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Domestic and External Trade in the Dominican Republic:

Diagnosis, Challenges, and Opportunities

Francisco Parro
Joaquin Zentner

Country Department Central America, Haiti, Mexico, Panama and the Dominican Republic

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Contents

Domestic and External Trade in the Dominican Republic: Diagnosis, Challenges, and Opportunities*

Francisco Parro† Joaquin Zentner¥

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Abstract

A consensus exists in the literature regarding the welfare gains derived from international trade. Motivated by this well-documented fact, this paper provides a diagnosis and evaluation of the challenges and opportunities that a higher level of trade integration offers to the Dominican Republic economy. We document a slowdown in the trade openness level of the economy during recent years. In contrast, during the same period, the country's trade policy moved towards an overall reduction in tariffs. We conjecture two explanations for this dichotomy. First, the slowdown in trade openness could be explained by an acceleration of GDP growth during recent years, mainly driven by the service economy. We present evidence consistent with this explanation. However, this pattern also suggests that the goods produced locally have become somewhat less attractive in the world economy, possibly due to internal bottlenecks or distortions. To shed light on this second explanation, we use recent methodologies developed in the international trade literature to quantify internal distortions. We also assess the impact of these distortions on the aggregate GDP, relative to the impact of changes in external distortions or trade costs. Two main messages emerge from the empirical analysis. First, the elasticity of real GDP with respect to changes in internal distortions is of an order of magnitude larger than that with respect to external distortions. This finding highlights the importance of studying further different drivers of internal distortions. Second, internal distortions in a given sector spread out to the rest of the economy through input-output linkages and are especially relevant in the non-tradable sectors. We discuss some possible bottlenecks as a source of distortions in the economy at the end of the analysis.

JEL Codes: H00, O00

Key word: Trade, Exports, Industry, Credit to DGP, Imports, Comparative Advantage, Economic Development, Tariff, Competitiveness, Dominican Republic.

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† Universidad Adolfo Ibáñez. Email: francisco.parro@uai.cl

¥ Inter-American Development Bank. Email: joaquinz@IADB.ORG

1. Introduction

A clear consensus exists in the literature and policy debate on the benefits that economic growth brings to the standard of living of people, especially, for the most vulnerable groups of the population. Several policies have been highlighted in the literature as the most effective ones to foster growth in a given country. One of these policies is trade integration. In particular, academic research has advanced substantially in the understanding and quantification of the aggregate and distributional consequences of economic integration. One important conclusion of this literature is that trade openness results in an increase in average welfare, although it also triggers important distributional effects (Costinot and Rodriguez-Clare 2014).[1]

The well-documented benefits of a more open economy on the well-being of the population make relevant the evaluation of the opportunities and challenges that trade integration offers to countries. This paper provides such evaluation for the Dominican Republic economy. We address three main issues. First, we provide a detailed description of the structure of international trade of the country and compare it with other regions of the world. Concretely, the first part of this paper provides an answer to questions such as: how open to international trade is the Dominican Republic economy? how the level of trade openness compares with other countries of the world? are exports mostly concentrated or diversified? which are the sectors where the economy exhibits a bigger comparative advantage? and, is the country trading too much or too little conditional on its level of development and geographic location?

In addition, recent literature has turned to understand not only transactions of goods across countries but also within countries (across industries, firms, etc.). Firms purchase goods from other countries but also intermediate goods from local industries. Indeed, a parallel can be drawn between the effects of distortions on the local transaction of intermediate goods and the effects that trade

[1] Costinot and Rodriguez-Clare (2014) discuss recent advances in the quantification of the welfare gains from trade.

barriers trigger on the exchange of goods between countries. Moreover, distortions in internal trade in a given sector can spread out to the rest of the economy through input-output linkages. All these issues motivate the second goal of this paper: we study the international and domestic trade linkages of the Dominican Republic economy. Using recent methodologies developed in the international trade literature (Caliendo, Parro, and Tsyvinski 2018, CPT hereafter), we compute the elasticity of real GDP in Dominican Republic with respect to changes in internal distortions, and compare it with the same elasticity with respect to changes in external distortions or trade costs. Our main result here is that the real GDP elasticity with respect to changes in internal distortions is of an order of magnitude larger than the elasticity with respect to changes in external distortions. We then compute the elasticity of GDP to changes in domestic distortions across industries, considering the internal and international production network. The result of this analysis is a ranking of sectoral elasticities in terms of their relevance for the aggregate economy.

A third goal of the paper is to quantify the internal distortions in the Dominican Republic economy. This quantification allows us to detect the sectors that represent the largest bottleneck for the economy. In doing so, we rely on the methodology developed in CPT to overcome the main challenge of distinguishing distortions from TFP.

Our paper, therefore, builds on two main strands of the literature. First, the paper is related to the international trade literature which has developed tools to quantify the gains from economic integration (Eaton and Kortum 2002; Caliendo and Parro 2015; Arkolakis, Costinot, and Rodriguez-Clare 2012). Second, the paper is related to the recent macroeconomic literature that has studied the aggregate economic impact of internal distortions in the presence of production networks (Jones 2011, 2013; Carvalho et al. 2017; Caliendo, Parro, and Tsyvinski 2018).

The rest of this paper is organized as follows. In Section 2, we provide a complete characterization of the trade structure of the Dominican Republic economy. In Section 3, we analyze how interconnected the economy across sectors and with the rest of the world is and compute the elasticity of real GDP with respect to changes in internal distortions. In Section 4, we quantify distortions, highlighting the sectors that represent a larger bottleneck for the economy. Finally, Section 5 concludes.

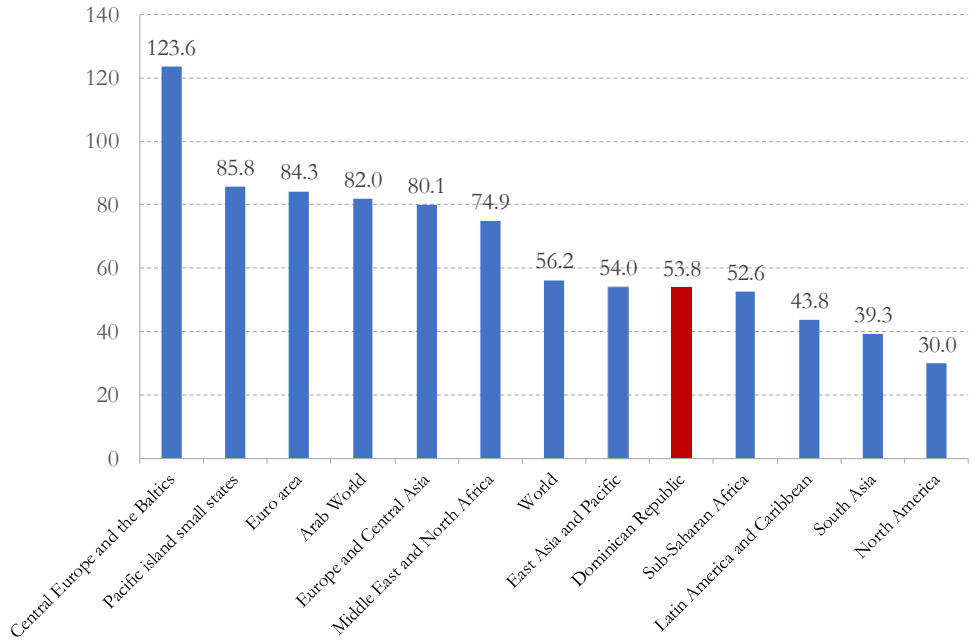
2. A Portrait of Trade Openness in the Dominican Republic

This section presents an overview of trade openness in the Dominican Republic. We first construct a measure of the current level of trade openness of the economy and compare it with the levels observed in other regions of the world. We then describe how the level of trade openness of Dominican Republic has evolved over time, distinguishing some phases of openness through which the economy has gone through. We then turn to analyze the trade structure of the economy. In doing so, we first describe the sectoral composition of exports and imports, and then analyze the degree of concentration in production of the economy. After doing so, we compute a simple measure of revealed comparative advantages and rank sectors according to this indicator. In the last part of this section, we examine the state of the country's trade policy and its evolution over time.

2.1 Aggregate Measures of Trade Openness

This section starts by constructing some aggregate measures of trade openness for the Dominican Republic and compare them to the ones observed in different regions of the world. A frequent measure of trade openness in the international trade literature is the ratio of exports and imports over GDP. Figure 1 shows this ratio. We observe that the Dominican Republic is currently an economy with a relatively low degree of trade openness. This openness measure is below the level exhibited by the world economy, and not far from the level of the Sub-Saharan Africa region. Moreover, we observe that, whereas trade openness in the Euro area reaches 83%, the same figure for the Dominican Republic is 54%. Notice that North America is the least open region, which is largely influenced by the presence of the United States, where the size of internal trade is very important.

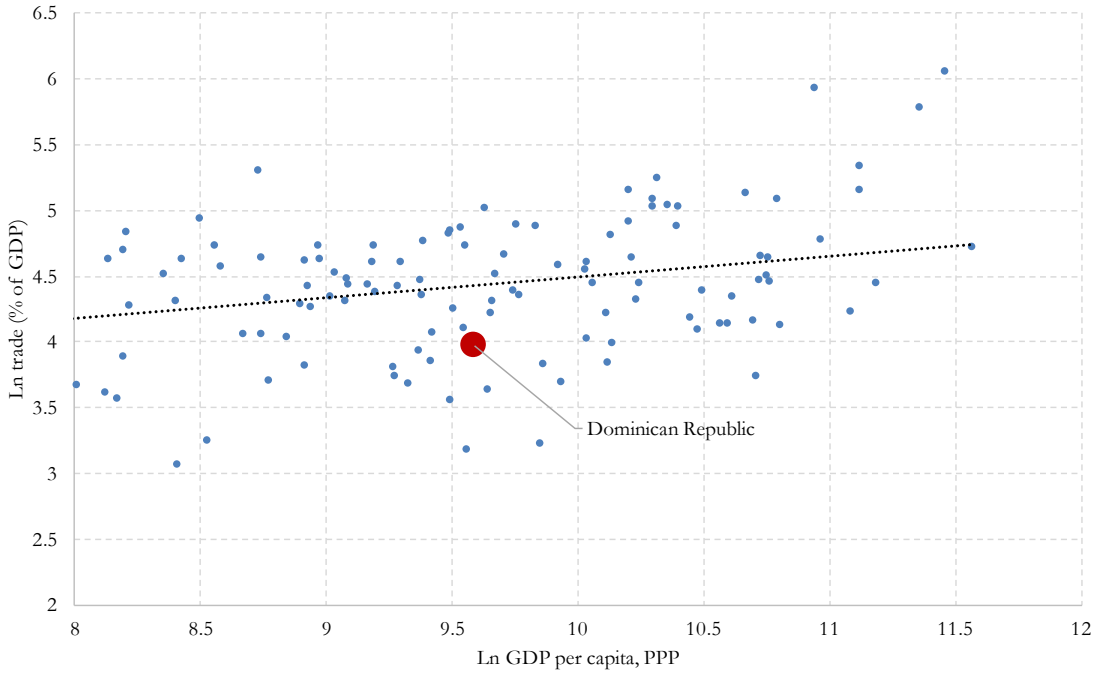
Figure 1: Trade Openness (% GDP) across Regions of the World, 2016



Source: World Development Indicators (World Bank).

In the international trade literature, there is a well-established empirical equation to describe the trade flows across countries: the so called gravity equation (McCallum 1995; Anderson and van Wincoop 2003). The gravity equation establishes a positive relationship between the level of trade and the size of the country, controlling by measures of geography (distance and other trade barriers). This empirical relationship motivates the question on whether the Dominican Republic economy is too little or too much open to trade, conditional on its size. To answer this question, Figure 2 displays a scatter plot between the level of trade openness, measured as before, and country size, measured by the GDP per capita (in terms of PPP). Data include a sample of 177 countries. First, we observe a positive relationship between trade openness and development, which is consistent with the results reported by the literature, as discussed above. More importantly, we observe that the level of openness of the economy that would be consistent with its level of development is much higher than its current level. Thus, Figure 2 shows that the Dominican Republic economy is indeed lagging behind in terms of trade openness; that is, the economy is trading too little given its level of development. We now turn to describe how the level of trade openness in Dominican Republic has evolved over time and assess whether trade openness has been permanently low or it is only a recent phenomenon.

