

Latin America and the Caribbean exports to the United States: Analysis of the competition with China and other regions at product level, 2002-2018

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Abstract

This research looks at Latin America and the Caribbean exports trajectory in the United States market in the almost two decades that followed China's accession to the WTO and compares it with that followed by China and other regions. The analysis exploits product-level United States imports data collected from the United States Census Bureau. The dataset contains information on more than 30.000 products per year for almost 200 countries.

The study finds that most Latin American countries lost market share between 2002 and 2018, with Mexico's notable exception, which increased 17 percentage points. In contrast, Asia increased its participation in the United States imports market and is now the second-largest exporter region, after the OECD that still dominates the United States import market in almost every sector. Overall, China and Mexico are the countries that gained the most market share. Moreover, Latin American countries' exports are not very similar to China's exports to the United States, indicating that they may not be directly competing in this market. In terms of product qualities, the comparison between Latin America and China reveals that Latin America specializes in high-value segments more than China does.

Introduction

China's entry into the World Trade Organization in 2001 unlocked new opportunities for this country to access the broader global market. The Asian country was already implementing unilateral tariff reductions of its own before that time and benefiting from low tariffs abroad (Feenstra and Kee, 2004). In the United States, China had already started to increase its participation well before becoming a WTO member. Using data from 1972 to 2001, Schott (2006) showed that China's manufacturing exports exploded in both the breadth of products exported to the United States and the volume of exports. The growth rate of product penetration and market share was significantly higher than that of Latin America over the same period. The United States continues to be the leading trade partner for Latin America and Caribbean exports. Understanding threats to the region's competitiveness in the United States imports market is a relevant policy issue.

This research looks at Latin America and the Caribbean exports trajectory in the United States market in the almost two decades that followed China's accession to the WTO and compares it with that followed by China and other regions. The study compares the year 2002, when China enters the World Trade Organization¹, and the year 2018, the last year for which complete information is available. The assessment is made along two complementary dimensions: the distribution of countries' export products to the United States and the distribution of export prices across countries within each product category.

The analysis exploits product-level United States imports data collected from the United States Census Bureau. According to thousands of finely detailed categories, these data record the customs value of all United States imports by exporting country (HST10). Following Schott (2004), we refer to them as "products" or "goods." Imports at higher aggregation levels, such as the one-digit Standard International Trade Classification, Revision 3 (SITC1) system, are referred to as "industries." The dataset contains information on more than 30.000 products per year for almost 200 countries.

¹ China's accession to the WTO was on 11th December 2001.

The analysis first focuses on the evolution of market shares and product penetration² in the United States import market. Both measures provide an indication of the level of countries' specialization in different products. In theory, countries specialize in products that use intensively the factor of production that is relatively abundant in that country and import products that use intensively the factor of production that is relatively scarce (Heckscher-Ohlin model). In this regard, early in the 2000s, the premise was that China would specialize in products that use intensively low-skill labor and OECD countries in those products that use intensively capital and skilled labor.

Contrary to the a priori theoretical expectation, Schott (2006) found that there was an overlap in the products exported to the United States by China and the OECD. The overlap grew significantly between 1972 and 2001. This was the result of considerable increases in China's manufacturing market share and product penetration. Schott also found that by 2001, China's product penetration exceeded that of Latin America and the Caribbean combined and that only Mexico and, to some extent, Brazil had comparable levels of sophistication and penetration in manufacturing³. Our research finds that China's overall market share continued to increase faster than Asia's between 2002 and 2018, from 9% to 20%, compared to Asia's growth from 22% to 33% and much faster than that of Latin America. Latin America's share in the United States market grew very little between 2002 and 2018, from 17.5% to 18.6%. In fact, most Latin American countries lost market share between 2002 and 2018, with Mexico's notable exception, which increased 17 percentage points. Peru, Chile, and Colombia also increased their participation, albeit at a much lower rate. These results break the trend observed in the forty years prior when Latin America and the Caribbean increased their participation in the United States market at a 1.8% annual rate. Latin America continues to have a relatively high market share in resource-based products.

China and Mexico are the countries with the highest market share accumulated gain in the United States in the period of analysis. China gained 52 percentage points to Mexico's 17. While China specialized in manufacturing materials, machinery, and miscellaneous manufacturing, Mexico specializes in natural resources-based industries such as food and beverages and tobacco as well as machinery.

Besides market share, the similarity between China and Latin America and the Caribbean's export structure to the United States market provides another assessment of their competition or lack thereof. The analysis is based on the Export Similarity Index (ESI) that Finger and Kreinin (1979) developed to measure the degree of similarity between developed and developing countries' export structure. The idea was to assess the importance of reducing the tariffs imposed by developed countries on exports from developing countries. The hypothesis is that the more dissimilar the export structure between these groups of countries, the less relevant a tariff reduction would be since countries tend to protect the products they export. More recently, ESI has also been used to gauge the extent to which a country, e.g., China, may be a competitive threat to other countries. Schott (2006) used the ESI to compare the export structure of China to that of Latin America and the Caribbean as regions and to each of their individual countries to evaluate the relative threat that the growth of China as an exporter was to countries in those regions in the United States import market. In general, Schott found that the ESI of Latin American and Caribbean countries to China was low. China seems to have a much more similar structure of exports to other Asian countries than those of Latin American countries, except Mexico and some industries related to Central American countries. In this research, we found similar results.

Trends observed between 1972 and 2001 continued in our sample for the period 2002-2018. China's export structure is much more similar to that of Asia (excluding China) than Latin America or the Caribbean. When compared to individual countries in Latin America, we observe that ESI fell over the

² Product penetration refers to the number of products exported to the United States as a share of all possible export products.

³ This is consistent with Rodrik (2006) finding that "(W)hile labor intensive exports (toys, garments, simple electronics assembly) have always played an important role in china's export basket, China also exports a wide range of highly sophisticated products....its export bundles is that of a country with an income-per-capital level three times higher than China's"

period. While in 2002, industries such as beverages and tobacco had an ESI of 0.2 or higher for Colombia, Mexico, Paraguay, Peru, and Uruguay. In 2018, only Colombia, El Salvador, and Peru continued to have a relatively high ESI in that industry. Moreover, that was the only industry with some overlap between Latin American exports and those of China. Again, Mexico shows an ESI of 0.2 or higher in five out of the nine industries considered. Thus, China's exports are more of a threat to Mexico and some Central American countries than the rest of Latin America and the Caribbean.

Exploiting the richness of the product-level United States imports data collected from the United States Census Bureau that record the customs value of all United States imports by exporting country at the 10-digit-level of disaggregation as well as the quantity imported for each of those products, we compute the unit value of each product. Schott (2004) had observed that unit values of United States imports vary widely within products and that unit values are higher for varieties exported by high-income countries, a result that was subsequently found to be generalized beyond the United States import market (Schott, 2004, Fontagné et al., 2007). Consistent with those results, we find that, on average, an OECD product in the United States sells for more than three times that of a Latin American product and almost twice as much as an Asian product. Asian unit values are catching up to those of the OECD much faster than those of Latin America. In 2002, Latin America's average unit value was one and a half times higher than Asia's. By 2018, that was reversed, and the average unit value of Asian exports to the United States was one and a half times higher than that of Latin America. However, China's products sell for a much lower unit value than those of Asia and Latin American products. This fact contradicts the empirical research that has consistently found that as countries climb up the income ladder, they also tend to export high unit value products, especially to more developed markets. It also opposes previous findings (Rodrik, 2006, Hausman et al., 2006) that found China's export bundle to reflect that of a country with an income level three times higher.

The paper is organized as follows: the first section presents some methodological issues. The second section dives into the question of the level of specialization of Latin American and Caribbean countries in the United States import market and compares it with other regions. The third section uses the export similarity index to evaluate China's exports level of competition to Latin American exports in the United States import market. The fourth section looks at the question of price similarity, product varieties as indicated by unit values. The last section concludes and proposes future lines of research.

I. Methodological issues

The United States has historically been the major trade partner of Latin America and the Caribbean and continues to do so, representing about 43% of Latin American and Caribbean export's market and 32% of the region's imports origin. However, trade with the United States is dominated by Mexico, representing around 80% of the region's exports to the United States. In 2018, three-fourths of Mexico's export went to the United States. That share is much smaller for most countries of the region, some of which count China as their leading export market. In 2018, this was the case of Brazil, Chile, and Peru, for which China represented 27%, 34%, and 28%, respectively, while the United States represents 12%, 14%, and 17%, in those three countries. Although China, and the European Union, also play a significant role as markets to Latin American and Caribbean products, competitiveness in the United States market remains a significant concern of policymakers and businesses in the region.

