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# Free Trade and Economic Growth: A Critical Assessment of the Evidence

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# Abstract

This paper surveys the recent literature on free trade and economic growth. While theory suggests many potential linkages, empirical evidence from cross-country and panel growth regressions remains inconclusive. Measures of single instruments of trade policy, such as the average tariff rate, are typically weak in explaining differences in growth but may underestimate the true level of protectionism. Aggregated measures of trade policy, on the other hand, are often highly significant in a standard growth regression but run the risk of capturing effects of other policies as well. One important goal of this survey is to compare area four of the Economic Freedom of the World index, “Freedom to exchange with foreigners”, with other indicators since this index has historically not been used as a measure of trade policy in the empirical growth literature. This index can potentially solve some of the measurement and methodological problems that the literature still faces, but only further empirical testing can fully determine its strengths.



Keywords: Economic growth, Economic freedom, Free trade, Trade policy, Trade volumes

# Contents

# 1. Introduction

*Non-robustness and fragility in cross-national regressions is probably something we have to live with. But inappropriate and misleading methods are something we can dispense with.*
*-- Dani Rodrik*

Ever since the days of Adam Smith, economists have long sung the praises of free trade. The basic idea is that everybody stands to gain from specialising in what one does relatively best. Some have even emphasised international trade as an engine for economic growth and thereby as an effective tool for ridding the world of poverty. But this well-known idea has not always been a popular one. In fact, during the 20$^{th}$ century, advocates of protectionism dominated the policy arena and many developing countries adopted industrialisation policies that kept their economies closed. These policies, which are known as import substitution strategies, were based on the belief that in order for smaller countries to industrialise, the domestic manufacturing sector required assistance in the form of protectionism.

However, the economic stagnation in the countries of Latin America, most of which had followed the import substitution route, and in stark contrast, the rise of the East Asian "tiger" economies, which had adopted outward oriented strategies during the 1960s and 1970s, led some to seriously question the protectionist-growth nexus. Consequently, economists, dealing with poorer nations, began to promote development strategies based on trade reform and opening up for foreign competition. In the beginning of the 1980s, institutions like the World Bank and the IMF made it compulsory to reduce trade barriers in order for developing countries to receive financial assistance. Following Berg and Krueger (2003), it is thus pretty safe to conclude that the general opinion among scholars and policymakers shifted, some 20 years ago, from the protectionist view to trade liberalisation.

In the end, the question of what constitutes a growth-enhancing trade doctrine is an empirical one. On the basis of econometric cross-country comparisons, authors such as Sachs and Warner (1995) and Edwards (1998) have argued that there are overwhelming empirical evidence to suggest that a liberal trade policy is conducive to economic growth. But this notion has recently been questioned by Rodrik and Rodriguez (2000), who argue that many of the selected measures in these studies are patently inappropriate indicators of trade policy and that the methods used to derive these results lead to a systematic bias in the estimations.

Rodrik and Rodriguez also show that the most obvious instruments of trade policy, such as tariffs and quotas, are typically weak in explaining differences in economic growth.

Simultaneously, the empirical growth literature has expanded during recent years to include institutional measures as potential explanatory variables. In particular, some authors have constructed measures of *economic freedom*, which in many empirical studies has been found to exert a highly significant and positive effect on growth.[1] The most widely used and comprehensive measure of this term is the Economic Freedom of the World index (EFI), published by the Fraser Institute.[2] However, since the EFI is a highly aggregated measure, it is not always clear in what exact way or through which mechanism economic freedom influences economic growth. To shed some light on this issue, Carlsson and Lundström (2002) decomposed the EFI and inserted its five respective areas as independent variables in a growth regression. They show that some elements of economic freedom are significant determinants of economic growth. They also arrive at the controversial result that area four of the index, "Freedom to exchange with foreigners", exerts a significantly negative influence on economic growth. This result was replicated by Berggren and Jordahl (2003) but they show that it is not a robust one.

In this paper I survey the recent literature on the link between trade policy and economic growth, trying to evaluate and determine to what extent the notion that free trade increases the wealth of nations is supported by empirical evidence. I review and analyse the most frequently used indicators of trade policy and I scrutinise the techniques and methods used to derive the empirical link between trade and growth. One important contribution is to compare area four of the EFI with other trade policy indicators since this measure has rarely been used in the empirical trade literature. I will also offer some explanations as to why single measures of trade policy generally produce fragile results and, in particular, why the results of Carlsson and Lundström (2002) and Berggren and Jordahl (2003) deviate from the general finding in the literature.

Before proceeding, I do want to remind the reader that the main focus of this paper is to assess the empirical link between *trade policy* and growth. Although *trade volumes* and trade policy are closely related, they are to some extent conceptually different. Many authors, such as

[1] See Berggren (2003) for a survey.
[2] For a detailed description of the EFI, see Gwartney and Lawson (2003[a]).

Frankel and Romer (1999) and Rodrik et al. (2002), use the geographical component of trade volumes as an instrument to identify the effects of international trade but for reasons that will be explained later, there are questions to be raised whether these results can be directly linked with the effects of trade policy.

The remainder of this paper is organised as follows: In section 1, I briefly review the theoretical arguments for linking trade policy with growth. The next section reviews systematically the indicators of trade policy that the literature has relied on. Section 3 surveys those recent studies that have investigated the relation between trade policy and growth empirically. In section 4, I evaluate and interpret the results more in-depth and suggest some directions for further research. Concluding remarks close the paper.

# 2. The theoretical link between free trade and growth

From a static viewpoint, openness to trade is said to affect the economy positively by equating domestic relative prices with international relative prices. If relative prices differ between two countries, then mutual welfare gains among these can be achieved by exchanging commodities up to the point where prices equal. When all countries face the same trade-off between traded commodities, a country cannot acquire further welfare gains (or increases in real income) without lowering welfare in another country. As an example of static gains from trade, consider a Ricardian one-factor world with two traded goods. Suppose that the opportunity cost of producing one more unit of good one in a given country is lower than the relative price on the world market. Such a country would clearly stand to gain from specialising in the production of good 1 and trade it for good 2 rather than producing good 2 for itself. Krueger (1980) notes that protection of domestic markets, which are typically small in developing countries, may lead to inefficient sizes of production plants and that relative efficient activities tend to expand at the same rate as those activities that are profitable only when protection is in place. In contrast, opening up to trade will increase competition and help an economy to exploit its comparative advantages. Further, in a dynamic context, trade could enhance specialization in industries with scale economies and thereby help boost overall efficiency in the long-run.

However, as pointed out by Bhagwati and Srinivasan (1999), static or even dynamic efficient resource allocation does not imply that an economy will experience increased long-run economic growth in its steady-state due to free trade or reductions in trade barriers. Indeed, the famous neo-classical growth model of Solow (1956) considers a closed economy where the engine of growth is modelled exogenously, unaffected by trade policy. In contrast, the endogenous or the “new” growth theory opens up for a link between trade policy and growth through the transfer of knowledge between countries and the amount of resources available for research and development. Endogenous growth models emphasise the discoveries of new knowledge and technology as the main source of sustained economic growth. In Romer (1990), the aggregated stock of technology or new ideas evolves according to the level of human capital devoted to research. If the world consisted of two economies that were fully integrated, then the amount of human capital available to each country would increase and hence speed growth. Ben-David and Loewy (1998) focus on the diffusion of knowledge as an

engine of growth. In their model, the share of foreign knowledge that a country has access to is assumed to be an increasing function of the volume of trade. In the steady-state equilibrium, a reduction in tariffs, in a given country, would here result in a positive transitional level effect as well as a positive long-run growth effect that affects all countries.

Grossman and Helpman (1990) emphasize the role of dynamic scale theory in the link between trade and growth. In their simple model, a two-sector, two-factor economy is considered, where long-run growth is driven by knowledge spillovers that arise as a by-product in one of the sectors, say sector 1. The effects of trade policy would then depend upon which sector that is protected. Protection of sector 1 would shift resources into the knowledge-creating activity and speed the growth rate, whereas the opposite would occur if sector 2 were protected. Thus, the role of trade policy is here rather ambiguous; protectionism can both increase and decrease the rate of growth. In an attempt to avoid such assumptions of scale economies, Lee (1993) considers a neo-classical production function with the addition of an imported input. When a tariff is imposed on foreign inputs, the steady-state level of the capital stock decreases and thereby reduces the level of income. The distortionary effect is especially large in a small, resource-scarce economy. The role of trade policy here has, however, no permanent effects on growth.

It is thus the case that the theoretical growth literature does not provide a clear and consistent picture on the relationship between free trade and economic growth. Many authors, such as Berg and Krueger (2003) and Berggren and Jordahl (2003), therefore stress the need of empirical investigation on the matter.

## 2.1. *Levels vs. changes*

As Winters (2004) points out, if a positive relationship between free trade and economic development is assumed to work through static efficiency gains primarily, then the most obvious empirical approach would be to study the relationship between openness and income. This would suggest that the focus on growth, as the dependent variable, is conceptually wrong. Following Hall and Jones (1998), it may very well be that the effects of trade policy are foremost transitory and the right choice of dependent variable would then be the level of income. On the other hand, if trade policy openness is believed to affect the steady-state

growth rate then growth should indeed be the variable of interest as is the case in most empirical studies.

Another related issue is whether or not one should focus on levels or changes in trade policy. Berggren and Jordahl (2003) state that the most consistent method with endogenous growth theory would be to study the impacts of levels. But, as Krueger and Berg (2003) point out, it may very well be that policy changes are of relevance as well. In a neo-classical growth model, a change of openness would typically lead to a change in the steady-state level of income and thus only affect growth during a transitional period. Endogenous growth models that emphasize the diffusion of knowledge or technology as the primary source of long-run growth would also imply that changes in trade policy would lead to increases in growth rates. For instance, consider China, a country that in recent years has experienced rapid growth while remaining a fairly closed economy. On the other hand, by focusing primarily on the level of openness in this case, one would tend to overlook the fact that Chinese growth has been accompanied with a relatively high increase in openness. Overall, one could expect a variety of processes to work at different times, countries and levels of development.

# 3. Measuring Trade Policy

## 3.1. *Defining trade liberalisation*

As Edwards (1993) notes, the trade literature has not been overwhelmingly consistent in defining different trade policies, nor has it been able to successfully measure the type of trade orientation followed by a particular country. According to him, the first systematic attempts to identify various trade regimes were undertaken by Krueger (1978) and Bhagwati (1978). In their judgement, trade orientation should be measured to the extent that protection is biased against the export sector in a given country. A formal index of this bias was defined as the ratio of the exchange rate effectively paid by importers to the exchange rate faced by exporters. If this ratio is bigger than one, then there exists a bias against exports. They went on to define trade liberalisation as any policy that reduces the degree of anti-export bias. It is worthwhile mentioning that this definition has a puzzling implication: Krueger (1978) herself notes that a regime could be considered fully liberalised and yet employ high tariffs to protect

the import sector by, for example, promoting favourable exchange rates to the exporting sector.

Two highly popular and cited descriptions of trade regimes have emerged in the literature during recent years: openness and outward orientation. It is not all that clear, however, what their implications are and how they relate to each other. Pritchett (1996), for instance, first defines openness as an economy's trade intensity and outward orientation according to the Krueger-Bhagwati framework as the lack of bias against exports. On the other hand, Dollar (1992) defines outward orientation as a relatively low level of protection and low variability in exchange rates and Edwards (1998) seems to treat openness and outward orientation as virtually the same concept. Some authors have, however, focused on neutrality of all potential trade distortions as the right characterisation of a country's trade regime. Michaely et al. (1991) define trade liberalisation as the process of moving a country's trade system closer to the situation that would prevail if no government interference occurred.

