



The Link Between Openness and Long-Run Economic Growth

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Abstract

We review the most cited empirical analyses of the relationship between international trade and economic growth and more recent empirical analyses of the link between trade and productivity growth. We conclude that there is likely to be a positive relationship between international trade and economic growth. There are, however, two caveats. First, we are concerned about the way problems of measurement error and endogeneity are handled in much of the empirical literature. The second caveat relates to the ability of developing countries to gain productivity growth through trade liberalization. To do so, it may very well be necessary to invest in, e.g., education facilities, to ensure property rights and to build up institutions.

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Introduction

Increasingly, the countries of the world seem divided into performers and non-performers regarding their ability to provide decent standards of living for their inhabitants. The underlying causes that have allowed some countries to attain high income levels and have kept others at lower echelons have been debated at least since Adam Smith published his seminal work on the growth of nations. For a long period, this debate was focused on static level effects. Yet nowadays, it is increasingly recognised that high living standards are the product of sustained significant additions to per capita GDP over time – or in other words maintaining significant growth rates. To illustrate this, consider the economic development of Japan during the last 100 years. By the end of the 19th century, Japan was not a rich country. The real GDP per person was well behind Argentina's and only a third of the levels of the United States and the United Kingdom. But during the ensuing 100 years, Japan maintained an average growth rate of GDP per capita of 2.81 percent implying that, today, Japan is among the richest countries of the world with a GDP per capita that is higher than that of the United Kingdom. If Japan had only been able to generate an average growth rate of 1.16 percent (the average growth rate of Pakistan and Bangladesh 1900-2000), then Japan's GDP per capita today would be in line with that of China and less than 20 percent of that of the United Kingdom (numbers from Mankiw, 2004). The example illustrates that "if we want to understand why countries differ dramatically in standards of living, then we have to understand why countries experience . . . sharp divergences in long-term growth rates" (Barro and Sala-i-Martin 1995, 4).

Significant growth rates are often associated with countries embracing the ongoing globalisation and increasing openness to the international exchange of goods and services as well as ideas and technologies. Many researchers believe that participation in the international economy was the primary source of growth in many East Asian countries that have experienced fast economic development during the past 50 years (World Bank 1993). And there is hardly any doubt that international trade facilitates technological development. "When a country exports wheat and imports steel, the country benefits in the same way as if it had invented a technology for turning wheat into steel" (Mankiw 2004, 551). The question is how strong the correlation between openness and economic growth is,

and whether international trade liberalization is sufficient to ensure sustained improvements in living conditions in developing countries.

In his fellows address at the AAEA conference in 2006, lead World Bank economist Kym Anderson (2006) posited that we need better empirical analysis of the link between openness and economic growth. In this paper we examine this statement by reviewing the literature that examines the openness-growth link. The paper is organised as follows. In the following section, we turn to some of the most cited empirical analyses of the relationship between international trade and growth. In section 3 we dig a bit deeper and examine through which channels international trade may affect the growth rate. We conclude that the primary potential channel is through an increase in the productivity growth rate, and consider empirical analyses of this link. Throughout the paper we focus on cross-national evidence and exclude microeconomic studies. The final section contains concluding remarks.

Empirical Studies of the Link Between Trade and Economic Growth

Conventional trade theory determines the pattern of international trade and the distribution of welfare across countries in a static setting. It relates trade patterns to comparative advantage, and suggests that for nations that engage in trade, each will specialize in the production of goods in which it has a comparative advantage, i.e., in production processes with lower opportunity costs prior to trade than the other country (e.g., Dixit and Norman 1980). Each country thus exports goods in which it has a comparative advantage. Usually, comparative advantage is assumed to be derived from either exogenous technological differences (the classical Ricardian model) or different factor endowments (the Heckscher-Ohlin model). Hence, conventional trade theory associates international trade with a reallocation of resources within the national borders determined by exogenous differences across countries. This reallocation of resources generates efficiency gains that increase the level of aggregate national income.

