text{exports}_{kj}) = \alpha_k + \beta_k * \ln(\text{GDP}_j) + \gamma_k * \ln(\text{Distance}_j) + \mu_k * \ln(t_{kj})$

The tariff term t_{kj} refers to the tariff in country j for sector k. We have tariffs at the 6-digit product level, but group these into 12 main sectors k. In Appendix B, the sector definition is provided. We will undertake some regressions using aggregate sector trade data and average tariffs for the sector, and some regressions at the product level. For the aggregate sector regressions, the number of observations depends on the number of countries in the sample (maximum around 130 due to missing data for some variables). When running disaggregated regressions, we assume that the parameter estimates are common to all products within a sector.

With disaggregated regressions there is a problem involved in (3) since it mixes products with different magnitudes. For example, the fish sector contains salmon which is exported in large volumes and values to many countries, along with some product with small exports to a few countries only. Maurseth (2003) took this into account by adding the total exports of each product as a right hand side variable, in logs. Maurseth also included the log of GDP per capita in the equation, given that tariffs and income levels are correlated and there could be an omitted variable bias unless the income level is taken into account. The equation then becomes

(4) $\ln(\text{exports}_{kpj}) = \alpha_k + \beta_k * \ln(\text{GDP}_j) + \gamma_k * \ln(\text{Distance}_j) + \mu_k * \ln(t_{kpj})$
$+ \lambda_k * \ln(\text{exports}_p) + \varphi_k * \ln(\text{GDP per capita}_j) + \text{residual term}_{kpj}$

where subscript p are added in three of the terms. We use this as a starting point and benchmark, which we will later modify and elaborate.

Note that in the regressions, tariffs are always expressed in the form

(5) $\ln(t_{kj})$ where $t_{kj} = (100+TARIFF_{kj})/100$

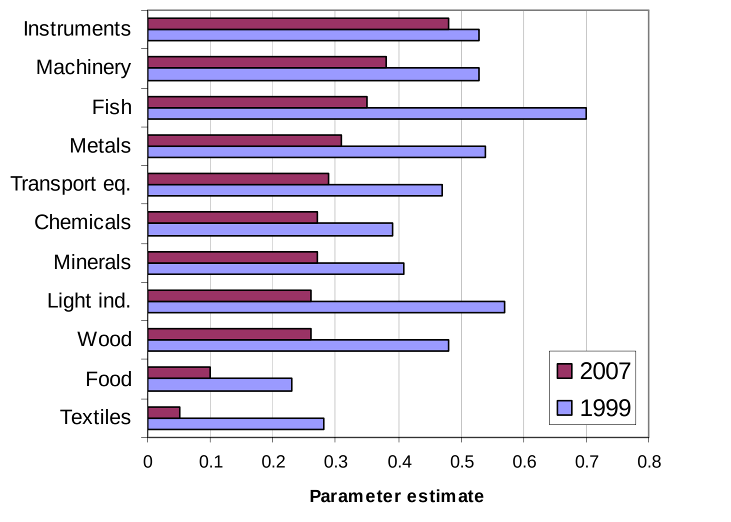
Hence if the tariff is 10%, t_{kj} is 1.1. If the tariff is zero, we have $t_{kj}=1$ and $\ln(t_{kj})=0$. Using this form, the parameter μ_k can be interpreted as an ordinary elasticity; a 1% tariff change is approximately equivalent to a 1% change in the price.

4. Regression results

As a starting point, we replicate the results of Maurseth (2003) with disaggregated data at the product level, using equation (4). We will refer to this as "**Model 1**". Table C1b in the Appendix shows the results. Table C1a in the Appendix compares the main parameter estimates with those obtained by Maurseth (2003).

The two sets of estimates are methodologically identical although a bigger data set with more observations, covering many more countries, is used for 2007. In most sectors, R^2 is however lower in 2007, and the estimates on GDP and distance are smaller in absolute magnitude. Figure 6 compares the estimates on GDP, i.e. the parameter β_k.[4]

Figure 6: Parameter estimates for GDP, 1999 and 2007



A similar but not so strong pattern is observed for the distance parameter. Hence the results suggest that the gravity equation tends to lose some of its explanatory power over time.We also undertook gravity regressions with total Norwegian exports to different countries for various years as the trade

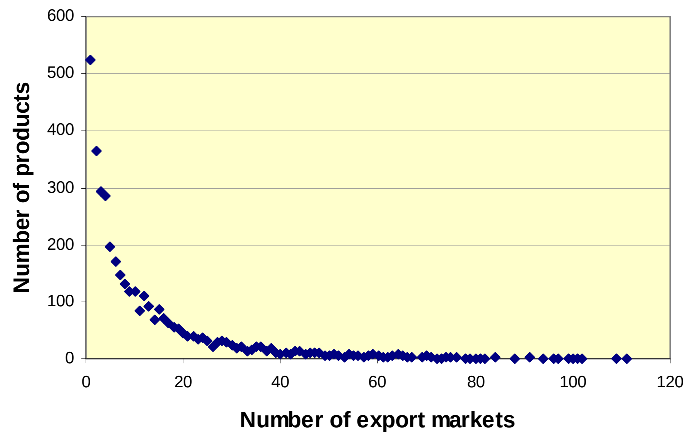
[4] The oil sector is not reported since the 1999 estimate was non-significant and the number of observations is very low.

variable (not reported here), and these confirmed this trend: At least for Norway, the gravity equation tends to lose some of its explanatory power over time. Detecting the reasons for this is an interesting task for further research: Has the "world become smaller" so that distance becomes less important, or have scale economies become less important so that country size matters less for the trade pattern?

In spite of this deterioration in the fit of the gravity equation, parameter estimates are in general still highly significant and the model can be used for our purpose: To estimate the impact of tariff barriers. Turning to tariffs, the elasticities reported in Table C1 and C2 are mixed both for the 1999 and 2007 results: Some are higher in 2007, and some lower. Some are non-significant and some even positive. More work is therefore needed in order to provide a more reliable assessment of the tariff impact. The Model 1 estimates use MFN tariffs which do not actually apply to Norwegian exports and this may be cause biased results. We therefore introduce preferential tariffs, and also undertake other modifications of the model. In the following, we will report five other regressions, named Model 2- Model 6. Their motivation is explained in the following.

Model 1 uses product-level data and for many products, exports are limited and concentrated on very few markets. In the data set, we observe exports of 3746 products from Norway in 2007 but for many of these, the number of export markets is very limited. Figure 7 shows the frequency distribution.

Figure 7: The number of export markets per product



The horizontal axis shows the number of export markets (countries) per product and we see that more than 500 products were sold only one market. In these cases, the right hand side variable for total product exports will be identical to the independent variable, which is clearly an econometric problem potentially causing a bias. If we had run the regressions for these 500 products only, the total export variable would "explain" 100% of the variation in exports and the other variables would contribute little. Furthermore, we try to measure the impact of tariffs across markets but for these products there is clearly no variation in tariffs since there is only one tariff observation. Such variation is also limited for many other products that are sold to only a few markets. Products sold to less than 20 countries represent 81% of the products and 43% of the observations.

In order to address this problem; in **Model 2** we delete all products sold to less than 20 countries; thus reducing the number of observations by 43%. We could also have used a lower threshold but even with a threshold at 20 markets we have sufficient degrees of freedom. We try three different specifications: Pooled regressions maintaining the total product export variable on the right hand side, or panel (fixed and random) models where we drop the total export variable. There was however little difference between the three, and we therefore report the pooled OLS regression since it is easier to use for predictions of the trade potential later (since we do not have to use product-level dummies).

The results on tariffs from Model 2 are significant in more cases and the absolute value of the elasticities is on average higher. Still, however, there is uncertainty about the results since we use MFN tariffs, that actually do not apply to Norway's exports. In **Model 3** we therefore use preferential tariffs. We experiment with different specifications including pooled OLS as well as panel methods (e.g. with fixed or random effects for products, and with the reduced sample used in Model 2). There are not big differences across specifications, and we report OLS with the whole sample. Maybe surprisingly (since we now use PRF tariffs), the tariff elasticity estimates are not consistently higher compared to Models 1 and 2, but slightly lower.

A possible limitation of models 1-3 is that we do not distinguish between tariff cuts in the context of FTAs, and tariff cuts that apply to all suppliers. This distinction may be particularly important since a purpose is to evaluate the impact of potential FTAs. If Norway obtains privileged tariff cuts in a market, it can take over market shares from other suppliers worldwide. On the other hand if tariff cuts are given to all suppliers, such market share responses will be limited; all exporters may increase their supply by taking over shares from domestic suppliers.

In the regressions, we try to address this problem in various ways. One is to introduce a variable that measures the relative preference in a market. The difference between the average actually applied (AHS) tariffs and the PRF (preferential) tariffs may be used as an approximation to the relative tariff preference. In equation 6 we replace the tariff term in equation (4) with two new terms; one measuring the general tariff level in a market (using AHS), and one measuring the relative preference of Norway (using the ratio $t_{kpj-PRF}/t_{kpj-AHS}$).

$$(6)\ \ln(\text{exports}_{kpj}) = \alpha_k + \beta_k * \ln(\text{GDP}_j) + \gamma_k * \ln(\text{Distance}_j) + \mu_k * \ln(t_{kpj-AHS}) + \theta k * \ln(t_{kpj-PRF}/t_{kpj-AHS}) + \lambda_k * \ln(\text{exports}_p) + \text{residual}_{kpj}$$

Attempting this specification, we obtained some results in line with the prediction; e.g. for machinery we find an elasticity for the first terms of -2.49 and an elasticity for the relative preference term at -7.67. Similar results were found for five other sectors but only in one case were both estimates statistically significant at the same time. Running regressions with the relative preference term alone (see e.g. Hoekman and Nicita 2008 for an approach along these lines) did not improve results either; probably since then we miss the impact of the tariff level as such.

We therefore try an indirect route in order to assess the impact of preferences: A common approach in modern modelling of demand is two-step budgeting where consumers first choose between aggregates; and thereafter between varieties within each aggregate. In the context of Norwegian exports, we may think of a market where consumers in the first step choose their spending on some product (say some species of fish); and thereafter between different varieties of this (say Norwegian or Chilean salmon). Now the point is that the substitution elasticity between products (step 1) should be lower than between varieties of the product. Using a so-called CES function at the second step, we can derive the formula

(7) $e_{Nj} = -\sigma_i + s_{Nj} * (\sigma_i - \varepsilon_i)$

where σ_i is the "substitution elasticity" between suppliers in market j, s_{Nj} is the market share of Norway in market j and ε_i is the demand elasticity for the product in market j. If Norway has the whole market (market share = 1) it is not possible to take shares from others so the elasticity is equal to ε_i. But if the market share is zero, a tariff cut for Norway can make it possible to take shares from others, so the elasticity will be σ_i. Kee et al. (2008) estimate more than 377 000 (!) import demand elasticities and find a global average across products and markets of -3.12. This covers all imports to a country so it does not correspond directly to any of the terms in (7). According to the literature, the elasticity of substitution could typically be around 5 while the demand elasticity might be around 1-1.5. For a preferential agreement the appropriate value should be between, but more likely closer to the higher end. If the demand elasticity ε_i is used, one may underestimate the trade potential.

As an attempt to capture this, we calculate the share of Norway in the total imports for each country/product and use the following specification:

(8) $\ln(\text{exports}_{kpj}) = \alpha_k + \beta_k * \ln(\text{GDP}_j) + \gamma_k * \ln(\text{Distance}_j)$
$+ \mu_k * \ln(t_{kpj\text{-}PRF}) + \theta_k * s_{kJ} * \ln(t_{kpj\text{-}PRF}) + \text{residual}_{kpj}$

We then expect the parameter μ_k to be negative and the parameter θ_k to be positive. We estimate this using ordinary OLS as well as fixed and random effects. The results from differet approaches are similar and we report the OLS estomates. This is **Model 4**, with detailed results provided in Table C4 in the Appendix.

