Revisiting the Effect of the Great Liberalization on the Growth of Latin America and the Caribbean, 1980–2010*

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Abstract

As Latin America and the Caribbean's "Great Liberalization" reaches its 30th anniversary, we revisit the trade and growth debate by updating and expanding Estevadeordal and Taylor's 2013 paper. To better understand the region's heterogeneity of policies and outcomes, we extend this analysis to include a larger sample of countries, a new and more disaggregated bilateral product-level tariff dataset; a longer timespan; and a country-sector analysis. The results indicate that liberalization is likely to have made a significant contribution to the acceleration in growth observed in the postliberalization period—an extra 0.6 to 0.7 percentage points on annual per-capita growth—-driven by lower tariffs on capital and intermediate goods (as suggested by Solow's growth model) and by the manufacturing sector.

JEL Codes: F10, F13, F43, F61, F62, E65

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1. INTRODUCTION

It has been at least 30 years since Latin America and the Caribbean (LAC) embarked on a wide-ranging trade liberalization exercise, part of what has been dubbed the "Great Liberalization" of developing countries (Estevadeordal and Taylor 2013). The motivation was clear. Decades of inward-oriented development had unwound into paralyzing balance-of-payment crises and fiscal imbalances. Growth had ground to a halt. After rising 2.4% per year on average in the previous decades, per-capita GDP had shrunk at an annual average of 0.6% in the 1980s.[1] These dismal results contrasted sharply with the fast export-led growth of East Asia, which began to break away from the import substitution strategy in the early 1960s.

This shift in strategy contained many shades of gray. Some countries moved earlier and faster and went further than others, amid different political and economic contexts. There was, however, a common thread running through all the reform initiatives: a similar political and policy discourse that pinned many of the hopes for higher growth on trade and trade policy.

This is clear from the speeches of politicians leading the reforms. For instance, speaking to a GATT meeting in 1990, former Mexican president Carlos Salinas de Gortari argued that "Mexico has committed to modernizing its economy by integrating effectively into international markets. This change will require us to make an unprecedented effort to export, since foreign trade will be the most important driver of growth in modern economic development."[2]

More than a quarter of a century after the first initiatives to open the region's economies began, what can be said of these expectations? Were they well-grounded in sound economic theory and robust empirical evidence? Were they consistent with the results that followed?

There were certainly good theoretical reasons to be hopeful, particularly regarding the so-called physical investment channel, as liberalization would make capital goods cheaper. However, uncertainty about the impacts of knowledge accumulation—the other important channel for growth—(see, e.g., Grossman and Helpman, 2015, and Melitz and Trefler, 2012) and the complex nature of economic growth (Helpman, 2004) called for a more cautious approach.

Unsurprisingly, LAC has not replicated East Asia's growth performance since the onset of the Great Liberalization, and frustrations often lay the blame for this on trade policy. Yet, as figure 1 shows, since the early 1990s, the region has made great strides toward closing the gap with developing Asia, although the results vary widely among countries. This achievement may not be as impressive as the overly optimistic scenarios that were anticipated but seems to be more realistically in line with trade and growth theories and countries' overall policy and structural constraints.

But how exactly did liberalization contribute to these results? There is a significant amount of indirect micro evidence, based on firm-level data, that suggests that lower tariffs and greater import competition had a statistically and economically significant impact on manufacturing total factor productivity (TFP) in the 1990s (see, e.g., Goldberg and Pavcnik, 2016, and Amiti and Konings, 2007), an effect that is likely to have boosted growth. However, this contrasts with the region's lackluster aggregate TFP growth during the period (Pages, 2010) and with the micro evidence for the 2000s, particularly during the China shock, which suggests that these micro gains lost momentum and even reversed direction in some cases (Mesquita Moreira and Stein, 2019).

In theory, research based on macro data could allow for a more direct and precise assessment of the role played by liberalization. However, much of the work adopting this approach has been plagued by indirect, and often misleading, trade policy indicators and has generally ignored the role of other policies and institutional, political, and structural factors.[3] Fortunately, more recent attempts have made good progress in addressing these shortcomings.[4]

[1] WDI data for growth.

[2] GATT/1474, February 1, 1990. Original in Spanish.

[3] See Rodríguez and Rodrik 2001 and Easterly 2005 for a review of these attempts.

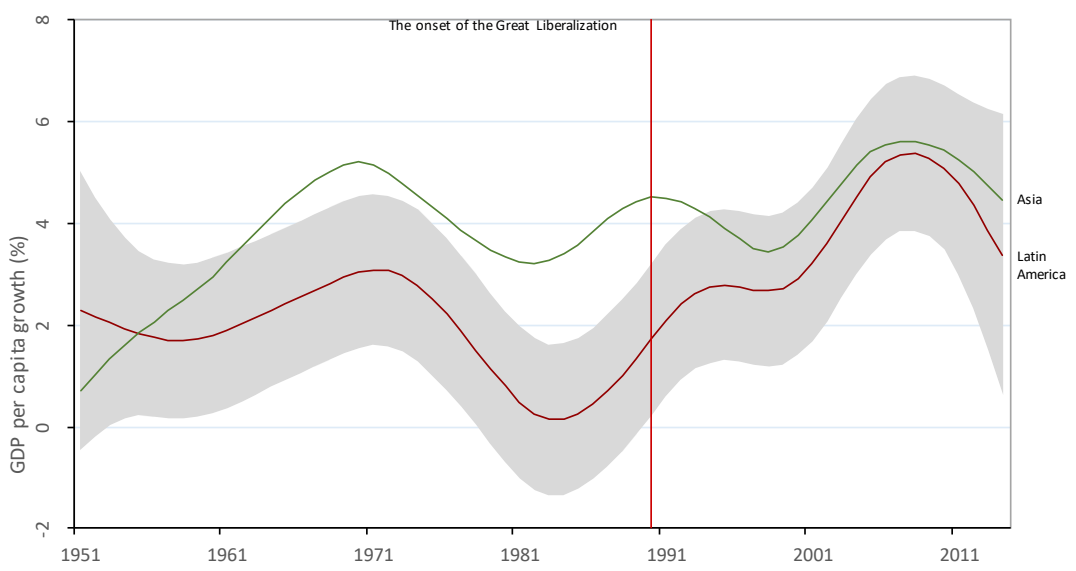
[4] See Irwin 2019 for a review.

For instance, Wacziarg and Welsh 2008 use data for nearly 140 countries over the 1950–98 period and a fixed-effect regression to net out the influence of countries' time-invariant characteristics (e.g., geography or culture). They found that trade liberalization increased countries' annual growth on average by about 1.5 percentage points.

Billmeier and Nannicini 2013, in turn, drop the traditional cross-country regression for a case-study approach based on synthetic controls. They generally find positive and robust impacts, particularly in LAC. A decade after liberalization, per-capita GDP is estimated to be about 57% higher than that of the regional synthetic comparator in Barbados, 23% in Colombia, 26% in Costa Rica, and 21% in Mexico. The exception is Chile, the analysis of which is compromised by difficulties in finding a reliable regional comparator.

Although these results are more reliable, there are still limitations to these studies. For instance, trade liberalization is still represented by periods (instead of actual trade policy indicators), defined by somewhat arbitrary criteria that erase the significant differences in scope and implementation across countries. There is also limited control of the influence of other growth correlates that can vary with time—public policies, institutions, and human capital.

FIGURE 1. ANNUAL PER-CAPITA GDP GROWTH: LATIN AMERICA AND DEVELOPING ASIA. 1951–2014 (%)



Source: Authors' calculations based on PTW 9.0 data.

Note: Trends are based on simple averages in 2011 international dollars, using the Hodrik-Prescott filter, with a smooth factor of 100. The shade area is the 95% confidence interval. PPP data is only available up to 2014. Latin America includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela. Developing Asia includes Cambodia, China, Hong Kong, Indonesia, India, Korea, Malaysia, Pakistan, Philippines, Singapore, Thailand, Taiwan, and Vietnam.

Estevadeordal and Taylor 2013 offer a more promising approach. To begin with, they ask a more reasonable research question: whether trade can *accelerate* rather than *fully determine* how much a country grows. It is reasonable to expect that trade liberalization may accelerate a country's rate of growth compared to a nonliberalization scenario. However, it is a huge stretch to argue that it will completely define a country's rate of growth, regardless of all the other contributing factors, such as institutions, education, and demographics, all of which drive differences in long-term economic growth across countries. They also solved the trade-growth endogeneity issue with a novel historical approached,[5] instead of the traditional use of geographic conditions as an instrument for trade value (Franklen and Romer, 1999, and Feyer, 2009).

[5] Estevadeordal and Taylor 2013 used the interaction of the deviation of 1930-35 GDP from its 1929 level with initial tariff levels before the Uruguay round as an instrument for the change in tariffs. The instrument works because the countries that were most affected by the 1929 crisis—an exogeneous shock—were more likely to have protectionist policies in the postwar period.

They also employ better measures of the impact of trade policy, which they define in two ways. The first is indirect, grouping countries into liberalizers—those that cut their most favored nation (MFN) tariffs between 1985 and 2002—and nonliberalizers (those that did not). The second is direct, by relating changes in per-capita income growth to changes in MFN tariffs. Looking at samples of up to 75 countries (14 of which are Latin American) in 1975–2004, they find that liberalizers accelerated their growth between 0.8 and 1 percentage points per year relative to nonliberalizers; liberalizers that cut intermediate and capital goods tariffs showed the highest impact. In the second, direct, case, they find that a 25% tariff cut (the median tariff cut during the period analyzed) accelerates growth between 0.75 and 1 percentage point per year, and the largest gains are again linked to cuts in capital and intermediate goods tariffs. Both findings are consistent with Solow's canonical growth model and provide support for the relevance of the physical capital channel.

