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International Trade and Income Inequality: The Case of Latin American Countries

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ABSTRACT

The literature suggests that international trade may have different results over income inequality according to a country's trade and economic structure. The main goal of this article is to analyze the impact of international trade on income inequality in Latin American countries between 1997 and 2020. Our results suggest that international trade variables, such as trade openness and economic complexity, are highly significant and have impacted the income distribution. The results show that following the process of trade openness, the "simplification" of the economy led to a reduction in income inequality in the region.

KEYWORDS

Income inequality; international trade; Latin America; trade openness; trade structure

I. Introduction

During the last decades, globalization – specifically trade – has grown significantly and is widely regarded as one of the main drivers of global economic growth (Jaumotte, Lall, and Papageorgiou 2013). However, the impact of the increase in trade flows in the well-being of populations and, in particular, over income disparities within countries is a controversial subject in the economic literature. The evidence suggests that an increase in international trade may have different results over income inequality according to the country's trade and economic structure and to the degree and specificities of the openness process (e.g., Anderson 2005; Hartmann et al. 2017).

To this purpose, Hellier and Chusseau (2012) state that, in regards to the effect of trade openness upon inequality, the Heckscher-Ohlin-Samuelson (HOS) model predicts a decrease in inequality in developing countries when trade openness is implemented. The theorem argues there will be an increase in the real return of the factor used extensively in the export sector and a reduction in the real return of the factor used extensively in the import sector. Thus, according to Meschi and Vivarelli (2009), in the context of low-

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skilled labor-abundant developing countries, international trade should raise the prices for this kind of labor force to provoke a more even wage distribution.

Hellier and Chusseau (2012) contrast the Heckscher-Ohlin-Samuelson (HOS) model with the Kuznets hypothesis, which suggests that countries in the intermediary stages of economic development have higher levels of inequality (Kuznets 1955). As a consequence, inequality should increase in the initial stages of development, due to the enlargement of the modern sector and the increase in exports as a result of changes in the economy's orientation from autarchy to international trade. However, several empirical studies complement the Kuznets hypothesis, suggesting there is no evidence of a systematic relationship between the income per capita and income inequality (Bourguignon 2015), and providing evidence of the existence of several mechanisms and policies that determine the evolution of inequality.

In addition, there are studies that seek to further explore the implications of international trade over income inequality and focus on the impacts of openness and trade structure on inequality. According to Anderson (2005), three different hypotheses can be drawn to distinguish the effects of openness over income inequality: (i) increases inequality in all countries; (ii) decreases in developing countries, but rises in developed countries, and (iii) has a diverse effect according to the factor endowments of countries. However, the existing literature shows no conclusive empirical findings on the effects of openness on inequality. In what concerns trade structure, few studies analyze its impact on income inequality. Using the Economic Complexity Index (ECI) to assess the degree of sophistication of a countries' productive structure, Hartmann et al. (2017) concluded that complex product exporters have lower levels of income inequality if compared with simple products exporters.

In the case of Latin American countries, Hellier and Chusseau (2012) claim that Latin America tends to contradict the predictions of the HOS theorem, as trade openness increases income inequality. The authors mention the work of Pagés and Márquez (1998) for Latin America and the Caribbean and Green, Dickerson, and Arbache (2001) for Brazil, both sustaining this statement. However, studies analyzing more recent data show that there has been a reduction in inequality in the region at least since the 2000s. According to the literature (e.g., Bresser-Pereira 2008; De la Torre, Messina, and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017), several Latin American countries witnessed Dutch disease effects, which may have led to the fall in inequality due to changes in the labor market.[1]

[1]According to Bresser-Pereira (2008), Dutch disease may occur in the presence of abundant and inexpensive human or natural resources, in a situation in which growth in the booming export sector leads to currency appreciation, a reduction of the competitiveness of the manufacturing sector, and to low profitability of technological tradable goods.

Understanding the links between international trade and income inequality in Latin America is the main purpose of this article. More specifically, this research investigates whether trade flows and trade structure influence income inequality in Latin American countries.[2] The central questions to answer are the following: What is the evidence concerning trade structure and income inequality in Latin American? What is the relationship between openness to trade and income inequality? Is the complexity of exports relevant for inequality reduction?

This research focuses on Latin America for several motives. Firstly, despite being one of the most unequal regions in the world,[3] it showed a significant reduction of its income disparities in the 2000s.[4] Also, in the past decades, the region presented important shifts in the external trade policy for most of its countries, which have not been sufficiently explored in academic studies. In addition, the increasing relevance of international trade for the region[5] and the importance of controlling income inequality for social and political stability demonstrate the importance of understanding the relationship between international trade and income inequality in Latin America for policymaking purposes.

This study's contributions can be translated into four groups of messages: (i) demonstrate how international trade has contributed to the reduction of inequality on a continent overwhelmed by this problem; (ii) demonstrate that the social and economic benefits brought by trade are essentially cyclical and highly dependent on favorable global conditions (commodity boom); (iii) be alert to the tension between short- and long-term gains: despite bringing social and economic gains in the short term, trade contributes to a weakening of the economy in the long run (simplification of the economy), leaving the continent even more vulnerable; and (iv) suggest that new cycles of favorable global conditions generate policies that favor the complexification of the economy to make it more resilient and sustainable.