Table 1: Estimates indicating that the elasticity depends on market share Selected results from Model 4 estimation. Details are in Table C4 in the appendix.		
Sector	Parameters	
	Pref. tariffs μ_k	Share term θ_k
Food	-2.11**	12.18**
Fish	-7.14***	8.87***
Minerals	-7.92***	28.21
Chemicals	-5.03***	90.52***
Wood	-0.83	82.14**
Metals	-3.93***	122.64***
Textiles	1.07	24.90***
Machinery	-3.24***	77.63***
Transport eq.	-0.02	24.54
Light ind.	-1.94	121.23***
Instruments	-3.97**	79.27***
Note: Significance levels indicated by *** (P value<0.01), ** (0.01<P value<0.05).		

The parameter to the left should in principle capture the elasticity of substitution, while the second parameter captures the last term in (7). In order to find the demand elasticity for Norway's exports, we use (7) at the product level and then calculate simple averages across products.

Models 1-4 are all estimated with disaggregated data at the product level. Some potential problems have been discussed but there may be even more problems due to the heterogeneity. We have tried panel approaches but there are some problems involved due to the highly unbalanced nature of the data, with the number of countries per product as well as the number of products per country varying strongly. With disaggregated data there may also be greater problems with outliers as well as data errors. As an attempt to address these issues we therefore also estimate the elasticities using aggregate data at the sector level. In this case we do not need dummies or variables correcting for heterogeneity across product, and we can run a simple cross-section. The number of observations now depends on the number of countries, and the maximum in a sector is 130. In **Model 5** we use MFN tariff data, and in **Model 6** we use preferential tariffs. The detailed results are found in Tables C5-C6 in the Appendix. For tariffs, the results are significant for the majority of sectors. With aggregated data, the GDP estimates are generally higher than for product-level data. This may be natural since there will be more heterogeneity at the product level and many aspects driving export performance at the product level.

In Table 2; we sum up the estimates on tariff elasticities for the six models, including the Model 4 elasticities calculated on the basis of Table 1 above. As noted, there are no tariff barriers for oil exports and therefore no elasticities to report for this sector. For the remaining 11 sectors we present 6*11=66 tariff estimates. The results are consistent in the sense that there are significant tariff elasticity estimates with the expected negative sign in the majority of cases (41/66 or 62%). Parameter estimates are not significantly different from zero in 23 cases (35%), and significantly positive in 2 cases (3%).

Table 2: Comparison of estimates for tariff parameters

Results from OLS regressions by product group

Data	Disaggregated data at the product level				Aggregated data for each country		Range used for prediction	
Model	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**		
Method	Pooled OLS by group	Pooled OLS by group	Fixed effect by group	Pooled OLS by group	Pooled OLS by group	Pooled OLS by group		
Observations used	All obs.	>20 countries per product	>20 countries per product	All obs.	All	All		
Parameter	MFN tariff	MFN tariff	Pref. tariffs	Pref. tariffs dep. on share	MFN tariffs	Pref. tariffs	Lower	Upper
Food	-1.90***	-3.07***	-2.50***	-1.44**	-6.59***	-6.05***	-1.90	-6.59
Fish	-4.10***	-5.06***	-2.51**	-4.82***	-4.66	-2.21	-2.51	-5.06
Minerals	-4.32***	-12.68***	-4.22***	-5.47**	-20.18***	-19.77***	-4.22	-20.18
Chemicals	-1.25*	-3.69***	-1.64**	-1.92***	-5.20*	-6.73**	-1.25	-6.73
Wood	2.86**	1.65	2.39***	0.72	-7.19***	-9.59***	0	-9.59
Metals	-1.76***	0.52	-1.01*	0.35	0.20	-0.12	0	-1.76
Textiles	-2.05***	-2.08***	0.57	1.91	-6.08**	-6.66***	-2.05	-6.66
Machinery	-1.18***	-4.24***	-2.34***	-1.81***	4.27	3.70	-1.18	-4.24
Transport eq.	0.50	-2.19**	-1.34	0.87	-6.42**	-6.28	0	-6.42
Light ind.	0.23	-1.93*	-2.47***	-0.42	-6.48***	-6.13**	-1.93	-6.48
Instruments	0.62	-4.04***	-0.89	-2.15	-5.94	-6.05	0	-4.04

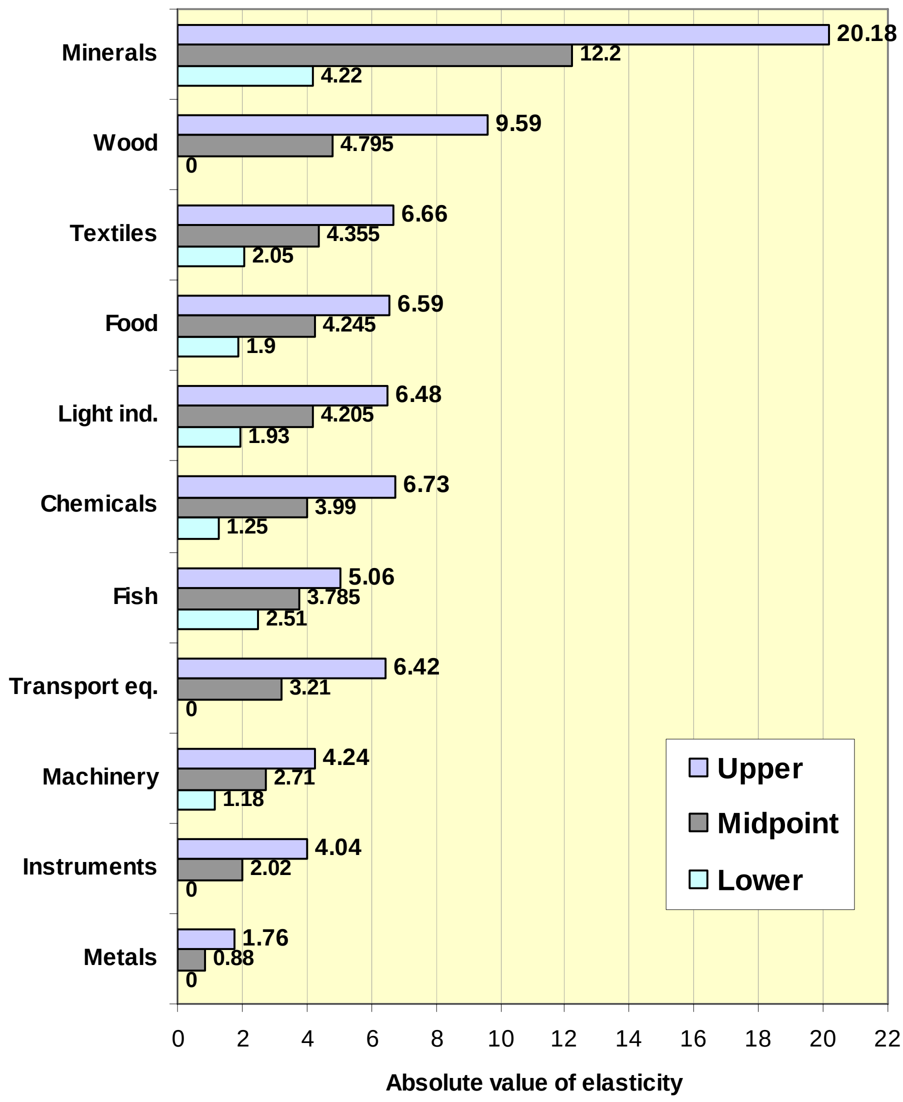
Note: Significance levels indicated by *** (P value<0.01), ** (0.01<P value<0.05) and * (0.05<P value<0.10). For model 4, elasticities are not directly estimated but calculated from other parameter estimates (see equation in text).

Model 2 is the “best” according to the number of significant estimates with the expected sign; with elasticities that are significant and negative in nine out of 11 cases. However, we can not be sure that these are the true values, and therefore also have to take into account results from the other models. To the right in the table, we list ranges with lower and upper bounds that will be used for analysing the impact of tariff changes.

- For seven sectors, the estimates are significant in the majority of cases and we use the lowest and highest significant estimate to define the range. This applies to food, fish, minerals, chemicals, textiles, machinery and light industry.
- For the four remaining sectors, the results are more mixed, with more non-significant results, and even two positive estimates for one sector (wood). Due to the uncertainty about these result, we use zero ass the lower bound and the highest significant estimate as the upper bound.

With these criteria, we obtain the tariff elasticity ranges shown in Figure 8.

Figure 8: Range for tariff elasticities



There is a considerable gap between lower and upper bounds but we deliberately report this range in order to illustrate the uncertainty. It is well known from research in the field that estimates at the detailed product level tend to give estimates with a lower absolute value. This is also the case here, but it is difficult to decide to what extent the lower or higher estimates are the "true" ones. In spite of this uncertainty about the exact magnitude, the regressions strongly indicate that tariffs have a real effect and their elimination will led to increased trade. We expect the true value of the elasticity to lie within the lower and upper bounds, and in the graph the midpoint within each range is also indicated. This midpoint does not correspond closely to any of the estimated models individually, since the ranking of elasticities across sectors depend at least for some sectors on specification. For example, Model 2 is in the upper range for some sectors but in the intermediate or lower range for others. By using different models to derive the range of elasticities, the aim is to obtain a more reliable overall assessment.

The average of the midpoint estimates across sectors is -3.74; i.e. somewhat higher than the average of -3.12 found by Kee et al. (2008). This is however plausible since their estimated was for all imports; and according to the reasoning underlying model 4, our estimate should be higher in absolute value. Our average is pulled upward by the high value for minerals; for the other 10 sectors the average is -2.85. This is a bit below the Kee et al. (2008) result. On the whole, however, we may say that our estimates are in line with the most recent international literature in the field.

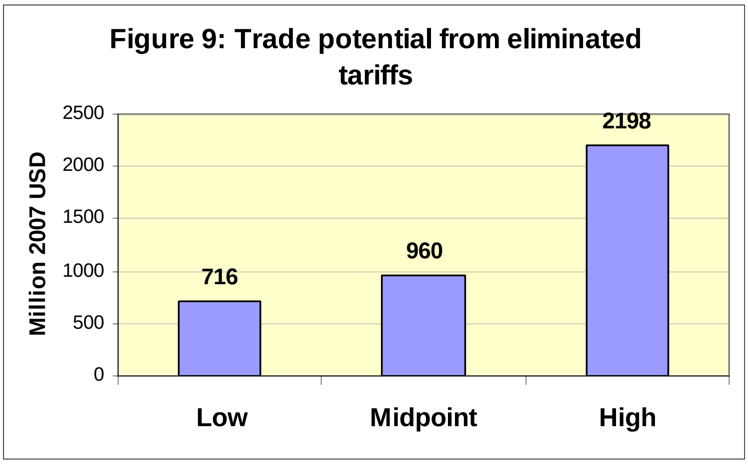
5. The impact of tariff elimination

We estimate the impact of tariff elimination using the lower, midpoint and upper estimates of tariff elasticities. One method would be to use these directly to scale existing trade up, using these estimates. This would however be inaccurate since we would assume that also the regression residuals (the unexplained part of trade) would be scaled up or down by tariff changes. We therefore use predicted values with and without tariffs in order to calculate the trade potential, as the difference between the two.

We undertake this calculation using aggregate trade data by sector/country, as used in model 6. Since the parameter estimates on GDP, distance and the constant term differ considerably depending on whether we use aggregated or disaggregated data, we use the average of estimates from Models 5 and 6 (undertaken with aggregate data), for calculating the predicted trade. In this way we obtain a predicted trade potential if tariffs are eliminated, disaggregated by countries and sectors. We calculate a lower, midpoint and upper estimate using the tariff elasticities in Figure 8. We report figures in 2007 USD.

