Openness and Growth: What Have We Learned?

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1. Introduction

The period since 1990 has been a decade of trade policy reform. According to the World Bank's *World Development Indicators*, the average tariff rate in the world went down from 10.5% to 6.0% between 1990 and 2002 and the ratio of imports plus exports in GDP rose from 75.2% to 86.8%. In 1990, the General Agreement on Tariffs and Trade had been signed by 96 countries: between 1990 and 2005, 65 countries joined it either as the GATT or in its most recent incarnation as the WTO. In Wacziarg and Welch's (2002) analysis of trade liberalization experiences, the authors account for 49 countries that liberalized between 1990 and 2001.[2]

The trade policy reform of the nineties was spurred by a broad coincidence among a significant proportion of highly-trained economists regarding the benefits of greater economic integration. Anne Krueger's words in her 1997 Presidential Address at the AEA capture the state of thinking at the time:

> "It is now widely accepted that growth prospects for developing countries are greatly enhanced through an outer-oriented trade regime and fairly uniform incentives (primarily through the exchange rate) for production across exporting and import-competing goods... Policy reform efforts removing protection and shifting to an outward-oriented trade strategy are under way in a number of countries. It is generally believed that import substitution at a minimum outlived its usefulness and that liberalization of trade and payments is crucial for both industrialization and economic development...while there are still some disagreements over particular aspects of trade policy both among academic researchers and policy makers, the current consensus represents a distinct advance over the old one, in terms both of knowledge and of the prospects it offers for rapid economic growth" (Krueger, 1997, p.1)

Krueger's statement is indeed a reflection of the state of academic debate at the time. In a citations count of the most cited papers dealing with openness and growth published after 1992 that Dani Rodrik and I carried out (Rodríguez and Rodrik, 2001, henceforth RR), the four most cited papers were concerned with cross-national statistical evidence linking trade and growth, and all claimed to find a positive association between economic integration and growth or convergence.

In RR, we carried out a systematic critique of this evidence. We argued that the results in these papers either derived from the fact that the openness indicators used were *not* appropriately measuring openness (while more appropriate indicators in fact failed to deliver a significant association) or that the papers in question had made questionable methodological choices. Using the same data than the authors of these papers, we showed that correcting for these

[2] As we argue below, we believe that Wacziarg and Welch actually underestimate the amount of globalization that occurred during this period.

shortcomings in measurement and methods made the significance of the results go away.

Reactions to RR were varied. As was to be expected, a number of the authors whose work we surveyed responded to our objections. In his comment on our paper in the 2000 NBER Macroeconomics Annual Conference, Charles Jones (2001) staked out a position that would be followed by a number of researchers. He distinguished between a narrow and a broad interpretation of our results. The narrow interpretation was that the results of the studies that we surveyed were not as strong as their authors had indicated. The broad interpretation would be that trade policy is not very important for growth. Jones agreed with the narrow interpretation of our results, but disagreed with the broad one. A number of researchers have followed this line, attempting to remedy the faults that we had found in earlier research and to provide methodologically sounder strategies for estimating the relationship between trade and growth. One interesting result of a number of these studies appears to be the confirmation of our finding that there was no significant statistical association between trade policy indicators and growth, but at the same time the identification of a strong positive partial correlation between trade volumes and growth. Questions about the causality behind this partial association remain. I will discuss the results of this research in section 2.

Meanwhile, the world did not stop in its tracks to wait for the results of these more careful studies. The trend towards liberalization continued into the twenty-first century, with only some signs of what political scientists and commentators have dubbed “reform fatigue” in recent years. Therefore, the evidence on trade and growth today is not the same as it was in the early nineties. Most of the studies that we surveyed at the time used the Mark 5.6 version of the Penn World Tables, which covered the 1950-1992 period (for many countries, the data only went up to the late eighties). Recent studies have used data ranging up to 1998 and in some cases up to 2000. Given that we now have data available up to 2003 from World Bank (2005), it is worth taking a closer look at the data to see what, if anything, has changed.

The second part of this paper looks at the results of growth experiences around the world during the 1990-2003 period and their implications for hypotheses of the growth-openness link. As we show, this period did not confirm the predictions of liberalization enthusiasts. As a rule, more open economies did not fare better than less open economies during this period, and according to some measures of openness, tariff restrictions are actually negatively associated with growth (though never significantly so). The list of star performers from this period includes some economies that are commonly perceived as being highly restrictive of international trade, such as Lebanon and Lesotho, whereas some of the worst growth performances have been in economies that made substantial efforts to liberalize their trade regimes, such as Ukraine and Mongolia. This evidence is discussed in greater detail in Section 3.

In Section 4, we take up the issue of the meaning and significance of these weak correlations. There are at least two positions that can be taken with respect to these results. In one interpretation, these results show that there is no evidence linking greater openness and economic growth. In an alternative

interpretation, they emerge from the inherent coarseness of the cross-country data and the limitations of using regression-based analysis to study phenomena of such complexity. I discuss these interpretations in the concluding section.

2. A Review of Recent Contributions.

RR started out from a simple observation: If we look at the correlation between growth and the most straightforward indicators of trade policies, such as tariffs and non-tariff barriers, it is very hard to find a significant negative correlation between them and economic growth. This is illustrated in Figure 1, which is reproduced from RR (p. 263), and captures the partial correlation between growth and the average import-weighted tariff rate from the World Bank's *World Development Indicators* after controlling for the level of initial income and secondary education. This fact extends to other simple measures of trade restrictions such as unweighted tariff rates and non-tariff barrier indicators. If there is a negative relationship between growth and protection, it is not one that jumps out at first sight in the data.

RR then went on to focus on a set of very influential papers in the literature that had claimed to find a negative association between barriers to trade and economic growth: Dollar (1992), Ben-David (1993), Sachs and Warner (1995), Edwards (1998), and Frankel and Romer (1999). What we found is that these papers relied either on constructing indicators of openness that were in effect inappropriate measures of trade restrictions or on a questionable use of econometric methodologies.

Thus, Sachs and Warner (1995) constructed an indicator of openness that enters very robustly in most growth specifications. Sala-i-Martin, Doppelhoffer and Miller (2004) place this variable among the 18 variables with a posterior inclusion probability greater than 97.5%, a Bayesian measure of robustness calculated from the results of approximately 89 million regressions using different combinations of potential explanatory variables.[3] So there are no doubts about its robustness. But does this variable really measure growth? The Sachs-Warner dummy is a variable that classifies an economy as closed if it is closed according to any one of the following five criteria: (i) its average tariff rate exceeded 40%, (ii) its non-tariff barriers covered more than 40% of imports, (iii) it had a socialist economic system (iv) it had a state monopoly of major exports, or (v) its black-market premium exceeded 20% during either the decade of the 1970s or the decade of the 1980s. Whereas we found the rationale for including these variables jointly into an index reasonable, we also found that the explanatory power of this variable in growth regressions came almost exclusively from its use of the state monopoly of exports and black-market premium variable: an index that combined just these two indicators had as much explanatory power as the Sachs-Warner variable, and an index that combined the

[3] Sala-i-Martin, Doppelhoffer and Miller used the fraction of years open according to Sachs and Warner (1995), a slightly different variable from the 0-1 openness dummy that our robustness tests emphasized and that plays a central role in Sachs and Warner's paper.

other three variables (socialism, tariffs and non-tariff barriers) did not enter significantly into the regression.

This fact in itself was preoccupying since it implied that the robustness of these variables in cross-country growth regressions derived from the two components of the index whose link to trade policy was most tenuous. We went on to take a closer look at these variables and found that there were good reasons to think that they were not proxying for trade policy but were rather bringing in measurement errors that tended to bias the coefficients in favor of finding a growth-openness link. For example, the export-marketing board dummy was based on a 1994 World Bank study called *Adjustment in Africa* that covered only 29 African economies undergoing adjustment programs during the eighties. Thus non-African economies that had state monopolies of exports would not be classified as closed according to this variable; neither would African economies that had state monopolies of exports but were not undergoing adjustment programs during the eighties. For example, if the state monopoly of exports criteria had been uniformly applied further than this restricted sample, economies like Mauritius and Indonesia would have been classified as closed. Mauritius was excluded from the sample despite the fact that its sugar exports were sold through the state-owned Mauritius Sugar Syndicate because it was not under a structural adjustment program during the eighties (precisely because of its high growth); Indonesia was excluded, despite managing its oil exports through the Pertamina state-owned monopoly, because it was not in Africa. It just so happened that Indonesia and Mauritius, which Sachs and Warner thus go on to classify as open, are among the ten fastest growing economies in their sample.

Or, take Dan Ben-David's (1993) *Quarterly Journal of Economics* article on convergence and European economic integration. Ben-David argued that the post-war decline in the dispersion of inter-country levels of income within the European Economic Community could be ascribed to growing commercial integration among these countries. His argument was based on three observations: that this convergence was not a continuation of a long-term trend, that the European countries that chose not to enter a free-trade agreement did not experience the same extent of convergence, and that other subsets of economies in the world that were not economically integrated did not experience convergence.