In addition to the economic risks that have been discussed for decades in the region with respect to the impoverishing effect of natural resources caused by the decline of terms of trade (inspired by Raul Prebish's

[2]Most mechanisms that explain income inequality are actually focused on functional inequality (share of total income received by each production factor) rather than personal income inequality (share of total income received by each individual or household). However, the first are useful for understanding the patterns of personal income inequality; according to Messina and Silva (2017), in Latin America, labor income explains 73% of the total household income on average.

[3]Out of the 30 most unequal countries – on ranking using the Gini coefficient developed by the Central Intelligence Agency – 13 are Latin American. Data is available at https://www.cia.gov/library/publications, accessed on August 15, 2018.

[4]The Gini index runs from 62 in 1990 to 38 in 2020 for selected countries in Latin America. Data on income inequality (Gini index) is available on an annual basis and is constructed by the World Development Indicators (WDI), World Bank. Available at https://data.worldbank.org/indicator/, accessed on November 14, 2022.

[5]The value of merchandise exports for the region went from US$158 billion in 1990 – which represented only 23% of the region's GDP – to US$1.2 trillion, reaching almost 37% of the region's GDP in 2011. Data for merchandise exports (current US$) and for merchandise trade (% of GDP) is available at https://data.worldbank.org/indicator, accessed on November 28, 2018.

findings), the continent is currently threatened by even more hostile issues, such as climate change, which may exhaust the possibilities of a region specialized in commodity production. New cycles of commodity appreciation will arise and should favor the complexification of the local economy. As such, this research hopes to contribute to the elaboration of smart policies that will benefit the long-term development of Latin America. To the best of our knowledge, the link between trade and inequality has been scarcely explored by scientific studies, and in particular, no study focuses on the link between trade structure and income inequality for the region. Thus, we intend to fill this research gap with this study.

We use a multivariate econometric model to empirically assess the effects of international trade over income inequality. This methodology is the standard choice for research conducting similar quantitative empirical studies. We use panel data for 14 countries in Latin America from 1997 to 2020. The dependent variable is income inequality, and we use trade indicators as explanatory variables, besides other control variables typically considered in the literature.

The article is organized as follows. The following section is devoted to a brief exposition on the interaction between international trade and income inequality. In Sections 3 and 4, we proceed through the economic modeling to study the impact of international trade on income inequality for Latin American countries. Subsequently, we end with final remarks and future research path suggestions.

II. Inequality and trade: Main insights from the literature

In this section, we describe the main mechanisms that explain the relationship between trade and inequality. It is worth mentioning that, according to Harrison et al. (2011), despite the existence of several possible mechanisms to describe the linkages between trade and inequality, most empirical studies still ignore their contributions and focus on the implications of the Heckscher-Ohlin-Samuelson framework.

Heckscher-Ohlin-Samuelson theorem

According to Krugman, Obstfeld, and Melitz (2012), under certain assumptions, such as identical technology and preferences across countries, different factor endowments, factors with internal but not external mobility, we see the Heckscher-Ohlin model has a key proposition: a country has a comparative advantage in products that extensively use production factors the country has in abundance. Thus, exported goods use locally abundant production factors. Another important proposition under the Heckscher-Ohlin model, and known as the Stolper-Samuelson

theorem, is that trade affects the real reward of the production factors. The theorem argues there will be an increase in the real reward of the factor used extensively in the export sector, which is locally abundant, and a reduction in the real reward of the factor used extensively in the import sector, which is locally scarce.

Thus, according to Meschi and Vivarelli (2009), in an autarchic situation, developing countries generally present an abundance of low-skilled labor and a scarcity of high-skilled labor; therefore, the former is relatively cheap and the latter expensive. With trade opening, the prices of goods and services respond to the new situation: products intensive in low-skilled labor become relatively more expensive, if compared with the price of high-skilled labor-intensive products. Also, national factor prices will respond; and consequently, wage rates for low-skilled labor will rise, while wage rates for high-skilled labor will fall. Thus, in the long run, there would be an inequality reduction for developing countries; and as for developed countries, the reverse process occurs with wage inequality increasing.[6]

Dutch disease

Another important mechanism for understanding the relationship between inequality and international trade is the Dutch disease. According to Corden and Neary (1982), the Dutch disease is a pathology that describes the adverse effects to an economy which benefits from a commodity boom in the short run at the expense of de-industrialization in the long run.[7]

The literature for Latin America (e.g., De la Torre, Messina, and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017) states that the Dutch disease impacted inequality mainly through the spending effect mechanism. Accordingly, income growth, a consequence of the performance of the booming sector, induces an expansion of internal demand, especially for non-tradable goods, driving prices for these goods higher and transferring labor away from the manufacturing to the non-tradable goods sector. Guerra-Salas (2018) states that as the latter is a low-skill intensive sector, the spending effect increases the relative demand for low-skilled workers, which reduces the skill premium and, thus, contributes to a reduction in income inequality.

[6]It is worth mentioning that inequality in the Heckscher-Ohlin model refers to functional inequality, i.e., considers the share of total national income that each of the factors of production receives, through wages, profits, or rents, rather than personal inequality, that is, the share of total income received by each individual or household.

[7]According to Corden and Neary (1982), the commodity boom induces: an appreciation in the exchange rate, a resource movement from the rest of the economy into the booming sector (resource-movement effect), an increase in the domestic demand for services (spending effect), rising prices and output in the non-tradable sector, and worsening de-industrialization.