For these calculations, we use *simple* tariff averages by sector/ country. An alternative might have been to use weighted tariff averages since these correspond better to tariffs actually paid. The problem with this, however, is that if the tariff elasticity is above 1 in absolute value, tariffs will reduce trade more than proportionately so that trade value will be small if the tariff is high. For this reason weighted tariff averages are generally lower than simple averages. The weighted averages however underestimate the true impact of tariffs. One approach is to use estimated elasticities to find what trade would have been in the absence of tariffs, or construct a "trade restrictiveness index" (TRI) that takes this allocation effect into account. Kee et al. (2008) calculated such indexes and found that at the country level, weighted tariff averages would underestimate the tariff impact by on average 64%. We have not calculated TRIs here, but we use simple tariff averages for prediction in order to reduce the "substitution bias" obtained with weighted averages.

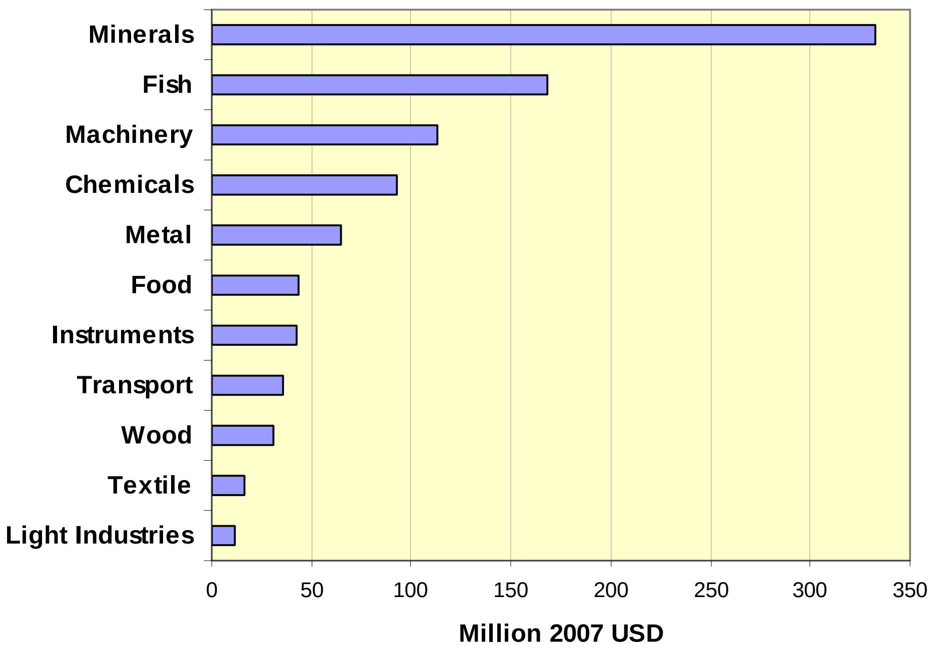
Figure 9 shows the overall predicted trade potential summed across all sectors and countries.



Depending on the elasticities applied, the trade potential varies from 711 to 2174 million USD, based on 2007 trade data. Recalculated into 2007 NOK the range is 4.2-12.9 billion NOK. This is equivalent to 1.22-3.74 % of total exports excluding oil and gas in 2007. Hence even if tariffs are low in many important markets and for some export products (for example oil and gas), there is a significant trade potential.

The trade increase is significant for some markets and products. Figure 10 shows the mid-point estimate of the trade potential across sectors (oil excluded since the potential is zero).

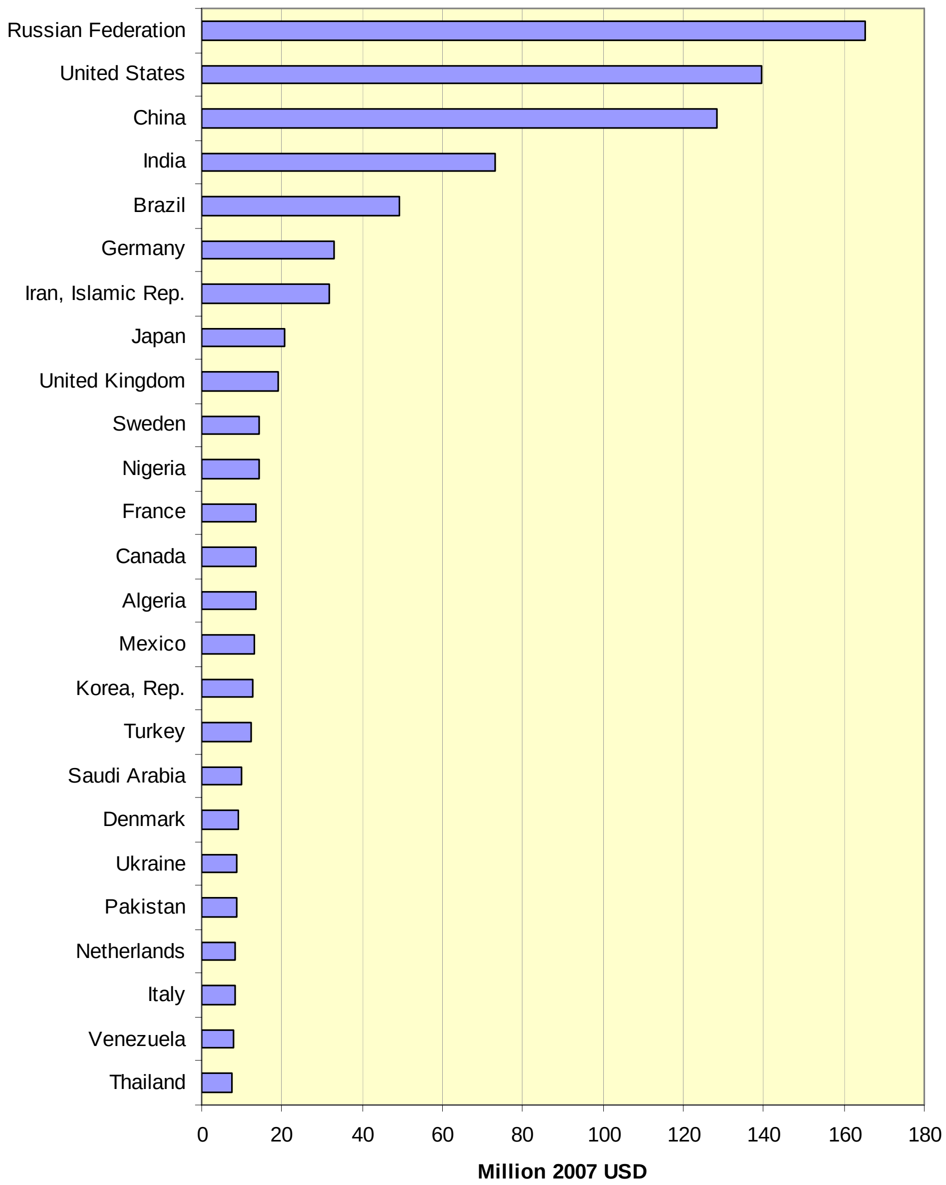
Figure 10: Trade potential by sector



The trade potential is highest for minerals, fish, machinery and chemicals. While the latter three were to be expected, the estimate for minerals is more surprising. This is mainly driven by the high elasticity estimate for minerals, which is persistent across specifications in Table 2. The trade potential for minerals is particularly found in the USA and the BRICs.

Turning to the export potential by countries, Figure 11 shows the trade potential for the top 20 countries among the 157 included in the analysis. Also here we use the mid-point estimates. Table D1-D3 in the Appendix shows the trade potential (lower, midpoint, upper estimates) by sector and the total, for a list of selected countries. Among these, there are candidates for future FTAs and the tables may be used in order to assess the trade potential from tariff cuts.

Figure 11: Trade potential by country, for the top-25



Not surprisingly, the BRICs and the USA rank highest, followed by Germany, Iran and Japan. The figure includes some EU countries due to tariffs for agriculture and particularly fish. The trade potential may however be overestimated since there are tariff-free quotas for fish in the EU so true tariffs are actually lower than according to the TRAINS data (Melchior 2007). The current trade volume is however large with the EU and for that reason the trade potential may be significant even for modest tariff cuts.

6. Non-tariff barriers

Tariffs for trade in goods are only one of the numerous elements covered by FTAs and such agreements may cover services, intellectual property rights, investment etc. The European internal market is probably the clearest example showing that the impact of an FTA may extend far beyond that created by lower tariffs. Tariff reductions through the WTO and unilaterally have led to considerable reductions so tariffs are lower than a decade or two ago. This also reduces the potential gains from tariff elimination.

In some countries, tariffs may be low but non-tariff barriers (NTBs) for trade in goods may be high, and there may be gains from eliminating NTBs as well. Recently, new estimates have been made internationally about the impact of NTBs, and we will use these in order to shed light on the issue. The recent paper of Kee et al. (2009) includes data on NTBs in 72 countries, including 30 countries in the list of countries with a particular focus in our analysis. Figure 12 shows estimates for trade restrictiveness indexes (correcting for substitution bias) for tariffs and NTBs for these countries (plus Norway for comparison).

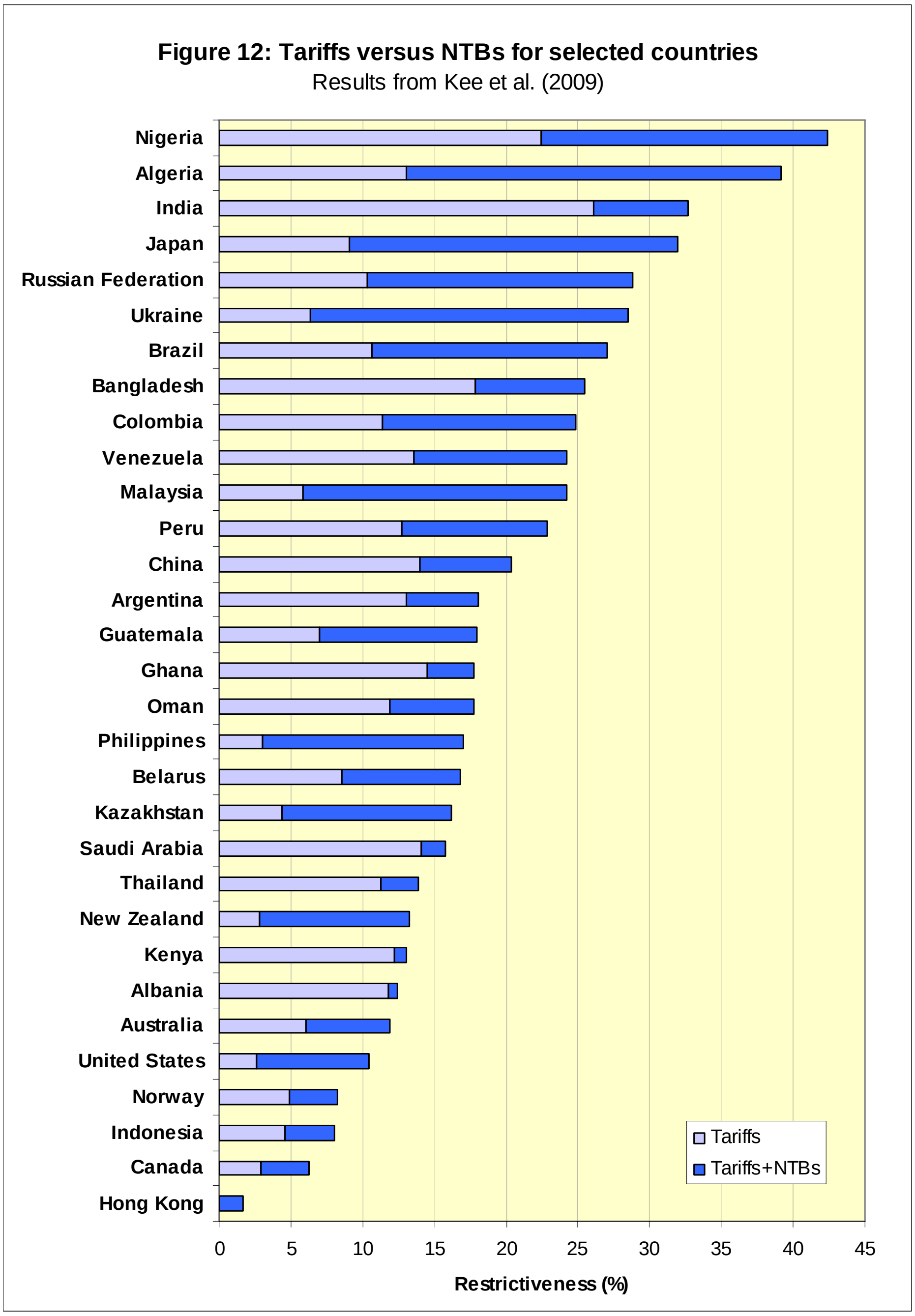


Figure 12 illustrates that for some countries, NTBs constitute the major share of overall barriers in a number of countries. While it is on average (for a lager sample) true that high-tariff countries often also have high NTBs, this relationship is not at all monotonous. Hence one finds low-tariff countries such as the USA, New Zealand and the Philippines that have high NTBs, and one finds higher-taruiff countries such as China and India where the registered magnitude of NTBs is relatively lower. A general precaution should be taken about the data; measuring NTBs is a difficult task and the estimates shown are based on available data.