Table 1 lists the ten mutually exclusive SITC1 industries and reports the number of product categories within each industry in 2002 and 2018⁴. Industries 0 through 4 comprise natural resources-based products, while industries 5 through 8 encompass manufacturing goods. We exclude products from industry 9 (Not Elsewhere Classified) from the analysis because it covers an extensive range of products that sometimes do not even belong to the same industry, making it challenging to draw valuable conclusions from this category.

This table gives an idea of the difference between industries and products levels. Product-level trade data helps determine the extent to which countries export similar goods to the United States. Product-level trade data provides more precise information of export competition than industry-level data: while all countries of the world export all aggregate industries (SITC1 industry categories) to the United States, goods within industries are much more heterogeneous. Many countries only export a handful of products within any given industry and therefore comparing bundles of products exported may reveal that countries are not exporting the same goods whatsoever. Simultaneously, analyzing the trade specialization at the product level may help identify countries' comparative advantages. Table 1

⁴ Table A1 in the Appendix describes how products at the 10-digit-HTS classification were assigned to the 10 SITC1 industries.

also exposes how different the same industry may look between different points in time. The number of products per industry has been steadily increasing in the last fifty years or so. For instance, while in 1972, the chemicals industry comprised 757 products, by 2018, there were 2184 traded products in that same industry. The same tendency is observed throughout all nine industries. The number of products traded increased in all industries from 2002 to 2018, except machinery.

Table 1
Products by SITC1 Industry

STIC1	STIC2 Examples	Product Examples	Number of Traded Products 2002/2018
0 Food	Meat, dairy, fruit	Live sheep	1 944/2 240
1 Beverage Production	Wine, cigarettes	Carbonated soft drinks	170/178
2 Crude Materials	Crude rubber (including synthetic and reclaimed)		821/927
3 Mineral fuels	Petroleum, petroleum products, and related materials	Unleaded gasoline	110/117
4 Animal/Vegetable Oil	Animal/Vegetable Fats and Oils, processed; waxes of animal or vegetable origin...	Lard	76/81
5 Chemicals	Dyeing, tanning, and coloring materials	Paints and varnishes, a queue, acrylic or vinyl polymer	2 045/2 184
6 Manufactured Materials	Cork and wood manufactures (excluding furniture)	Natural cork, raw or simply prepared	4 452/4 716
7 Machinery	Metalworking machinery	Tubes, pipe, hollow profile, boiler	2 535/2 463
8 Miscellaneous Manufacturing	Travel goods, handbags, and similar containers	Handbags of beads, bugles, and spangles	3 157/3 604

Source: ECLAC based on United States Census Bureau

The study includes 183 countries classified into six regions: Africa, Asia, the Caribbean, Latin America, Europe, OECD. See Table A.1 in the Appendix for the complete list of countries.⁵

The analysis first focuses on the evolution of market shares and product penetration in the United States import market. Product penetration refers to the number of products exported to the United States as a share of all possible export products⁶.

To deepen the understanding of China's level of competition in the United States import market, the following section looks at the similarity in China's export structure to that of Latin America and the Caribbean and with countries in the region individually. The analysis is based on the Export Similarity Index (ESI) that Finger and Kreinin (1979) developed to measure the degree of similarity between developed and developing countries' export structure.

⁵ The study only includes the Caribbean countries that are members of ECLAC. The OECD region was assigned to all countries that belong to the OECD except Mexico, Chile, Colombia, and Costa Rica that were allocated to the Latin America region. All the Oceania countries, except Australia and New Zealand that belong to OECD, are excluded from the analysis. Small islands and territories from Africa and Europe were also excluded from the sample. Countries may have been excluded because the volume of exports to the United States was not large enough to merit its inclusion or because there was not enough data at the level of disaggregation carried out in the study.

⁶ The potential traded products varies over the years (i.e., new products are traded every year). However, at the time of collecting the data for this research, only the potential number of products associated with the most recent period was available. As a result, the product penetration ration of 2002 could be biased downward.

II. Market share and product penetration

This section looks at the regional market share in the United States imports market at two points in time 2002 and 2018 and at the number of products exported as a share of the potential products (product penetration) to assess different regions' export characteristics in the United States. The analysis then focuses on China compared to Latin America and the Caribbean as regions and individual countries.

The United States imports market grew significantly between 2002 and 2018 from US\$909 billion to US\$2036 billion (see Table A.2 for the value of imports by industry and region in both years). The industrial structure of those imports remained stable, with more than 40% of total United States imports in machinery, followed by between 12% and 14% in miscellaneous manufacturing and manufactured materials. There is an increase in the share of chemical imports and a slight fall in machinery and misc. manufacturing between both years, but overall, the structure did not change much (Table 2).

Table 2
Industry share in the United States imports market
(in percentages)

STIC	2002	2018	Change in percentage points
0 Food	4.2	5.5	1.3
1 Beverage Production	1.1	1.3	0.2
2 Crude Materials	2.2	1.8	-0.4
3 Mineral Fuels	11.6	11.2	-0.4
4 Anima/Vegetable Oil	0.1	0.3	0.2
5 Chemicals	9.5	12.4	2.9
6 Manufactured Materials	12.4	12.4	0
7 Machinery	44.5	42.5	-2
8 Misc. manufacturing	14	11.7	-2.3
9 N.E.C.	0.3	0.8	0.5

Source: Authors calculations using United States Census Bureau

III. Market share

Between 2002 and 2008, the United States' imports became more geographically diversified. The OECD still dominates the United States imports with 45% of total U.S. imports in 2018 but less than in 2002 when that share was 57%. During that period, Asia picked up most of the slack, followed by Latin America to a lesser degree. This outcome continues the trend observed previously by Schott (2006) for the period 1972-2001 where the market share of OECD countries fell from 73% to 51% while that of Asia and Latin America increased.

With 33% of the United States import market, Asia is now the second-largest exporter region. Asia's market share showed the fastest growth of all regions with a 2.6% cumulative annual rate from 22% in 2002 to 33% in 2018. This trend was also observed in the period before 2002, where Asia's market share went from 10% in 1972 to 25% in 2001, a 3.2% cumulative annual growth rate.

Latin America's share in the United States market has shown a much more modest increase between 2002 and 2018 -from 17.5% to 18.6%, a 0.4% cumulative annual rate. This breaks the trend observed in the forty years prior when Latin America increased its participation in the United States market at a rate of 1.8% cumulative annual.

Africa and the Caribbean regions faced contractions in their respective market shares during the same period.

The increase in geographical diversification is also observed in the industry-region shares. For example, while in 2002 28.4% of United States imports were machinery products from OECD countries, in 2018, only 18% were. Across the board, there is no industry-country pair that concentrates more than the 18% mentioned above in the most recent year. Continuing with the example, machinery imports were sourced more evenly among regions--OECD (18%), Asia (15%), and Latin America (9%) (Table 3). The next are chemicals-OECD (9%) and Misc. Manuf.-Asia (8%). There does not seem to be a regional specialization across industries.

Table 3
Share of United States imports by region and industry, 2002, 2018
(in percentages)

2002										
Region	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures	All industries
Africa	0.1%	0.0%	0.1%	1.5%	0.0%	0.1%	0.3%	0.1%	0.2%	2.3%
Asia	0.7%	0.0%	0.2%	1.9%	0.0%	0.8%	2.4%	8.4%	7.3%	21.8%
The Caribbean	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.5%
Europe	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.3%	0.1%	0.1%	1.0%
Latin America	1.3%	0.2%	0.4%	3.3%	0.0%	0.5%	1.7%	7.6%	2.4%	17.5%
OECD	2.0%	0.8%	1.5%	4.5%	0.1%	7.9%	7.7%	28.4%	3.6%	56.7%
World	4.2%	1.1%	2.2%	11.5%	0.1%	9.4%	12.4%	44.5%	14.0%	100.0%
2018										
Region	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures	All industries
Africa	0.1%	0.0%	0.1%	0.6%	0.0%	0.1%	0.3%	0.1%	0.1%	1.5%
Asia	1.2%	0.0%	0.3%	2.1%	0.1%	2.2%	4.4%	14.7%	8.0%	33.3%
The Caribbean	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.4%
Europe	0.0%	0.0%	0.0%	0.5%	0.0%	0.1%	0.4%	0.1%	0.0%	1.3%
Latin America	2.1%	0.3%	0.4%	2.4%	0.0%	0.6%	1.7%	9.4%	1.3%	18.6%
OECD	2.0%	0.8%	1.0%	5.3%	0.2%	9.2%	5.5%	18.1%	2.1%	44.7%
World	5.5%	1.3%	1.8%	11.0%	0.3%	12.4%	12.4%	42.5%	11.7%	100.0%

Source: Author's calculations using United States Census Bureau data.