Static models of monopolistic competition and economies of scale (Krugman 1979, 1980) suggest two other sources of gain from international trade. First, opening up for trade between two countries that produce differentiated products implies that there are more varieties available for

consumption, which is a source of gain for consumers. Second, the increased competition lowers the equilibrium prices because the increased size of the market allows firms to realize economies of scale. The lower prices raise real wages, which is another source of gain for consumers.

Even though the size and distribution of the welfare gains from trade may be disputed, there is strong consensus within the economics profession of a positive relationship between international trade and aggregate national income. The same degree of consensus does not appear to hold for the growth effects of international trade.² Many empirical analyses estimate positive growth effects of trade liberalization, but the size of these effects is often rather small, and the empirical methods used to estimate the effects have been subject to substantial criticism.

A fundamental problem with empirical analyses of the trade-growth link is how to measure openness. The most obvious approach is to use the simple concept of the total trade volume (exports plus imports) relative to GDP. The OLS estimator is, however, likely to be biased and inconsistent due to endogeneity of the trade volume.³ What economists and policy makers are interested in is the hypothesis that an economy's trade volume is a significant contributor to growth, thereby providing policy makers with an income-generating tool. It is, however, likely that a higher level of economic activity in society leads to increased exchange of goods and services, that is, enhanced trade volume. In that case, there is a bidirectional link between growth and trade volume implying that the total trade volume is correlated with the error term, whereby the OLS estimator is biased and inconsistent.

An alternative indicator of openness is a measure of trade policies. A potential advantage of this approach is that it is directly informative about the role of trade *policy* for growth. Simple measures of trade policies such

² A level effect occurs when, for example, a tariff reduction increases income in a given period but not in subsequent periods. In this case, the growth rate of income increases one period and then it is back to the normal rate. If, on the other hand, a change in the trade policy induces consecutive increases in the income level such that the growth rate is above normal in many periods, then the policy change elicits growth effects. These may be temporary or permanent.

³ Also, one may doubt whether any particular measure of openness or trade is likely to include all aspects of how trading activities affect growth. For example, Alcalá and Ciccone (2004) point out that measuring openness as exports plus imports relative to nominal GDP has drawbacks due to the treatment of nontradable goods. They propose, instead, to use a measure which they refer to as real openness.

as an average tariff rate or a coverage ratio for nontariff barriers to trade have, however, drawbacks such as inordinate weight to categories of goods that are relatively unimportant for a country and gaps between statutory rates and actually collected tariffs (in the case of an average tariff rate) and data that do not provide information on how binding barriers to trade are and excludes less-easily quantifiable barriers to trade (Pritchett 1996). A further concern is that these measures have little correlation with observed trade volumes (Dollar and Kray 2003). Therefore, a variety of other trade policy indicators have been constructed in the literature.

An often-cited attempt to measure the protection level was carried out by Dollar (1992). He used distortions in the real exchange rate to test the hypothesis that the law of one price holds in the long run.⁴ The contention is that deviations from the law of one price are maintainable if potential importers/exporters face barriers preventing them from taking advantage of the price differences. Thus, real exchange rate deviations embody an aggregate estimate of the protection level. Dollar found a significant negative correlation between real exchange rate distortions and growth, which indicates a positive trade-growth link. Rodriguez and Rodrik (2001) noted, however, that the law of one price may not hold for a variety of other reasons. In particular, monetary and nominal exchange rate policies have a significant impact on the real exchange rate regardless of trade policies. Moreover, Rodriguez and Rodrik applied the Dollar procedure to an updated version of the same data and found that the same regressions now yield the oppositely signed result. Baldwin (2003) agrees with Rodriguez and Rodrik that Dollar failed to demonstrate a significant relationship between outward orientation and growth.