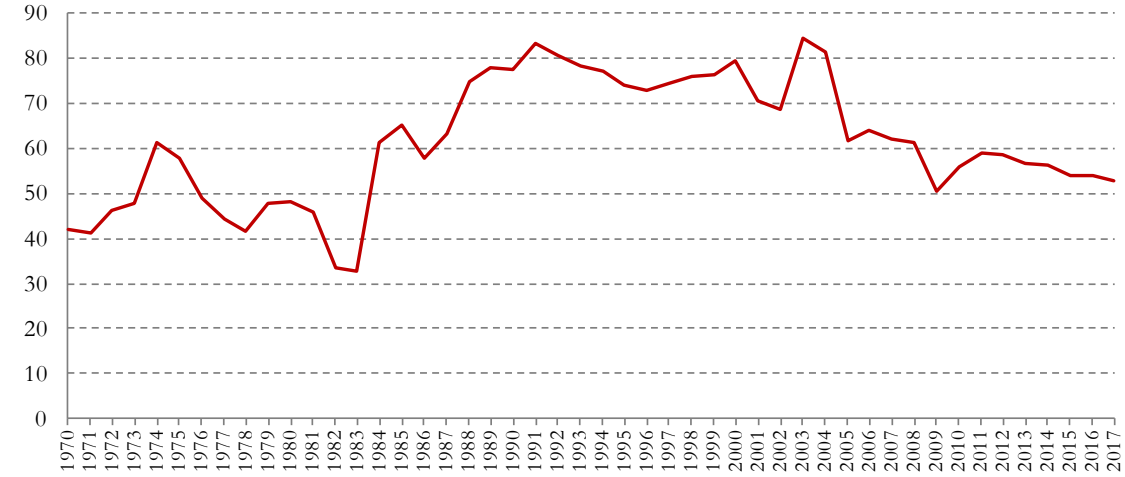
Figure 2: Trade and Economic Development, 2017



Source: World Development Indicators (World Bank).

Figure 3 plots the evolution of trade openness in the Dominican Republic economy over the past decades. We observe relatively low levels of trade openness in the 1970s, reaching the minimum level in 1984. Then, trade openness started to recover in the mid 1980s and stayed at a level between 70% and 80% during the 1990s and mid 2000s. Afterwards, this measure of openness has steadily fallen, reaching a similar level to the average observed in the 1970s.

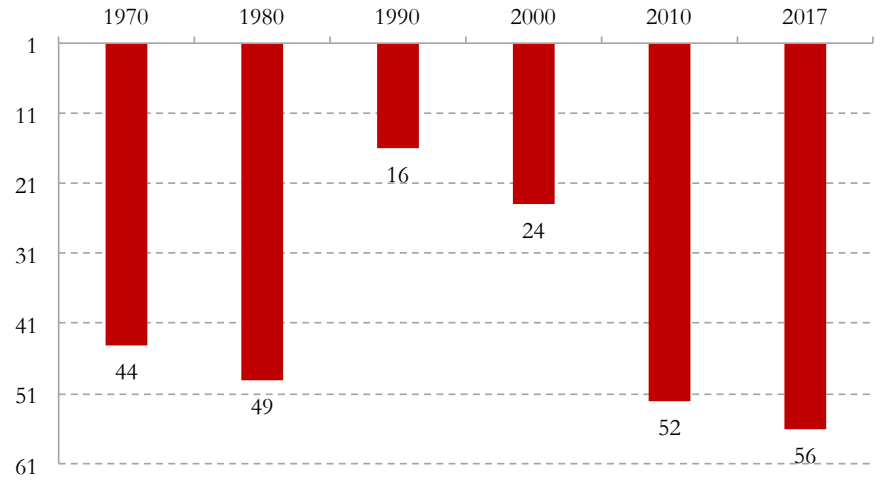
Figure 3: Trade Openness (% GDP) over the Period 1970-2017



Source: World Development Indicators (World Bank).

Therefore, Figure 3 unveils four distinct periods of trade openness: low level of openness in the 1970s, a pronounced process of openness in the 1980s, a stable period during the 1990s and mid 2000s, and a decreasing trend during the last decade, reaching the average level of the 1970s. These phases of trade openness could simply reflect the globalization phases of the world economy. In contrast, they could be explained by idiosyncratic factors of the economy. To shed light on this issue, the next figure documents the trend of trade openness in the Dominican Republic relative to other countries.

Figure 4: Relative Openness of the Dominican Republic Economy



Source: World Development Indicators (World Bank). Note: The sample includes 81 countries.

We first compute the trade openness measure (exports and imports over GDP) for 81 countries over the period 1970-2017. After doing so, we compute the position of the Dominican Republic in the world ranking of trade openness across decades. Figure 4 plots that ranking. We observe that, in the 1970s, the Dominican Republic was a relatively closed economy, located in the

positions 44-49 of the world ranking. During the 1980s, Dominican Republic turned to be a relatively open economy. Specifically, from 1980 to 1990, the economy advanced 35 positions in the world ranking of trade openness. Dominican Republic remained as a relatively open economy until 2000. However, in the last two decades, we observe that the economy went back to the decreasing trend of the 1970s, which left the economy with a lower relative level than that observed in the 1970s. The latter conclusion is important because, even though the trade openness of the economy seems to be similar to the level observed in the 1970s (see Figure 3), Figure 4 suggests that the relative trade openness of the economy is currently lower than in the 1970s.

Hence, Figure 4 suggests that idiosyncratic factors, not a global trend, could be more important to explain the slowdown in trade openness in the Dominican Republic economy during recent years. We now turn to discuss some factors that might explain the latter issue. One possibility is that trade has become more restrictive due to higher tariffs. In Section 2.4, we discuss the trade policy of the country and relates it to the evolution of trade openness that we have documented in this section. Another possibility is that exports became less competitive due to domestic distortions in production, an issue that we will discuss in Section 4.

Before doing so, in the next section, we complete the characterization of the trade structure of the Dominican Republic economy by exploring the sectoral composition of trade, the degree of diversification of exports and imports, and sources of comparative advantages across sectors.

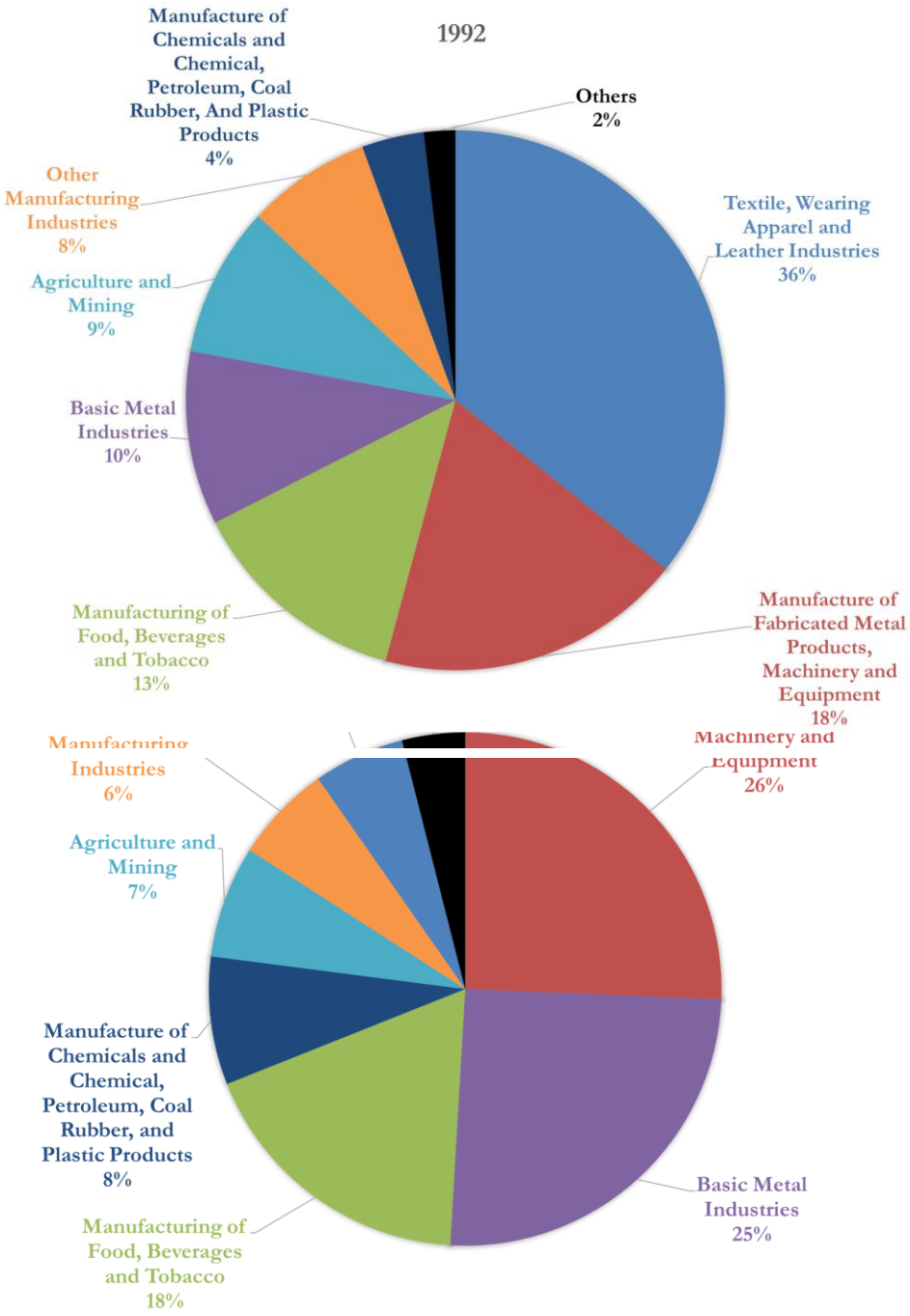
2.2 Trade Diversification

In this section, we characterize the sectoral composition of trade. To do so, we first describe the sectoral composition of exports and imports, and the change in the relative importance of different sectors over the period 1992-2017. We then construct a measure of exports and imports diversification at the industry level and compute a Herfindahl index of concentration of economic activity.

Figure 5 plots the share of exports at the ISIC revision 2 industry digit level. Exports are measured at transaction values. We observe that the two main exporting industries are "Manufacture of Fabricated Metal Products, Machinery and Equipment" and "Basic Metal Products", representing half of the total exports of the economy. Two decades ago, the textile industry (and those related) represented a significant fraction of the Dominican Republic exports. However, the participation of

this industry fell to 6%. We conjecture that the latter could reflect the increased competition from China, which is an important player in the world textile industry, especially after entering the WTO. Regarding imports, the "Manufacture of Fabricated Metal Products, Machinery and Equipment" and "Manufacture of Chemicals and Chemical, Petroleum, Coal, Rubber, and Plastic Products" exhibit the greatest participation and it has been so at least since 2001.