Economic complexity

Hartmann et al. (2017) introduce the Economic Complexity Index (ECI) that assumes the development of a country is associated with the intensity of knowledge incorporated in its economy. In turn, this knowledge is expressed by the number of activities performed and the complexity resulting from the interaction of these activities. In a given country, higher ECI values reveal the production of more complex products; similarly, lower values indicate less sophisticated economies. Hartmann et al. (2017) conclude that a higher ECI is related to a decrease in inequality because the sophistication of a productive structure is decisive to a country's capacity to distribute income.

Empirical studies on international trade and inequality

Next, we summarize the empirical literature on trade and inequality, starting with studies that explore the effects of trade openness on inequality. We then focus on trade structure; and finally, we analyze research on trade in Latin America.

Openness

A significant body of literature focuses on the effects of openness over income distribution within countries. According to Anderson (2005), three different hypotheses can be drawn to distinguish the effects of openness over income inequality, in which greater openness: (i) increases inequality in all countries; (ii) decreases in developing countries but rises in developed countries, and (iii) has a diverse effect according to the factor endowments of countries. The influence of the Heckscher-Ohlin model is seen in the second and third hypotheses, in which the proportion of factors is a determinant for income distribution.

Anderson (2005) argues there is virtually no support for the first hypothesis, in which openness increases inequality in every country. According to Lundberg and Squire (2003), using different measures of openness and analyzing a sample for the period of 1960 to 1994 from 38 countries, there is no significant overall positive correlation between openness and income distribution. Beaton, Cebotari, and Komaromi (2017) also refute the idea that trade openness necessarily promotes income inequality, and Cassette, Fleury, and Petit (2012) argue that different results can be obtained from a short-term or long-term perspective on the economy.

Secondly, Anderson (2005) supports the fact that there is contradictory evidence concerning the hypothesis of inequality reduction after trade openness in developing and developed countries. According to Calderón and Chong (2001), who analyze a sample from 1960 to 1995 of 102 countries, there is evidence of inequality reduction for developed countries and an increase for developing countries. However, a recent study from Khan and

Nawaz (2019) for CIS member countries[8] from 1990 to 2016 shows that trade openness appears to be significant in reducing income inequality for this specific group of developing countries.

Finally, Fischer's (2001) study endorses the idea drawn on the third hypotheses. Examining a sample of 66 countries with observations for each five-year period beginning in 1965, the author finds that the impact of openness on inequality intensifies as countries' endowments of human capital rise. Conversely, he observed the opposite effect when considering endowments of capital.

Trade structure

In addition to the effect of openness, other authors, focusing on the type of exports and trading partners, analyze the impact of trade structure over inequality and economic performance.

Several empirical studies seek to explore economic and trade structure through disaggregated data and analyze products or the mix of products and their relationship with economic development and inequality. The cause of the composition of a given mix may vary according to Leamer et al. (1999). The key idea is that the product mix depends upon factor endowments. For example, countries rich in natural resources present one type of product mix while countries where natural resources are rare show a different mix. Analyzing two datasets from 1980 and 1990, the authors state that different development paths occur according to the intensity of the factors of production. Also, within natural resource intensive products, the authors differentiate the development paths of countries producing permanent and temporary crops. Accordingly, permanent crops, such as bananas and coffee, present a positive association with income inequality, while temporary crops, such as cereals and forest products, are negatively associated.

Hausmann, Hwang, and Rodrik (2007) claim the importance of analyzing the mix of products to comprehend the path of development adopted by a country. According to the authors, "not all good are alike in terms of their consequences for economic performance. Specializing in some products will bring higher growth than specializing in others" (Hausmann, Hwang, and Rodrik 2007, 1).

In the sequence of Hausmann, Hwang, and Rodrik's (2007) work, Hartmann et al. (2017) introduce the concept and an index of economic complexity. The Economic Complexity Index (ECI) combines two layers of information to define the degree of sophistication of its productive structure: diversity, measured by the number of exported products in which the country presents revealed comparative advantages, and ubiquity, measured by the number of countries that export that product. After analyzing data from 150 countries for 45 years (1963 to 2008), they

[8]According to its website, the Commonwealth of Independent States (CIS) was created in December 1991 and is composed of the following countries: Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan, and Ukraine. Available at http://www.cisstat.com/eng/cis.htm, accessed on April 2, 2019.

concluded that complex products exporters have inferior levels of income inequality if compared with simple products exporters.

In addition to the mix of exports, another relevant variable is the degree of exports diversification. According to Isham et al. (2005), export concentration, especially in natural resources, is associated with weak institutions and slow growth. Analyzing data from 1974 to 1997, the authors affirm that countries dependent on products obtained from a contracted economic or geographic source, such as minerals and oil, are inclined to higher social and economic inequality as well as debilitated institutions.

The characteristics of the trading partner constitute another relevant aspect, with effects on income inequality. Diverse authors analyzing different regions and periods reach diverging conclusions in this regard. According to Fawaz and Rahnama-Moghadamm (2019), trade with economically more complex countries is associated with a decrease in income inequality. By contrast, Meschi and Vivarelli (2009) conclude that middle-income developing countries that trade with high-income countries show worse income distribution.

The Latin American case

Most studies for the specific case of Latin America focus on the relationship between openness and inequality and ignore the connection between trade structure and income inequality. Latin America is a relevant case in which trade openness may have induced structural change, followed by a transformation in the trade structure and income distribution.