Another attempt to construct a reliable openness measure was done by Sachs and Warner (1995). They designed an openness variable that combined five different indicators: nontariff barriers to trade, average tariff rates, a black market premium, whether the economy is socialist, and government monopolies on exports. Sachs and Warner found evidence that openness had a significant and positive influence on growth between 1970 and 1989. Rodriguez and Rodrik's (2001) reestimations of Sachs and Warner's regressions suggested that only two out of the five indicators account for the bulk of the variation in the data. The first indicator suggested effects of a state trading enterprise's monopoly power over exports. Since state trading enterprises in Sachs and Warner's dataset are

⁴ The law of one price says that within a single market identical goods must sell at identical prices.

mostly confined to sub-Saharan Africa, this indicator corresponds to a dummy variable for sub-Saharan Africa. Thus, this variable captures other features specific to this region rendering the state trading enterprise effect indistinguishable from other factors. Rodriguez and Rodrik concluded that this indicator's ability to reflect only trade barrier impacts is dubious. The second significant indicator is the black market premium that may conceivably arise from a host of policies other than trade barriers. They concluded that with these qualifications on the two indicators it is unlikely that the aggregate measure with five indicators provides a reliable estimate of openness per se. Bosworth and Collins (2003) regressed growth on an array of potential growth determinants including the Sachs-Warner indicator. They found only limited evidence associating the indicator with growth. Frankel (2003) noted that the indicator is a bit idiosyncratic.

Edwards (1998) tested the robustness of the openness-growth relationship to the use of nine existing indicators including the Sachs-Warner indicator and other trade policy indicators. He found that six of the measures are statistically significant in the expected direction when controlling for per-capita GDP and the average number of years of education in 1965. Rodriguez and Rodrik (2001) demonstrated that his results are dependent on the fact that he weights his regression by per-capita GDP. If one weights differently, the number of measures that are significant drops to four or five, and Rodriguez and Rodrik also criticized these measures based on recalculations with more recent data.

Using trade policy measures is not necessarily a solution to the problem of endogeneity of trade since trade policies are likely to be correlated with factors that are omitted from the regression but are likely to affect income (such as free-market domestic policies and stable fiscal and monetary policies) implying correlation between the regressor and the error term (Sala-i-Martin, 1991). An alternative solution to the endogeneity problem is to use Instrumental Variable Estimation (IVE) where either lagged values of openness or other economic indicators that are uncorrelated with the error and highly correlated with openness serve as instruments. Dollar and Kraay (2003) instrumented openness via lagged values of trade as a fraction of GDP assuming that trade volumes are correlated with contemporaneous and lagged GDP growth but uncorrelated with future GDP growth. They found a significant effect of trade on growth. This approach is, however, also problematic if part of the growth rate in the future is driven by investment today that requires imported goods, implying that the degree of openness today affects future growth rates (Lee, Ricci, and Rigobon 2004). Frankel and Romer (1999) used geographic characteristics such as the size

of countries, their distance from each other, whether they share a border and whether they are landlocked as instruments for trade. They found that trade has a quantitatively large but only moderately statistically significant positive effect on income. Irwin and Terviö (2002) evaluated this finding across different time periods and obtained the same result. Geography may, however, be a determinant of income through channels other than growth – for example via a relationship between geography and health conditions, the quality of institutions and the availability of natural resources, respectively (Rodriguez and Rodrik, 2001; Durlauf, 2000). Rodriguez and Rodrik showed that when any of three summary indicators of geography is introduced as a control in Frankel and Romer's regression, the result that trade has a positive effect on income disappears. Noguer and Siscart (2005), using a richer data set, confirmed Frankel and Romer's findings and demonstrated that the estimator remains positive and significant even after introducing the geographic controls of Rodriguez and Rodrik.

In conclusion, the surveyed analyses indicate the existence of a positive link between trade and growth, but the validity of the results may be questioned based on (i) the robustness tests performed by Rodriguez and Rodrik; (ii) the fact that many of the analyses fail to address the endogeneity problem; and (iii) the “open endedness” of growth theories, which makes IVE disputable. Durlauf (2000) describes growth theories, as “open ended” in the sense that if one variable influences growth it does not typically imply that other variables do not. In this case, the error term is the cumulation of omitted growth determinants and a valid instrument is uncorrelated with these variables. Since many growth determinants are ex ante plausible, acceptance of an instrument variable estimator is based on subjective criteria. Frankel (2003) puts it this way, “The proper test of the ex ante plausibility of one's claim that a variable is a good candidate for an instrumental variable... is not whether or not one can think of a story whereby it *might* be correlated with other independent variables, but rather how convoluted and implausible the story has to be.” (p. 196). Presently, there seem to be some agreement among economists that the most promising way forward is to solve the endogeneity problem through instrumentation with geography as proposed by Frankel and Romer.