## 3.2. *Indicators of trade policy*

If the task of defining different trade regimes or policy seems confusing, then finding appropriate trade policy indicators is even more demanding. Many studies in the empirical growth literature have relied foremost on direct measures of protectionism. These indicators are typically constructed by observation of the policy instruments in place, such as tariffs and quotas. In addition, there are indices that rely only on subjective data to measure the degree to which trade is distorted as well as area 4 of the EFI that uses a combination of subjective and objective data. Some studies have even relied on trade shares to proxy trade orientation. What follows below is a discussion of these measures; what their pros and cons are and how effectively they are able to describe the effects of different trade orientations.

| **Table 1** An overview of trade policy indicators | | | | |
|---|---|---|---|---|
| Indicator [a] | Data source [b] | Time period [c] | No. of countries [d] | Studies [e] |
| Import-weighted average tariff rate | UNCTAD, Barro and Lee (1993), Barro-Lee data set from 1994 | 1985-1988 | - | Sachs and Warner (1995), Pritchett (1996), Edwards (1998), Rodrik and Rodriguez (2000), Warner (2003) |
| Mercantilist trade restrictiveness index (MTRI) | TRAINS database | - | 25 | Anderson and Neary (2003) |
| Ratio of import duties to imports | WB Development Indicators (various years), Clemens-Williams data set | - | - | Harrison and Hanson (1999), Rodrik and Rodriguez (2000), Clemens and Williams (2001), Yanikkaya (2003) |
| Ratio of trade taxes to total trade | IMF, WB Development Indicators (various years) | - | - | Edwards (1998), Rodrik and Rodriguez (2000), Yanikkaya (2003) |
| Coverage ratio of non-tariff barriers | UNCTAD, Lee (1993), Barro-Lee data set from 1994 | 1985-1988 | - | Sachs and Warner (1995), Pritchett (1996), Edwards (1998), Rodrik and Rodriguez (2000), Warner (2003) |
| Leamer's openness index | See Leamer (1988) | 1982 | 49 | Levine and Renelt (1992), Pritchett (1996),Edwards (1998 |
| Wolf's distortion index | See Wolf (1993) | 1985 | 62 | Edwards (1998) |
| Black market premium | Pick's Currency Yearbook (various years), World Currency Yearbook (various years), Barro-Lee data set 1994 | - | - | Levine and Renelt (1992), Lee (1993), Sachs and Warner (1995), Harrison (1996), Edwards (1998), Rodrik and Rodriguez (2000), Warner (2003) |
| Dollar's price distortion index | See Dollar (1992) | 1976-1985 | 95 | Dollar (1992), Levine and Renelt (1992), Harrison (1996), Rodrik and Rodriguez (2000) |
| Sachs-Warner openness dummy | UNCTAD, Barro-Lee data set from 1994, World Currency Yearbook (various years), WB data | 1970-1989 | 111 | Sachs and Warner (1995), Sala-I-Martin (1997), Edwards (1998), Hall and Jones (1998), Harrison and Hanson (1999), Rodrik and Rodriguez (2000), Krueger and Berg (2003), Warner (2003) |
| Liberalisation index of Michaely et al. | See Michaely et al. (1991) | 1948-1985 | 19 | Edwards (1993), Harrison (1996) |
| 1987 WB outward orientation index | See Edwards (1993) | 1963-1973, 1973-1985 | 41 | Edwards (1998), Rodrik and Rodriguez (2000) |
| Structural Adjustment Loans (SALs) | WB data | 1979-1991 | 73 | Greenway et al. (2002) |
| Bilateral Payment Arrangements (BPAs) | IMF | 1976- | - | Yanikkaya (2003) |
| Area 4 of the EFI (EFI4) | See Gwartney and Lawson (2003) | 1970-2000 | 123 (for year 2000) | Carlsson and Lundström (2002), Berggren and Jordahl (2003) |

(a) The name of a particular indicator as referred to in the literature.
(b) The data source used to calculate an indicator. In some cases there are multiple data sources available for the same kind of measure, such as the black market premium. In addition, some aggregated measures rely on more than one source, such as the EFI4.
(c) The period of time for which a particular indicator is available. The "-" sign means that the indicator is not limited to a specific time period except for the MTRI, which is only calculated sporadically for a number of years due to limited data availability. For further information, see Anderson and Neary (2003).
(d) The number of countries for which a particular indicator is available. The "-" sign means that the sample size varies with the data source used and/or the time period considered.
(e) References to studies that have used these indicators empirically.

### 3.2.1. *Trade volumes*

Perhaps the most appealing measure of openness would be to use recorded trade volumes of some sort. Indeed, this was a popular approach in early studies back in the 1970s and 1980s where the growth rate of exports was emphasised as an engine of growth.[3]

Following Pritchett (1996), openness is simply calculated as a country's trade share; the ratio of import plus export volumes to GDP. Alcalá and Ciccone (2002) showed, however, that simply using the ratio of nominal trade volumes to nominal GDP might be biased against the traded goods. To illustrate this potential bias, they consider an economy in which there is a tradable manufacturing goods sector and a non-tradable service sector. Suppose that specialization via international trade increases productivity in the manufacturing sector that will ultimately lead to a rise in the relative price of non-traded services. Now, depending upon the elasticity of services demanded, the relative price change may very well decrease the ratio of trade to GDP (or openness). This led them to construct a slightly new measure called real openness, which is the ratio of nominal trade to purchasing-power-parity GDP (PPP GDP). This ratio eliminates cross-country differences in the relative price level of non-traded services.

Rodrik et al. (2002) find, however, this adjusted measure as misleading to some extent. In fact, they show that the use of real openness can cause an opposite, and potentially more severe, bias. The reason for this is that the rationale for using the real openness measure of Alcalá and Ciccone is only valid as long as increases in productivity is in fact driven by trade. If productivity among traded goods is caused by other factors, then by using PPP GDP the level of openness will be biased upwards. The conventional measure, using nominal GDP, does not suffer from this shortcoming and hence is the preferred measure of Rodrik et al. (2002). It is nonetheless clear that these measures based on trade volumes are at all related to trade policy, which is also the central theme of this survey. Other factors that affect trade volumes are, for example, country size, population density and whether a country is landlocked or not. It is hardly worth pointing out that these factors are not very responsive to changes in policy. So why use trade volumes as a proxy for trade policy in the first place? An overwhelming amount of scholars cite foremost the numerous measurement issues involved

[3] See, for example, Michaely (1977) and Balassa (1985).

with using direct indicators of trade policy. Dollar and Kraay (2003) take the example of China, which experienced the fastest growth in trade when it was removing administrative barriers, not when it was cutting tariffs. In this case, using tariff rates would not capture the effects of trade liberalisation. They therefore continue to rely on trade volumes in their study.

Other scholars have relied on more sophisticated methods to connect observed trade shares with trade policy. One of these methods involves regressing trade volumes on factors likely to determine trade, such as geographical characteristics. The estimated residual from a regression of this sort reports how much a country's trade volume differs from its predicted value and could therefore be interpreted as a measure of policy-induced openness. Pritchett (1996) calls this measure the structure adjusted trade intensity (SATI). Still, Frankel and Romer (1999) and Rodrik and Rodriguez (2000) point out that geography-induced variations in trade and policy-induced differences in trade may very well be conceptually different. The point is that trade may affect growth in different ways and variation of trade volumes that are due to geographical factors may give rise to different effects than variation of trade volumes that are due to policy. Trade policies do of course affect trade volumes. But there is no strong reason to believe that the effects of trade policies on trade volumes will be quantitatively similar to changes in trade volumes that arise from reductions in, for instance, transportation costs or improved infrastructure.

Moreover, the SATI approach has been criticised for being atheoretic from an economical point of view. In response to this kind of criticism, Leamer (1988) proposed a measure of openness using the Hecksher-Ohlin-Vanek (HOV) model of trade flows.[4] He compared actual trade intensity ratios and intensity ratios predicted by the model and interpreted the displayed differences as trade barriers. Wolf (1993) followed Leamer's approach, but extended the index by including a larger set of factors of production and using a more diversified set of commodities. Pritchett (1996) and Edwards (1998) do, however, raise some concern regarding the assumptions and validity of Leamer's openness index, questioning whether the large deviations from predicted trade flows could solely be attributed to trade barriers.

[4] In the same paper, Leamer (1988) constructed a similar index of trade distortion, using the HOV model. The openness index is, however, the most cited.

### 3.2.2. *Measures of tariff and non-tariff barriers*

One of the most widely used indicator of protectionism in cross-country regressions is the simple average of different tariff rates across traded commodities, commonly referred to as the average or mean tariff rate in the literature. Another measure used in the literature, often intended to proxy the average tariff rate, is total tariff revenues or total import duties divided by the total value of imports. Harrison and Hanson (1999) call this indicator the 'effective' tariff. Another related measure, commonly referred to as taxes on international trade, is total import duties and export duties divided by the total value of trade. The setback of these measures is, however, rather obvious: they treat all the commodities identically. In characterising the level of protectionism in a country, one would typically want to assign the relative importance of a particular tariff on a particular good. Such an approach would be to weight tariffs by their trade volumes. Hence, we arrive at the trade-weighted or import-weighted average tariff, which is given by:

$$\tau = \frac{\sum_i m_i t_i}{\sum_i m_i p_i^{(w)}},$$

where $m_i$ is the import volume and $t_i$ is the specific tariff for good *i*, and $p_i^{(w)}$ its world price.

As Anderson and Neary (2003) point out, however, weighting tariffs by import volumes may underestimate the discriminatory effects of protectionism.[5] For instance, consider what happens when the tariff of a good rises. Then imports of that good will fall, resulting in a lower weight in the index for that particular tariff. In some cases this fall might be so big that the index is decreasing in the tariff rate. This effect would be particularly big for goods with high demand elasticities. As an alternative, Anderson and Neary (1996) proposed a new measure of protectionism, called the trade restrictiveness index (TRI). The TRI is a welfare-equivalent index which operationalises as the uniform tariff that would yield the same amount of welfare as the tariffs actually in place. Thus, the TRI can be seen as the value of the average tariff that is needed to attain balance-of-payments equilibrium at the initial level of utility or real income in the economy.

[5] O'Rourke (1997) also stresses this point.

Anderson and Neary (2003) went on to focus on trade volumes rather than welfare. Using an underlying competitive general equilibrium (CGE) model, with a highly disaggregated trade structure, their mercantilist trade restrictiveness index (MTRI) is defined as the uniform tariff that would yield the same volume of tariff-restricted imports as the initial tariffs in place. The authors argue that this index would be a better measurement of distortions caused by trade policy than the TRI, using trade volume instead of welfare as benchmark. However, when cross-country comparisons are made a generic model is often needed, which in turn should raise some caution using the indices described above. In addition, O'Rourke (1997) shows that the TRI can be very sensitive to model specifications of the CGE as well as, to some extent, demand elasticities.[6]

Another problem one typically faces when using average tariffs as an indicator of trade policy, is that one tends to overlook other important barriers to trade. According to Edwards (1993), the most dominant form of protection, especially in developing countries, has been the usage of non-tariff barriers (NTB:s). These barriers are typically quotas, licences and prohibitions. Krueger (1978) and Bhagwati (1978) addressed the problem of quantitative restrictions by calculating the difference between actual domestic prices and prices that would prevail given no restrictions at all. This is of course quite a monumental task, not to mention the difficulties of constructing a weighted average for all traded commodities that are subject to restrictions.