Hellier and Chusseau (2012) state that Latin America contradicts the predictions of the HOS theory, as trade openness has a negative effect over income inequality. The authors mention the study of Pagés and Márquez (1998), with a sample of 18 countries in Latin America and the Caribbean for the period of 1970 to 1996 that suggests that trade reforms had a negative impact on employment growth. Also, Green, Dickerson, and Arbache (2001) are mentioned, suggesting that – considering data from 1981 to 1999 – trade liberalization in Brazil is associated with a rise in the return of college education.

Studies, however, analyzing more recent data show there has been a reduction in inequality in the region since at least the 2000s. Amarante (2016) mentions the report produced by the Economic Commission for Latin America and the Caribbean (ECLAC) in 2011 to highlight that most Latin American countries presented falling income inequality indicators during the 2000s after a decade (1990s) of rising inequality.

Although no consensus has been reached, a recurrent hypothesis relates to the rise of commodity prices, which have a large influence on the trade balance of these countries, during this period. According to Messina and Silva (2017), during the 2000s, a boom occurred in commodity prices, driven by economic growth in China and other Group of Seven (G7) countries, which led to widespread growth in Latin America. Several studies (e.g., Bresser-Pereira 2008; De la Torre, Messina,

and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017) argue that the commodity prices boom may have led some countries to experience Dutch disease effects, while causing a reduction of inequality in the short term and having uncertain impacts in the long run.

III. Methodology

The model

Aiming to empirically evaluate the role of international trade on income inequality in Latin America, we use an unbalanced panel data model combining annual data from 1997 to 2020 and cross-section data of 14 countries.[9] The literature (e.g., Gujarati and Porter 2009) suggests that panel data regression models are the most suitable for situations in which data combines cross-sectional and time-series observations. We also use the Hausman test in order to define the specification of the common effects in the models (fixed or random effects) and the likelihood ratio test to make conclusions about the redundance of both cross and time fixed effects, described in Appendix 3 online.

The model can be described as follows:

$$I_{it} = \beta_1 + \beta_2 T_{it} + \beta_3 X_{it} + \alpha_i + \varepsilon_{it}$$

where i represents the country ($i = 1, \ldots, 14$), and t represents time ($t = 1997, \ldots, 2020$). I_{it} is the dependent variable and refers to a measure of inequality of a country i at time (year) t; β_1 is the common intercept; β_2 is the vector of coefficients associated with trade variables; T_{it} is the vector of explanatory variables characterizing trade in country i at time t; β_3 stands for the vector of coefficients associated with the control variables; X_{it} is the vector of control variables for country i at time t; α_i is the unobserved country specific effect (in the case of the fixed effects model (FEM), this specific effect is constant, whereas in the random effects model (REM), it is considered a random element); and ε_{it} is the error term for country i at time t.

Data

Dependent variable: income inequality

We use the Gini index to measure the personal income inequality in a country.[10,11] To ensure a more robust estimation, we also consider the Kuznets ratio,

[9]The dataset chosen contains 14 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, and Peru. Data availability for the Gini index was a determinant for selecting both the time horizon and individual countries. We excluded from the database countries with inconsistent data availability, that is, countries with less than 5 observations between 1997 to 2020 or with no data on the Gini index for more than 5 consecutive years.

[10]According to Todaro and Smith (2012, 209), "the Gini coefficient is among a class of measures of inequality that satisfy four highly desirable properties: the anonymity, scale independence, population independence, and transfer principles."

[11]Data for Statistical Databases and Publications, 1997 to 2020, Comisión Económica para América Latina (CEPAL), available at http://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp/, accessed November 14, 2022.

which includes the proportion of income received by the top 20% and the bottom 40% of the population (Todaro and Smith 2012).

As we see in Figure 1, there is a general downward trend in income inequality in Latin America for the period studied. Given the importance of extraction to inequality (Leamer et al. 1999), we also explore the link between natural resources and inequality. We group the 14 studied countries into two different groups, high and low exports of primary products (EPP), and consider as the threshold the average EPP.[12] Figure 1 shows that the degree of inequality varies according to countries' intensity in the exports of primary products. As seen at the beginning of the period, countries with a high intensity of exports of primary products (Group 1) presented higher levels of inequality when compared with those characterized by a lower intensity of primary products exports (Group 2). However, countries highly intensive in the exports of primary products showed an accelerated reduction in the inequality levels.

Explanatory variables

We consider as explanatory variables the intensity of international trade (trade openness) and its structure (economic complexity, terms of trade, and natural resources rents).[13] In addition, we use control variables (GDP *per capita*, unemployment, employment in industry, average years of education, and political stability) that might impact inequality. We detail and justify the choice of these variables below.

Trade openness. According to Anderson (2005), in recent decades, numerous developing countries have become more open to the trade of goods and services. Krugman, Obstfeld, and Melitz (2012) point out that, since the 1990s, there has been a rising popularity of emerging markets, which are increasingly integrated into global value chains.[14]

The Heckscher-Ohlin-Samuelson model postulates a decrease in functional inequality in developing countries when trade openness is implemented (Meschi and Vivarelli 2009). However, empirical studies (e.g., Beaton, Cebotari, and Komaromi 2017; Calderón and Chong 2001; Fischer 2001; Lundberg and Squire 2003) show that the expected effect of trade openness

[12]Data for EPP at Socio-Economic Database for Latin America and the Caribbean (SEDLAC), Universidad Nacional de la Plata (CEDLAS), and World Bank, available at http://estadisticas.cepal.org/cepalstat/, accessed on November 8, 2022.

