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China and Latin America and the Caribbean

Export competition in the United States market

Raquel Artecona
Daniel E. Perrotti
Lennard Welslau

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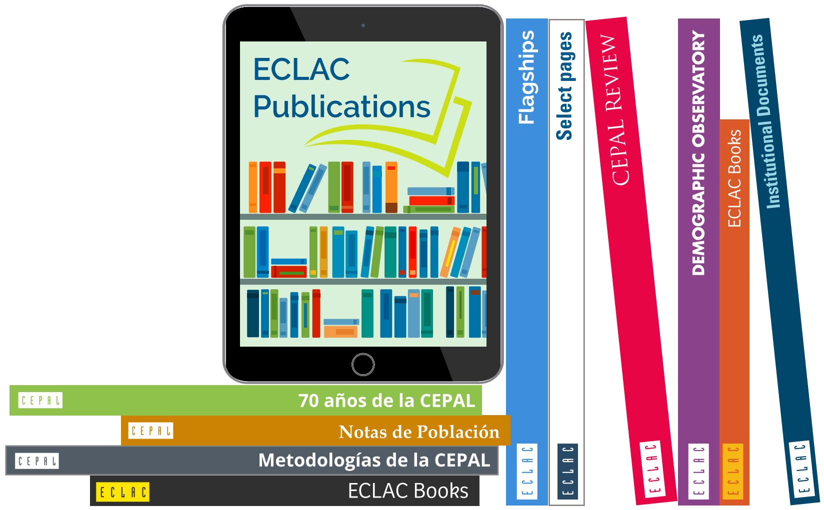

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This document was prepared by Raquel Artecona, Officer in Charge, Daniel E. Perrotti, Research Assistant and Lennard Welslau, consultant, of the office of the Economic Commission for Latin America and the Caribbean (ECLAC) in Washington, D.C.

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Abstract

This paper uses an augmented gravity trade model to examine the impact of Chinese exports to the United States on Latin America and the Caribbean (LAC) exports to the same market over the last two decades. The analysis relies on a sample of 33 LAC countries and trade data disaggregated to the 10- digit Harmonized Tariff Schedule (HTS) level. The results show that the impact of Chinese exports on US imports from LAC is negative and statistically significant across model specifications and levels of aggregation in the trade data. The estimations show a displacement of LAC exports by China's exports in the period under analysis of between 0.25 and 1.26 percent per percentage change in Chinese exports. In addition, the model suggests that after accounting for such export competition, Free Trade Agreements with the United States, on average, increased imports from LAC countries by up to 1.5 percent. That is, countries with a trade agreement with the US have an advantage over those without, particularly in the manufacturing sector.

Introduction

China's broad access to the global market increased significantly since the turn of the century. The Asian country was already implementing unilateral tariff reductions of its own and benefiting from low tariffs abroad (Feenstra and Kee, 2004) before entering the World Trade Organization (WTO) in 2001. More recently, the increase in the level of competitiveness in a range of manufacturing products has propelled even more China's predominance as a world exporter. In the United States, China had already started to increase its participation well before becoming a WTO member. Using data from 1972 to 2001, (Schott, 2006) showed that China's manufacturing exports exploded in both the breadth of products exported to the United States and the volume of exports. The growth rate of product penetration and market share was significantly higher than that of Latin America over the same period. The United States continues to be the leading trade partner for Latin America and Caribbean exports, absorbing about 44% of the region's total exports. Mexico's exports represent about 80% of Latin America and Caribbean exports to the United States. Understanding threats to the region's competitiveness in the United States imports market is a relevant policy issue.

Between 2002 and 2018, China's overall market share in the US continued outgrowing that of Latin America and the Caribbean (LAC), increasing from 9% to 20% compared to an increase from 17.5% to 18.6% for LAC. Most Latin American countries lost market share during this period. The only exceptions are Mexico, Peru, Chile, and Colombia, all of which have a free trade agreement (FTA) with the US in place (Artecona and Perrotti, 2021).

To determine the level of competition between China and LAC, this paper examines the impact of Chinese exports on LAC exports to the US between 2002 and 2020 using an augmented gravity model of trade. The analysis relies on a sample of 33 exporters and trade data disaggregated to the 10- digit Harmonized Tariff Schedule (HTS) level. Gravity trade models have been used extensively to estimate the degree of export competition between China and Asian, African, and European countries in third markets; however, few studies have focused on the entire LAC region. In addition, the studies that focus on the region do not necessarily address some of the estimation issues that have been pointed out in the literature. This paper addresses three of them. First of all, the potential endogeneity of the Chinese exports (i.e., unobserved variables like consumer sentiments in the US might influence both Chinese and LAC exports), that enters to the right-hand side of the equation. To account for such endogeneity, two instrumental variables are employed: Chinese GDP and Chinese export shares in third industrialized nations.

At the level of desegregation utilized in this analysis, there are numerous tariff lines that present a trade flow value of zero. However, zero trade flows may have structural causes like trade in products that has seized due to Chinese competition. Linear gravity models omit such structural zero trade flows because they state trade in logarithmic terms; to include them, this article estimates a non-linear Poisson regression model.

A disadvantage of the non-linear Poisson model is that its estimations are inconsistent with the inclusion of high dimensional fixed effects, needed to account for the multilateral resistance terms (i.e., factors like the proximity to other trading partners or natural trade barriers like oceans) pointed out by Anderson and Van Wincoop (2003). To address this issue a linear two-stage least-squares (2SLS) model including country and sector-time fixed effects is also estimated.

The results show that the impact of Chinese exports on US imports from LAC is negative and statistically significant across model specifications and levels of aggregation in the trade data. The estimations show a displacement of LAC exports by China's exports in the period under analysis: a percentage increase in imports from China is associated with a decrease in imports from LAC countries of between 0.25 and 1.26 percent. Here, the former estimate stems from the fixed effects model (2SLS), while the latter comes from the Poisson specification. Since potential biases of the two models are of opposite signs, the displacement effect probably lies within the range of the two estimates. When estimating the models for individual industries, the negative effect is only significant for manufacturing products; meanwhile, the displacement in resource-based sectors is not significant. These findings underline the current threat to LAC countries relying predominantly on the export of manufactured goods and the challenge faced by countries hoping to diversify their resource-based export structure. In addition, the model suggests that after accounting for Chinese export competition, FTAs, on average, increased imports from LAC countries by up to 1.5 percent. That is, countries with a trade agreement with the US have an advantage over those without and this advantage is particularly noticeable in the manufacturing sector.

The remainder of this paper is structured as follows: Section 2 reviews previous studies of export competition between China and LAC; Section 3 explores the similarity of the LAC and Chinese export structures; Section 4 introduces the theoretical background of gravity estimation; Section 5 reviews the gravity model literature on Chinese export competition; Section 6 lays down our estimation approach; while Section 7 summarizes the data used in the analysis; Section 8 presents the empirical results and Section 9 concludes the analysis.

I. Export competition between China and Latin America and the Caribbean

The expanding presence of China in the world market since the start of the century has prompted the study the potential consequences for LAC countries. These studies have traditionally relied on comparing factor endowments and the evolution of export compositions and market shares to investigate export competition in third markets. For the US market, however, there is no consensus about the extent of export competition between China and LAC.