The most commonly used proxy for non-tariff barriers in empirical studies is the NTB coverage ratio, which Pritchett (1996) defines as "the import weighted percent of tariff code lines covered by various types of NTB:s (licences, quotas, prohibitions) as a percentage of all tariff code lines within the aggregate" (p. 314). Harrison (1996) mentions two procedures of calculating such coverage. One would be to calculate the percentage of imports covered by trade barriers, which would result in a low weight on effective barriers that exclude most imports. The second procedure would be to compute the percentage of product categories that are subject to import licenses, which gives no information whether quotas are binding.

[6] In fact, no study has used these indices to address openness-growth nexus explicitly. In personal correspondence, James Anderson stresses that the chief difficulty is to obtain the detailed tariff line distortion data for a number of countries and years. If one had access to such data, then the MTRI or TRI could easily be calculated. But, as James Anderson concedes, in larger cross-country comparisons one is often limited to import-weighted tariff rates or ratios of import duties.

Harrison (1996) concludes that “the coverage ratio only suggests that barriers to trade exist, but cannot measure their effect” (p. 424).

### 3.2.3. *Exchange rate and price distortions*

Another indicator of trade policy that has been used frequently in the literature is the black market premium (BMP). It measures the extent of rationing in the market for foreign currency. Following Lee (1993), the BMP is simply defined as the difference between the black market rate and the official rate for foreign exchange. Black market activities for foreign exchange usually emerge when access to the official market is limited or when there are quantitative exchange controls or restrictions on international transactions. Those who are in need of foreign currency and cannot obtain all they desire from official resources will therefore have an incentive to look for other sources and those who have an excess of foreign exchange prefer to sell it for a higher price than the official rate. Lee (1993) suggests that “the associated black market premium […] plays exactly the same role as an import tariff. The distortion that arises from foreign exchange controls always increases the price of the imported inputs and thereby lowers steady-state income, and consequently growth rates in the transitional period” (p. 314).

Levine and Renelt (1992) are sceptical towards this approach, indicating that the BMP represents the interaction of many policies and not just trade policy. This point has been emphasized by Rodrik and Rodriguez (2000) even further, stating that a high BMP “is likely to emerge (i) when there is a deep inconsistency between domestic aggregate demand policies and exchange rate policy, or (ii) when the government tries to maintain a low level of the exchange rate in order to counteract transitory confidence or balance of payment crises” (p. 32). These relationships are also present in the data when one investigates the simple correlations between the BMP and, for example, the level of inflation and the debt/export ratio. Rodrik and Rodriguez (2000) therefore conclude that “the BMP is not a good measure of trade policy, because it is also a proxy for many other variables unrelated to trade policy (p. 34).”

Warner (2003), however, heavily defends the use of the BMP as an indicator of trade policy:

> "It is true that rampant inflation with all nominal prices rising except for a lagging official exchange rate would produce an exchange rate premium. In the special case in which no transactions were conducted at the official rate, this premium would affect no relevant relative price and should not be considered an import barrier. But if the importer of the capital good in our earlier example had to buy the imported good at the official exchange rate, then even in this high-inflation scenario the exchange rate premium would be a relevant proxy for the rise in the relative price of imports" (p. 11).

Thus, even if macroeconomic demand expansions are present, this does not diminish the fact that the BMP serves as a barrier to acquire foreign exchange and thereby constitutes a barrier to imports. A good example is Algeria who had a BMP as high as 418 percent in 1987, but maintained an average tariff rate of 13.2 percent and an inflation rate of 8.6 percent in the 1980's. If one did not consider the BMP in this case, then countries like Algeria would be considered to be fairly open, according to Warner.

The belief that trade barriers create a higher price level has led some scholars to use indicators of price distortions as a proxy for outward orientation. This is perhaps best reflected by Dollar (1992), who calculates the relative price level (RPL) for the same basket of consumption goods in different countries, using the U.S. as benchmark.[7] If all goods were completely tradable and no trade barriers existed, then the relative price level would be the same for all countries. Since not all goods are tradable, the author regresses the relative price level on country endowments in order to control for systematic differences arising from these goods.[8] Dollar's index of distortion is then given by the averaged value of $RPL_i / \hat{RPL}_i$, for the years 1976-1985, where $\hat{RPL}_i$ is the predicted value from the regression. Dollar (1992) states that "a country sustaining a high price level over many years would clearly have to be a country with a relatively large amount of protectionism" (p. 524). In addition, he calculates the index of variability, using the annual observations of $RPL_i / \hat{RPL}_i$. As reported in the previous section, Dollar defines the concept openness partly as little variability in real exchange rates, which justifies the inclusion of the variability index.

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[7] The relative price level for country *i* is formally given by: $RPL_i = 100 \times \frac{eP_i}{P_{U.S}}$, where $e$ is the exchange rate and $P_i$ is the price index in country $i$.

Rodrik and Rodriguez (2000) have criticised Dollar's index of distortion on four grounds. Firstly, the index does not account properly for export taxes or subsidies. For instance, a country that employs export restrictions would be considered outward orientated by Dollar's standard, because domestic prices of exported goods would now be lower relative to world prices. Secondly, Dollar assumes that the law of one price holds continuously which is not very plausible and thirdly, Dollar neglects the impacts of transportation costs. Finally, Rodrik and Rodriguez find the index of variability more of a measure of overall economic instability than an indicator of trade orientation.

### 3.2.4. *The Sachs-Warner openness dummy*

In his survey, Edwards (1993) writes that early studies in the free trade literature ventured little into analysing how countries might evolve from one trade regime to another. Moreover, Krueger and Berg (2003) point out that many countries tend to switch from one form of protection to another, rather then smoothly remove trade barriers. Trade openness will remain unaffected if, for example, tariffs are replaced by equivalent non-tariff barriers. Krueger and Berg therefore argue that "in measuring openness it is important to try to control for the possible substitution between various policy measures" (p. 9). Sachs and Warner (1995) attempt to provide such a measure, referred to as the Sachs-Warner openness dummy or index in the literature. According to their classification an economy is labelled as *open* if none of the following conditions hold:

(i) NTBs covering 40 percent or more of trade;
(ii) average tariff rates of 40 percent or more;
(iii) BMP rate exceeding the official exchange rate by 20 percent or more, on average, during the 1970s or 1980s;
(iv) a socialist economic system;
(v) a state monopoly on major exports.

Simultaneously, an economy is said to be *closed* if at least one of the above conditions applies. The Sachs-Warner index then works just like a dummy variable when inserted in

[8] The endowments used are real per capita GDP and population density. Time and regional dummies are included in the regression as well.

growth regressions, taking the value of one if the economy is considered open and respectively taking the value of zero if the economy is considered closed. The inclusion of the first three criterions is most obvious given the discussion above. The socialist classification is used to cover countries that rely on central planning instead of overt trade policies to keep their economies closed. Because export controls are symmetrical with import controls, Sachs and Warner include the monopoly variable.[9]

Rodrik and Rodriguez (2000) question whether the Sachs-Warner index actually captures the effects of trade policy and not a combination of different policy areas. With regards to the use of the BMP as indicator of trade policy, their criticism has been fully addressed above as well as the defence provided by Warner (2003). Further, the export variable seems to resemble a Sub-Saharan dummy rather than measuring the existence of state monopoly exports. According to the authors, this is due to the fact that the data on this variable was taken from a World Bank study, covering 29 African economies that were under structural adjustment programs from 1987 to 1991. Thus, other countries (even African) with state monopolies on major exports were excluded from the sample and therefore automatically passed this criterion. In their assessment, Rodrik and Rodriguez (2000) therefore find the Sachs-Warner index more of a proxy for a wide range of policy and institutional variables combined than an appropriate trade policy indicator.[10]

Warner (2003), however, provides a spirited defence for the design of the Sachs-Warner dummy in general and the inclusion of state export monopolies in particular. He argues that these monopolies played an essential role in African protectionism that could not rely on costly traditional barriers such as tariffs and quotas. African export marketing boards distorted trade in two ways: First of all by acting as monopsonies, they set the prices of agricultural output from farmers sold on the world market. Secondly, they practically worked as monopolies in the re-sale of foreign exchange that they received, thereby upholding an

[9] A.P. Lerner established this in a celebrated paper from 1936.

[10] In all fairness, it should be noted that Sachs and Warner (1995) recognize this point so some extent: "Among developing countries, open trade has tended to be correlated with other features of a healthy economy, such as macroeconomic balance and reliance on the private sector as the main engine of growth. To some extent, opening the economy has helped to promote governmental responsibilities in other areas. To that extent, trade policy should be viewed as the primary instrument of reform. But to some degree, our measure of trade policy serves as a proxy for entire of policy actions. Only further cross-country analysis, with a more detailed characterization of the entire policy regime, would allow us to distinguish the growth effects of the various components of economic policy" (p. 63).

exchange control system. There were other marketing boards outside Africa, but they typically restrained themselves from import controls.[11]

### 3.2.5. *Subjective indices*

Because of the measurement problems raised above and the fact that indicators tend to overlook different aspects of trade policy, some scholars have used information on policy to construct indices in a more 'subjective' manner (Edwards, 1998). In the comparative study of Michaely et al. (1991), 19 countries were evaluated individually during the period from 1948 to 1985 by country economists from the World Bank, which resulted in a trade liberalisation index. A similar approach was undertaken in a world development report from 1987, conducted by the World Bank (Edwards, 1993). 41 developing countries were, according to their trade orientation, classified into four groups: strongly outward oriented; moderately oriented; moderately inward orientated and strongly inward orientated. Dean et al. (1994) examined post-1985 liberalisation in a sample of 32 developing countries. Timing of liberalisation was assessed by reference to data on levels and changes in tariffs, quotas, export impediments and promoters and exchange rate distortion.

At the same time, these types of subjective indices have been criticised for their rather arbitrary classification methods and that applied evaluation standards have differed within the country sample. For instance, there has been a large debate over Korea's classification as a strongly outward orientated country according to the World Bank study from 1987.[12] Edwards (1993) suggests that these indices have contributed greatly in documenting the evolution of trade liberalisation for a particular country over time, but are not equally meaningful or informative for cross-country comparisons.

Rather than evaluating the trade orientation currently in place, some authors have used partial information on intended future trade reforms. Greenaway et al. (2002) use a measure which draws on data of the World Bank Structural Adjustment Loans. These loans (SALs) are tied to

[11] Rodrik and Rodriguez (2001) mention the sugar marketing board Mauritius as an example of a state export monopoly that was neglected in the Sachs-Warner index. In response, Warner (2003) points out that that the board in Mauritius did not impose controls in the selling of foreign exchange for imports and the existence of export processing zones for firms that want to import intermediate goods duty free.
[12] See for instance Edwards (1993).

commitments of policy reform when agreed upon and could therefore serve as a signal of intent to open up the economy. The SAL indicator behaves just like a dummy variable that activates when a loan has been agreed upon. The obvious weakness with the SAL indicator is that it only captures trade liberalisation to the extent that countries have signalled to undertake reforms. On the other hand, the SAL indicator does not suffer from the measurement problems associated with direct measures of trade policy. Moreover, because the timing of reform is so well recorded, the causality issues that normally arise in econometric modelling involving policy indicators and growth are more easily confronted in this case. For example, a country that engages in SAL agreements due to an external crisis can easily be removed from the sample to resolve the potential problem of endogeneity.

Yanikkaya (2003) uses data on bilateral payments arrangements (BPAs) as a measure of trade orientation. A BPA is an agreement that defines the method of settlement of trade balances between two countries. The general idea behind this measure is that countries that engage in BPAs can maintain discriminatory trade policies and the size of their export markets simultaneously. At the same time, Yanikkaya (2003) recognises that BPAs have historically not been used to explain growth differences between countries. One critique is that some countries may use BPAs for other reasons than maintaining trade barriers, such as financing trade without the need of finding hard currency.