To gain more insight into the idiosyncrasies of LAC's trade-growth relationship, we extend Estevadeordal and Taylor's (2013) analysis in five ways: using data for a more recent and longer time period (1980–2010); experimenting with different tariff databases and trade liberalization indices; expanding the number of LAC countries in the sample (18 out of 88); adopting an empirical strategy that allows regional idiosyncrasies to be identified, and looking at the trade-growth relationship at the country-sector level.

The lower bound estimates suggest that a 56% tariff cut (the median cut during that period) would have increased LAC's per-capita GDP by 0.61 percentage points per year: this is slightly less than Estevadeordal and Taylor's estimate but is consistent with their finding that tariffs on intermediate and capital goods had the strongest effects. The estimates using the *de jure* KOF liberalization index indicate that a 74% increase (the median gain during the period) would have accelerated growth by 0.74 percentage points per year. A counterfactual exercise based on these estimates suggests that LAC's per-capita GDP would have grown between 30% and 40% less between 1990 and 2010. This result does not suggest that the Great Liberalization was a panacea, but—to repeat Estevadeordal and Taylor's argument—it is hard to think of other policy measures that could singlehandedly deliver this sort of gain.

These cross-country results are confirmed by the country-sector analysis, which also suggests that it is manufacturing that drives most of the gains. This activity alone would explain between 9% to 11% of the accumulated, economywide value-added growth during liberalization, depending on whether output or inputs tariffs are the source of gain, respectively.

This paper proceeds as follows. The next section describes the data, section 3 reviews the descriptive statistics, section 4 describes our empirical strategy, section 5 presents the macro and sectoral results, and section 6 concludes.

2. DATA

The per-capita GDP data we use is in constant 2010 international dollars, drawn from the World Bank Development Indicators for 1980–2010. The sectoral value-added data is in constant 1984 US dollars, drawn from Eora—a multiregion input-output matrix database, which covers 190 countries and 10 tradable sectors for 1990–2015.[6]

The tariff data comes from two sources: CESIfo-World Bank and Economic Freedom in the World (EFW). The former is based on Felbermayr, Teti, and Yalcin's 2018 methodology. The dataset includes applied tariffs imposed by an importer for every good (at the Harmonized System 6-digit level) from any destination country for 1988–2015. The applied tariff equals the MFN tariff except when the country pair is a member of a preferential trade agreement (PTA).[7] In the cross-country regressions, we use unweighted importer-country averages, while for the sectoral analysis, we calculate the following for each Eora sector in each importer country: (a) the simple average applied tariff for the final product and (b) the sector-weighted applied input tariff using input-output technical coefficients as weights.[8]

[6] Sectoral value-added was deflated by the US Producer Price Index disaggregated into three categories: agriculture, mining, and manufacturing. The 10 tradable sectors are agriculture, fishing, mining and quarrying, food and beverages, textiles and wearing apparel, wood and paper, petroleum, metal products, electrical and machinery and transport equipment.

[7] The imputation method could generate some bias in the information before 1995, when WITS was consolidated. See Felbermayr, Teti, and Yalcin 2018.

[8] We merged the CESIfo Group-World Bank dataset using correspondence tables that allowed us to classify HS 6-digit products into the Eora sectors.

The second source of tariff data is a subindex from the EFW 2018 report, which provides the mean rate by country from 1970 to 2018. Tariffs before 1995 are calculated based on tariff revenue (Block et al., 1995); a method that may underestimate protection levels as products with lower tariffs are assigned higher weights. Nevertheless, to the best of our knowledge, this is the most complete historical database available.[9] After 1995, tariffs are simple MFN averages, drawn from the WTO (Gwartney et al., 2010).

To obtain simple average tariffs by broad product categories, we converted the CESIfo Group-World Bank HS 6-digit data to the UN Broad Economic Categories classification. The categories include foods and beverages, industrial supplies, fuels and lubricants, capital (excluding transport), transport equipment, and consumer goods.

Since the Great Liberalization involved not just tariffs but also the removal of extensive nontariff barriers (NTBs), we use the *de jure* trade component of the KOF economic globalization index as an alternative measure of liberalization for 1980–2010. This index reflects changes in foreign trade regulation, including taxes, NTBs, and MFN and preferential tariffs.[10]

To control for other growth correlates such as institutions and education, we use the ESW index of impartial courts and the average years of schooling from Barro and Lee's 2013 database.

Finally, to address endogeneity concerns, we build two instruments for tariffs and the KOF liberalization index along the lines suggested by Estevadeordal and Taylor 2013. The first is GDP deviation between 1930 and 1935 from the 1929 level drawn from the Maddison Project Database (2018 version). The database includes information for 55 countries, 18 of them in Latin America and the Caribbean. The second is GATT membership before 2000, taken from Rose 2004.

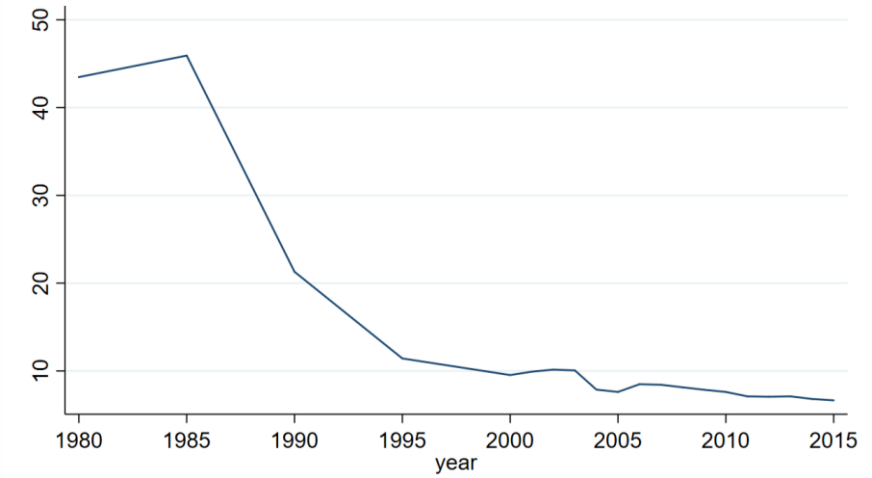
3. DESCRIPTIVE STATISTICS

The sheer extent of LAC's Great Liberalization can be observed from different angles and data sources. Figures 2 and 3 take the tariff angle, using data from different sources (EFW and CESIfo-World Bank, respectively), but the story is very similar, with a drastic reduction in average protection since the late 1980s, in both the multilateral and preferential dimensions. Figure 3 offers a broader view of the KOF liberalization index, which is designed to also capture NTB trends. It also shows indications of a structural break in protection trends in the late 1980s.

[9] We required information from national governments for those countries where the CESIfo Group-World Bank dataset reports a tariff increase for the 1990–2010 period and EFW reports a decrease (appendix table 9). We confirmed that the information for Colombia and Uruguay is biased in the CESIfo Group-World Bank reports. Consequently, the econometric results of the disaggregated tariffs were checked excluding Colombia and Uruguay from the CESIfo Group-World Bank sample. We also replaced the simple average tariff in the CESIfo Group-World Bank with the official government information.

[10] https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html As Gygli et al. (2018, 37) puts it: "The trade regulations include the average of two subcomponents: prevalence of nontariff trade barriers and compliance costs of exporting. The variable trade taxes measure the income of taxes on international trade as a share of total income in a country. The variable tariff rates refer to the unweighted mean of tariff rates. Free trade agreements refer to the stock of multilateral and bilateral free trade agreements."

FIGURE 2. AVERAGE APPLIED TARIFFS IN LATIN AMERICA (1980–2015)

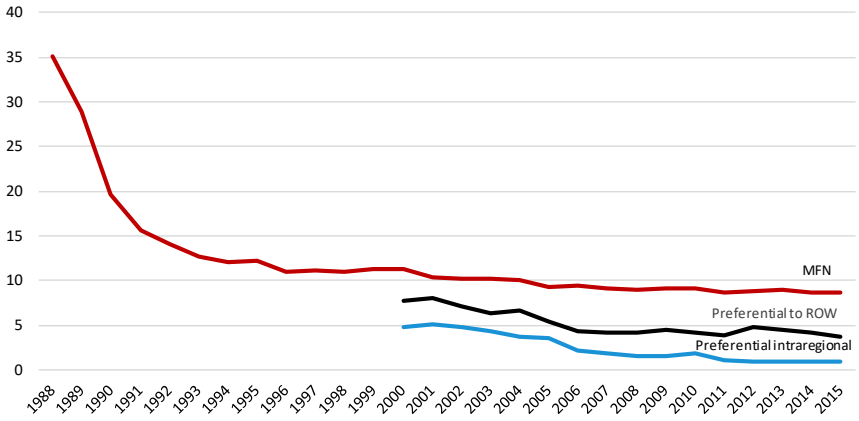


Source: Economic Freedom of the World.

Note 1: The countries included are Argentina, Chile, Colombia, Costa Rica, Guatemala, Honduras, Mexico, Peru, Paraguay and El Salvador.

Note 2: The data is available for the next years: 1980, 1985, 1990, 1995, 2000-2015.

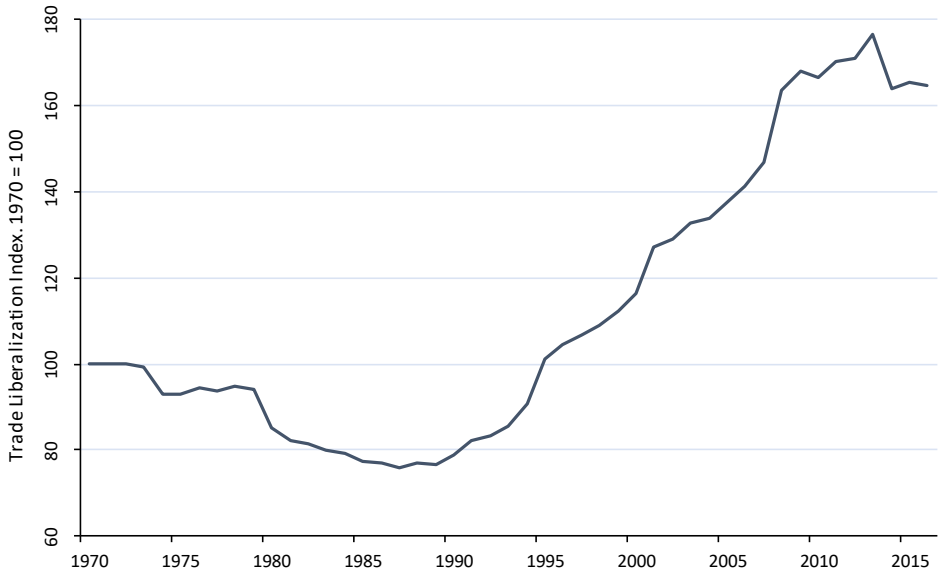
FIGURE 3. MFN AND PREFERENTIAL TARIFFS. LATIN AMERICA AND THE CARIBBEAN. 1988–2015 (%)



Source: Authors' calculations based on LAIA, Lora 2001, and CESIFO Group-World Bank data.