Note: China is included in Asia in all regional calculations. Japan and the Republic of Korea are included in the OECD. See Table A.1 for a detailed classification of countries into regions.

Table 4 displays the market share of each region in each industry of the United States import market. The regional market share in the industry i is the sum of United States imports in the industry i from countries in the region r , divided by all United States imports of that industry, as specified in equation (1).

$$(1) \quad MS_{ri}^t = \frac{\sum_{c \in r} Imports_{ci}^t}{\sum_c Imports_{ci}^t}$$

The last row in Table 4 shows the market share of the region across all industries.

Table 4
United States import market share by region and year

STIC1 Industry	Africa		Asia		Caribbean		Latin America		OECD		Europe	
	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018
0 Food	2.2	2.5	17.4	21.8	1	0.6	30.6	38.1	48	36.4	0.8	0.7
1 Beverage Production	0.8	0.3	1.6	2.4	2.6	3.6	21.5	26.6	72.4	66.7	1.2	0.4
2 Crude Materials	3.1	3.7	10.4	18.7	0.9	0.7	18.2	22.7	67	52.8	0.5	1.4
3 Mineral fuels	13	7.4	16.4	19.1	1.7	0.7	28	21.2	38.9	47	2	4.6
4 Animal/Vegetable Oil	0.5	3.3	27.5	36.8	0.1	0	5.5	5.9	66.5	53.4	0	0.5
5 Chemicals	1	0.9	8	18.2	0.9	0.6	5.3	4.8	83.2	74.5	1.6	1.1
6 Manufactured Materials	2.4	2.7	19.1	35.6	0.3	0.4	13.6	13.8	61.9	44.3	2.7	3.2
7 Machinery	0.2	0.2	18.9	34.7	0.1	0.1	17	22.1	63.7	42.7	0.1	0.3
8 Miscellaneous Manufacturing	1.3	1.1	52.4	68.5	2.1	0.9	17.4	11	26	18.2	0.8	0.4
Overall	2.3	1.5	21.8	33.3	0.5	0.4	17.5	18.6	56.7	44.7	1	1.3

Source: Author's calculations using United States Census Bureau

Note: China is included in Asia in all regional calculations. Japan and the Republic of Korea are included in the OECD. See Table A.1 for a detailed classification of countries into regions.

Table 4 shows that in 2018, the OECD still dominates the United States import market in almost every sector—except for the food industry, dominated by Latin America and miscellaneous manufacturing, dominated by Asia.

Despite the dominance, the OECD has been losing market share in all industries, except mineral fuels. And the fall has been significant—17.6 percentage points in manufactured materials, 14.2 percentage points in crude materials, 13.1 in animal and vegetable oils, and 11.6 in food.

At the same time, Asia increased its participation in all sectors over the same period. The highest increases were observed in manufactured materials (16.5 percentage points), miscellaneous manufacturing (16.1), and machinery (15.8).

Inside the industries, the market share performance for Latin America is mixed, with increases in food (7.5 percentage points), beverage (5.1 percentage points), machinery (5.1 percentage points), and crude materials (4.5 percentage points), and reductions in mineral fuels (-6.8 percentage points), and miscellaneous manufacturing (-6.4 percentage points).

At a 5.1% cumulative annual rate, China's overall market share increased faster than Asia's between 2002 and 2018, from 9% to 20%, a steady trend since 1972 where China's market share in the United States was 0% and rose to 9% in 2001. Table 5 shows China's share in the United States market by industry and year. The table shows a significant increase in China's overall market share, a cumulative increase of 53 percentage points in the period considered. Manufacturing industries – chemicals, manufacturing materials, machinery, and miscellaneous manufacturing all increased during the period, with manufacturing materials and miscellaneous manufacturing leading the way. Natural resources-based industries, on the other hand, show little to no increase over the period.

Most Latin American countries lost market share between 2002 and 2018 (Table A.2), with Mexico's notable exception, which increased 17 percentage points its market share. Peru comes far behind with about a three-percentage point increase and Chile and Colombia with almost one

percentage point increase⁷. Mexico's growth was led by the food, beverage and tobacco, and machinery industries. Chile's growth was driven by a 1.11 percentage point increase in manufacturing materials. For the other Latin American countries, market growth was led by natural-resources-based industries.

Table 5
United States imports value market share by industry: China and Latin American countries with the highest increase in market share, 2002,2018

		Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufact. Materials	Machinery	Miscell. Manufact.	Cumulative Change
China	2002	3.9	0.4	3.1	0.3	0.5	2.6	9.4	9.1	29.4	
	2018	5.7	0.4	6.5	0.2	0.9	8	20.7	26.5	42.1	
	Change	1.8	0	3.4	-0.1	0.4	5.4	11.3	17.4	12.7	52.3
Mexico	2002	11.7	15.6	3.7	10.9	1.7	2.5	7.9	15.4	9.8	
	2018	19.6	21.8	5.4	7.0	2.6	2.8	8.2	21.3	6.9	
	Change	7.9	6.2	1.7	-3.9	0.9	0.3	0.3	6.0	-3.0	16.4
Peru	2002	0.68	0.06	0.52	0.20	0.05	0.03	0.59	0.00	0.31	
	2018	2.15	0.03	1.55	0.45	0.49	0.04	0.33	0.01	0.28	
	Change	1.47	-0.03	1.02	0.25	0.44	0.01	-0.26	0.01	-0.03	2.89
Chile	2002	3.85	1.32	2.69	0.06	0.01	0.32	0.62	0.01	0.03	
	2018	4.22	0.92	2.33	0.02	0.65	0.16	1.73	0.01	0.02	
	Change	0.37	-0.39	-0.36	-0.04	0.64	-0.16	1.11	0.01	-0.01	1.16
Nicaragua	2002	0.45	0.21	0.05	0.00	0.20	0.00	0.00	0.00	0.35	
	2018	0.64	0.86	0.04	0.00	0.14	0.00	0.00	0.00	0.71	
	Change	0.19	0.65	-0.01	0.00	-0.06	0.00	0.00	0.00	0.36	1.13
Colombia	2002	1.70	0.33	1.53	2.56	0.19	0.37	0.29	0.01	0.33	
	2018	1.64	0.04	2.01	3.81	0.30	0.15	0.30	0.01	0.13	
	Change	-0.07	-0.30	0.48	1.24	0.11	-0.22	0.02	0.01	-0.20	1.07
Brazil	2002	2.6	2.1	5.2	1.0	1.2	0.7	2.7	1.4	1.1	
	2018	2.6	1.0	7.9	2.2	0.6	1.0	2.4	0.6	0.3	
	Change	0.0	-1.1	2.8	1.2	-0.6	0.3	-0.3	-0.7	-0.8	0.7

Source: Authors elaboration

Latin America has a relatively high market share in resource-based products. Pairs country-industry with a market share of at least 1% are all in the first five industries, except for Mexico, Brazil, Chile. Although not shown in the table, Guatemala, Honduras, and Nicaragua also participate higher than 1% in miscellaneous manufacturing.

⁷ Noteworthy, these four countries have a Free Trade Agreement with the United States. Mexico since 1994, Chile since 2004, Peru since 2009 and Colombia since 2012.

Table 6 shows the countries that experienced the highest cumulative market share gain in the world in the period considered. China and Mexico are the countries with the highest market share accumulated gain. China gained 52 percentage points to Mexico's 16. Other Asian and OECD countries complete the top 10 list. Market share by industry shows a relative specialization of China in manufacturing. China's share in miscellaneous manufacturing reaches a high of 42%, followed by machinery with 27% and manufactured materials with 21%.