### 3.2.6. *Area 4 of the EFI: Freedom to exchange with foreigners*

Area 4 of the Economic Freedom of the World Index (EFI), which measures the extent to which one is free to exchange with foreigners, has historically not been used in the empirical growth literature as a measure of trade policy. It differs from previous indices of trade policy, that we have discussed above, in the sense that it weighs together subjective and objective data. The inclusion of objective data may suggest that area four of the EFI is more suitable for empirical cross-country comparisons than the subjective indices presented above.

Similarly, to the extent that subjective data includes partial information on trade policy that is normally not contained in observed instruments of trade policy, area four may do a better job in summarising different manifestations of trade barriers rather than to proxy protectionism with a single measure. The components and subcomponents of the index are given in table 2.

A quick glance at the table above reveals that a substantial part of the index uses the same measures and indicators that we have already seen above, most notably the subcomponents of component 4A, "Taxes on international trade" and component 4D, which proxies the black market premium. Most of these components are also available for the whole index period (1970 to 2000), unlike the Sachs-Warner openness dummy in which tariff and NTB data only ranges from1985 to 1988. However, this also means that Gwartney and Lawson (2003[a]) have had to rely on more than one data source for some components, which could give rise to measurement problems if data definitions differ among the sources.

| **Table 2** Area four of the EFI: Freedom to exchange with foreigners |
|---|
| A Taxes on international trade |
| (i) Revenue from taxes on international trade as a percentage of exports plus imports |
| (ii) Mean tariff rate |
| (iii) Standard deviation of tariff rates |
| B Regulatory trade barriers |
| (i) Hidden import barriers: no barriers other than published tariffs and quotas |
| (ii) Costs of importing: the combined effect of import tariffs, license fees, bank fees, and the time required for administrative red-tape raises the costs of importing equipment |
| C Actual size of the trade sector compared to the expected size |
| D Difference between official exchange rate and market rate |
| E International capital market controls |
| (i) Access of citizens to foreign capital markets and foreign access to domestic capital markets |
| (ii) Restrictions on the freedom of citizens to engage in capital market exchange with foreigners: index of capital controls among 13 IMF categories |

Note: All the subcomponents are assigned an index number on a 0-10 scale, where 0 means no freedom to exchange with foreigners and 10 means full freedom to exchange with foreigners. The weights of the subcomponents and components, respectively, are determined by simple averages.

Measurement problems are also the reason why some components are quantified with subjective data. Gwartney and Lawson (2003[b]) stress the difficulties in quantifying, for example, the impact of regulatory constraints and the consistency of a country's legal system with economic freedom. While they prefer objective data as the basis for the EFI, they wish not to neglect the impact of policies that cannot be measured objectively. Indeed, as many authors have pointed out, the lack of good data to construct, for instance, the NTB coverage ratio seriously undermines the validity of that indicator, not to mention the flawed procedure used to calculate it. Moreover, it is virtually impossible to find objective data on administrative barriers, but, as shown by Dollar and Kraay (2003), these restrictions can be as discriminatory as any other instrument of trade policy. Consequently, component 4B and subcomponent 4Ei are based upon survey data from the *Global Competitiveness Report* from 2001-2002 and 2002-2003. However, component 4E, "International capital market controls", is not a direct restriction on the exchange of goods and services. James Gwartney suggests in

personal correspondence with the author that one should exclude this component if the main objective is to investigate the discriminatory effects of trade restrictions.

Component 4C is included to account for trade restrictions such as quotas and monopoly grants. As we have discussed above, these types of discriminatory regulations are typically hard to measure directly. To approximate their severity on trade, an indirect method of regression analysis, very similar to the SATI measure as described by Pritchett (1996), is used to compare the actual size of a country's trade sector with the expected size, given geographical characteristics and distance to potential trading partners. A country with a trade sector, whose size is lower than expected, therefore receives a lower ranking in the index.

The obvious benefit of using area 4 of the EFI as an indicator of trade policy is its potential explanatory power of the overall effects of protectionism. This would be consistent with the views of Warner (2003) and Baldwin (2003), who have questioned the meaningfulness of including single measures of trade barriers in an empirical framework. On the other hand, following Rodrik and Rodriguez (2000), a highly aggregated measure of this kind might also be correlated with other groupings of explanatory variables that are not related to trade policy. As will be explained later, only further empirical testing of EFI 4 can shed light on such matters.

## 3.3. *Correlation among trade policy indicators*

Pritchett (1996) argues that the validity of any given measure of outward orientation or openness would strengthen if it could be shown that the group of these very measures were collectively correlated to some extent. He states further that "if it had been the case that several of the indicators were strongly correlated and one had disagreed with the rest, then this partial consensus would have strengthened the claims of those that agreed and indicted the loner" (p. 326). In the Pritchett study cited above, correlation between the adjusted trade intensity (SATI), NTB coverage ratio, tariff levels, price distortions and trade pattern distortion were calculated. The relatively surprising result was the lack of a systematic relation among these measures. This finding seems to suggest that these measures fail to capture overall trends in the development of trade policy for a specific country.

Harrison (1996) examined both the level and changes for a number of openness measures and found a positive relationship among indicators but that the majority of the rank correlations were not statistically significant. Yanikkaya (2003) found significant and positive correlations between measures belonging to the same group of indicators, such as trade intensity ratios and direct measures of trade barriers, but that indicators across the groups were weakly correlated, sometimes even showing the "wrong" sign. An interesting feature of Harrison (1996), however, is the significant correlation between the black market premium and other openness measure, price distortions excluded. In light of the discussion above, this result seems to strengthen the use of the BMP as a trade policy indicator.[13]

To the extent that some indicators seem unrelated, Berg and Krueger (2003) point out that different indicators of trade policy also measure different fields of trade policy. A country that has, for example, embarked on a high tariff route may very well have kept quota restrictions on a low level, hence the lack of correlation between tariff ratios and NTB ratios. The authors remain, however, somewhat puzzled over the lack of correlation between indicators designed to capture overall trends of trade policy.

# 4. Trade policy and growth in cross-country comparisons

Keeping in mind the serious measurement problems of trade orientation, demonstrated in the text above, Edwards (1997, 1998) suggested that researchers should move away from the area of constructing satisfactory summary indices of trade policy. Instead, he argues, one should focus on existing measures and try to determine econometrically whether these are robust to alternative indices. In his cross-country comparison, Edwards (1998) analyses 9 different indicators; Sachs-Warner index, world development report outward orientation index, Leamer's openness index, average BMP, average import tariff on manufacturing, average coverage of non tariff barriers, the Heritage foundation index of distortions in international trade, collected trade taxes ratio and Wolf's index of import distortions. The dependent variable in the regression is total factor productivity growth (TFP) during 1980-90.[14] Using

[13] Needless to say, this says nothing about the causality of the BMP and trade distortion; they only indicate that they are correlated, as Harrison (1996) points out.

[14] TFP growth was estimated from a panel regression using a Hick-neutral production function approach, given by $Y_t = B_t f(K_t, L_t)$, where $B_t$ is TFP at time $t$. These estimates were then averaged over time periods for which the different openness indicators were available. Thus, the underlying assumption in this framework is that openness to trade spurs technological change and thereby affects productivity growth.

weighted least squares, with GDP per capita in PPP dollars in 1985 as weight, all measures, but Wolf's index, had the "right" sign, and among these a majority showed significance.[15]

The findings of Edwards (1998) have been confirmed by other studies as well. DeLong and Summers (1991) considered the World Bank's outward orientation index from 1987 and an effective protection rate dummy variable as trade distortion variables in a productivity growth regression.[16] Both of these variables entered the regression significantly; the more outward oriented, the faster a country grows. Sachs and Warner (1995) found a highly positive relationship between their openness dummy and real per capita GDP growth between 1970-1989, remaining significant after controlling for other growth factors. They also found that open countries have a significantly higher level of investment-to-GDP ratio. Dollar (1992) reports a strong and positive correlation between outward orientated countries, measured according to his distortion index, and growth. Lee (1993) tests his growth model empirically, using the import-weighted average tariff rate and the average BMP rate as trade distortions. With real capita GDP growth from 1960-85 entering the regression as the dependent variable, both the tariff and BMP have independent significant negative effects on growth.

## 4.1. *A tale of controversy*

At a first glance, such findings above would indicate a strong consensus on the notion that a more liberal trade policy is conducive for growth. But how robust are these results when other explanatory factors are controlled for? In the extreme bound analysis of Levine and Renelt (1992), the ratio of exports to GDP, the ratio of imports to GDP, Leamer's openness index, the black market premium and Dollar's distortion index were all considered in a standard growth regression. Their main finding is that none of the above variables were robust when the investment share of GDP was included in the regression as a fixed variable. When moving away from the extreme bounds, Sala-i-Martin (1997) found that the Sachs and Warner's openness dummy was strongly correlated with growth in the eyes of his sensitivity test. At the same time, Leamer's openness index, the black market premium, the degree of tariff barriers

[15] The variables that showed high explanatory power over productivity growth were the outward orientation index from the World Bank, the black market premium, Heritage's distortion index, the average tariff and the collected trade taxes ratio.

and a tariff distortion measure by Lee (1993) failed to pass this test.[17] That is, they were sensitive to alternative specifications and therefore labelled as not strongly correlated with growth. These results remain virtually the same even when the share of investment is included as a fixed variable.

**Table 3** The effects of trade policy on economic growth

| Studies | Dependent variable | Independent variable | Effect |
|---|---|---|---|
| DeLong and Summers (1991), Dollar (1992), Lee (1993), Sachs and Warner (1995), Sala-I-Martin (1997), Harrison and Hanson (1999), Clemens and Williams (2001), Warner (2003) | GDP growth | Level of trade policy indicator | Significantly positive |
| Levine and Renelt (1992), Harrison (1996), Sala-I-Martin (1997), Rodrik and Rodriguez (2000), Clemens and Williams (2001), Harrison and Hanson (1999), Warner (2003), Berggren and Jordahl (2003) | GDP growth | Level of trade policy indicator | Insignificant |
| Carlsson and Lundström (2002), Berggren and Jordahl (2003), Yanikkaya (2003) | GDP growth | Level of trade policy indicator | Significantly negative |
| Edwards (1998) | TFP growth | Level of trade policy indicator | Significantly positive |
| Harrison (1996), Vamvakidis (1999), Greenway et al. (2002), | GDP growth | Change in trade policy indicator | Mixed results |
| Hall and Jones (1998) | Level of GDP | Level of trade policy indicator | Significantly positive |
| Frankel and Romer (1999), Irwin and Terviö (2002), Alcalá and Ciccone (2001) | Level of GDP | Level of instrumented trade share | Significantly Positive |
| Rodrik and Rodriguez (2000), Irwin and Terviö (2002), Dollar and Kraay (2003), Rodrik et al. (2002), Alcalá and Ciccone (2001) | Level of GDP | Level of instrumented trade share | Insignificant |
| Dollar and Kraay (2003) | GDP growth | Change in instrumented trade share | Significantly positive |

Rodrik and Rodriguez (2000) go beyond these sensitivity analyses and examine some of the studies mentioned above in greater detail, most notably the studies of Dollar (1992), Sachs and Warner (1995) and Edwards (1998). In addition to their overall criticism of the trade policy indicators frequently used in the literature, which we discussed in depth in the previous chapter, they believe that the empirical strategies employed in some studies suffer from serious shortcomings. They confirm the findings of Levine and Renelt (1992) that the

[16] DeLong and Summers (1991) actually considered quite a few trade indicators in their regression framework. They are left out here, however, because of their limited relation with trade policy, which is the main focus of this survey.

distortion index of Dollar (1992) is generally not robust. Interestingly, they only have to include regional dummies to render the coefficient insignificant. This result raises the possibility that regressions using this index might be spurious, arising from the index's correlation with omitted regional characteristics.