Several studies have concluded that, except for Mexico, China presents little threat to LAC countries in the US market. The argument favoring complementarity rather than competition with China builds on the notion of endowment-driven comparative advantages. Devlin, Estevadeordal, and Rodríguez-Clare (2006) stress that the land abundance in LAC favors resource-based production, while Asia's labor abundance provides a comparative advantage for manufacturing. Analyzing the shares and product penetration of the US market by China and LAC, the authors find that while the Chinese export share grew more quickly than that of LAC between the 1970s and the 2000s, it was concentrated in manufacturing products, particularly in manufactured materials and miscellaneous manufactures. Lately, China has also increased its export of more sophisticated technologies like consumer electronics. China's focus on manufacturing and the increasing sophistication of its export basket is therefore seen as a sign of complementarity rather than competition with mostly resource-based exports from LAC (Devlin, Estevadeordal, and Rodríguez, 2006). Blázquez-Lidoy, Rodríguez, and Santiso (2006) study the export structure of the regions and come to the same conclusion: as net exporters of commodities, most LAC countries face no competition from manufacturing exporting China. However, they acknowledge the risk that the expansion into various export sectors by China poses for Mexico and partially Brazil. Similarly, Olarreaga, Lederman, and Perry (2007) find that any evidence of substitutability is limited to Mexico and, to a minor extent, Central America, within a few manufacturing sectors.

For other authors, however, the degree of overlap suggested by the indices of export similarity and the relative labor abundance of China do not warrant an optimistic view of export competition between LAC and China. For example, Schott (2006) compares relative endowments, market shares, product penetration, and indices for product and price similarity of Chinese and LAC exports to the US and finds that although China's urban centers boast an enormous labor force, explaining its comparative advantage in the export of manufacturing products, resource-rich regions and growing penetration of high-tech product segments make China a competitor in many industries. The geographical diversity of endowments and the size of China make it a threat to a broader range of countries.

Similarly, Jenkins, Peters, and Moreira (2008) stress that not just Mexican but also Central American and Caribbean exports compete with China in third markets. Because indices traditionally relied on in the analysis of export competition substantially underestimate the degree of competition smaller countries face when comparing them with a large and diversified economy like China, previous studies may have understated the threat from China.

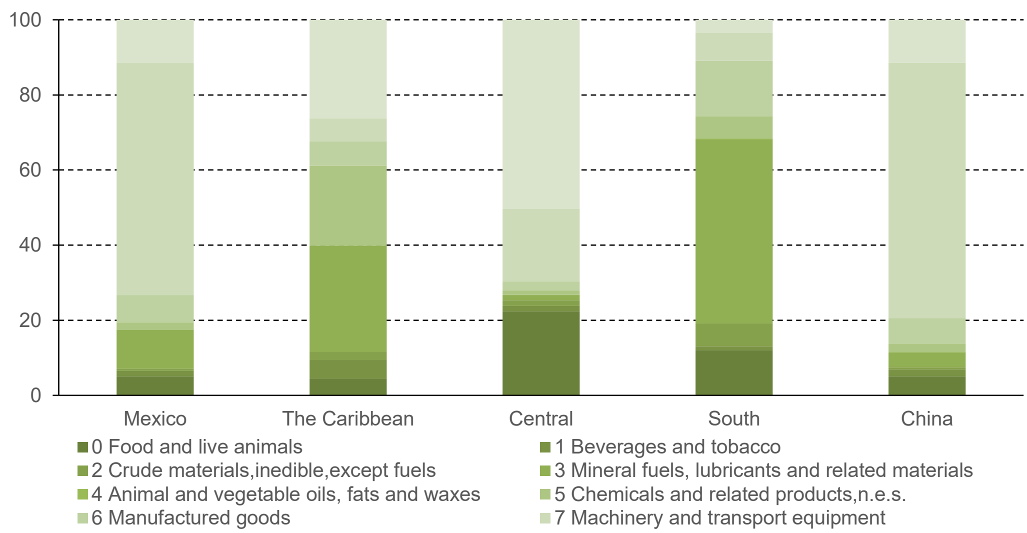
Other studies have focused on sectoral threats. For example, using export similarity indices and estimates of the elasticity of substitution of exports to the US, López-Córdova, Micco, and Molina (2008) argue that the manufacturing industries of Mexico, Central America, and the Caribbean, as well as low-wage industries of other countries are at risk. Lall and Weiss (2007) classify the development and correlation of US import market shares between 1990 and 2002 held by China and LAC into levels of competitive threat. According to their analysis, although China affects a larger share of exports from East Asian economies, it poses a threat to 40 percent of exports from a range of LAC countries to the US.

Moreover, some studies have found that China's competitive threat applies to a broad range of products: the increasing diversification of China, stressed by Schott (2006), has affected more capital-intensive industries such as iron, steel, and aluminum (Lall and Weiss, 2007). Other studies highlight that China competes with Mexico in textiles, garments, electronics, and auto parts (Dussel Peters, 2016; Jenkins, Peters, and Moreira, 2008). Likewise, while affected negatively primarily in low-tech industries, Brazil also faces threats in the high-tech sector (Jenkins, 2014). China's comparative and competitive advantages thus go well beyond cheap labor and have expanded since the early 2000s (Dussel Peters, 2016).

II. Similarity of Latin American and Chinese export structures

The composition of sectoral exports of LAC and China reveals a relative similarity. Figure 1 shows that manufactured articles dominate exports from Mexico, Central America, and China and make up most of Caribbean exports. Meanwhile, South American exports are mostly resource-based products.

Figure 1
Export structures of Latin America and the Caribbean and China by SITC sections (2002–2020)



Source: Author's calculations based on United States Census Bureau data (USA Trade Online, 2022).

However, decompositions of export flows based on aggregated sectors offer only an incomplete picture. Two countries with similar sector composition could specialize in different products within a sector and complement each other's exports. To determine how similar the export structures of China and LAC are on a product-level basis, this study calculates the Export Similarity Index (ESI) for all countries, sectors, and years in the sample based on the 10-digit HTS US import data. The index, first developed by Finger and Klein (1979), represents the similarity of two countries' exports in a common third market based on the relative product share among their respective total exports. For any two US trading partners, the ESI is defined as:

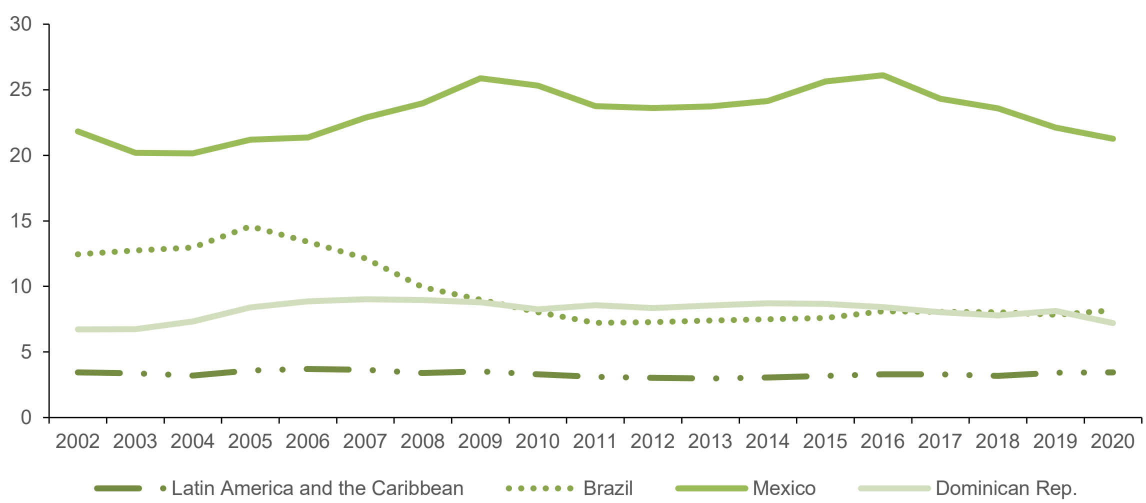
$$ESI_{c,d,t} = \sum_{p} \min\left(s_{pct}, s_{pdt}\right)$$

Where s_{pct} and s_{pdt} are the shares of product p among total exports from countries c and d respectively in a given year t. Here, the ESI is normalized to a scale between zero, indicating no similarity, and one hundred, indicating complete similarity.

$$s_{pct} = \frac{Country\ c\ exports\ of\ product\ p\ to\ the\ third\ market}{Total\ country\ c\ exports\ to\ the\ third\ market} * 100$$

Figure 2 shows the evolution of export similarity between LAC and China in the US market over 2002 to 2020. The average ESI of the region remained relatively stable, around an average value of 3.3. The countries with the highest average ESI over the sample period were Mexico, Brazil, and the Dominican Republic. The Mexican ESI degree is higher than other major US trade partners (such as Canada, the United Kingdom, Japan, and Germany). At a world-level comparison, the average ESI of LAC in 2017 was 3.3, below the global average of 5.5.