In our closer look at Ben-David's results, we found that some of them were not warranted by the actual data. For example, in order to argue that European convergence was not the continuation of a long-term trend, Ben-David showed that previous to World War II there had not been a decline in the dispersion of per capita incomes in the EEC. But he excluded Germany from his calculations, arguing that "its exclusion should bias the results away from convergence." RR showed that including Germany in the calculations actually resulted in a very clear trend of declining dispersion of per capita incomes between 1870 and 1939, a trend that was confirmed by using Maddison's (1995) more recent data on historical economic growth. In other words, excluding Germany biased the calculations in favor of Ben-David's hypothesis, not against it. RR also raised objections to Ben-David's methodology for evaluating whether non-EEC

countries had converged to the European mean and whether geographically proximate regions that had not liberalized trade policies had experienced convergence.

A particularly influential paper in the literature has been Jeffrey Frankel and David Romer's 1999 *American Economic Review* paper "Does Trade Cause Growth?" That paper used an ingenious device for disentangling causality links in the estimation of the trade-growth relationship. It constructed an indisputably exogenous variable – the amount of trade that caused by geographical factors – to use as an instrument for trade/GDP ratios in a regression in which income levels are the dependent variable. Their results show that, when instrumented with this predicted trade share, trade ratios maintain a strongly significant coefficient in these regressions. Our objection to the Frankel and Romer argument was that this predicted trade share could be acting as a proxy for geography's direct effect on growth which could work through the effect of climate on disease (Sachs, 2005), international transmission of technology and institutions (Diamond, 1997) or patterns of specialization (Engerman and Sokoloff, 2002). Normally, this would be handled through a traditional exclusion restrictions test, but the nature of Frankel and Romer's just identified model precluded them from carrying out such a test. RR showed, however, that if one introduces several measures of geography such as distance from the equator into the Frankel and Romer regressions, the coefficient on trade becomes statistically insignificant.

Naturally, some of the authors of the work we surveyed did not agree with our conclusions. Some of these reactions were initially captured by Jones (2000), who contacted some of these authors in order to write his comment on our paper. Sebastian Edwards, for example, pointed to conceptual concerns about our use of White-robust standard errors to control for heteroskedasticity and defended his strategy of weighting by the level of GDP instead of the log of GDP, as we did. Dan Ben David pointed to the convergence observed in per capita GDP between the US and Canada after the Kennedy Round reduction in tariffs and discounted the relevance of Nazi Germany's pre-war economic growth during a period of military buildup.

Warner (2003)

Andrew Warner (2003) provided a more extensive reply. In that paper, he contrasted our argument that simple correlations tended to show no relationship between tariffs and GDP with the fact that the unweighted average tariff rate on capital and intermediate goods did display such a simple negative correlation (at least after dropping India from the sample). He also argued that most African countries that were catalogued as closed because of the export marketing board variable would indeed be classified as closed in any reasonable analysis. Furthermore, Warner recalled the relevance of export marketing boards and exchange controls in limiting access to international trade.

Let us look at Warner's arguments in turn. First, Warner shows a number of regression results displaying a negative significant effect of the unweighted average tariff rate on capital and intermediate goods from Lee (1993) on growth.

Warner is incorrect in asserting that "Rodriguez and Rodrik never show the reader results using this average tariff data." (p.7). Indeed, it is used several times in our Table 3, in regressions which have the same controls as Sachs and Warner (1995) but attempt to identify the individual significance of the coefficients: there we show that it displays a t-statistic of -0.18 when introduced together with other openness indicators (whereas the black market premium and the state monopoly of exports variable remain strongly significant), and that when it is combined into a 0-1 indicator variable together with non-tariff barriers and the socialism indicator, the resulting index fails to attain conventional significance levels. It is also used in Tables IV.1 and IV.3 of our working paper version (Rodríguez and Rodrik, 1999), where we show that its simple partial correlation with growth is -.048 and that when it is used to construct alternative indicators of openness with the other four components of the Sachs-Warner index, it is consistently outperformed by those indicators from which it is excluded. Indeed, most of our results in these tables use the Sachs-Warner threshold of a 40% tariff rate to distinguish between economies that are closed and open only on the tariff dimension, thus avoiding the capacity of outliers in average tariff rates like India to have an inordinately high leverage on the results.

Regrettably, I have been unable to reproduce Warner's results using the Barro-Lee data. Table 1 shows the results of running a regression of growth of 1970-90 growth from the Barro-Lee data set on the Lee measure of tariffs. The coefficient, -1.51 (t-stat=-1.24), is not too different from Warner's reported coefficient of -1.53 (t-stat=-1.23), so that the results could be due to approximation errors. The same thing is true when one excludes India from the regression; the estimated coefficient of -3.67 (t-stat=-2.38) which is similar (though not identical) to his -3.84 (-2.22). The differences start when one controls for the log of GDP: the estimated coefficient is now -3.38 (t-stat=-1.33), whereas he reports -4.70 (t-stat=-2.43) and when one adds schooling rates, making the estimated coefficient -3.96 (t-stat=-1.06) versus his reported -7.45 (t-stat=-3.43). In order to test whether the differences refer to differences in the data set used, Table 2 reproduces the last equation (where controls for log of initial GDP and secondary schooling are introduced) with alternative data sources. In column 1 we combine the 1970-90 growth rate with the 1970-89 growth rate for countries that did not have an observation in 1990. In column 2 we restrict ourselves simply to the 1970-89 growth rate. In columns 3 and 4 we use the Penn World Tables version 5.6 and 6.1 respectively, which are updated in comparison to that used by Barro and Lee (5.0). In no case was I able to replicate Warner's results; only for the case of version 5.6 of the Penn World Tables are we able to derive a coefficient that is significant (at 10%). The results in these tables are consistent with the idea that there is a weak, insignificant statistical relationship between tariffs and growth.[4]

Even if we were to trust Warner's results and accept that the own-weighted average tariff rate on capital goods and intermediates had a negative effect on growth, where would that leave us? Warner does not dispute the result that the

[4] At the time of writing, we had yet to receive a reply from Andrew Warner regarding these differences in our estimates.

weighted average tariff rate does not have a significant coefficient in a growth regression; what he argues is that the tariff rate on intermediate inputs and capital goods does. Taking his analysis at face value, we would be led to conclude that a policy of protecting consumer goods industries is not harmful for growth but that protecting the intermediate and capital goods industry is. This would be an interesting conclusion, but it would be quite distinct and much more nuanced than the Sachs and Warner claim to have found a significant linear effect of openness on growth.

Warner asserts that a measure of average import-duties is "know to be inferior due to the fact that high tariffs may depress imports and therefore tariff revenue and make tariffs seem small." This may be true, but it is just as true of the measure that he uses, which is Lee's (1993) own-import weighted tariff rate, as incorporated into the Barro-Lee (1995) data set. This fact is evident when one reads Lee's own discussion abut the shortcomings of his data, where he recognizes that "tariff rates for each country are weighted by their own import value. Thus, an import-weighted average of sectoral tariff rates has a problem of downward bias because imports become smaller in a sector with a higher tariff rate." (Lee, 1994, p. 320).

It is probable, however, that differences between the variable used by Warner and the World Bank data do not reflect a difference between the effects of imports on intermediates and capital goods *vis-à-vis* consumer goods. Lee's data was constructed combining three different data sets: Lee and Swagel (1992), GATT (1980) and Greenaway (1983) which cover different time periods and different groups of products (see Lee, 1993, p. 319 for a description). Our preferred tariff indicator, the weighted tariff rate derived from the *WDI*, has thus three distinct advantages over the Lee data: (i) it corresponds to the average level over the period of interest in our regressions, 1974-1995, and not just over the 1985-88 period (ii) it is built according to a consistent methodology for all countries, and (iii) it refers to the tariff rate on all goods and not just imported and intermediate goods.

Warner's second objection to RR is that we ask readers "to focus only on the tariffs and quotas of textbook trade policy, ignoring inconvertible currencies and a wide range of other barriers." In section 3 of his paper, Warner lays out a set of arguments why exchange restrictions and state monopolies of exports can have effects similar to those of conventional trade barriers, and criticizes RR for "advocat[ing] a radical narrowing of the evidence." (p.8). It is difficult to read this criticism without feeling that the thrust of our argument has not gotten across. Our basic argument was that the statistical significance of the Sachs-Warner variable comes not from the more direct measures of trade policy such as tariffs and quotas, but from those whose link to trade policy is most tenuous, such as the Black Market Premium and the Export Marketing Variable. The fact that the former is correlated with a number of macroeconomic distortions – as one would expect it to be on theoretical grounds – and that the latter is biased against classifying well-performing economies as closed because it is derived from a study of African economies under adjustment, produces a negative correlation between the Sachs-Warner index and economic growth which is completely uninformative about the growth effect of trade policies.