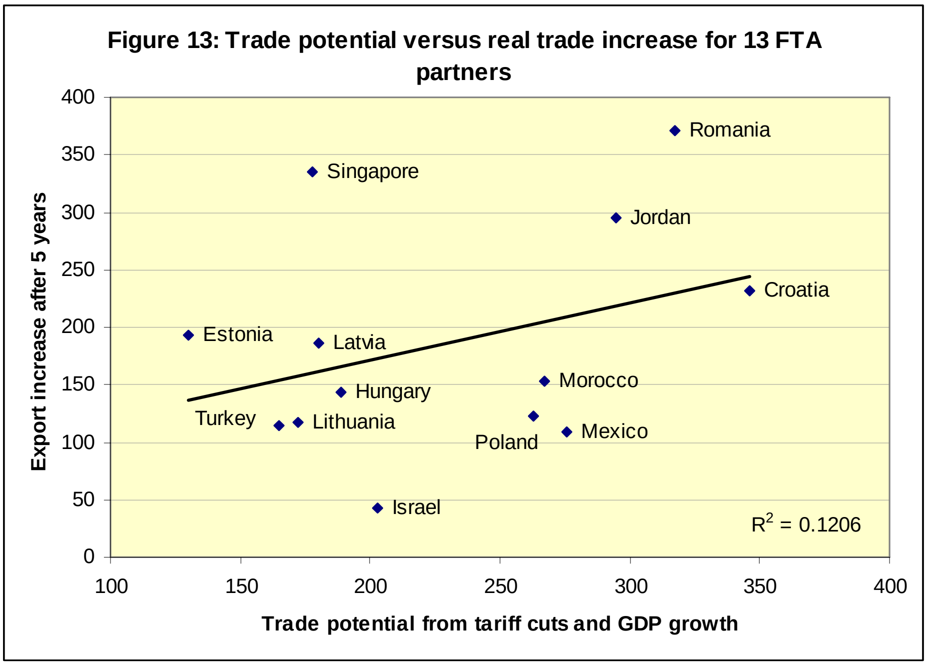
In spite of these data reservations, Figure 12 is sufficient to show that in FTA negotiations, NTBs should be particularly high on the agenda with respect to some countries.

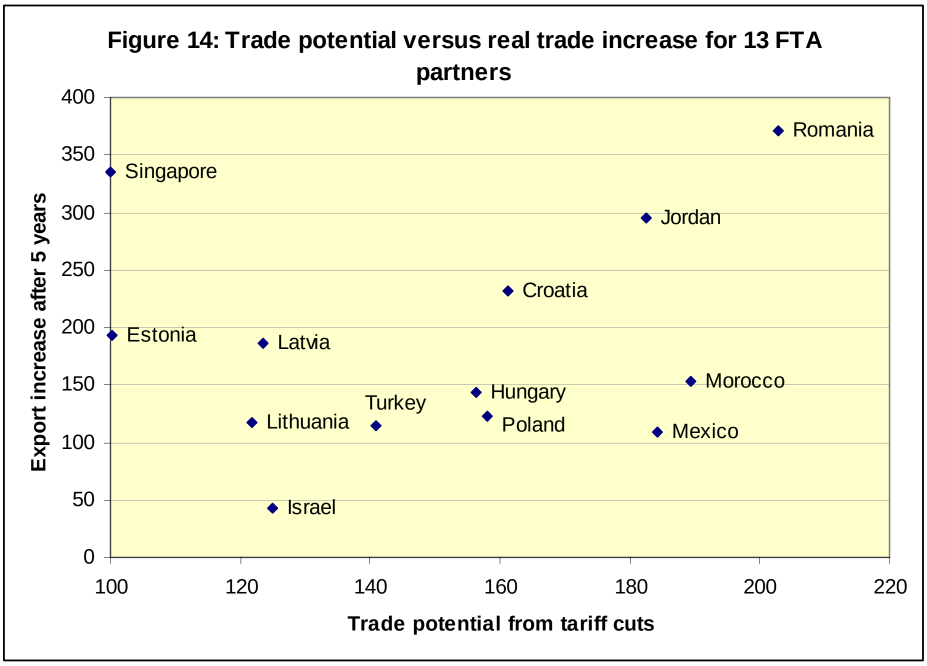
7. Dynamic gains: An ex post assessment of trade predictions for current FTAs

The estimates are based on trade and GDP levels in 2007 and therefore static: They do not take into account GDP growth or other changes that may also affect trade.

As a check on how such predictions compare to actual trade developments, we will examine how similar predictions would fare, for FTAs that Norway has entered into after 1990. In Table E in the Appendix, we list these agreements, with the year of entry into force and information about tariffs and trade. For these countries, we undertake a simplified calculation of predicted exports five years after the entry into force of the agreement. We then compared this prediction with the actual trade development. For the trade potential estimates, we take into account tariff cuts as well as GDP growth. Table E in the Appendix contains the detailed information. The calculation is simplified for two reasons: For the trade potential, we scale up or down existing trade without taking into account how well it is explained by the gravity regression. In the former results, we compared predicted values from the regressions only. Second, we use nominal trade figures in USD without attempting to find the appropriate deflators, which creates some inaccuracy.

In Figure 13, we show the results for 13 FTA partners. We show the predicted trade potential from tariff elimination and GDP growth along the horizontal axis (with minimum=100), and trade 5 years after the entry into force of the FTA on the vertical axis. In Figure 14, we show a similar graph but with the predicted trade potential from tariff cuts only on the horizontal axis.





There is a positive albeit not too impressive association between predictions and actual trade growth, with R^2=0.12 for the regression line indicated in Figure 13. In Figure 14, some countries are lined up close to a ray from lower left corner. These are Israel, Latvia, Turkey, Hungary, Poland, Croatia, Jordan and Romania. For these, there is a relatively good proportionality between trade potential and true ex post exports. Singapore, Estonia, Mexico and Morocco are however outliers. GDP growth explains part of the gap, and for Mexico an issue may be that tariffs have not been fully eliminated yet. Figure 13 suggests that the average order of magnitude for predictions is acceptable. For some countries, however, predictions are too high, e.g. Poland and some other countries in Central Europe. In some of these cases, export growth was higher after the first 5-year period and it is hard to say how long time it takes before a trade potential is realised.

It is also evident that trade may be affected by a number of aspects beyond those captured by our regression models. For example, security problems and instability may affect trade. For the Palestine Territory, trade remains close to zero in spite of free trade, for obvious reasons, and trade between Norway and Israel has fallen in spite of the FTA. For the majority of Norway's FTAs there has been fast import growth in spite of modest tariff barriers, in many cases faster than export growth. Even in cases where GDP growth as well as the tariff reduction was larger in the partner country than in Norway, imports into Norway grew faster than exports to the country in question. This indicates that FTAs may have an institutional side which is not captured by our predictions. Furthermore, liberalisation may shift the composition of trade because of comparative advantage, and this is not necessarily captured in gravity-based approaches.

Another limitation with static trade predictions is that if initial trade is zero, the prediction for the future will be zero whatever is the scaling. It is easy to find examples of such cases where trade has "taken off", so the trade increase can be much higher than what we might obtain from static predictions. Russia and Ukraine are examples where trade has expanded rapidly in recent years.

As Russia and Ukraine also illustrate, tariff cuts are also often part of a broader reform process in countries and it can be difficult to establish whether tariffs alone "cause" trade to increase, or if other aspects such as institutional changes and changes in the economic structure is the main driver. Hence if many other variables were to be included in regressions, they could "weaken" the role of tariffs and in some cases even make parameter estimates insignificant. In this paper, we do not try to sort out these more complex interactions between tariffs and other features of the economies of the trade partners.

Hence our gravity model only captures some of the forces driving trade. Static trade predictions provide a tool for examining proportions and sector distribution, but they do not capture all important aspects. These limitations should be kept in mind when interpreting the results.

8. Concluding comments

This analysis has shown that even if tariffs facing Norwegian exports have been eliminated or reduced in many markets, there is still a considerable trade potential to be gained from further tariff elimination. Our estimates suggest trade can increase by 1.2-3.9 percent or 4-13 billion NOK; with the largest increases for the exports of minerals, fish, machinery and chemicals.

In order to derive these predictions we have estimated the impact of tariffs on trade, using a large dataset for 2007. By trying different estimation models we have shown that there is some uncertainty about the exact magnitude of the elasticity estimates, and we have therefore indicated a range for the trade potential with lower and upper bounds. Using historical data we have shown that gravity-based predictions are correlated with true trade developments, but trade is affected by a number of other aspects that are not taken into account in the analysis.

In the analysis, we also observed that the predictive power of gravity regressions tends to shrink over time. The reasons for this constitute an interesting issue for future research. In the analysis, we have also argued that tariff elasticities used to examine FTAs should be different from elasticities related to tariff changes for all imports of a country. We were not fully able to distinguish between the two empirically, but found some evidence supporting this argument empirically.

The study has been made within a short period of time and more work could be done in order to refine the econometric approach; for example by controlling for country-level heterogeneity and zero trade flows. In spite of this we believe that the estimates presented provide a useful tool for assessing the potential gains from trade agreements.

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Appendix A: About data

The World Bank and United Nations Conference on Trade and Development (UNCTAD) have developed software for access and retrieval of information on trade and tariffs called the World Integrated Trade Solution (WITS). Using WITS, tariff data were downloaded from the Trade Analysis Information System (TRAINS). TRAINS contain information on 120 countries for 2007, 166 for 2006 and 105 for 2005. It should be noted that most countries do not report tariff data annually - less than half of the countries reported tariff levels for both 2007 and 2008 for instance. Data on the Dominican Republic and Kuwait were downloaded from the WTO Integrated Database (IDB).

In total, tariff data for approximately 150 countries (counting the European Union and its 27 member states as one unit) were downloaded. The data set covers 48 out for the countries listed by the NHD (GCC countries consist of seven member states). The missing countries include Cayman Islands and Liberia. For Serbia, we make an estimate of the trade potential using tariffs for Serbia and Montenegro.

The product classification is internationally agreed upon and changes over time so it exists in different "vintages". Hence some countries present tariffs in the latest version which is the "Harmonised System" of 2007, or HS2007. Tariffs for other countries may however be reported in older classifications; i.e. HS2002, HS1996 or HS1988/932. Furthermore, trade data classification may vary across countries. Hence it is a puzzle to obtain the best possible match between tariffs and trade data.

Tariff data for 130 countries (counting the European Union and its 27 member states as one unit) were used in the regressions, from which 100 were data for 2007, 26 from 2006 and 4 from 2004. 39 of the countries listed by the NHD were included in the regression analysis. Six out of the 130 countries had missing values for preferential tariffs. Tariff data for some countries were defined as too old to be included in the regression analysis, the case of Kazakhstan (2004) and Belarus (2002). Other countries lacked trade data for 2007 and were therefore excluded. Due to missing trade or missing values, the number of countries included in each regression could be lower.