The main critique of the Edwards (1998) paper, put forward by Rodrik and Rodriguez, is the choice of weighting variable in the regression framework, which produces errors that seem unreasonably high for poor countries' growth data. Once GDP per capita is replaced by the natural log of GDP per capita in 1985 as weight, these errors behave much more reasonable. Simultaneously, a majority of the measures of openness now becomes insignificant when using this alternative weight.[18] They extend their critique to raise questions regarding the validity of the data used to calculate the collected trade taxes ratio, a variable that was still significant after changing the specification. This measure, which is defined as the trade tax revenues as proportion of total trade, produces some rather bizarre results when using the data from Edwards' (1998) paper.[19] For instance, in this sample, India, which used to have one of the highest tariff rates in the world, has virtually the same average tariff ratio as Chile. When they use data from the World Bank's World Development Indicators from 1988 instead, which appears to be more reasonable, the coefficient now becomes insignificant with the "wrong" sign. Based on their alternative results, Rodrik and Rodriguez (2000) do not side with Edwards (1998) and others that there exists a robust relationship between openness and growth.

When examining the study by Sachs and Warner (1995), Rodrik and Rodriguez do find that the Sachs-Warner openness dummy is robust to alternative specifications, confirming previous findings by Sala-i-Martin (1997), but the authors are still concerned with the validity of this variable as an indicator of trade policy. To determine the individual explanatory power of the components in the Sachs-Warner index, these were all inserted one by one in a growth regression. The components of the index that were found to drive the results are the BMP

[17] For the degree of tariff barriers, see Barro and Lee (1993).
[18] Rodrik and Rodriguez (2000) point out that Edwards (1998) never justifies the inclusion of weighted least squares. It is pretty safe, however, to assume that this procedure is undertaken to correct for heteroskedasticity in the residuals. An alternative approach to using weighted least squares would be to compute the regression with White's heteroskedasticity-consistent standard errors. When Rodrik and Rodriguez do so, a majority of the openness measure becomes insignificant once again.
[19] The data on trade taxes in Edward's (1998) paper comes from the IMF.

variable and the export monopoly variable.[20] In particular, the most obvious measure of trade policy, tariffs and NTBs, account for a substantially low impact on growth. Warner (2003), on the other hand, offers an alternative decomposition of the Sachs-Warner index. When he removes all countries from Sachs-Warner openness index whose rating relied solely on the export monopoly or the BMP conditions, the positive relation between openness and growth continues to hold. Even when the tariff and quota threshold is lowered from 40 to 20 percent and excluding the BMP and export monopoly variables, so that countries like Taiwan and Thailand are now considered closed, the significance and the magnitude of the openness index remain virtually the same. Finally, Warner shows that this slimmed version of the Sachs-Warner index, relying foremost on tariffs and non-tariff barriers, is robust for control variables such as climate, average inflation and a sub-Saharan dummy variable.[21]

### 4.1.2. *The ambiguity of tariffs*

In addition to the Rodrik-Rodriguez critique, Yanikkaya (2003) actually finds a positive relationship between growth and various indicators of trade restrictions. He considers a three-equation regression system where the dependent variable is average real GDP growth over three periods: 1970-79, 1980-89 and 1990-97. The indicators of trade policy used are total import duties, total export duties and taxes on international trade, as well as data on BPAs.[22] The surprising result is that import duties and taxes on trade are positively and significantly correlated with growth. The export duty variable exerts a negative impact on growth but the relation is not significant. This variable, however, actually becomes significantly positive when previous 5-year averages enter the equation system. BPAs have a positive impact on growth although the relation is not very strong.[23] The only indicator of trade restrictions that is negatively correlated with growth in Yanikkaya (2003) is restrictions on payments with respect to current account transactions, which is based on data from IMF, but this relation is not statistically significant at the conventional levels. It should be noted, however, that the regression approach used by Yanikkaya differs from the type of regression models of Sachs

[20] Harrison and Hanson (1999) found similar results in their study.
[21] Strangely enough, Warner (2003) does not control for the black market premium.
[22] The measures used are duties as percentage of the values of imports and exports respectively. Taxes on trade as a percentage of revenues collected include import duties, export duties, profits of export or import monopolies, exchange profits and exchange taxes. Yanikkaya (2003) also considers trade volumes as measures of openness but since their relation with trade policy is not straightforward we do not discuss the results here.
[23] The relation becomes insignificant when previous 5-year averages are used.

and Warner (1995), in that investment share, government consumption in GDP and primary and secondary school enrolments are not included as control variables.[24] Also, the three-equation system might suffer from limited time horizons that fail to isolate the effects of trade restrictions.

Indeed, the results of Harrison and Hanson (1999) and Clemens and Williamson (2001) seem to contradict the findings of Yanikkaya (2003). Harrison and Hanson (1999) follow the framework proposed by Sachs and Warner (1995), using average growth in real GDP per capita between 1970-1989 as the dependent variable, but replace the overall openness measure with a measure of 'effective' tariffs after having found insignificant results with Sachs-Warner data. However, this 'effective' tariff variable is by definition the same as the import duty variable used in Yanikkaya (2003), differing only with regard to the averaging periods. Inserted in the regression, the 'effective' tariff or total import duty now has an independent negative impact on growth, remaining significant when the black market premium and the exporting monopoly variable are controlled for.

Clemens and Williamson (2001) also measure the average tariff rate as total import duties as a share of import values.[25] They point out that the inclusion of other explanatory variables, especially education, appears to decrease the explanatory power of tariffs in their cross-country comparison when data from 1970 to 1997 are used. In addressing this potential multicollinearity problem, they expand their sample, including 110 countries, and the time period considered is the half-century between 1950 and 1997. Using this data, they find a clear and negative relationship between the tariff rate and growth that is now "very significant" (p. 18). The authors suspect that this negative relationship originates from the interaction between a country's tariff policy and the tariff policy of principal trading partners. Exporting countries that experienced faster growth in the post-war era engaged in mutual tariff-reduction agreements to gain further access to the external market. This could explain the negative correlation because in such an environment tariffs work detrimental for a particular country when the rest of the world keeps it at a low level.

[24] The regression model used by Yanikkaya (2003) is a function of initial GDP in the period, human capital which is measured by life expectancy and physical capital which is measured by telephone mainlines per worker. Moreover, the control variables, besides various measures of trade openness, are war deaths, the type of regime, type of climate and whether a country has access to international waterways.

## 4.2. *Right idea, wrong method?*

Some scholars have argued that trying to separate the effects of economic openness into various trade policy indicators is a too narrow approach. The inclusion of other explanatory policy variables or even dummy variables might lower the impact of trade indicators because countries that liberalise their trade sectors tend to liberalise other sectors simultaneously. This problem of multicollinearity or separation of different liberalising effects might then render the coefficients of trade policy indicators insignificant in a cross-country regression. Baldwin (2003) points out that

> "[…] not only does the search for the relationship between trade barriers and growth seem futile, but it does not even seem to make much sense to investigate what the empirical evidence is on this relationship in view of the complex interrelationships between trade policy and other government policies and various macroeconomic variables when one is talking about trade policy actions covering a wide group of goods, e.g., manufactures, rather than a particular industry. Actually most of the country studies, particularly the later ones, have been concerned with government policies that cover much more than narrowly-defined trade barriers to international trade" (p. 30).

Bhagwati and Srinivasan (1999) think these problems are so demanding that they reject large cross-country comparisons overall on this matter. Instead, it is argued that one should focus on detailed country studies, which have a greater chance of distinguishing effects of policy changes in a broader sense. Studies by the OECD and NBER from 1960s and 1970s that follow these suggested methods also report a more persuasive positive link between open trade and growth performance.[26]

## 4.3. *The panel data approach*

One way of escaping some of the methodological problems involved with cross-country regressions is to introduce time series or panel-data. This approach allows the control for unobserved country-specific effects. Secondly, this technique makes it possible to quantify the relative importance of changes of trade policy that have occurred over time within a particular

[25] Whereas Harrison and Hanson (1999) call this measure 'effective' tariff, Clemens and Williamson (1999) use the phrase "exogenous tariff policy" (p. 4, footnote 2).

country. Indeed, the survey of Dean et al. (1994) documents nicely the rather swift changes from one trade regime to another among developing countries during the post-war era. Consequently, long-run averages or initial values for trade policy variables would then neglect these effects. Harrison (1996) considers a model where output (GDP) is a function of capital stock, years of primary and secondary education, labour force, arable land and technological change. Taking logs, totally differentiating and including the *level* or *change* of an openness measure then allow for asserting the impact of trade policy on growth in a panel-data environment. [27] The equation to be estimated is:

$$d\log y_{it} = dA_{it}/A_{it} + \beta_1 d\log k_{it} + \beta_2 d\log prim_{it} + \beta_3 d\log \sec_{it} + \beta_4 d\log lab_{it} + \beta_5 d\log land_{it} + \beta_6 OPENNESS + r_i + e_{it},$$

where lower case variables represent division by output, $A_{it}$ is estimated technological change, $r_i$ is a country-specific effect and $e_{it}$ is a an error-term in country $i$ at time $t$.

Harrison (1996) reports weak results when the equation described above is estimated in a pure cross-country manner, with only the black market premium rate showing significance. But with panel data inserted instead, there exists a significant and positive relationship between openness and growth for four measures when annual data is used and for three measures when five-year averages are used. Harrison also estimates the model using changes in openness instead of levels. The suggestive reason for doing so is that movements towards openness might temporarily increase the rate of growth through a more effective allocation of resources. In the case of annual data, this line of arguing seems to be reasonable, with results showing that movements towards a more open trade regime is associated with higher growth in six out of the seven cases. Out of these, the index of Michaely et al. (1991), BMP, trade share and movement towards international prices are significant at the 5% level.[28]

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[26] For a survey of these studies, see Edwards (1993), Bhagwati and Srinivasan (1999) and Berg and Krueger (2003).

[27] The different measures used as proxies for openness or trade policy include the trade liberalisation index for 1960-84 of Michaely et al. (1991), a second trade liberalisation index of Thomas et al. (1992) that was calculated using country data on tariffs and non-tariff barriers for 1978-88, the black market premium, the ratio of exports and imports to GDP, a measure of movement toward international prices, the distortion index of Dollar (1992) and an indicator that measures the indirect bias against agriculture from industrial sector protection and overvaluation of the exchange rate.

[28] On the other hand, using changes over five-year averages only the index of Michaely et al. (1991) and the BMP show a significant and positive relationship with growth.

Vamvakidis (1999) considers a similar model to that of Harrison (1996) but uses other data sets. With entry dates for 18 different regional trade agreements (RTAs) and the liberalisation dates from the Sachs-Warner index, he confirms previous cross-country findings that the Sachs-Warner indicator exerts a highly significant and positive impact on growth, whereas RTAs, on the other hand, do not foster growth. The probable cause for the latter result, according to Vamvakidis (1999), is that most RTAs consist of small developing countries. This means that intratrade shares are relatively small and that high tariff barriers keep these economies closed towards the rest of the world. Time-series evidence thus suggests that countries have grown faster on average after broad liberalisation, but not after joining a RTA.