Studies of the Link Between Trade and Productivity Growth

To enhance our understanding of the trade-growth link, it is instructive to consider the particular channels through which openness may affect a country's growth rate. The economic theory distinguishes between two sources of GDP-per-capita growth: capital accumulation (physical and human) and productivity growth. Openness may affect both. First, openness to international flows of capital may raise the speed at which physical capital and human capital are accumulated locally (at least temporarily). Second, openness may speed up productivity growth through faster technological progress.⁵ Empirical evidence suggests that (i) capital accumulation is not the primary source of growth (Hall and Jones 1999; Klenow and Rodriguez-Claire 1997), and (ii) growth effects of trade work primarily through productivity (Frankel and Romer 1999). Therefore, we focus on the effects of international trade on productivity growth.

Various theoretical analyses of the link between trade, productivity and growth exist in the innovation-based growth literature (Grossman and Helpman 1991; Rivera-Batiz and Romer 1991). These frameworks combine productivity growth through increased product variety with intentional research and development (R&D) by profit-seeking firms where the outcome of research generates designs for new product varieties. The productivity of primary factors in manufacturing depends positively on the number of product varieties that exists. In this sense each new product variety constitutes a new technology for manufacturing. Monopolistic competition in the market for product variety and a license law that prevents any firm from producing a variety without the consent of the patent holder of the design ensures that successfully innovating firms are compensated with monopoly rents. Hence, the outcome of R&D is excludable but it is also nonrival in the sense that each research project contributes to a stock of general knowledge representing a collection of ideas and methods that is useful to later generations of innovators. The degree of this knowledge spillover is crucial to the long-run behaviour of the model. Often it is assumed that the output of designs is linear in the stock of general knowledge, which ensures perpetual endogenously determined per-capita growth (Romer 1990).

⁵ In theory one distinguishes between two components of productivity: technology and efficiency. Openness may affect both. Here, we focus on the effects on technology since these have been modelled theoretically and tested empirically.

In this set-up, international trade may affect the growth rate of productivity through three channels: it gives access to foreign intermediate inputs or, implicitly, technologies; it expands the market size for new product varieties; and it facilitates the international diffusion of general knowledge. Countries that are open to trade are able to import product varieties from abroad that are not invented locally, thereby increasing productivity in manufacturing. This is often referred to as a level effect because it raises the productivity level in manufacturing permanently but it does not change the innovation rate of new products. A permanent growth effect of access to foreign intermediate inputs may appear if product varieties are used as input to research. In that case, more varieties increase productivity in the research sector, which raises the innovation rate and may ensure a permanent increase in the growth rate. An expansion of the market size for new product varieties raises the expected profit from R&D, which gives greater incentives to engage in research. These greater incentives may ensure a faster innovation rate and faster economic growth. The third channel through which international trade may affect the productivity growth rate is if trade facilitates the international diffusion of general knowledge capital. If that is the case, then the stock of general knowledge available locally increases as a result of trade which raises the productivity in the research sector, thereby speeding up the innovation rate.