Note: Tariff data are simple averages from a balanced panel taken from LAIA and Lora 2001 for 1988–95 and from CESIFO-World Bank for 1996 onwards. Preferential data is only consistently available from 2000 onwards. Preferential rates are simple averages calculated at the country-pair HS 6-digit level, with Latin American and Caribbean countries as importers. Intraregional rates only include country pairs within the region and ROW rates only have exporters outside the region. Latin American and the Caribbean includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Paraguay, Peru, Uruguay, Venezuela, and Trinidad and Tobago.

FIGURE 4. KOF DE JURE TRADE LIBERALIZATION INDEX FOR LATIN AMERICA AND THE CARIBBEAN



Source: Own calculations based on KOF data.

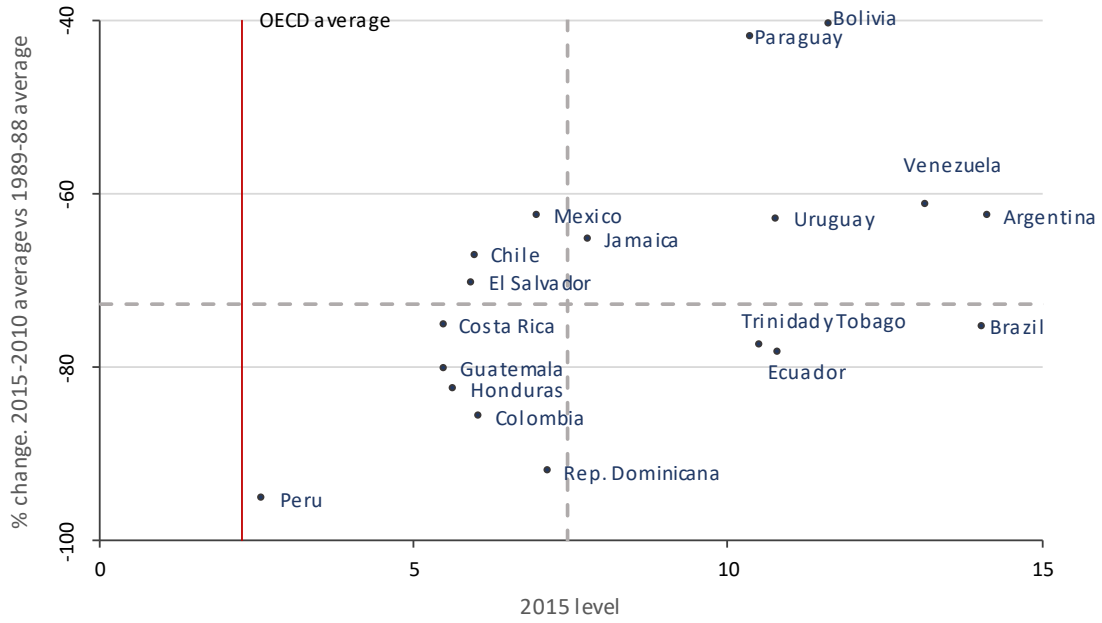
Note: The higher the index, the greater the liberalization is. This de jure index is structured as: (a) 32.5%. Nontariff and trade barriers to imports and exports (b) 34.5%. Taxes on international trade as percentage of revenue and (c) 33%. Simple mean of tariff rates. Sample includes ARG, BLZ, BOL, BRA, CHL, COL, CRI, DOM, ECU, GTM, GUY, HND, JAM, MEX, NIC, PAN, PER, PRY, SLV, SUR, TTO, URY, VEN.

Behind these averages, though, there is significant heterogeneity in the extent of the liberalization across countries in the region, as shown in figure 5. The Pacific Alliance (Mexico, Chile, Colombia, and Peru) and Central American countries went much further in liberalizing their economies than those in MERCOSUR (Argentina, Brazil, Uruguay, and Paraguay) and the Caribbean.

This heterogeneity seems to be correlated with differences in the countries' growth rates. For instance, the coefficient of correlation between tariff change, as measured by the EFW, and annual per-capita GDP growth between 1990 and 2015 is -0.3 for a world sample and -0.41 for LAC. Likewise, the coefficient of correlation for the KOF index and the same measure of growth is 0.24 for the world sample and 0.36 for LAC (See figure 6).[11]

[11] The correlation coefficients for the tariff change are statistically significant at 1% for the world sample and at 10% for the LAC sample. For the KOF index, the same figures are 1% for the world sample and are not statistically significant for the LAC sample.

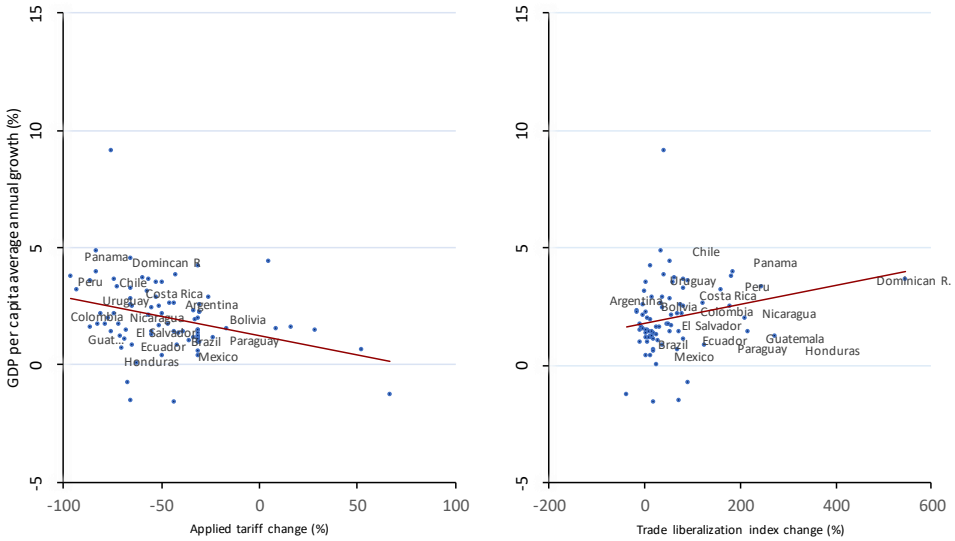
FIGURE 5. LEVEL OF AND CHANGES TO MFN TARRIFS. 1988–2015. SELECTED LAC COUNTRIES (%)



Source: Authors' calculations based on LAIA, Lora 2001, and CESIFO Group-World Bank data.

Note: Tariff data are simple averages taken from LAIA and Lora 2001 for 1988–95 and from CESIFO World Bank for 1996 onwards.

FIGURE 6. PER-CAPITA GDP GROWTH AND TRADE LIBERALIZATION. SELECTED COUNTRIES. 2015-1990



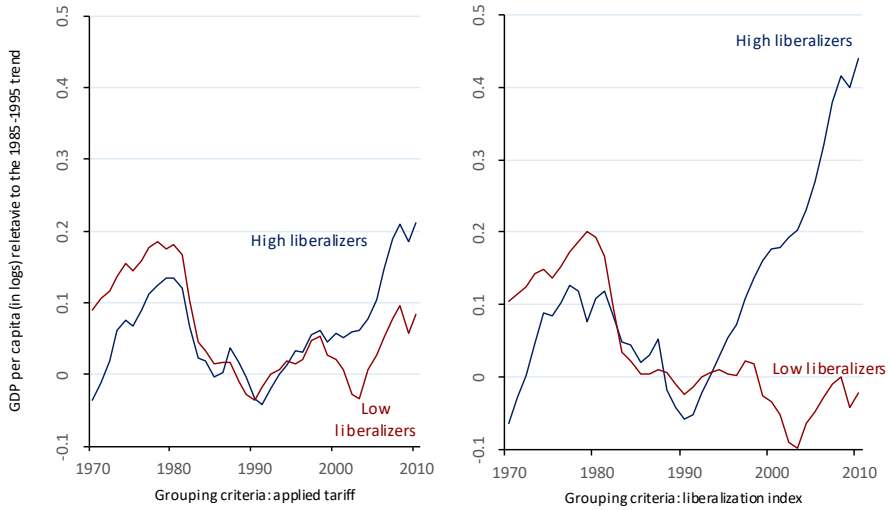
Source: Authors' calculations based on Economic Freedom of the World database and KOF de jure trade liberalization index.

Note: The tariff sample covers 73 countries, including 17 in Latin America and the Caribbean. Tariffs are simple averages from the Economic Freedom of the World database. The liberalization index is the KOF de jure trade globalization index. The higher the index number, the more liberalized the country. Per-capital GDP is in constant USD sourced from WDI.

The same relationship pattern emerges when LAC countries are grouped based on the magnitude of their tariff cuts between 1980 and 2015 and their applied tariff levels in 2015. Those whose tariff cuts are above (below) and tariff rates are below (above) the median of the region's sample are classified as high (low) liberalizers. An analogous criterion is applied for the KOF *de jure* trade liberalization index. As figure 7 shows, after the onset of the Great

Liberalization, LAC high liberalizers accelerated their growth vis-à-vis the low liberalizers, with a particularly distinct postliberalization trend when the grouping is based on the KOF index.

