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Trade and development
- a selective review

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[Summary] This paper reviews parts of the recent literature on trade and growth. The relationships between trade and growth have been extensively studied in recent research. Many studies indicate that trade stimulates income and growth. The literature is controversial and many studies are criticised for weaknesses in methodology. Despite the methodological controversies, most evidence gives support for the view that trade stimulates growth. It is argued that major deficiency in the literature is that it does not discriminate between the impact of market access in other countries and the impact of liberal domestic trade policies.

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Introduction

In debates about development issues international trade has gained increased attention. 'Trade not aid' has become a slogan among some. Among others the slogan 'Trade and aid' is popular. While import substitution and industry protection was popular in the post war period, now market access and trade liberalisation is on the agenda. In the WTO this point of view has gained acceptance. Through the Generalized System of Preferences (GSP) member countries in the WTO are allowed to treat developing countries better than they treat other member countries. Such differentiated treatment of trading partners violates the most favoured nations treatment (MFN) principle in the WTO. This reflects that trade is recognised as an important determinant for economic development.

In the current negotiations in the Doha-round – also paraphrased as the 'Doha Development Agenda' - developing countries demand increased market access for their export products. This applies in particular to agricultural goods. Better market access can be achieved by use of different strategies. One is general liberalisation of trade regimes. For agriculture this would imply lower import duties on imports from all countries. Another strategy would be to extend preferences for developing countries.

In this note, some arguments about trade and development will be discussed. In the next section the theory on these issues are discussed. Thereafter we present the empirical literature and add some new findings. The literature on trade and growth is extensive. We have no ambition to present a complete survey, but limit ourselves to some important contributions.

Trade and development.

Why some countries are poor and some are rich is one of the most important and debated questions among economists, politicians and the wider audience. An important question is whether globalisation will tend to increase or reduce inequality between poor and rich countries. Naturally, there is no simple answer to this question. Even after decades with research and debates, scholars have not come to an agreement whether and to what extent trade liberalisation promotes development and economic growth. There are several reasons for this. One is methodological. Measuring the exact impact of trade liberalisation is difficult. Often both trade liberalisation and its consequences are difficult to quantify. One also has to control for other variables that influence. Import barriers are designed for many purposes and in many different ways. Therefore their effects will also be diverse. Another reason is that different researchers ask and answer different questions. For instance, the question whether trade promotes growth is a different one from the question whether trade liberalisation promotes growth.

Our impression from the literature is that trade liberalisation may promote development, under certain circumstances and in some situations. Also, even if trade liberalisation is heatedly debated, other factors may be more important for growth and

development. The literature is extensive, so here we will discuss the most important lines of thought only. We will argue that an important deficiency in the existing literature is that is does not discriminate between countries' market access in foreign markets and their openness for imports.

In studies of economic growth, one approach has been to investigate whether poor countries tend to catch up with richer countries. Growth rates in income per capita in a period are assumed to be a function of income levels initially. If there is a systematic positive relationship, rich countries tend to have higher growth rates than poor countries. If so, income differences between countries tend to increase over time. This is denoted as *divergence* in economic development. If there is a negative relationship, the opposite is true.[1] In this case income differences between countries tend to decrease. This is denoted as *convergence* in economic development. In figure 1, growth rates in 140 countries for the period from 1990 to 2002 are graphed against the levels of income per capita in 1990. The countries termed 'developing' (circles) are African, Latin American, Asia and Oceanian countries while the counties termed 'developed' (triangles) are European and North American countries. The data used to construct the figure are from the World Bank.[2] They are in purchasing power parities (PPP) so that the numbers better can be used for international comparisons. The numbers are also constant over time so that inflation is depressed.

The figure does not give any evidence that there was convergence in the world economy during the 1990s. There is no systematic negative relationship between growth rates and initial income levels. In fact, there is a positive correlation between income levels in 1990 and average annual growth rates from 1990 to 2002. For developed countries this trend is pronounced and significant. On reason for this is the recessions in the formerly planned economies during transition to market based systems.

Figure 1A in the appendix gives a somewhat different picture. In that figure, observations for each individual country are weighted by their population. The weights of India and China give an impression of convergence. The high growth rates in populous countries like China and India in this period, and also in Russia and Brazil at the end of the period, have affected many people. In sum these changes have counteracted the impact of divergence between countries so that global inequality measured in terms of average income per capita in each country, but weighted by population in each country, have declined. For the purpose of this paper, we stick to our cross-country approach un-weighted for population. The reason is that our focus is international trade and trade policy. In this respect, it is clear that countries are the units of observations and also the agents in question.

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[1] Barro (1991) is a classical reference. Also see Barro and Sala-i-Martin (1995). There are several methodological reservations about the cross section regression approach, however. Inequality might increase even if poor countries grow faster than rich countries if there is frequent *leapfrogging* between countries on the income-ladder (Quah, 1993 and Quah, 1996). Furthermore, cross-section regressions do not take into account differences in size between countries. For instance, China and Luxembourg are weighted similarly in this approach. For an impression about developments in inequality between poor and rich people, population and within country inequality have to be taken into account. Melchior and Telle (2001) discuss inequality in the world population. Maurseth (2003a) presents a survey of the literature.

[2] World Bank (2004).

Even if global income inequality when countries' population is taken into account, has declined, the evidence presented in figure 1 tells a story about increasing income differences between countries. The 1990s was a period when trade liberalisation gained speed. The Uruguay round in the GATT was completed in 1993. These negotiations resulted in decreased tariffs for many goods, the TRIPS agreement on intellectual property rights and establishment of the WTO (from 1995 onwards). The developing countries gained increased market access for agricultural goods and in particular for textiles. In addition to the multilateral liberalisation of trade, the 1990s witnessed trade liberalisation at regional levels (in terms of free trade agreements (FTAs)) and unilaterally by many countries. Also, many countries shifted their economic systems from centrally planned to market based economies in this period. In sum therefore, the 1990s was a period of accelerated trade liberalisation in the world economy. In the same period, inequality between countries increased. Some countries, in particular African countries and formerly planned economies experienced negative growth over the period. There are therefore good reasons to be sceptical to messages that market based systems and trade liberalisation are panaceas for growth. In fact, we do not witness high growth in most developing countries.

Figure 1. Growth and initial income levels.
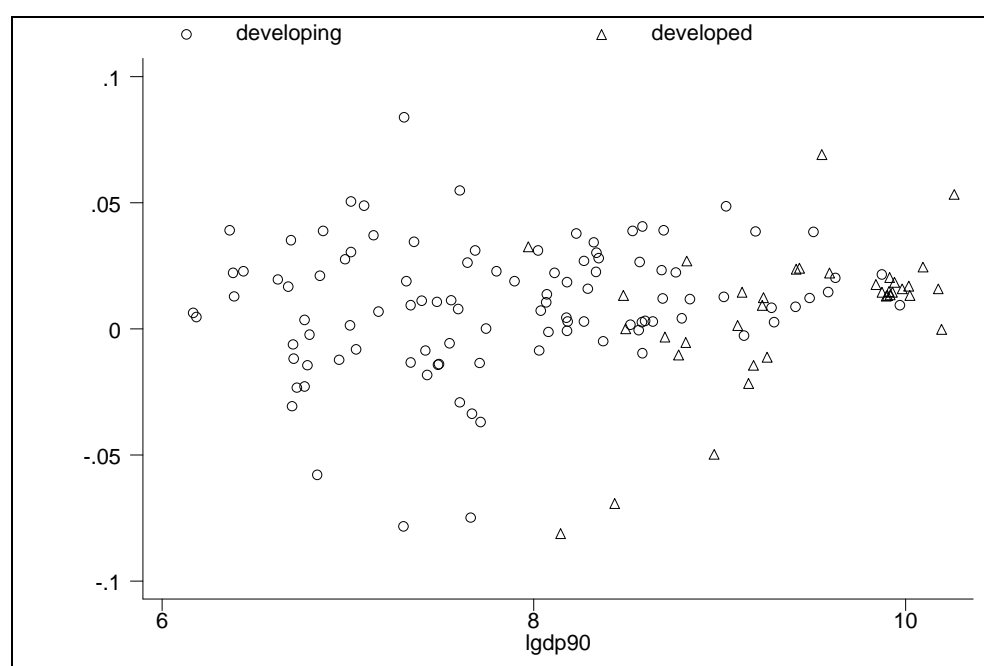
We have calculated growth rates for 140 countries for the period from 1990 to 2002. Among the 45 African countries, 18 had negative average annual growth rates in the period from 1990 to 2002. 8 African countries had average annual growth rates above 3 per cent. Among the 30 Asian countries, 5 countries had negative growth rates and 10 had rates exceeding 3 per cent. In the European camp, most of the formerly planned economies experienced negative growth rates while most of the Western European countries had positive growth rates. There was one Western European country that experienced negative growth. This was Switzerland! In Latin America, 6

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out of 24 countries had negative growth rates while only two had growth rates exceeding 3 per cent. Of the 40 countries that experienced negative growth, 18 were African, 14 were transition countries and seven were Latin American countries.

Deviations in percentage points of growth rates are important. A country that grows at one per cent annually gets 22 per cent richer over a 20 years period. If on the other hand, the country manages to grow at three per cent annually, it gets 88 per cent richer during the same period.

Figure 1 does not say anything about the relationships between trade, openness and development. It just describes one aspect of the international income distribution during a period in which there also has been intensive trade liberalisation.

What are the mechanisms through which trade may stimulate growth? Here we focus on four effects that have been analysed much in the literature on trade and growth.

Most economists agree that trade is important for economic welfare - not through exports - but through imports. Exports are the mean while imports are the end for international trade. The reason for a country to export is to become able to import. Through imports a country may be able to make use of products made abroad that would have been more costly to produce domestically. While this may seem obvious, it is very important. In many debates on international trade, market access and export performance is in focus. There are good reasons for this, but it should be kept in mind that the reason to export is to become able to pay for imports. So why is it important to engage in such trade?

First: Trade stimulates growth because it allows imports of goods which would have been relatively more expensive to produce at home. This is the *comparative advantage* argument for trade. If this argument is valid, trade is most important not because it allows industrialisation in developing countries but because it allows more specialisation in the industries in which these countries have comparative advantages. By specialising in these industries countries may increase their access to goods for consumption. It is important that gains from trade do not depend on competitiveness. If a country is 10 percent as efficient as compared to another country in one industry and only 5 percent as efficient in the other industry, it will gain from trade even if it specialises in the first industry. This applies even if the other country is ten times as efficient.

Comparative advantages may arise from many sources. One is technology. Some countries may (for many reasons) have relatively better technology for production of some goods relative to other countries. Germany is good at producing cars and Switzerland is good at producing watches. This may be due their access to different technologies in these two industries. Another reason for comparative advantages is factor endowments. If one country is relatively abundant in unskilled labour and another is relatively abundant in capital, the first country may be in a better position for production of labour-intensive goods while the other may be in a better position for production of capital-intensive goods. If comparative advantages are due to differences in resource endowments a very important, but still controversial hypothesis follows. This is the *factor price equalisation theorem.* Under stringent

conditions it can be shown that international trade may result in equal factor prices in all countries.[3]

This is also a theory that explains why trade policy will be controversial. In a country which is relatively well endowed with capital, labour will be relatively scarce. As a result, labour intensive goods will be relatively expensive and wages will be relatively high. If this country opens up for trade labour-intensive goods will become cheaper and wages will fall. In this country workers have reasons to oppose trade liberalisation. In the other country, the opposite applies. In that country, labour intensive goods are relatively cheap while capital-intensive goods are relatively expensive. Therefore, workers will favour trade liberalisation while capital owners will not. Still total incomes in both countries increase as a result of trade.