Warner's third argument relies on the presentation of a set of robustness tests in which he progressively modifies the original Sachs-Warner variable in ways similar to those suggested by us. In particular, his equation (3) excludes from the sample the set of countries that are rated as closed according to the Black Market Premium or Export Marketing Board criteria. This would appear to be a similar test to our construction of a variable with the other three criteria (although instead of reclassifying them, Warner simply drops them from the sample). But the coefficient on the openness variable here remains significant, leading Warner to claim that "it is hard to argue that this result is due to a special way in which closed and open are defined because it survives alterations to the definition."

The regressions that Warner uses to support this claim, however, are different from those of the original Sachs-Warner paper. In these regressions he also includes an interaction term between openness and initial GDP. He neglects to take this term into account when evaluating the statistical significance of the openness effect. Quite simply, under the specification:

$$\gamma_y = \alpha_1 * open + \alpha_2 * \ln(gdp) * open + \beta X \quad ,$$

the marginal effect of openness on growth is $\alpha_1 + \alpha_2 \ln(gdp)$ and *not* α_1. Any significance test for this coefficient will depend on the value of per capita GDP. Figure 1 plots the point estimates of this marginal effect (as well as their associated confidence intervals) that can be derived from Warner's estimates. Note that the coefficient turns negative at a per capita GDP of just above \$7800. Note also that the point estimate becomes not significantly different from zero at a per capita GDP of just over \$4500, roughly equal to Hong Kong's 1970 per capita GDP.

The possibility that openness may be beneficial to very poor countries but not for middle-income economies, as well as the idea that tariffs on intermediate and capital goods (bout not tariffs on consumer goods) are detrimental to growth are interesting and merit further exploration. They are very much in the spirit of the call to look for contingent relationships which RR close with. They are also very far from Sachs and Warner's original claim to have found "a strong association between openness and growth, both within the group of developing and the group of developed countries."

Dollar and Kraay (2002)

In their paper "Trade, Growth and Poverty," David Dollar and Aart Kraay attempt to deal with some of the measurement and robustness issues that had been raised in the discussion by looking at differences in openness over time and its correlation with changes in growth rates. Dollar and Kraay argue that many of the reasons for which we could be skeptical of cross-sectional results on openness and growth have to do with omitted variable and simultaneity problems that can be significantly diminished in a first-difference analysis. The main problem with a first-difference approach would be that it throws away valuable information and may increase measurement error. The attenuation bias that comes from

increased measurement error, however, will tend to bias coefficients downward, making it all the more striking if significant results are found.

Dollar and Kraay's findings can be summarized in two key facts. First, they find that countries that have increased their exposure to international trade – which they label "globalizers" - have increased their growth rates from 2.9% in the 1970s to 5.0% in the 1980s, while those that have not have seen their growth rate decline from 3.3% to 1.4% over the same period. Second, they find that trade shares have a significant effect on growth in a first-differences instrumental variables regression that is presumed to reduce simultaneity and omitted variable biases.

Rodrik (2000) and Nye, Reddy and Watkins (2002) have criticized Dollar and Kraay on several grounds. Rodrik, who commented on an early version of the paper, criticized the way in which the groups of globalizers and non-globalizers had been built and pointed to a number of arbitrary criteria that Dollar and Kraay had adopted in order to build these groups. He provided, using Dollar and Kraay's data, a "no-tricks" classification of globalizers and non-globalizers: to find countries that are in the top 40 in terms of growth in Trade/GDP ratios and proportionate reduction in tariffs and select countries that make it to the list. He finds that the countries in this list (as well as an alternative list built only with tariff reductions) have had undistinguished growth performances and have seen decelerations in their growth rates since the 70s.

Nye, Reddy and Watkins (2002) point to several shortcomings of the Dollar and Kraay approach. They point out that, if one uses the criteria of tariff reductions to distinguish globalizers from non-globalizers, one find that non-globalizers actually outperform globalizers: non-globalizers saw an acceleration of 1.7 percentage points in their growth rates between 1985-89 and 1995-97, whereas globalizers saw an increase of 1.3 percentage points. How do Dollar and Kraay claim the exact opposite? By comparing tariff reductions between the late eighties and the nineties with growth rates between the late *seventies* and nineties. Obviously, such a comparison is not meaningful. Nye *et al.* also bring up the interesting observation that the set of "globalizers" in the Dollar-Kraay categorization are invariably more *closed* economies according both to the Trade/GDP criterion and the tariff criterion. These are indeed economies that are increasing their exposure to international trade from a position of being relatively closed. Therefore, if we are to take Dollar and Kraay's evidence at face value and accept that countries that saw greater increases in their trade also saw their growth rates accelerate, we would have to accept that less open economies experienced greater accelerations in their growth rates.

It is indeed striking that in their published version Dollar and Kraay produce two criteria for constructing groups of globalizers and non-globalizers, one based on trade/GDP ratios and the other one based on tariff rates, but when they turn to regression analysis they only produce results with trade/GDP ratios. One cannot help but ask what the regressions with tariff rates looked like (we'll see the answer in section 3).

In any case, the Dollar and Kraay evidence is consistent with the Frankel and Romer (1999) findings discussed above. The data appears to display a strong correlation between trade ratios and growth rates, both in levels as well as in

first-differences. Whether this correlation is spurious or not is an open question: Dollar and Kraay's solution to the identification problem, which is to instrument the first differences with lagged levels, is far from perfect. If shocks are persistent over time, this will not be an appropriate solution to simultaneity problems; it also leaves open the problem of omitted variables such as institutions.

Wacziarg and Welch (2003)

Romain Wacziarg and Karen Welch's 2003 paper "Trade Liberalization and Growth: New Evidence" constitutes an attempt to correct some of the problems with the Sachs-Warner variable while retaining their basic approach. The authors revised the Sachs-Warner criteria in order to correct for the biases pointed out by RR and others[5] and have extended their data to cover the 1990s. They summarize their results as follows:

> "We revisited the evidence on the cross-country effects of SW's simple dichotomous indicator of outward orientation on economic growth, confirming the pitfalls of this indicator first underlined by RR. Additionally, we showed that the partitioning of countries according to the SW dichotomous indicator, while it effectively separates fast growing countries from slow growing ones in the 1980s and to a lesser extent in the 1970s, fails to do so in the 1990s." (p. 28)

Wacziarg and Welch do not stop here, however. They go on to build a time-dependent index of liberalization based on a country's date of trade liberalization. This exercise uses as its starting point Sachs and Warner's (1995) liberalization dates, a somewhat different exercise that did not play such a central role in their original analysis. These dates are in principle built according to the same criteria as the dichotomous variable, but given the lack of yearly data availability the criteria are necessarily less strictly applied and there is substantial room for subjective judgment. Using these dates, the authors produce estimates that show liberalization having significant effects on growth, investment, and openness.

In order to understand the full implication of Wacziarg and Welch's work, it is important to understand what their exercise consists in. Wacziarg and Welch consistently apply the same criteria used by Sachs and Warner (tariffs or quotas above 40%, black market premium above 20%, state monopoly of exports and socialist economic system) to determine the date in which countries liberalized. Thus, in essence, this is the Sachs-Warner exercise carried out at the country-wide level. Is it still open to the criticisms made by RR?

Remember that the key objections that RR made to the Sachs-Warner variable were that: (i) the variable relied heavily on the black market premium and export marketing board variables to classify countries as open and closed. (ii) The black market premium variable is likely to capture the effects of a number of macroeconomic distortions, and the export marketing board variable acted as a

[5] See Hanson and Harrison (1999)

proxy for being an African country undergoing structural adjustment in the eighties. Both of these variables thereby introduced trade-unrelated information that was likely to bias the estimates of openness's growth effect.

A look at the Wacziarg and Welch data indicates a heavy reliance on the black market premium and export marketing boards to rate economies as open or closed. Out of 31 economies that they classify as closed at the end of 2001, 27 are deemed closed exclusively because of their black market premium or state monopoly of exports. Only in 3 cases (Angola, China and India) is information provided that would lead to classifying these countries as closed because of their tariffs, quotas or state socialist system. In one remaining case (Republic of Congo) an IMF assesment of its "insufficient progress" in economic reforms was used to classify it as closed. The average growth rate of the countries that are rated as closed **exclusively** because of their black market premium or state monopoly of exports during the 1990-03 period is -0.1%, considerably below the world average of 1.1%. While dropping these observations would not affect their results given their use of fixed effects and the fact that these economies remain closed throughout the sample, reclassifying some of them as having liberalized in the late eighties /early nineties could have a significant effect, given the precipitous decline in growth rates suffered by many of them.

Despite Wacziarg and Welch's attempt to correct some of the biases in the Sachs-Warner data by comprehensively revising their ratings, a close examination of their revisions show a number of preoccupying inconsistencies. Gabon is rated as closed because of state ownership of the petroleum industry, but Mexico and Indonesia are not. Ukraine and Venezuela are rated as closed in periods in which they adopt exchange controls despite having maintained relatively liberal trade regimes; Malaysia, which did the same thing at the end of the nineties, is not.