Is it then the case that the innovation-based endogenous growth theory predicts an unambiguous positive relationship between international trade and productivity growth? No, frameworks have been developed where international trade induces some countries to specialize in the production of goods with relatively low growth potential (Grossman and Helpman 1991; Matsuyama 1992; Young 1991; Galor and Mountford 2006). To illustrate this possibility, consider the following example. There exist two types of final goods: a traditional good that is produced with the use of labour and a high-tech good that is produced with the use of differentiated intermediate goods. Invention of new intermediate goods requires labour and the stock of general knowledge generated nationally in the past. Consider trade between two countries with identical labour forces but one country has accumulated slightly more general knowledge in the past than the other country. This country has a comparative advantage in R&D and devotes relatively more labour to innovation activity than the other country. Therefore, this country specializes relatively in R&D and high-tech manufacturing while the country with the lower stock of general knowledge specializes relatively in traditional goods production. Since productivity of the traditional manufacturing sector is constant while productivity of high-tech manufacturing increases with product

development, it follows that the country with the lower amount of general knowledge experiences a trade-induced reduction in the growth rate.

Crucial to this type of result is the existence of knowledge spillovers in some sectors that are confined to the national level. If the knowledge spillover in research were international then the stocks of general knowledge would be identical in the two countries and neither would have a disadvantage in conducting research. Empirical studies of the extent to which a country's productivity level depends on the foreign stock of general knowledge suggest the existence of international knowledge spillovers. By comparing total factor productivity among OECD countries with the stock of foreign knowledge proxied by cumulative R&D expenditure, Coe and Helpman (1995) found that foreign R&D enhances domestic productivity. This result is confirmed by Keller (1998) and Lumenga-Neso, Olarreaga and Schiff (2005). Coe, Helpman and Hoffmaister (1997) found substantial R&D spillovers from developed countries in the North to less developed countries in the South.

Another reason why countries may fail to gain productivity growth through international trade is a lack of complementary inputs (Basu and Weil 1998; Acemoglu and Zilibotti 2001). For developing countries to copy and adapt goods or techniques invented in more technologically advanced countries may require some basic inputs, for example a minimum level of human capital. A lack of complementary inputs may, however, prevent developing countries from obtaining productivity gains through technological innovations in developed countries. Consequently, technologies designed for optimal productivity in developed countries may incite little or no productivity growth in developing countries, even though there are no barriers to the technology's diffusion. There are many dimensions in which technological needs of developing countries differ from those of developed countries, including skill levels, capital intensities, climate, geography and culture.

Summarily then, the growth theory points to three distinct channels through which international trade may raise the productivity growth rate of countries: through diffusion of intermediate goods or, implicitly, technologies; through an expansion of the market for output from innovation; and through diffusion of general knowledge. We have, however, also pointed towards examples in the theoretical literature that predicts a negative relationship between international trade and productivity growth. So, the question of the link between international trade and productivity growth is an empirical one, but the theory may serve

as a guide for more targeted empirical analyses than the ones surveyed in the previous section.

The above-mentioned studies of the geographical extent of knowledge spillovers also shed some light on the question of a positive correlation between trade and international diffusion of general knowledge. Coe and Helpman (1995) proxied the foreign stock of general knowledge by import-weighted cumulative R&D expenditure and found that the benefits increase with the degree of openness. Keller (1998) questions the robustness of this finding by obtaining the same positive link using random trade shares. Lumenga-Neso, Olarreaga and Schiff (2005) reconciled the results of Coe and Helpman and Keller by incorporating indirect trade-related R&D spillovers. The idea is that countries may benefit from general knowledge in countries with which they have no direct trade relation if these countries export to trading partner countries. They found evidence of both direct and indirect trade-related R&D spillovers. Geography may be important for trade-induced international diffusion of general knowledge. Keller (2002) used sectoral data and distance to trading partners as the weight and found that the benefits from spillovers are declining with distance.

As to the question of growth effects of international trade due to the extension of the market, we turn to some studies that focus on the importance of market size for growth. There is no empirical evidence of scale effects on growth, i.e., that the size of countries matter for economic growth, when one does not control for international trade (Jones 1995a, 1995b; Backus, Kehoe and Kehoe 1992). Market size depends, however, both on country size and trade openness and, since small countries adopt more open trade policies, a regression of growth on country size without controlling for international trade is biased towards zero (Alesina, Spolaore, and Wacziarg 2005). Controlling for international trade, Frankel and Romer (1999) and Alcalá and Ciccone (2004) found significant positive relationships between country size and productivity. Another group of cross-country growth regressions found that the coefficient on an interaction term between openness and country size is significantly less than zero which the authors interpreted as evidence of a substitutability between openness and country size (Ales and Glaeser 1999; Alesine, Spolaore, and Wacziarg 2000; Spolaore and Wacziarg 2005; Alcalá, Spolaore, and Wacziarg 2005). Since both country size and openness enter significantly in the regressions, these results provides further evidence of the existence of growth effects from trade liberalization due to the extension of the market.