There are by now acceptance that complete factor price equalisation is at best a hypothetical result of free trade. The world has neither witnessed equalisation in profit rates, wages nor land rents. The theory is valid only under very strict conditions and many other factors influence on factor prices.[4] However, the theoretical framework may indicate directions of change due to trade liberalisation. As such it also sheds light on the political economy of trade policy. It identifies losers and winners from liberalisation and therefore also the likely role of interest groups.

For developing countries this is especially important. We have argued that international trade may increase a country's total income. If a country has institutions that are able to compensate losers from international trade, trade may potentially benefit all inhabitants. The quality of institutions varies between countries. For poor countries, social security is often low and very often losers from trade are not compensated. Therefore, often trade liberalisation can increase levels of conflict in a society. In Ben-David *et al.* (1999) effects of trade policy on poverty are discussed. The links from agreements in the WTO to poor people in the third world are indirect and vague. Reductions in tariff rates benefit importers. These become able to import more. If markets work properly they may also sell the imported products at lower prices. Does that benefit the poor? This depends on the poors' consumption patterns. Reduced tariff rates may also increase competition towards domestic producers. Some plants may have to close down. Does that benefit the poor? This depends on whether workers in these plants are among the poor and whether these poor are able to find better or equally paid work elsewhere. In sum therefore, the potential for trade to ease the life of poor countries' poor may not always realize. Below we review a few empirical studies on the impacts of trade on domestic inequality and poverty.

Trade theory based on endowments of resources most often assume that these endowments are fixed. For some of them this is clearly wrong. For instance, physical

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[3] The Heckscher-Ohlin-Samuelson model of international trade is based on the neo-classical modelling framework. It is assumed that all countries produce all goods and that all countries have available the same production technology.

[4] For an overview of trade theory, see Krugman and Obstfeld (2003). A more advanced text is Helpman and Krugman (1985). For a review of the literature on the factor price equalisation theorem see, Leamer and Levinsohn (1995). They write: 'More, importantly, the real question isn't whether FPE (factor price equalisation) is true or not. Trust us, it isn't true. The real question is what causes the violations that we observe.'

and human capital are results of investment. Therefore countries are able to change their comparative advantages over time. We return to this below.

In theories based on comparative advantage, protectionism is costly. Protection reduces trade and national incomes decreases as compared to free trade. However, as underlined above, interest groups may have different interest than to maximise national income.

Second: Trade stimulates growth because there are increasing returns in production. Trade theory based on increasing returns have been analysed intensively during the last two decades.[5] When there are increasing returns in production, unit costs are lower when the scale of production is large. Therefore, two countries that produce two goods will be able to increase their total production if one country specialises in production of one good and the other country specialises in production of the other good. If these two goods belong to the same industry, there is two-way trade for this industry. Such two-way trade in industries constitutes a large and increasing share of total world trade, in particular for trade between developed countries.

It is important that trade explained by increasing returns do no depend on differences between countries like the theories of comparative advantages do. When countries are different however, trade based on increasing returns may give different results than trade based on comparative advantages does. Industries in the largest and most developed countries may benefit at the cost of smaller and less developed countries. This is because large countries may have a cost advantage over small countries with a smaller home market. In order to build manufacturing industries, some may argue that there is need for protection in small countries. Market access however, is important. Market access will allow countries to build up competitive industries.

Third: Trade may have dynamic effects. The effects of trade described above are static. Both comparative advantages and increasing returns may give rise to higher incomes, but not necessarily higher growth rates. Trade is important however, also because it stimulates technology production and technology diffusion. Recent growth theories have focused on motives for R&D and effects of technology diffusion. There is a growing literature on growth effects of trade. One possible effect is that trade increases growth because it makes R&D more profitable. Since trade increases the markets in which a new good is sold, it may pay more off to do research to develop new products as compared to a situation in which new goods can be sold domestically only.[6]

Another effect of trade on growth is that it allows technology diffusion from technologically sophisticated countries to lagging countries. As such trade may stimulate economic convergence between countries. Even if new goods are developed in developed countries, developing countries may benefit from imports of these goods and from technology diffusion for domestic production.[7]

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[5] See Helpman and Krugman (1985) and Dixit and Norman (1980).

[6] These effects are discussed in Helpman and Grossman (1991) and in Rivera-Batiz and Romer (1991).

[7] Eaton and Kortum (2001 and 2002) discuss these effects of international trade. Lucas (1988) is also a classic reference in this respect. Krugman (1979) and Helpman (1993) discuss the effects of intellectual property rights on relative income levels and growth rates in rich and poor countries.

New growth theory has also identified a third mechanism through which trade may both *increase or reduce* long run growth in countries. Productivity in industries often evolves as an unintended effect of learning by doing. Firms learn from each other and ideas developed by one firm are picked up by others. In turn this stimulates new technology in other firms. In some industries such dynamic learning effects are important. Over time productivity growth in these industries may be high. In some industries they may be less important. If trade causes a country to specialise in a dynamic industry with high growth potentials in the long rung, trade may increase the long run growth in this country. If trade causes the country to specialise in industries that lack such growth potentials, trade may decrease long run growth. Note that when such a process has been going on for a time it will be increasingly difficult to catch up with the leading industry. Therefore, specialisation in the 'wrong' industries, e.g. because of static comparative advantages, may become an underdevelopment trap in the long run.[8]

This gives arguments for use of trade policy. By means of trade policy a country may stimulate the high growth industry, for instance by use of tariffs. When the industry has grown more competitive the tariff is no longer necessary. This is the *infant industry* argument for trade policy. This is an old idea but its popularity has varied. Historically Adam Smith was in favour of free trade while Friedrich List favoured protection.

Infant industry tariffs to protect growing industries have been used by many developed countries during their phases of industrialisation.[9] Infant industry protection was also used intensively by developing country in the post-war period.

Former minister of finance in Argentina, Raul Prebisch (1959) argued that also another argument favours protection. Countries specialised in industries for which there is a low elasticity of income in the world market may experience reduced growth opportunities as compared to other countries. When world income increase, the demand for products from such countries will not grow as fast as demand from other countries. Therefore, such countries may become lost in a low-growth trap from which they have to escape by switching their industrial structures to other industries with higher income elasticities of demand. In order to be able for such structural changes in their economies, trade policy measures may be effective.

From the 1970s on however, scepticism about protection and import substitution has increased. Baldwin (2000) explains this by the historical experiences. Many countries have tried to increase their industrial bases by means of tariffs, but success has been limited. Among the countries that have grown fast, infant industry protection seems to have had a limited role. Johansson (2005) argues that import substitution with high tariffs on manufactured goods have harmed many developing countries. It has increased the prices of imported goods, reduced efficiency in manufacturing and prevented specialisation according to comparative advantages. She argues that the reasons that import substitution has been so popular are ideological prejudices and imperfect information. Policy makers did simply not have access to correct analyses and information.

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[8] Romer (1986 and 1990) and Lucas (1988) are important references in this respect. So is Young (1991).
[9] For a historical overview, see Chang (2002)

This is a controversial point of view however. During some periods, import substitution has occurred at the same time as high growth rates. This was the case for many developed countries during their industrialisations, for developing countries in the post-war period and for the centrally planned economies in several periods. Clemens and Williamson (2004) present evidence suggesting that tariffs was positively correlated with growth before 1914, uncorrelated with growth in the inter-war period and negatively correlated with growth after world war II. They argue that one reason for this is that average tariff rates in the world economy have decreased. They argue that protection is growth promoting when other countries' tariffs are high, that there is a negative relationship between protection and growth when other countries' tariff rates are low. Clemens and Williamson's data are restricted to a smaller sample of countries for which long time series of tariff rates are available, however.

There are several reasons why infant industry protection may be problematic and also risky. The first is that it may be difficult for governments to know in advance which industry that has long run growth potentials. If the government is wrong and protects the wrong industries, infant industry protection will be harmful. The second argument is that most industries will try to obtain protection. Therefore, industrialists will try to lobby for protection of their business. Infant industry protection may therefore stimulate rent seeking behaviour. A third reason is that high tariff barriers on imports may prevent technology diffusion from abroad since very often such new technologies are embedded in goods that are imported. A fourth reason is that competition, also from foreign countries, will increase efficiency.

The arguments about infant industry protection may be wrong also for another reason. Take the example with two industries with different growth potential over time. One grows slowly (or not at all) while the other industry grows fast due to e.g. learning mechanisms. If one country specialises in the low growth industry its productivity will grow slowly. However, productivity growth in the other industry is high. Therefore prices for products belonging to this industry will tend to decline. This will benefit the slowly growing country too. This is not just an academic example. Finland has benefited from specialisation in production of cellular telephones. NOKIA has grown to a large multinational company. Naturally, this has stimulated growth in Finland. It has also benefited other countries. Now cellular phones are in use all over the world, also among poor people.

In much theoretical work on trade policy, unemployment is assumed to be non-existent. This is not realistic. Unemployment exists and is often much higher in developing than in developed countries. In many countries, there is a so-called dual economic system. This is a system in which there is one modern high-wage industry and a larger, old-fashioned low-wage sector. Often the low-wage sector is agriculture. In the agricultural sector there is over-employment so that total production would not decrease much if employment was reduced. For economic development it is crucial to move the working population from low-productivity agricultural employment to employment with higher returns. For this to be possible productivity growth both in agriculture and in manufacturing and services are important. This gives arguments that market access both for agricultural products and for manufactures is important.

Finally, trade policy in terms of tariffs and other taxes is often used not only to protect industries but also as a source of government incomes. In figure 2 we show import taxes as a share of government incomes versus (the log of) income per capita. The figure shows that import taxes are important for government incomes in many countries, in particular among the poor ones.

Poor countries often have low institutional qualities. This means that they often will have problems in establishing efficient and modern tax authorities. Taxing profits, wage income and land rents are common in rich countries. This requires relatively advanced institutions and a well-organised society. For poor countries modern tax systems are often out of reach. Therefore they rely more on imperfect tax objects. International trade is often taxed, often simply because it easy. This reduces growth and economic performance.