It is also hard to look at this data and not conclude that the excessive reliance on the black market premium is causing a number of economies to be misclassified. Most specialists would agree that Russia is today, by and large, a free market economy with a liberalized trade regime (see, e.g., Shleifer and Treisman, 2004) but Wacziarg and Welch classify it as closed due to its black market premium. In 1998, the final year used in Wacziarg and Welch's panel regressions, Estonia was among the five economies in the world to score the lowest possible score (1.0) in the Heritage Institution's index of trade restrictions (the other four being Hong Kong, Singapore, Lithuania and Mongolia) (Heritage, 2005). Wacziarg and Welch nevertheless classify Estonia as closed, again due to its black market premium.[6]

Given that Wacziarg and Welch construct a time-dependent version of the Sachs-Warner dummy, it is not surprising that they are able to derive strong

[6] Again, dropping these observations would not change Wacziarg and Welch's results, but reclassifying them as having liberalized during the late 80s/early 90s could have a significant effect. Wacziarg (personal communication) has noted that, even if these economies were reclassified, it would be very difficult to obtain GDP data for them prior to 1990 as many of them did not exist as nations. While this is correct, it implies that an important piece of information regarding the relationship between openness and growth, which is the precipitous decline in per capita GDP levels of many Eastern European nations which aggressively liberalized, is not taken into account in the statistical estimates presented by the paper.

statistical effects of openness on growth in this exercise. Their classification is, as in the original Sachs and Warner data, heavily dependent on the black market premium and export marketing board variables. They are thus open to the same objections that were leveled against Sachs and Warner: they have provided us with a measure of trade liberalization that is negatively correlated with growth but that is at the same time so contaminated by non-trade information so as to leave room for considerable skepticism as to the appropriate interpretation of their results.[7]

Recent advances

One of the main reasons why it is so hard to reach definitive conclusions regarding the trade-growth link is the complex web of interrelationships that is involved in the determination of a nation's income. Trade can have a significant impact on GDP, but so can many factors that can be related to trade. As highlighted in the discussion of Frankel and Romer's work, geography can have effects on trade but also have direct effects on growth. Geography could in turn also be related to the institutions that an economy can develop, as in Engerman and Sokoloff's (2002) account of how comparative advantage in labor intensive crops generated the high levels of inequality of many Latin American nations. Trade itself could affect institutions directly. Disentangling the effects of trade on growth from the effects of geography and policies would appear to be an unmanageable task.

Rodrik, Subramanian and Trebbi (2002) and Rigobon and Rodrik (2004) constitute two recent attempts to tackle these issues. The first of these papers uses the instruments derived by Frankel and Romer as well as the instrument for institutions suggested by Acemoglu, Johnson and Robinson (2000) – the European settler mortality rate, to run a horse race between geography, trade and institutions. The authors show that the institutions variable consistently comes out with a significant coefficient in these regressions, whereas geography displays an insignificantly positive coefficient and the coefficient on the trade/GDP ratio actually turns negative.[8] Rigobon and Rodrik (2004) take this experiment one step further, relying not on instrumental variable methods but on the novel technique of identification through heteroskedasticity proposed by Rigobon

[7] Wacziarg and Welch recognize that the RR critique is valid "not only in terms of countries' statuses based on the OPEN90-99 dummy, but also to some extent in terms of trade liberalization dates." (p.10), but claim, based on their analysis of a number of case studies, that liberalizations of exchange controls and eliminations of state monopolies of exports were also accompanied by more comprehensive liberalizations. However, this would occur naturally if there was a worldwide tendency to liberalize trade, as there has been during the nineties: since virtually all counties in the world now have tariffs and NTBs below the Sachs-Warner thresholds, it will obviously be true that countries that eliminated their black market premia and export marketing boards would also sooner or later end up with lower tariffs. The relevant question to ascertain is whether these are reasonable indicators of trade policy is to ask whether there are a significant number of countries that have liberalized their trade regimes but that retain high black market premia and state monopolies of exports. As I have argued above, this appears to be true.

[8] Sachs (2005) has contested this finding on the geography side, showing that an indicator of malarial transmission rates, which are strongly impacted by geography, remain significant after controlling for institutional quality.

(2002). Their results confirm the relevance of institutions: both political and economic institutions are estimated to have positive effects on growth, although the effects of the latter are much more important. In contrast, openness is estimated to negatively affect income levels and democracy, although it appears to reinforce the rule of law.

Discussion

If the adoption of protectionist policies took the life out of growth prospects in the developing world during the postwar period, it managed to leave no smoking gun behind. Growth displays no significant correlation with the most direct measures of trade policy. The case against trade policy necessarily hinges on the interpretation of particular pieces of circumstantial evidence: Growth is negatively correlated with policy measures with some theoretical link to trade, such as the black market premium; income levels and growth rates are negatively correlated with trade shares, an imperfect and highly endogenous measure of trade policy. As is commonly the case with circumstantial evidence, alternative interpretations can be offered to explain these facts. The black market premium can pick up the effect of alternative macroeconomic distortions. State monopolies of exports have yet to be consistently measured. And different methodologies to control for causality give widely divergent results with respect to the identification of the direct effect of trade on growth.

The existence of gains from trade is one of the main tenets of modern economic theory. Even authors who have shown how these results can be reversed in theory shy away from questioning them in practice. It is thus not surprising to see economists devote substantial intellectual resources to try to find such a link. Perhaps the fact that the link is so hard to find can serve as intellectual stimulus to uncover techniques that will allow us to confirm the intuitions of basic trade theory. Or perhaps the link is so difficult to find because it does not exist.

3. Trade and Growth in the Nineties

During the time that the academic debate on the merits of openness was going on, a large number of countries was implementing economic reforms with a substantial trade liberalization component. Indeed, by 1998, not a single country in the world had an average tariff rata above 40%, the level that Sachs and Warner had deemed sufficient to determine that an economy was closed. This increase in economic integration was not accompanied by an evident increase in world growth rates: average growth during the 1990-03 period was 1.07%, actually lower than the 1.42% average growth rate of the 1975-90 period.[9]

What does the post-1990 experience tell us about the link between trade and growth? Did open economies grow faster during this period? The evidence does not show significant differences between economies' growth rates based on their

[9] The comparisons and regressions in this section use the World Bank's (2005) PPP adjusted per capita GDP, which at the time of writing was available up to 1993.

level of integration. Table 3 displays the average growth rates of open and not open economies, where we have used several common criteria to distinguish the restrictiveness of trade regimes: the Trade/GDP ratio, the import-weighted tariff rate calculated using import and export tax revenues from the *World Development Indicators,* Wacziarg and Welch's (2003) unweighted tariff rate, two versions of the Wacziarg-Welch openness variable, as well as the changes in the trade ratios and tariff rates between the 1980-90 and 1990-03 periods. The difference between the two Wacziarg-Welch indicators is that the first one uses the original Sachs and Warner thresholds while the second one lowers the tariff and NTB thresholds to 20% and he black market premium threshold to 10%. As we can see there, when the *level* of trade restrictions is used to distinguish between open and closed economies., the growth rate of these two groups is undistinguishable. Indeed, when one uses the import-weighted tariff rate the group of economies that were not open slightly outperforms open economies. When one uses the Wacziarg-Welch indicator that we have discussed in section 2, one does find a significant difference between open and not open economies, but this difference vanishes if one lowers the threshold for tariff rates. When we turn to a measure of changes in trade shares, as do Dollar and Kraay, we find that economies that saw greater increases in trade shares do seem to have outperformed those that did not. However, this difference is not significant at conventional levels (p-value=0.13).

Tables 4(a) and 4(b) help us get some insight as to why there is no simple link between trade and openness (at least in levels) in this data. Both the list of fastest growing and slowest growing economies in the world are populated by open and closed economies. According to the trade ratio and tariff criteria, Lebanon cannot be classified as an open economy, but it has the third highest growth rate in the world for the 90-03 period. Lesotho has one of the highest remaining levels of tariffs in the world, 19.7%, more than twice the world average of 7.05%, but has the sixth highest growth rate of per capita incomes in the world. At the same time, there are obvious cases of unquestionably open economies, such as Ireland and Luxembourg, on this list. Similarly, the list of slowest growing economies displays some clearly restrictive economies such as Sierra Leone and Burundi, but is also integrated by open economies such as Moldova and Mongolia. Similarly, Tables 5(a) and 5(b) display the growth performance of the most closed economies according to the tariff and trade ratio criteria. The message is the same: some closed economies do badly, but some (India, Lesotho, Ghana and Botswana) appear to do pretty well.

Tables 6-10 present the result of cross-sectional regressions that attempt to account for growth in per capita GDP as a function of the alternative openness indicators and a set of common controls. The Trade/GDP ratio has a positive albeit far from significant effect on growth, which actually becomes negative (always insignificant) as more controls are added to the regression. When measured by import-weighted tariffs or unweighted tariffs, the coefficient of openness on growth is actually negative though not significant (tariffs are multiplied by -1 to make interpretation of these coefficients as effects of openness simple). Consistent with the results of Wacziarg and Welch (2003), we find that the Sachs-Warner-Wacziarg-Welch indicator has a positive but insignificant

effect on growth when the original thresholds are used, but a negative insignificant coefficient with the lower thresholds. Figures 3-7 show the partial scatter plots of these regressions, underscoring the point that there is no simple relationship evident in the data.