A particular feature of the TRAINS database is that one obtains tariffs only for traded goods. Hence if one asks for average tariffs for imports from Norway and Norway only exports ten out of the 5000 product groups, one obtains an average only for these ten groups. We have used this method for retrieving PRF tariffs, since we are interested in those tariffs that actually apply to the observed exports. For BND, AHS and MFN tariffs at the product level, data are retrieved for imports from the world. In order to make tariff averages across product groups comparable, they should be done for the same selection of products. In the descriptive statistics presented, we therefore use tariffs for goods that are exported by Norway, also for BND, AHS and MFN tariffs. For smaller countries, these averages could therefore be based on rather few products and we do not report such averages in detail since they may be less reliable due to the product selection. For averages at the product level, such averages are broader and more reliable (i.e. as those shown in Figures 4 and 5 in the main text).

Appendix B: Classification of sectors.

Shorthand description	HS chapters/ headings included
Food	1, 2, 4-16.02, 17-24
Fish	3, 16.03-16.05
Minerals	25-27, 68-70
Chemicals	28-40
Wood	44-49
Metals	71-83
Textiles	41-43, 50-67
Machinery	84, 85
Transport eq.	86-89
Light ind.	94-96
Instruments	90-93

Table C1a: Comparison of results for 2007 and 1999. Note: results for 1999 are from Table 5, page 23 in Maurseth (2003). Results for 2007 are from Table C1b here.										
	Parameter estimates (elasticities) on:						R^2		N (observations)	
	GDP		**Distance**		**MFN tariff**					
	1999	**2007**	**1999**	**2007**	**1999**	**2007**	**1999**	**2007**	**1999**	**2007**
Food	0.23	0.10	-1.13	-0.73	-0.71	-1.90	0.40	0.33	1387	1531
Fish	0.70	0.35	-0.54	-0.62	-1.42	-4.10	0.38	0.29	1153	1283
Oil	0.27	0.79	-0.84	-0.59	-307	n.a.	0.60	0.75	22	25
Minerals	0.41	0.27	-1.02	-0.69	-4.66	-4.32	0.48	0.50	1469	1612
Chemicals	0.39	0.27	-1.09	-0.61	-6.26	-1.25	0.56	0.36	4785	5118
Textiles	0.28	0.05	-1.02	-0.64	-4.08	-2.06	0.37	0.26	4170	5412
Wood	0.48	0.26	-1.47	-0.98	-3.08	2.86	0.52	0.41	1827	1768
Metals	0.54	0.31	-1.03	-0.64	-3.69	-1.76	0.52	0.42	4011	5758
Machinery	0.53	0.38	-0.97	-0.44	-2.88	-1.18	0.44	0.34	8716	12288
Transport eq.	0.47	0.29	-1.74	-0.75	0.57	0.51	0.43	0.36	1054	1553
Instruments	0.53	0.48	-0.94	-0.32	-0.00	0.63	0.49	0.44	2201	3053
Light ind.	0.57	0.26	-1.43	-0.84	-2.78	0.23	0.52	0.41	1399	1692
All products	0.46	0.29	-1.04	-0.59	-1.45	-1.51	0.47	0.38	32194	41728
Note: Parameter estimates in small font size are not significant at the 10% level or better. Most other estimates are significant at the 1% level or better. For details on 2007 estimates, see Table C1 in the Appendix.										

Table C1: Model 1, pooled OLS, full sample, MFN tariffs

Industry	Variable	Estimate	t	P value	N		
Chemicals	Intercept	-5.58243	-10.19	<.0001	5118	R-Square	0.3592
Chemicals	LOG_GDP	0.26695	14.50	<.0001		Adj R-Sq	0.3586
Chemicals	LOG_GDP_PER	0.19751	5.98	<.0001			
Chemicals	LOG_DIS	-0.60643	-18.26	<.0001			
Chemicals	LOG_W_MFN	-1.25410	-1.86	0.0627			
Chemicals	LOG_WLD_EXP	0.57301	48.24	<.0001			
Fish	Intercept	-5.70713	-4.06	<.0001	1283	R-Square	0.2929
Fish	LOG_GDP	0.34847	7.28	<.0001		Adj R-Sq	0.2901
Fish	LOG_GDP_PER	-0.03140	-0.39	0.6950			
Fish	LOG_DIS	-0.62220	-7.41	<.0001			
Fish	LOG_W_MFN	-4.09553	-3.96	<.0001			
Fish	LOG_WLD_EXP	0.63471	21.48	<.0001			
Food	Intercept	0.95737	0.88	0.3808	1531	R-Square	0.3305
Food	LOG_GDP	0.09570	2.75	0.0061		Adj R-Sq	0.3283
Food	LOG_GDP_PER	0.12742	1.94	0.0520			
Food	LOG_DIS	-0.72629	-11.63	<.0001			
Food	LOG_W_MFN	-1.90236	-3.58	0.0004			
Food	LOG_WLD_EXP	0.52703	26.80	<.0001			
Instrument	Intercept	-14.38101	-22.56	<.0001	3053	R-Square	0.4386
Instrument	LOG_GDP	0.48719	22.04	<.0001		Adj R-Sq	0.4376
Instrument	LOG_GDP_PER	0.20439	5.61	<.0001			
Instrument	LOG_DIS	-0.32302	-8.36	<.0001			
Instrument	LOG_W_MFN	0.62534	0.61	0.5451			
Instrument	LOG_WLD_EXP	0.64401	44.75	<.0001			
Light Ind.	Intercept	-5.61371	-6.14	<.0001	1692	R-Square	0.4071
Light Ind.	LOG_GDP	0.26474	8.75	<.0001		Adj R-Sq	0.4053
Light Ind.	LOG_GDP_PER	0.30769	5.56	<.0001			
Light Ind.	LOG_DIS	-0.84039	-14.69	<.0001			
Light Ind.	LOG_W_MFN	0.23430	0.26	0.7947			
Light Ind.	LOG_WLD_EXP	0.61525	29.29	<.0001			
Machinery	Intercept	-9.74475	-29.46	<.0001	12288	R-Square	0.3361
Machinery	LOG_GDP	0.37719	33.22	<.0001		Adj R-Sq	0.3359
Machinery	LOG_GDP_PER	0.16771	8.95	<.0001			
Machinery	LOG_DIS	-0.43701	-21.03	<.0001			
Machinery	LOG_W_MFN	-1.18129	-2.80	0.0051			

Industry	Variable	Estimate	t	P value	N		
Machinery	LOG_WLD_EXP	0.58814	68.58	<.0001			
Metal	Intercept	-5.66955	-10.92	<.0001	5758	R-Square	0.4195
Metal	LOG_GDP	0.30659	17.54	<.0001		Adj R-Sq	0.4190
Metal	LOG_GDP_PER	0.05228	1.66	0.0970			
Metal	LOG_DIS	-0.64096	-20.85	<.0001			
Metal	LOG_W_MFN	-1.76184	-2.89	0.0039			
Metal	LOG_WLD_EXP	0.65937	60.25	<.0001			
Minerals	Intercept	-5.19649	-5.04	<.0001	1612	R-Square	0.5007
Minerals	LOG_GDP	0.26527	7.70	<.0001		Adj R-Sq	0.4991
Minerals	LOG_GDP_PER	0.15885	2.46	0.0138			
Minerals	LOG_DIS	-0.69095	-11.36	<.0001			
Minerals	LOG_W_MFN	-4.32280	-3.65	0.0003			
Minerals	LOG_WLD_EXP	0.69219	36.97	<.0001			
Oil	Intercept	-7.33236	-0.69	0.4990	25	R-Square	0.7490
Oil	LOG_GDP	0.79036	4.21	0.0004		Adj R-Sq	0.6988
Oil	LOG_GDP_PER	0.69140	2.35	0.0292			
Oil	LOG_DIS	-0.58849	-1.76	0.0938			
Oil	LOG_W_MFN	0	.	.			
Oil	LOG_WLD_EXP	-0.16193	-0.35	0.7287			
Textile	Intercept	2.10265	4.69	<.0001	5412	R-Square	0.2574
Textile	LOG_GDP	0.05106	3.24	0.0012		Adj R-Sq	0.2567
Textile	LOG_GDP_PER	0.03751	1.25	0.2123			
Textile	LOG_DIS	-0.64104	-20.67	<.0001			
Textile	LOG_W_MFN	-2.05527	-4.47	<.0001			
Textile	LOG_WLD_EXP	0.51066	40.31	<.0001			
Transport	Intercept	-5.10374	-5.12	<.0001	1553	R-Square	0.3570
Transport	LOG_GDP	0.28725	8.00	<.0001		Adj R-Sq	0.3549
Transport	LOG_GDP_PER	0.20049	3.28	0.0010			
Transport	LOG_DIS	-0.74765	-10.83	<.0001			
Transport	LOG_W_MFN	0.50663	0.53	0.5972			
Transport	LOG_WLD_EXP	0.58246	22.52	<.0001			
Wood	Intercept	-3.26824	-3.38	0.0007	1768	R-Square	0.4118
Wood	LOG_GDP	0.25541	8.06	<.0001		Adj R-Sq	0.4101
Wood	LOG_GDP_PER	0.18170	3.05	0.0023			
Wood	LOG_DIS	-0.98411	-16.83	<.0001			
Wood	LOG_W_MFN	2.85857	2.54	0.0112			
Wood	LOG_WLD_EXP	0.65769	31.08	<.0001			

Table C2: Model 2, pooled OLS, reduced sample with products exported to at least 20 countries, MFN tariffs

Industry	Variable	Estimate	t	P value	N		
Chemicals	Intercept	-1.17742	-1.55	0.1222	2782	R-Square	0.1704
Chemicals	LOG_GDP	0.38416	15.23	<.0001		Adj R-Sq	0.1695
Chemicals	LOG_DIS	-0.66727	-14.34	<.0001			
Chemicals	LOG_W_MFN	-3.68719	-4.28	<.0001			
Fish	Intercept	1.26680	0.74	0.4582	792	R-Square	0.0873
Fish	LOG_GDP	0.30031	5.51	<.0001		Adj R-Sq	0.0838
Fish	LOG_DIS	-0.46252	-4.54	<.0001			
Fish	LOG_W_MFN	-5.05915	-3.90	0.0001			
Food	Intercept	1.93651	1.02	0.3072	404	R-Square	0.1967
Food	LOG_GDP	0.31729	4.96	<.0001		Adj R-Sq	0.1907
Food	LOG_DIS	-0.75239	-6.90	<.0001			
Food	LOG_W_MFN	-3.06579	-2.62	0.0092			
Instrument	Intercept	-9.82213	-10.79	<.0001	1840	R-Square	0.2052
Instrument	LOG_GDP	0.59031	20.48	<.0001		Adj R-Sq	0.2039
Instrument	LOG_DIS	-0.19587	-3.46	0.0006			
Instrument	LOG_W_MFN	-4.03517	-2.79	0.0053			
Light Ind.	Intercept	0.13495	0.12	0.9032	1191	R-Square	0.2039
Light Ind.	LOG_GDP	0.37920	9.76	<.0001		Adj R-Sq	0.2019
Light Ind.	LOG_DIS	-0.86176	-10.97	<.0001			
Light Ind.	LOG_W_MFN	-1.93038	-1.77	0.0774			
Machinery	Intercept	-4.27676	-10.47	<.0001	8895	R-Square	0.1545
Machinery	LOG_GDP	0.41253	31.86	<.0001		Adj R-Sq	0.1542
Machinery	LOG_DIS	-0.34346	-13.18	<.0001			
Machinery	LOG_W_MFN	-4.23975	-8.50	<.0001			
Metal	Intercept	-0.79620	-1.06	0.2913	3077	R-Square	0.1343
Metal	LOG_GDP	0.37141	14.81	<.0001		Adj R-Sq	0.1335
Metal	LOG_DIS	-0.68615	-14.50	<.0001			
Metal	LOG_W_MFN	0.52138	0.65	0.5151			
Minerals	Intercept	0.74573	0.34	0.7310	586	R-Square	0.1202
Minerals	LOG_GDP	0.31091	4.24	<.0001		Adj R-Sq	0.1156
Minerals	LOG_DIS	-0.58139	-4.61	<.0001			
Minerals	LOG_W_MFN	-12.67594	-5.25	<.0001			
Textile	Intercept	4.29518	5.62	<.0001	1809	R-Square	0.1263
Textile	LOG_GDP	0.14178	5.56	<.0001		Adj R-Sq	0.1248