Figure 2
Evolution of export similarity between Latin America and China in the United States market



Source: Author's calculations based on United States Census Bureau data (USA Trade Online, 2022).

While the calculation of the ESI reveals the potential for competition, it does not deliver conclusive insights. Firstly, the ESI and the simple comparison of sectoral compositions in Figure 1 are relative measures: because of the large absolute magnitude of Chinese exports to the US market, exports that make up only a tiny share of Chinese exports can still present a significant threat to LAC countries without this threat being captured by the index. Secondly, the index does not reveal causal relationships between export shares: exports of products within the same HTS 10-digit code may complement each other if they inhabit different quality segments (i.e., expensive, high-quality garments may not compete in the same market as low-price, low-quality products). Thirdly, the ESI is limited by its static nature. A structural gravity models that considers time and sector-specific trends to address these shortcomings is used in the following sections.

III. Gravity models of trade

Gravity equations of trade have been the workhorse for analyzing determinants of bilateral trade for more than half a century. Tinbergen (1962) was the first to use a gravity equation to describe bilateral trade flows. Analogous to the Newtonian theory of gravitation, in which gravitational force is proportionate to the mass and distance of two bodies, he described how bilateral trade flow is proportional to any two countries' GDP and bilateral distance. In most general terms, gravity models of trade, like their Newtonian counterparts, can be expressed in the following multiplicative form:

$$X_{ij} = GS_iM_j\phi_{ij}.$$

Here, X_{ij} stands for the value of exports from country i to country j, G is a gravitational constant that describes characteristics like the level of trade liberalization worldwide, S_i denotes exporter-specific factors and represents total supply by the exporter, M_j comprises importer-specific factors and represents the demand of the importer, and ϕ_{ij} represents the market access for exporter i to the market of country j. Expressing market access as the inverse of trade costs and denoting supply and demand as GDP of the respective countries, the equation could be log linearized and expressed as the following linear regression:

$$lnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnD_{ij} + \varepsilon_{ij},$$

Here, the gravitational constant is captured by the constant β_0, S_i and M_j are estimated by the GDP Y of country i and j, respectively. Since trade costs are not directly observable, they have been traditionally proxied by geographical distance D_{ij}, as well as additional covariates like dummies for common borders, language, colonial history, landlockedness, and free trade agreements. The error term is denoted by ε_{ij}. Although purely agnostic, this relationship was so statistically robust that Krugman (1997) referred to it as an example of *social physics* and Frankel and Rose (2002) as one of the most robust findings in econometrics. Gravity models have since been adopted widely to describe global trade flows and quantify the determinants of trade, including among others: WTO membership (Rose, 2004; Subramanian and Wei, 2007; Grant and Boys, 2012; Dutt, Mihov, and Van Zandt, 2013), free trade agreements (Baier and Bergstrand, 2007, 2009; Baier, Bergstrand and Mariutto, 2014; Egger et al., 2011; Dai, Yotov and Zylkin, 2014), currency unions (Rose and Van Wincoop, 2001; Rose and Honohan, 2001;

Barro and Tenreyro, 2007), colonial links (Head, Mayer and Ries, 2010; Berthou and Ehrhart, 2017), and non-tariff barriers (Disdier and Head, 2008; Disdier, Fontagné, and Cadot, 2015.

In tandem with the growth of empirical applications, theoretical work has succeeded in deriving gravity equations from various mainstream modeling frameworks. These include the Armington-CES model of Anderson (1979), which was popularized by Anderson and Van Wincoop (2003), as well as Heckscher-Ohlin (Bergstrand, 1985; Deardorff, 1998) and Ricardian models (Eaton and Kortum, 2002). Later contributions combined gravity models with those of firm heterogeneity (Chaney, 2008; Helpman, Melitz, and Rubinstein, 2008), as well as sectoral Armington models (Anderson and Yotov, 2016), sectoral Ricardian models (Arkolakis, Costinot, and Rodríguez-Clare, 2012; Chor, 2010; Caliendo and Parro, 2015), and dynamic models (Olivero and Yotov, 2012; Anderson, Larch, and Yotov, 2015; Eaton et al., 2016).

Empirical applications have been guided by these theoretical advances to varying degrees. Some theoretical works had a considerable impact on the estimation methods, first and foremost, the formulation of a structural gravity equation with multilateral resistance terms by Anderson and van Wincoop (2003). Following the work of Anderson (1979), the model context is given by the Armington assumption, according to which goods are differentiated by country of origin. Consumers then form preferences over the pool of goods from all countries; thus, all countries import at least some of every good from every country. Because national income equates to total demand for domestically produced goods in equilibrium, larger countries trade more. Trade costs, the second factor in the general gravity framework, function analogously to iceberg costs and grow proportionate with geographical distance. Besides country size and direct trade costs, however, Anderson and van Wincoop (2003) show that two additional factors impact trade volume: the multilateral resistance terms (MRTs), which describe the overall resistance that exports from country i and imports of country j are faced with respectively. These resistances depend not only on absolute bilateral trade costs but also on the weighted average of trade costs with other nations. An intuitive explanation for the inclusion of relative trade costs is that two countries would trade more with each other if they were surrounded by an ocean since the trade costs with alternative trading partners would be much higher. If a country borders several other nations, however, the opposite would be the case.

Head and Mayer (2014) demonstrate the derivation of MRTs in structural gravity models from two identities that hold for several model frameworks. First, the share of imports of country j from country $i\, X_{ij}\ on\ total\ country\ j's\ imports$ can be expressed as a share π_{ij} of its total expenditures X_j:

$$X_{ij} = \pi_{ij} X_j,$$

where $\pi_{ij} \geq 0$ and $\sum_i \pi_{ij} = 1$. π_{ij} can be expressed as the product of the exporter's capability and market access, weighted by the relative capability and access of all exporters:

$$\pi_{ij} = \frac{S_i \phi_{ij}}{\Phi_j}, where\ \Phi_j = \sum_n S_n \phi_{nj}.$$

Here, S_i denotes the capability of exporter i, ϕ_{ij} is exporter i's access to the import market j, and Φ_j is the sum of all exporters' access to the import market ϕ_{nj}, weighted by their capabilities S_n. Φ_j thus, measures the degree of competition in the import market j.