Greenway et al. (2002) model openness and growth in a similar way as Harrison (1996) but also consider a dynamic approach. The reason for going this route is that dynamic modelling permits the tracking of the short-run effects of trade liberalisation. The explanatory variables in the model are investment, population growth, initial per capita GDP and initial human capital.[29] The measures of trade policy include the SAL indicator, the liberalisation index of Dean et al. (1994) and the Sachs-Warner index and all of these enter the equation as dummy variables. The general result in Greenway et al. (2002) is that trade liberalisation or openness is associated with higher growth. The one pattern that stands out, however, is when lagged variables of the trade policy indicators are introduced as well, a *J*-curve type effect of liberalisation emerges.[30] That is, the coefficient of trade reform is negative in the first year, effecting growth negatively, but then it switches sign in the subsequent years, exerting a positive impact on growth. This line of modelling thus suggests that the impact of trade liberalisation is conducive for growth primarily in the short-run. These effects are also more apparent when the Sachs-Warner index is used and less apparent when the SAL indicator is used. The authors state that this result is not all too surprising since, as previously reported, the Sachs-Warner index is an ex. post measure of openness whereas the SAL indicator is ex. ante.

It is thus tempting to argue that panel data does a better job in capturing the effects of trade liberalisation than cross-country data. But one must also realise the obvious drawbacks; many measures of trade policy or openness are only available for shorter periods of time, while

[29] The model is then given by $y_{i,t} = f(y_{i,t-1}, X_{i,t})$, where $y$ is GDP growth and $X$ is a vector of explanatory variables, including a measure of openness or trade liberalisation.

some are not available in a panel setting at all. Moreover, using averages in cross-country comparisons might reduce measurement errors or the effects of extreme values of some indicators gathered over time, such as tariffs and non-tariff barriers. These implications are also recognised by Harrison (1996).

## 4.4. *Institutions, trade and levels of income*

Some studies in the empirical growth literature have focused on the level of income rather than the rate of growth. Hall and Jones (1998) report two overall reasons for following this approach. First, levels capture the differences in long-term economic growth that is most relevant to consumption of goods and services. Second, many recent studies point out that differences in growth rates across countries are likely to be transitory; in the end all countries will grow at the same rate since technology transfer keep countries from drifting indefinitely far from each other. The central hypothesis of their paper is that the long-run level of income is determined by a country's social infrastructure.[31] The measure of social infrastructure is formed by combining an index of government anti-diversion policies (GADP) and the Sachs-Warner openness index.[32] The latter is included in this context because "not only does the imposition of tariffs divert resources to the government, but tariffs, quotas and other trade barriers create lucrative opportunities for private diversion" (p. 18). This line of reasoning yields the following simple model:

$$\log Y / L = \alpha + \beta S + e ,$$

where $Y / L$ is output per worker, $S$ denotes social infrastructure and $e$ is a random error.

[30] In this case, the dummy indicator is only activated in the year of liberalisation only. The lags pick up the effect effects of reform in subsequent years.
[31] By social infrastructure they mean "the institutions and government policies that provide the incentives for individuals and firms in an economy" (Hall and Jones (1999), p. 14). The argument is that in a society with a high level of social infrastructure, productive units are rewarded fully and resources are not needed to invest in activities designed to avoid diversion. The government enters the picture by deterring private diversion and by refraining from diverting itself.
[32] The GADP index is provided by Political Risk Service. See the paper for further details.

Social infrastructure is, however, likely to be endogenously determined.[33] Poorer countries, for instance, may not have the same resources as rich countries to establish efficient social institutions in the first place. To address this issue, Hall and Jones (1998) instrument their measure of social infrastructure on a number of correlates associated with Western European influence. These instruments are distance from the equator, fraction of a country's population that speaks any of the major Western European languages, fraction that speaks English as mother tongue and a country's predicted trade share calculated from a gravity model.[34] The idea behind these instruments is that Western European influence has historically been associated with a high level of social infrastructure but is not intensively targeted towards regions of the world that have high output per worker today. In econometric terms this means that the instrumented explanatory variable, social infrastructure in this case, will not be correlated with the random error $e$. The instrument procedure therefore produces consistent estimates that do not suffer from any serious bias when endogenous variables are at hand. The basic result of Hall and Jones (1998) is that higher social infrastructure is indeed associated with a higher level of output per worker around the world. These results appear to be robust to the inclusion of other explanatory variables, such as ethnical and geographical features, as well as when the two areas of social infrastructure are included separately in the model.

Frankel and Romer (1999) also model the level of income instead of growth rates when trying to determine the impact of trade. But in contrast to Hall and Jones (1998) they find the measurement issues of trade policy too difficult to overcome and decide use trade shares instead. However, they acknowledge the fact that the trade share may be endogenous. For instance, a country that has a relatively high income for reasons other than trade may trade more. Consequently, they direct their attention to constructing an appropriate instrument for international trade. A bilateral trade equation is estimated in the spirit of a gravity model, regressing observed trade volumes (exports plus imports) between countries on mainly geographical factors, such as size of population and area and dummy variables for landlocked countries and common border. The idea behind these instruments is that countries' geographic characteristics are not affected by their incomes. Similarly, Frankel and Romer argue that it is hard to imagine that these characteristics could affect income except via trade, which would

[33] Actually, Hall and Jones include a second equation in their model, given by:
$S = \phi + \delta \log Y / L + X\theta + \eta$, where $X$ is a vector of other explanatory variables. They do not, however, try to estimate it.
[34] The trade share calculated here comes from an earlier version of the paper of Frankel and Romer (1999), which we will discuss further below.

strengthen the quality of these instruments considerably. Both OLS and instrumental variables (IV) estimation are used in an income regression where the independent variables are trade share, land area and population. Two results stand out: first of all, trade significantly raises income and second, the IV estimates, with the constructed trade share as instrument, are systematically larger than the OLS estimates.

The goal of the papers of Dollar and Kraay (2003) and Alcalá and Ciccone (2001) is to draw together the contributions of Frankel and Romer (1999) and Hall and Jones (1998) into the same framework. In trying to shed some light of the relative importance of trade and institutional quality, Dollar and Kraay (2003) include an index of rule of law and the trade share to GDP as right hand side variables in a standard income regression.[35] The results are by no means surprising: both trade and institutional quality have strong and independent effects on economic performance. But once again it is reasonable to suspect that both these variables are endogenous, which makes estimation with OLS an inappropriate method. Consequently, the authors re-estimate the equation with instrumental variables that draw upon Hall and Jones in the case of institutional quality and Frankel and Romer in the case of trade share. Now, however, the independent effects of both explanatory variables of interest become insignificant. The reason for these results, according to the authors, is that the instrumented variables, trade and institutional quality, are highly correlated. The authors therefore decide to shift their attention to a dynamic framework, much like the approach taken by Greenaway et al. (2002), relating changes in growth within countries over time to changes in the explanatory variables. This specification will be more successful than the static counterpart to the extent that changes in trade and changes in institutional quality are less correlated than the corresponding levels of these variables.[36] Dollar and Kraay (2003) estimated the following equation using both OLS and IV between the 1970s to the 1990s:

$$y_{i,t} - y_{i,t-k} = \beta_1(y_{i,t-k} - y_{i,t-2k}) + \beta_2(X_{i,t} - X_{i,t-k}) + (\lambda_t - \lambda_{t-k}) + (v_{i,t} - v_{i,t-k}),$$

[35] The index of rule of law comes from Kaufmann et al. (2002).
[36] The authors cite other advantages as well: Once differentiation is performed, disturbances arising from time-invariant and time-varying factors are relaxed. Moreover, as mentioned earlier, reversed causation from growth to trade or growth to institutions, that is likely to be present, is much easier to control for here. Specifically, Dollar and Kraay (2003) use levels of income and the explanatory variables as a natural set of internal instruments to address endogeneity.

where $y_{i,t}$ is log-level of per capita GDP, $k$ is the lag length (here $k$ is set fixed to 10), $X_{i,t-k}$ is column vector of explanatory variables, $\lambda_t$ is an unobserved period effect and $v_{i,t}$ is a combined period and country effect. The results are now much more convincing with respect to the IV estimates. The one thing that stands out is that the instrumented trade share is significant and has the "right" sign in four out five alternations of the different institution measures used.

Alcalá and Ciccone (2001) regress average labour productivity (ALP) on trade share (openness), a measure of institutional quality, the log of workforce, the log of country size and a set of geographical variables.[37] Recognising the potential fact that both trade and institutions may be endogenously determined they use the constructed trade share of Frankel and Romer (1999) and the language variables of Hall and Jones (1998) as instruments. Using generalized method of moments (GMM) and the instruments mentioned above, they find that only institutional quality is a significant determinant of productivity. Instead of worrying about potential multicollinearity issues, they proceed with their analysis by changing the trade variable to their preferred real openness measure, described in the previous section.[38] The change of measure changes the picture completely with both trade and institutional quality showing a significant impact on ALP. The real openness variable is also robust when controlling for geographical variables.[39] Finally, Alcalá and Ciccone (2001) regress their real openness measure on the Frankel-Romer constructed trade share and the Sachs-Warner openness dummy, which both have significant explanatory effects on trade. In response to Rodrik's and Rodriguez's (2000) critique of the Sachs-Warner dummy they decompose this variable to include only the tariff- and NTB-criteria and the relation remains unchanged. This leads them to suggest that a favourable trade policy may be an effective tool for increasing trade and thereby growth.

[37] The measure of institutional quality follows Hall and Jones (1998). The geographical variables are regional dummies and latitude (distance from equator). Average labour productivity is given by:

$$ALP_i = \log\left(\frac{PPP\ GDP_i}{Workforce_i}\right)$$

[38] In fact, the log of real openness enters the regression. Alcalá and Ciccone (2001) experimented with the untransformed measure of real openness but obtained better results with the former.

[39] As a further robustness test, Alcalá and Ciccone (2001) also estimate the relationship between trade and income per capita in former colonies in their study. Following Acemoglu et al. (2000) institutional quality is replaced by expropriation risk for which settler mortality is used as the corresponding instrument. Estimating this income equation with the instruments laid out above, including the language variables of Hall and Jones (1998), both trade (measured by real openness) and expropriation risk are independent and significant determinants of

### 4.4.1. *The controversy revisited*

It seems as if trade really does matter for economic development, but there are two major complications that require some discussion. The first one is concerned with the relative importance of trade when geography is controlled for. Irwin and Terviö (2002) follow the same procedure as Frankel and Romer (1999) but expand the sample to include different time periods during the 20th century. Their basic findings confirm previous results with IV estimates having a higher explanatory power on income than corresponding OLS estimates.[40] But as Rodrik and Rodriguez (2000) point out, and demonstrated by Irwin and Terviö (2002), these results are not robust to the inclusion of latitude (distance from equator) on the right-hand-side of the income equation. To control for latitude in a pure trade-income equation is on the other hand not as easily interpreted from an economic point of view as the inclusion of other geographic variables such as distance from trading partners. If we return to Hall and Jones (1998) once again we saw that latitude was included to control for western influence. But here the independent variable was social infrastructure and not trade share. Indeed, in their framework latitude was insignificantly positive while social infrastructure remained highly positive and significant.

The second problem is concerned with the relative importance of trade over institutions. Alcalá and Ciccone (2001) changed measure from openness to real openness in order to render that variable significant and Dollar and Kraay (2003) shifted their attention to dynamic modelling. Rodrik et al. (2002), however, find that in all their specifications "institutions trump geography and trade" (p. 7). In fact, the ratio of trade is nowhere near significant. In their analysis, integration is given by the usual ratio of trade to GDP and geography by latitude whereas institutional quality is measured according to a rule of law index due to Kaufmann et al. (2002). The corresponding instruments used for these explanatory variables are the Frankel-Romer constructed trade share and settler mortality which both enter a first stage equation system together with latitude. These findings of Rodrik et al. (2002) suffer from no serious multicollinearity and are robust to increases in the sample and using the

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income. Replacing the expropriation risk variable with institutional quality, but still including settler mortality as instrument, does not alter the results – trade and institutions matter for economic development.