Finally, a much diverse group of papers investigates the correlation between product variety and productivity growth. These papers include, e.g., Eaton and Kortum (1999, 2001, 2002) who estimate a Ricardian model of trade, and some very recent analyses by Broda and Weinstein (2006) and Broda, Greenfield, and Weinstein (2006) who employ Feenstra's (1994) method of estimating the elasticity of substitution between product varieties. Eaton and Kortum (1999, 2001, 2002) assumed that trade is based on differences in technology and that unit transaction costs are increasing in geographic distance. For a cross-section of 19 OECD countries in 1990 they found that trade allows countries to benefit from foreign technological advances but for big benefits to occur, the country must be near the source of the advance and be able to reallocate resources to activities outside manufacturing. Keller (2004) questions Eaton and Kortum's model because it predicts that rich countries have higher equipment prices than poorer countries, which is the opposite of Summers and Heston's price data.

A prerequisite for variety growth to affect productivity is a relatively low elasticity of substitution across varieties – if new varieties are close substitutes to existing ones, increasing the number of varieties does not increase productivity much. Feenstra (1994) developed a method for estimating the impact of new varieties on an exact price index of a single good using only the data available in a typical trade database. Broda and Weinstein (2006) modified Feenstra's estimation strategy and used it to estimate 30,000 elasticities of substitution for the United States based on 8-digit and 10-digit trade data. Broda, Greenfield and Weinstein (2006) applied the same method to estimate elasticities of substitution for 73 countries using 6-digit trade data. They found that new imported varieties increased productivity by 0.27 percent per year on average in the period 1994-2003 implying that 15 percent of the average annual total factor productivity growth rate in that period is caused by new imported varieties. Splitting the sample into developed and developing countries revealed a large difference between the importance of new import varieties in the two groups of countries. In developed countries new import varieties account for only 5 percent of the average annual total factor productivity growth while the comparable number is 32 percent in developing countries. Part of this difference may be due to the level of aggregation in data. The estimation method precludes measurement of gains from new varieties which appear in categories in which the country already imports. Especially large, developed countries typically import most goods at the 6-digit level such that more detailed data are needed to measure the true productivity gain due to increased product variety in these countries. For

the US, for example, it was estimated that new import varieties raise productivity by only 0.024 percent per year using 6-digit trade data but using 10-digit trade data Broda and Weinstein (2006) estimated a gain that was 3 times larger.

Broda, Greenfield and Weinstein also obtained some results that may highlight the relative importance of the level versus the growth effect of increased product variety identified in the theory. They found that the ongoing level effect accounts for an increase in the growth rate of 0.13 percent per year while the growth effect accounts for only 0.02 percent in the typical country. These findings suggest that the primary channel through which increased product variety affects the productivity growth of countries is through an impact on the productivity level in manufacturing. The estimate of the growth effect may, however, be downward-biased due to the above-mentioned problem of not measuring the true productivity gain from new import varieties in large developed countries. Since these countries conduct most of the world's R&D, the growth effect will primarily be encountered in large, developed countries, but the level of details in the data prevents measurement of the true productivity gains in these countries. It would, therefore, be interesting to see the result for only developed countries where detailed trade data exist.

In conclusion, the empirical findings lend support to the hypothesis that the extent of the markets matters for productivity growth, to the existence of a positive correlation between openness and the international diffusion of general knowledge and to the existence of level effects of increased product variety. There may be some potential for ongoing level effects for some time to come, since only 15 percent of the world's countries imports a good that is currently exported. And in turn, this may imply productivity growth due to increased product variety over an even longer-run horizon (see Broda, Greenfield, and Weinstein, 2006). Also, more empirical work is needed before we can rule out the existence of positive effects on productivity in the research sector from increased product variety.