FIGURE 7. PER-CAPITA GDP RELATIVE TO 1985–1995 TREND. HIGH AND LOW LIBERALIZERS. SELECTED LATIN AMERICAN COUNTRIES.

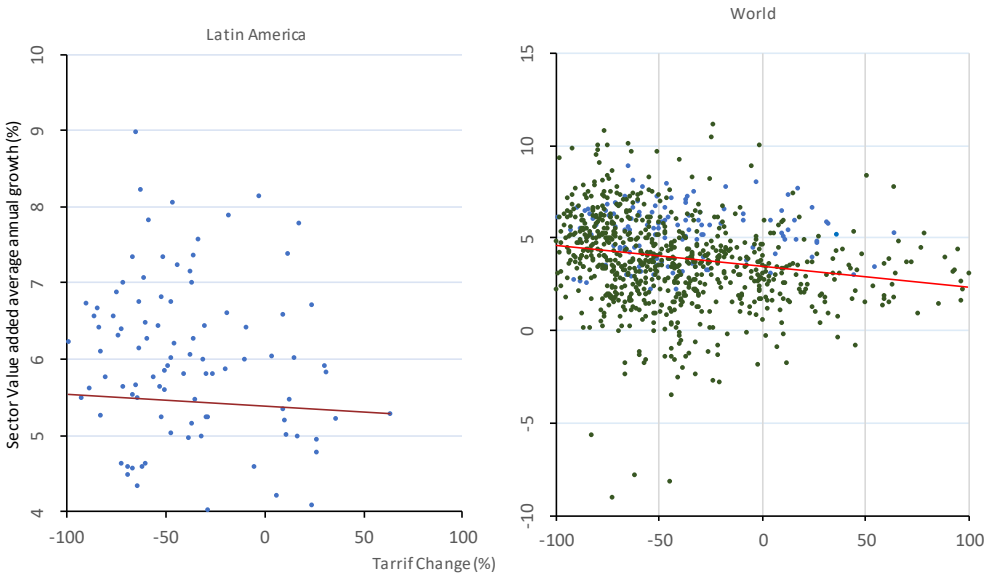


Source: Authors' calculations based on KOF de jure trade liberalization index data and tariff data from LAIA, Lora 2001, and CESIFO-World Bank.

Note: This figure shows the difference in logs between the observed per-capita GDP and the one predicted by the 1985–1995 trend. The sample selection was based on data availability. The graph on the left divides countries into high liberalizers (Colombia, Costa Rica, Guatemala, Honduras, Peru, and the Dominican Republic) and low liberalizers (Argentina, Bolivia, Brazil, Chile, Ecuador, El Salvador, Mexico, Nicaragua, Panama, Paraguay, Uruguay, and Venezuela) based on changes in applied tariffs (see text). The graph on the right uses changes in the KOF liberalization index, with the high liberalizers being Costa Rica, Dominican Republic, Guatemala, Honduras, Nicaragua, Panama and Peru, and the low liberalizers Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Uruguay, and Venezuela. Per-capita GDP is in PPP (WDI).

In contrast to the macro data, the sectoral evidence points to a weaker relationship between protection and growth. Correlations at the country-sector level between tariffs changes and growth are still negative but are only statistically significant for the world sample (see figure 8).

FIGURE 8. TARIFF CHANGE AND GROWTH IN SECTOR VALUE-ADDED. SELECTED COUNTRIES. 2015-1990 (%)



Source: Own calculation based on Eora and CESIFO Group- World Bank tariff data

Note: Observations are country-sector pairs. The coefficient is -0.03 for LAC, not statistically significant, and -0.2 for the rest of the world (significant). World includes 89 countries. LAC countries are in blue.

4. EMPIRICAL STRATEGY

We use the difference-in-difference design proposed by Estevadeordal and Taylor 2013, adding an interaction between changes in the trade liberalization indicator and the LAC dummy:

$$\Delta growth_{it} = c + \beta \Delta In(1+tl)_{it} + \eta(\Delta In(1+tl)_{it} * LAC_i) + \mu growth_{it-1} + \Delta X_{it} + \epsilon_{it} \quad (1)$$

where *tl* is the liberalization indicator (it is either the KOF trade liberalization index or applied tariffs) in country *i* at year *t*. $growth_{it}$ is the growth in per-capita GDP in constant 2010 international dollars. Rates of growth over long periods are calculated in a continuous fashion, using differences in log levels divided by elapsed years.

GDP growth acceleration is the difference between the 1990–2010[12] and 1980–1990 average annual growth rates. The differences in the independent variables are calculated between 2010 and 1990.[13] Thus, the average effect of trade liberalization on LAC growth acceleration is the sum of two coefficients, $\beta + \eta$. [14]

To address endogeneity issues, we use the two-stages least-squares approach (2SLS) and the instruments proposed by Estevadeordal and Taylor 2013. That is:

$$Z_{1i} = \ln(1 + tl_{i,1990}) * Avg\ deviation\ of\ 1930-35\ GDP\ level\ from\ 1929\ level_i \quad (2)$$

$$Z_{2i} = \ln(1 + tl_{i,1990}) * GATT\ member\ 1975_i \quad (3)$$

When the IV strategy is implemented there are two endogenous variables: $\Delta In(1+tl)_{it}$ and $\Delta In(1+tl)_{ijt} * LAC_i$. Hence, $Z_1, Z_1 * LAC$ and $Z_2, Z_2 * LAC$ are the two instruments in each first stage.

[12] The results are robust when GDP growth acceleration is calculated as the difference between the average annual growth rates for 1990–2015 and 1980–1990. However, the regressions do not include the same controls because the education variable is not available for 2015.

[13] The availability and time coverage of the disaggregated tariff databases do not allow us to estimate the model including the differences of the independent variables between 2010 and 1980. However, the appendix (table A2-A4) includes the estimations for an alternative 2010–1980 period just for country tariffs and liberalization indices.

[14] The standard errors of the overall LAC effect were calculated with the F-stat of the null hypothesis: β + η = 0.

The country-sector analysis includes two econometric specifications. The first is a difference-in-difference regression at the country-sector level, which captures the *average* effect of a tariff change on sector-country growth:

$$\Delta growth_{ijt} = c + \beta \Delta In(1+tf)_{ijt} + \eta\left(\Delta In(1+tf)_{ijt} * LAC_i\right) + \mu growth_{ijt-1} + \Delta X_{it} + \epsilon_{ijt} \quad (4)$$

where *tf* is the output or input tariff for country *i*, sector *j*, and year *t*. $growth_{it}$ is the value-added growth. Rates of growth over long periods are calculated in a continuous fashion, using differences in log levels divided by elapsed years.

The value-added growth acceleration is calculated as the difference between the average annual growth rates for 2015-2002 and 2002-1990. The change in the independent variables was calculated for 2015–1990. Analogously to the cross-country model, the *average* effect of tariff changes on sectoral growth for LAC countries is the sum of two coefficients $\beta + \eta$. Additionally, country or industry fixed effects are included in some specifications.

Ideally, the instrument should be defined as the interaction of the intensity of the 1929 crisis for each sector in each country with the initial tariff level. Nevertheless, as this information is not available, we interact a country-level variable (average deviation in 1930–1935 GDP from the 1929 level) with a sectoral variable (initial tariff for the period) to generate the sectoral instrument.

The second specification captures the *heterogeneous* effect of tariff changes across three broadly defined activities *k:* manufacturing, mining-petroleum, and agriculture. For this purpose, the sample is divided into four groups. The first one (*g1*) includes the LAC observations for activity *k*. The second group (*g2*) includes the ROW observations for the same activity *k*. The third group (*g3*) includes the LAC observations for activities other than *k*. Finally, the fourth group (g4) includes the ROW observations for sectors other than *k*.

We then define a dummy for each group (*d_g1, d_g2, d_g3, d_g4*) and estimate the following model for each sector *j*:

$$\Delta growth_{ijt} = c + \beta_1 \Delta In(1+tf)_{ijt} * d\_g1 + \beta_2 \Delta In(1+tf)_{ijt} * d\_g2 + \beta_3 \Delta In(1+tf)_{ijt} * d\_g3 + \beta_4 \Delta In(1+tf)_{ijt} * d\_g4 + \mu growth_{ijt-1} + \Delta X_{it} + \epsilon_{ijt} \quad (5)$$

Coefficients β_1 and β_2 indicate the growth response of sector *j* in LAC and ROW, respectively, to changes in output or input tariffs. This specification allows the comparison of responses between regions (for example, between manufacturing in LAC and in the ROW) and *within* the region (for instance, between manufacturing and agriculture in LAC).

5. RESULTS

A. Cross-country analysis

The OLS results indicate that LAC's greater integration into the world economy in 1990–2010, as measured by the trade liberalization index, had a positive and significant impact on per-capita GDP growth (table 1). A similar effect is found when applied tariffs are used as a measure of liberalization, as their coefficients are estimated to be negative and significant.[15] However, the IV1 specification (GDP deviation, table 2) suggests that the OLS results underestimate the positive impact of trade liberalization on per-capita GDP growth.[16]

When tariffs are broken down into end-use goods categories, the results confirm Estevadeordal and Taylor's 2013 findings that the largest impact, most robust on growth comes from lower tariffs on capital and intermediate goods, as suggested by Solow's growth model. The coefficients are negative and statistically significant in the OLS, IV1, and IV2 (GATT entry) estimations (table 3). As with the country average tariff, the OLS estimation underestimates the impact of lower tariffs on capital and intermediate goods on GDP growth, with the IV1 coefficients generally being higher. The

[15] The results for tariffs are robust to changes in the period covered by the independent variable (1980 to 2010, Appendix A2-A4).
[16] As a caveat, the result for trade liberalization index is not robust in the IV specifications.

ranking in terms of end-use categories, however, does not significantly change. Capital and intermediate goods continue to show the highest and most robust impacts.