Industry	Variable	Estimate	t	P value	N		
Textile	LOG_DIS	-0.68684	-14.03	<.0001			
Textile	LOG_W_MFN	-2.08329	-2.74	0.0062			
Transport	Intercept	1.13175	0.89	0.3730	958	R-Square	0.2569
Transport	LOG_GDP	0.38956	10.22	<.0001		Adj R-Sq	0.2546
Transport	LOG_DIS	-0.91628	-11.34	<.0001			
Transport	LOG_W_MFN	-2.19548	-1.99	0.0464			
Wood	Intercept	-0.03817	-0.03	0.9793	823	R-Square	0.2159
Wood	LOG_GDP	0.46152	9.14	<.0001		Adj R-Sq	0.2130
Wood	LOG_DIS	-1.10554	-11.67	<.0001			
Wood	LOG_W_MFN	1.65079	1.03	0.3055			

Table C3: Model 3, fixed effect model, reduced sample with products exported to at least 20 countries, PRF tariffs

Industry	VarName	Estimate	t	P value	FValue	Prob	
Chemicals	Intercept	-1.87194	-2.62	0.0087	6.94	<.0001	
Chemicals	LOG_GDP	0.314131	18.07	<.0001			R-Squared
Chemicals	LOG_DIS	-0.67371	-19.33	<.0001			0.4410
Chemicals	LOG_PRF	-1.63541	-2.29	0.0223			
Fish	Intercept	-4.51111	-2.75	0.0060	7.99	<.0001	
Fish	LOG_GDP	0.379873	8.77	<.0001			R-Squared
Fish	LOG_DIS	-0.5828	-7.45	<.0001			0.3488
Fish	LOG_PRF	-2.51245	-2.14	0.0323			
Food	Intercept	2.751011	1.80	0.0729	3.58	<.0001	
Food	LOG_GDP	0.181191	4.58	<.0001			R-Squared
Food	LOG_DIS	-0.87421	-12.50	<.0001			0.4135
Food	LOG_PRF	-2.50131	-2.95	0.0032			
Instrument	Intercept	-11.4555	-10.52	<.0001	12.22	<.0001	
Instrument	LOG_GDP	0.551763	27.52	<.0001			R-Squared
Instrument	LOG_DIS	-0.39855	-10.57	<.0001			0.4859
Instrument	LOG_PRF	-0.89053	-0.83	0.4069			
Light Ind.	Intercept	-0.07716	-0.08	0.9353	9.43	<.0001	
Light Ind.	LOG_GDP	0.353827	12.24	<.0001			R-Squared
Light Ind.	LOG_DIS	-0.94164	-15.91	<.0001			0.4356
Light Ind.	LOG_PRF	-2.4693	-2.86	0.0042			
Machinery	Intercept	-5.3579	-10.38	<.0001	9.07	<.0001	
Machinery	LOG_GDP	0.423947	41.74	<.0001			R-Squared
Machinery	LOG_DIS	-0.45668	-22.35	<.0001			0.3910
Machinery	LOG_PRF	-2.34405	-5.43	<.0001			
Metal	Intercept	-1.59018	-2.37	0.0179	10.43	<.0001	
Metal	LOG_GDP	0.301064	18.53	<.0001			R-Squared
Metal	LOG_DIS	-0.62211	-19.88	<.0001			0.5006
Metal	LOG_PRF	-1.01363	-1.69	0.0918			
Minerals	Intercept	0.15476	0.15	0.8813	11.60	<.0001	
Minerals	LOG_GDP	0.296279	9.02	<.0001			R-Squared
Minerals	LOG_DIS	-0.67084	-10.84	<.0001			0.5841
Minerals	LOG_PRF	-4.21912	-3.12	0.0018			
Oil	Intercept	10.26968	0.82	0.4361	1.34	0.2918	
Oil	LOG_GDP	0.634602	1.56	0.1567			R-Squared

Industry	VarName	Estimate	t	P value	FValue	Prob	
Oil	LOG_DIS	-1.8711	-3.48	0.0083			0.6836
Oil	LOG_PRF	0	.	.			
Textile	Intercept	7.226111	7.26	<.0001	3.67	<.0001	
Textile	LOG_GDP	0.073552	4.98	<.0001			R-Squared
Textile	LOG_DIS	-0.7266	-20.25	<.0001			0.3339
Textile	LOG_PRF	0.573814	1.08	0.2804			
Transport	Intercept	0.162183	0.15	0.8771	9.49	<.0001	
Transport	LOG_GDP	0.378532	13.17	<.0001			R-Squared
Transport	LOG_DIS	-0.81755	-12.97	<.0001			0.4849
Transport	LOG_PRF	-1.3406	-1.29	0.1983			
Wood	Intercept	3.03806	3.39	0.0007	9.85	<.0001	
Wood	LOG_GDP	0.270596	9.25	<.0001			R-Squared
Wood	LOG_DIS	-1.03653	-18.16	<.0001			0.5209
Wood	LOG_PRF	2.387965	1.94	0.0524			

Table C4: Model 4, pooled OLS, all observations, PRF tariffs, with additional term including Norway's share of imports, see equation (8) in text.

Industry	Variable	Estimate	tValue	Probt	N		
Chemicals	Intercept	-6.07074	-9.95	<.0001	3387	R-Square	0.3751
Chemicals	LOG_WLD_EXP	0.62988	40.40	<.0001		Adj R-Sq	0.3742
Chemicals	LOG_GDP	0.38407	17.84	<.0001			
Chemicals	LOG_DIS	-0.75036	-18.09	<.0001			
Chemicals	LOG_PRF	-5.00430	-4.38	<.0001			
Chemicals	SHARE_LOG_PRF	88.87769	7.58	<.0001			
Fish	Intercept	-5.58076	-3.74	0.0002	861	R-Square	0.2948
Fish	LOG_WLD_EXP	0.64626	17.51	<.0001		Adj R-Sq	0.2907
Fish	LOG_GDP	0.31532	6.35	<.0001			
Fish	LOG_DIS	-0.53825	-6.34	<.0001			
Fish	LOG_PRF	-7.12789	-3.95	<.0001			
Fish	SHARE_LOG_PRF	8.84620	3.42	0.0006			
Food	Intercept	-0.29280	-0.26	0.7920	1133	R-Square	0.3560
Food	LOG_WLD_EXP	0.58460	24.03	<.0001		Adj R-Sq	0.3532
Food	LOG_GDP	0.22336	5.54	<.0001			
Food	LOG_DIS	-0.87655	-13.16	<.0001			
Food	LOG_PRF	-2.10663	-2.18	0.0297			
Food	SHARE_LOG_PRF	12.17671	2.33	0.0201			
Instrument	Intercept	-15.66932	-21.67	<.0001	2124	R-Square	0.4737
Instrument	LOG_WLD_EXP	0.68568	40.06	<.0001		Adj R-Sq	0.4725
Instrument	LOG_GDP	0.64074	25.91	<.0001			
Instrument	LOG_DIS	-0.46543	-11.14	<.0001			
Instrument	LOG_PRF	-3.92856	-2.51	0.0122			
Instrument	SHARE_LOG_PRF	79.34588	3.94	<.0001			
Light Ind.	Intercept	-4.35302	-4.60	<.0001	1227	R-Square	0.3891
Light Ind.	LOG_WLD_EXP	0.64466	24.28	<.0001		Adj R-Sq	0.3866
Light Ind.	LOG_GDP	0.37418	10.94	<.0001			
Light Ind.	LOG_DIS	-1.01464	-14.42	<.0001			
Light Ind.	LOG_PRF	-1.89638	-1.32	0.1875			
Light Ind.	SHARE_LOG_PRF	121.22650	2.65	0.0081			
Machinery	Intercept	-9.97261	-25.73	<.0001	8423	R-Square	0.3553
Machinery	LOG_WLD_EXP	0.65285	61.38	<.0001		Adj R-Sq	0.3549
Machinery	LOG_GDP	0.46251	35.32	<.0001			
Machinery	LOG_DIS	-0.56169	-23.65	<.0001			

Industry	Variable	Estimate	tValue	Probt	N		
Machinery	LOG_PRF	-3.14848	-4.99	<.0001			
Machinery	SHARE_LOG_PRF	77.80714	6.48	<.0001			
Metal	Intercept	-7.46485	-12.66	<.0001	3724	R-Square	0.4937
Metal	LOG_WLD_EXP	0.74499	56.09	<.0001		Adj R-Sq	0.4931
Metal	LOG_GDP	0.42625	20.61	<.0001			
Metal	LOG_DIS	-0.84260	-22.73	<.0001			
Metal	LOG_PRF	-3.89929	-4.32	<.0001			
Metal	SHARE_LOG_PRF	122.97105	7.08	<.0001			
Minerals	Intercept	-6.19319	-5.46	<.0001	1025	R-Square	0.5417
Minerals	LOG_WLD_EXP	0.75570	32.90	<.0001		Adj R-Sq	0.5394
Minerals	LOG_GDP	0.39244	9.57	<.0001			
Minerals	LOG_DIS	-0.86654	-11.78	<.0001			
Minerals	LOG_PRF	-7.91678	-3.30	0.0010			
Minerals	SHARE_LOG_PRF	28.21250	1.55	0.1210			
Oil	Intercept	-2.26451	-0.16	0.8745	21	R-Square	0.5988
Oil	LOG_WLD_EXP	-0.08284	-0.12	0.9055		Adj R-Sq	0.5280
Oil	LOG_GDP	0.92828	4.30	0.0005			
Oil	LOG_DIS	-1.06528	-3.61	0.0022			
Oil	LOG_PRF	0	.	.			
Oil	SHARE_LOG_PRF	0	.	.			
Textile	Intercept	2.16910	3.75	0.0002	3038	R-Square	0.2919
Textile	LOG_WLD_EXP	0.59942	33.93	<.0001		Adj R-Sq	0.2907
Textile	LOG_GDP	0.10833	5.40	<.0001			
Textile	LOG_DIS	-0.88154	-18.11	<.0001			
Textile	LOG_PRF	1.14653	1.08	0.2796			
Textile	SHARE_LOG_PRF	24.92389	2.59	0.0096			
Transport	Intercept	-5.46696	-4.64	<.0001	955	R-Square	0.3699
Transport	LOG_WLD_EXP	0.63479	19.06	<.0001		Adj R-Sq	0.3666
Transport	LOG_GDP	0.45993	11.33	<.0001			
Transport	LOG_DIS	-1.12828	-13.40	<.0001			
Transport	LOG_PRF	0.05000	0.02	0.9842			
Transport	SHARE_LOG_PRF	24.52054	1.49	0.1358			
Wood	Intercept	-4.00048	-3.70	0.0002	1174	R-Square	0.4447
Wood	LOG_WLD_EXP	0.71450	26.76	<.0001		Adj R-Sq	0.4423
Wood	LOG_GDP	0.41817	10.77	<.0001			
Wood	LOG_DIS	-1.28623	-17.80	<.0001			
Wood	LOG_PRF	-0.83105	-0.32	0.7510			
Wood	SHARE_LOG_PRF	82.13721	2.56	0.0105			

Table C5: Pooled OLS by group, using aggregated data at the country level and MFN tariffs