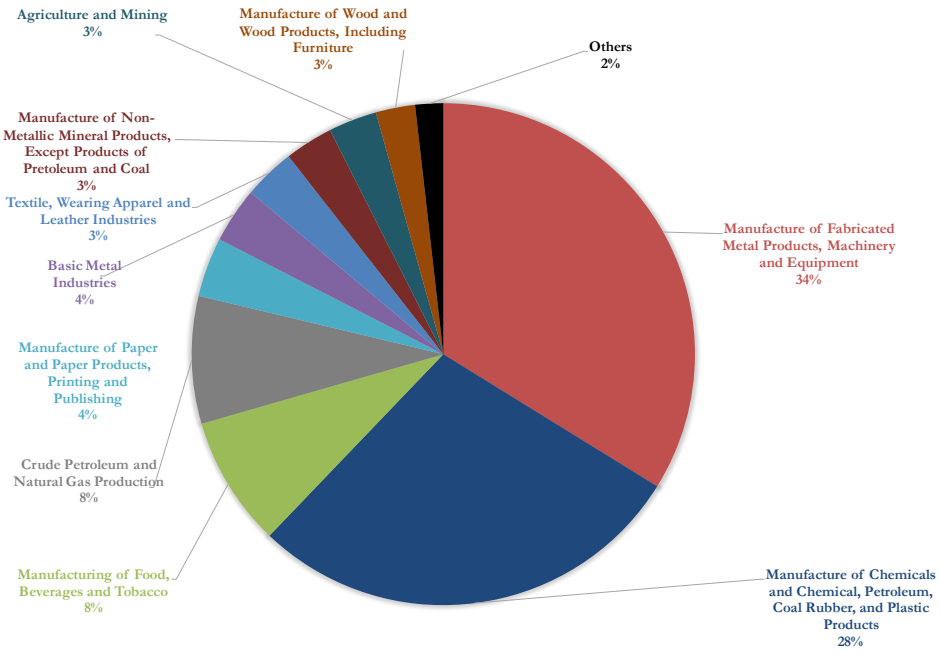
Figure 5: Share of Exports by Industry, 1992 and 2017



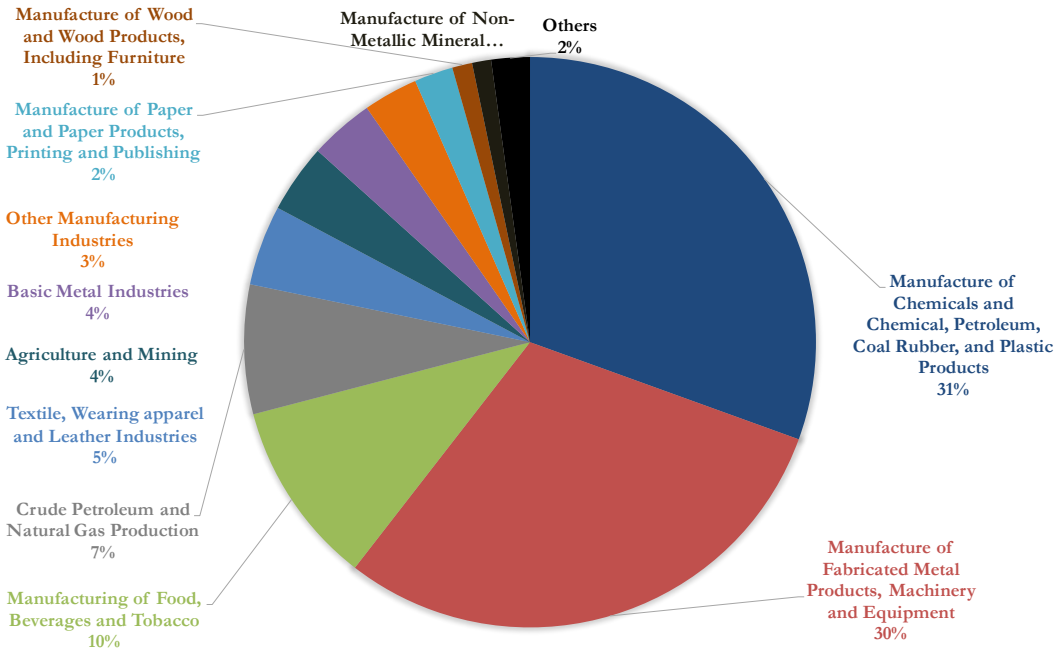
Source: World Integrated Trade Dataset (World Bank).

Figure 6: Share of Imports by Industry, 2001 and 2017

2001



2017



Source: World Integrated Trade Dataset (World Bank).

The fact that only a few sectors represent a large fraction of trade in Dominican Republic seems to indicate that the trade structure of the country is not well-diversified. To formally analyze this issue, we construct a concentration index of exports and imports. In particular, we compute a Herfindahl Index of concentration, HH (not standardized), defined as the summation of the squared export shares of each sector:

$$HH = \sum_{i=1}^{N} S_i^2 \tag{1}$$

Then, we obtain the normalized value of the HH as follows:

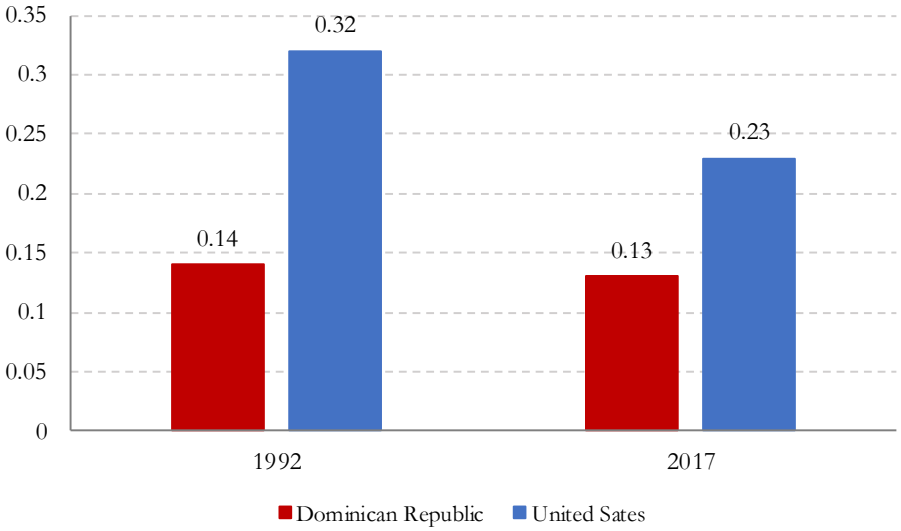
$$HHN = \frac{(HH - \frac{1}{n})}{1 - \frac{1}{n}} \tag{2}$$

where *n* is the number of sectors. Notice that the normalized index, *HHN,* ranges between zero and one, where zero means that the economy is perfectly diversified, and one means that it is fully concentrated.

We compute the Herfindahl index at the industry level for the same years considered in Figures 5 and 6. As a reference, we state that an index value of 0.18 or higher means that a sector is highly concentrated, an index between 0.10 and 0.18 is considered of moderate concentration, while the range between 0 and 0.10 reflects a diversified sector. For comparison purposes, we also present this indicator for the US economy.

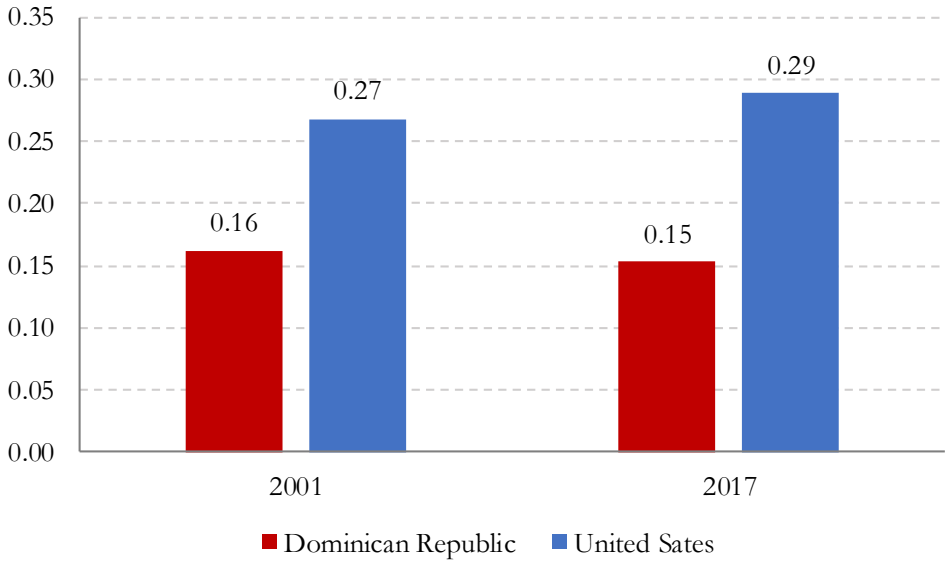
We observe that the concentration levels for both exports and imports have remained relatively stable, reaching moderate levels of concentration. Moreover, we observe that Dominican Republic is a more diversified economy compared to the United States. Overall, the concentration of exports and imports does not seem to be high in the Dominican Republic economy.

Figure 7: Herfindahl Index for Exports



Source: Own elaboration based on the World Integrated Trade Dataset (World Bank).

Figure 8: Herfindahl Index for Imports



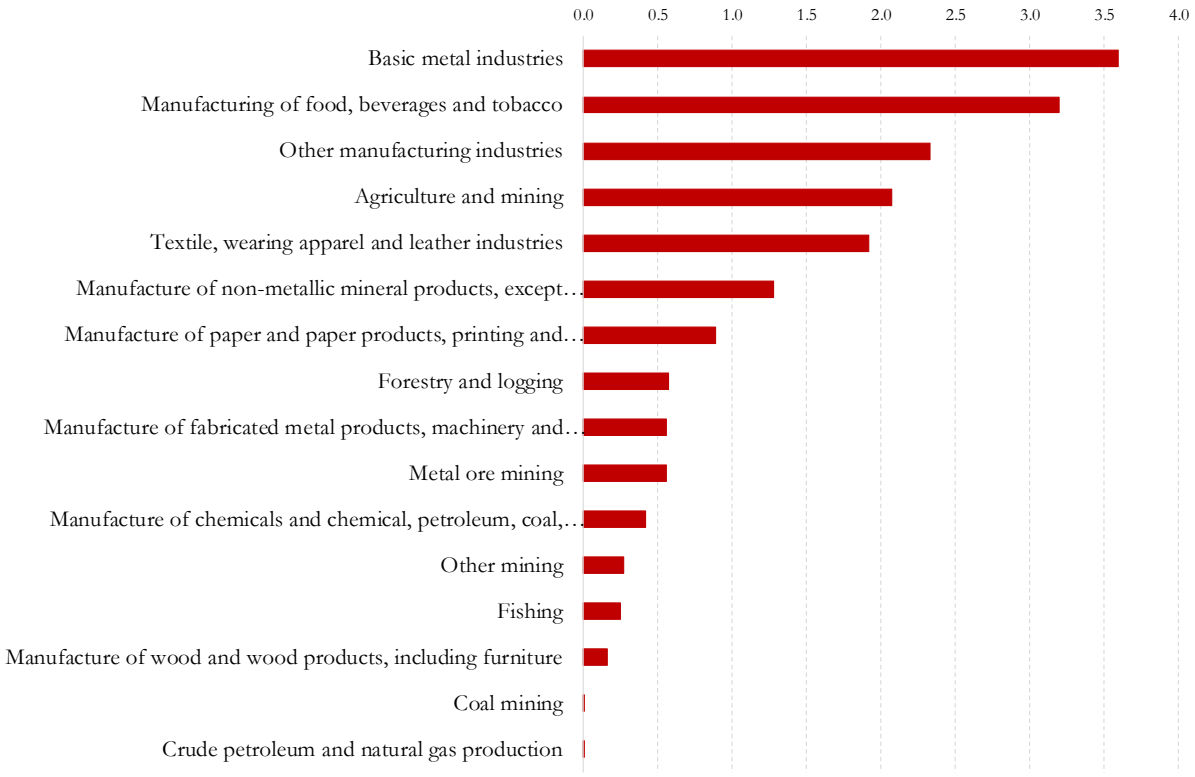
Source: Own elaboration based on the World Integrated Trade Dataset (World Bank).

2.3 Relative Openness and Revealed Comparative Advantages

We now turn to analyze an industry-level measure of comparative advantage. We then conclude the description of the trade structure of the economy by documenting the Dominican Republic's trade diversification across trading partners.