The generally low F statistics of the first stage in the IV specification is a concern, which reflects the small sample size. However, it is at least larger than 10 for the LAC dummy interaction in some of the specifications. Most of the results are robust to a different instrument (IV2 results, table 3, panel B). With the second instrument, though, the coefficients are generally smaller.

To have a better sense of the economic significance of these results, we use the statistically significant coefficients and the median percentage change in the trade liberalization variables across LAC to estimate the average impact on the region's per-capita GDP growth during the period of analysis. Considering the capital and intermediate goods OLS coefficients, liberalization is likely to have accelerated annual growth by 0.61 percentage points (-55.87%*-0.011). This effect is higher—0.74 percentage points (73.70%*0.011)—in the case of the trade liberalization index (which includes both tariff and nontariff barriers).

These results are somewhat lower than Estevadeordal and Taylor's 2013 and Wacziarg and Welch's 2008 but are still quite significant when accumulated over the whole 1990–2010 period. In a counterfactual, partial equilibrium, nonliberalization scenario, LAC's per-capita GDP would have been between 17% (tariffs) to 20% (tariffs and NTBs) lower. In the context of the actual per-capita GDP growth, this liberalization effect would have explained between 32% to 39% of the performance in the period.

TABLE 1. EFFECT OF TARIFF CHANGE ON ECONOMIC GROWTH IN LATIN AMERICA (OLS)

	Dependent variable: Difference in growth, Δgrowth									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Variables Δ 2010–1990	Trade Liber. Index	Country Average (EFW)	Country Average (WB-CESifo)	Food and Beverages	Ind. supplies	Fuels	Capital goods (excl. transport)	Transport	Consumer goods	Capital and industrial supplies
					A. With growth model controls					
Δ ln (1+var)	0.0103	-0.00902**	-0.000589	-0.000218	-0.000281	-0.000674	-2.04e-05	-0.00435*	-0.00329	-0.000562
	(0.00644)	(0.00397)	(0.00340)	(0.00202)	(0.00361)	(0.00327)	(0.00481)	(0.00250)	(0.00219)	(0.00377)
Δ ln (1+var)*LAC	0.00226	-0.00415	-0.0125*	-0.00795	-0.0103*	-0.00661	-0.0117**	-0.00579	-0.00445	-0.0107*
	(0.00621)	(0.00447)	(0.00666)	(0.00558)	(0.00534)	(0.00416)	(0.00546)	(0.00470)	(0.00733)	(0.00547)
Growth lagged	-0.729***	-0.722***	-0.833***	-0.861***	-0.815***	-0.814***	-0.811***	-0.844***	-0.854***	-0.812***
	(0.103)	(0.121)	(0.0922)	(0.0859)	(0.0981)	(0.0967)	(0.0963)	(0.0922)	(0.0921)	(0.0984)
Δ Education	-0.00526	-0.00603	-0.000793	-0.00175	-0.000414	0.000405	0.00333	-0.00424	-0.00583	-0.000395
	(0.0134)	(0.0103)	(0.0138)	(0.0138)	(0.0153)	(0.0161)	(0.0134)	(0.0134)	(0.0139)	(0.0151)
Δ Institutions	0.0106**	0.0104**	0.0164**	0.0162**	0.0173**	0.0167**	0.0164**	0.0122*	0.0145*	0.0170**
	(0.00490)	(0.00515)	(0.00687)	(0.00682)	(0.00783)	(0.00768)	(0.00786)	(0.00724)	(0.00766)	(0.00785)
LA Effect	***0.013*****	***-0.013*****	***-0.013****	***-0.008***	***-0.011****	***-0.007****	***-0.012*****	***-0.010****	***-0.008***	***-0.011****
Observations	88	74	73	73	73	73	73	71	73	73
R-squared	0.622	0.725	0.675	0.668	0.678	0.679	0.681	0.708	0.672	0.679
					B. Excluding Institutions and Education					
Δ ln (1+var)	0.00241	-0.00785**	-0.00459	-0.00182	-0.00376	-0.00287	-0.00372	-0.00633***	-0.00531***	-0.00428*
	(0.00530)	(0.00372)	(0.00284)	(0.00180)	(0.00246)	(0.00223)	(0.00385)	(0.00178)	(0.00156)	(0.00256)
Δ ln (1+var)*LAC	0.00831	-0.00507	-0.0101	-0.00892	-0.00780*	-0.00459	-0.0104**	-0.00598	-0.00261	-0.00825*
	(0.00531)	(0.00386)	(0.00633)	(0.00662)	(0.00453)	(0.00340)	(0.00417)	(0.00404)	(0.00665)	(0.00452)
Growth lagged	-0.724***	-0.722***	-0.832***	-0.851***	-0.808***	-0.811***	-0.811***	-0.829***	-0.840***	-0.807***
	(0.0619)	(0.0986)	(0.0750)	(0.0715)	(0.0756)	(0.0745)	(0.0755)	(0.0734)	(0.0720)	(0.0755)
LA Effect	***0.011*****	***-0.013*****	***-0.015****	***-0.011***	***-0.012****	***-0.007****	***-0.014*****	***-0.012*****	***-0.008***	***-0.013*****
Observations	116	80	88	88	88	88	88	86	88	88
R-squared	0.643	0.709	0.687	0.678	0.688	0.689	0.691	0.723	0.688	0.690

Robust standard errors in parentheses. Note: Ad valorem tariffs. *** p<0.01, ** p<0.05, * p<0.1

TABLE 2. EFFECT OF TARIFFS ON ECONOMIC GROWTH IN LATIN AMERICA (IV1: DEVIATION GDP)

Dependent variable: Difference in growth, Δgrowth (2010–1990–1980)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Method	IV1	IV1	IV1	IV1	IV1	IV1	IV1	IV1	IV1	IV1
Variables Δ 2010–1990	Trade Liber. Index	Country Average (EFW)	Country Average (WB-CESifo)	Food and Beverages	Ind. supplies	Fuels	Capital goods (excl. transport)	Transport	Consumer goods	Capital and industrial supplies
					A. With growth model controls					
Δ ln (1+var)	0.0158	-0.00721	0.00678	0.0208	-0.00152	-0.000795	-0.00272	-0.0183	-0.0404	-0.00250
	(0.0508)	(0.0115)	(0.0352)	(0.0549)	(0.0119)	(0.0137)	(0.0351)	(0.0427)	(0.123)	(0.0143)
Δ ln (1+var)*LAC	0.0429	-0.0279***	-0.0454***	-0.0347	-0.0308***	-0.0168	-0.0336**	-0.0395	-0.180	-0.0318***
	(0.0341)	(0.00810)	(0.0107)	(0.0346)	(0.00870)	(0.0120)	(0.0138)	(0.0254)	(0.409)	(0.00925)
Growth lagged	-0.298	-0.263	-0.545**	-0.703***	-0.442***	-0.519***	-0.465***	-0.388	0.767	-0.426**
	(0.202)	(0.164)	(0.224)	(0.118)	(0.158)	(0.121)	(0.149)	(0.347)	(3.751)	(0.169)
Δ Education	-0.00581	-0.0101	-0.00385	-0.00160	-0.0111	-0.00142	0.00604	-0.0123	-0.164	-0.0111
	(0.0264)	(0.0120)	(0.0261)	(0.0343)	(0.0192)	(0.0231)	(0.0128)	(0.0352)	(0.435)	(0.0203)
Δ Institutions	-0.00457	0.00655	0.0190	0.00740	0.0192*	0.0181	0.0130	-0.00530	0.00591	0.0184
	(0.0194)	(0.00907)	(0.0154)	(0.00861)	(0.0115)	(0.0140)	(0.0291)	(0.0436)	(0.0546)	(0.0131)
LA Effect	***0.059****	***-0.035*****	***-0.039***	***-0.014***	***-0.032****	***-0.018*****	***-0.036***	***-0.058***	***-0.221***	***-0.034****
Observations	49	50	43	43	43	43	43	43	43	43
F 1st stage Δ ln (1+var)	2.259	3.258	1.468	0.207	5.267	4.636	2.404	1.219	3.240	4.546
F 1st stage Δ ln (1+var)*LAC	6.074	11.862	3.093	1.382	9.094	7.609	3.481	2.652	5.236	9.034
					B. Excluding Institutions and Education					
Δ ln (1+var)	0.0148	-0.00908	0.00538	0.0359	-0.00117	-0.00149	-1.38e-05	-0.00622	-0.0331	-0.00186
	(0.0494)	(0.0114)	(0.0225)	(0.114)	(0.00835)	(0.00675)	(0.0204)	(0.0165)	(0.115)	(0.00970)
Δ ln (1+var)*LAC	0.0428	-0.0278***	-0.0494***	-0.0273	-0.0339***	-0.0184**	-0.0358**	-0.0465*	-0.213	-0.0351***
	(0.0361)	(0.00824)	(0.0125)	(0.0727)	(0.0115)	(0.00847)	(0.0139)	(0.0277)	(0.571)	(0.0121)
Growth lagged	-0.299	-0.270*	-0.527***	-0.731***	-0.432***	-0.499***	-0.449***	-0.391	0.806	-0.416**
	(0.211)	(0.163)	(0.160)	(0.189)	(0.166)	(0.122)	(0.149)	(0.285)	(4.463)	(0.175)
LA Effect	***0.057*****	***-0.037*****	***-0.044***	***0.009***	***-0.035****	***-0.020*****	***-0.036***	***-0.053***	***-0.246***	***-0.037****
Observations	49	50	43	44	44	44	44	44	44	44
F 1st stage Δ ln (1+var)	1.705	3.733	1.468	0.269	3.105	3.404	0.383	0.751	1.154	2.529
F 1st stage Δ ln (1+var)*LAC	8.047	17.162	3.093	2.310	11.063	13.747	5.126	4.448	4.678	10.765

Robust standard errors in parentheses. Note: Ad valorem tariffs. *** p<0.01, ** p<0.05, * p<0.1