[13]Two other explanatory variables for trade structure (product concentration and exports of primary products) were initially tested, but the results presented a low significance level. Also, the two variables showed a strong correlation and overlap with other indicators (e.g., Economic Complexity Index and natural resources rents).

[14]The foundation of Mercosur can be mentioned as an example of this integration effort. According to its official website (www.mercosur.int), Mercosur is currently a customs union and was founded in 1991. Its founding countries are Argentina, Brazil, Paraguay, and Uruguay. Mercosur was the only South American bloc during the last decades until 2012, when the Pacific Alliance was formed by Chile, Colombia, Mexico, and Peru.

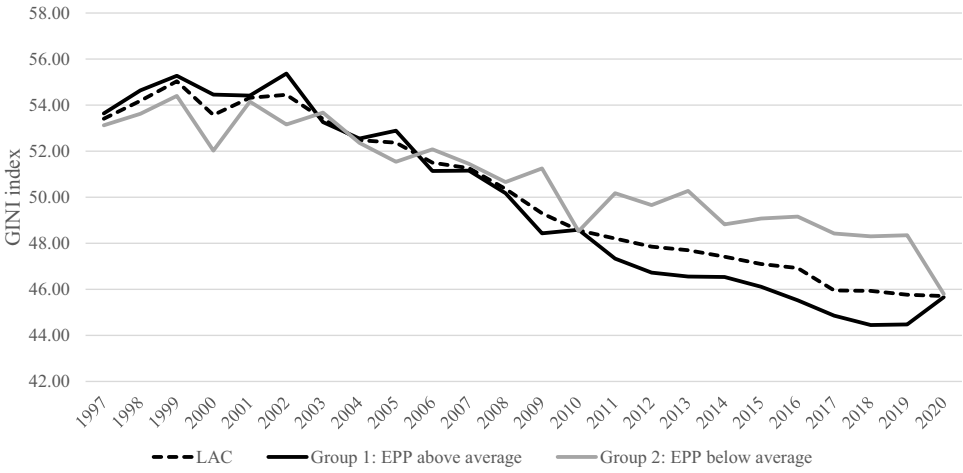

Figure 1. Gini index of income inequality in Latin America, countries grouped by exports of primary products (average), 1997 to 2020. Source: Own elaboration. Data for Gini was obtained from World Bank, Development Research Group, available at http://databank.worldbank.org/, accessed on November 14, 2022. Data for EPP at Socio-Economic Database for Latin America and the Caribbean (SEDLAC), Universidad Nacional de la Plata (CEDLAS), and World Bank, available at http://estadisticas.cepal.org/cepalstat/, accessed on November 08, 2022. Group 1: Argentina, Bolivia, Chile, Colombia, Ecuador, El Salvador, Honduras, Paraguay, and Peru. Group 2: Brazil, Costa Rica, Dominican Republic, Mexico, and Panama.

over inequality is mixed as both positive and negative results are observed for different groups of countries and periods.[15]

Economic complexity. Hartmann et al. (2017) consider the Economic Complexity Index (ECI) that captures the intensity of knowledge incorporated within an economy.[16, 17] In a given country, higher ECI values reveal the production of more complex products; similarly, lower values indicate less sophisticated economies.

Hartmann et al. (2017) conclude that a higher ECI is related to a decrease in inequality because the sophistication of a productive structure is decisive in a country's capacity to distribute income. However, for this specific sample of

[15]Timing is crucial for understanding the differences in results. According to De la Torre, Messina, and Silva (2017), the Heckscher-Ohlin-Samuelson model fails to explain the absence in the fall of inequality during the 1990s, when most of the trade liberalization measures were implemented and inequality in countries had grown or remained stable, but it is helpful to explain the downward trend in the 2000s.

[16]The ECI was developed by a group of researchers from Harvard University and the Massachusetts Institute of Technology during the 2000s. First, the products in which countries have a comparative advantage are defined using Balassa's revealed comparative advantage (RCA). Then, products and countries are assigned into a matrix, with a binary value for the existence or not of RCA for the country-product correspondence. The complexity of the economy is the result of the relationship between the two layers of information extracted from this data: diversity and ubiquity. Diversity is measured by the number of exported products in which the country presents revealed comparative advantages, while ubiquity is measured by the number of countries that export that specific product. Some corrections and improvements are then made to the calculation in order to merge the two dimensions within a single index.

[17]Data for Economic Complexity, 1998 to 2020, Observatory of Economic Complexity, available at https://atlas.media.mit.edu/en/rankings/country/eci/, accessed on November 14, 2022.

Latin American countries in the period studied, positive results for ECI as explaining inequality are expected. Contrary to what was observed by Hartmann et al. (2017), specialization in less sophisticated products would be associated with inequality reduction, for this set of countries highly dependent on natural resources and in a context of increasing international commodities prices.

Natural resources rents. There is a vast literature exploring the link between natural resources endowments and economic performance (Leamer et al. 1999). Messina and Silva (2017) also observe that, during the 2000s, there was a boom in commodity prices driven by economic growth in China and the Group of Seven (G7) countries. In the same period, revenues coming from natural resources had risen sharply in Latin American countries. The increase in natural resources rents in the period studied might explain a reduction in income inequality for the region. The mechanism that supports this hypothesis is sustained by the Dutch disease.