Figure 2 Import duties as percent of tax income and income per capita.
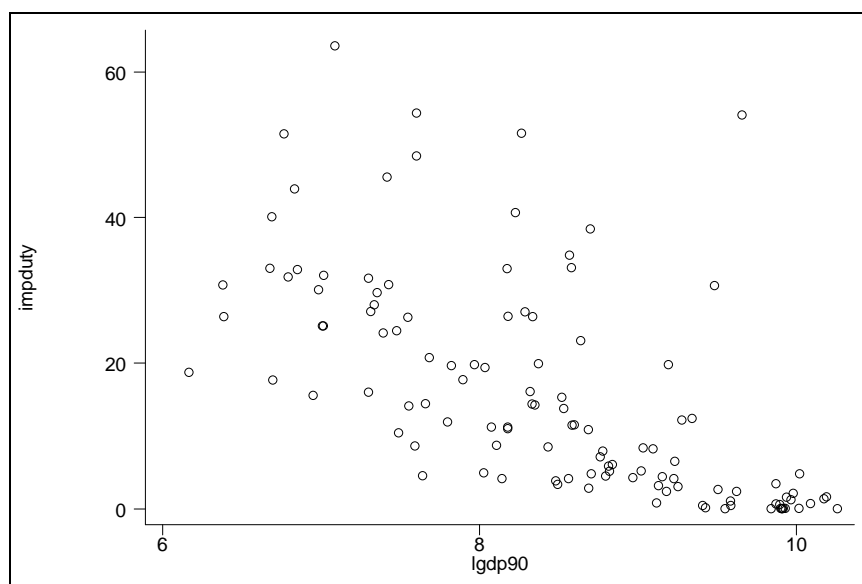
Source: World Bank (2004)

In sum, economic theory gives arguments for free trade but also for protection in certain circumstances. Despite decades of research there is no agreement about the right development strategies for poor countries. Tariffs may increase growth and they may reduce distributional conflicts in countries. It is clear however, that tariffs may also be abused and that they have the potential to harm economic development. One important message from the theoretical literature is that trade liberalisation may have different impacts in different circumstances. This is partly because a wide set of other factors, also political ones, influence on development. Winters (2004) presents a review of how other policies and institutions are linked with effects of trade policy. Winters discusses the relationships between trade policy and variables like corruption, macroeconomic stability, institutional quality and education.

Even if the relationships between domestic trade policies and development are not unambiguous, it is clear from our review that in most cases tariffs will harm exporting countries. This is important for the perspective in this note: Tariffs imposed by rich countries in order to protect their industries are harmful for those countries that do not get access to these markets. In the appendix, a graphical representation of effects of tariffs for importing and exporting countries is presented. It is clear from the figures presented there, that exporting countries normally loose from other countries' protectionism.

Trade and growth – a first look
How does empirical research conclude about trade and growth? Is there a neat correlation between international trade and growth? Is it exports or imports that matters? What is the role of trade policy? Before we look at the data a clarification of terminology is called for. Most trade theories are static economic theories. Trade liberalisation may increase income and therefore lead to increased growth for a transitional period. After the transitional period growth rates will not be affected. Some growth theories also indicate such *level* effects of trade liberalisation. Liberalisation increases levels of income and therefore the growth rate for a period, but it does not increase long-term growth rates. Other growth theories do predict changes in long run growth rates as a consequence of international trade. The difference between *level* and *growth* effects is very important. As mentioned above, just small deviations in percentage points in long term growth rates aggregate into large income differences over time. For our purpose however, we stick to growth effects of trade. That is, we try to investigate whether trade leads to *growth* and we focus less on whether trade leads to higher income. Our main reason for this is that our ten years period is too short to disentangle between short run and long run. Furthermore, *growth* effects are more important, but also harder to detect from the data than *level* effects. As such we look for stricter evidence on the impact of international trade on development by focusing on growth rather than levels.

Figures 3a and 3b graph income levels per capita and growth rates against trade as a share of GDP. Trade is measured as export plus imports. The data are from the World Bank (2004). This graph gives indications that trade is good for income and somewhat weaker indications that trade is good for growth. There is a positive relationship between trade as share of GDP and income levels and growth rates. Regressing growth rates and income levels on trade shares give a positive and statistically significant coefficient (at the 10 percentage level for growth and at the 5 percentage level for (log of) income levels.

Despite the evidence presented in figure 3b (and 3a) there are many reservations before one can conclude that trade stimulates growth. First, several factors influence on growth, like investments and population size. Second, it is well known that small countries trade more as compared to their GDP than large countries. This is because more of world's supply of and demand for products is outside small countries as compared to larger countries. Therefore, one also has to control for size. Third, even if there is a positive relation, one cannot conclude about the direction of causation. Does trade cause growth or does growth cause trade? In figure 3b trade shares in the beginning of the period is graphed against subsequent growth. This is not, however, a robust check for causation. Fourth, geography plays an important role. It is well known that neighbour countries tend to trade more than distant countries. Therefore,

one implication is that countries with large average distances to other countries will tend to trade less than others. Fifth, the trade measure used to construct figure 3 is the sum of exports and imports as a share of GDP. As such, the figure does not reveal whether it is exports or imports (or both) that potentially stimulate growth. Sixth, the figure below does not say anything about trade policy. Therefore, it is not possible to conclude from the figure whether a liberal imports regime stimulates growth or if open markets in foreign countries exports are important. Despite all these hesitations, figures 3a and b do give the impression that countries that trade a lot (in relation to their GDP) also experience higher income levels and growth rates.
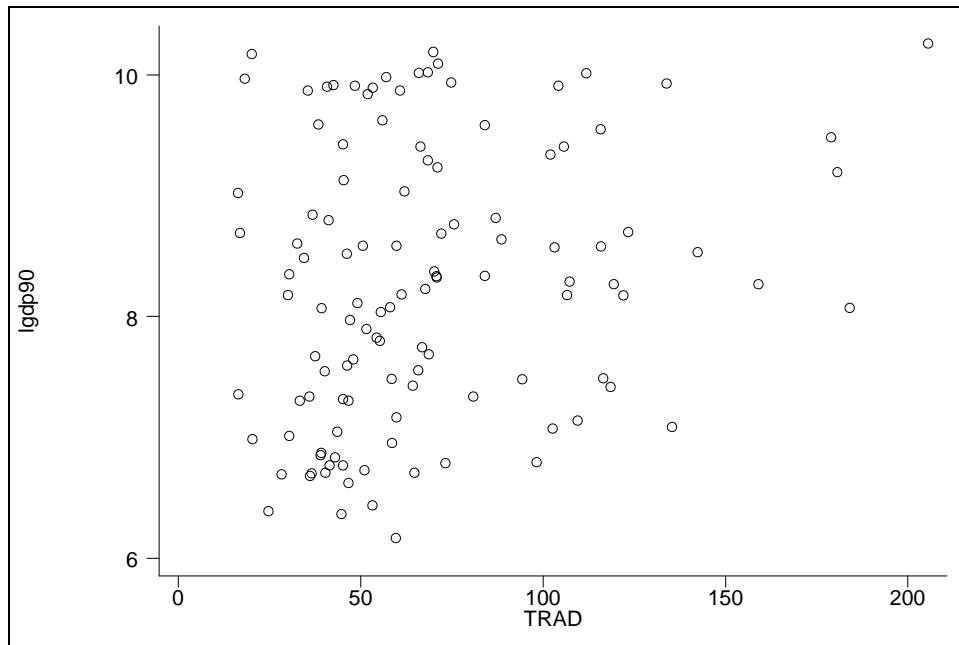
Figure 3a Growth and income levels

Figure 3b Growth and trade
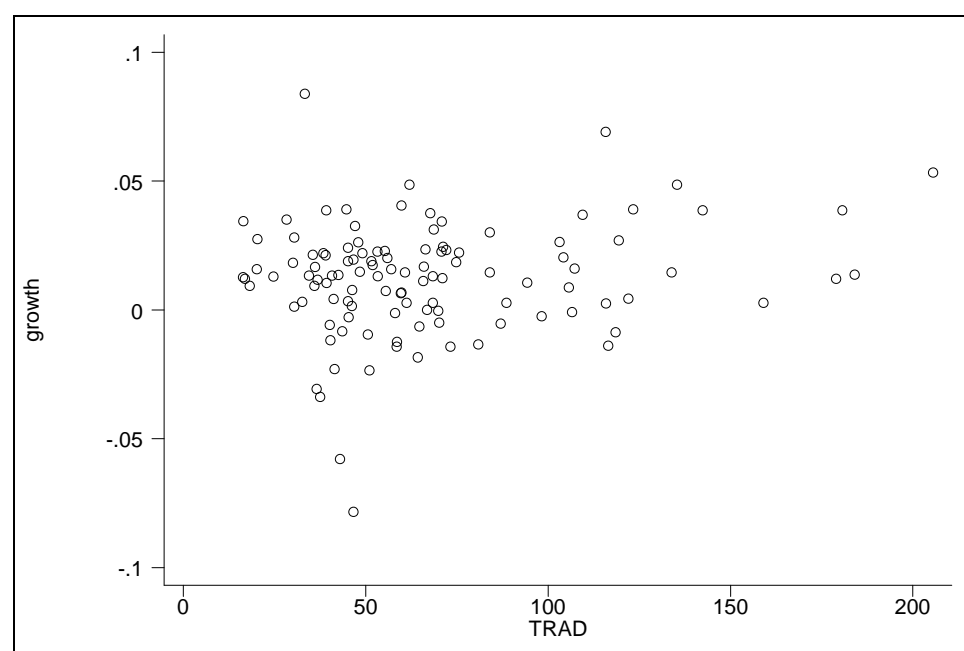
Several studies conclude that trade is good for growth. However, many studies fail to take into account the reservations mentioned above. Many studies make use of either trade as share of GDP or *growth rates* in trade as explanatory variables in cross-country growth regressions. In such regressions several variables are inserted into a regression model that attempts to explain economic growth.

In table 1 we present regression results for economic growth. We include as explanatory variables (log of) initial GDP per capita, trade as a share of GDP, (log of) population and (log of) gross fixed capital formation as share of GDP (GFC). Initial GDP per capita controls for convergence. Gross fixed capital formation measures investments. In addition we included the interaction term between trade as share of GDP and population (interaction). This will to some extent account for the fact that small countries trade more than rich countries compared to their GDP. We also include a number of dummy variables. Dummy variables take the values zero or one to measure whether a country belong to a certain category or nor. The dummy variables used are for each continent and for whether the country is in transition from a planned to a market based system. We believe that many other variables influence on growth. Such variables could be education, institutional quality, rule of law and the protection of property rights. A problem in growth regressions is that good variables are only available for a small number of countries. Our choice of variables is the result of a trade off between sample size and inclusion of relevant variables. In total we have 110 countries in our sample. We report the coefficients from the regression (the estimated impact) and the p-value. The p-value denotes the statistical significance of the estimated coefficients. A p-value lower than 0.1 indicates statistical significance (at the ten percentage level). The R^2 is a measure for the overall fit of the model. R^2 varies between 0 and 1, with 1 as the highest possible.

Table 1

N=110	R^2=0.35	
Variable	Coefficient	P-Value
lgdp90	-0.0041	0.128
lpop90	0.0048	0.049
TRAD	0.0008	0.014
Interaction	-0.0001	0.026
Lgfc	0.0282	0.007
Trans	-0.0218	0.081
Europe	0.0003	0.934
Asia	-0.0118	0.029
Africa	-0.0226	0.000
Namerica	-0.0063	0.277
Lamerica	-0.0128	0.004

The table gives some indications that trade is good for growth. The partial effect of the trade variable is positive and significant at the five per cent level (p-value lower than 0.05). In addition to trade also population size and investments seem to correlate positively with growth. The dummy variables for transition countries and for Africa are negative and significant. Note however, that the results reported are not robust to inclusion of variables. When population is left out, the effect of trade becomes insignificant. When the interaction term between size and trade is left out, the trade share is also not significant. The regressions are robust however, for inclusion of dummy variables. As we will return to below, this is important because dummy variables for continents capture many variables that explain growth.