In order to analyze the comparative advantage of the Dominican Republic economy across industries, we compute a Revealed Comparative Advantage Index (RCA). The RCA index measures the industry shares in the country's exports compared with the same figure for the world economy. Therefore, this index contains information on the importance of exports in a given sector relative to the world, which is a measure of comparative advantage that is commonly used in the trade literature. Figure 9 shows the results.

Figure 9: Revealed Comparative Advantage Index, 2017

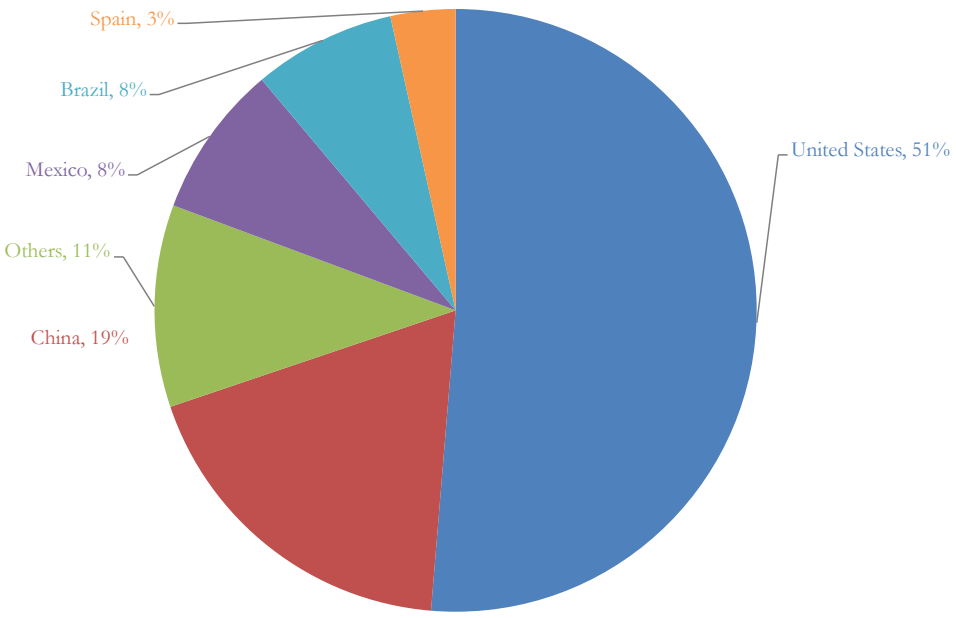


Source: Own elaboration based on the World Integrated Trade Dataset (World Bank).

We observe that revealed comparative advantages appear in the basic metal industry and manufacturing of food, beverage and tobacco industry. However, the manufacture of fabricated metal products, machinery and equipment industry, which represents 26% of the exports in 2017 (see Figure 5), is only in the ninth place of revealed comparative advantages. Thus, the main exporting industry seems not to obey the comparative advantage principle. In the case of the basic metal industry, it exhibits a higher degree of consistency between its share in the export sector and the comparative advantage that it reveals; this industry represents 25% of total exports and it is ranked first in the RCA index. The fact that export shares are not well-aligned with the measure of comparative advantages, points to some distortions in the economy (external and/or internal). As we mentioned above, this issue will be discussed later in more detail.

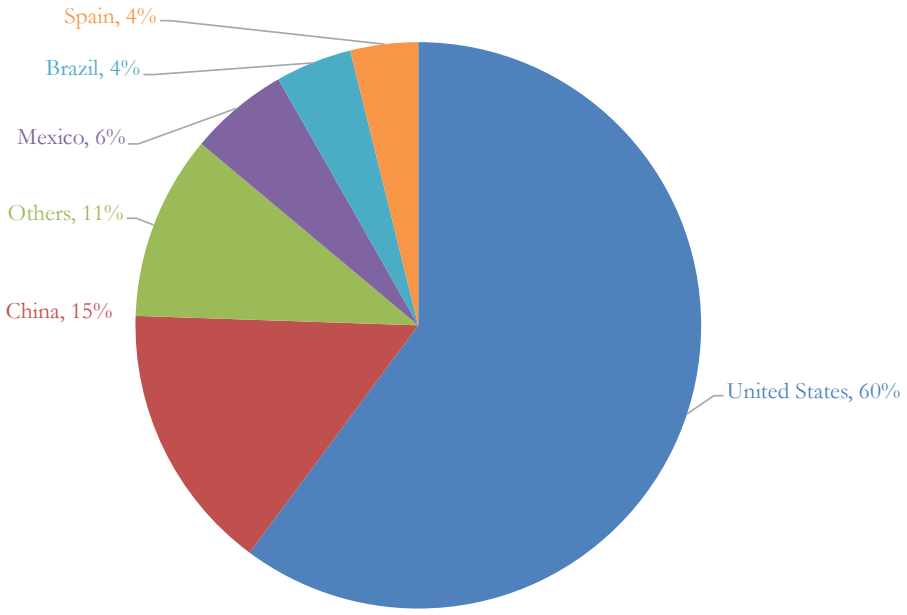
To conclude this section, we document in figures 10 and 11 the Dominican Republic main trading partners in the export and import sectors. We observe that United States is currently the main trading partner, representing 51% of total exports, and 60% of total imports. The importance of the United States as a trading partner is in part the consequence of the trade agreements that both economies signed in the past, and it is also explained by the geographic proximity between both countries. This information is important to understand the underlying forces behind the openness phases identified in Section 2.1. Next section digs deeper into this issue.

Figure 10: Exports Partners, 2017



Source: World Development Indicators (World Bank).

Figure 11: Imports Partners, 2017



Source: World Development Indicators (World Bank).

2.4 Trade Policy

As concluded in Section 2.1, the evolution of trade openness in Dominican Republic can be divided in four periods: a low degree of openness in the 1970s, the opening of the economy in the 1980s, the stability of trade openness in the 1990s and mid-2000s, and a decreasing trend since the mid-2000s. We next discuss some developments that can explain these four phases.

The 1970's were characterized by a low degree of openness of the economy. In that decade, the development strategy heavily relied on an import substitution industrialization, as it happened in other countries in Latin America. The trade policy figured high tariffs and import quotas to specific goods, such as agricultural goods. Moreover, 70% of total exports were originated in commodity sectors.

In the early eighties, the economy started a transition process towards a more services-oriented economy, which extended until the nineties. This transition started with a macroeconomic adjustment that considered tax exemptions in free zones, lifting barriers to foreign investment, and the privatization of public companies. This macroeconomic adjustment was mainly a response to the financial and currency crises that affected several Latin American countries in 1982.

After the financial crisis, the trade policy involved the participation of the country in the Caribbean Basin Initiative (CBI).[2] The CBI was an economic program promoted (unilaterally) by the United States, and it was motivated by the Law of Economic Recovery of the Caribbean Basin. The CBI stated unilateral preferential trade and tax benefits for eligible Caribbean countries, including the Dominican Republic. Goods from the beneficiary countries had access to a duty-free entrance to the United States, which mainly aimed at boosting the regional economy.

The 1990's were characterized by a "dual" regime. On the one hand, exports continued to benefit from the integration to the global market, mainly through the CBI. On the other hand, some industries continued to be protected from foreign imports. In 1995, the Dominican Republic joined the World Trade Organization (WTO), which cleared the ground for signing preferential tariff agreements and free trade agreements with other countries.

Among the preferential tariff agreements, we highlight the Cotonou Agreement (CA) and the Caribbean Basin Trade Partnership Act (CBTPA). The CA was a treaty signed in 2000 between the European Union and African, Caribbean and Pacific Group of States. It was enacted in 2003 and has been subsequently revised in 2005 and 2010. The CA stated reciprocal trade agreements, meaning that not only the European Union provided duty-free access to its markets for the exports from the Caribbean and Pacific Group of States, but the latter group of countries also provided duty-free access to their own markets for European Union exports. The CBTPA is a United States legislative act signed in 2000, which extended a preferential tariff treatment to the textile and apparel products from the US fabrics that were previously excluded from the CBI.

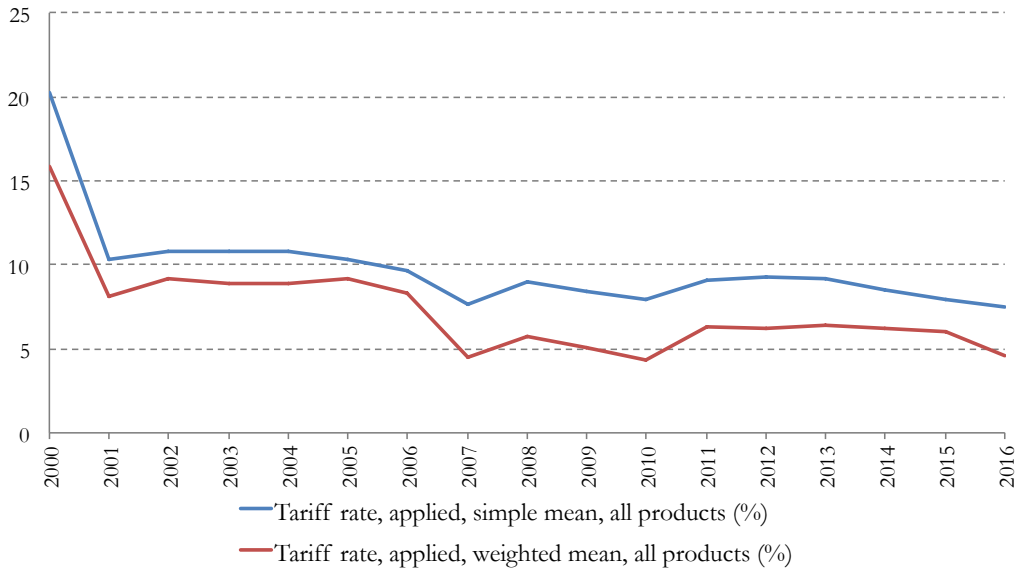
Among the trade agreements that are currently in force, two important ones are the DR-CAFTA and the Economic Partnership Agreement (EPA). The DR-CAFTA was an agreement signed in 2004 by the Dominican Republic, the United Sates, and other Central American countries. This agreement has been in force since 2007 and considered removals of custom duties for products that were original from the member countries. It also considered the creation of a free trade area similar to NAFTA. The EPA, signed in 2008, included the European Union, the Dominican Republic, and other Caribbean and African countries. EPA created a free trade area for the member countries. We

[2] The CBI was enacted on January 1st, 1984.

can also highlight the Caribbean Community (CARICOM), which is an organization of fifteen Caribbean countries that promotes the economic integration and cooperation among its members.

As a consequence of the waves of trade agreements signed by the country in the 2000s, the average tariffs of all imported products steadily declined, as we observe in Figure 12. Particularly interesting is the sharp fall observed in 2000. This fact was consequence of Law 146-00 of Customs Reform, which was enacted to foster trade, and included the elimination of tariff distortions and the reduction of the average tariff rate, from 20.21% to 10.31%. The declining trend continued since then, mainly driven by several trade agreements, some of which we described above.

Figure 12: Tariffs (%) 2000 -2016

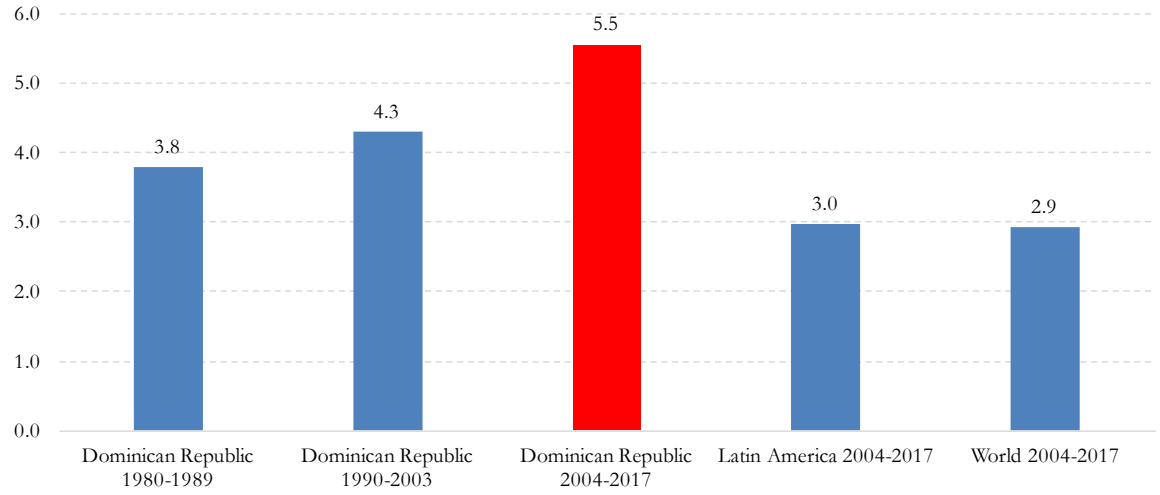


Source: World Development Indicators (World Bank). Note: Years 2009 and 2014 are not available. Then for expositional purposes, we linearly interpolated the values for these years.