Second, the total value of the production of exporter i, Y_i, is equal to the sum of its exports to all destination markets n, including i's domestic market, which can be expressed as the product of its capability S_i and the sum of its market access ϕ_{in} relative to competition in the import markets Φ_n and weighted import expenditures X_n:

$$Y_i = \sum_n X_{in} = S_i \sum_n \frac{\phi_{in} X_n}{\Phi_n}$$

Solving for S_i, yields

$$S_i = \frac{Y_i}{\Omega_i}, where\ \Omega_i = \sum_n \frac{\phi_{in} X_n}{\Phi_n},$$

Where Ω_i is the index of relative market access ϕ_{in}/Φ_n weighted by expenditure X_n. Substituting the expression $S_n = Y_n/\Omega_n$ into the expression for competition in the import market Φ_j gives:

$$\Phi_j = \sum_n \frac{\phi_{nj} Y_n}{\Omega_n},$$

Which plugged into the initial expression for total expenditures of the exporter yields the following gravity equation:

$$X_{ij} = \frac{Y_i}{\Omega_i} \frac{X_j}{\Phi_j} \phi_{ij}.$$

Here, the value of the exporter's production Y_i and the importer's expenditure X_j enter divided by their respective MRTs, the exporter's relative market access Ω_i and the relative access to the import market Φ_j, weighted respectively by overall importer expenditures and exporter productions.

Log linearized, the structural gravity equation with MRTs can again be expressed as linear regression:

$$lnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnD_{ij} + \beta_5 lnMRT_i + \beta_4 lnMRT_j + \varepsilon_{ij},$$

where, assuming balanced trade as in Anderson and Wincoop (2003), expenditure of country j is equal to its production Y_j, the resistance terms $1/\ \Omega_i$ and $1/\Phi_j$ are denoted by MRT_i and MRT_j respectively, and bilateral trade costs ϕ_{ij} are again approximated by bilateral geographical distance D_{ij}. In addition, several dummy variables controlling for shared colonial history, language, or trade agreements are often added. Since the MRTs are by construction related to other explanatory variables, their omission in the estimation strategy is what Baldwin and Taglioni (2007) call the gold medal mistake in the gravity literature.

IV. Augmented gravity models and export competition

Since China's accession to the WTO in 2001, the gravity framework has been employed increasingly to analyze the effects of Chinese exports on exports of other countries. Starting with Eichengreen et al. (2004), these studies rely on augmented versions of the gravity regression, including Chinese exports among its covariates. Work so far includes analyses of the effects of exports competition between China and Asian (Athukorala, 2009; Eichengreen, Rhee and Tong, 2004, 2007; Greenaway, Mahabir, and Milner, 2010; Kong and Kneller, 2016), African (Geda and Meskel, 2007; Giovannetti and Sanfilippo, 2009; Edwards and Jenkins, 2014), and European countries (Giovannetti, Sanfilippo and Velucchi, 2012; Stanojevic, Bin and Jian, 2020; Elleby, Yu, and Yu, 2018), as well as sector-specific applications that include individual Latin American countries (Zeidan, 2015; Lederman, Olarreaga and Soloaga, 2007; Módolo and Hiratuka, 2017; Pham et al., 2017).

Lederman, Olarreaga, and Perry (2007) examine the partial correlation between Chinese and Indian non-fuel exports and LAC trade with third markets between 2002 and 2004. Their estimates are small or insignificant except for Central America and Mexico, which show evidence of export complementarity. Notably, the model does not rely on instrumental variables to account for potential endogeneity. Other studies that decide against an instrumental variable approach have similarly found positive coefficients for Chinese exports (e.g., Elleby et al., 2018)

Zeidan (2015) looks at export competition between China and the 13 largest exporters of textiles in the US market for apparel between 2002 and 2010. Because Chinese exports are found to be exogenous, a panel estimation without instrumental variables is performed. The study finds evidence of displacement for more than half of the countries in his sample, including both developing and developed countries. For the two LAC countries in the sample, a 1 percent increase in Chinese textile exports is found to decrease Mexican exports by 0.82 percent and exports from the Dominican Republic by 0.31 percent.

Módolo and Hiratuka (2017) find similar displacement effects for the manufacturing sector from 2000 to 2009 using 2SLS with bilateral distance as an instrumental variable. Annual product data is aggregated to technological intensities following Lall (2000). Mexico and Central America are among the regions with the highest degree of export competition. A percentage increase in Chinese exports was associated with a drop in exports by 0.37 percent. For South America, the drop is 0.22 percent and thus is similar to the world average of 0.22 percent. For medium-tech industries, Central American and Mexican exports drop by 0.52 percent and South American exports by 0.55. Likewise, Central American and Mexican low-tech industries are strongly affected, dropping by 0.42 percent. South American high-tech industries drop by 0.37 percent. These findings underline the variety of sectors potentially at risk of displacement by China.

Pham et al. (2017) examine high-tech industries between 1992 and 2014 using 2SLS, employing, bilateral distance and Chinese GDP as instruments. Their sample includes data on chemistry, computer- office machinery, electrical and non-electrical machinery, electronics–communications, pharmacy, and scientific instruments exports of 18 major high-tech exporters and 56 major high-tech importers. The authors find that Chinese high-tech exports increase those of East Asian economies such as Japan and South Korea as well as of OECD exporters while displacing those of developing competitors such as India, Brazil, Mexico, and Malaysia. For Brazil and Mexico, a 1 percent increase in Chinese exports was found to cause export drops between 0.1 and 0.16 percent.

To summarize, the gravity literature on export competition with China finds evidence of displacement across various sectors and geographical regions. The results suggest that developing countries are at greater risk of displacement and that crowding out mainly occurs in different manufacturing sector segments. However, many studies fail to adequately control for multilateral resistance terms, an issue that is further discussed below. Second, studies that account for multilateral resistance terms by including country-fixed effects either report only marginal displacement effects (see, e.g., Kong and Kneller, 2016) or do not rely on an instrumental variable approach (see, e.g., Elleby, Yu, and Yu, 2018; Lederman, Olarreaga and Soloaga, 2007), giving rise to a potentially upward bias. Importantly, none of the studies cover a broad range of sectors and countries in LAC or use more disaggregate product data to account for competition within specific product groups. The analysis presented here addresses these issues and closes the respective gap in the literature by estimating two models for LAC using HS 10-digit level important data. The estimation approach is presented and discussed in the next section.

V. Estimation approach

As mentioned in the introduction, several econometric issues must be addressed when estimating displacement effects with augmented gravity models. Unobserved macroeconomic factors (e.g., demand shocks that move imports from all trading partners in the same direction) could generate endogeneity issues, that is, the inability to disentangle the changes in LAC exports to the US market that are the genuine result of changes in Chinese exports to the US markets from those that are the result of other factors. The standard approach to address this issue is using instrumental variables that only correlate with Chinese exports but not with those of its competitors. The most common instruments are gravity covariates like bilateral distance and GDP, which have been popular since being suggested by Eichengreen et al. (2004) (Athukorala, 2009; Giovannetti and Sanfilippo, 2009; Greenaway, Mahabir, and Milner, 2010; Pham et al., 2017; Módolo and Hiratuka, 2017). Additionally, time-varying instruments include political risk (Eichengreen, Rhee, and Tong, 2004), a measure of time - varying economic distance calculated as weighted averages of distances to Chinese trade hubs (Eichengreen, Rhee, and Tong, 2007; Elleby, Yu, and Yu, 2018), a time-varying distance measure based on increasing reliance on air traffic (Kong and Kneller, 2016), or the number of Confucius Institutes in destination countries (Stanojevic, Bin and Jian, 2020).