As mentioned above, a positive correlation between trade shares in GDP and growth is not enough to conclude that trade is good for growth. Neither can one conclude that liberal trade policies are good for growth. We will discuss these hesitations in turn.

More robust measures for trade's impact on growth.

We have discussed above that correlations between trade and growth may give a wrong impression that trade causes growth. It might be, for example, that some third variable explains both trade and growth. Inclusion of more explanatory variables in our growth regression is one way to try to control for such variables. Above we included investments, population and initial income. In our data trade as share of GDP and investments are positively correlated. By inclusion of both we control for their independent effects. However, there might be (and probably there are) other variables that correlate both with growth and trade. It is hardly possible to control for all potential variables.

One way to control for these problems is to use changes in growth rates rather than growth rates and changes in trade-related variables rather than the levels of these trade-related variables. This is the strategy chosen by Dollar and Kray (2004). They present regressions of changes in growth rates over a period on changes in the volume of trade. Dollar and Kraay argue that this strategy controls for other variables that influence both on growth and trade but which are constant over time. One typical

example of such variables is geography. It might be that tropical countries have both lower growth rates and less trade than other countries. By looking at changes over time one controls for this since being tropical does not change over time. Dollar and Kraay's results show that changes in trade shares do indeed correlate with subsequent growth. Their results indicate that this effect is substantial. Their lowest estimate indicates that a 100 percentage increase in trade increase growth rates by 25 percentage. Dollar and Kraay's study has some drawbacks however. One is that they omit several variables that we know influence on growth and that change over time. One example is investments. Another example is education. Another drawback is that it might not be true that Dollar and Kraay actually control for variables that are constant over time. This is because the impact of such variables may change over time. It is well-known that growth rates in countries correlate with growth rates in neighbour countries. In some periods a 'cluster' of countries may experience low growth. In other periods the same cluster may experience higher growth rates. Therefore, even if the location of a country is constant, the impact of this location may change depending on whether neighbour countries experience high or low growth.

An alternative strategy is to investigate the determinants of trade and construct a new measure that indicates trade, but does not reflect determinants of growth. This has become a common way to investigate the impact of trade on growth. Below we sketch the strategy and give some references to the literature.

Bilateral trade is known to be approximated very well with the so-called gravity of international trade. For a pair of countries, i and j, the following expression 'explains' trade with a high degree of empirical exactness:

$$ltrade_{ij} = a_1\, lgdp_i + a_2\, lgdp_j + a_3\, ldistance_{ij}$$

Above, lgdp denotes the log of total GDP and ldistance the log of the distance between the two countries. The as are coefficients. These are elasticities so that they indicate the percentage increase in trade per percentage increase in the variables. Fitted models give positive signs for a_1 and a_2 and negative signs for a_3. In Maurseth (2005) we make use of this model in order to investigate Norway's trade with developing countries.

A corollary of and an approximation to the gravity model is that total trade as share of GDP (for country i) will be given as a variant of the following expression:

$$trade_i/gdp_i = S(gdp_j/distance_{ij})$$

This expression says that trade as share of GDP equals a weighted sum of all other countries' GDP. The weights are the inverse of the distance between the country in question and the country's trading partners. We calculated a distance matrix based on the latitude and longitude of the capitals of all countries. By means of the resulting distance matrix we calculated the above expression for all the countries in our sample The resulting expression is commonly as denoted countries' *market potential*. This is because it reflects how close a country is to markets around the world. Mexico for

instance, has a large market potential since it is close to the large US market. South Africa is surrounded by poor neighbours and therefore has a low market potential. An alternative to using trade shares directly in growth regressions is to use trade determinants. For our purpose, this strategy would imply to insert the market potential into a growth regression instead of trade shares.

The implicit hypothesis behind such a strategy is the following: It might be that trade and growth correlates because of some variables that influence on both. Productivity, R&D, institutional quality and other variables are important for growth. Probably they are also important for countries' international competitiveness. Since we do not have data for all these variables (and since it would be a difficult task to estimate their joint influence) it not possible to include them in the growth regression. However, these variables do not influence directly on a country's market potential. A country's market potential is defined only by geography and other countries' total income.

In table 2 we report results from a growth regression that includes (the log of) market potential instead of trade as share of GDP.

Table 2.

N=110	R^2=0.35	
Variable	Coefficient	P-Value
lgdp90	-0.0038	0.179
lpop90	0.0004	0.714
lmp90	0.0093	0.094
lgfc	0.0314	0.001
trans	-0.0237	0.060
europe	-0.0148	0.138
asia	-0.0160	0.019
africa	-0.0270	0.001
namerica	-0.0123	0.192
lamerica	-0.0185	0.004

It is seen from the regression results that market potential seems to correlate positively and significantly with growth. The significance however, is weak. Therefore, these results are in line with Frankel and Romer (1999). Frankel and Romer test correlations between trade and income levels for a large set of countries. They go a long way in order to control for possible correlations between trade and growth that stem from other factors. Their approach is to use well-known determinants for trade, and in particular geography and size, to construct a variable that correlates with trade, but not with growth. Thereafter they test whether this constructed variable is correlated with income levels. Frankel and Romer conclude that trade correlates with income (and therefore with growth). Their results indicate that the impact of trade on growth is substantial, but not very statistically significant. This is in line with our results. This means that even if there is a positive correlation, trade alone is not the only determinant for growth. Noguer and Siscart (2005) find more precise, robust and significant results based on a larger and more detailed dataset, but with essentially the same method as the one used by Frankel and Romer.

Both the results reported in table 2 and those found by Frankel and Romer indicate that trade is good for growth.

The results obtained by Frankel and Romer were criticised in Rodrik and Rodriguez (2001). They argue that the geography-based indicators used by Frankel and Romer correlate not only with trade but also independently with growth. Therefore, the positive effect on growth by their trade measure might not be a result of trade per se. How can this be the case? Rodrik and Rodriguez argue that the geographical variables used correlates with growth. African countries, for instance, all have low market potential and low growth. Low growth in Africa might be because climate and other geographical variables influence. As such Africa's low market potential may not be the explanation why Africa grows slowly. Rodriguez and Rodrik show that Frankel and Romer's results vanish when geographical variables are included as control in the regressions. Noguer and Siscart include variables that control for geography and still find positive effects of trade on growth. Note that our continental dummy variables are introduced for the same purpose. If e.g. Africa grows less for geographical reasons (or other common Africa reasons), this is controlled for.

Ben-David (1996) and Ben-David *et al.* (1999) study growth and trade from a different perspective. Ben-David's point of the departure is the literature on convergence. Table 1 and 2 above report results from regressions of growth on initial levels of income (and other variables). The results indicate insignificant convergence. The coefficients for initial income are negative, but the p-values are larger than 0.1. It is a well-known result however, that over long periods, there is *conditional* convergence (see e.g Barro, 1991 and Baumol, 1986). This means that groups of countries that share similar characteristics converge in income per capita. Ben-David's approach is to study convergence conditional on trade patterns. For each country in his sample, Ben-David constructs new samples of countries constituting these countries' main trading partners. He shows that countries seem to converge in income levels towards their trading partners. In essence this result indicates that trading countries become more similar. Ben-David also shows that this type of convergence is of the catching-up-type: Poor countries catch up with their richer trading partners.

Gaulier (2003) argues that there are two weaknesses in Ben-David's results. First, even if there is convergence in the sense that poor countries on average catch up with their trading partners, this does not lead to reduction in differences in standards of living. The reason is that there are shocks and disturbances in income levels that counteract the convergence process (cfr. footnote 1 and Quah, 1993). If a poor country grows fast and a rich country grows slowly, the result might be that income differences between these two countries is the same after a period if the poor country has grown richer than the rich country.

Second, the result obtained by Ben-David is biased because some large countries (in particular USA, Japan and the larger European countries) get high weights. These countries are big and therefore major trading partners for many countries. If the United States for a period experiences low growth this will go a long way in explaining Ben-David's findings since USA is an important trading partner for many countries. Gaulier therefore concludes that the results obtained by Ben-David do not necessarily imply that trade stimulates catching up.

Both the results obtained by Ben-David and those reported on above take into account the geographical position of countries. Since countries that are close to each other trade more, the impacts of geography are (more – as in the study by Levine and Renelt – or less directly– as in the study by Ben-David) taken into account. Geography is known to be important not only for international trade but also for other variables, like foreign direct investments and e.g. knowledge spillovers.[10] Since economic interaction depends on geography, it is a possible hypothesis that also growth depends on geography. If so, growth-stimulating policies in one country only may be less efficient than co-ordinated policies. For trade policy it might be more important to stimulate trade among neighbouring developing countries than between rich and poor countries.

Arora and Vamvakidis (2005) use a very detailed database for more than 100 countries and for a long period to investigate relationships between trade and growth. One important finding in their paper is that a distance-weighted growth rates in other countries seem to influence positively on growth. This means that an expression of neighbour countries' growth rates influence on growth rates in individual countries. Growth is contagious and spills over to neighbour countries. This may be one reason why we observe clusters of rich and poor countries in the world economy. Arora and Vamvakidis actually find that the effect of such local spillovers is more important for growth than trade is.

In order to get an impression of whether growth is geographically contagious figure 3 plots individual countries growth rates against the weighted average of other countries growth rates. Individual countries' growth rates (normalised to the average) are shown along the horizontal axis and the weighted growth rates of countries are shown along the vertical axis. The weights decrease with geographical distance. Therefore, observations in the first (northwest) quadrant indicate countries with high growth rates surrounded by other countries with high growth rates. Observations in the third (southeast) quadrant indicate countries with low growth rates that are surrounded with other low-growth countries. Observations in the second (southwest) quadrant indicate countries with high growth rates surrounded by countries with low growth rates. The interpretation of the fourth quadrant follows.

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[10] See e.g. Brenton and Di Mauro (1999) and Narvestad (2000) for international investments or Jaffe, Trajtenberg and Henderson (1993) for technology spillovers.