How about the correlation between changes in openness and changes in growth found by Dollar and Kraay (2002)? Recall that Dollar and Kraay used 1990-98 data for their comparison, so that we now have five more years of data. We find that these five years of data are sufficient to overturn the Dollar and Kraay results, at least in specifications in which alternative controls are used: in three of the five specifications estimated, the point estimate of openness on growth is actually negative. Note, however, that the explanatory power of these regressions as measured by the F-tests for model significance is quite low. The low correlation may thus be induced by the fact that going to the first-difference analysis has entailed an increase in measurement error.

If there was a relationship between openness and growth in the data, it seems to have disappeared during the period since 1990. In this section, I have looked at the effects of six measures of openness that have been widely used in the literature. A fair summary of the evidence previous to 1990 is that some of these measures (tariffs, non-tariff barriers) displayed a negative correlation with growth, while others (trade shares, changes in trade shares, Sachs-Warner dummy) portrayed a positive correlation. The results above show that over the 1990-03 period, **none** of these measures have been significantly associated with growth.

4. Concluding Comments.

In the preceding pages I have discussed recent empirical research regarding the link between openness and growth in cross-country data. I have argued that a close reading of the evidence presented in recent papers such as Warner(2003), Dollar and Kraay(2002) and Wacziarg and Welch (2003), does not alter the conclusion that standard measures of trade policy are basically uncorrelated with growth. It is only by adding information with a tenuous link to trade policies that these papers are able to derive such a correlation. And, while the data does display a correlation between income (both in levels and growth rates) and trade shares, recent attempts at disentangling the complex set of links of causality and endogeneity among geography, trade shares and institutions do not point to a strong effect of integration on economic growth.

The experience of the 1990s reaffirms the conclusion that emerged from this discussion of the literature. In section 3 I examined how growth rates between 1990 and 2003 correlated with several measures of openness. Recent data again fails to display a no self-evident link between greater integration and economic growth. Some of the fastest growing economies since 1990, such as Lebanon and Lesotho, have applied restrictive trade policies, whereas some of the most open economies in the world, such as Moldova and Mongolia, have experienced considerable growth collapses. If there ever was a negative relationship between trade and growth, it fell apart in the nineties.

Armed with this evidence, one could conclude that openness is not important for growth. An alternative interpretation of the evidence is that such results are simply indicative of the pitfalls of cross-country regression analysis. Such a line of argumentation has been adopted by Bhagwati and Srinivasan (1999), who highlight the need to use detailed country-level case studies instead of cross-country regressions to understand complex phenomena such as the relationship between trade and growth. According to these authors, growth regressions are simply too oversimplified and subject to too much measurement and specification error to take seriously their results.

In my view, none of these extreme views would be justified. It is simply a *non-sequitur* to argue for the inexistence of a relationship form a non-significant regression coefficient. By construction, standard significance tests cannot establish that two variables are unrelated. The most that they can do is show that the data is not inconsistent with the hypothesis that they are unrelated, which is quite a different thing. A positive (or negative) relationship between trade and growth could well exist but failed to be picked up because the information contained in the data is not sufficiently strong. The suspect may have shot the victim but the jury may still have insufficient evidence to indict her.

Bhagwati and Srinivasan's (1999) extreme position of discounting all the evidence from trade regressions, however, is akin to throwing the baby out with the bath water. One may argue that the evidence from trade regressions is insufficient, but not that it is *irrelevant*. Trade regressions simply summarize the existence evidence and provide a systematic way of making comparisons that we will inevitably make anyway. When one writes that "No country in the world had as rapid growth as China whereas fewer than ten countries exceeded the Indian growth rate" (Bhagwati and Srinivasan, 2002) a cross-national comparison is being made. The question is whether we want to carry out such a comparison with the methods of statistical analysis that best allow us to do it systematically. I see no clear alternative to doing so.

References

Barro, R. and J.-W. Lee (1994). Data Set for a Panel of138 Countries, National Bureau of Economic Research.

Ben-David, D. (1993). "Equalizing Exchange: Trade Liberalization and Income Convergence." Quarterly Journal of Economics 108(3): 653-679.

Bhagwati, J. and T. N. Srinivasan (2001). Outward-Orientation and Development: Are the Revisionists Right? Trade, Development, and Political Econoy: Essays in Honor of Anne Krueger. D. Lal and R. Snape. London, Palgrave: 3-26.

Bhagwati, J. and T. N. Srinivasan (2002). "Trade and Poverty in the Poor Countries." American Economic Review 92(2): 180-183.

Diamond, J. (1997). Guns, Germs, and Steel: The Fates of Human Societies. New York, W. W. Norton.

Dollar, D. (1992). "Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-85." Economic Development and Cultural Change 40(3): 523-544.

Dollar, D. and A. Kraay (2002). "Trade, Growth, and Poverty." Economic Journal 114(493): F22-F49.

Edwards, S. (1998). "Openness, Productivity and Growth: What Do We Really Know?" Economic Journal 108(447): 383-398.

Engerman, S. and K. Sokoloff (2002). "Factor Endowments, Inequality, and Paths of Development among New World Economies." Economía 3(1): 41-109.

Frankel, J. and D. Romer (1999). "Does Trade Cause Growth?" American Economic Review 89(3): 379-399.

GATT (1980). The Tokyo Round of Multilateral Trade Negotiations. Geneva, General Agreement on Tariffs and Trade.

Greenaway, D. (1983). Trade Policy and the New Protectionism. New York, St. Martin's Press.

Harrison, A. and G. Hanson (1999). "Who Gains from Trade Reform? Some Remaining Puzzles." Journal of Development Economics 50(1): 125-154.

Heritage Foundation (2005). Economic Freedom Index Database, Heritage Foundation.

Jones, C. (2001). Comment. NBER Macroeconomics Annual 2000. B. Bernanke and K. Rogoff. Cambridge, MA, National Bureau of Economic Research.

Krueger, A. (1997). "Trade Policy and Development: How We Learn." American Economic Review 87(1): 1-22.

Lee, J.-W. (1993). "International trade, distortions, and long-run economic growth." International Monetary Fund Staff Papers 40(2): 299-328.

Lee, J.-W. and P. Swagel (1992). Measuring Trade Distortions, Harvard University.

Maddison, A. (1995). Monitoring the World Economy: 1820-1992. Paris and Washington, Organisation for Economic Co-operation and Development.

Nye, H. L. M., S. Reddy, et al. (2002). Dollar and Kraay on "Trade, Growth and Poverty": A Critique, Columbia University.

Rigobón, R. and D. Rodrik (forthcoming). "Rule of Law, Democracy, Openness and Income: Estimating the Interrelationships." Economics of Transition.

Rodríguez, F. and D. Rodrik (1999). "Trade Policy and Economic Growth: A skeptic's guide to the cross-national evidence." NBER Working Paper #7081.

Rodríguez, F. and D. Rodrik (2001). Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence. NBER Macroeconomics Annual 2000. B. Bernanke and K. Rogoff. Cambridge, MA, National Bureau of Economic Research. 2000.

Rodrik, D. (2000). Comments on "Trade, Growth, and Poverty" by D. Dollar and A. Kraay, Harvard University.

Rodrik, D. (2003). In Search of Prosperity: Analytic Narratives on Economic Growth. Princeton, NJ., Princeton University Press.

Rodrik, D., A. Subramanian, et al. (2004). "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development." Journal of Economic Growth 9(2): 131-165.

Sachs, J. (2005). "Institutions Don't Rule: Direct Effects of Geography on Per Capita Income." NBER Working Paper 9490.

Sachs, J. D. and A. Warner (1995). "Economic Reform and the Process of Global Integration." Brookings Papers on Economic Activity 1995(1): 1-118.

Sala-i-Martin, X., G. Doppelhofer, et al. (2004). "Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach." American Economic Review 94(4): 813-35.

Shleifer, A. and D. Treisman (2004). "A Normal Country." Foreign Affairs 83(20-38).

Wacziarg, R. and K. H. Welch (2003). "Trade Liberalization and Growth: New Evidence." NBER Working Paper 10152.

Warner, A. (2003). Once more into the breach: economic reform and global integration, Center for Global Development.

World Bank (2005). "World Development Indicators." 2005.