[40] So, from where do these differences in estimates originate? Frankel and Romer seem to believe that sampling variation is at blame or, alternatively, that the OLS estimate is in fact biased down by neglecting other beneficial transactions between countries such as R&D spillovers. The findings of Irwin and Terviö seem to support the latter explanation.

instruments proposed by Hall and Jones (1998) as well as including country size and area on the right-hand-side of the second stage equation.[41] Even more striking is that nothing changes when the real openness measure, proposed by Alcalá and Ciccone (2001), is included instead of the usual openness measure.

## 4.5. *EFI as an indicator of trade policy*

Up to this point we have seen mixed findings in the search for an empirical relation between economic growth and trade. Using various indicators of openness and outward orientation does not solve the case, nor does there exist a consistent pattern between the various indicators. In light of these results, we now turn to the literature on economic freedom by considering the trade policy areas and components of the Economic Freedom of the World Index (EFI) in an attempt to shed some more light on this issue.

Carlsson and Lundström (2002) insert the different areas of the EFI one by one in a cross-country growth regression. Some areas of the index are indeed found to be positively correlated with growth. But the variable of interest in this case, "Freedom to Exchange with Foreigners", actually imposes a significantly negative effect on growth.

Berggren and Jordahl (2003) consider a similar framework to the one of Carlsson and Lundström, but use an updated version of the EFI, published in 2002.[42] Their basic specification is:

$$\Delta Y_i = \alpha + \beta_1 Y_{75} + \beta_2 INV_i + \beta_3 SCHOOL_i + \sum_{j=1}^{5} \delta_j EFI_{j,i} + \varepsilon_i ,$$

where $\Delta Y_i$ is average growth, $Y_{75}$ is initial income in 1975, $INV_i$ is the investment share of GDP, $SCHOOL_i$ is the percentage of the population having completed secondary school in 1975 and $EFI_{j,i}$ is area *j* of the EFI in country *i*. In order to allow for a lagged effect, the values of the different elements of the freedom index are averaged over the period 1970-95,

[41] The latter two variables were included to control for market size. Frankel and Romer (1999) argue that smaller countries tend to trade more than larger ones, and one should therefore control for country size at the income stage regression.

whereas the dependent variable, average growth, is measured as the average value between 1975 to 2000.

The basic results in Berggren and Jordahl (2003) are consistent with the previous findings of Carlsson and Lundström (2002). Especially area 2, "Legal structure and property rights", exerts a highly significant and positive influence on growth. This finding seems to confirm the importance of institutional quality for economic development when measured by some sort of a rule of law index as in Rodrik et al. (2002), Alacalá and Ciccone (2002) and Hall and Jones (1998). They also replicate the more controversial result that a more liberal trade policy is significantly detrimental for economic growth.

Having found the latter discovery rather surprising, Berggren and Jordahl decide to disaggregate area 4, "Freedom to exchange with foreigners", of the EFI down to its five components. They do, however, exclude component 4B "Regulatory trade barriers" due to limited data availability. When inserted in the regression, together with the other remaining *areas* of the EFI, none of the four *components* of area 4 show significance at the 5 percent level. Component 4A, "Taxes on international trade", is, however, very close.[43] When area 4 is decomposed even further, down to its very subcomponents, the only variable that shows any significance is subcomponent 4Aii, "Mean tariff rate". Berggren and Jordahl therefore conclude that the component most likely to drive the negative effect of area 4, "Freedom to exchange with foreigners", is "Taxes on international trade" and possibly, when narrowed down to its subcomponents, the "Mean tariff rate."

To examine how sensitive these findings are to the model specification, Berggren and Jordahl (2003) perform an unweighted version of the robustness test of Sala-i-Martin (1997). When other potential explanatory variables are controlled for, area 4 of the EFI is found not to be robustly correlated with growth according to this test. Moreover, to determine whether certain countries drive the results, the authors perform a test called least trimmed squares to identify potential outliers in the sample. After removing 24 countries from the sample and re-estimating the equation set out above, the variable, "Freedom to exchange with foreigners",

[42] Carlsson and Lundström (2002) use a version of the EFI from 2000. For a description of the changes made in the version from 2002 compared with the one from 2000, see Berggren and Jordahl (2003).
[43] In another specification considered by Berggren and Jordahl (2003), component 4A actually becomes significantly negative when the remaining components of area 4 are weighed together into one index and inserted on the right hand side of the equation.

now exerts a significant and positive effect on growth. It should be noted, however, that Berggren and Jordahl do not pretend to have established a positive relation between free trade and growth. Rather, these findings should be seen as indicators of measurement errors or parameter heterogeneity; problems that are common in cross-country comparisons. Consequently, they recommend some caution when interpreting the empirical findings of Carlsson and Lundström (2002).

# 5. Discussion and interpretation

In this section, the author of this survey evaluates and compares the findings laid out above. The guiding question is why there is such a lack of consistency among the results. There do not exist any straightforward answers. Instead, a few observations are presented and some plausible explanations are offered. Finally, the author proposes some avenues for further research, which might help to settle some of the controversies we have encountered so far.

## 5.1 *Measurement and data*

As indicated in previous sections, the empirical relation between trade policy and growth is subject to serious measurement and data problems. Consider once again the impact of tariff barriers. Using total import duties to imports in a growth regression, which is the case in Rodrik and Rodriguez (2000), Clemens and Williamson (2001) and Yanikkaya (2003), tend to produce weak results and with the coefficient of the tariff indicator even showing the “wrong” sign in some specifications.

More broadly, when growth is examined for a period in which no major trade liberalisation took place with regards to tariffs, or tariffs were already kept at a low level, then the impact of tariffs might be limited. This would be consistent with growth models where trade policy only has transitional or short-term effects on growth and does not affect the steady-state growth rate. The results of Clemens and Williamson (2001) seem to confirm this suspicion at least to some extent. But as Warner (2003) remarks, high tariff barriers may depress imports and therefore tariff revenues. In this case, the import duty ratio would clearly underestimate the discriminatory effects of tariffs, which might render the coefficient insignificant. The preferred measure of Warner (2003) is the trade-weighted average tariff rate with data taken

from the Barro-Lee data set from 1994, which is also used to construct the Sachs-Warner openness dummy. On the other hand, Harrison and Hanson (1999) and Rodrik and Rodriguez (2000) point out that the tariff data for this measure were gathered in the mid-1980s. Following the framework put forward by Sachs and Warner (1995), this means that the data used are end-of-period averages in a cross-country comparison that considers the period between 1970 and 1989. Ironically, Warner (2003) criticises Rodrik and Rodriguez on a similar basis for using data from the World Bank's Development Indicators (WDI) from 1998.[44] Warner (2003) states that "the data used were measured […] *after* most of the major trade liberalisations of the 1980's in the developing world. The tariff data should be measured before, or at least contemporaneous with, the growth in question, and certainly not after the growth happened" (p. 7). Thus, Warner criticises some scholars (Rodrik and Rodriguez, Yanikkaya) for using "wrong" data but is subject to the same kind of critique put forward by other scholars (Harrison and Hanson, Rodrik and Rodriguez)! This is indeed puzzling since Warner (2003) and Harrison and Hanson (1999) both agree with regards to the basic result, namely that openness to trade is conducive to growth.

The example of tariff barriers entering a growth regression as an indicator of trade policy suggests that the results are, at least to some extent, sensitive to (i) how one proxies or measures the degree of tariffs and (ii) the data used to calculate the measure. The import duty ratio, with data from the World Bank, is available for longer time periods but may underestimate the true level of tariffs. In contrast, the trade-weighted average tariff rate may capture the discriminatory effects of tariffs more efficiently but is only available for a short period of time.

## 5.2. *Single instruments of trade policy*

Another potential reason for finding such weak results might be a consequence of neglecting the various forms of protectionism. The average tariff rate, regardless of how one measures this variable, is only one of many barriers to trade. If countries rely on other forms of protectionism than maintaining high tariffs, then the insignificant results may not be all that surprising. To control for non-tariff barriers, authors have been confined to the NTB coverage

[44] Yanikkaya (2003) use data from WDI (1999) so the critique of Warner (2003) applies here as well.

ratio with data once again taken from Barro-Lee data set from 1994. But this measure is clearly flawed and, even more importantly, it is only available for the period 1985-88. The lack of good data on non-tariff distortions makes it hard to draw any certain conclusions at all on the role of protectionism. Moreover, even if one did possess reasonable data with respect to both tariffs and non-tariffs, collected within the same time frame, it is still not all that clear whether the appropriate technique is to include both of them as independent variables in a growth regression. It is true that authors who have compared various indicators of trade policy generally report low correlation between them, which would relax the problem of multicollinearity.[45] But what would a regression, with both tariffs and non-tariff barriers included on the right-hand-side, actually indicate in terms of overall trade policy? For instance, assume that the tariff variable is found to exert a highly negative effect on growth whereas the NTB frequency has no significant effect at all in such a regression. Would that imply that protection manifested through non-tariffs barriers is not equally discriminatory as manifested through tariff levels? Or does it simply imply that tariffs are the main instruments of protectionism in place? Even an econometric test of the joint significance of the separate policy variables is not ideal since such a specification would have to estimate a wide range of coefficients. The argument is, following Warner (2003), that trade policy instruments behave more as substitutes than complements.

When asked, Dani Rodrik recognises these econometric problems as well as the enormous measurement problems with non-tariff barriers in personal correspondence with the author, but suggests, in contrast to Warner, that the use of average tariff rates actually provides enough information about a country's trade regime. The reason for this is that the incidence of non-tariff barriers has diminished greatly during the last two decades. This means in all likelihood, according to Rodrik, that it is enough to rely on tariffs alone, at least for work that covers more recent periods.

Another solution would, of course, be to use time-series data. To the extent that different countries rely on different trade barriers, time-series data would definitely stand a better chance in capturing the effects of trade liberalisation within countries over time. In such a framework it would make much more sense to include several indicators that measure

[45] The rank correlation in Pritchett (1996) between the trade-weighted average tariff rate and the NTB coverage ratio is 0.38.

different aspects of trade policy. But once again limited data availability stands in the way to fully benefit from this approach, so one is often left with pure cross-country regressions.

## 5.3. *What do aggregated measures of trade policy really tell us?*

Aggregated measures of trade policy are likely to overcome some of the problems described above. Indeed, as we have seen previously, the Sachs-Warner openness dummy is highly significant in a standard growth regression. But even aggregated measures do not escape the problems associated with data and measurement. Once the openness dummy of Sachs and Warner (1995) is disaggregated both Harrison and Hanson (1999) and Rodrik and Rodriguez (2000) show that tariffs and non-tariffs account for a very small explanatory power. Warner (2003), however, shows that the significance of the openness dummy does in fact remain even after the threshold has been narrowed down to include only the tariff and NTB condition.