On the other hand, Mexico has about one fifth of the United States import market in food, beverages and tobacco, and in machinery. Switzerland has about the same share of the market as China in chemicals, and Indonesia specializes in animal and vegetable oils, where it participates with 17% of the market.

Table 6
United States import value market share by industry for the countries that experienced the highest market share gain between 2002 and 2018

Country	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures	Cumulative Change all industries
China	5.7	0.4	6.5	0.2	0.9	8.0	20.7	26.5	42.1	52.3
Mexico	19.6	21.8	5.4	7.0	2.6	2.8	8.2	21.3	6.9	16.4
Indonesia	2.7	0.2	2.8	0.5	16.7	0.3	1.0	0.2	3.1	15.0
Viet Nam	3.4	0.1	0.4	0.0	0.3	0.1	1.3	1.5	9.7	13.4
India	3.3	0.2	3.0	1.3	1.9	4.1	7.2	0.7	2.4	11.5
Switzerland	0.5	2.8	0.1	0.0	0.0	7.7	0.5	0.4	1.7	7.9
Singapore	2.4	0.0	0.5	0.3	0.5	3.5	0.1	0.6	0.7	4.0
Austria	0.1	3.9	0.2	0.0	0.0	0.9	0.6	0.6	0.2	3.2
Spain	1.1	1.6	0.9	0.8	8.5	1.3	1.0	0.4	0.3	3.0
Iraq	0.0	0.0	1.0	4.8	0.0	0.3	0.0	0.0	0.0	3.0

Source: Author's elaboration

IV. Product penetration

This section looks at the number of products exported by the different regions and countries to the United States market as a share of total products traded. Product penetration gives an idea of the breadth of the trade exchange between different countries. Trade based on the comparative advantages of the parties trading would increase the number of products traded by some countries in some industries and others for different countries with different endowments.

Table 7 shows that the product penetration of countries in all regions has increased over time. That is, countries with very different relative endowments are increasingly exporting the same or similar products to the United States.

Table 7
Product penetration by region and year

STIC1 Industry	Africa		Asia		Caribbean		Latin America		OECD		Europe	
	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018
0 Food	9%	13%	23%	30%	7%	8%	25%	31%	38%	42%	7%	9%
1 Beverage Production	10%	11%	16%	18%	12%	13%	20%	20%	28%	30%	9%	10%
2 Crude Materials	14%	15%	26%	33%	5%	6%	29%	29%	46%	51%	8%	9%
3 Mineral fuels	23%	21%	33%	35%	13%	10%	36%	31%	41%	46%	21%	19%
4 Animal/Vegetable Oil	14%	22%	30%	46%	8%	9%	29%	41%	57%	62%	5%	13%
5 Chemicals	8%	9%	42%	53%	4%	5%	27%	28%	53%	54%	9%	14%
6 Manufactured Materials	15%	15%	45%	57%	5%	6%	39%	40%	57%	59%	12%	16%
7 Machinery	11%	13%	36%	40%	5%	7%	32%	33%	45%	44%	11%	18%
8 Miscellaneous Manufacturing	17%	23%	40%	48%	12%	11%	31%	35%	42%	47%	16%	26%
9 Not elsewhere classified	8%	10%	10%	17%	6%	9%	11%	16%	13%	18%	2%	5%
Overall	13%	15%	37%	45%	7%	8%	31%	34%	47%	49%	11%	17%

Source: Author's calculations using United States Census Bureau data (dataweb)

In Latin America, although as a region product penetration has increased in all industries (Table 7) from 31% to 34%, most countries are exporting fewer products in some or all industries than they did about 20 years ago (Table 8). The exceptions are Mexico, El Salvador, Guatemala, and Suriname, where the number of products exported increased in all industries. Table 8 shows product penetration for Latin American countries; highlighted in bold are the country-industry pairs for which the number of products has decreased. Of note, product penetration has decreased in all industries in Venezuela and for most industries in Argentina.

Since the turn of the century, China has increased the number of products exported to the United States in all industries (Table 9), except Beverages and Tobacco, where it fell by 10%. Animal and Vegetable oils, food, and crude materials are the industries that saw a more considerable increase in the number of products as a share of potential traded products. In fact, in 2018, China exported 100% of the available products in chemicals, manufactured materials, machinery, and misc. manufactures. On the other hand, Mexico has significantly increased its product penetration in the food industry, animal and vegetable oils, and machinery. Still, it has decreased its participation in the rest of the industries.

Table 8
Latin American Product Penetration, by country and year

Country	Food		Beverage and Tobacco		Crude Materials		Mineral Fuels		Animal and Vegetable Oils		Chemicals		Manufactured Materials		Machinery		Misc. Manufactures	
	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018	2002	2018
Argentina	20%	21%	44%	40%	19%	12%	38%	20%	22%	26%	12%	8%	19%	8%	15%	15%	23%	8%
Belize	3%	3%	1%	3%	2%	1%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	2%	1%
Bolivia (Plurinational State of)	2%	4%	3%	6%	6%	6%	0%	2%	0%	0%	0%	0%	2%	1%	1%	2%	7%	4%
Brazil	27%	28%	56%	49%	32%	33%	38%	41%	21%	34%	28%	26%	45%	35%	46%	49%	36%	33%
Chile	25%	27%	26%	35%	22%	18%	11%	7%	5%	36%	7%	6%	10%	6%	7%	12%	11%	6%
Colombia	21%	22%	25%	20%	12%	11%	54%	39%	14%	18%	9%	12%	18%	14%	9%	17%	35%	36%
Costa Rica	16%	19%	7%	16%	11%	9%	2%	3%	0%	0%	5%	6%	5%	6%	10%	13%	15%	7%
Ecuador	19%	27%	21%	25%	8%	8%	24%	26%	3%	14%	2%	3%	6%	5%	4%	7%	14%	9%
El Salvador	12%	14%	8%	10%	4%	4%	3%	3%	2%	0%	1%	2%	5%	5%	2%	3%	21%	20%
Guatemala	16%	19%	18%	28%	9%	11%	7%	9%	3%	6%	3%	3%	8%	7%	3%	4%	24%	19%
Guyana	4%	5%	13%	5%	4%	4%	0%	3%	0%	0%	0%	0%	1%	0%	1%	2%	3%	0%
Honduras	9%	13%	29%	19%	10%	7%	0%	4%	0%	0%	1%	2%	3%	4%	2%	4%	15%	11%
Mexico	53%	69%	76%	63%	49%	46%	65%	52%	45%	62%	49%	44%	73%	61%	72%	75%	70%	57%
Nicaragua	8%	14%	21%	24%	5%	4%	1%	1%	2%	6%	0%	1%	1%	1%	1%	2%	8%	10%
Panama	7%	6%	15%	8%	4%	4%	8%	6%	0%	6%	2%	2%	2%	2%	4%	7%	10%	5%
Paraguay	1%	2%	4%	5%	3%	5%	0%	1%	2%	8%	0%	1%	1%	1%	0%	1%	2%	1%
Peru	20%	32%	24%	33%	15%	17%	16%	10%	7%	14%	4%	5%	13%	10%	4%	8%	21%	29%
Suriname	2%	2%	0%	1%	2%	2%	0%	2%	0%	0%	0%	0%	0%	0%	1%	2%	0%	1%
Uruguay	6%	8%	11%	9%	8%	6%	0%	0%	2%	6%	2%	2%	4%	2%	2%	2%	7%	4%
Venezuela (Bolivarian Republic of)	9%	6%	15%	9%	8%	6%	72%	39%	3%	0%	7%	2%	11%	3%	10%	4%	10%	3%

Source: Author's calculations using United States Census Bureau data (dataweb)

Table 9
China and Mexico Product Penetration, by industry and year, 2002, 2018 and percentage change

	China			Mexico		
	2002	2018	Change	2002	2018	Change
Food	52%	69%	34%	53%	69%	30%
Beverage and Tobacco	42%	38%	-10%	76%	63%	-18%
Crude Materials	54%	71%	32%	49%	46%	-6%
Mineral Fuels	40%	48%	19%	65%	52%	-20%
Animal and Vegetable Oils	40%	90%	127%	45%	62%	38%
Chemicals	87%	100%	15%	49%	44%	-11%
Manufactured Materials	92%	100%	9%	73%	61%	-16%
Machinery	83%	100%	20%	72%	75%	4%
Misc. Manufactures	100%	100%	0%	70%	57%	-19%

Source: Author's calculations using United States Census Bureau data (dataweb)

V. Export product similarity

This section examines the similarity of countries' export product structure to that of China to see China's direct competition in the United States import market to those countries.