Terms of trade. Raul Prebish suggests an impoverishing effect of natural resources caused mainly by the decline of terms of trade (Leamer et al. 1999). The main idea is that as countries enrich, they demand relatively less primary goods in comparison with manufactures and services and contribute to a decline in terms of trade for primary product exporters. Calderón and Chong (2001) observe that the effects of terms of trade over inequality are inconclusive. However, Messina and Silva (2017) – specifically for the Latin American region – show that the gains in terms of trade (driven by the commodity boom) contribute to a reduction in income inequality.

In Appendix 1 online, we show the descriptive statistics of the variables included in this study as well as the data sources. In addition, in Appendix 2, we offer Pearson correlation coefficients between each pair of variables.

IV. Trade and inequality in Latin America, 1997 to 2020

This section analyzes the effects of international trade over income inequality in Latin America. For this purpose, we proceed with an ordinary least squares (OLS) panel data estimation between 1997 and 2020. Data availability for the Gini index, retrieved from the World Development Indicators, was the determinant for selecting both the time horizon and individual countries. Thus, the dataset chosen contains 14 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, and Peru.

Using as the dependent variable the Gini index of income inequality, we selected nine models that combine different explanatory and control variables. In addition, to ensure the robustness of the results, we estimated the same

models using the Kuznets ratio as the dependent variable (included in Appendices 4 and 5 online).

In Appendix 3, we test for cross-sectional dependence (Table A3.1) that confirms cross-sectional dependence in all models. We use the cross-section SUR – panel corrected standard errors (PCSE) to guarantee the validity of the estimators. We also test for stationarity (Table A3.2) using second generation unit root tests, given the presence of cross-sectional dependence, confirming that all variables, except employment in industry (% of total employment), are non-stationary. The following test for panel cointegration (Table A3.3) allows us to conclude that the variables are cointegrated, allowing us to use variables at levels even if nonstationary. When testing for causality (Table A3.4), there is no evidence of inverted causality except for two controls, real minimum wage and WGI-political stability. In Table A3.5, the tests for correlated random effects (Hausman tests for cross-section and for period) and for redundant fixed effects (likelihood ratio) are shown. We can conclude that there is no correlation between the regressors and the common effects in all the models; this demonstrates the adequacy of the fixed effects model. Also, the likelihood ratio test indicates that combined cross-section and period effects are not redundant, except for Models 5 and 6, given the financial crisis dummy.

The estimated results, considering the Gini index as the dependent variable, are shown in Table 1. Overall, according to the adjusted R-squared, the models explain between 81% and 85% of the variation in the inequality measure. To ensure the robustness of the results, we also tested the models using the Kuznets ratio as the dependent variable. We found similar results for both measures of inequality (see Appendix 4 online).

International trade

The results demonstrate that trade openness affects income inequality. As revealed, an increase in trade openness (as a percentage of GDP) of 1% results in a decrease of between 0.03 and 0.05 points in the Gini index. In all models, the variable is significant and shows a negative impact over income inequality; this presents evidence that trade openness contributed to reducing income inequality between 1997 and 2020 in Latin America.

The results are in accordance with the empirical findings of Beaton, Cebotari, and Komaromi (2017), showing that trade openness can stimulate economic growth without negatively affecting income inequality. In contrast, the results indicate divergence with some previous studies (e.g., Calderón and Chong 2001; Fischer 2001), whose sample was restricted to data prior to the 2000s and whose authors considered information from economies with a high degree of heterogeneity, both in relation to trade structure and geographic location. Fischer (2001) associates a decrease in inequality to labor abundant

Table 1. Determinants of income inequality in Latin America, 1997 to 2020: Gini index.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	80.43478 (0.0000) ***	93.95298 (0.0000) ***	89.76195 (0.0000) ***	97.72586 (0.0000) ***	156.8906 (0.0000) ***	148.0444 (0.0000) ***	73.22712 (0.0000) ***	72.86120 (0.0000) ***	80.21635 (0.0000) ***
Trade openness (% GDP)	−0.045699 (0.0023) ***	−0.033807 (0.0046) ***	−0.031256 (0.0066) ***	−0.037277 (0.0016) ***	−0.026718 (0.0219) **	−0.013849 (0.2070)	−0.034069 (0.0074) ***	—	−0.029059 (0.0072) ***
Economic complexity index	—	3.583733 (0.0000) ***	3.595677 (0.0000) ***	3.658223 (0.0000) ***	3.808571 (0.0000) ***	3.937463 (0.0000) ***	—	3.452385 (0.001) ***	2.873508 (0.0024) ***
Net barter terms of trade	—	—	−0.006738 (0.3165)	—	—	—	—	—	−0.009285 (0.2541)
Natural resources rents (% of GDP)	—	—	—	0.091927 (0.1566)	—	—	—	0.016362 (0.8117)	0.054793 (0.4207)
Log GDP per capita	−2.937930 (0.0310) **	−4.407689 (0.0010) ***	−3.889805 (0.0119) **	−4.820971 (0.0002) ***	−10.94418 (0.0000) ***	−10.26265 (0.0000) ***	−2.327172 (0.1084)	−2.669667 (0.0338) **	−1.595451 (0.3290)
Unemployment	—	—	—	—	—	0.209031 (0.0024) ***	—	0.392407 (0.0000) ***	0.277374 (0.9498)
Employment in industry (% of total employment)	—	—	—	—	−0.015794 (0.8590)	—	—	—	0.007330 (0.6100)
Real minimum wage (average annual index)	—	—	—	—	—	—	—	—	−0.012112 (0.0232) **
Average years of education	—	—	—	—	—	—	—	—	−1.581585 (0.0021) ***
WGI: Political stability	—	—	—	—	—	—	−1.040708 (0.0339) **	—	−0.389362 (0.4365)
Financial crisis (dummy = 1)	—	—	—	—	−2.992766 (0.0000)***	−3.099286 (0.0000)***	—	—	—
Model Summary									
R-squared	0.839192	0.855340	0.855965	0.856632	0.826908	0.826578	0.843248	0.870163	0.880602
Adjusted R-squared	0.814651	0.832146	0.832162	0.832940	0.814243	0.814431	0.817598	0.848707	0.854886
F-statistic	34.19544	36.87708	35.96117	36.15682	65.28934	68.05174	32.87479	40.55551	34.24270
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Durbin-Watson stat	0.648118	0.680276	0.686020	0.699622	0.678681	0.670729	0.603665	0.651571	0.769169
Observations	288	276	276	276	265	276	257	276	238
Number of countries	14	14	14	14	14	14	14	14	14