This study includes, in addition to Chinese GDP, the sum of Chinese exports to third industrialized nations normalized by respective total imports at the HS 6-digit level and Chinese GDP. This approach addresses a central issue with the instruments presented above: since traditional instruments model trade flows at the national level, they rely on variation in the importer dimension. Such approaches are not feasible in analyses with only a single importer and highly disaggregated data. If the instrument is not time-varying or includes time-fixed effects in the specification, the instrument takes identical values for all observations and is thus dropped due to collinearity. Therefore, following the approach of David, Dorn, and Hanson (2013), we additionally rely on disaggregate trade data in other countries to model trade flows with China. The strategy rests on the premise that China's export growth is primarily driven by supply-side factors like the rising competitiveness of its manufacturing firms, industrial policy, and reductions in trade barriers. David et al. (2013) identify eight industrialized markets whose imports from

China strongly correlate with US imports of Chinese commodities.[1] The eight countries' geographical dispersion and global economic integration lower the chance of exclusive correlations with local US or LAC shocks. Here, the same countries are used to compute the instrumental variable for Chinese imports (CHIMPIV) as follows:

$$CHIMPIV_{p*t} = \sum \frac{ITNI^{ch}_{p*t}}{ITNI_{p*t}}$$

where $ITNI^{ch}_{p*t}$ are the industrialized third nations' HS 6-digit import values from China of commodity $p*$ in year t, and $ITNI_{p*t}$ are total import values for the respective year and commodity.

Another challenge in estimating gravity models with highly disaggregated trade data is dealing with the prevalence of zero trade flows: i.e., records of goods that were not exported in a given year. This may not be an issue of concern at the more aggregate level, where countries are likely to report a trade value different from zero. However, many countries would report a zero trade flow when looking at specific products at the HS 10-digit level.

The traditional estimation of a gravity model with Ordinary Least Squares (OLS) disregards all observations that take the value of zero; the gravity equation, which is stated in the multiplicative form, must be log-linearized to make it estimable with OLS. Zeros are thus dropped before estimation. Since zero flows can reflect meaningful structural information, like firms not exporting due to high costs or excessive competition in the export market, omitting them could yield inconsistent OLS estimates (Helpman, Melitz and Rubinstein, 2008) and, as will be shown later, an upwards bias of export competition coefficients. Likewise, solutions like adding a small constant to all trade values to avoid zeros are inconsistent with OLS (Bacchetta et al., 2012). Instead, Silva and Tenreyro (2007) suggest estimating the gravity equation using Pseudo Poisson maximum likelihood (PPML). Because PPML assumes the sample distribution's first moment to take multiplicative form, it is no longer necessary to take the logarithm of the dependent variable, thus allowing zero flows to remain part of the estimation. Since PPML performs well in the presence of many zero flows, it is especially relevant for more disaggregated data. In addition, PPML provides unbiased estimates in the presence of heteroscedasticity which is commonly found in trade data (Barro and Tenreyro, 2007). Moreover, PPML performs well in both small and large samples, according to a Monte Carlo study by Egger and Staub (2016), comparing various estimators. The exponential form of the augmented gravity model estimated with PPML can be written as:

$$X_{ijspt} = exp\big[\beta_0 + \beta_1 lnCHX_{ispt} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 contig_{ij} + \beta_5 landl_j + \beta_6 island_j + \beta_7 rta_{ijt} + \gamma_t\big] * \varepsilon_{ijspt},$$

where X_{ijspt} is the import value of commodity p, within HS section s, by importing country i from exporting country j, in year t. $lnCHX_{ispt}$ is the logarithm of US import value for commodity p from China in the year t. The remaining variables are logarithms of nominal exporter GDP lnY_j and of the weighted distance between importer and exporter lnD_{ij}, as well as dummy variables taking the value one if the exporter is landlocked, an island, shares a border, or has a trade agreement with the x in year t. Lastly, year-fixed effects are included to account for the US and global economic conditions, absorbing annual importer-specific variables like US GDP.

[1] The eight industrialized countries are Australia, Denmark, Finland, Germany, Japan, Spain, Switzerland, and New Zealand.

A further estimation issue, pointed out by Anderson, and van Wincoop (2003), is adequately accounting for multilateral resistance. As mentioned above, these resistance terms describe factors like relative trade costs. For instance, producers on an island nation close to the US might face higher absolute export costs than a country that can transport its exports via land. However, if shipping costs to the US are lower than the costs of exporting to any other country, the exporter on the island nation faces relatively low resistance and is thus more likely to export to the US despite the high absolute costs. Likewise, the country shipping via land might directly border several other nations, for which transport costs might be even lower, decreasing its propensity to trade with the US. Popular approaches to account for the MRTs are the inclusion of remoteness indices that measure the weighted distances between countries or the inclusion of dummy variables for landlocked or island nations; however, these measures have been criticized for lacking theoretical consistency since they ignore economic determinants of multilateral resistance and rely primarily on geographical characteristics to estimate MRTs (Anderson and Van Wincoop, 2003; Bacchetta et al., 2012; Head and Mayer, 2014). A structurally consistent approach is the use of exporter and country fixed effects, first employed by Harrigan (1996) and adopted for panel data by Olivero and Yotov (2012). They suggest using exporter and importer-time fixed effects.

However, because country-time fixed effects absorb country-level time-varying variables like GDP, they are incompatible with most instrumental variables commonly used in the export competition literature. Consequently, many authors have chosen not to account for MRTs properly, despite the dangers of their omission (Baldwin and Taglioni, 2007). Authors who circumvent this issue by interacting Chinese import values with other characteristics of export countries can only retrieve the relative impact of Chinese competition (Edwards and Jenkins, 2014; Kong and Kneller, 2016). To estimate the absolute impact, Elleby et al. (2018) choose to avoid instrumental variables altogether, trusting in fixed effects to account for all endogeneity. Because the analysis in this document relies on an instrumental variable that varies across time and commodities, coefficients for the export competition are not affected by the inclusion of country-sector-time fixed effects used to account for multilateral resistance.

A critical caveat of an estimation strategy involving such high dimensional fixed effects is that the estimator can become inconsistent and substantially biased away from zero for most non-linear models, an issue known as the incidental parameter problem (Lancaster, 2000). While Poisson models are a notable exception to this problem in a standard setting, they, too, become inconstant when accounting for an endogenous regressor using instrumental variables (Cameron and Trivedi, 2013). Accounting for structural terms thus requires estimating a linear model and risks a bias due to the omission of zero values discussed above.

In this chapter, two model specifications are estimated to account for both zero values and MRTs. First, a non-linear Poisson specification without high dimensional fixed effects is used to account for zero trade flows. This specification accounts for remoteness only by including geographical dummy variables for landlocked and island nations. Second, two linear specifications that include country-year and country-sector-year fixed effects, respectively, are estimated to control the robustness of the estimates when accounting for MRTs. The linear augmented gravity models featuring fixed effects can be written as:

$$lnX_{ijspt} = \beta_0 + \beta_1 lnCHX_{ispt} + \gamma_{ijst} + \varepsilon_{ijspt},$$

where γ_{ijst} are, depending on the model, exporter-year or exporter-sector-year fixed effects. Since the data contains only one importer, directional time-fixed effects absorb all importer and country-pair characteristics.

Table 1 summarizes the four estimation challenges outlined above and how the different gravity model specifications address them. The estimation strategy draws on all specifications. The general model fit and the instrumental variables' robustness are determined with various specification tests. Full sample estimates of baseline PPML and OLS specifications are estimated to confirm the fit of the gravity model. The results of these baseline models are assessed to determine whether they lie within the standards suggested by the gravity model literature. The baseline model is then augmented using Chinese exports. Two versions of the augmented model are estimated: the non-linear Poisson specification, which accounts for zero trade flows, and the linear specification, which accounts for MRTs via the inclusion of country-sector-year fixed effects. The impact of export competition is estimated for all products as well as for individual sectors using both model specifications.

Table 1
Estimation challenges addressed by different gravity model specifications

	Estimation Challenges Addressed			
	Endogeneity of Chinese exports	Zero Values	Heteroskedasticity	Multilateral Resistance
Gravity OLS	No	No	No	No
Gravity PPML	No	Yes	Yes	No
Augmented Gravity IV Poisson	Yes	Yes	Yes	No
Augmented Gravity 2SL2	Yes	No	No	Yes

Source: Authors' elaboration.