However, it is striking that the decreasing trend in trade openness observed in Figure 3 during the 2000s parallels the fall in tariffs exhibited in Figure 12. In what follows, we will attribute the slowdown in trade openness to two factors: first, an acceleration of the growth rate of the economy, mainly driven by the service sector, and second, a slowdown in the foreign demand for Dominican Republic exports during recent years.

Figure 13 compares the average annual growth rate of the economy during the period 2004-2017 with the growth rate observed in earlier periods, and the growth rate exhibited by the Latin American region and the world economy.

Figure 13: Economic Growth across Different Periods and Regions (%)

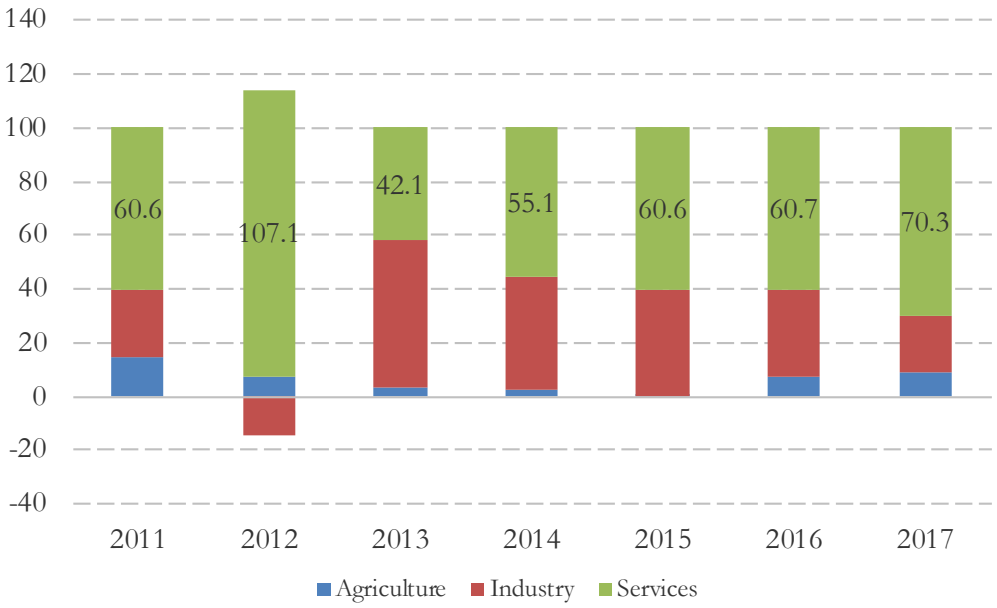


Source: World Development Indicators (World Bank).

Figure 13 unveils a remarkable performance of the Dominican Republic during the period 2004-2017. The average annual growth of the economy reached 5.5%, more than one percentage point higher than the average growth during the period 1990-2003, and almost two percentage points higher than the average rate between 1980-1989. Moreover, the outstanding economic performance of the country is confirmed when we compare it with the growth rate observed in other regions. As a benchmark, we selected the Latin American countries and the world economy. We observe that the average annual growth rate of the Dominican Republic economy during 2004-2017 was also higher than the economic growth observed in Latin America and the world economy, during the same period.

We now dig deeper into the causes behind the acceleration of economic growth of the economy during recent years. To do so, we report the contribution of different productive sectors to the value-added growth. In the analysis, we decided to exclude the years of the global financial crisis because they could misrepresent recent trends.

Figure 14: Incidence of the Main Productive Sectors to the Value-Added Growth (%)

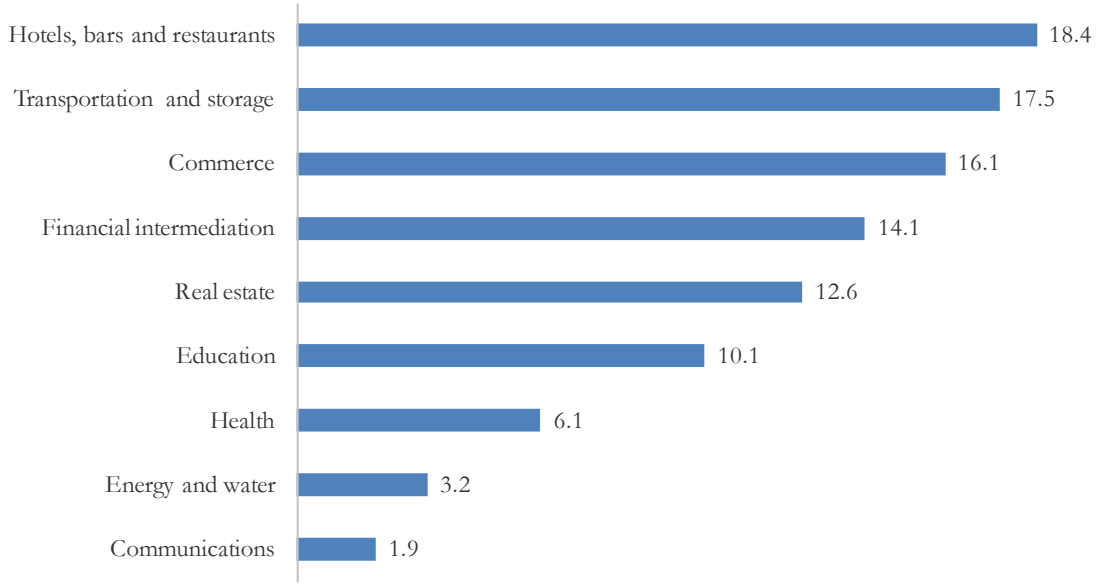


Source: Central Bank of the Dominican Republic.

Figure 14 shows that the strong economic performance of the economy during recent years has been driven by the service sector. We observe that the incidence of the service sector in the value-added growth of the economy ranges between 40% and 100%, and it explains more than half of the growth rate of the economy. Overall, the service sector represents 67% of the total value-added of the economy, whereas similar figures for agriculture and industry are 6% and 27%, respectively.

In order to identify the type of services that contributed the most to the economic growth of the overall economy, Figure 15 plots the average contribution of different services to the valued-added growth of the sector.

Figure 15: Contribution of Specific Services to the Value-Added Growth of the Service Sector

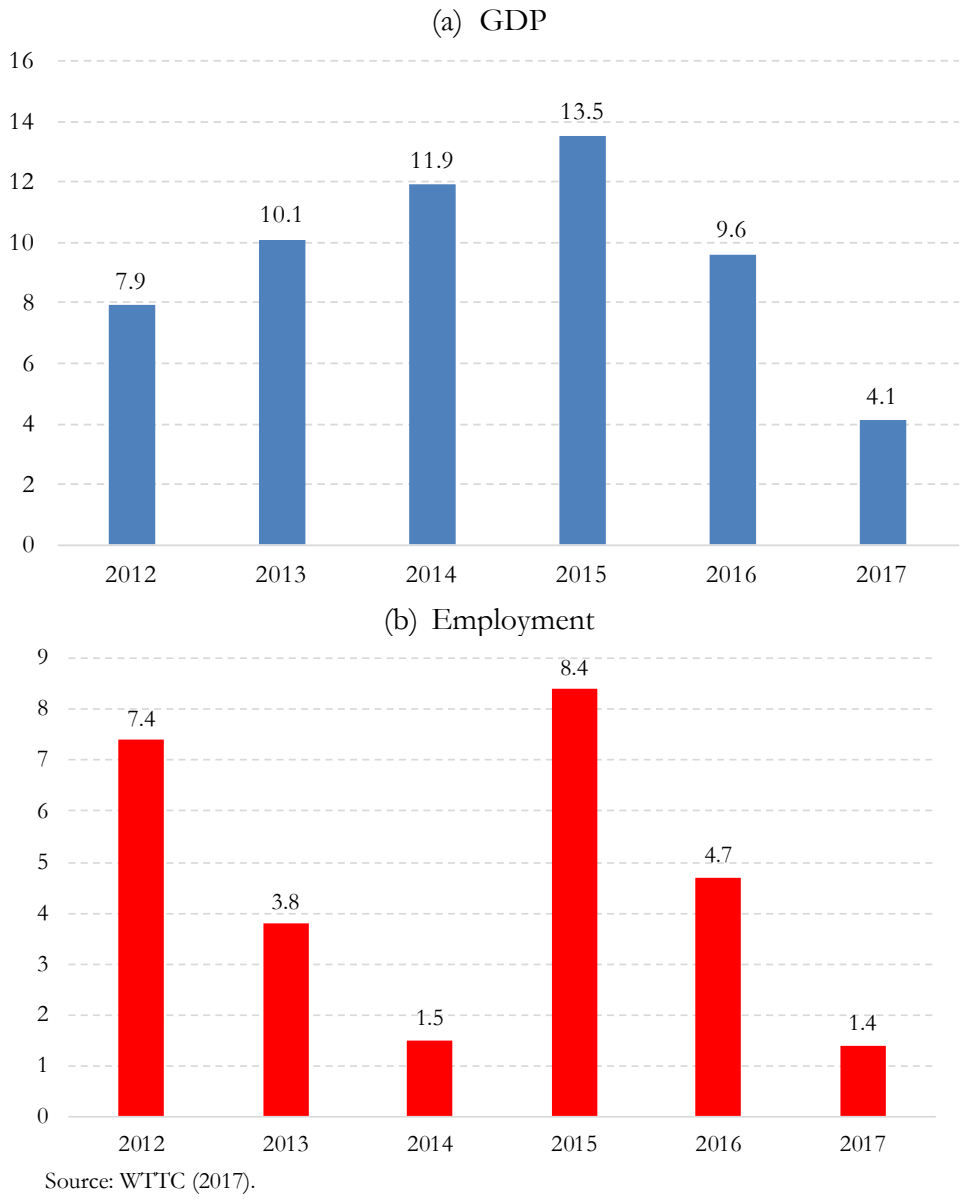


Source: Central Bank of the Dominican Republic.

We observe, in Figure 15, that "hotels, bars and restaurants" is the item that exerted the strongest influence on the valued-added growth of the service sector. These services have been traditionally related to tourism. Therefore, the evidence provided in Figure 15 suggests that the tourism industry is becoming an important engine of growth for the Dominican Republic economy. That is good news since the tourism industry creates jobs and promotes investment in the local economy. For instance, the World Travel & Tourism Council (WTTC) documents that, overall, the travel and tourism sector accounted for 10.4% of global GDP and 9.9% of total employment in 2017.

In the case of the Dominican Republic, the WTTC reports that the direct contribution of the travel and tourism sector to GDP was 5.4% in 2017. The total contribution (direct and indirect) to the GDP of the economy reached 17.2% in 2017. Moreover, the sector supported 206,500 jobs (4.8% of total employment). Lastly, the investment in the travel and tourism sector represented 3.8% of the total investment in 2017. For a comparison purpose, the analogous figures for the Caribbean economies are 4.8% (direct contribution to GDP), 15.2% (total contribution to GDP), 4.3% (total employment), and 12.9% (total investment). Then, as reported by Figure 16, the contribution of the tourism sector to the economy has been significant during the recent years.