TABLE 3. EFFECT OF TARIFFS ON ECONOMIC GROWTH IN LATIN AMERICA (IV2: GATT ENTRY)

	Dependent variable: Difference in growth, Δgrowth									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Method	IV2	IV2	IV2	IV2	IV2	IV2	IV2	IV2	IV2	IV2
Variables Δ 2010–1990	Trade Liber. Index	Country Average (EFW)	Country Average (WB-CESifo)	Food and Beverages	Ind. supplies	Fuels	Capital goods (excl. transport)	Transport	Consumer goods	Capital and industrial supplies
				A. With growth model controls						
Δ ln (1+var)	-0.0275	-0.00784	0.00765	0.00735	0.00230	0.00437	0.00361	-0.00745	-0.00481	0.00216
	(0.0542)	(0.0110)	(0.0115)	(0.00826)	(0.00688)	(0.00528)	(0.0111)	(0.00941)	(0.0113)	(0.00754)
Δ ln (1+var)*LAC	0.0498	-0.0175**	-0.0318**	-0.0343*	-0.0204**	-0.0143**	-0.0234***	-0.0228*	-0.0442	-0.0209**
	(0.0383)	(0.00867)	(0.0152)	(0.0179)	(0.00866)	(0.00583)	(0.00879)	(0.0131)	(0.0347)	(0.00869)
Growth lagged	-0.595***	-0.607***	-0.761***	-0.771***	-0.769***	-0.782***	-0.755***	-0.763***	-0.722***	-0.765***
	(0.134)	(0.152)	(0.109)	(0.118)	(0.104)	(0.103)	(0.105)	(0.110)	(0.142)	(0.105)
Δ Education	0.0194	-0.00423	0.00475	-0.00189	0.00374	0.0101	0.00888	-0.00415	-0.0129	0.00407
	(0.0323)	(0.0105)	(0.0145)	(0.0142)	(0.0158)	(0.0169)	(0.0125)	(0.0136)	(0.0229)	(0.0157)
Δ Institutions	0.0111*	0.0104*	0.0202**	0.0146**	0.0204**	0.0217**	0.0185*	0.00793	0.0159	0.0202**
	(0.00597)	(0.00618)	(0.00865)	(0.00687)	(0.00905)	(0.00876)	(0.0102)	(0.0114)	(0.0108)	(0.00933)
LA Effect	***0.022***	**-0.025*** **	**-0.024***	**-0.027***	**-0.018***	**-0.010****	**-0.020**	**-0.030***	***-0.049***	**-0.019***
Observations	88	74	73	74	73	73	73	71	73	73
F 1st stage Δ ln (1+var)	3.104	2.069	3.482	2.069	6.070	10.094	3.112	2.697	4.060	5.374
F 1st stage Δ ln (1+var)*LAC	4.365	13.765	3.511	13.765	9.481	21.749	4.730	3.994	3.464	9.634
				B. Excluding Institutions and Education						
Δ ln (1+var)	0.0969	-0.00268	0.00133	0.00310	-0.00140	0.000453	0.00379	-0.0124	-0.00866	-0.00171
	(0.753)	(0.00934)	(0.0102)	(0.00647)	(0.00695)	(0.00453)	(0.0157)	(0.0118)	(0.0145)	(0.00791)
Δ ln (1+var)*LAC	-0.0244	-0.0176***	-0.0285**	-0.0344*	-0.0187**	-0.0117**	-0.0220***	-0.0209	-0.0428	-0.0192**
	(0.415)	(0.00664)	(0.0139)	(0.0188)	(0.00793)	(0.00506)	(0.00708)	(0.0129)	(0.0367)	(0.00788)
Growth lagged	-0.665**	-0.643***	-0.780***	-0.796***	-0.769***	-0.780***	-0.765***	-0.782***	-0.739***	-0.768***
	(0.271)	(0.114)	(0.0848)	(0.0896)	(0.0820)	(0.0781)	(0.0841)	(0.0824)	(0.112)	(0.0819)
LA Effect	***0.072***	**-0.020****	**-0.027***	**-0.031***	**-0.020****	**-0.011****	**-0.018**	**-0.033***	***-0.051***	***-0.021****
Observations	116	80	88	88	88	88	88	86	88	88
F 1st stage Δ ln (1+var)	1.608	3.356	2.534	4.420	3.271	10.542	0.712	0.711	1.459	2.606
F 1st stage Δ ln (1+var)*LAC	6.526	22.122	5.063	2.513	14.791	39.873	6.379	5.323	4.603	14.434

Robust standard errors in parentheses. Note: Ad valorem tariffs. *** p<0.01, ** p<0.05, * p<0.1

B. Cross-country-sector analysis

The results reviewed thus far refer to average country effects, based on a cross-country analysis. Would these results hold if the regressions were run at the country-sectoral level? How did the impact of changes in output and input tariffs differ? How did the impact of trade liberalization vary between activities and between LAC and the rest of the world? To answer these questions, we run equations (4) and (5) at the Eora 10-sector level for 1990–2015. It is both a robustness exercise and an attempt to capture idiosyncratic activity and tariff effects.

Table 4 shows the average effect of the output tariff coming out of equation (4). As in the cross-country specification, the OLS results point to a negative and statistically significant effect on growth, and these results are generally robust across the IV specifications, except when country (IV2) and country and sector fixed effects (IV1) are included. This does not seem critical for the robustness of the results given that these difference-in-difference specifications already control for time-invariant, nonobservable characteristics and the fact that the additional fixed effects (which could control for differences in trends) test the limits of the sample size. The IV results also suggest that the OLS estimation clearly underestimates the tariff effect on sectoral growth.

Table 5 shows the results of equation (4) for input tariffs. The results closely follow those for output tariffs, although they are higher in magnitude and not as robust. They are negative and statistically significant in the OLS specification but are only significant (and larger in magnitude) in the IV2 specifications without country fixed effects. There are two possible explanations for this. First, the instrument in the sectoral regressions is not as accurate as in the cross-country regressions because of the lack of historical sectoral output data. Ideally, the instrument would be the interaction between two sectoral variables. Second, the smaller sample size tends to compromise statistical power. This probably explains why the IV1 specifications, which run in a smaller sample, are never significant.

To get a better grasp of the economic significance of these results, we follow the same procedure of multiplying the coefficients for the statistically significant regressions by the median percentual change in the output and input tariffs. Considering the OLS estimation and the output tariff effects only, liberalization boosted annual growth by 1.1 percentage points (-0.024*-46.96%). This effect is higher (+1.2pp) when the input tariff is used (-0.023*-57.20%).

Assuming trade liberalization had no impact on the services sector, these results would have explained 12% (14%) of the overall accumulated value-added growth and 30% (33%) of the tradable sector growth (see appendix A5). The former could be considered a lower bound estimate because we are assuming that there are no forward linkages that could boost services growth. The latter is similar in magnitude to the contribution found in the cross-country exercise.[17]

To capture the heterogeneity across activities and regions, we run equation 5 and the OLS results are presented in figures 9 and 10. Figure 9 shows the 95% confidence intervals for the activity-region-specific output (β_1) and input (β_2) tariffs coefficients. Figure 10 uses these coefficients to calculate similar intervals for the implicit impact on annual growth for region-activity pairs.[18] As before, this is calculated by multiplying the coefficients by the median tariff percentual change in the period for each activity-region pair.

Manufacturing emerges as the only LAC activity in which output and input tariff cuts are likely to have had a positive and statistically significant impact on growth. Estimates range from 1.7 (output) to 2.4 (input) percentage points. These findings are in sharp contrast to those for the rest of the world, where only agriculture and mining are found to have statistically significant effects; probably driven by low manufacturing tariffs at the beginning of the period in most of the developed world and developing Asia.

Figure 11 compares the observed results in manufacturing with counterfactual nonliberalization scenarios using the OLS coefficients. Assuming again that services are not impacted by liberalization, the gains in manufacturing alone would explain 9% (11% in case of input tariffs) of the accumulated, economywide value-added growth and 23% (30%)

[17] They are not strictly comparable because the macro regressions included the per-capita GDP as a dependent variable and the sample covered 1980–2010. In contrast, the value-added in the sectoral section is not calculated by worker or per capita, and the analysis covered 1990–2015.
[18] See table A6 and A7 for detailed results.

of that of the tradable sector (see appendix A8). Again, this is likely to be a lower bound effect because we are assuming no forward linkage effects on services.

Overall, it is important to bear in mind that these are positive, long-term, average effects, and thus do not rule out losses in country-sector pairs, particularly in those that do not have comparative advantages.

TABLE 4. EFFECT OF OUTPUT TARIFFS ON SECTORAL GROWTH IN LATIN AMERICA (2015–1990)

	Dependent variable: Difference in value-added growth (2015–2002–1990)								
Variables Δ 2015–1990	(1) OLS	(2) OLS	(3) OLS	(4) IV1	(5) IV1	(6) IV1	(7) IV2	(8) IV2	(9) IV2
Δ ln (1+tariff)	-0.00795***	-0.00833***	0.000163	0.00828	0.0455	-0.0704	-0.0164**	-0.00922*	-0.0251
	(0.00170)	(0.00169)	(0.00240)	(0.0165)	(0.0312)	(0.0666)	(0.00660)	(0.00467)	(0.0147)
Δ ln (1+tariff)*LAC	-0.0164***	-0.0185***	0.00394	-0.0398***	-0.0516***	-0.0217	-0.0392***	-0.0400***	-0.0436
	(0.00420)	(0.00367)	(0.00728)	(0.00565)	(0.00883)	(0.144)	(0.00652)	(0.00622)	(0.113)
Growth lagged	-1.361***	-1.366***	-1.647***	-1.095***	-0.843***	-1.204***	-1.404***	-1.389***	-1.665***
	(0.103)	(0.102)	(0.142)	(0.0943)	(0.160)	(0.234)	(0.0964)	(0.103)	(0.166)
Δ Institutions	0.0145***	0.0150***		0.0248**	0.0503*		0.0134**	0.0172***	
	(0.00373)	(0.00375)		(0.0115)	(0.0262)		(0.00541)	(0.00375)	
LA Effect	*-0.024***	*-0.027***	*0.004*	*-0.031***	*-0.006*	*-0.092*	*-0.056***	*-0.049***	*-0.069*
Observations	833	833	833	448	448	448	833	833	833
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Industry FE	No	Yes	No	No	Yes	No	No	Yes	No

Robust standard errors clustered at country level in parentheses. Note: AD valorem tariffs

Latin American (LA) countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela.