INDID	Variable	Estimate	t	P value	N		
Chemicals	Intercept	-12.44346	-4.35	<.0001	116	R-Square	0.7386
Chemicals	M_LOG_GDP	1.10028	13.92	<.0001		Adj R-Sq	0.7316
Chemicals	M_LOG_DIS	-0.90794	-4.40	<.0001			
Chemicals	LOG_M_W_MFN	-5.19913	-1.87	0.0643			
Fish	Intercept	-0.47810	-0.11	0.9119	89	R-Square	0.4814
Fish	M_LOG_GDP	0.75370	6.31	<.0001		Adj R-Sq	0.4631
Fish	M_LOG_DIS	-1.18497	-4.17	<.0001			
Fish	LOG_M_W_MFN	-4.65655	-1.50	0.1380			
Food	Intercept	-8.13905	-2.47	0.0157	86	R-Square	0.6370
Food	M_LOG_GDP	0.89078	9.06	<.0001		Adj R-Sq	0.6237
Food	M_LOG_DIS	-0.94055	-4.28	<.0001			
Food	LOG_M_W_MFN	-6.58957	-3.27	0.0016			
Instrument	Intercept	-17.18066	-6.01	<.0001	112	R-Square	0.6978
Instrument	M_LOG_GDP	1.09102	13.72	<.0001		Adj R-Sq	0.6894
Instrument	M_LOG_DIS	-0.32783	-1.65	0.1028			
Instrument	LOG_M_W_MFN	-5.94911	-1.50	0.1355			
Light Ind.	Intercept	-2.81350	-0.86	0.3929	99	R-Square	0.6333
Light Ind.	M_LOG_GDP	0.72593	7.38	<.0001		Adj R-Sq	0.6217
Light Ind.	M_LOG_DIS	-1.07285	-4.21	<.0001			
Light Ind.	LOG_M_W_MFN	-6.48474	-2.67	0.0089			
Machinery	Intercept	-12.50328	-4.99	<.0001	130	R-Square	0.7423
Machinery	M_LOG_GDP	1.07151	16.20	<.0001		Adj R-Sq	0.7362
Machinery	M_LOG_DIS	-0.68873	-3.74	0.0003			
Machinery	LOG_M_W_MFN	4.27345	1.37	0.1724			
Metal	Intercept	-12.47389	-4.00	0.0001	120	R-Square	0.7812
Metal	M_LOG_GDP	1.31535	15.65	<.0001		Adj R-Sq	0.7756
Metal	M_LOG_DIS	-1.54896	-6.78	<.0001			
Metal	LOG_M_W_MFN	0.20350	0.07	0.9404			
Minerals	Intercept	-12.86511	-2.92	0.0045	89	R-Square	0.6486
Minerals	M_LOG_GDP	1.11948	8.81	<.0001		Adj R-Sq	0.6362
Minerals	M_LOG_DIS	-0.84501	-2.80	0.0063			
Minerals	LOG_M_W_MFN	-20.18006	-5.22	<.0001			
Oil	Intercept	-8.51856	-1.21	0.2442	19	R-Square	0.6872
Oil	M_LOG_GDP	1.16173	4.52	0.0004		Adj R-Sq	0.6481

INDID	Variable	Estimate	t	P value	N		
Oil	M_LOG_DIS	-1.25143	-4.41	0.0004			
Oil	LOG_M_W_MFN	0	.	.			
Textile	Intercept	-5.62019	-1.74	0.0848	105	R-Square	0.6148
Textile	M_LOG_GDP	0.81884	8.96	<.0001		Adj R-Sq	0.6034
Textile	M_LOG_DIS	-1.03214	-4.48	<.0001			
Textile	LOG_M_W_MFN	-6.07855	-2.58	0.0112			
Transport	Intercept	-0.62352	-0.15	0.8833	101	R-Square	0.4626
Transport	M_LOG_GDP	0.68187	5.92	<.0001		Adj R-Sq	0.4460
Transport	M_LOG_DIS	-1.05277	-3.56	0.0006			
Transport	LOG_M_W_MFN	-6.41997	-2.20	0.0301			
Wood	Intercept	-8.98203	-2.97	0.0037	96	R-Square	0.7632
Wood	M_LOG_GDP	1.06784	12.06	<.0001		Adj R-Sq	0.7555
Wood	M_LOG_DIS	-1.36655	-6.62	<.0001			
Wood	LOG_M_W_MFN	-7.19261	-3.03	0.0031			

Table C6: Pooled OLS by sector using aggregate data and PRF tariffs.

INDID	Variable	Estimate	t	P value	N		
Chemicals	Intercept	-12.72174	-4.50	<.0001	116	R-Square	0.7440
Chemicals	M_LOG_GDP	1.08212	13.69	<.0001		Adj R-Sq	0.7372
Chemicals	M_LOG_DIS	-0.82009	-3.87	0.0002			
Chemicals	LOG_M_PRF	-6.73409	-2.43	0.0165			
Fish	Intercept	-1.25500	-0.29	0.7716	89	R-Square	0.4706
Fish	M_LOG_GDP	0.75573	6.21	<.0001		Adj R-Sq	0.4520
Fish	M_LOG_DIS	-1.13989	-3.91	0.0002			
Fish	LOG_M_PRF	-2.21442	-0.68	0.4953			
Food	Intercept	-8.52973	-2.62	0.0105	86	R-Square	0.6464
Food	M_LOG_GDP	0.87818	9.02	<.0001		Adj R-Sq	0.6335
Food	M_LOG_DIS	-0.86582	-3.92	0.0002			
Food	LOG_M_PRF	-7.17001	-3.63	0.0005			
Instrument	Intercept	-17.09056	-5.97	<.0001	112	R-Square	0.6980
Instrument	M_LOG_GDP	1.07968	13.26	<.0001		Adj R-Sq	0.6896
Instrument	M_LOG_DIS	-0.30935	-1.53	0.1279			
Instrument	LOG_M_PRF	-6.05403	-1.53	0.1282			
Light Ind.	Intercept	-2.94493	-0.90	0.3728	99	R-Square	0.6302
Light Ind.	M_LOG_GDP	0.72461	7.23	<.0001		Adj R-Sq	0.6185
Light Ind.	M_LOG_DIS	-1.07026	-4.13	<.0001			
Light Ind.	LOG_M_PRF	-6.12780	-2.50	0.0141			
Machinery	Intercept	-12.45254	-4.96	<.0001	130	R-Square	0.7415
Machinery	M_LOG_GDP	1.07264	15.98	<.0001		Adj R-Sq	0.7354
Machinery	M_LOG_DIS	-0.69021	-3.71	0.0003			
Machinery	LOG_M_PRF	3.69642	1.23	0.2216			
Metal	Intercept	-12.45958	-4.00	0.0001	120	R-Square	0.7812
Metal	M_LOG_GDP	1.31299	15.35	<.0001		Adj R-Sq	0.7756
Metal	M_LOG_DIS	-1.54058	-6.59	<.0001			
Metal	LOG_M_PRF	-0.11637	-0.04	0.9671			
Minerals	Intercept	-13.42809	-3.06	0.0030	89	R-Square	0.6500
Minerals	M_LOG_GDP	1.08565	8.49	<.0001		Adj R-Sq	0.6376
Minerals	M_LOG_DIS	-0.71003	-2.31	0.0235			
Minerals	LOG_M_PRF	-19.77074	-5.26	<.0001			
Oil	Intercept	-6.03345	-1.06	0.3038	20	R-Square	0.6850
Oil	M_LOG_GDP	1.07836	5.01	0.0001		Adj R-Sq	0.6479
Oil	M_LOG_DIS	-1.28399	-4.69	0.0002			

INDID	Variable	Estimate	t	P value	N		
Oil	LOG_M_PRF	0	.	.			
Textile	Intercept	-6.39794	-2.00	0.0477	105	R-Square	0.6237
Textile	M_LOG_GDP	0.78636	8.53	<.0001		Adj R-Sq	0.6125
Textile	M_LOG_DIS	-0.85691	-3.48	0.0007			
Textile	LOG_M_PRF	-6.65665	-3.04	0.0031			
Transport	Intercept	-1.17127	-0.28	0.7820	101	R-Square	0.4630
Transport	M_LOG_GDP	0.67046	5.78	<.0001		Adj R-Sq	0.4463
Transport	M_LOG_DIS	-0.96734	-3.18	0.0020			
Transport	LOG_M_PRF	-6.28087	-2.22	0.0291			
Wood	Intercept	-8.94131	-3.00	0.0034	96	R-Square	0.7699
Wood	M_LOG_GDP	1.05578	12.06	<.0001		Adj R-Sq	0.7624
Wood	M_LOG_DIS	-1.32825	-6.49	<.0001			
Wood	LOG_M_PRF	-9.58573	-3.49	0.0007			

Table D1: Trade potential from tariff liberalisation in selected countries: Lower estimates
Figures in 1000 2007 USD.

	Chem	Instrument	Light Ind	Machinery	Metal	Minerals	Textile	Transport	Wood	Food	Fish	TOTAL
Albania	18	0	67	24	0	0	46	0	0	28	0	184
Algeria	511	0	573	1955	0	3459	521	0	0	0	1910	8930
Angola	87	0	47	97	0	467	50	0	0	43	687	1478
Argentina	364	0	130	1218	0	1238	136	0	0	126	285	3495
Australia	458	0	56	1275	0	1738	165	0	0	23	0	3715
Azerbaijan	91	0	78	175	0	484	69	0	0	19	605	1520
Bahrain	13	0	14	66	0	94	0	0	0	10	111	308
Bangladesh	138	0	0	229	0	0	0	0	0	63	959	1389
Belarus	401	0	349	755	0	0	228	0	0	112	2589	4434
Bosnia and Herzeg.	41	0	63	106	0	0	68	0	0	0	0	278
Brazil	2560	0	509	9518	0	10972	667	0	0	643	1980	26849
Canada	1095	0	255	1122	0	3157	668	0	0	201	565	7064
Cayman Islands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	6549	0	814	19927	0	32462	1337	0	0	2227	9220	72536
Colombia	220	0	125	694	0	810	107	0	0	121	629	2706
Congo Rep.	17	0	16	30	0	83	0	0	0	0	109	255
Congo, Dem. Rep.	16	0	25	48	0	48	18	0	0	0	159	314
Dominican Republic	74	0	54	132	0	91	52	0	0	38	448	889
Ghana	37	0	37	69	0	116	25	0	0	28	182	494
Guatemala	20	0	0	29	0	0	0	0	0	0	168	217
Hong Kong, China	0	0	0	0	0	0	0	0	0	0	0	0
India	4076	0	603	10358	0	16200	699	0	0	2038	11250	45224
Indonesia	434	0	116	633	0	1511	139	0	0	80	569	3481
Iran, Islamic Rep.	2099	0	623	3853	0	8260	1037	0	0	127	5907	21906
Jamaica	16	0	0	0	0	0	19	0	0	0	131	166
Japan	1644	0	68	155	0	4161	1019	0	0	1835	6255	15136

	Chem	Instrument	Light Ind	Machinery	Metal	Minerals	Textile	Transport	Wood	Food	Fish	TOTAL
Kazakhstan	85	0	50	20	0	537	54	0	0	0	0	748
Kenya	56	0	49	143	0	0	52	0	0	30	499	830
Kuwait	53	0	43	209	0	399	39	0	0	41	307	1090
Kyrgyz Republic	0	0	9	10	0	0	0	0	0	0	77	97
Liberia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	285	0	36	425	0	1262	86	0	0	50	179	2324
Montenegro	2	0	0	6	0	0	0	0	0	0	0	8
New Zealand	57	0	22	171	0	192	37	0	0	11	0	489
Nigeria	547	0	254	907	0	2518	204	0	0	246	1714	6391
Oman	45	0	25	139	0	207	23	0	0	0	234	674
Pakistan	530	0	256	1088	0	1279	149	0	0	166	1164	4633
Panama	12	0	21	56	0	78	16	0	0	17	145	345
Peru	94	0	52	287	0	0	76	0	0	61	0	571
Philippines	124	0	50	174	0	465	62	0	0	68	397	1341
Qatar	52	0	32	220	0	303	31	0	0	27	298	963
Russian Federation	8687	0	1720	12088	0	38541	1354	0	0	1537	20790	84717
Saudi Arabia	448	0	127	1318	0	2472	141	0	0	150	770	5425
Serbia	168	0	191	396	0	1053	195	0	0	132	1716	3850
Thailand	375	0	168	841	0	1832	230	0	0	225	750	4421
Ukraine	325	0	305	837	0	2468	181	0	0	339	296	4751
United Arab Emirates	128	0	51	386	0	642	50	0	0	55	254	1566
United States	7210	0	438	8760	0	45085	2896	0	0	4582	3382	72354
Venezuela	421	0	173	1137	0	1485	175	0	0	140	1612	5141
Vietnam	72	0	88	256	0	206	104	0	0	79	876	1680

Table D2: Trade potential from tariff liberalisation in selected countries: Midpoint estimates

Figures in 1000 2007 USD.