Notes: (1) Significance level at 1% (***), 5% (**), and 10% (*); p-value in parenthesis. (2) All models are estimated using fixed effects. Models 1, 2, 3, 4, 7, 8, and 9 are estimated controlling for cross-section and period fixed effects. Models 5 and 6 are estimated controlling for cross-section fixed effects. All models use the cross-section SUR – panel corrected standard errors (PCSE) to correct for cross-sectional dependence.

countries while Calderón and Chong (2001) link a diminishing inequality to export manufacturing economies.

According to Camarero et al. (2016), after several crises in the 1980s, Latin American countries went through structural adjustment programs that replaced import substitution policies, diffused in most economies by trade liberalization measures. De la Torre, Messina, and Silva (2017) state that the first period that followed the trade liberalization process showed an increase in income inequality – a trajectory that was reversed at the beginning of the 2000s, more precisely in 2003. The authors point out that this trend contrasts not only with data for this region during other periods but also with other regions in the world in the same period.

The results also demonstrate that economic complexity affects income inequality (Models 2, 3, 4, 5, 6, 8, and 9). The Economic Complexity Index is always highly significant: in all models – both using the Gini index and Kuznets ratio as the dependent variable – it presents a level of significance of 1%. In every model, the variable shows a positive impact over income inequality. This result contradicts what was expected according to Hartmann et al. (2017), which suggested a reduction of economic complexity should produce an increase in inequality.

However, it is worth noting that data used by Hartmann et al. (2017) contemplates the period between 1963 and 2008 and, therefore, fails to consider a relevant period of the present study's sample (period in which there is the strongest reduction of ECI and which is characterized by intense turbulence due to the global financial crisis). Also, the sample used by Hartmann et al. (2017) considers 150 countries from different regions across the globe, while our study uses a narrow sample of Latin American countries. Finally, Hartmann et al. (2017) find at least two exceptions for the negative relation between economic complexity and inequality, one of which is Mexico – the second largest economy[18] in Latin America.[19] In addition, De la Torre, Messina, and Silva (2017) point out that the trend presented by Latin America in this period is exceptional, in comparison to both its history and to the situation of the other countries in the period.

Our results show that the "simplification" of the economy, as opposed to "complexification," led to a reduction in income inequality. This "simplification" means concentrating the production on products with low-knowledge intensity, following the logic of the Dutch disease. Thus, the concentration (rather than diversification) in the production of low-knowledge intensity products (rather than high-knowledge intensity products) contributed to the fall in both the Economic Complexity Index and income inequality. In fact,

[18]According to the GDP ranking provided by the World Bank. Available at https://datacatalog.worldbank.org/dataset/gdp-ranking, accessed on November 14, 2022.

[19]The other relevant exception mentioned by Hartmann et al. (2017) is Australia. The country presents both low complexity and low inequality levels.

several authors (e.g., Bresser-Pereira 2008; De la Torre, Messina, and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017) state that one of the consequences of the Dutch disease is the reduction of inequality through changes in the labor market. Such a strategy poses risks in the long run but has proved effective in reducing inequality in the short term in the face of a favorable external environment (e.g., increase in commodity prices) and other domestic conditions.

In the period under analysis, the results demonstrate that the terms of trade and natural resources rents were not significant, which might be explained by the end of the commodity boom. However, estimations restricting the period until 2016 turn these variables significant and with a negative result, in accordance with Messina and Silva (2017), which shows that labor benefited from the commodity boom, promoting a structural change in the economy and a decrease in income inequality.

According to the literature (e.g., Bresser-Pereira 2008; De la Torre, Messina, and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017), some of these countries witnessed Dutch disease effects, and that may have led to the fall in inequality, through the spending effect mechanism (i.e., positive performance of the booming sector leading to exchange rate appreciation, income growth, expansion of internal demand (particularly for non-tradable goods), higher prices for the service sector, transference of labor from the manufacturing to non-tradable (low-skill intensive) sector, increase of the relative demand for low-skilled workers, and, finally, a reduction of the skill premium).[20]

Control variables

All models in which the GDP *per capita* is significant (tested both with the Gini index and Kuznets ratio as dependent variables) confirm a negative relationship between the level of economic development and inequality (i.e., higher GDP *per capita*, lower inequality). The results are in accordance with Milanovic (2002) that suggests growth is one of the main factors for inequality reduction. Focusing on structural change variables, the results show that employment in industry (as a percentage of total employment) presents a negative coefficient when significant (Model 9).