VI. Data

The gravity models are estimated using US import data at the product level retrieved from the US International Trade Commission (USITC) trade and tariff data (USA Trade Online, 2022, usatrade.census.gov). The sample includes 33 exporters and the US as an importer and spans the period from 2002 to 2020.[2] We estimate all models using 2, 4, 6, and 10-digit HS data. Import values for third industrialized markets used to construct the Chinese import instrumental variables are retrieved from the UN Comtrade database at HS 2, 4, and 6-digit levels. Sectoral variables conform to the 21 HS sectional categories. Data on regional and bilateral trade agreements and bilateral distance are sourced from the CEPII Gravity Database (Conte, Cotterlaz, and Mayer, 2021) from 2002 to 2019. For 2020, the data was compiled by the authors of this article. GDP of exporters in constant 2010 dollars is sourced from CEPALSTAT. China's real GDP in current dollars is sourced from the World Bank's national accounts data. Real GDP in current USD of LAC countries is sourced from CEPALSTAT. The distance measure is stated in km and equal to the population-weighted distance between most populated cities.[3] Other geographical dummies specifying whether countries share a border are landlocked, or an island is partly taken from the Rose (2004) dataset and partly compiled by the authors.

[2] The 33 countires are Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bol, Bolivarian Republic of Vene-zuela, Brazil, Chile, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, French Guiana, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Plurinational State of Bolivia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay.

[3] Its calculation was originally proposed by Head and Mayer (2002) and can be stated as $d_{ij} = \left(\sum_{k\epsilon i}(pop_k/pop_i)\sum_{l\epsilon j}(pop_l/pop_j)d^{\theta}{}_{kl}\right)^{1/\theta}$, where pop_k and pop_l are the populations of agglomerations k and l in country i and j respectively. The parameter θ expresses the sensitivity of trade flows to bilateral distance d_{kl} bilateral and is equal to 1 in our case.

VII. Results

A. Baseline gravity model

We estimate a baseline gravity model that includes real exporter GDP, weighted distance, and dummy variables for geographical features and trade agreements. The model is estimated using HS 2, 4, 6, and 10-digit level data, using PPML and OLS for comparison. Standard errors are clustered by exporters' respective HS chapters, which equate to country pair-sector fixed effects in the absence of importer variation. Table 2 reports the results at the HS 10-digit level.

PPML estimates for the sample period are of the expected signs and magnitudes.[4] Geographical remoteness dummies for island and landlocked countries are negative. In contrast, the positive estimate for the contingency dummy, which is one if countries share a border, reflects Mexico's higher propensity to trade. However, the large discrepancy between PPML and OLS estimates at the 10-digit level merits attention. OLS estimates for LAC GDP are smaller, likely reflecting the effect of zero values. Under OLS, zero values are excluded after log linearizing the dependent variable and are thus not reflected in the results. When estimating the model at higher aggregation, where fewer observations take the value zero, OLS estimates for GDP and distance are closer to the PPML estimates. The finding suggests that estimating gravity models based on more aggregate data or linear estimation methods risks underestimating effects partly reflected by trade flows that take the value zero.

[4] The estimates sign and value are in line with averages of coefficients from 159 papers using gravity models presented by Head and Mayer (2014).

Table 2
Baseline gravity estimation at HS 10-digit level

	(I) PPML	(III) OLS
ln_gdp_lac	0.796***	0.163***
	(0.139)	(0.0558)
ln_distw	-1 415	-0.188
	(0.940)	(0.217)
Contig	0.942	1.465***
	(0.881)	(0.341)
Landl	-0.888	-0.390
	(0.625)	(0.315)
Island	-0.937	-0.148
	(0.863)	(0.187)
Rta	-0.0137	0.117
	(0.484)	(0.106)
Constant	1 139	0.254
	-2 278	(0.482)
Observations	19 032 585	722 308

Source: Author's estimations.
Note: Pseudo Poisson maximum likelihood (PPML) and ordinary least squares (OLS) results for baseline gravity estimations using exporters' log nominal GDP, log population-weighted distance, and border, landlocked, island, and trade agreement dummies.

B. Specification tests

Several tests confirm the robustness of the model specifications. The Durbin-Wu-Hausman confirms the endogeneity of Chinese imports, rejecting the null of exogeneity, as expected. To account for the endogeneity, an augmented gravity model using the log of Chinese real GDP and the log of Chinese exports to third industrialized nations, normalized by respective total imports at the 2, 4, and 6-digit levels, are employed as instrumental variables. The latter instrument is calculated as laid out in Section 4. Both instruments are strongly correlated with Chinese exports (see Table 4). Since Chinese GDP could impact both Chinese and LAC exports through its effects on the demand for LAC goods, the instruments are tested for overidentification. Using a Kleibergen-Paap rk LM test, the null hypothesis of under-identification is rejected. The test for overidentification fails to reject the null hypothesis that additional instruments are exogenous. Lastly, a RESET test is performed. Here, too, the null hypothesis that coefficients are zero when including non-linear combinations of the fitted values to help explain the response variable cannot be rejected. Therefore, the non-linear model with endogenous regressor is well specified. Specification test results for the HS 10-digit level are reported in Table 3.

A linear specification with country and sector-time fixed effects is estimated to control for the robustness of estimates with respect to multilateral resistance. Since time-fixed effects absorb yearly values of Chinese GDP, the linear specification relies only on the instrument calculated from third nations' imports. In addition to multilateral resistance, the fixed effects specification addresses two other sources of potential bias. First, fixed effects account for potentially remaining endogeneity stemming from shocks to global trade. Second, by excluding zero values entirely, any potential bias that could arise from zero values caused by rounding rather than export competition is avoided. As pointed out above, excluding zero values likely comes at the cost of a considerable downward bias in the absolute magnitude of coefficients. The linear estimates are thus very conservative and viewed as a lower bound for the actual size of the displacement effect.

Table 3
IV and specification tests at HS 10-digit level

Specification test	(I) PPML, two instruments	(II) PPML, one instrument	(III) Kleibergen-Paap rk LM	(IV) Durbin-Wu-Hausmann	(V) Hansen's J	(VI) Reset
ln_chimp_iv	0.893***	0.892***				
	(0.0290)	(0.0294)				
ln_gdp_ch	0.559***					
	(0.0159)					
Constant	-0.971***	0.323***				
	(0.0510)	(0.0540)				
Observations	14 199 636	14 199 636				
Test statistic			156 903	259.19	0.828	0.70
p-value			0.0000	0.0000	0.3628	0.4045

Source: Authors' estimations.
Note: Robust standard errors clustered by HS sections in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

C. Instrumental variable results

Table 4 reports the results of the Poisson model with endogenous regressor using HS 2, 4, 6, and 10-digit level US import data and the instrumental variables discussed above. The model is estimated using GMM and includes standard gravity covariates, geographical dummies to account for remoteness, and a trade agreement dummy. Gravity estimates are significant across aggregation levels and take the expected signs and magnitudes with slight variations between aggregation levels. Geographical dummies take the expected sign, reflecting the lower propensity to trade for relative remote countries.

Coefficient estimates for the effect of trade agreements deserve special attention. The dummies are significant and positive. Estimating the model at the 2-, 4-, and 6-digit level, trade agreements accounted for about a 0.48 to 0.63 percent increase in export value during the sample period. At the 10-digit level, the positive effect is estimated to be 1.5 percent. Notably, the impact of trade agreements becomes significant only after controlling for Chinese export competition. This result could suggest that the negative effects of export competition can cloak the benefit of trade agreements.