	Chem	Instrument	Light Ind	Machinery	Metal	Minerals	Textile	Transport	Wood	Food	Fish	TOTAL
Albania	38	58	77	32	0	0	51	0	0	34	0	289
Algeria	1056	462	649	2484	1339	5144	568	634	0	0	1014	13348
Angola	179	49	55	126	27	741	55	123	95	52	388	1889
Argentina	743	630	149	1553	219	2079	150	0	129	151	148	5951
Australia	974	305	66	1644	234	3114	183	223	165	28	0	6936
Azerbaijan	186	18	90	224	72	747	76	18	42	23	325	1822
Bahrain	28	32	17	85	10	164	0	82	19	12	58	506
Bangladesh	280	121	0	295	63	0	0	224	81	75	554	1692
Belarus	811	165	402	964	741	0	253	1058	824	137	1392	6747
Bosnia and Herzeg.	87	27	73	136	50	0	75	347	59	0	0	855
Brazil	5210	5581	585	12092	2499	17716	736	1747	1289	774	1041	49270
Canada	2354	455	299	1453	1122	5807	743	509	104	247	288	13380
Cayman Islands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	13611	10227	945	25511	8306	53808	1483	4039	2587	2671	4963	128152
Colombia	457	300	143	889	174	1384	118	0	203	145	335	4150
Congo Rep.	35	14	19	38	0	125	0	51	0	0	59	341
Congo, Dem. Rep.	32	22	28	61	6	78	19	104	14	0	90	455
Dominican Republic	148	34	62	169	37	164	57	0	51	45	251	1019
Ghana	74	47	42	89	11	186	28	67	23	33	98	698
Guatemala	43	0	0	37	0	0	0	0	13	0	89	182
Hong Kong, China	0	0	0	0	0	0	0	0	0	0	0	0
India	8158	5029	697	13187	4477	25374	775	3563	2812	2364	6631	73066
Indonesia	908	548	134	817	228	2650	155	480	241	98	296	6555
Iran, Islamic Rep.	3885	1310	705	4871	1801	10492	1100	2507	1658	156	3481	31965
Jamaica	32	8	0	0	0	0	20	0	0	0	72	132

Japan	3564	953	80	201	1322	7766	1135	0	201	2218	3297	20738
Kazakhstan	184	106	59	26	73	957	61	0	0	0	0	1466
Kenya	113	8	57	183	33	0	57	157	42	36	287	972
Kuwait	113	106	50	270	56	693	43	159	89	49	159	1790
Kyrgyz Republic	0	0	11	13	0	0	0	0	0	0	41	65
Liberia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	581	62	43	548	185	2033	95	94	91	61	92	3884
Montenegro	3	0	0	8	0	0	0	0	0	0	0	11
New Zealand	120	63	26	220	17	346	41	67	7	13	0	922
Nigeria	1086	158	290	1162	466	3701	226	760	182	293	947	9270
Oman	95	71	30	179	24	359	26	136	42	0	123	1084
Pakistan	1045	374	292	1388	275	2117	165	1942	170	200	626	8593
Panama	25	44	24	72	7	132	17	129	14	21	78	563
Peru	198	138	61	368	54	0	84	111	97	74	0	1185
Philippines	261	59	58	225	71	819	69	321	64	82	209	2239
Qatar	112	107	37	283	43	533	35	140	44	33	155	1523
Russian Federation	17975	4183	2001	15550	26571	62976	1511	7161	14512	1874	11112	165426
Saudi Arabia	954	518	148	1698	488	4319	158	567	375	184	397	9804
Serbia	350	22	221	507	175	1638	215	370	182	159	929	4767
Thailand	773	360	193	1080	228	2974	253	975	225	269	397	7727
Ukraine	696	158	355	1079	425	4202	202	1028	220	411	151	8926
United Arab Emirates	273	177	60	497	97	1124	56	230	107	67	131	2819
United States	15633	6918	515	11346	9299	82534	3230	1025	1508	5575	1728	139311
Venezuela	858	408	199	1453	283	2469	193	865	311	169	901	8109
Vietnam	151	6	101	328	52	366	113	319	89	94	507	2126

Table D3: Trade potential from tariff liberalisation in selected countries: Upper estimates
Figures in 1000 2007 USD.

	Chem	Instrument	Light Ind	Machinery	Metal	Minerals	Textile	Transport	Wood	Food	Fish	TOTAL
Albania	86	101	168	85	0	0	114	0	0	80	0	634
Algeria	2223	863	1182	5909	2464	7004	1034	1176	0	0	3527	25381
Angola	376	96	127	335	52	1152	127	229	144	122	1127	3887
Argentina	1519	1173	319	3801	416	3707	332	0	228	345	551	12392
Australia	2206	604	176	4361	460	6660	453	428	310	78	0	15735
Azerbaijan	386	35	204	574	138	1090	172	36	78	60	1085	3858
Bahrain	66	62	44	221	19	325	0	154	35	31	214	1172
Bangladesh	561	231	0	759	120	0	0	399	135	169	1513	3888
Belarus	1621	310	880	2384	1397	0	577	1870	1246	340	4656	15280
Bosnia and Herzeg.	193	52	176	353	97	0	169	610	106	0	0	1757
Brazil	10585	10037	1250	28766	4738	28666	1564	2952	2159	1746	3723	96185
Canada	5488	904	785	3976	2220	13445	1786	991	206	665	1126	31593
Cayman Islands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	29128	19184	2275	64185	16074	92834	3444	6941	4755	5801	16553	261174
Colombia	973	572	306	2242	331	2582	270	0	323	322	1150	9070
Congo Rep.	69	26	42	98	0	175	0	93	0	0	196	700
Congo, Dem. Rep.	62	40	52	144	12	124	38	162	20	0	261	915
Dominican Republic	291	67	128	431	69	350	117	0	80	99	746	2378
Ghana	143	85	86	223	22	298	61	123	37	67	327	1473
Guatemala	98	0	0	101	0	0	0	0	24	0	310	533
Hong Kong, China	0	0	0	0	0	0	0	0	0	0	0	0
India	15933	9163	1584	31853	8473	38330	1783	5602	4410	3959	17139	138228
Indonesia	1984	1059	327	2185	445	5319	379	866	428	254	1091	14336
Iran, Islamic Rep.	6398	2357	1282	11188	3314	11556	1470	3662	2147	404	8999	52776
Jamaica	66	15	0	0	0	0	42	0	0	0	229	351

	Chem	Instrument	Light Ind	Machinery	Metal	Minerals	Textile	Transport	Wood	Food	Fish	TOTAL
Japan	8499	1898	225	556	2632	18832	2815	0	400	5156	11697	52710
Kazakhstan	431	208	157	73	145	2012	162	0	0	0	0	3187
Kenya	226	15	117	454	62	0	112	272	66	81	793	2200
Kuwait	263	204	130	711	110	1358	113	303	161	126	593	4072
Kyrgyz Republic	0	0	25	35	0	0	0	0	0	0	140	200
Liberia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	1190	122	112	1434	351	3268	228	182	165	156	351	7560
Montenegro	8	0	0	22	0	0	0	0	0	0	0	30
New Zealand	273	125	66	584	34	753	100	128	15	35	0	2112
Nigeria	2083	309	566	2930	869	4937	480	1274	326	589	2926	17288
Oman	212	135	77	466	47	697	68	252	76	0	445	2473
Pakistan	1970	702	560	3388	526	3637	377	2223	305	441	2094	16222
Panama	56	81	55	186	13	244	41	211	24	46	262	1218
Peru	434	265	142	952	105	0	183	208	156	169	0	2614
Philippines	579	116	145	606	138	1660	170	562	118	197	745	5037
Qatar	259	206	97	739	85	1086	93	266	82	86	573	3572
Russian Federation	38045	7994	4881	40561	51026	104858	3863	12738	23793	4706	37840	330305
Saudi Arabia	2179	1005	388	4474	957	8586	416	1067	696	476	1504	21749
Serbia	753	44	499	1292	340	2438	456	693	327	357	3048	10248
Thailand	1623	693	415	2778	440	4876	507	1487	385	555	1393	15151
Ukraine	1605	310	883	2859	839	7775	531	1911	428	968	593	18701
United Arab Emirates	621	342	157	1306	191	2253	147	434	198	172	499	6320
United States	37298	13717	1428	31181	18512	188330	8168	2025	2989	13711	6736	324096
Venezuela	1753	779	422	3618	540	4295	420	1361	494	391	2695	16767
Vietnam	331	12	202	837	100	764	213	528	142	194	1374	4697

Table E: Gravity-based prediction of exports to selected countries where Norway have entered into FTAa after 1990

NB: Based on current dollars!

Country	**Tariff data from** year	**Tariff** ave-rage	**Trade potential** (year before entry into force = 100)			**Year of FTA** entry into force	**Exports** from Norway to the country in question (year before entry into force of FTA = 100)										
			From tariff cuts	From GDP growth	Combi ned		In year of entry into force	Number of years after entry into force: 1	2	3	4	5	6	7	8	9	10
Turkey	1993	8.45	141	117	165	1993	81	46	76	96	150	115	127	160	185	271	349
Romania	1991	18.24	203	156	317	1993	184	216	303	293	260	372	258	412	557	707	722
Israel	1993	5.45	125	162	203	1993	78	82	93	99	38	42	49	50	49	46	50
Hungary	1993	11.15	156	121	189	1993	74	80	102	122	104	143	159	137	158	188	205
Poland	1992	11.47	158	166	263	1994	105	114	108	112	108	123	113	117	122	137	173
Latvia	1996	5.12	123	146	180	1996	259	361	279	150	146	186	217	357	296	407	820
Estonia	1995	0.07	100	130	130	1996	109	189	197	131	169	193	217	229	257	315	473
Lithuania	1995	4.78	122	141	172	1997	109	96	69	75	113	118	135	161	190	251	294
Morocco	1997	16.34	189	141	267	1999	175	185	177	58	130	153	398	416	166	238	
Mexico	2000	15.58	184	150	276	2001	177	108	126	136	209	108	141	158			
Jordan	2001	15.34	183	162	295	2002	311	156	69	71	217	296	1045				
Croatia	2001	11.97	161	215	346	2002	106	137	151	145	205	232	252				
Singapore	2002	0.00	100	178	178	2003	195	108	205	238	295	336					
Chile	2002	6.99	133	n.a.		2004	243	209	277	449	416						
Korea	2004	6.30	129	n.a.		2006	95	158	225								

Method for calculating trade potential (Figure 13 and Figure 14):

- We set Norwegian exports to the country in question the year before entry into force of the agreement at 100, and calculate the development in the subsequent years.
- Second, we obtain from the TRAINS database simple average tariffs for imports from Norway, for goods actually traded in the base year. We use tariffs for a year preceding but close to the entry into force of the agreement. Some countries are dropped since data are not available.
- We undertake a simplified calculation of the trade potential from tariff elimination, using an average of all lower/upper elasticities in Table 2 above, i.e. -4.22. The simplified trade potential is then equal to $100/t^{-4.22}$, where t is the average tariff expressed as 1+T/100 (T=% tariff rate).
- Fourth, we use data on GDP in current USD and calculate the predicted trade growth from the GDP increase. For this purpose, we use an average of GDP parameter estimates from Model 6, at 0.955.