The Finger and Kreinin's (1979) export similarity index (ESI) is used to measure countries' export overlap with China. This index incorporates information about both market share and product penetration. For any two United States trading partners c and d in year t , Finger and Kreinin define their export similarity index as:

Where s_{pct} is the share of country c exports in product p in year t , this bilateral measure is computed using all product categories and is bounded by zero and unity.

$$S_{pct} =$$

There are at least four takeaways from Table 10. Asia's exports (without China) are very similar to China's exports. With an export similarity index of 0.073 in 2018. Latin America and OECD countries' exports are less similar to China's exports, with an ESI of about 0.02 each. The export similarity between Latin America and China and between the OECD and China has remained stable during this century.

Table 10
Regional Export Similarity with China⁸ in the United States market
(ESI*1000)

	2001	2002	2018
Africa	4	4	6
Asia	60	61	73
Caribbean	7	6	6
Latin America	19	21	20
OECD	21	18	21

Source: Author's calculations using United States Census Bureau data (dataweb)

Notes: Figures for 2001 correspond to Schott (2006) estimates. China is excluded from Asia in this calculation

⁸ To compute China's ESI with a region, the exports of all countries in a region are added so that the regional share of product p is MS_{rit} as estimated in the previous section.

On the other hand, Asia's export similarity with China has increased significantly from 0.06 in 2001 to 0.073 in 2018. China competes more directly with other Asian countries in the United States market than with Latin American or OECD countries. This is probably due to the similar endowments of all the countries in the region and Asia's integration as a region where countries all feed into the same supply chains. They may be specializing in different varieties of the same products. This is not captured by this index that only considers products within industries but not varieties within products. The issue of varieties or qualities within product categories is treated in the next section.

Table 11 shows the export similarity index of the Latin American countries concerning China for all products. In 2018, the countries that face more direct competition from China were Mexico (who reduced by 2pp its similarity index with China in the period) and Brazil (which reduced by 5pp its similarity index with China in the period) and a lesser degree in Costa Rica, Guatemala, and Honduras. Export similarity index has, however, decreased over time. Previous literature has found that China's accession to the WTO displaced Mexico and Central America exports to the United States market (especially in the yarn-textile-garment chain); even though China faced significantly higher tariffs rates than Mexico (see Duseel Peters, 2005, Hanson and Roberson, 2009 and Guszman and Toledo, 2009).

Table 11
Latin American countries. ESI with China, ranked by 2018 ESI.
*(ESI*100)*

Country	2018	2002
Mexico	19	21
Brazil	7	12
Costa Rica	5	5
El Salvador	5	5
Guatemala	5	5
Honduras	4	4
Peru	4	3
Colombia	3	4
Panama	3	3
Nicaragua	3	2
Argentina	2	4
Chile	2	2
Paraguay	1	2
Suriname	1	0
Ecuador	1	2
Belize	1	1
Uruguay	1	2
Bolivia (Plurinational State of)	1	3
Guyana	0	2
Venezuela (Bolivarian Republic of)	0	2

Source: Author's calculations using United States Census Bureau data (dataweb)

Among the Caribbean countries, the Dominican Republic is the country that faces more direct competition from China in the United States market. The export similarity index has almost doubled in the period between 2002 and 2018 from 6 to 11. Jamaica and Haiti also face some, albeit much lower, direct competition from China.

Table 12
Caribbean countries. ESI with China
*(ESI*100)*

	2018	2002
Dominican Republic	11	6
Jamaica	5	5
Haiti	5	2
Trinidad and Tobago	4	5
Bahamas	3	6
Saint Kitts and Nevis	2	1
Saint Lucia	2	0
Antigua and Barbuda	1	1
Barbados	1	3
Dominica	1	0
Saint Vincent and the Grenadines	1	0
Grenada	0	0
Cuba	.	0

Source: Author's calculations using United States Census Bureau data (dataweb)

When looking at the ESI of individual countries with China, we observe a decrease in the number of countries with an ESI of 20 or more between 2002 and 2018. Table 13 shows that in 2002 there were seven industries and ten countries where ESI was greater than 20. They were Colombia, Mexico, Paraguay, Peru, and Uruguay in Beverages and Tobacco industry; Argentina, Brazil, Colombia, Peru, and Venezuela in mineral fuels; Chile, Guatemala, and Mexico in animal and vegetable oils, Mexico in Manufacturing materials and in machinery and Argentina in miscellaneous manufacturing. Within each industry, those countries had an export-product-basket that was similar to China in 2002. Interestingly only Mexico, and to some degree, Argentina competed with China in manufacturing industries.

By 2018, the ESI of Latin American exports to the United States with China had decreased. The direct competition was restricted to four countries in six industries. They were Colombia, El Salvador, and Peru for beverages and tobacco; Colombia and Mexico for miscellaneous manufacturing and Mexico for animal and vegetable oils, chemicals, manufactured materials, and machinery. Direct competition in manufacturing was limited to Mexico.

Table 13
Export product similarity of Latin American countries with China, by industry, 2002, 2018
*(ES)*100*

Country	2002								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Argentina	16	6	6	32	5	5	6	10	21
Belize	9	0	4	0	0	0	3	0	3
Bolivia	1	18	7	0	0	0	1	1	7
(Plurinational State of)									
Brazil	11	10	12	24	4	11	12	11	18
Chile	8	0	5	21	37	2	3	4	6
Colombia	7	57	4	29	13	3	10	5	13
Costa Rica	3	5	4	4	0	7	6	5	8
Ecuador	16	4	4	17	35	1	6	6	8
El Salvador	6	21	2	0	16	4	9	1	8
Guatemala	4	5	3	17	21	2	9	7	8
Guyana	13	5	3	0	0	0	0	1	3
Honduras	15	2	3	0	0	3	7	2	6
Mexico	11	23	13	23	22	15	25	26	18
Nicaragua	13	0	1	0	0	0	7	3	5
Panama	15	6	2	9	0	2	2	16	10
Paraguay	1	48	10	0	9	1	1	4	3
Peru	10	66	4	24	5	2	3	5	5
Suriname	9	0	1	0	0	0	0	1	0
Uruguay	6	48	5	0	1	7	1	2	8
Venezuela	16	9	1	32	0	2	5	4	6
(Bolivarian Republic of)									
Country	2018								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Argentina	12	2	10	9	7	5	2	6	8
Belize	2	0	0	0	0	0	1	2	9
Bolivia	5	6	6	0	0	1	0	4	2
(Plurinational State of)									
Brazil	8	17	14	12	18	12	10	9	16
Chile	5	1	10	0	12	4	2	8	4
Colombia	7	30	6	10	12	9	9	7	21
Costa Rica	2	18	9	0	0	6	8	9	9
Ecuador	8	10	2	5	5	1	4	4	10
El Salvador	7	29	2	0	0	4	11	2	12
Guatemala	3	16	6	5	10	4	9	6	12
Guyana	5	2	3	0	0	0	0	2	1
Honduras	5	3	5	0	0	1	7	3	11
Mexico	8	9	19	2	30	22	28	21	30
Nicaragua	2	1	3	0	1	1	6	3	10
Panama	4	0	1	0	7	2	5	11	10
Paraguay	4	1	12	0	9	1	2	11	4
Peru	8	21	5	0	9	4	3	5	13
Suriname	3	0	1	2	0	1	1	3	2
Uruguay	2	3	3	0	9	3	1	6	9
Venezuela	6	0	2	7	0	0	2	3	6
(Bolivarian Republic of)									

Source: Author's elaboration using United States Census Bureau Data (Dataweb)

Table 14
Export product similarity of Caribbean countries with China, by industry, 2002, 2018
*(ESI*100)*