Why is there a lack of consistency here? First of all, it should be noted that when Harrison and Hanson (1999) decompose the Sachs-Warner index they put in place the actual data of tariffs and quotas as independent variables together with the other variables used to construct the dummy. Secondly, Warner (2003) narrows the conditions of the Sachs-Warner dummy and removes countries whose ranking depend on the BMP and export monopoly. Finally, Rodrik and Rodriguez (2000) offer a decomposition in which the modified Sachs-Warner dummy depends only on the first three criteria in Sachs and Warner (1995). It is therefore plausible to suspect that the insignificant result in the Harrison-Hanson version is due to identification issues as discussed above. Further, countries that were removed in the Warner version are included in the sample of the Rodrik-Rodriguez version and consequently labelled as open countries. Thus, the disagreement of the results probably originates from differences in the samples. Overall, it is hard to say which decomposition is preferable. But the arbitrary classification method used to rank countries according to Sachs and Warner (1995) certainly leaves room for further debate.

Area four of the EFI, “freedom to exchange with foreigners”, is of particular interest in this survey since it has not been widely used as a trade policy indicator in the literature. However, the use of this index in an empirical framework only seems to underline the inconsistencies. Indeed, some of the results in Carlsson and Lundström (2002) and particularly Berggren and

Jordahl (2003) deviate quite strongly from other studies. The finding that taxes on international trade, and particularly the mean tariff rate, are driving the results is to some extent peculiar. As reported above, when the ratio of duty revenues to imports works like a proxy for the average tariff rate, we have seen significant results in both ways; higher tariffs can either be detrimental or conducive for economic growth when inserted independently in a regression.[46] But more importantly, Rodrik and Rodriguez (2000) show that the average tariff, regardless of the choice of proxy, is typically weak in explaining growth when other factors are controlled for. Let aside the disagreement whether or not exchange rates distortions is an appropriate indicator of trade policy, but in all the studies reviewed in this survey the black market premium always exerts a higher explanatory power than any measure of average tariffs when both variables are inserted in a growth regression. The result in Berggren and Jordahl (2003) that component 4A, "Taxes on international trade", and subcomponent 4Aii, "Mean tariff rate", trumps component 4D, which measures the black market premium, is therefore not consistent with the overall findings in the literature.

At the same time, it is important to remember that the negative impact of EFI 4 on growth is derived from specifications that differ considerably from previous specifications considered; all other areas of the EFI are included as independent variables in the same regression. Indeed, both Berggren and Jordahl (2003) and Carlsson and Lundström (2002) recognise the disadvantage of decomposing an index as highly aggregated as the EFI. In one of the specifications in Berggren and Jordahl (2003), as many as 15 variables are inserted on the right-hand-side of the equation. In light of the discussion above it may not be very useful to introduce various policy instruments of trade, or any other policy variable for that matter, as independent variables side by side in a regression. These regressions may simply be uninformative, since it is hard to identify or account properly for the marginal effects of the various policies. For instance, it may very well be the case that the positive effects of a liberal trade policy are manifested through other variables as pointed out by Baldwin (2003). If this is the case then the negative coefficient of the EFI 4 certainly gives a misleading picture.

The low impact of the black market premium in Berggren and Jordahl (2003) might be a result of calculation techniques used to construct the EFI. In the case of the black market premium, countries with a BMP rate exceeding 50 percent do not receive a lower rating in the EFI than those with a black market rate at exactly 50 percent. Warner (2003) demonstrates

[46] See for example Harrison and Hanson (1999) or Yanikkaya (2003).

that there are countries that have experienced BMP rates well above 50 percent. These distortions would not manifest themselves fully in the index. On the other hand, as James Gwartney points out in personal correspondence with the author of this survey, it remains questionable whether the difference between a reported rate of say 200 percent and 600 percent is very meaningful. Further, and perhaps more important, if one allows the entire range of reported data, which might for example run from zero to 1200, it would mean that a country with a 50 percent black market premium would receive a relatively high rating in the index. The point is that a BMP rate of 50 percent is high enough given the restrictiveness of the exchange rate controls.

One related issue is how one should weigh together the different components into one measure. The obvious advantage with the EFI 4 is that it does not depend on arbitrary ratings like the Sachs-Warner openness dummy. The weighting method in earlier versions of the EFI was based on a principle component approach, whereas the latest index version, notably used by Berggren and Jordahl (2003), was calculated by simple averages. Thus, all the components in area four of the EFI are given equal weights. It could very well be argued that this approach is flawed if, for instance, there is a tendency among countries to rely foremost on tariffs as opposed to non-tariffs as the main source of protectionism. In this case one would typically want to assign a greater weight to the tariff component in the EFI. On the other hand, one could easily argue that some countries that do not rely on tariffs as the main instrument for protection of the domestic market are then given a more favourable ranking in the index than they actually deserve. Ideally, one would want to construct an individual weighting scheme for each country but such a task is unlikely to be feasible. Given these implications, the most neutral approach is to use simple averages until a better method comes about.

## 5.4. *A share of trade does not a policy make*

When inserted independently in a regression, the volume of trade generally exerts a positive effect on growth or levels of income. Further, using IV estimation, as opposed to OLS, seems to strengthen this relation. The disagreement lies in how robust this relation is when other factors are controlled for, especially geographic determinants and institutional quality. But whatever these regressions may report the literature has not fully explained what this means in terms of trade policy. To see this, assume there actually exists a strong and independent effect

of trade volumes on economic development. Does this imply that the right choice of policy would be to dismantle trade distortions per se? Not necessarily. It could very well be argued that the right choice of policy, in this case, would be to stimulate or promote larger volumes of trade. If it is believed that the growth enhancing effects lies within the export market, some might propose a general subsidy of exports while raising barriers to imports. If it is believed that only some traded goods are conducive to growth, one might restrict trade liberalisation to only include these. The point is that a reported link between trade openness and growth could actually increase the incentives to distort trade. Alternatively, given a reported negative link between trade openness and growth, does this imply that the right choice of policy would be to protect the domestic market per se? Again the answer is "not necessarily." For instance, it may be that a liberal trade policy works favourable for growth through other channels than by increasing trade volumes. One such channel might be social infrastructure as described by Hall and Jones (1998).

## 5.5. *The work ahead*

In light of these mixed findings, some may find it hard to side with Edwards (1998) on the notion that researchers should move away from the area of constructing satisfactory summary indices of trade policy. It would not be an overstatement to conclude that the measurement problems involved in quantifying tariff and non-tariff barriers call for further examination. One possible direction would be to calculate tariff measures as proposed by Anderson and Neary (2003) instead of relying on simple averages. Another direction would be to study, in more depth, the raw data on trade barriers and corresponding measures that already are available. For instance, are there any systematic differences between tariff data from the World Bank and data from UNCTAD? To what extent does the import duty ratio differ from the trade-weighted average tariff rate?

Another potential direction for further research would be to move away from direct measures of trade policy and instead use information on the government's intentions to liberalise its trade sector. This approach has been emphasised by Greenaway et al. (2002). The point is that markets, and their agents, may not always respond to actual outcomes of reforms but rather expectations of future policy changes. It may even be the case that the willingness to engage in international trade is foremost determined by communicated attitudes from the government.

For example, Rodrik and Subramanian (2004) argue in their analysis of India's economic reforms that Indian growth took off when policymakers became more market oriented and pro-business during the 1980s and not, as widely believed, when the government pursued actual reforms during the 1990s.[47] One should keep in mind, however, the enormous difficulties in constructing such indicators and that measures of policy attitudes may appear too subjective for usage in cross-country comparisons. It should also be noted that the indicator used by Greenaway et al. (2002), structural adjustment loans, proxies a wide range of intended policy reforms and not just trade reforms. Still, it would be interesting to assess whether economic development depends foremost on expectations of future trade reforms or reforms already in place.

While trade volumes may serve as a bad proxy for trade policy, it certainly opens up the debate over through which channels trade influences growth. In fact, because theory suggests so many potential links, the literature may have put too much emphasis on the trade-growth nexus and, simultaneously, failed to understand how the mechanism from openness or trade policy to economic development actually operates. Future studies should try to determine more in-depth if trade has any notable effect on the diffusion of knowledge and technology or if the primary gains are static. These types of studies could then give some guidance in the quest for suitable trade policy indicators.

The discussion about EFI 4 stresses the need for further empirical investigation. A first step in this direction would be to compare EFI 4 with other indicators of trade policy in a more systematic way. This can be achieved by calculating the rank correlation between EFI 4 and other aggregated measures of trade policy, such as the Sachs-Warner openness dummy, but also by inserting the EFI 4 on its own in a standard growth regression. In fact, one cannot fully judge the strengths and weaknesses of the EFI 4 before such modelling is performed. There are even suggestive reasons to follow this line of investigation down to the very components and subcomponents of the index. For instance, it would be interesting to compare component 4A, "Taxes on international trade", with other similar measures, such as the trade-weighted average tariff, keeping in mind that this part of the index accounted for the most explanatory power in Berggren and Jordahl (2003). Since the index relies on subjective data to measure the effects of non-tariff barriers, calculating the correlation between component 4B,"Regulatory trade barriers", and the NTB coverage ratio could provide some guidance in

[47] Although some initial reforms did take place in the late 1980s, see Panagaryia (2004).

determining the validity of such data. It could also prove informative to calculate the correlation between the components in EFI 4. As previously stated, Pritchett (1996) showed that the correlation between different instruments of trade policy is generally weak, but relied on data gathered during limited time periods. Since the EFI is available in five-year intervals between 1970 to 2000, data on the different components could be used to more extensively assess general trends in trade policy during the last decades.
In response to the questioned legitimacy of certain trade policy measures, one might want to examine how EFI 4 behaves in a growth regression when some components are excluded in the index. Component 4E, "International capital market controls", for instance, is really not a measure of trade restrictions. A similar argument could be made about component 4D, "Difference between official exchange rate and market rate", keeping in mind the critique of the black market rate as a valid indicator of trade policy. How does the EFI 4 perform when these components are not included in the index? In fact, if one wants to follow the Rodrik-style argument all the way, the index ought to be constructed with only the inclusion of component 4A.

Researchers might also want to consider modelling EFI 4 in a panel setting, given the fact that the index is available for a relatively large time period. Several reasons for doing so have been addressed in previous sections, but as a reminder we point out once again that this approach would be able to capture the effects of trade liberalisation within countries. It may also be useful to consider changes in EFI 4 over time rather than levels. Of course, modelling panel data in conjunction with changes in the explanatory variables presents us with a number of statistical and empirical problems that would not occur in cross-country regressions. For instance, it is potentially hard to assess the timing of lagged effects. On the other hand, one should not neglect the obvious advantages: the use of changes makes it possible to control for reversed causality from growth to trade liberalisation (or trade policy), by using lagged values as instruments. In addition, unobserved time invariant country effects, e.g. geography, cultural differences, do not matter for the estimates in such a specification. In the end, the key issue is to determine what changes in trade policy actually tell us. It is true that the empirical literature has relied almost exclusively on levels, but it is equally true that theory, especially endogenous growth theory, does not dismiss the potential effects of changes either.

# 6. Concluding remarks

This survey has reviewed recent cross-national evidence on the link between trade policy and economic growth. Although an overwhelming majority of empirical studies report a positive effect of liberal trade on economic performance, the literature still faces conceptual and methodological difficulties. It is typically hard to measure or approximate the effects of trade policy. Some indicators of trade policy are likely to underestimate the true level of protectionism, suffering from theoretical shortcomings or limited data availability. Aggregated measures of trade policy certainly provide more information about a country's trade regime than measures of single trade policy instruments, but they run the risk of capturing the effects of other policies as well. Moreover, cross-country regressions do not take into account the trade liberalisation process over time within a country and might therefore underestimate the growth-enhancing effects of a liberal trade policy. One important goal of this paper was to compare EFI 4 with other measures of trade policy. This area of the EFI is certainly a promising candidate among the many indicators of trade policy, but that only further research can fully determine its potential strengths.

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