Table 1: Replication attempts of Warner (2003) results: Barro-Lee Data				
Dependent Variable: Barro-Lee (PWT 5.0) Growth, 1970-90	**(1)**	**(2)**	**(3)**	(4)
Constant	2.006665 (6.37)***	2.322868 (6.96)***	1.805165 (0.61)	2.748851 (0.78)
Lee (1993) Tariffs	-1.514296 (-1.24)	-3.672483 (-2.38)**	-3.381879 (-1.33)	-3.068279 (-1.06)
Log of 1970 GDP			.0600999 (0.19)	-.1201777 (-0.30)
Secondary enrolment				.0240136 (1.80)*
R-squared	0.0201	0.0541	0.0547	0.0808
# of Obs	74	73	73	65

Table 2: Replication attempts of Warner (2003) results: Alternative Growth Data				
Dependent Variable	1970-90, 1970-89 for missing values, PWT 5.0	1970-89, PWT 5.0	PWT 5.6	PWT 6.1
Constant	3.508661 (1.12)	3.553547 (1.17)	4.757151 (1.47)	3.055499 (1.11)
Log of 1970 GDP	-.2380782 (-0.65)	-.2552282 (-0.72)	-.4029782 (-1.07)	-.2232623 (-0.70)
Lee (1993) Tariffs	-3.725361 (-1.47)	-3.477662 (-1.45)	-4.616517 (-1.79)	-2.371624 (-0.97)
Secondary enrolment	.0346897 (2.33)**	.0349804 (2.41)**	.043706 (2.36)**	.0444808 (2.67)***
R-squared	0.1097	0.1116	0.1384	0.1288
# of Obs	76	76	74	75

Table 3: Average Growth Rates by level of Openness, 1990-2003			
Category Variable	Open	Not Open	P-Value of Test for Equality of Means
Trade/GDP Ratio	1.14%	0.98%	0.68
Weighted Tariff Rate	1.19%	1.20%	0.97
Unweighted Tariff Rates	1.31%	1.25%	0.87
Sachs-Warner Openness (1)	1.25%	0.26%	0.03

Sachs-Warner Openness (2)	1.06%	0.89%	0.69
Changes in Trade Ratio	1.63%	0.74%	0.13

Table 4(a): 10 Fastest Growing Economies, 1990-2003						
Rank	Country	Growth Rate, 1990-2003	Trade/GDP Ratio	Average Tariff Rate	Openness (Trade/GDP)	Openness (Tariffs)
1	China	8.3%	37.28057	3.3%	Not Open	Open
2	Ireland	6.5%	134.1582	0.0%	Open	Open
3	Lebanon	6.1%	57.11254	8.2%	Not Open	Not Open
4	Vietnam	5.1%	75.3637	8.7%	Open	Not Open
5	Luxembourg	4.8%	227.215	0.0%	Open	Open
6	Lesotho	4.8%	129.8257	19.7%	Open	Not Open
7	Korea	4.7%	57.41397	3.8%	Not Open	Open
8	Chile	3.9%	53.99634	.	Not Open	.
9	Mozambique	3.9%	51.6874	.	Not Open	.
10	Mauritius	3.8%	133.7954	11.5%	Open	Not Open

Table 4(b): 10 Slowest Growing Economies, 1990-2003						
Rank	Country	Growth Rate, 1990-2003	Trade/GDP Ratio	Average Tariff Rate	Openness (Trade/GDP)	Openness (Tariffs)
140	Burundi	-2.8%	32.97216	23.1%	Not Open	Not Open
141	Kyrgyz Republic	-3.0%	81.04452	.	Open	.
142	Mongolia	-3.0%	91.4524	2.7%	Open	Open
143	Haiti	-3.1%	42.7533	.	Not Open	.
144	Ukraine	-3.8%	68.10678	1.8%	Open	Open
145	Sierra Leone	-5.1%	52.59718	17.0%	Not Open	Not Open
146	Georgia	-5.5%	35.94983	2.0%	Not Open	Open
147	Tajikistan	-6.1%	125.2794	.	Open	.
148	Congo, Dem. Rep.	-6.9%	50.89663	.	Not Open	.
149	Moldova	-7.4%	107.0574	1.3%	Open	Open

Table 5(a): Growth Performance of 10 Economies with Most Restrictive Trade Policies (Tariff-based)			
Rank	Country	Growth, 1990-2003	Average Tariff Rate
1	Guinea	0.87%	32.21%
2	Rwanda	-0.05%	25.71%
3	Cote d'Ivoire	-2.07%	25.01%
4	India	3.64%	23.21%
5	Burundi	-2.82%	23.15%
6	Vanuatu	1.04%	20.24%
7	Lesotho	4.76%	19.69%
8	Ghana	1.98%	19.14%
9	Ethiopia	0.61%	18.88%
10	Botswana	2.79%	18.52%
	Average,10 most restrictive economies	1.07%	22.58%
	World Average	1.07%	7.05%

Table 5(b): Growth Performance of 10 Economies with Lowest Trade/GDP Ratios			
Rank	Country	Growth, 1990-2003	Trade/GDP Ratio
1	Brazil	0.99%	14.71
2	Japan	0.99%	17.64
3	Argentina	1.95%	19.90
4	India	3.64%	21.90
5	United States	1.69%	22.41
6	Bangladesh	2.73%	25.21
7	Peru	1.92%	26.28
8	Colombia	0.52%	30.09
9	Uganda	3.46%	30.81
10	Burundi	-2.82%	32.97
	Average,10 most restrictive economies	1.51%	24.19
	World Average	1.07%	78.57

Table 6: Cross-Sectional Growth Regressions 1990-03, Trade/GDP Ratio as Indicator of Openness				
	(1)	(2)	(3)	(4)
Constant	-0.0168	0.0265	0.0457	0.0816
	-1.17	0.91	1.75	2.68
Log(1990 GDP)	0.0029	-0.0039	-0.0074	-0.0223
	1.83	-0.96	-1.98	-3.47
Trade/GDP Ratio	0.0000	0.0000	0.0000	0.0000
	1.16	1.65	0.04	-0.21
Years of Schooling		0.0030	0.0017	0.0002
		2.07	1.55	0.20
Investment Rate			0.0014	0.0009
			4.33	2.39
Life Expectancy				0.0012
				2.17
Rule of Law				0.0081
				2.46
Population Growth Rate				-0.0034
				-1.48
n	141	93	93	82
R2	2.46	3.42	6.99	4.2

Table 7: Cross-Sectional Growth Regressions 1990-03, Weighted Tariffs as Indicator of Openness				
	(1)	(2)	(3)	(4)
Constant	-0.0680	0.0243	0.0146	0.0270
	-0.84	0.25	0.17	0.28
Log(1990 GDP)	0.0050	-0.0030	-0.0058	**-0.0214**
	1.40	-0.55	-1.17	**-2.85**
Weighted Tariffs*(-1)	-0.0347	-0.0023	-0.0199	-0.0379
	-0.70	-0.04	-0.39	-0.63
Years of Schooling		0.0024	0.0012	0.0004
		1.75	1.14	0.45
Investment Rate			**0.0014**	**0.0008**
			4.14	**2.06**
Life Expectancy				**0.0014**
				2.09
Rule of Law				0.0070
				1.96
Population Growth Rate				-0.0032
				-1.25
n	114	81	81	71
R2	0.0274	0.0427	0.2069	0.4087

Table 8: Cross-Sectional Growth Regressions 1990-03, Unweighted Tariffs as Indicator of Openness				
	(1)	(2)	(3)	(4)
Constant	**-0.0413**	0.0103	0.0228	0.0740
	-2.27	0.36	0.90	1.98
Log(1990 GDP)	**0.0056**	-0.0025	-0.0056	**-0.0215**
	3.04	-0.64	-1.60	**-2.93**
Unweighted Tariffs*(-1)	-0.0005	-0.0004	-0.0004	-0.0001
	-1.83	-1.42	-1.74	-0.49
Years of Schooling		**0.0034**	0.0018	0.0004
		2.34	1.68	0.38
Investment Rate			**0.0014**	**0.0008**
			5.03	**2.55**
Life Expectancy				**0.0012**
				2.04
Rule of Law				**0.0081**
				2.45
Population Growth Rate				-0.0032
				-1.42
n	115	91	91	80
R2	0.0611	0.0987	0.2681	0.4313

Table 9: Cross-Sectional Growth Regressions 1990-03, Sachs-Warner-Wacziarg-Welch (Original Thresholds) as Indicator of Openness				
	(1)	(2)	(3)	(4)
Constant	-0.0195	0.0371	**0.0510**	0.0912
	-1.38	1.39	**2.14**	2.99
Log(1990 GDP)	0.0029	-0.0058	**-0.0087**	**-0.0234**
	1.71	-1.48	**-2.48**	**-3.59**
SWWW Dummy (1)	0.0071	0.0108	0.0089	0.0076
	1.33	1.40	1.29	1.25
Years of Schooling		**0.0030**	0.0015	0.0003
		2.03	1.36	0.30
Investment Rate			**0.0013**	**0.0008**
			4.71	**2.73**
Life Expectancy				**0.0012**
				2.11
Rule of Law				**0.0078**
				2.47
Population Growth Rate				-0.0042
				-1.98
n	129	93	93	82
R2	0.0518	0.1104	0.2665	0.4443

Table 10: Cross-Sectional Growth Regressions 1990-03, Sachs-Warner-Wacziarg-Welch (New Thresholds) as Indicator of Openness				
	(1)	(2)	(3)	(4)
Constant	-0.0272	0.0267	0.0413	**0.0809**
	-1.67	0.93	1.66	**2.46**
Log(1990 GDP)	**0.0046**	-0.0035	-0.0067	**-0.0222**
	2.29	-0.84	-1.81	**-3.26**
SWWW Dummy (2)	-0.0030	-0.0025	-0.0036	-0.0004
	-0.60	-0.48	-0.76	-0.08
Years of Schooling		**0.0032**	0.0017	0.0002
		2.15	1.46	0.22
Investment Rate			**0.0014**	**0.0008**
			4.91	**2.66**
Life Expectancy				**0.0012**
				2.19
Rule of Law				**0.0081**
				2.47
Population Growth Rate				-0.0034
				-1.46
N	129	93	93	82
R2	0.0393	0.0783	0.2481	0.4292