Country	2002								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Antigua and Barbuda	0	0	0	0	0	2	0	2	1
Bahamas	2	20	1	21	0	1	0	3	4
Barbados	3	6	2	9	0	0	1	1	3
Cuba	0	0	0	0	0	0	0	0	0
Dominica	0	0	2	0	0	0	1	1	0
Dominican Republic	3	10	8	0	13	7	6	5	10
Grenada	0	0	0	1	0	0	0	0	0
Haiti	0	0	5	0	0	0	11	1	5
Jamaica	4	26	3	10	0	1	6	2	2
Saint Kitts and Nevis	1	0	0	0	0	0	4	1	1
Saint Lucia	1	0	0	0	0	0	1	1	2
Saint Vincent and the Grenadines	0	0	0	0	0	0	0	0	1
Trinidad and Tobago	4	22	0	18	0	1	2	4	3
Country	2018								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Antigua and Barbuda	0	0	0	0	0	0	1	5	2
Bahamas	0	6	1	0	0	0	0	4	4
Barbados	3	0	0	0	0	2	0	1	5
Dominica	2	1	0	0	0	1	0	3	1
Dominican Republic	6	8	12	27	23	9	9	3	17
Grenada	0	0	1	0	0	0	0	1	0
Haiti	3	6	1	0	17	1	6	3	8
Jamaica	10	19	2	0	0	1	5	5	5
Saint Kitts and Nevis	1	2	0	0	0	2	4	2	2
Saint Lucia	1	0	0	0	0	0	3	2	0
Saint Vincent and the Grenadines	1	1	0	0	0	0	1	0	2
Trinidad and Tobago	7	15	2	3	2	0	0	5	5

Source: Author's elaboration using United States Census Bureau Data (Dataweb)

In the case of the Caribbean, in 2002, Bahamas, Jamaica, and Trinidad and Tobago showed an ESI of 20 or more in the beverages and tobacco industry and The Bahamas in mineral fuels. By 2018, the Dominican Republic was the only Caribbean country that showed an ESI of 20 or more and only for two industries: mineral fuels and animal and vegetable oil.

VI. Export price similarity

Export prices, measured via unit values, vary significantly among countries and regions. One explanation for the difference in unit prices of similar products is that the products emanating from high-unit-value countries offer higher quality or more attributes than those originating in other regions, thereby driving up their value (Schott, 2004). An alternate explanation is that relatively low prices reflect greater productive efficiency. Understanding the underlying reasons for the difference in unit value bears implications for countries/regions trying to remain competitive in the United States market.

This section computes the unit value of products exported to the United States by dividing United States imports' custom value by import quantity at the HST₁₀ level of disaggregation.

The unit value of each product imported by the United States from individual countries is defined as:

Where “ u ” is the unit value of product “ p ” imported from country “ c ”; “ V ” is the total import value, and “ Q ” is the total import quantity. All these values are at current dollars.

Table 14 shows the average unit value by region and year, calculated as the regional average of the unit prices of each product exported by the region. Among the regions, OECD countries generally have the highest unit value. And that continues to be true in 2018, although Latin America, Asia, and Africa's growth rate contribute to a narrowing of the, still significant, gap⁹. On average, an OECD product sells for more than three times that of a Latin American product and almost twice as much as an Asian product. In contrast, in 2002, those ratios were 6 and 10, respectively.

⁹ Custom value of imports is measured in current United States dollars, therefore the change in unit values overtime may also reflect different inflation rates among countries (regions) rather than just a closing gap in the quality of the products exported. However, assuming that the behavior of the law of one price holds, prices changes can be interpreted as changes in qualities.

Asian unit values are advancing much faster than those in Latin America. In 2002, Latin America's average unit value was one and a half times higher than Asia's. By 2018, that was reversed, and the average unit value of Asian exports to the United States was one and a half times higher than that of Latin America.

Unit prices also vary by sector. Machinery is the industry with the highest unit value, followed by chemicals, in both years, although chemicals have lowered the unit value in the last couple of decades.

Table 15
Export product similarity of Caribbean countries with China, by industry, 2002, 2018
(*ESI*100*)

Country	2002								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Antigua and Barbuda	0	0	0	0	0	2	0	2	1
Bahamas	2	20	1	21	0	1	0	3	4
Barbados	3	6	2	9	0	0	1	1	3
Cuba	0	0	0	0	0	0	0	0	0
Dominica	0	0	2	0	0	0	1	1	0
Dominican Republic	3	10	8	0	13	7	6	5	10
Grenada	0	0	0	1	0	0	0	0	0
Haiti	0	0	5	0	0	0	11	1	5
Jamaica	4	26	3	10	0	1	6	2	2
Saint Kitts and Nevis	1	0	0	0	0	0	4	1	1
Saint Lucia	1	0	0	0	0	0	1	1	2
Saint Vincent and the Grenadines	0	0	0	0	0	0	0	0	1
Trinidad and Tobago	4	22	0	18	0	1	2	4	3
Country	2018								
	Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufactured Materials	Machinery	Misc. Manufactures
Antigua and Barbuda	0	0	0	0	0	0	1	5	2
Bahamas	0	6	1	0	0	0	0	4	4
Barbados	3	0	0	0	0	2	0	1	5
Dominica	2	1	0	0	0	1	0	3	1
Dominican Republic	6	8	12	27	23	9	9	3	17
Grenada	0	0	1	0	0	0	0	1	0
Haiti	3	6	1	0	17	1	6	3	8
Jamaica	10	19	2	0	0	1	5	5	5
Saint Kitts and Nevis	1	2	0	0	0	2	4	2	2
Saint Lucia	1	0	0	0	0	0	3	2	0
Saint Vincent and the Grenadines	1	1	0	0	0	0	1	0	2
Trinidad and Tobago	7	15	2	3	2	0	0	5	5

Source: Author's elaboration using United States Census Bureau Data (Dataweb)

VII. Quality segments

Schott (2004) observed that unit values of United States manufacturing imports varied widely within product categories. Furthermore, he showed that unit values were higher for varieties exported by capital and skill abundant countries and are increasing with the capital intensity of exporters' production techniques. The hypothesis is that higher unit values for the same product are due to better attributes or qualities of that product.:

Under the assumption that higher unit values reflect higher quality products, this section classifies United States imports into quality segments and compares imports from Latin America with those from China to analyze how they compare their positioning concerning quality products. Following Fongané et al. (2007) two-step methodology, each flow of United States imports is classified into three quality segments (low, medium, high) by comparing its unit value with the world distribution of unit values. Table 15 shows how Latin American and China's export flows to the United States are classified among these categories. However, it is important to clarify that the product quality segmentation does not correspond to the technological intensity of the products considered. In fact, within high-tech products, there will be high, medium, and low quality (or variety). For example, among the imports of the advanced technology product: television cameras, color; there will be high, medium, and low-quality products¹⁰.

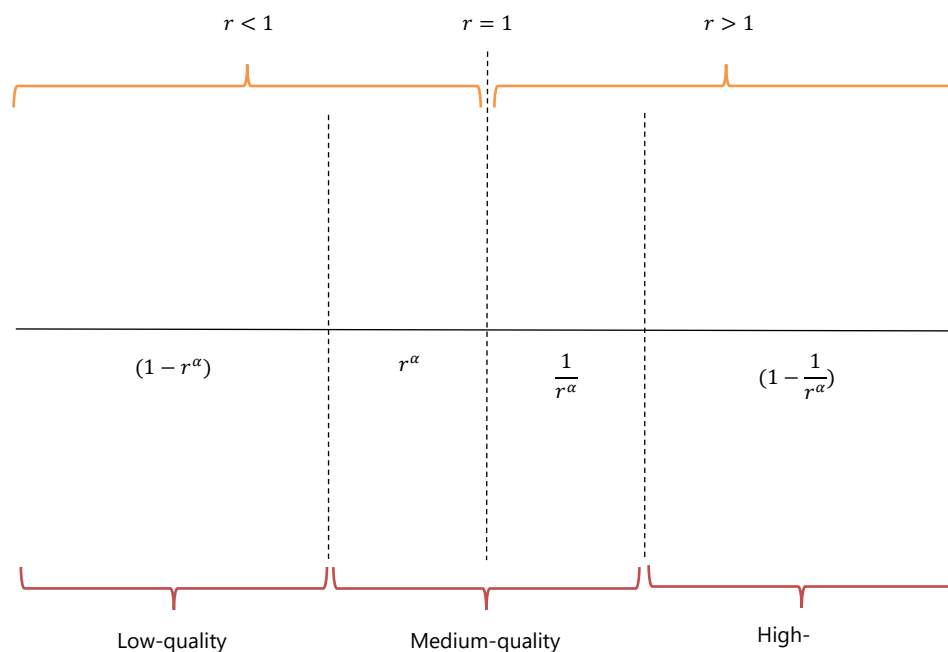
After estimating the unit values, the next step consists of building a sample frequency distribution of unit values for each product, including all countries that export the product to the United States to avoid a potential truncated sample. The estimation of the frequency distribution allows the classification of each product in one of three alternative varieties – e.g., high, medium, and low – according to the following rule:

- (1) Estimation of the relative unit value ratio of any trade flow:

¹⁰ In other words, the increment (reduction) in the share of the quality (or variety) products exported to the U.S. by any country does not imply that this country has increased (reduced) its technological export basket to the U.S.: there could be a decrease (increase) in the quality of exported products along with an increase (decrease) in the tech level of the same basket of exports.