The effect of Chinese imports is significant and negative across aggregation levels. Like GDP and trade agreement coefficients, its absolute magnitude is largest at the 10-digit level. A percentage increase in the value of imports from China for a given commodity resulted in a decrease of imports from LAC of the respective commodity by about 0.31 percent when measured at the 2-digit level, 0.29 percent at the 4-digit level, 0.4 percent at the 6-digit level, and 1.26 percent at the 10-digit level. As mentioned above, the increase in the absolute magnitude of most coefficient estimates at higher disaggregation levels could reflect the richness of information in the more detailed data.

Table 4
Poisson IV results

	(I)	(II)	(III)	(IV)
HS level	2	4	6	10
ln_imp_ch	-0.311**	-0.289***	-0.402***	-1.257***
	(0.138)	(0.0897)	(0.144)	(0.127)
ln_gdp_lac	0.958***	0.673***	0.432***	0.986***
	(0.126)	(0.126)	(0.162)	(0.137)
ln_distw	-1.623***	-1.273**	-0.832	-1.956***
	(0.487)	(0.562)	(0.821)	(0.643)
contig	0.580	1.791**	2.707***	2.004**
	(0.809)	(0.758)	(0.926)	(0.988)
landl	-0.464	-1.241**	-1.901***	-0.330
	(0.655)	(0.574)	(0.713)	(0.704)
island	-0.472	-0.876*	-0.806	-1.308***
	(0.440)	(0.525)	(0.772)	(0.476)
rta	0.628**	0.553***	0.483*	1.506***
	(0.263)	(0.208)	(0.281)	(0.342)
Constant	1 705	1 205	1 510	8.199***
	-1 177	-1 336	-2 037	-1 523
Observations	60 225	705 408	2 669 964	7 942 704

Source: Authors' estimations.
Note: Poisson results for gravity models at different levels of HS aggregation, augmented with log US import value from China using instrumental variables normalized third nations' shares of imports from China and Chinese GDP.
Robust standard errors clustered by country pair HS sections. *** p<0.01, ** p<0.05, * p<0.1.

To control for potential biases stemming from unobserved time trends as well as the multilateral resistance terms discussed above, we estimate two fixed effect specifications. These are estimated using 2SLS since the incidental parameter problem prohibits the inclusion of high dimensional fixed effects in a Poisson model with an endogenous regressor. Based on the results at the 2-digit level, we expect the omission of zero values in the fixed effects model to reduce the absolute magnitude of estimates and potentially underestimate the effect of Chinese imports. Table 5 reports the results of the two linear models. Both the country pair-fixed effect specification and the country pair-sector-fixed effect specification show significant and negative estimates for Chinese exports, corroborating the results of the non-linear model. As expected, the estimates of the two models are lower, suggesting respectively that a percentage increase in Chinese imports lead to 0.41 or 0.25 decrease in LAC imports. Because potential biases of the non-linear and linear model point in the opposite direction, we judge the negative effect of export competition on LAC exports to be between 0.25 and 1.26 percent, with the lower value being a notably conservative estimate.

Table 5
Fixed effect results at HS 10-digit level

2SLS FE	(I) exp-year	(II) exp-sitc-year
ln_imp_ch	-0.414***	-0.247***
	(0.0491)	(0.0383)
Observations	608 839	608 314

Source: authors' estimations.
Note: Different fixed effects results for linear gravity models augmented with log US import value from China, using as instrumental variable normalized third nations' shares of imports from China. Robust standard errors clustered by country pair HS sections.
*** p<0.01, ** p<0.05, * p<0.1.

D. Industry results

Separating the sample of HS 10-digit level data by SITC sections, we estimate the Poisson model separately for manufacturing and resource-based products and report results in Table 6. Gravity covariates are significant and of the expected signs. The distance parameter estimate is higher for manufacturing products, most of which are imported from Mexico and Central America and thus in proximity to the US. The landlocked dummy is negative but insignificant for manufacturing products and negative and significant at the 5 percent level for resource-based products, a result that is likely driven by the relative export structures of Bolivia and Paraguay. A similar line of reasoning explains the higher magnitude of island dummy estimates for resource products. The trade agreement dummy is positive and significant for manufacturing but not for resource-based products. On average, countries with trade agreements exported 0.88 percent more manufacturing goods to the US. This finding is especially interesting given the significance of manufacturing products for the export diversification of Latin American countries.

Table 6
Poisson IV results for industries at HS 10-digit level

SITC sections	(I) 5-8, manufacturing	(II) 0-4, resource-based
ln_imp_ch	-0.402***	0.0580
	(0.143)	(0.0508)
ln_gdp_lac	0.784***	0.902***
	(0.165)	(0.158)
ln_distw	-2.515***	-1 294
	(0.659)	-1 054
Contig	1 098	-0.958
	(0.931)	-1 218
Landl	-0.189	-1.446**
	(0.706)	(0.703)
Island	-1.423***	-1.819**
	(0.523)	(0.914)
Rta	0.883***	0.535
	(0.285)	(0.937)
Constant	17.24***	0.322
	-5 457	-8 742
Observations	7 379 657	558 625

Source: authors' estimations.
Note: Poisson results for gravity models estimated for manufacturing and resource-based products, augmented with log US import value from China, using as instrumental variables normalized third nations' shares of imports from China and Chinese GDP.
Robust standard errors clustered by country pair HS sections. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The estimated effect of Chinese imports is negative and significant for the manufacturing sector products but not for resource-based products. For manufacturing goods, a percentage increase in import value from China decreased LAC exports by about 0.4. The results from the fixed effects specification in Table 7 confirm the difference between the two categories. The linear model, including country pair-year fixed effects, estimates a percentage increase in Chinese manufacturing imports to decrease LAC imports by 0.4 percent and Chinese resource imports to reduce LAC imports of the same commodities by 0.1 percent. Including country pair-sector-year effects, the negative impact for manufacturing products is 0.3 percent while becoming insignificant for resource-based products.

Table 7
Fixed effect results for industries at HS 10-digit level

	(I)		(II)	
SITC Section	5-8, manufacturing		0-4, resource-based	
2SLS FE	exp-year	exp-sitc-year	exp-year	exp-sitc-year
ln_imp_ch	-0.403***	-0.300***	-0.106**	0.0368
	(0.0648)	(0.0466)	(0.0505)	(0.0380)
Observations	549 681	549 623	58 011	57 708

Source: authors' estimations.
Note: Different fixed effects results for linear gravity models for manufacturing and resource-based products, augmented with log US import value from China, using as instrumental variable normalized third nations' shares of imports from China.
Robust standard errors clustered by country pair HS sections. *** p<0.01, ** p<0.05, * p<0.1.

VIII. Conclusions

This paper investigated the effect of US imports from China on US imports from LAC countries between 2002 and 2020. Using a sample of 33 LAC countries and product-level trade data disaggregated up to the 10-digit level, we estimated a Poisson model following an instrumental variable approach using GMM and two instruments, Chinese GDP and an instrument constructed from Chinese exports to eight other industrialized nations. We employed a second, linear model specification that included country-time and country-sector-time fixed effects to account for the multilateral resistance terms that Anderson and Van Wincoop (2003) pointed out.

Our results indicate that a percentage increase in imports from China decreased imports from LAC at the 10-digit level between 0.25 and 1.26 percent. The smaller estimates stem from more conservative linear fixed effect estimation and are potentially subject to a downward bias due to the omission of zero values. Conversely, higher estimates from the Poisson specification avoid such bias but omit structural trade terms. Countries with trade agreements in place traded up to 1.5 percent more. The positive effect of trade agreements becomes significant only after controlling for Chinese export competition. This result could suggest that their benefits may often be cloaked by the negative impact of the export competition. The sectoral decomposition shows that the effect of Chinese exports is negative and significant for manufacturing products, where a percentage increase led to a decrease in US imports from LAC countries by about 0.4 percent. For resource-based products, the estimated effect is insignificant.