Table 11: First-Differenced Regressions, Trade/GDP Ratio as Indicator of Openness					
	(1)	(2)	(3)	(4)	(5)
Lagged Growth	-0.1014	-6.8881	-6.4389	-0.0470	-0.5163
	-0.19	-0.13	-0.13	-0.08	-0.49
Trade/GDP Ratio	0.0004	0.0049	0.0054	-0.0003	0.0008
	0.95	0.15	0.15	-0.23	0.71
Years of Schooling		0.0076	-0.0025	0.0018	
		0.07	-0.04	0.14	
Investment Rate			-0.0037	0.0011	
			-0.14	0.61	
Life Expectancy				0.0021	
				1.15	
Rule of Law				0.0043	
				1.47	
Population Growth Rate				-0.0008	
				-0.05	
Ln(1+Inflation Rate)					-0.0054
					-0.3
Political Instability					-0.0036
					-0.79
Government Consumption					-0.0009
					-0.82
n	104	89	89	79	95
F	1.64	0.04	0.04	2.11	10.13

Figure 1: Correlation between tariffs and growth from Rodríguez and Rodrik (2000)

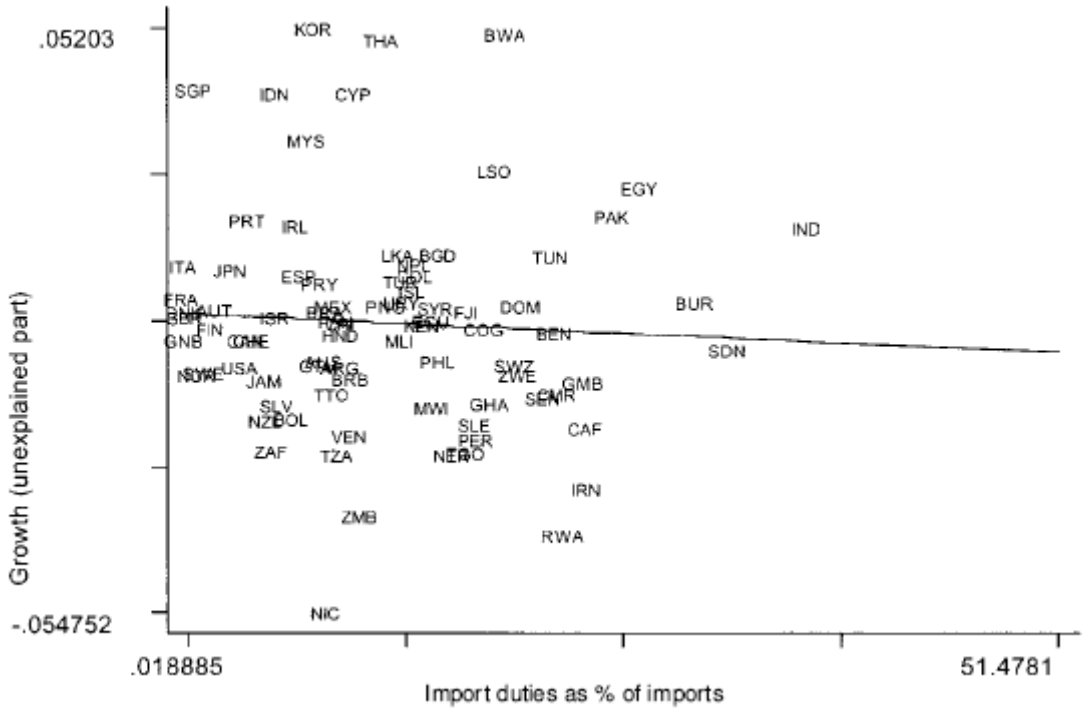

Figure 2: Confidence Intervals for Estimates of Openness Effect by Levels of Income derived from Warner's (2003) estimates

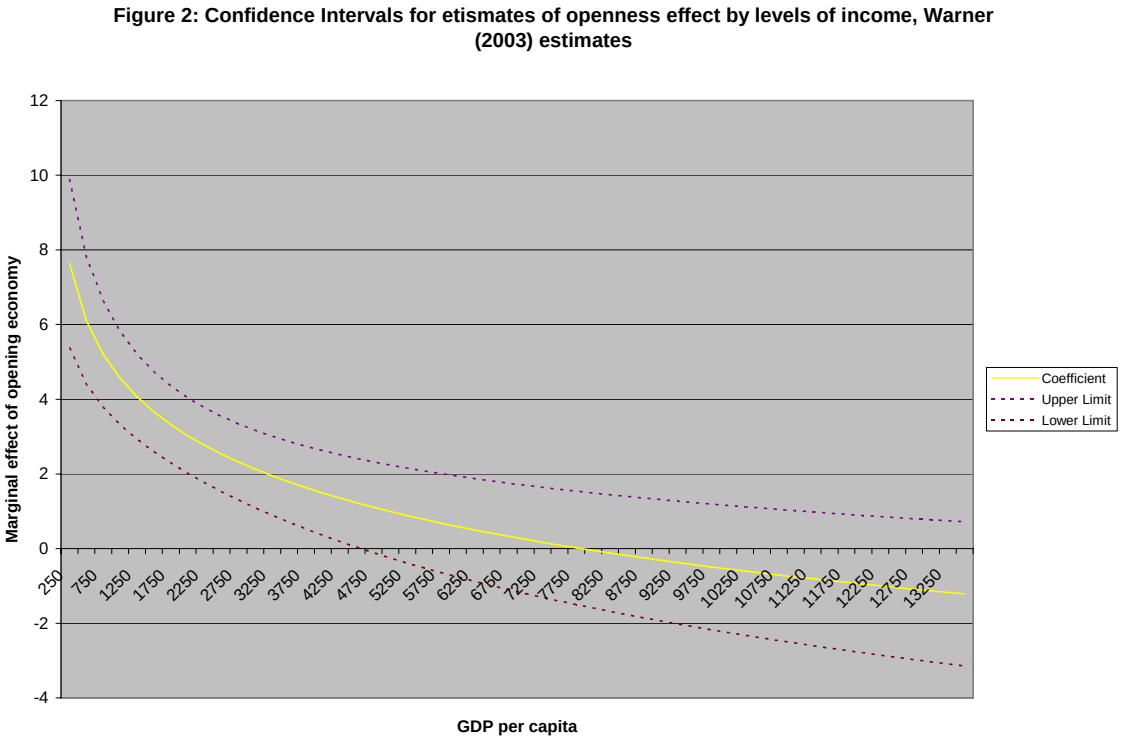

Figure 3: Partial Association between Trade/GDP Ratio and Growth

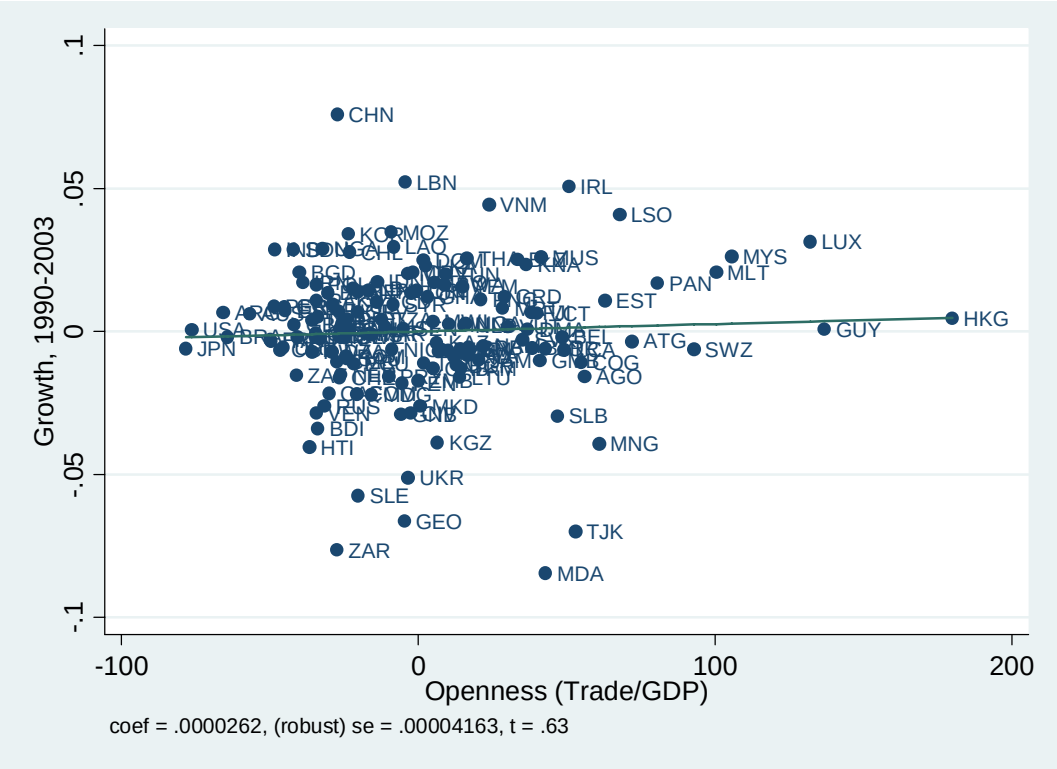

Figure 4: Partial Association between Import-Weighted Tariff Based Measure of Openness and Growth.