Conclusion and Policy Perspectives

Is there a link between openness and growth? Based on this survey of the more recent empirical and theoretical literature, we believe that the answer is yes. Nearly all the empirical analyses confirm this. There are, however, two “buts” or caveats. The first is related to our concern regarding the way

problems of measurement error and endogeneity are handled in much of the empirical literature. The second caveat relates to the ability of developing countries to gain productivity growth through international trade. We consider each of the two in turn.

We have highlighted two fundamental problems related to empirical tests of the link between trade and growth. First, it is not clear whether international trade causes growth, whether growth causes trade, or if there is a bidirectional link between them. The second flaw is a measurement problem. Since openness may affect growth through many channels, it is difficult to develop a single, universal measure that includes all aspects of how trade affects growth. These problems imply biased and inconsistent estimators and invalid inference when not handled with care. Some promising attempts have been made to solve the problems. The instrumental variable approach is a step in the right direction and Frankel-Romer's geography instrument may be criticized but it is the best thus far. Also, the empirical analyses that quantify the exact channel through which trade affects growth are interesting. In particular, attempts to quantify level versus growth effects of new product varieties based on detailed trade data (Broda, Greenfield, and Weinstein 2006) may deliver results that enhance our understanding of the link between trade and growth.

The second caveat is related to the ability of developing countries to gain productivity growth through international trade. The findings of Broda, Greenfield and Weinstein suggest that perhaps developing countries are the countries that may gain the most from trade liberalization. The theory, however, warns us of the danger that the countries that mostly need economic development will not benefit from openness due to a lack of complementary inputs, institutions, general knowledge capital, etc. Therefore, policy makers cannot "just" liberalize world trade and then all countries of the world will automatically converge towards a high-growth trajectory in the long run.

The Doha Development Agenda of the World Trade Organisation (WTO) places the needs and interests of developing countries at the heart of the international trade negotiations. The ministerial declaration begins by asserting a firm link between trade and growth.⁶ Our review clearly demonstrates that even though a full Doha agreement is certainly a right

⁶ "The multinational trading system embodied in the WTO has contributed significantly to economic growth, development and employment throughout the past fifty years", Ministerial Declaration, Doha WTO Ministerial 2001.

step in the direction of eradicating poverty, developing countries may very well require more to ensure positive growth effects. Education facilities, property rights, the political environment, infrastructure, institutions, business environment etc. are all matters that may interactively determine to which degree poor countries are able to benefit from trade liberalization.

The exact recommendations of what to do in order to be able to gain productivity growth through trade liberalization are to be revealed in micro studies. But we need more cross-national evidence of the exact channels through which openness may affect productivity growth. First, trade may enhance productivity growth through the diffusion of technology, but it may also affect productivity through a positive effect on the efficiency in production (Trefler 2001; Dollar and Collier 2001). Second, and related to the first point, is the potential relationship among trade, institutions and growth. A prerequisite for R&D of new product varieties to take place in the innovation-based growth theory is the existence of institutions that can enforce patent protection. Institutions that secure property rights may also be essential for profit-seeking firms to spend resources on adoption and imitation activity. So, a necessary condition for countries to gain productivity growth through international trade may very well be the existence of institutions of a certain quality. A number of empirical analyses find evidence of a positive relationship between the quality of institutions and economic growth (Hall and Jones 1999; Acemoglu, Johnson, and Robinson 2001). There exists, however, many different types of institutions (different types of social arrangements, laws, regulations, enforcement of property rights, etc.) and we know little about what specific types of institutions are important for countries to benefit from openness. Acemoglu, Antras, and Helpman (2007) analyse the link between contracting institutions and technology but more work needs to be done on this topic. There may also be a link from openness to the quality of institutions. So, empirical analyses of the partial effects are needed (Dollar and Kray 2003; Alcalá and Ciccone 2004).

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