Where r_{ij} is the relative unit value ratio, uv_{ij} is the unit value for the trade flow of product i exported by country j to the United States, and uv_i is the geometric average of the unit value of product i exported by all exporting countries in the United States.

(2) This relative unit value ratio is used for the calculations of the following chart:



That is:

If $r_{ij} < 1$ then the value of trade flow of product i exported by country j is divided into the low-quality and medium-quality segments.

If $r_{ij} > 1$ then the value of trade flow of product i exported by country j is divided into the medium-quality and high-quality segments.

If $r_{ij} = 1$ then the value of trade flow of product i exported by country j is ascribed to the medium-quality segments.

$r_{ij} < 1$ low-quality share: $(1 - r_{ij}^\alpha)$; medium quality share: r_{ij}^α

$r_{ij} = 1$ medium quality share: 100%

$r_{ij} > 1$ high-quality share: $1 - 1/r_{ij}^\alpha$, medium quality share: $1/r_{ij}^\alpha$

Following Fontagné et al. (2008), we set the smoothness parameter α to be 4 to make each segment roughly equal to one-third of the world trade.

Table 16
Quality segments of United States imports from Latin America and China

	2002		2018	
	Latin America	China	Latin America	China
Low	53	87	49	82
Medium	35	10	33	16
High	12	3	18	2

Source: Author's calculations

The comparison between Latin America and China reveals that Latin America specializes in high-value segments more than China does in both years. If anything, Latin America increased its specialization in high-value products while China remained unchanged or even decreased. This result is unexpected, given that China has moved up the ladder in the value-added of its exported goods (Garcia-Herrero et al. 2018, Rodrik, 2006). One would expect its specialization in high-quality goods should have gone up. However, under the alternative explanation that low unit values actually reflect higher efficiency, and given that China's market share has increased significantly, especially in manufacturing, this result could be interpreted as China capitalizing on its increased capacity to compete and increased access to the United States market.

Further research is needed to explain this result. In the current analysis, trade flows are classified among three value levels (high, medium, low) without consideration of sector or the technological level of products or industries. China may be specializing in industrial segments with higher R&D. However, Chinese products at higher R&D may be of lower relative quality within these segments than those of the other countries also specializing in them.

Table 12 shows that the unit value of Latin America as a region in 2018 was US\$3,417, while for Asia, it was US\$5,405 and for China, US\$ 2168. But only 2% of China's exports to the United States are in the high-quality segment, while 18% of Latin America's are in the high-quality segment (Table 15).

The results found in this research are similar to those found by Mulder et al. (2009). Using data for the period 1995-2004, they found that in general, Latin America had succeeded in charging higher prices for its exports than China in manufactures, and the price differences between Latin America and China increased over time. However, they pointed out that general results for Latin America hide large diversity among countries in the region. Mexico, Central America, and Brazil have increased the technological content of their exports and their positioning in quality segments. However, the export performance in technology products of the rest of South America stagnated. The emergence of China has mostly affected Latin America and the Caribbean exports of low (and medium)-quality varieties.

VIII. Conclusions

Latin America and the Caribbean exports trajectory in the United States market in the almost two decades that followed China's accession to the WTO remained pretty much the same between 2002 and 2018 with a participation of about 18% of the market. Most Latin American countries lost market share between 2002 and 2018, with Mexico's notable exception, which increased 17 percentage points its market share. Peru, Chile, and Colombia also increased their participation, albeit at a much lower rate. This result bears the question, not addressed here, about the role that free trade agreements play, given that all these countries have FTAs with the United States.

In contrast, Asia continued to increase its participation in the United States imports market and is now the second-largest exporter region, after the OECD that still dominates the United States import market in almost every sector. China's overall market share increased faster than Asia's between 2002 and 2018, from 9% to 20%, a steady trend since 1972 where China's market share in the United States was 0% and rose to 9% in 2001.

Overall, China and Mexico are the countries that gained the most market share. China gained 52 percentage points to Mexico's 17. While China specialized in manufacturing materials, machinery, and miscellaneous manufacturing, Mexico tends to specialize in natural resources-based industries such as food and beverages and tobacco.

Latin America countries' exports are not very similar to China's exports to the United States, indicating that they may not be directly competing in the United States market. The export similarity between Latin America and China and between the OECD and China has remained stable during this century. On the other hand, Asia's exports (without China) are very similar to China's exports, and their similarity has increased significantly from 0.06 in 2001 to 0.073 in 2018.

On average, an OECD product sells for more than three times that of a Latin American product and almost twice as much as an Asian product. Asian unit values are catching up to those of the OECD much faster than those of Latin America. In 2002, Latin America's average unit value was one and a half

times higher than Asia's. By 2018, that was reversed, and the average unit value of Asian exports to the United States was one and a half times higher than that of Latin America.

The comparison between Latin America and China reveals that Latin America specializes in high-value segments more than China does in both years. If anything, Latin America increased its specialization in high-value products while China remained unchanged or even decreased. This result is unexpected, given that China has moved up the ladder in the value-added of its exported goods, one would expect its specialization in high-quality goods should have gone up. Previous research found similar results and pointed out that further research is needed. Latin America is a very heterogeneous region, and while some countries have increased the technological content of their exports and their positioning in quality segments, others stagnated. Regional results hide these differences (Mulder et al., 2009).

The research leaves open some questions. First, the role played by free trade agreements with the United States in the relative performance of countries' exports to the United States. On the one hand, most countries showed a decrease in market participation in the period considered. Except for Mexico, Peru, and Chile, all countries that have an FTA with the United States in place. Also, Mexico, El Salvador, Guatemala, and Singapore are the only countries that experimented and increased product penetration in all industries during the period considered. Second, exploring the reasons behind the apparent specialization of China in low-quality segments. One possible explanation is that low unit values reflect higher efficiency rather than poor quality. In this case, this result could be interpreted as China capitalizing on its increased capacity to compete and increased access to the United States market. Alternatively, China may be climbing the technological ladder in its exports but has not been able to access the high-quality segment of those industries just yet. An analysis of the export technological content of Latin American exports and each country may provide additional explanations to the level of competition of China and individual Latin American countries in the region that could help design public policies recommendations.

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Annex

Table A.1
List of Countries

Latin America	Caribbean	Africa	Asia	Europe	OECD
Argentina	Antigua and Barbuda	Algeria	Afghanistan		Australia*
Belize	Bahamas	Angola	Armenia	Albania*	Austria*
Bolivia (Plurinational State of)	Barbados	Benin	Azerbaijan	Andorra*	Belgium*
Brazil	Cuba	Botswana	Bahrain	Belarus*	Canada*
Chile	Dominica	Burkina Faso	Bangladesh	Bosnia and Herzegovina*	Czechia*
Colombia	Dominican Republic	Burundi	Bhutan	Bulgaria*	Denmark*
Costa Rica	Grenada	Cabo Verde	Brunei Darussalam	Croatia*	Estonia*
Ecuador	Haiti	Cameroon	Cambodia	Gibraltar*	Finland*
El Salvador	Jamaica	Chad	China	Liechtenstein*	France*
Guatemala	Saint Kitts and Nevis	Comoros	China, Hong Kong Special Administrative Region	Malta*	Germany*
Guyana	Saint Lucia	Congo	China, Macao Special Administrative Region	Monaco*	Greece*
Honduras	Saint Vincent and the Grenadines	Côte d'Ivoire	Cyprus	Montenegro*	Hungary*
Mexico	Trinidad and Tobago	Djibouti	Democratic People's Republic of Korea	North Macedonia*	Iceland*
Nicaragua		Egypt	Georgia	Republic of Moldova*	Ireland*
Panama		Equatorial Guinea	India	Romania*	Israel*
Paraguay		Eritrea	Indonesia	Russian Federation*	Italy*
Peru		Eswatini	Iran (the Islamic Republic of)	San Marino*	Japan*
Suriname		Ethiopia	Iraq	Serbia*	Latvia*
Uruguay		Gabon	Jordan	Ukraine*	Lithuania*