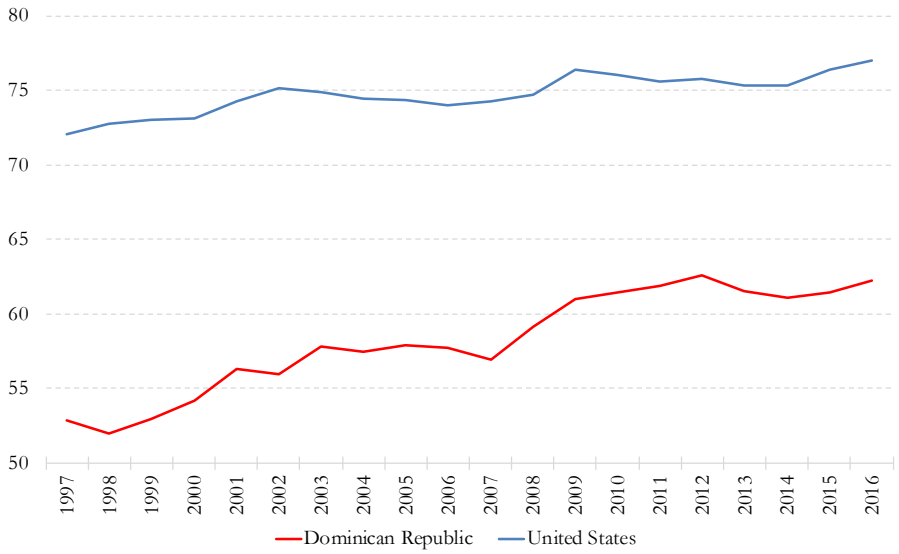
Figure 16: Growth (%) in the Total Economic Contribution of the Travel and Tourism Sector to GDP and Employment, Dominican Republic



Source: WTTC (2017).

Overall, the evidence reported in the previous figures suggests that an acceleration of economic growth, mainly driven by the service sector, seems to be a contributing factor to the slowdown in the trade openness of the economy (see Figure 3). That is good news since the rise of the service economy is an intrinsic aspect of the development process of countries that have caught up the developed world (Buera and Kaboski 2012). As we observe in Figure 17, the rise of the service economy in the Dominican Republic resembles the US trend (with a narrowing gap).

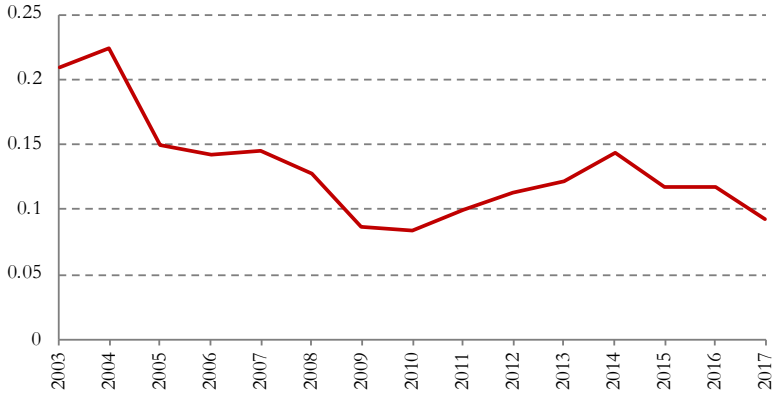
Figure 17: The Rise of the Service Economy (% share), U.S. and the Dominican Republic



Source: World Development Indicators (World Bank). Note: The selected years correspond to data availability.

We next discuss a second possible explanation for the apparent dichotomy between figures 3 and 12. Figure 18 plots the ratio of export to GDP for the Dominican Republic during the last decades. We observe a pronounced fall in exports scaled by GDP during the 2000s, followed by a period of stability. Thus, Figure 18 suggests that the demand for the Dominican Republic exports slowed down during the 2000s.

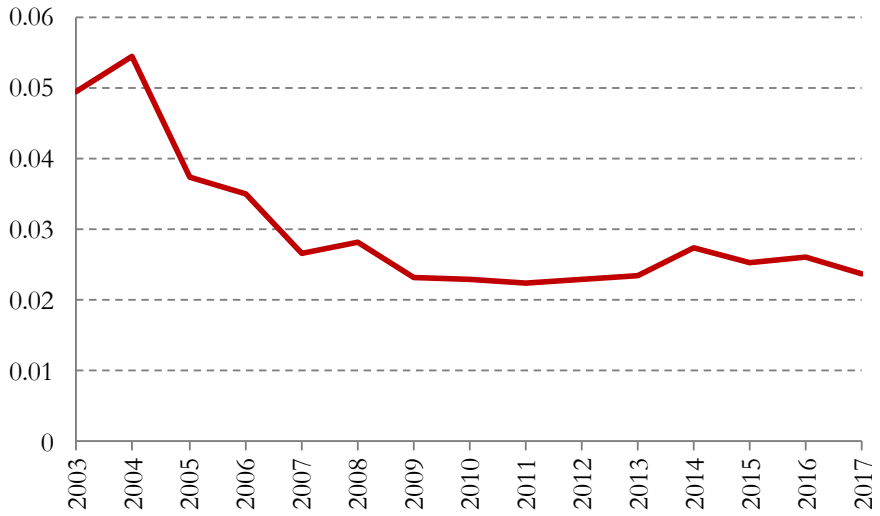
Figure 18: Exports to GDP (ratio) in the Dominican Republic



Source: World Integrated Trade Solutions for exports and World Bank for GDP.

As an illustration of the slowdown in the total demand for exports (see Figure 18) the next figure plots the evolution of exports from the metals products industry, scaled by GDP. As described in Figure 5, metals products represent 26% of total exports. Resembling what we observed in Figure 18, the foreign demand for metals experienced a strong falling trend during the 2000s.

Figure 19: Metal Products Exports to GDP (ratio) in the Dominican Republic



Source: World Integrated Trade Solutions for exports and World Bank for GDP.

The analysis suggests that Dominican Republic exports are less attractive for the rest of the world. This could be the consequences of inefficiencies or distortions in the domestic economy. This is the focus of the next section.

3. Distortions in the Dominican Republic Economy

In modern economies, firms purchase goods from different countries and also from local industries. All these transactions can be potentially affected by distortions arising from external as well internal factors. External distortions are frictions to move goods across countries; for instance, as a consequence of trade policy or other types of trade barriers. On the other hand, internal distortions are frictions to move goods across local industries. Importantly, both external and internal distortions can trigger different types of resource misallocations.

Internal distortions have important aggregate effects in an economy due to the interdependencies that characterize domestic and external production networks. To fix ideas, imagine

that the textile sector is subject to some type of distortion. This hypothetical distortion increases the price of textile products (since it is more inefficient the production in that industry), and therefore, it becomes the purchases of these goods less attractive for other countries. In addition, the rise in the price of textiles increases the price of other tradable goods that use textiles as inputs. It also affects the prices of non-tradable goods that use materials from the tradable sectors. Therefore, through these input-output linkages, domestic distortions can have large aggregate disruptive effects in the economy. They can also affect the export potential of several industries. The magnitude and effects of internal distortions is the issue that we study later on.

Before turning to identify the distortions in the economy, we start by studying the sectors that are more important for Dominican Republic. To do so, we consider the importance of sectors measured not only by their size but also by their impact on the rest of the economy through production networks. Specifically, (i) we compute the elasticity of aggregate real GDP in Dominican Republic with respect to changes in internal distortions and (ii) we provide a ranking of such elasticities by sector. To compute these elasticities, a model of the world input-output structure is needed. To analyze the role of internal distortions in the Dominican Republic economy, we rely on the framework and analysis developed in CPT.

CPT model the world economy as input-output relationships subject to distortions. In what follows, we provide a brief description of the environment modelled in CPT.[3] Specifically, we discuss how this framework is useful to think about the world economy as an input-output structure. The model allows the study of the relative importance of a given industry in the whole production network of the country, and also the identification of internal distortions. First, we describe the production side of the CPT economy, and then, we describe the demand side.

In the CPT model, the environment consists on a world with many countries and many industries in each country. Each country is endowed with equipped labor (that is, labor and capital) and produces goods in many industries. Goods in a given country and industry are produced with equipped labor and intermediate goods (materials) under a Cobb-Douglas production function. Intermediate goods or materials are a CES aggregate of intermediate goods from all countries and industries in the world. As discussed in CPT, the CES production structure has two important

[3] A formal presentation of the main elements of this model is provided in the Appendix.

implications for the analysis. First, it accommodates the fact that firms in a given country and industry purchase goods from all locations and industries in the world, allowing to match the model exactly with any observed world input-output matrix. Second, the CES structure implies that the shares of inputs purchased by firms in a given sector and country from another given sector and country are endogenous; that is, they respond to changes in prices. Those elements make the world input-output structure endogenous. The latter, in turn, allows to study and quantify how the production structure of a country changes, and also to assess the aggregate effects of changes in internal distortions in a given economy, which is one of our goals.

The model also assumes that sourcing a good from a given country and sector entails an exogenous cost τ, which is a wedge over the unit cost of producing in the origin industry/country. This wedge is called a distortion, and it is allowed to depend on the origin sector/country and the destination sector/country. Examples of such distortions are sector-specific taxes, regulations or policies that favor sourcing from one sector over another, and markups.

The demand side of the economy also features a CES structure where households purchase final goods from all locations and industries in the world. Given the CES structure, the final expenditure shares are also endogenous and, together with the production expenditure shares, allow the identification of the internal distortions of the economy.

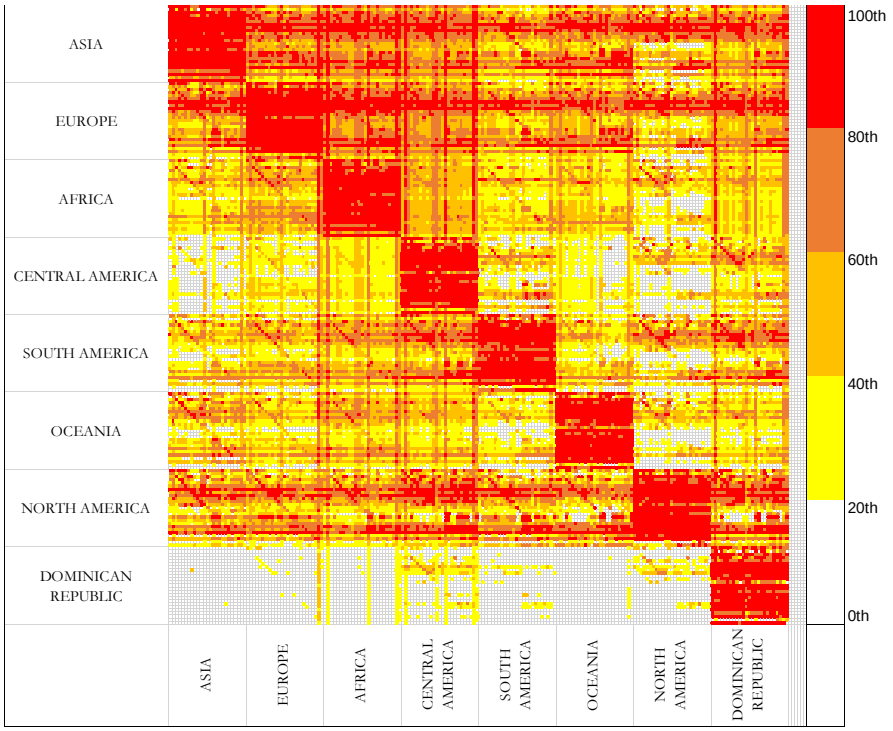
As mentioned above, the CPT model matches exactly any observed world input-output table. Thus, a world input-output table is the only data that the model needs for the empirical analysis of distortions. In what follows, we use the EORA's world input-output table, which describes the transactions of intermediate and final goods across industries and countries around the world. Crucially for this paper, this world input-output table contains information about the internal and external transactions across industries for the Dominican Republic economy.[1]

[1] In addition, the EORA global supply chain database consists of a multi-region input-output table (also called MRIO) that provides a time series of input-output tables for 190 countries. The EORA MRIO features a balanced global MRIO table linking 15,909 sectors across 190 countries for a complete time-series for the 1990-2015 period.