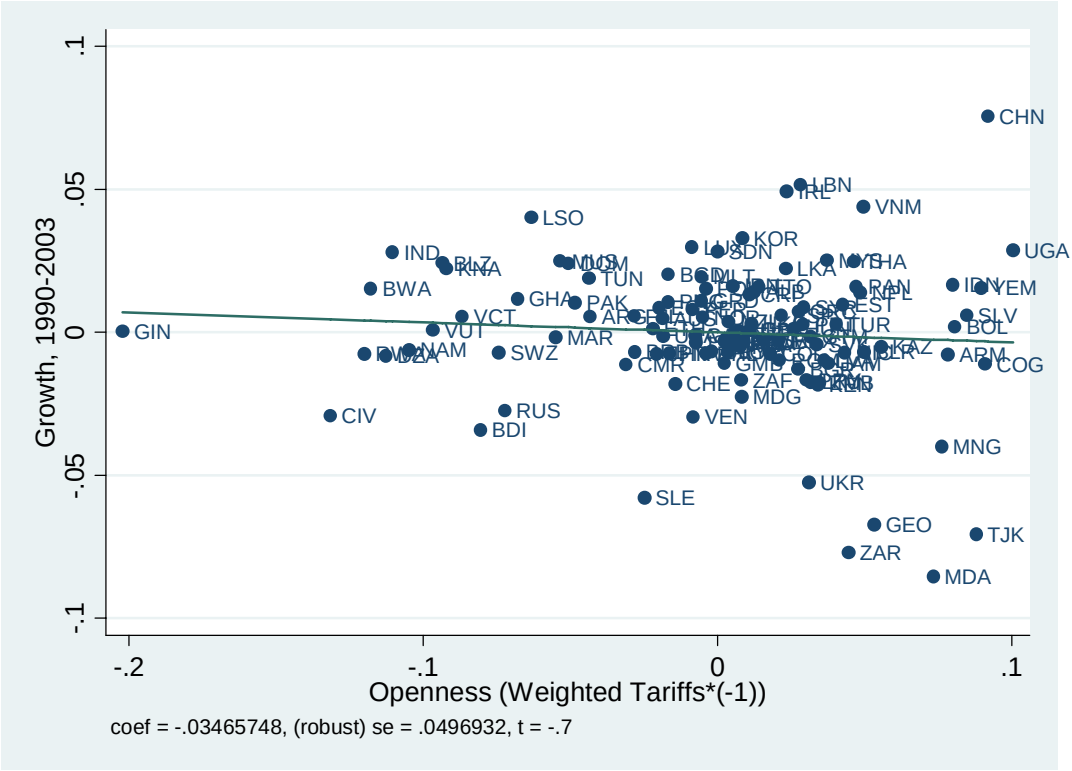

Figure 5: Partial Association between Unweighted Tariff Based Measure of Openness and Growth.

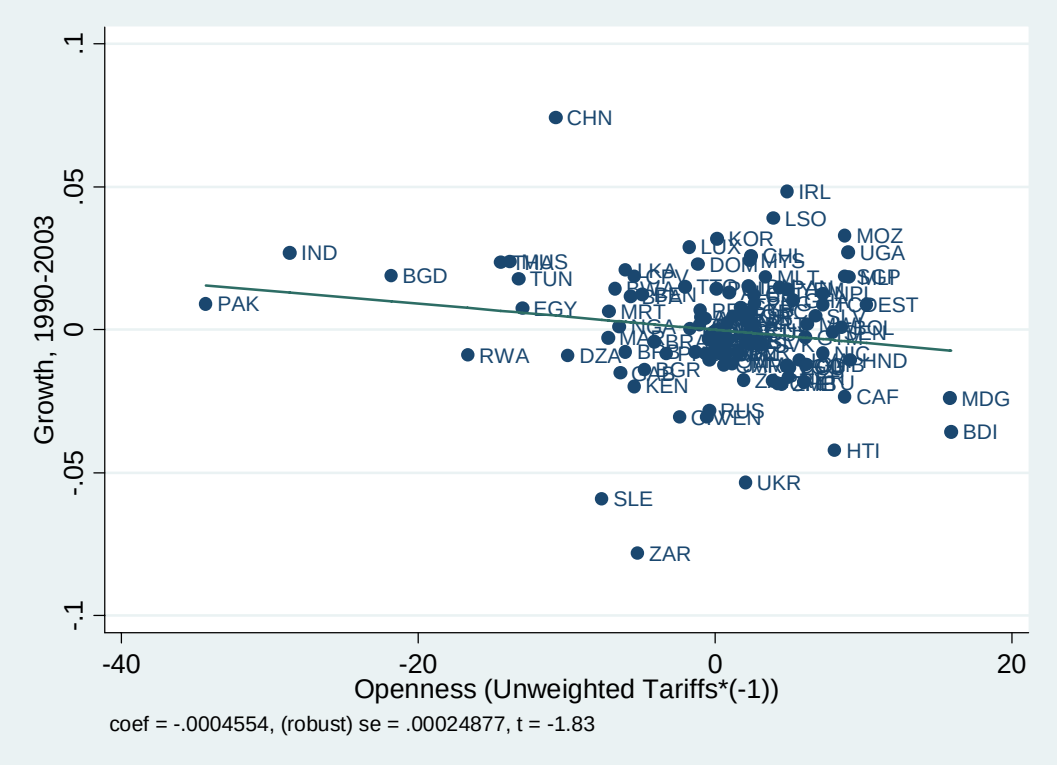

Figure 6: Partial Association between Sachs-Warner-Wacziarg-Welch variable (Original Thresholds) and Growth.

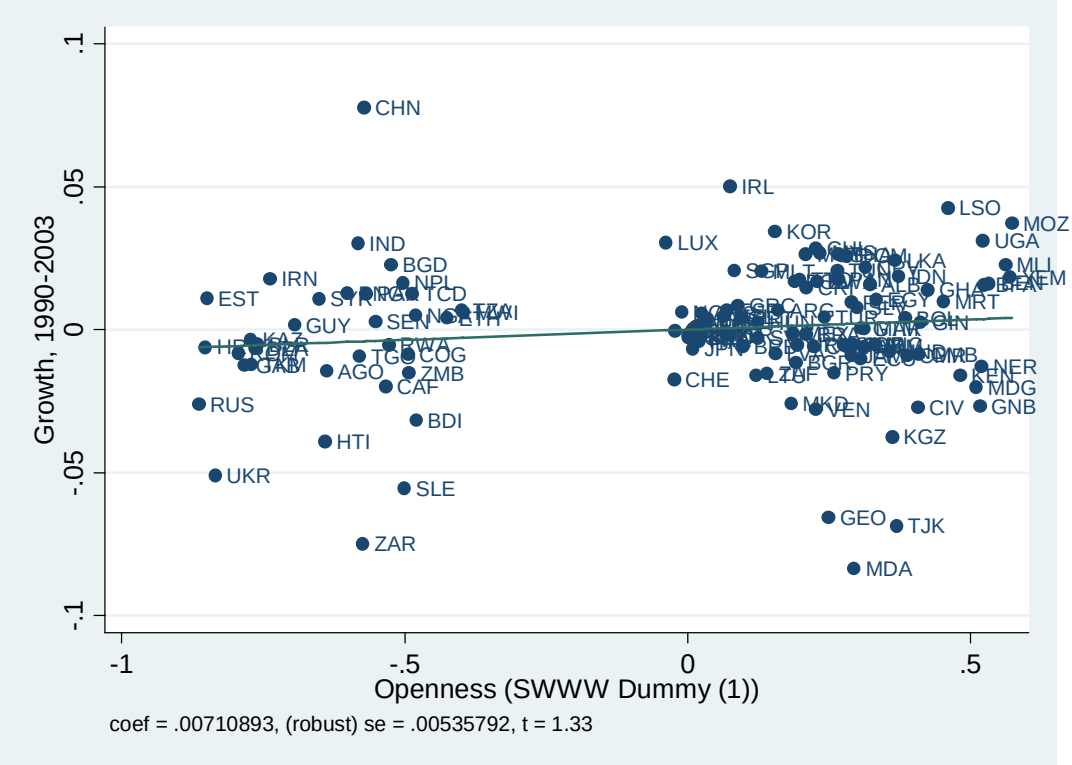

Figure 6: Partial Association between Sachs-Warner-Wacziarg-Welch variable (Lower Thresholds) and Growth.