Figure 3 Moran scatterplot of growth
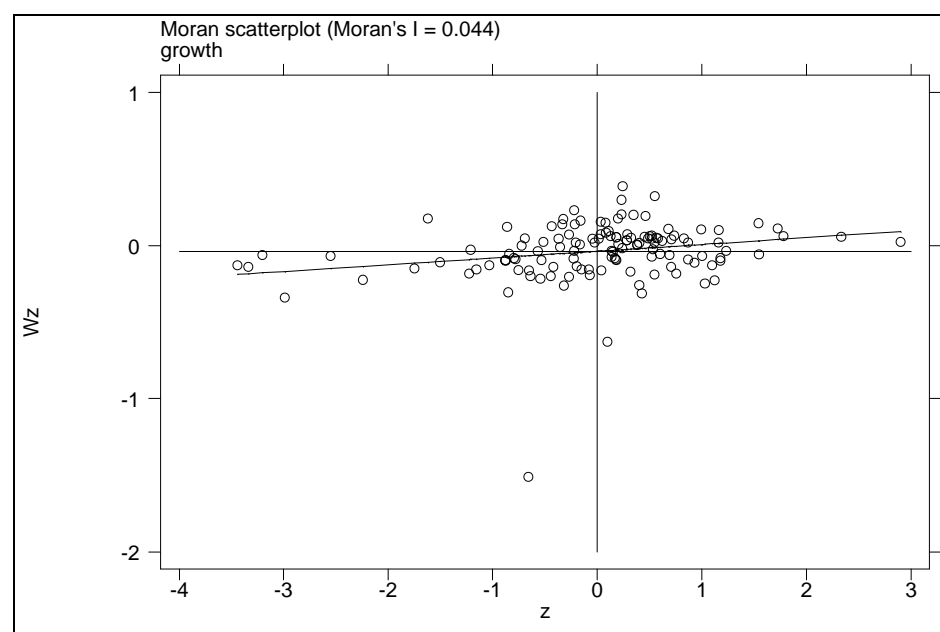
The figure gives some support for the idea that growth is geographically contagious. Growth in one country tends to spill over to neighbour countries. This is seen from the positively sloping regression line in the figure and by the fact that there are more observations in the first and the third quadrant than in the other two. To stimulate growth in poor countries therefore, it is good to stimulate growth in several countries in the region in which this country is located.

Table 3 presents results from a so-called spatial lag regression model. In this model the coefficient ? measures the effect of spatial spillovers. The regression results indicate that growth is indeed contagious. A one percentage point change in growth rates changes growth in the same direction in other countries with an elasticity of about 0.50. It is an important research task to investigate whether this relationship is robust to inclusion of other variables and whether it applies to all countries or sub samples of countries only.

Table 3 Spatial growth

R^2=0.10	N=129	
Variable		
Growth	Coefficient	P-value
lgdp90	0.002	0.70
lpop90	0.001	0.49
LGFC	0.018	0.014
?	0.0519	0.067

Imports or exports?

Note that the results reported on and reviewed so far only reflect total trade. Trade as share of GDP includes both exports and imports. Market potential reflects both export potential (how close a country is to important markets) and import potential (how close a country is to major suppliers of goods). Is it imports or exports that stimulates growth? In the theoretical discussion in the introduction we argued that imports are the end and exports are the means in international trade. If exports did not increase the ability to import, it would be better to use the productive resources that produced the exported goods for other purposes. Exports are necessary in order to pay for imports, however. In the long run a country will run into balance of payments problems if its exports is smaller than its imports. There are some exceptions from this. The first is that countries whose currencies are international reserves may have long run deficits in their current account. The USA and potentially Europe are in this position. A second exception is countries that receive development assistance from abroad. Furthermore, our period, from 1990 to 2002, is so short that trade deficits and surpluses can easily exist without limiting growth. Therefore it is of interest to try to discriminate the effects of exports versus imports on economic growth.

In the literature on trade and growth only few attempts has been done to discriminate the effects of imports from the effects of exports. Arora and Vamvakidis (2005) is one exception. Their strategy is to link growth in a country's trading partners economies to growth in the country itself. As mentioned above they use geography as one type of link. They also use a country's exports to its trading partner as another type of link. Arora and Vamvakidis find that growth in a country's trading partners significantly and strongly influences on growth. This is interesting in at least two respects: First it indicates that growth spill over to other countries, both as a function of distance and as a function of international trade. This is similar to what we found above. Second, they show that *exports* links growth in neighbour countries to individual countries. It is well known that imports may serve as such a link. Coe and Helpman (1995) is one pioneering study in this respect. This is explained by the hypothesis that being able to import means being able to import high-tech intermediates and consumer goods. The fact that also exports serves as a growth-promoting link indicates that market access to high growth countries also stimulates growth. One reason may be that demand is higher when market potential is high. Another may be that demand for high technology is higher when market potential is high. A third reason may be that technology spills over to nearby countries via other links so that these countries in turn come in a better position to export. More research is needed to shed light on possible mechanisms.

Below we report results on imports' and exports' influence on growth. We follow the same strategy as we did before. The first results are based on countries' exports and imports performance. These variables as shares of GDP are included in our growth regressions together with an interaction term between these shares and the size of the country in terms of population. Results are reported in table 4 and 5 (but we omit results for the dummy variables). For the results obtained here we relied on data from the COMTRADE database. This database contains trade statistics reported from national authorities. We prefer to use trade data in the beginning of the period. This is

because our hypothesised relationship is from trade to growth and not the opposite. Since reporting procedures were weaker before (and because some countries have ceased to exist) this reduced the sample size from 110 to 72 for imports and to 102 for exports.[11]

Table 4 Effects of imports on growth

N=72	R^2=0.37	
Variable	Coefficient	P-value
lgdp90	-0.0046	0.122
lpop90	0.0049	0.044
Imports/GDP	0.1932	0.013
Interaction	-0.0107	0.021
Lgfc	0.0274	0.017

Note: Dummy variables for each continent and transition countries were included but are not reported.

Table 4 indicates large and significant effects of imports on growth. One percentage point increase in imports as share of GDP raises growth with 0.2 percentage point. The coefficient is significant at the 5 percent level. This is an important result and should be taken as a reminder that imports is why a country should export. When the regression reported on in table 4 was rerun only for the 75 per cent poorest countries in the world, the results were the same. So it was for the 50 per cent poorest countries. The results are therefore robust for country at all income levels.

Table 5 Effects of exports on growth

N=102	R^2=0.34	
Variable	Coefficient	P-value
lgdp90	-0.0034	0.279
lpop90	0.0031	0.174
exports/GDP	0.3030	0.119
Interaction	-0.0189	0.109
Lgfc	0.0298	0.009

Note: Dummy variables for each continent and transition countries were included but are not reported.

The results reported on in table 5 give less reasons to believe that export performance is important for growth. The coefficient for exports is positive and of larger magnitude than it was for imports. It is not significant however. For exports reducing the sample similarly as we did for imports were instructive: For poor countries exports enter positively and significant as explanatory variable for growth. This may indicate that being able to export is more important for poor countries than it is for rich countries. This result gives some support to the ones reported by Santos-Paulino and Thirlwall (2004). They find that trade liberalisation stimulates imports more than exports. Therefore, trade liberalisation sometimes has as a negative side effect that the

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[11] When we used trade data for 2000 the results obtained were qualitatively similar, but we had more observations.

balance of payment worsens. Balance of payments problems are often more severe for poor countries. Rich (and large) countries often have better access to international credit markets than poor (and small) countries have. This may explain the special importance of exports for these countries.

For imports and exports the same hesitations as for total trade applies. Variables that correlate with trade may also correlate with growth. Also, reverse causation may occur, so that growth causes trade. For instance, countries that are on a peak in the business cycle will often run a trade deficit while countries in recession often import less.

We therefore introduce countries' exports and imports *potential*. A country's imports potential is calculated as all other countries' exports weighted by the inverse of the distance to the country in question. A country's exports potential is calculated as the other countries' imports, weighted by the inverse of the distance to the country in question. The construction of these variables therefore resembles the construction of our market potential measure used above. We constructed these imports and exports potentials as shares of GDP. These variables were in turn normalised to the average for all countries. We report on these results in tables 6 and 7.

Table 6 Growth and imports potential

N=110	R^2=0.33	
Variable	Coefficient	P-Value
lgdp90	-0.0034	0.238
lpop90	0.0007	0.536
importpotential	0.0064	0.058
Lgfc	0.0316	0.001
Trans	-0.0227	0.067
Europe	-0.0099	0.139
Asia	-0.0116	0.041
Africa	-0.0238	0.000
namerica	-0.0060	0.311
Lamerica	-0.0135	0.007

Table 6 indicates that import potential is important for growth. The estimated coefficient is positive and significant at the 10 percent level. This implies that countries that are 'well suited' for imports, in the sense that they are located close to major exporters, experience higher growth than other countries do. This is an important result. The results reported in table 4 (on imports and growth) are parallel to the ones obtained by Coe and Helpman (1995). Coe and Helpman used imports directly, but they weighted imports from different trading partners by these imports' R&D content. They found that imports of high-tech goods (defined as having high R&D contents) are positive for growth. Coe and Helpman included only developed countries in their sample. In a more recent exercise, Coe *et al.* (1997) applied the same method to a broader sample of countries including developing countries. Essential they found the same results also for developing countries. Imports of high-tech goods stimulate growth. Related studies to those of Coe and Helpman are Eaton and Kortum (2001 and 2002). Eaton and Kortum note that most capital goods are

produced in rich countries and that capital producing industries are R&D intensive. Investments in such goods are important for growth. Countries localised far away from capital producers are therefore in a worse condition than countries being localised close to capital producing countries. Capital goods are simply more expensive for these countries. Regression results in Eaton and Kortum give support for the hypothesis that these mechanisms are important. The results obtained in Eaton and Kortum and in table 6 above differ from those of Coe and Helpman, however. Coe and Helpman used data for imports directly. Thus, their study potentially reflects the impact of imports of high tech goods. Their methodology is subject to the same criticism as above. It might be that some variable, for instance investments, explain both imports and growth. If so, the connection between imports and growth is an indirect one. Our result is not based on observations of countries' import, but on their import potential. Therefore our results should not correlate with other national determinants of growth. A similar result is obtained in Maurseth (2003) where a theoretical model based on the modelling framework by Eaton and Kortum is also presented.

What about export potential? In debates on globalisation poor countries' market access to developed countries' market is regarded as particularly important. In the negotiations on the trade liberalisation in the Doha round in the WTO, developing countries most important demand is better market access in rich countries. In our discussion above and in the appendix we gave some reasons why tariff barriers are costly for exporting countries. Furthermore, as analysed by Prebish (1959) and in a wide set of subsequent contributions, balance of payments restrictions may be more severe for developing countries than for developed countries. Increasing developing countries' market access may therefore be of particular importance for stimulating growth in developing countries.

In table 7 we present similar regression results to those in table 6 for export potential. Export potential for each country is calculated as the sum of all other countries' import weighted by the inverse of the distance between the country in question and the other countries. The sum is then divided by GDP and normalised to the average. The export potential for each country should be interpreted as a potential only. It is based on each trading partners total imports and we assume that these imports could reflect exports of other countries adjusted by the distance between the trading partners.

Export data would reflect a wide range of variables, like productivity, costs and quality of products, which correlates with growth. As such export data cannot be used to draw inferences on the relationship between trade and growth. Productivity is important both for growth and trade. Therefore the results we reported on in table 5 (on exports' impact on growth) can be easily criticised. Our export potential expression does not correlate with national determinants of exports. The reason is that each countries' export potential is constructed not on the basis of data that reflect conditions within the countries' economies, but rather on data that reflect other countries' imports.