Bibliography

Anderson, J. E. & Van Wincoop, E. (2003), "Gravity with gravitas: A solution to the border puzzle", *American economic review*, vol. 93, No. 1.

Artecona, R. & Perrotti, D. E. (2021), "Latin America and the Caribbean exports to the United States: Analysis of the competition with China and other regions at product level, 2002-2018", *Economic Commission for Latin America and the Caribbean, ECLAC Office in Washington, DC*.

Athukorala, P. (2009), "The rise of China and East Asian export performance: Is the crowding-out fear warranted?", vol. 32, No. 2, Wiley Online Library.

Bacchetta, M. et al. (2012), "*A practical guide to trade policy analysis*", Geneva, CH: World Trade Organization

Baldwin, R. & Taglioni, D. (2007), "Trade effects of the euro: A comparison of estimators", *Journal of Economic Integration*, JSTOR.

Barro, R. & Tenreyro, S. (2007), "Economic effects of currency unions", *Economic Inquiry*, vol. 45, No. 1.

Blázquez-Lidoy, J., Rodríguez, J. & Santiso, J. (2006), *Angel or Devil? China's Trade Impact on Latin American Emerging Markets*, (journalAbbreviation: CEPAL Review), CEPAL Review, July.

Cameron, A. C. & Trivedi, P. K. (2013), *Regression analysis of count data*, Cambridge university press.

David, H., Dorn, D. & Hanson, G. H. (2013), "The China syndrome: Local labor market effects of import competition in the United States", *American economic review*, vol. 103, No. 6.

Devlin, R., Estevadeordal, A. & Rodríguez, A., (2006), *The Emergence of China: Opportunities and Challenges for Latin America and the Caribbean*, (Google-Books-ID: TspPmcyb41cC), IDB.

Dussel Peters, E. (2016), *La nueva relación comercial entre América Latina y el Caribe-China?` integración o desintegración regional?*, UDUAL.

Edwards, L. & Jenkins, R. (2014), "The margins of export competition: A new approach to evaluating the impact of China on South African exports to Sub-Saharan Africa", J*ournal of Policy Modeling*, vol. 36, Elsevier.

Egger, P. H. & Staub, K. E. (2016), "GLM estimation of trade gravity models with fixed effects", *Empirical Economics*, vol. 50, No. 1., Springer.

Eichengreen, B., Rhee, Y. & Tong, H. (2007), "China and the exports of other Asian countries", *Review of World Economics*, vol. 143, No. 2., Springer.

______(2004), "The impact of China on the exports of other Asian countries" *National Bureau of Economic Research.*

Elleby, C., Yu, W. & Yu, Q. (2018), "The Chinese Export Displacement Effect Revisited", FRO Working Paper.

Feenstra, Robert, and Hiau Looi Kee (2004), "On the Measurement of Product Variety in Trade", *American economic review*, 94 (2): 145-149.

Finger, J. M. & Kreinin, M. E. (1979), "A measure of export similarity' and its possible uses", *The Economic Journal*, vol. 89, No. 356, JSTOR.

Geda, A. & Meskel, A. G. (2007), "China and India: What is in it for Africa? The Case of Manufactured Exports", *Department of Economics, Addis Ababa University (mimeo, also at www. alemayeh. com).*

Giovannetti, G. & Sanfilippo, M. (2009), "Do Chinese Exports Crowd-out African Goods? An Econometric Analysis by Country and Sector," *European Journal of Development Research*, vol. 21, No. 4.

Giovannetti, G., Sanfilippo, M. & Velucchi, M. (2012), "The 'China effect' on EU exports to OECD markets: A focus on Italy," *The Chinese Economy*, Springer, pg. 163–180.

Greenaway, D., Mahabir, A. & Milner, C. (2010), "Has China displaced other Asian countries' exports?," *China and the World Economy*, Springer, pg. 60–90.

Harrigan, J. (1996), "Openness to Trade in Manufactures in the OECD" *Journal of international economics*, vol. 40, No. 1–2, Elsevier.

Head, K. & Mayer, T. (2014), "Gravity equations: Workhorse, toolkit, and cookbook" *Handbook of international economics*, Elsevier, pg. 131–195.

Helpman, E., Melitz, M. & Rubinstein, Y. (2008), "Estimating trade flows: Trading partners and trading volumes" *The quarterly journal of economics*, vol. 123, No. 2, MIT Press.

Jenkins, R. (2014), "Chinese competition and Brazilian exports of manufactures" *Oxford Development Studies*, vol. 42, No. 3, Taylor & Francis.

Jenkins, R., Peters, E. D. & Moreira, M. M. (2008), "The Impact of China on Latin America and the Caribbean" *World Development*, The Impact of Asian Drivers on the Developing World, vol. 36, No. 2, February 1.

Kong, Y. F. & Kneller, R. (2016), "Measuring the Impact of China's Export Growth on its Asian Neighbours" *The World Economy*, vol. 39, No. 2, Wiley Online Library.

Lall, S. (2000), "The Technological structure and performance of developing country manufactured exports, 1985-98" *Oxford development studies*, vol. 28, No. 3, Taylor & Francis.

Lall, S. & Weiss, J. (2007), "China and Latin America: Trade Competition, 1990-2002" Paris, OECD, pg. 85–107, May.

Lancaster, T. (2000) "The incidental parameter problem since 1948," *Journal of Econometrics*, vol. 95, No. 2, April 1.

Lederman, D., Olarreaga, M. & Soloaga, I. (2007), "The Growth of China and India in World Trade : Opportunity or Threat for Latin America and the Caribbean?" (Accepted: 2012-06-06T19:03:42Z), Washington, DC, World Bank, August.

López-Córdova, E. et al. (2008), "How Sensitive Are Latin American Exports to Chinese Competition in the U.S. Market? [with Comments]," *Economía*, vol. 8, No. 2, Brookings Institution Press.

Módolo, D. B. & Hiratuka, C. (2017), "The impact of Chinese competition on third markets: An analysis by region and technological category," *Development Policy Review*, vol. 35, No. 6, Wiley Online Library.

Olarreaga, M., Lederman, D. & Perry, G. (2007), "Latin America´s response to China and India: overview of research findings and policy implications - Observatorio de Política" *Revista de Economía y Estadística*, vol. XLV, January 1.

Olivero, M. P. & Yotov, Y. V. (2012), "Dynamic gravity: endogenous country size and asset accumulation" *Canadian Journal of Economics/Revue canadienne d'économique*, vol. 45, No. 1, Wiley Online Library.

Pham, C. S. et al. (2017), "Has China Displaced its Competitors in High-tech Trade?" *The World Economy*, vol. 40, No. 8, Wiley Online Library.

Schott, P. K. (2006), *The relative revealed competitiveness of China's exports to the United States vis a vis other countries in Asia, the Caribbean, Latin America and the OECD*, IDB-INTAL.

Stanojevic, S., Bin, Q. & Jian, C. (2020), "Sino-EU15 Export Competition in Central and Eastern Europe: Is China Crowding Out Exports from the EU15?" *Eastern European Economics*, vol. 58, No. 3, Taylor & Francis.

Zeidan, R. (2015), "The displacement effects of Chinese exports on the US clothing market" *Journal of Chinese Economic and Business Studies*, vol. 13, No. 3, Taylor & Francis.

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