To facilitate the analysis, we aggregated the number of countries in the EORA world input-output matrix to the Dominican Republic economy and seven other regions of the world: Asia, Africa, Central America, Europe, North America, Oceania, and South America.

Following CPT, we first illustrate the interconnections of countries in the world economy by constructing, in Figure 20, a heatmap of the world input-output table for the year 2012. Specifically, this figure shows the bilateral transactions across industries and regions, where the rows present the destination country/sector, and the columns show the origin country/sector. The colors in the figure represent bilateral input shares that are labeled on the right-hand side of the figure by percentiles, and the observations are ordered first by country and then by sector. Focusing on the Dominican Republic, we can see that, even though the economy is interconnected with the rest of world, domestic transactions seem to be more important than foreign transactions.

Figure 20: World Production Structure 2012



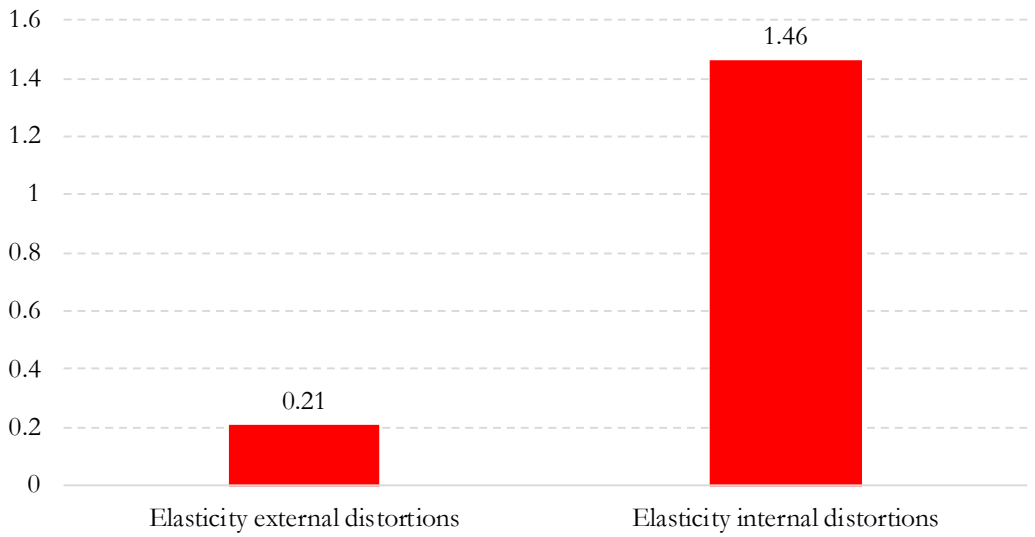
Source: Own elaboration based on Eora 2012.

We now turn to evaluate the interconnection of the Dominican Republic economy by computing the elasticity of the real GDP with respect to changes in sectoral distortions. We first compute the aggregate real GDP elasticity of the economy with respect to changes in the internal

versus external distortions. We build the following counterfactual exercise. We feed into the CPT model a one percent decline in the distortions of purchasing goods in all industries in the Dominican Republic from all industries located in foreign regions, holding constant the distortions of buying from other industries in the domestic economy. Then, we compute the percentage change in aggregate GDP in the Dominican Republic to this change in external distortions. Analogously, after doing so, we feed into the CPT model a one percent decline in the distortions of purchasing goods in all industries in the Dominican Republic from all industries located in Dominican Republic, holding external distortions constant.

The results are displayed in Figure 21. The main message from this figure is that the elasticity of real GDP in Dominican Republic with respect to changes in internal distortions is about seven times larger than with respect to changes in external distortions. Concretely, a one-percent reduction in internal distortions in the domestic economy leads to an increase in real GDP of about 1.46 percent. The same figure is only 0.21 percent when external distortions are reduced by one percent.

Figure 21: External versus Internal Distortions

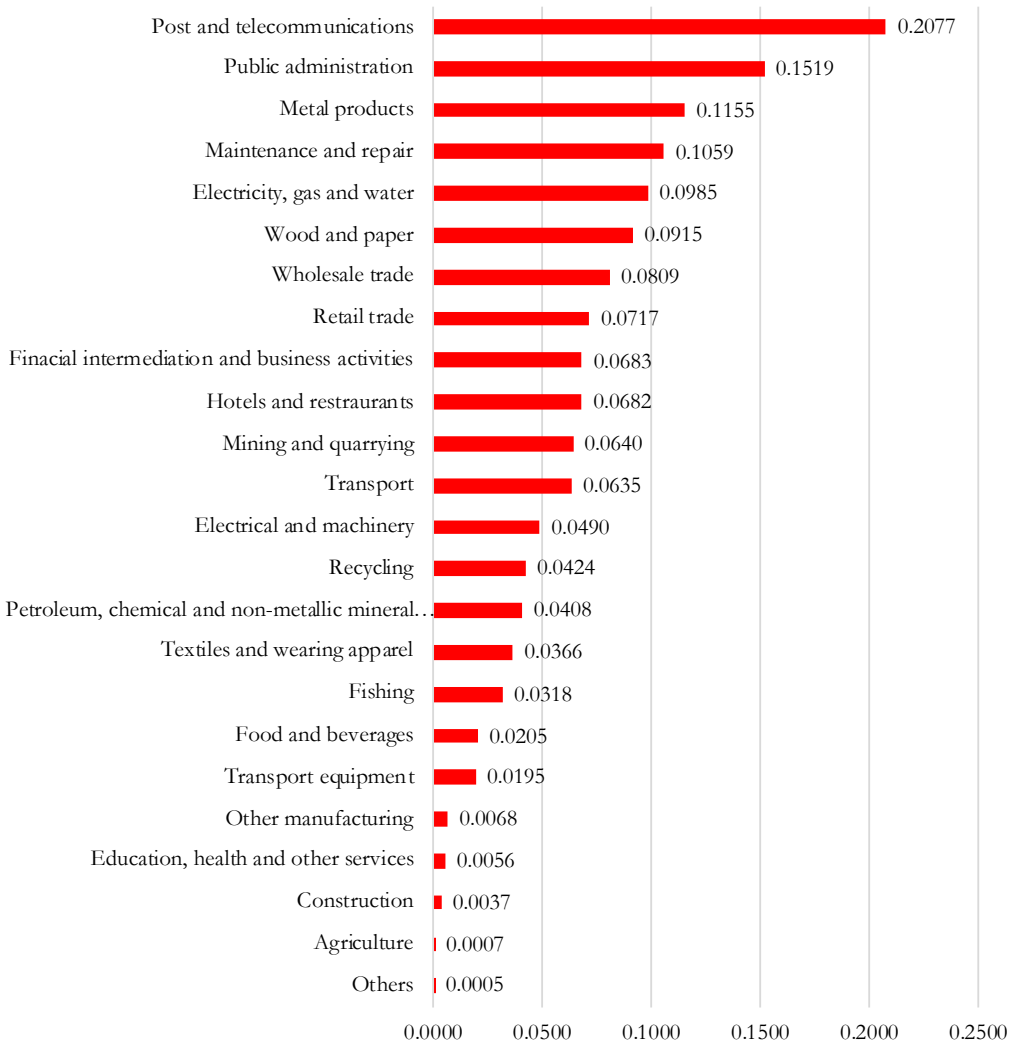


Source: Own elaboration.

We then dig deeper into the analysis of the internal distortions. In particular, we compute the elasticity of real GDP in the Dominican Republic with respect to changes in internal distortions, and evaluate the relative importance of different industries for the economy. As discussed above, these

elasticities consider the whole production network of the economy. The elasticities of real GDP with respect to a one percent decline in internal distortions across industries are displayed in Figure 22.

Figure 22: Internal Distortions, Sectorial Analysis



Source: Own elaboration.

We can observe that the importance of reducing internal distortions is especially relevant in the non-tradable sectors. Specifically, reducing distortions in the telecommunication and public administration sectors has the largest impact on aggregate real GDP. These sectors are of a relatively large size, but also heavily interconnected to the rest of the economy, which explain their importance for the aggregate economy. Some tradable sectors such as metals, and wood and paper are also very relevant for the economy. For instance, reducing distortions in the metal industry leads to an increase in aggregate GDP by about 0.12 percent.

Overall, the previous exercise highlights the importance of internal distortions for the Dominican Republic economy. It also reveals the large benefits of reducing them, much larger than those derived from reducing external distortions. The analysis also points to the industries that can have the largest impact on the aggregate economy. In the next section, we identify the actual changes in distortions across sectors.

4. Identifying Changes in Internal Distortions

We first use input-output data to identify changes in internal distortions across industries over the period 1992-2012. In particular, CPT develop a sufficient statistic, which is given by the following expression:[2]

$$\hat{\tau}_{ij,ik} = \frac{(\hat{\gamma}_{ik,ik}/\hat{\gamma}_{ij,ik})^{\frac{1}{\theta}}}{(\hat{\alpha}_{ik}/\hat{\alpha}_{ij})^{\frac{1}{1-\sigma}}},$$

where $\hat{\tau}$ is the change in internal distortions on goods purchased from industry *k* by firms located in country *i* and industry *j*, $\hat{\gamma}_{ik,ik}$ is the change in the share of within-sector materials purchased by firms located in country *i* and industry *k*, $\hat{\gamma}_{ij,ik}$ is the share of materials purchased by firms in industry *j* from industry *k*, and $\hat{\alpha}_{ij}(\hat{\alpha}_{ik})$ is the share of final demand of sector *j(k)* goods by households in country *i*. One important feature of this sufficient statistics is that the production and consumption shares are directly observable from any world input-output table. Lastly, θ and σ are the elasticties of substitution in production and consumption, respectively. The "hat" means change between two periods of time. We next discuss the intuition behind this statistic. Then, we present the results.

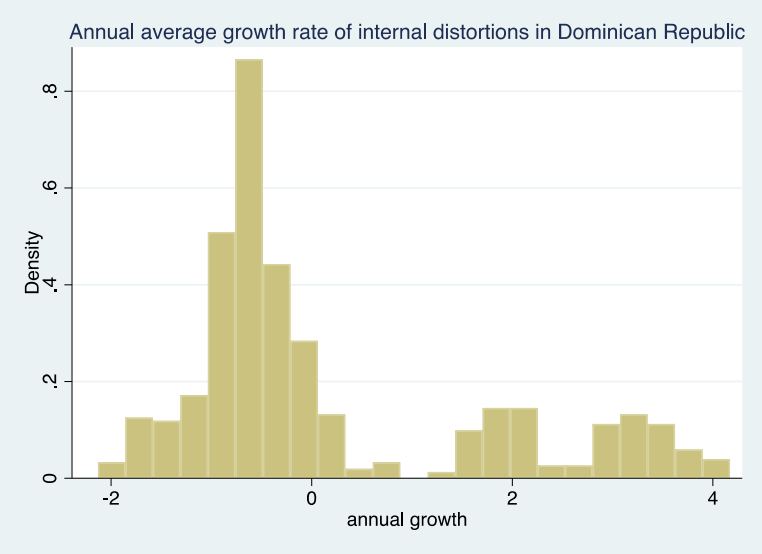
The relative production shares (the "gammas") reflect the intermediate goods that firms located in industry *k* purchase from industry *j*, relative to the purchases from the same industry *k*. This ratio embodies two effects. First, the price of materials produced in sector *k* relative to the price of materials produced in sector *j*. If materials from sector *k* are more expensive relative to materials from sector *j*, firms located in industry *k* will spend a higher share of intermediate consumption in materials from sector *j*. Second, the ratio of intermediate expenditure shares contains information on the sectoral distortions. If distortions from purchasing intermediate goods from sector *j* are high, firms

[2] See the Appendix for the derivation of this sufficient statistic.

located in industry *k* will purchase a larger fraction of materials from their own sector. How can the distortions be separated from the price effects? The cross-sectoral variation in the CES consumption share pins down the relative sectoral prices. As result, both the cross-sectoral variation in production shares and the cross-sectoral variation in consumption shares identify the changes in distortions.