Also, we believe that export potential reflect trade policy of other countries. If a country has high trade barriers its imports in general will be reduced. Therefore, this country will reduce the export potential of other countries. Our export potential

measure might therefore also reflect the impact of openness. Clemens and Williamson (2004) include average tariff barriers in countries' trading partners in some regressions in their historical study of a sample of few countries. They find that tariffs reduce growth in exporting countries, but the coefficients are not significant. More elaborate studies on this is called for in order to shed light on this important topic.

The results reported in table 7 give indications that export potential has a positive and significant effect on growth. The estimated coefficient is positive and significant at the 10 percent level. Note however, that the coefficient is smaller in magnitude and less significant than the one for import potential

Table 7 Growth and exports potential

N=110	R^2=0.33	
Variable	Coefficient	P-Value
lgdp90	-0.0033	0.239
lpop90	0.0007	0.573
exportpotential	0.0056	0.081
Lgfc	0.0315	0.001
Trans	-0.0228	0.064
Europe	-0.0092	0.157
Asia	-0.0110	0.048
Africa	-0.0233	0.000
namerica	-0.0059	0.329
lamerica	-0.0133	0.007

From table 7 we cannot conclude whether it is openness or geographical distance that is the most important for countries' export performance. In order to check for this it would have been necessary to include countries' tariffs and other trade policy measures. It is beyond the scope of this paper to do this. The impact of market access on growth is an important question and we regret that only few studies have concentrated on this issue.

Trade policy and growth.

Such neglect is not the case for the relationships between trade policy and domestic growth effects. There are many studies on the impact of openness on growth. From our discussion about trade policy, protection and growth above, there is no reason to expect a clear and unambiguous relationship. We presented arguments that tariffs and protection in many cases have potential growth stimulating effects. If a country succeeds in designing its trade policy so as to protect its 'promising' industries, protection might stimulate growth. We also argued that trade policy is risky. Governments have imperfect information about growth potentials in different industries. Therefore the chances of imposing tariffs in the 'wrong' industries exist. In that case, tariffs may be harmful for growth. We argued that many developing countries use trade policy not only to protect its industry but also to collect taxes. Probably such practice is harmful for growth.

There is a large and growing literature on the impacts of tariffs and growth in the countries that impose the tariffs. Here we will review just a few of these studies. We limit ourselves to the studies by Dollars (1992), Sachs and Warner (1995), Edwards (1998) and Wacziarg and Welch (2003). These studies are the most cited ones and they have also been intensively reviewed by others, like Rodriguez and Rodrik (1999).

Dollar (1992) has been one of the most cited studies of the relationships between openness and growth. Dollar does not use indices of trade policy directly. Instead he used deviations in domestic prices as compared to the price level in the USA. As discussed above, international trade tends to equalize prices between countries. The *law of one price* says that tradable goods should cost the same everywhere if there are no trade restrictions. If the law of one price holds only trade restrictions could explain deviations between domestic prices on tradable goods and international prices. Dollar also uses variability of prices as a measure of trade restrictions. Thereafter Dollar regresses growth on the index for price distortions, its variability and investments. He finds that both price distortions and their variability are significantly and negatively related to growth. Dollar concludes that open economies tend to have higher growth rates than other economies. Rodriguez and Rodrik examine Dollar's result. They argue that his results may not reflect real relationships between openness and growth. They use two sets of arguments for this. The first is that even open economies may experience deviations from the law of one price. One reason for this is that exchange rates often vary considerably over time. Often price changes that could restore the law of one price after exchange rate chocks occur slowly. Therefore deviations from the law of one price are the rule rather than the exception even for open economies. The second line of arguments is that Dollar's specification is non-standard. As mentioned, Dollar includes in his regression investments and his indices for price distortions and variability. As we have discussed at length, also other variables influence on growth. At the very least, growth regressions should include initial income per capita (to control for convergence) and regional dummy variables. Rodriguez and Rodrik show that when such variables are included, Dollar's results are no longer valid.

Another influential study is the one by Sachs and Warner (1995). Sachs and Warner construct a zero-one openness variable, which is equal to zero for 'closed' economies and one for 'open' economies. An economy is classified as 'closed' if any of five criteria is fulfilled. These criteria are that

   a) average tariff rates higher than 40 %
   b) non-tariff barriers covering more than 40 % of imports
   c) a socialist economic system
   d) state monopolies on important export goods
   e) the black market premium on foreign currency exceeds 20 %.

Sachs and Warner argue that each of these criteria distorts trade to a significant degree and that only countries that fail to fulfil all of them can be characterised as open. Each of the five criteria are sufficient for being classified as 'closed'. Sachs and Warner demonstrates that their openness variable is robust and significant when inserted into growth regressions. They also show that among the countries that qualified as open, not a single country grew at rates less than 1,2 per cent per year. Among the developing country, not a single open country grew at less than 2 per cent. Among the

non-qualifiers, only seven developing countries experienced growth rates at 3 per cent per year or more. Sachs and Warner discuss these seven cases and argue that only one (China) represents a case against their argument. For the other six there were good reasons why the non-qualifying countries had high growth rate in the period analysed.

The study by Sachs and Warner has been criticised. One criticism is that the openness variable reflects a wide set of indicators for bad policies and not only trade policy. As such Sachs and Warner do not show that trade barriers reduces growth, but that bad policy does. That could hardly be a surprise. The second type of criticism is that the indicator for socialist economic systems biases the sample. In the period studied by Sachs and Warner, the formerly planned economies did experience low growth rates. However, in the previous decades these countries had experienced very high growth rates. Therefore, it should be possible to grow fast even without liberal trade policies. Also, it is argued that not all the criteria included in Sachs and Warner's openness variable are necessary to include. Rodriguez and Rodrik show that inclusion only of state monopoly for exports and black market premium gives approximately the same results in growth regressions. Therefore, tariffs and non-tariff barriers may not be harmful for growth even if Sachs and Warner's index contain these variables. We are left with the impression that Sachs and Warner do not measure trade policy's impact on growth, but rather the impact of a composite index for bad economic policy.

Edwards (1998) uses nine alternative measures for trade policy in his study of the relationships between trade and growth. Edwards does not regress growth in income per capita, but growth in productivity on a set of explanatory variables, including his openness variables.[12] The additional explanatory variables are initial income per capita and indices if human capital measured by average years of schooling in the initial period in his study (1965). The nine openness variables include Sachs and Warner's openness variable, some of its components (like black market premium), average tariff rates, coverage of non-tariff barriers and several indices constructed by other authors. Edwards argue that many of the studies on the relationship between trade and growth do not contain appropriate checks for robustness of the variables. Edwards therefore includes other's indices for openness in order to test for robustness. Edwards finds that all the openness indicators had a positive estimated impact on growth and that they were significant in the majority of cases. Edwards conclude that his results 'suggest that more open economies have indeed experienced faster productivity growth'.

Edwards estimation procedure is somewhat special. Edwards weights the observations in his sample with GDP per capita. This is done in order to take into account so-called heteroscedasticity in the data. Rodriguez and Rodrik (1999) show that this weighting is inappropriate. By weighting the observations with the *log* of GDP per capita only five of the nine openness variables are significant and when estimated the standard way, only four of the nine variables are significant.[13] Edwards' study does not therefore, lends support to a view that there is a robust and clear relationship between openness and growth.

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[12] Edwards uses growth in total factor productivity, TFP. TFP is a constructed measure that adjusts growth in income for growth in use factors of production, in particular labour and capital.
[13] The standard way to take into account heteroscedasticity is to use White's (1980) consistent standard errors. In this paper, we report only p-values based on this procedure.

The last study we review is a new one. This is Wacziarg and Welch (2003). Wacziarg and Welch update and extend the openness indicator from Sachs and Warner so that it covers a longer period and more countries. They show that this indicator is not significantly correlated with growth in the most recent period. A more important contribution from the paper by Wacziarg and and Welch is to review the time paths of growth for individual countries. They show that after trade liberalisation very often growth rates increase to a level higher than before trade liberalisation. This indicates that periods of liberalisation increase subsequent growth. Wacziarg and Welch report results indicating that countries experienced 1.5 to 2 percentage points higher growth rates after trade liberalisation than before. Trade as share of GDP increase by 5 percentage point in the aftermath of liberalisation. An important hesitation however, is that periods of liberalisation very often comes at the same time as other types of policy changes. This could be stricter macro-economic policies, borrowing from the IMF, structural reforms or other types of policy changes. Also, policy changes often come after a period of recessions. In periods when the economy is growing fast, policy changes may not be regarded as necessary. Therefore, there are doubts whether the results obtained by Wacziard and Welch really reflect long run growth effects of trade policy or business cycle effects. Wacziarg and Welch also note that there is much variability in the responses to trade liberalisation. Some countries manage to increase their growth rates considerably while others do not succeed. They therefore conclude that 'future research should seek to further identify factors accounting for heterogeneity in the growth effects of trade reform'.

Rodrik (1999) argue that trade policy may be important for countries' growth performance, but that other variables are also important. Trade liberalisation may often stimulate investments, increase competition and improve macro economic performance. For long run growth rates to increase however, a wider set of policies should be imposed. Such policies should take into account specific conditions in each society, take notice of possible conflicts of interest and prevent new conflicts.

In sum, a growing literature of growth effects of trade policy has not yet established robust and clear relationships between openness and growth. From the literature however, our impressions are:

a) Most studies conclude that there is a positive relationship between openness and growth.
b) Measurement problems, statistical challenges and heterogeneity means that clear empirical relationships are hard to detect.
c) Many variables influence on growth, and probably so to a different degree in different societies. Therefore more work is called for in order to establish the role of trade policy in growth promoting reforms.

Trade and poverty

Our main focus in this paper is the literature on trade and growth. Growth in developing countries is presumed to have positive effects on poverty and for the well being of the poor. There is no guarantee however, that economic growth benefits the poor. In fact, many argue that globalisation and increased international competitiveness increases inequality within countries so that openness may actually harm poor people. If inequality is constant and trade stimulates growth however, poor

people will generally benefit from international trade. Kuznets (1955) postulates an inverted U-shaped relationship between inequality and development. Development results in higher income. Since development will tend to benefit some parts of the population first, inequality may increase in early phases of development. Only later on, when larger fractions of the population have experienced the positive effects of development, will inequality decrease, simply because the 'pool' of poor becomes smaller. Kuznets' approach is relevant in many countries. For instance, the Chinese economy is characterised by dualism. In some parts of the country, modern industries with high wages grow fast. In other parts of the country, traditional and low-productive agriculture dominates. Therefore inequality has increased in China. It should not however, be concluded that the high growth in China has harmed Chinese poor. China has now fewer poor people than before and also the lowest part of the income distribution experience growth in their incomes.

There are several studies about trade and poverty. For these issues methodological challenges abound. For poverty and inequality data are of worse quality than for macroeconomic variables like GDP per capita. Existing data are often based on household surveys. In many cases time series are short and observations for many countries are missing. In other cases poverty indices used for different countries are not easy to compare. Milanovic (2005) reviews the literature.

There are also case studies existing and there are some studies on effects of trade policy on the within-country income distribution for some countries. In Ben-David et al. (1999) possible links between poverty and international trade are discussed. These links go through labour markets, product markets and markets for intermediates. They also go through the effects of trade on institutions, competition and corruption. In addition comes trade's potential for creating conflicts.