The unemployment rate also positively impacts income inequality (Models 6 and 8), demonstrating that less unemployment results in lower inequality, and that reinforces the hypothesis that the inequality reduction mechanism is linked to the labor market. The results are in accordance with De la Torre, Messina, and Silva (2017), who demonstrated that the commodity boom

[20]Using a single country (Brazil) as a sample, Adão (2015) notes a parallel process in which there is a transference of labor from the manufacturing to the natural resource (booming) sector (also low-skill intensive) with similar results. If the spending effect causes an indirect de-industrialization, the effect described by Adão (2015) provokes a direct de-industrialization.

nurtured labor participation, thus reducing unemployment, favoring the low-income sector, and decreasing inequality. In addition, results show that the real minimum wage is highly significant (tested both with the Gini index and Kuznets ratio) and has a negative impact on inequality. As suggested by Duryea et al. (2017) and Messina and Silva (2017), in a rapidly growing economy, an increase in the minimum wage should contribute to the enrichment of the low-income sector and, thus, reduce inequality. The average years of education is also significant and negatively impacts income inequality, in accordance with the literature (e.g., Calderón and Chong 2001; Clarke 1995; Nafziger 2006).

With respect to the institutional variables, political stability shows negative results when significant. As observed in Hartmann et al. (2017), this variable demonstrates that the degree of sophistication of a country's institutions contributes to the reduction of income inequality.[21] Finally, the international financial crisis – included as a dummy variable – is significant, presents negative results, and demonstrates its impact in reducing income inequality in the Latin American region.

V. Conclusions

Historically high, income inequality in Latin America declined in the 2000s. Among the explanations, greater economic openness, due to changes in the trade policies carried out mostly in the 1990s, and a particular economic and trade structure, specialized in the production and export of natural products, are key issues (Anderson 2005; Beaton, Cebotari, and Komaromi 2017; Calderón and Chong 2001; Fischer 2001; Hartmann et al. 2017; Leamer et al. 1999; Meschi and Vivarelli 2009). Considering an external and more global perspective, the boom in commodity prices is a crucial explanation (Bresser-Pereira 2008; De la Torre, Messina, and Silva 2017; Guerra-Salas 2018; Messina and Silva 2017).

The mechanisms through which the local (trade structure and opening policies) and global (commodity price boom) contexts explain the reduction in inequality are delineated by theories of international trade (especially the Heckscher-Ohlin-Samuelson model) and structural change (e.g., Adelman and Morris 1973; Fields 1987; Kuznets 1955; Lewis 1955). In addition, the Dutch disease (specifically through the spending effect) resulted in the expansion of internal demand, transference of labor from the manufacturing to non-tradable goods sector, enrichment of the low-income population, and reduction of income inequality. Thus, this process of economic "simplification," as opposed to "complexification," through

[21] In accordance with Hartmann et al. (2017), we found that among the different dimensions associated with the quality of institutions, extracted from the Worldwide Governance Indicators, the most relevant one was political stability, and therefore, this is the only one we reported after testing for all six dimensions.

which occurs the concentration, rather than diversification, in the production of low knowledge intensity products, resulting from greater openness to international trade, can explain the reduction of income inequality in Latin America for the period studied.

In this article, we considered an unbalanced panel data model, combining annual data for 14 Latin American countries from 1997 to 2020, to assess the effects of international trade (using trade openness, economic complexity, terms of trade, and natural resources rents as proxies) on income inequality (employing the Gini index and Kuznets ratio). We found that international trade variables are statistically significant in explaining a reduction in income inequality, after controlling for other variables. More specifically, we highlight the impact that both trade openness and the specialization in "simple" products have had in reducing inequality in Latin America.

As revealed in our research, an increase in trade openness results in a decrease in the Gini index. Results also show that the "simplification," as opposed to the "complexification," of the economy, following the process of trade openness, led to a reduction in income inequality in the 2000s in Latin America. The increase in commodity prices induces a spending effect (Dutch disease) by which trade affects inequality.

Although effective in reducing inequality in the short term, in the face of a favorable external environment (e.g., increase in commodity prices) and other domestic conditions, the effects of the Dutch disease may lead to deindustrialization and place long-term risks for both economic growth and income distribution (Messina and Silva 2017). From the policymakers' perspective, special attention should be given to the risks of concentrating production and exports in a few products with volatile prices such as commodities.

In summary, we demonstrate that international trade played a positive role in the region for the period, contributing to the reduction of inequalities. However, we state that these changes are cyclical and highly dependent on favorable external conditions. A long-term perspective brings disturbing conclusions – both in terms of the regional economy and on global environmental aspects. Regionally, the simplification of the economy and increasing dependence on commodities is, by itself, concerning due to the already widely discussed impoverishing effect of natural resources caused by the decline of terms of trade. This risk is further intensified by the pressure that climate change is expected to have on the region. In the face of changing climate conditions, the vulnerability of a region highly dependent on natural resources and agricultural and livestock production is likely to be amplified. The window of opportunity for structural changes in the economy and, more specifically, associated with international trade is narrowing and must be urgently seized.

In future research, it would be important to further explore the relationship between international trade and inequality in different contexts and geographies. The study of this relation for groups of countries with different

economic structures (e.g., rich/poor in natural resources) in other geographies (e.g., Asia) for the same period could be enlightening. Another possible path would be to compare the impact of international trade over income inequality in countries belonging (or not) to trade blocs. New studies could also be conducted to better understand the impact of international trade on income inequality within countries – especially for nations with large dimensions and big disparities (e.g., Brazil).

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