Figure 23 presents a histogram with the annual change in internal distortions over the period 1993-2017. We can observe a high heterogeneity across industries. Overall, the median is -0.48 percent, which means that most of input-output transactions in the Dominican Republic have experienced a reduction in distortions. On the other hand, the histogram has a long right tail. That is, there are some input-output transactions that have experienced a relatively sizeable increase in distortions. As a result, the average annual growth in distortions is positive and about 0.18 percent.

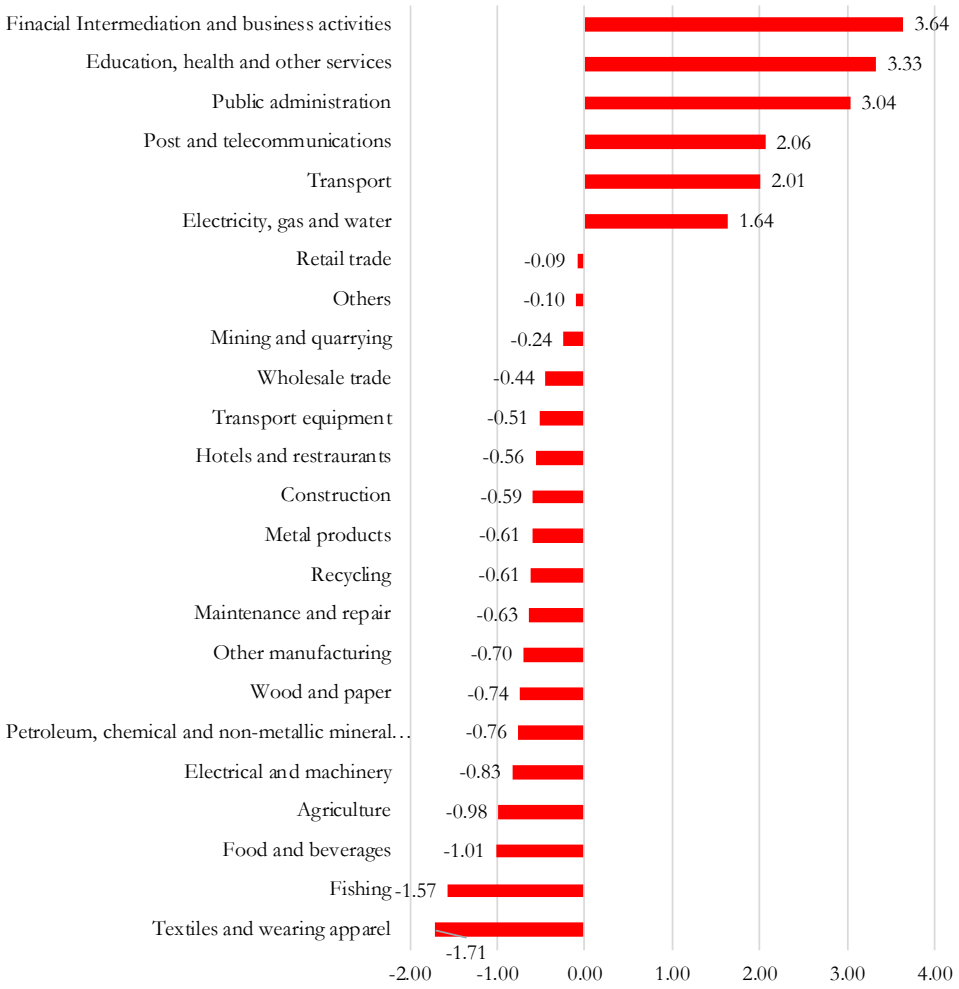
Figure 23: Changes in Internal Distortions, 1993-2012



Source: Own elaboration.

To shed light on the changes in distortions across different industries, Figure 24 plots the median distortion of selling from a given sector to the rest of the economy. We can see that financial intermediation is the sector that has the largest annual growth in internal distortions, followed by other non-tradable sectors such as education, public administration, and telecommunications. It is important to emphasize that a rise in distortions in non-tradable sectors can have sizeable effects in the tradable sectors because the high degree of interconnection of the Dominican Republic economy.

Figure 24: Median Distortions of Selling (%)



Source: Own elaboration.

Finally, we compute the aggregate real GDP effect of the actual changes in distortions in the Dominican Republic industries. To do so, we feed into the CPT model the actual changes in distortions over the period 1993-2017 and compute the change in aggregate GDP under a counterfactual scenario that keeps distortions constant over that period. We find that the increase in distortions in the non-tradable industries has had a large impact in the aggregate economy, more than offsetting the effect of the decline in distortions in the rest of the economy. In fact, if distortions would have remained unchanged at the 1992 level, the economy would have experienced a higher GDP growth; about one and half percentage points higher per year.

This paper advanced on identifying internal distortions and their importance for the aggregate economy. This paper also highlighted the importance of designing policies to reduce internal distortions. Identifying the origin of internal distortions and the cost of reducing them is clearly very challenging and outside the scope of this paper. However, we conclude the analysis by discussing some potential bottlenecks in the economy that seem to be consistent with the main findings of this paper.

The distortions in the service sector, in particular, in industries such as electricity and transport, are likely related to significant energy, transport, and logistic costs in these and other non-tradable industries. For instance, according to CEPAL, the cost of land transport in Dominican Republic is about three times higher than the average cost in Central America and Mexico, and about four times higher than in other markets, such as Nicaragua. Similarly, according to the World Economic Forum, the Dominican Republic is the second country, among 124 countries, with the highest cost of electricity. Hence, the cost of energy in the local economy is high relative to other countries. Also, the telecommunications industry has experienced an increase in the production cost and a fall in the quality of the service provided, together with a persistent rural-urban gap in accessibility.[4] In addition, the distortions identified in this paper could also reflect markups associated with a reduced competition as a consequence of mergers in the industry. Finally, the high distortions in the financial services industry and the public administration industry are in line with a relatively weak business environment and a low quality of public services, which has been highlighted by international organizations. For instance, Dominican Republic ranks 103 out of 190 in the ranking of Doing Business elaborated by the World Bank. This ranking also points to the resolution of insolvency and the difficult access to electricity as the main problems of the business environment.

5. Conclusions

This paper documented a slowdown in the level of trade integration in Dominican Republic during the last several years. Moreover, this slowdown is also relative to the world economy, and even in a period where the trade policy of the economy moved towards an overall tariff reduction. Part of the explanation for this pattern points to a reduction in the attractiveness of goods produced in the country, possibly due to internal bottlenecks or distortions.

[4] See "Estudio de Caso: República Dominicana," elaborated by *Alliance for Affordable Internet.*

Using recent tools developed in the international trade literature, we study the importance of external versus internal distortions in the Dominican Republic. The first result of the paper is that the elasticity of real GDP with respect to changes in internal distortions is of an order of magnitude larger than that with respect to external distortions. This fact highlights the importance of studying internal distortions. We also find that the economy is strongly interconnected through input-output linkages. As a consequence of this sectoral interconnections, internal distortions in a given sector spread out to the rest of the economy. Distortions are especially relevant in non-tradable sectors, and their effect on the aggregate economy are magnified by the sectoral linkages.

The results of this paper highlight the importance of identifying internal distortions to further foster the efficiency of the domestic economy. While this paper has highlighted the importance of reducing them, future work should focus on identifying specific policies (and their cost) that can attenuate distortions that are especially relevant in some industries, such as electricity, transport, telecommunications, finance, and public administration.

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Appendix: The CPT model to identify internal distortions

In this appendix, we reproduce and describe the main equations of the CPT model to identify internal distortions. Goods from country *i* and sector *j*, Q_{ij}, are produced with a Cobb-Douglas production function:

$$Q_{ij} = A_{ij} L_{ij}^{\beta_{ij}} M_{ij}^{(1-\beta_{ij})},$$

where A_{ij} is the TFP, L_{ij} is the amount of labor allocated to sector *j*, M_{ij} is the amount of materials used by sector *j*, and $\beta_{ij} \in [0, 1]$ is the share of value added in gross output.

A CES production function aggregates the intermediate goods from all sectors and locations. Then, materials in country *i* and sector *j*, M_{ij}, are:

$$M_{ij} = \left(\sum_{n,k} i_{nk} \, Q_{ij,nk}^{\frac{\theta}{1+\theta}} \right)^{\frac{1+\theta}{\theta}},$$

where $n = 1, \ldots, N$; $k = 1, \ldots, J$, and the sector *i* in the country *j* sources $Q_{ij,nk}$ of intermediate goods from sector *k* in country *n*. The parameters i_{nk} are time-invariant input weights.

Good Q_{ij} has a unit price given by:

$$c_{ij} = \frac{1}{A_{ij}} \omega_i^{\beta_{ij}} P_{ij}^{(1-\beta_{ij})},$$

where P_{ij} denotes the price of materials from country *i* and sector *j*, and ω_i is the wage in country *i*.

Preferences in country *i* are described by the following utility function:

$$U(C_i) = \left(\sum_{j=1,\ldots,J} \chi_{ij} C_{ij}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

where C_{ij} are the consumption goods from sector j in country i, C_i is the composite consumption good, and χ_{ij} are demand shifters applied to goods j in country i, which are assumed to be time invariant.

There is a cost $\tau_{ij,nk}c_{nk}$ of sourcing a good from country n, sector k to country i, sector j. The parameter τ is the distortion or wedge. The case of internal distortion is when $n = i$. CPT define two key statistics that are directly observable in any world input-output table. First, denote by $\gamma_{ij,nk}$ the share of inputs from country n, sector k in total intermediate consumption in country i, sector j. Second, denote by α_{ij} the share of consumption of goods from sector j in the aggregate consumption of country i.

The counterpart of the input-output shares in the model is given by

$$\gamma_{ij,nk} = \frac{A_{nk}^{\theta}\tau_{ij,nk}^{-\theta}P_{nk}^{-\theta(1-\beta_{nk})}i_{nk}{}^{1+\theta}}{(P_{ij}/\omega_n^{\beta_{nk}})^{-\theta}},$$

and the counterpart of the consumption shares in the model is given by

$$\alpha_{ij} = \frac{P_{ij}C_{ij}}{\sum_{k=1}^{J}P_{ik}C_{ik}} = \chi_{ij}\left(\frac{P_{ij}}{P_i}\right)^{1-\sigma}$$

We can divide the input shares, $\gamma_{ik,ik}$ and $\gamma_{ij,ik}$, so that the sector k TFP, A_{ik}, and the wage, ω_i, are canceled out. Then, we can use $\tau_{ikik} = 1$. Hence, the expression for the distortion as a function of the sectoral prices is:

$$\tau_{ij,ik} = \left(\frac{P_{ij}}{P_{ik}}\right)\left(\frac{\gamma_{ik,ik}}{\gamma_{ij,ik}}\right)^{\frac{1}{\theta}}$$

Dividing the shares of consumption for sector j and k gives the ratio of sectoral prices we get:

$$\frac{P_{ij}}{P_{ik}} = \left(\frac{\alpha_{ij}/\chi_{ij}}{\alpha_{ik}/\chi_{ik}}\right)^{\frac{1}{1-\sigma}}$$

Then, substituting the expression for the distortion we obtain:

$$\tau_{ij,ik} = \left(\frac{\gamma_{ik,ik}}{\gamma_{ij,ik}}\right)^{\frac{1}{\theta}} \left(\frac{\alpha_{ij}/\chi_{ij}}{\alpha_{ik}/\chi_{ik}}\right)^{\frac{1}{1-\sigma}}$$

Lastly, we can express this equation in changes and get the equation included in Section 4.