More systematic studies using larger data sets for more countries are few. In addition to Milanovic's study we review Lundberg and Squire (2003) and Dollar and Kraay (2004).

Lundberg and Squire incorporate the Kuznets mechanism with analyses of welfare effects for poor of growth. They use the Sachs-Warner index for openness (see above) and indicate that increased openness both result in growth and increased inequality. They argue that the effect on inequality is minor.

By use of a broader dataset based on household surveys Dollar and Kraay reach a different conclusion. They find that openness (defined as export plus imports as share of GDP) is positively associated with per capita income growth and that this effect is the same for the bottom income quintile as for the average income. Essentially this means that incomes of the poor grow at the same rate as incomes for the country in general. Milanovic (2005) on the other hand, using a better data set and a more detailed analysis, finds the opposite result. In poor countries, it is the rich and not the poor who benefits from openness. Only when average income rises, the incomes of the poor and the middle class rise proportionately more than incomes of the rich.

Studies of larger samples of countries have reached different conclusions on the effect of international trade on poverty and inequality. Existing research does not support the view that globalisation generally harms poor people. Rather, there is evidence that

economic growth benefits the lower parts of the income distribution. Often however, the poor benefit less and later than rich from their countries opening up for international trade.

Conclusions and summary

In this paper we have discussed the literature on trade and growth. This literature has grown fast in recent years. Despite the many article that have emerged, there is still no agreement among economists about the relationship between trade and growth. Most economists conclude that there is a positive relationship. Our results have given support for this view. We have established that trade as share of GDP does indeed correlate positively with growth. We have also established that trade promoting conditions, like market potential is an important determinant for growth. So are import potentials and export potentials. From our review of the literature on trade policy and growth, however, we did not find support for any clear conclusions, even if most studies conclude that openness do in fact stimulate economics growth.

Appendix A

Figure 1A Growth rates and initial income levels, weighted by population
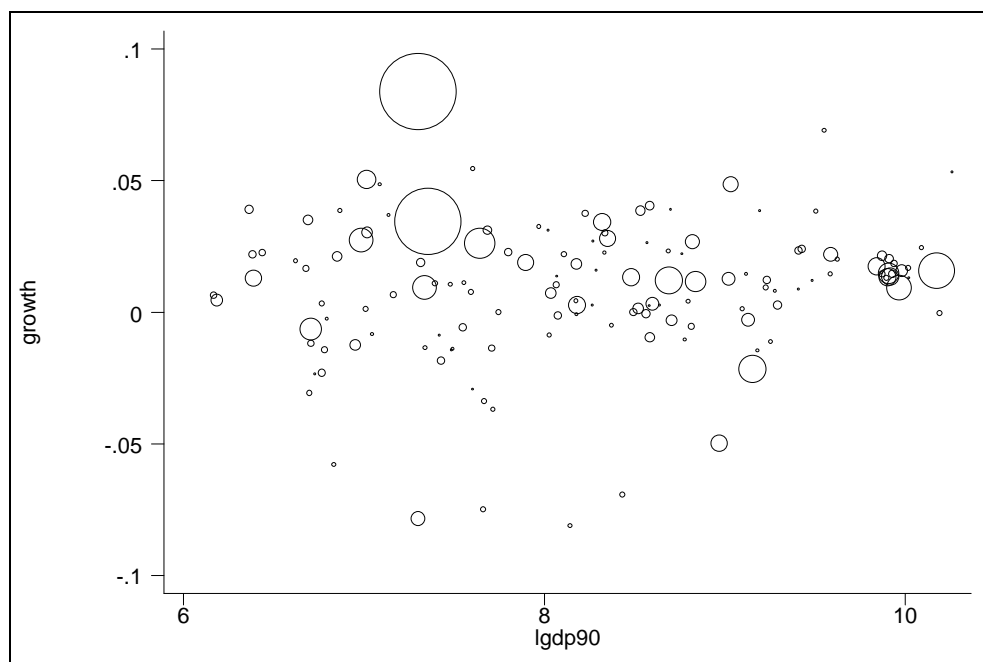
Appendix B. Effects of trade policy.

In this hypothetical example there are two countries. The home country (represented by the graph to the left in the figure and the foreign country (represented by the graph to the right in the figure). Both the home country and the foreign country produce the good in question. Let's denote this good beef. The foreign country has better conditions for production of beef than the home country. Therefore production costs increase less per unit produced in the foreign country than in the home country. This is why the supply curve is drawn steeper for the home country (S) than for the foreign country (S*). If the home country decides to produce its beef itself it will need to protect its beef producers. In the absence of international trade, the price and quantity of beef will be determined by the intersection of the home supply curve (S) and the home demand cure (D). This gives the price level P. If the home country instead allows free trade in beef, domestic consumers will buy beef from the foreign country as long as this beef is cheaper than in the home country. Prices abroad are lower than in the home country so there will be trade.
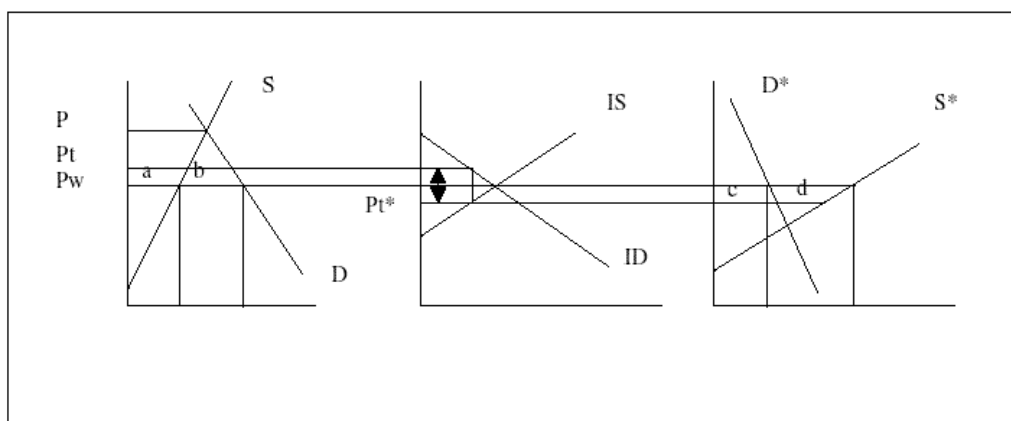
Home's import demand will be given by the difference between its own demand curve and its domestic producers supply. For prices below P this difference is positive. The home country's import demand curve (ID) is drawn in the figure in the middle, between the figures that describe the home country's market and the foreign country's market.

The foreign producers of beef will export beef as long as the international price is higher than in their home market. As can be seen from the right figure, this will be the case for all prices that are higher than were the demand and the supply curve in the foreign market cross. The export supply from the foreign country is the IS curve in the mid figure.

The world market price (in this hypothetical world with two countries) is the price where the IS and the ID curve cross each other. The world price in the case of free trade is Pw.

Now assume that domestic beef producers persuade its government to impose a tariff on imports of beef. In the figure, the tariff equals the double arrow in the figure. The tariff in this example is a fixed tariff and not an ad valorem tariff. This tariff has the

following effects. The tariff creates a wedge between the prices received by foreign beef producers and domestic consumers. This wedge equals the amount of the tariff. Prices in the home country increase to Pt. This is not equal to the amount of the tariff because prices on the world market decreases along the foreign country's export supply curve, IS. The increased price in the home country stimulates domestic production. It also reduces domestic consumption of beef. The result is that imports of beef decline.

In the foreign country the reduced world market price for beef reduces production along the foreign country's supply curve, S*. The reduced price for beef increases demand in the foreign country and therefore consumption of beef in the foreign country.

Welfare effects of trade policy are controversial and hard to calculate. A standard, but controversial measure for welfare is the areas below the demand curves and above the supply curves. In our example, the demand curve illustrates what consumers are willing to pay for beef. The price is what they actually pay. Consumers' welfare is the difference, i.e. the area between the demand curve and the price. Suppliers' profit is the difference between their unit costs and the price they receive. Therefore profit is often calculated as the difference between the price and the supply curve. If consumer and producer surpluses are valued equally, welfare effects of tariffs may be calculated.

In the home country producers gain and consumers loose from the tariff. The increase in producer surplus is the increase in the area between the price and the supply curve. This is equal to the area a. Consumers loose an amount equal to the area a+b. In addition come government incomes from the tariff which is not drawn in the figure. In the foreign country suppliers loose and consumers gain from the tariff. The loss in producers surplus equals the area c+d. The gain for consumers equals the area c.

Straightforward conclusions form this simple exercise are therefore:

- Consumers in the importing country loose from tariffs.
- Producers in the importing country gain from tariffs, but their gain is less than what the consumers loose.
- The overall impact in the importing country is not clear since the government collects the tariff. To the extent that the world market of the imported good decrease, an optimal tariff is positive.
- Consumers in the exporting country gain from tariffs.
- Producers in the exporting country loose from tariffs and producers' loss is larger than what consumers gain.

The example presented here is too simple to be realistic. It demonstrates though, that exporting countries will tend to loose from tariffs in their foreign markets.

Appendix C: List of countries used in growth regressions.