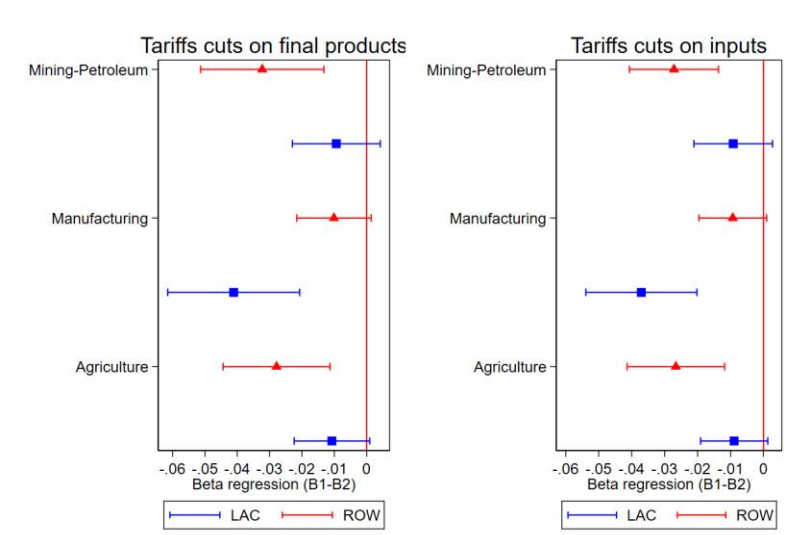
TABLE 5. EFFECT OF INPUT TARIFFS ON SECTORAL GROWTH IN LATIN AMERICA (2015–1990)

	Dependent variable: Difference in value-added growth, Δ va growth								
Variables Δ 2015–1990	(1) OLS	(2) OLS	(3) OLS	(4) IV1	(5) IV1	(6) IV1	(7) IV2	(8) IV2	(9) IV2
Δ ln (1+tariff)	-0.00645***	-0.00699***	0.000415	0.0178	0.0495	-0.0525	-0.0182***	-0.0128**	-0.0206
	(0.00157)	(0.00147)	(0.00223)	(0.0187)	(0.0316)	(0.0446)	(0.00615)	(0.00474)	(0.0119)
Δ ln (1+tariff)*LAC	-0.0154***	-0.0168***	0.00874**	-0.0336***	-0.0492***	0.0326	-0.0243***	-0.0260***	0.00152
	(0.00325)	(0.00331)	(0.00361)	(0.00940)	(0.0149)	(0.0319)	(0.00554)	(0.00521)	(0.0243)
Growth lagged	-1.353***	-1.357***	-1.619***	-1.042***	-0.811***	-1.387***	-1.395***	-1.385***	-1.661***
	(0.100)	(0.0999)	(0.134)	(0.107)	(0.156)	(0.160)	(0.101)	(0.106)	(0.141)
Δ Institutions	0.0164***	0.0170***		0.0309**	0.0513*		0.0128**	0.0161***	
	(0.00341)	(0.00350)		(0.0123)	(0.0246)		(0.00527)	(0.00376)	
LA Effect	*-0.0219****	*-0.0238****	*0.009*	*-0.0158*	*0.0003*	*-0.0199*	*-0.0426*	*-0.0388****	*-0.019*
Observations	914	914	914	492	492	492	914	914	914
Country FE	No	No	Yes	No	No	Yes	No	No	Yes
Industry FE	No	Yes	No	No	Yes	No	No	Yes	No

Robust standard errors clustered at country level in parentheses. Note: AD valorem tariffs

Latin American (LA) countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay and Venezuela.

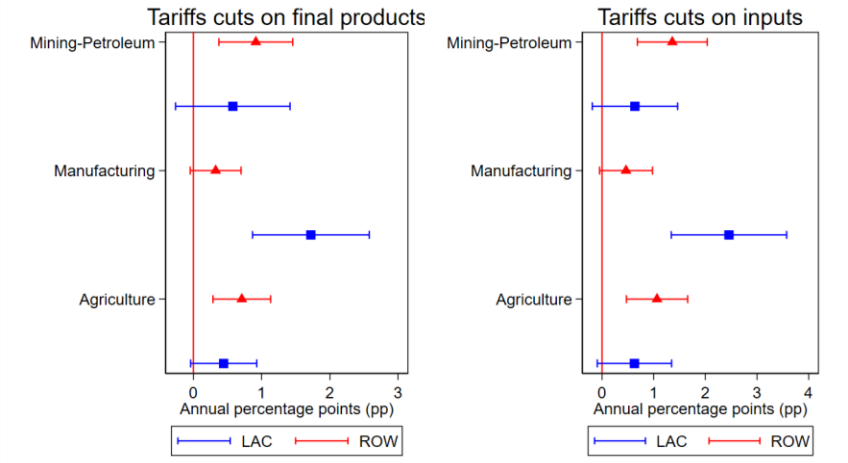
FIGURE 9. HETEROGENEOUS SECTORAL EFFECT (BETA REGRESSIONS)



Source: Authors' calculations.

Note: These are the 95% beta confidence intervals for the OLS coefficients. See Appendix A7.

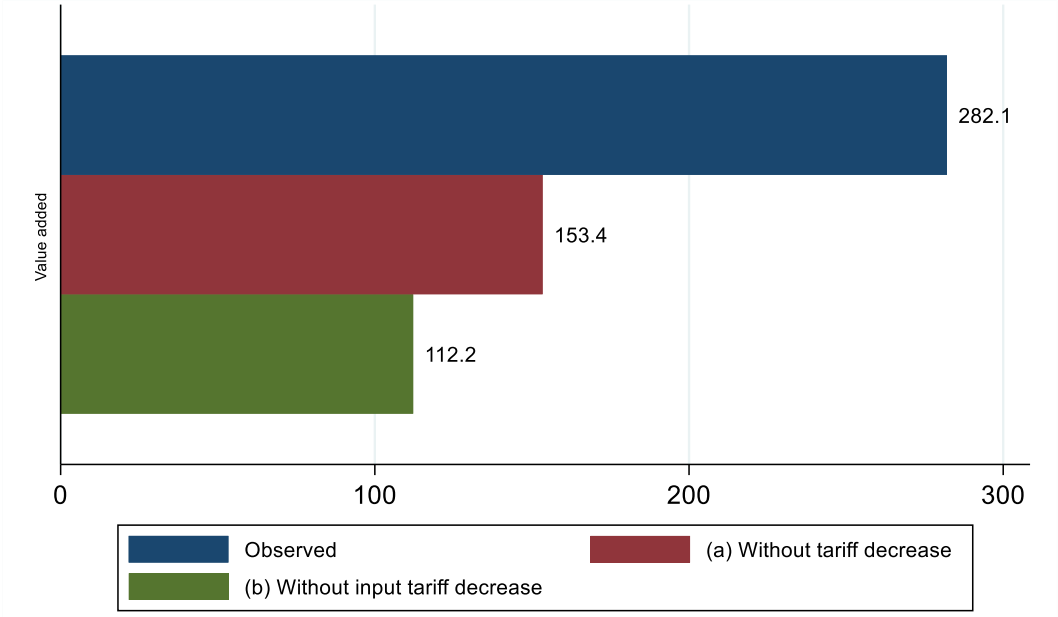
FIGURE 10. HETEROGENEOUS SECTORAL EFFECT (ANNUAL PERCENTAGE POINTS)



Source: Authors' calculations.

Note: These are the 95% beta confidence intervals calculated as the product between region-sector OLS coefficients and the median percentage change in applied tariffs in the 1990–2015 period.

FIGURE 11. TRADE LIBERALIZATION AND MANUFACTURING VALUE-ADDED (%). OBSERVED AND HYPOTHETICAL SCENARIOS. LATIN AMERICA. 1990–2015



Note: Scenarios (a) and (b) are based on the OLS coefficients. See text and appendix for details. Constant US$.

Source: Authors' calculations.

6. CONCLUSION

LAC's Great Liberalization, which began in the late 1980s and early 1990s, sparked great expectations regarding how it would impact growth. There were certainly good theoretical reasons to be hopeful, particularly in relation to Solow-inspired physical capital. There were also, however, major ambiguities to consider, particularly from the knowledge channel, which ultimately made the expected impact an empirical question.

The actual postliberalization growth shows that expectations were overly optimistic, but the results nonetheless point to a significant improvement. In this paper, we try to capture how liberalization contributed to this improvement more precisely, building on Estevadeordal and Taylor's 2013 contribution to cross-country literature.

The results suggest that this contribution is likely to have been sizable—an average effect on annual per-capita growth of between 0.6 to 0.7 percentage points, mainly driven by manufacturing and by tariff cuts in intermediate and capital goods. When accumulated over the liberalization period, these gains would have assured an increase in per-capita income of up to 20%. As Estevadeordal and Taylor 2013, this type of gain would be hard to replicate through other types of public policies.