Venezuela (the Bolivarian Republic)	Gambia	Kazakhstan	Luxembourg*
	Ghana	Kuwait	Netherlands*
	Guinea	Kyrgyzstan	New Zealand*
	Guinea-Bissau	Lao People's Democratic Republic	Norway*
	Kenya	Lebanon	Poland*
	Lesotho	Malaysia	Portugal*
	Liberia	Maldives	Republic of Korea*
	Libya	Mongolia	Slovakia*
	Madagascar	Myanmar	Slovenia*
	Malawi	Nepal	Spain*
	Mali	Oman	Sweden*
	Mauritania	Pakistan	Switzerland*
	Mauritius	Philippines	Turkey*
	Morocco	Qatar	The United Kingdom of Great Britain and Northern Ireland*
	Mozambique	Saudi Arabia	
	Namibia	Singapore	
	Niger	Sri Lanka	
	Nigeria	State of Palestine	
	Rwanda	Tajikistan	
	Sao Tome and Principe	Thailand	
	Senegal	The Syrian Arab Republic	
	Seychelles	Turkmenistan	
	Sierra Leone	United Arab Emirates	
	Somalia	Uzbekistan	
	South Africa	Viet Nam	
	South Sudan	Yemen	
	Sudan		
	The Central African Republic		
	The Democratic Republic of the Congo		
	Togo		
	Tunisia		
	Uganda		
	United Republic of Tanzania		
	Zambia		
	Zimbabwe		

Source: Author's elaboration

Notes: * Developed country according to the World Bank

Table A.2
Latin American 'countries' United States imports value market share, by year and industry

		Food	Beverage and Tobacco	Crude Materials	Mineral Fuels	Animal and Vegetable Oils	Chemicals	Manufact. Materials	Machinery	Misc. Manufact.	Cumulative Change in all industries
Bolivia (Plurinational)	Argentina	2002	1.30	0.74	0.46	1.24	2.00	0.19	0.47	0.03	0.02
		2018	0.89	1.21	0.31	0.53	0.93	0.20	0.38	0.02	0.01
		Change	-0.41	0.47	-0.15	-0.71	-1.07	0.01	-0.08	-0.01	-1.97
	Belize	2002	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
		2018	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	
		Change	-0.12	0.00	0.00	0.01	0.00	0.00	0.00	-0.01	-0.12
		2002	0.05	0.00	0.06	0.00	0.00	0.03	0.00	0.02	
		2018	0.08	0.00	0.18	0.01	0.00	0.09	0.00	0.01	
		Change	0.02	0.00	0.12	0.01	0.00	0.05	0.00	-0.01	0.20
	Brazil	2002	2.59	2.11	5.15	1.04	1.17	0.68	2.67	1.36	1.12
		2018	2.56	1.01	7.94	2.21	0.59	1.01	2.38	0.62	0.27
		Change	-0.03	-1.10	2.79	1.17	-0.59	0.33	-0.28	-0.74	0.71
	Chile	2002	3.85	1.32	2.69	0.06	0.01	0.32	0.62	0.01	0.03
		2018	4.22	0.92	2.33	0.02	0.65	0.16	1.73	0.01	0.02
		Change	0.37	-0.39	-0.36	-0.04	0.64	-0.16	1.11	0.01	1.16
	Colombia	2002	1.70	0.33	1.53	2.56	0.19	0.37	0.29	0.01	0.33
		2018	1.64	0.04	2.01	3.81	0.30	0.15	0.30	0.01	0.13
		Change	-0.07	-0.30	0.48	1.24	0.11	-0.22	0.02	0.01	1.07
	Costa Rica	2002	2.18	0.00	0.20	0.01	0.00	0.04	0.08	0.15	0.63
		2018	1.41	0.01	0.20	0.00	0.00	0.03	0.10	0.03	0.08
		Change	-0.77	0.01	-0.01	-0.01	0.00	0.00	0.02	-0.12	-1.42
	Ecuador	2002	2.18	0.10	0.43	0.94	0.00	0.02	0.02	0.00	0.03
		2018	1.43	0.01	0.73	1.73	0.14	0.07	0.06	0.00	0.01
		Change	-0.74	-0.09	0.31	0.79	0.14	0.05	0.04	0.00	0.47
	El Salvador	2002	0.20	0.04	0.02	0.00	0.00	0.01	0.07	0.01	1.33
		2018	0.18	0.07	0.05	0.00	0.00	0.01	0.04	0.00	0.81
		Change	-0.03	0.03	0.03	0.00	0.00	0.00	-0.03	0.00	-0.52
	Guatemala	2002	1.67	0.20	0.24	0.15	0.00	0.04	0.03	0.00	1.34
		2018	1.85	0.19	0.30	0.05	0.02	0.03	0.05	0.00	0.63
		Change	0.18	0.00	0.06	-0.10	0.01	-0.01	0.02	0.00	-0.71
	Guyana	2002	0.12	0.02	0.13	0.00	0.00	0.01	0.00	0.01	
		2018	0.06	0.04	0.12	0.00	0.00	0.00	0.00	0.00	

		Change	-0.07	0.03	-0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.07
		2002	0.91	0.69	0.06	0.00	0.00	0.00	0.01	0.00	1.99	
Honduras	2018	0.81	0.39	0.10	0.00	0.00	0.01	0.02	0.01	1.13		
	Change	-0.10	-0.30	0.04	0.00	0.00	0.01	0.01	0.01	-0.86	-1.19	
	2002	11.71	15.56	3.75	10.89	1.70	2.49	7.89	15.36	9.85		
Mexico	2018	19.56	21.81	5.43	6.99	2.55	2.82	8.19	21.34	6.89		
	Change	7.85	6.25	1.68	-3.90	0.86	0.33	0.30	5.98	-2.96	16.39	
	2002	0.45	0.21	0.05	0.00	0.20	0.00	0.00	0.00	0.35		
Nicaragua	2018	0.64	0.86	0.04	0.00	0.14	0.00	0.00	0.00	0.71		
	Change	0.19	0.65	-0.01	0.00	-0.06	0.00	0.00	0.00	0.36	1.13	
	2002	0.36	0.01	0.04	0.03	0.00	0.00	0.01	0.00	0.00		
Panama	2018	0.12	0.01	0.04	0.00	0.05	0.00	0.00	0.00	0.00		
	Change	-0.24	0.00	0.00	-0.03	0.05	0.00	0.00	0.00	0.00	-0.22	
	2002	0.02	0.05	0.05	0.00	0.09	0.00	0.00	0.00	0.00		
Paraguay	2018	0.02	0.01	0.11	0.00	0.05	0.00	0.00	0.00	0.00		
	Change	0.00	-0.05	0.06	0.00	-0.04	0.00	0.00	0.00	0.00	-0.03	
	2002	0.68	0.06	0.52	0.20	0.05	0.03	0.59	0.00	0.31		
Peru	2018	2.15	0.03	1.55	0.45	0.49	0.04	0.33	0.01	0.28		
	Change	1.47	-0.03	1.02	0.25	0.44	0.01	-0.26	0.01	-0.03	2.89	
	2002	0.05	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00		
Suriname	2018	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00		
	Change	-0.01	0.00	-0.53	0.00	0.00	0.00	0.00	0.00	0.00	-0.53	
	2002	0.13	0.02	0.03	0.00	0.00	0.01	0.05	0.00	0.01		
Uruguay	2018	0.27	0.01	0.10	0.00	0.00	0.01	0.02	0.00	0.00		
	Change	0.14	-0.01	0.07	0.00	0.00	0.00	-0.03	0.00	-0.01	0.16	
	2002	0.31	0.04	2.20	10.89	0.02	1.07	0.72	0.04	0.02		
Venezuela (Bolivarian Republic of)	2018	0.11	0.03	1.17	5.38	0.00	0.23	0.07	0.01	0.00		
	Change	-0.21	-0.01	-1.03	-5.51	-0.02	-0.84	-0.65	-0.04	-0.02	-8.33	

Source: Author's calculations using United States Census Bureau data (dataweb)

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