Country	growth	lgdp90	IGFC	TRAD	impot	expot	MP90
Albania	0.032528	7.970948	3.121443	47.12818	2.40E+09	2.49E+09	9.90E+09
Algeria	0.001389	8.520607	3.352803	46.26455	2.10E+09	2.18E+09	8.51E+09
Argentina	0.012548	9.022359		16.44182	5.61E+08	5.86E+08	3.00E+09
Australia	0.021382	9.871325	3.17574	35.57455	4.61E+08	4.41E+08	2.21E+09
Austria	0.018378	9.940687	3.144387	74.80637	3.42E+09	3.48E+09	1.32E+10
Bahrain	0.012026	9.485393	3.117628	178.9236	1.49E+09	1.19E+09	5.01E+09
Bangladesh	0.027455	6.984624	2.842793	20.33	9.59E+08	8.77E+08	4.84E+09
Barbados	0.008722	9.409109	2.732063	105.6864	9.29E+08	1.00E+09	4.70E+09
Belgium	0.014469	9.929448	2.984763	133.9682	6.87E+09	6.80E+09	2.36E+10
Belize	0.026876	8.269116	3.194434	119.4009	1.03E+09	1.15E+09	5.27E+09
Benin	0.019427	6.623627	2.615602	46.62455	1.20E+09	9.87E+08	4.82E+09
Bolivia	0.007699	7.593223	2.645723	46.40454	6.46E+08	6.80E+08	3.46E+09
Botswana	0.026331	8.570488	3.323563	103.2518	7.47E+08	7.04E+08	3.69E+09
Brazil	0.011953	8.692658	3.011919	16.95182	6.29E+08	6.59E+08	3.10E+09
Bulgaria	-0.00545	8.816646	3.043353	87.01727	2.21E+09	2.28E+09	9.76E+09
Burkina Faso	0.016599	6.67921	2.93844	36.12182	1.01E+09	1.01E+09	4.12E+09
Burundi	-0.03073	6.699119	2.691305	36.62909	7.88E+08	7.68E+08	3.36E+09
Cameroon	-0.00583	7.548134	2.901222	40.18364	8.92E+08	8.65E+08	3.90E+09
Canada	0.015688	9.981976	3.017716	57.04091	1.73E+09	2.28E+09	1.18E+10
Central African Republic	-0.00825	7.045254	2.451632	43.66636	8.82E+08	8.64E+08	3.74E+09
Chad	0.003331	6.76732	1.976225	45.20818	1.01E+09	9.96E+08	3.90E+09
Chile	0.040428	8.585692	3.061009	59.79364	5.47E+08	5.70E+08	3.00E+09
China	0.083841	7.301418	3.431668	33.30545	1.00E+09	9.53E+08	4.52E+09
Colombia	0.00308	8.600965	2.88475	32.70273	8.19E+08	8.81E+08	4.28E+09
Comoros	-0.01439	7.485435	2.845332	58.55273	7.01E+08	6.76E+08	2.71E+09
Congo, Dem. Rep.	-0.07841	7.301148	2.314604	46.63364	8.02E+08	7.78E+08	3.14E+09
Congo, Rep.	-0.0025	6.794744	3.174221	98.26637	8.02E+08	7.78E+08	3.50E+09
Costa Rica	0.023134	8.688285	2.978262	72.11455	8.83E+08	9.71E+08	4.71E+09
Cote d'Ivoire	-0.0185	7.427382	2.367095	64.41727	8.99E+08	9.08E+08	4.03E+09
Denmark	0.016776	10.01713	2.977985	66.00727	3.32E+09	3.26E+09	1.21E+10
Dominican Republic	0.037617	8.228097	3.117467	67.77728	1.03E+09	1.16E+09	5.59E+09
Ecuador	-0.00126	8.077602	2.959492	58.04727	7.64E+08	8.20E+08	4.15E+09
Egypt, Arab Rep.	0.018819	7.89711	3.151959	51.63636	1.43E+09	1.42E+09	6.27E+09
El Salvador	0.021953	8.110097	2.712646	49.10182	9.85E+08	1.08E+09	5.01E+09
Ethiopia	0.012774	6.387939	2.618788	24.76727	9.12E+08	8.75E+08	3.94E+09
Fiji	0.01585	8.28969	2.613073	107.3536	4.88E+08	4.78E+08	2.06E+09
Finland	0.012975	9.895909	3.17987	53.39455	2.20E+09	2.11E+09	9.26E+09
France	0.013483	9.917489	3.035172	42.61636	4.39E+09	4.50E+09	1.47E+10
Gabon	0.00275	8.639694	3.354137	88.64182	8.53E+08	8.31E+08	3.67E+09
Gambia, The	-0.00868	7.418001	2.955194	118.6209	9.55E+08	9.91E+08	3.82E+09
Germany	0.01463	9.910414	3.121484	48.42636	4.29E+09	4.44E+09	1.40E+10
Ghana	0.018786	7.314819	2.702154	45.22364	9.40E+08	9.07E+08	4.22E+09
Greece	0.024002	9.427868	3.061392	45.24273	1.90E+09	1.92E+09	8.29E+09
Guatemala	0.010389	8.0674	2.586601	39.37455	9.85E+08	1.09E+09	5.03E+09
Guinea-Bissau	-0.02348	6.727911	3.493804	51.13	9.30E+08	9.60E+08	3.28E+09
Guyana	0.013703	8.070469	3.434046	184.0382	8.48E+08	9.04E+08	4.27E+09

Haiti	-0.03381	7.668748	2.499721	37.66091	1.06E+09	1.21E+09	5.51E+09
Honduras	-0.00012	7.745003	2.992682	66.85091	9.73E+08	1.08E+09	5.11E+09
Hungary	0.012234	9.234545	3.055372	71.11727	2.96E+09	3.04E+09	1.18E+10
Iceland	0.013149	10.0214	2.949498	68.42	1.58E+09	1.60E+09	6.60E+09
India	0.034452	7.354938	3.092446	16.63545	9.50E+08	8.82E+08	4.03E+09
Indonesia	0.026145	7.643723	3.268532	47.97091	8.07E+08	7.78E+08	3.10E+09
Iran, Islamic Rep.	0.027998	8.350642	2.902819	30.5	1.25E+09	1.16E+09	5.47E+09
Ireland	0.069128	9.550306	2.83961	115.7573	2.91E+09	3.00E+09	1.12E+10
Israel	0.014449	9.585072	3.04001	84.01546	1.43E+09	1.47E+09	5.90E+09
Italy	0.013166	9.902838	3.013617	40.80636	2.33E+09	2.38E+09	9.02E+09
Jamaica	-0.00087	8.178611	3.218512	106.6409	1.03E+09	1.17E+09	5.60E+09
Japan	0.009314	9.968104	3.385899	18.29636	8.14E+08	7.63E+08	3.59E+09
Jordan	0.004237	8.174929	3.230301	122.0382	1.57E+09	1.57E+09	6.42E+09
Kenya	-0.01241	6.953684	2.762022	58.67636	7.92E+08	7.67E+08	3.63E+09
Korea, Rep.	0.048474	9.034713	3.517633	62.02727	1.28E+09	1.09E+09	6.69E+09
Lao PDR	0.038613	6.868224		39.18636	1.07E+09	9.67E+08	3.89E+09
Lesotho	0.048639	7.088158	3.924365	135.31	6.63E+08	6.38E+08	2.77E+09
Luxembourg	0.053286	10.26102	3.102832	205.5273	1.11E+10	1.11E+10	3.50E+10
Madagascar	-0.02308	6.768137	2.425285	41.59364	6.49E+08	6.25E+08	2.94E+09
Malawi	0.006328	6.168019	2.851074	59.67273	7.07E+08	6.86E+08	3.08E+09
Malaysia	0.038693	8.53283	3.484173	142.3809	1.03E+09	1.06E+09	3.92E+09
Mali	0.022645	6.437175	3.082285	53.23363	9.77E+08	9.96E+08	4.02E+09
Malta	0.038485	9.194811	3.35051	180.7382	2.12E+09	2.16E+09	9.04E+09
Mauritania	0.036976	7.138311	3.126322	109.4482	1.03E+09	1.07E+09	4.54E+09
Mauritius	0.039005	8.699081	3.233854	123.3964	6.25E+08	5.98E+08	2.81E+09
Mexico	0.011655	8.840667	2.915163	36.95182	7.94E+08	8.89E+08	4.38E+09
Mongolia	-0.01401	7.49053	3.693935	116.5873	1.17E+09	1.03E+09	5.30E+09
Morocco	0.007181	8.037737	3.088353	55.60637	1.67E+09	1.75E+09	7.17E+09
Mozambique	0.039012	6.365783	2.639252	44.71545	6.82E+08	6.55E+08	3.40E+09
Namibia	0.002532	8.582194	2.875873	115.98	6.59E+08	6.44E+08	2.94E+09
Nepal	0.021055	6.851407	2.97102	39.00727	9.95E+08	9.09E+08	5.45E+09
Netherlands	0.020411	9.912348	3.070966	104.1736	5.38E+09	5.56E+09	1.88E+10
New Zealand	0.020177	9.623509	3.02171	56.00909	4.39E+08	4.32E+08	2.17E+09
Nicaragua	0.011151	7.556428	3.043223	65.86636	9.48E+08	1.04E+09	4.91E+09
Niger	-0.01196	6.707632	2.244763	40.44909	1.03E+09	1.03E+09	4.08E+09
Nigeria	-0.00641	6.707486	2.884699	64.75	9.02E+08	9.17E+08	4.03E+09
Norway	0.024512	10.09221	3.139124	71.17727	2.66E+09	2.63E+09	1.01E+10
Pakistan	0.009362	7.337327	2.862097	35.95546	1.06E+09	9.73E+08	6.17E+09
Panama	0.022574	8.334519	2.805397	70.80363	8.87E+08	9.65E+08	4.76E+09
Papua New Guinea	0.010497	7.478283	3.080992	94.35909	5.88E+08	5.56E+08	2.64E+09
Paraguay	-0.00502	8.374269	3.119397	70.26363	6.28E+08	6.50E+08	3.53E+09
Peru	0.018267	8.179115	2.995778	30.10455	6.49E+08	6.87E+08	3.46E+09
Philippines	0.00275	8.181553	3.009546	61.21	8.80E+08	8.00E+08	4.02E+09
Portugal	0.023527	9.41001	3.193092	66.38545	1.92E+09	2.01E+09	8.05E+09
Rwanda	0.00129	7.010943	2.669435	30.38909	8.06E+08	7.86E+08	3.03E+09
Saudi Arabia	0.002598	9.293118	3.015579	68.42	1.13E+09	1.06E+09	4.82E+09
Senegal	0.006563	7.164334	2.589744	59.78545	9.62E+08	9.94E+08	4.35E+09
Sierra Leone	-0.05801	6.835152	2.102137	42.97091	9.03E+08	9.31E+08	3.63E+09
South Africa	-0.00291	9.131265	2.888451	45.36636	6.11E+08	6.08E+08	2.86E+09

Spain	0.021933	9.589256	3.133239	38.42	2.16E+09	2.20E+09	8.59E+09
Sri Lanka	0.031031	7.685887	3.164285	68.79091	8.09E+08	7.52E+08	3.80E+09
Swaziland	0.002677	8.268553	3.020691	159.0755	7.17E+08	6.81E+08	3.68E+09
Sweden	0.014502	9.872307	2.99104	60.86636	2.42E+09	2.35E+09	9.69E+09
Switzerland	-0.00035	10.19208	3.198079	69.97818	4.16E+09	4.25E+09	1.54E+10
Syrian Arab Republic	0.022714	7.799999	3.090381	55.32636	1.57E+09	1.64E+09	6.42E+09
Thailand	0.034244	8.32271	3.562517	70.97909	9.28E+08	8.52E+08	4.02E+09
Togo	-0.0135	7.339148	2.821649	80.91637	9.94E+08	9.44E+08	4.00E+09
Trinidad and Tobago	0.022157	8.764568	2.838547	75.57636	9.05E+08	9.68E+08	4.54E+09
Tunisia	0.029977	8.338186	3.27271	84.04	2.21E+09	2.25E+09	9.23E+09
Turkey	0.013194	8.482519	3.129031	34.53182	1.62E+09	1.60E+09	7.06E+09
Uganda	0.035088	6.692815	2.5303	28.38636	8.13E+08	7.91E+08	3.66E+09
United Kingdom	0.017429	9.841293	2.900872	51.88818	4.20E+09	4.17E+09	1.39E+10
United States	0.015692	10.17451	2.876693	20.15909	1.03E+09	9.28E+08	3.53E+09
Uruguay	0.004066	8.796051	2.544104	41.21636	6.72E+08	6.76E+08	4.14E+09
Venezuela, RB	-0.00968	8.586084	2.930903	50.60455	8.65E+08	9.59E+08	4.67E+09
Zambia	-0.01446	6.783733	2.345819	73.28909	7.06E+08	6.85E+08	3.23E+09

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