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APPENDIX

TABLE A1. AVERAGE TARIFF CHANGE IN LATIN AMERICA COUNTRIES BY SOURCE, 2010–1990

ISO	Country	EFW (Economic Freedom of the World)	CESIfo Group-World Bank	Government
ARG	Argentina	-7.90	-7.30	
BOL	Bolivia	-5.50	-1.15	
BRA	Brazil	-16.30	-15.39	
CHL	Chile	-9.00	-3.09	
COL	Colombia	-17.90	3.35	-18.30
CRI	Costa Rica	-11.00	-3.35	
DOM	Dominican Republic	-20.90	1.48	
ECU	Ecuador	-25.90		
GTM	Guatemala	-17.40		
HND	Honduras	-14.50		
MEX	Mexico	-2.10	-1.62	
NIC	Nicaragua	-19.20	-2.89	
PAN	Panama	-32.80		
PER	Peru	-30.60	-12.86	
PRY	Paraguay	-5.80		
SLV	El Salvador	-15.20		
URY	Uruguay	-20.00	1.22	-9.12
VEN	Venezuela	-18.10	-4.53	

TABLE A2. EFFECT OF TARIFFS ON GROWTH IN LATIN AMERICA, ROBUSTNESS (OLS)

Dependent variable: Difference in growth, Δgrowth (2010–1990–1980)

	(1)	(2)	(4)
Method	OLS	OLS	OLS
Variables Δ 2010–1980	Economic globalization	Trade globalization	Total tariff (EFW data)
	A. With growth model controls		
Δ ln (1+var)	0.00942	0.00748	-0.00764*
	(0.0121)	(0.00828)	(0.00400)
Δ ln (1+var)*LAC	0.00936	0.00116	-0.00142
	(0.0119)	(0.00747)	(0.00329)
Growth lagged	-0.844***	-0.823***	-0.669***
	(0.0994)	(0.109)	(0.116)
Δ Education	-0.00381	-0.00353	0.00382
	(0.00881)	(0.00912)	(0.00744)
Δ Institutions	-0.00445	-0.00301	-0.00561
	(0.0102)	(0.00988)	(0.00997)
LAC Effect	***0.018****	***0.008****	***-0.009****
Observations	77	77	53
R-squared	0.624	0.625	0.715
	B. Excluding institutions and education		
Δ ln (1+var)	0.00254	0.000959	-0.00804**
	(0.00738)	(0.00570)	(0.00337)
Δ ln (1+var)*LAC	0.0102	0.00630	-0.000692
	(0.00950)	(0.00543)	(0.00309)
Growth lagged	-0.794***	-0.725***	-0.645***
	(0.0819)	(0.0652)	(0.0991)
LAC Effect	0.012*	0.007*	-0.008***
Observations	118	113	66
R-squared	0.520	0.632	0.676

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

TABLE A3. EFFECT OF TARIFFS ON GROWTH IN LATIN AMERICA, ROBUSTNESS (IV1)

Dependent variable: Difference in growth, Δgrowth (2010–1990–1980)

	(1)	(2)	(3)
Method	IV1	IV1	IV1
Variables Δ 2010–1980	Economic globalization	Trade globalization	Total tariff (EFW data)
A. With growth model controls			
Δ ln (1+var)	-0.0670	-0.187	-0.00518
	(0.280)	(0.587)	(0.0214)
Δ ln (1+var)*LAC	0.136	0.174	-0.0139
	(0.263)	(0.419)	(0.00865)
Growth lagged	-0.478	0.187	-0.435
	(1.067)	(1.914)	(0.270)
Δ Education	0.00457	0.0462	-0.00153
	(0.0466)	(0.166)	(0.0171)
Δ Institutions	-0.0191	0.0227	0.000557
	(0.0350)	(0.0971)	(0.0129)
LAC Effect	0.068*	-0.013	-0.019
Observations	47	47	41
F 1st stage Δ ln (1+var)	4.668	2.308	4.894
F 1st stage Δ ln (1+var)*LAC	5.596	5.939	12.303
B. Excluding institutions and education			
Δ ln (1+var)	-0.457	-0.455	-0.00981
	(2.696)	(4.155)	(0.0203)
Δ ln (1+var)*LAC	0.542	0.396	-0.0153
	(2.772)	(3.187)	(0.0100)
Growth lagged	1.157	1.233	-0.274
	(10.13)	(13.09)	(0.198)
LAC Effect	0.084	-0.059	-0.025*
Observations	49	49	42
F 1st stage Δ ln (1+var)	1.944	2.529	3.889
F 1st stage Δ ln (1+var)*LAC	6.604	7.828	15.820

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

TABLE A4. EFFECT OF TARIFFS ON GROWTH IN LATIN AMERICA, ROBUSTNESS (IV2)

Dependent variable: Difference in growth, Δgrowth (2010–1990–1980)			
	(1)	(2)	(3)
Method	IV2	IV2	IV2
Variables Δ 2010–1980	Economic globalization	Trade globalization	Total tariff (EFW data)
A. With growth model controls			
Δ ln (1+var)	0.0275	-0.0275	-0.00784
	(0.0859)	(0.0542)	(0.0110)
Δ ln (1+var)*LAC	0.0296	0.0498	-0.0175**
	(0.0673)	(0.0383)	(0.00867)
Growth lagged	-0.748***	-0.595***	-0.607***
	(0.133)	(0.134)	(0.152)
Δ Education	0.00429	0.0194	-0.00423
	(0.0130)	(0.0323)	(0.0105)
Δ Institutions	0.00291	0.0111*	0.0104*
	(0.0105)	(0.00597)	(0.00618)
LAC Effect	0.03	0.012	-0.08
Observations	88	88	74
F 1st stage Δ ln (1+var)	2.387	3.104	2.069
F 1st stage Δ ln (1+var)*LAC	5.627	4.365	13.765
B. Excluding institutions and education			
Δ ln (1+var)	-0.218	0.0969	-0.00268
	(0.458)	(0.753)	(0.00934)
Δ ln (1+var)*LAC	0.176	-0.0244	-0.0176***
	(0.294)	(0.415)	(0.00664)
Growth lagged	-0.769***	-0.665**	-0.643***
	(0.197)	(0.271)	(0.114)
LAC Effect	-0.01	0.017	-0.031*
Observations	122	116	80
F 1st stage Δ ln (1+var)	1.074	1.608	3.356
F 1st stage Δ ln (1+var)*LAC	5.659	6.526	22.122

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

TABLE A5. HYPOTHETICAL GDP GROWTH: AVERAGE SECTORAL EFFECT

Sector	Observed growth (%)	Hypothetical GDP growth 1 (output tariff)	Hypothetical GDP growth 2 (input tariff)
Agriculture	203.6	132.0	125.4
Manufacturing	282.1	192.8	184.5
Mining-petroleum	211.4	138.1	131.3
Services	190.2	190.2	190.2
Total tradable sector	240.5	160.6	153.2
Total economy	207.0	180.3	177.8

	% growth due to trade liberalization	
Sector	Output tariff	Input tariff
Agriculture	32.19	35.17
Manufacturing	29.53	32.28
Mining-petroleum	32.91	35.96
Services	0.00	0.00
Total tradable sector	30.39	33.21
Total economy	12.85	14.07

TABLE A6. HETEROGENEOUS SECTORAL EFFECT: OUTPUT TARIFF

Dependent variable: Difference in growth, Δgrowth			
		Sector j	
VARIABLES	Agriculture	Mining	Manufacturing
Δ ln (1+tf)*D[Sector j=1 & LAC = 1]	-0.0107*	-0.00936	-0.0411***
	(0.00596)	(0.00693)	(0.0104)
Δ ln (1+tf)*D[Sector j=1 & LAC =0]	-0.0278***	-0.0323***	-0.0101*
	(0.00845)	(0.00973)	(0.00587)
Δ ln (1+tf)*D[Sector j=0 & LAC=1]	-0.00611	0.00119	-0.0130***
	(0.00438)	(0.00438)	(0.00275)
Δ ln (1+tf)*D[Sector j=0 & LAC=0]	-0.00835***	-0.0115***	-0.00174
	(0.00306)	(0.00272)	(0.00338)
Growth lagged	-1.359***	-1.365***	-1.357***
	(0.0736)	(0.0731)	(0.0739)
Δ Institutions	0.0149	0.0147	0.0147
	(0.0110)	(0.0112)	(0.0110)
Observations	833	833	833
R-squared	0.626	0.633	0.636

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

TABLE A7. HETEROGENEOUS SECTORAL EFFECT: INPUT TARIFF

Dependent variable: Difference in growth, Δgrowth			
	Sector j		
VARIABLES	Agriculture	Mining	Manufacturing
Δ ln (1+tf)*D[Sector j=1 & LAC = 1]	-0.00890*	-0.00919	-0.0371***
	(0.00520)	(0.00608)	(0.00860)
Δ ln (1+tf)*D[Sector j=1 & LAC =0]	-0.0266***	-0.0272***	-0.00932*
	(0.00756)	(0.00690)	(0.00524)
Δ ln (1+tf)*D[Sector j=0 & LAC=1]	-0.00666*	0.00290	-0.0108***
	(0.00360)	(0.00420)	(0.00259)
Δ ln (1+tf)*D[Sector j=0 & LAC=0]	-0.00651**	-0.00983***	-0.00110
	(0.00285)	(0.00240)	(0.00310)
Growth lagged	-1.350***	-1.358***	-1.348***
	(0.0721)	(0.0720)	(0.0726)
Δ Institutions	0.0167	0.0167	0.0167
	(0.0112)	(0.0114)	(0.0111)
Observations	914	914	914
R-squared	0.628	0.635	0.638

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

TABLE A8. HYPOTHETICAL GDP GROWTH: HETEROGENEOUS SECTORAL EFFECT

Sector	Observed growth (%)	Hypothetical GDP growth 1 (Output tariff)	Hypothetical GDP growth 2 (Input tariff)
Agriculture	203.6	203.6	203.6
Manufacturing	282.1	153.4	112.2
Mining-petroleum	211.4	211.4	211.4
Services	190.2	190.2	190.2
Total tradable sector	240.5	184.8	166.9
Total economy	207.0	188.4	182.4

	% growth due to trade liberalization	
Sector	Output tariff	Input tariff
Agriculture	0.0	0.0
Manufacturing	45.6	60.2
Mining-Petroleum	0.0	0.0
Services	0.0	0.0
Total tradable sector	23.2	30.6
Total economy	9.0	11.9