Driving Forces behind Premature Deindustrialization in Latin America

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Abstract While deindustrialization is a universal phenomenon that most countries are destined to experience at a certain stage of economic development, it materialized in Latin America too soon. Most countries in the region reached peak levels of industrialization that were lower than those experienced by early industrializers and these peak levels were reached at lower levels of economic development. We present empirical evidence based on a panel dataset of 191 countries for the 1990-2018 period to suggest that premature deindustrialization witnessed in most parts of the region is a consequence of the interaction of distinct deindustrialization forces. It is a combined product of the "conventional" factors such as demographic, income and time trends and the "less conventional" ones such as the Dutch Disease, foreign direct investment inflows and deepening trade relations with China.

Keywords Premature deindustrialization · Latin America

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Introduction

Deindustrialization is a universal phenomenon that most countries are destined to experience at a certain stage of economic development. Rodrik (2015) calls it the common fate of countries that are growing. Indeed, as Rowthorn and Wells (1987) rightly argue, it should be considered a natural consequence of the industrial dynamism in a developed economy, rather than a trend that is detrimental to the economy. As a matter of fact, most of the early industrializers have long moved into a post-industrial phase of economic development, experiencing a continuous shrinkage in the contribution of manufacturing to GDP or employment since the beginning of the 1970s.

The decline of the manufacturing sector observed in many late industrializers is a reflection of the universality of deindustrialization. For example, for most of the countries in Latin America, industrialization was on the way during the second half of the last century driven by the state-led strategy of import substitution industrialization, but from the 1980s, a deindustrializing trend became predominant across the region. What concerns many is that deindustrialization came too early in Latin America, a phenomenon that Dasgupta and Singh (2006) call "premature deindustrialization."

Most Latin American countries reached the peak levels of industrialization that were lower than those experienced by early industrializers. At the same time, these peak levels were reached at lower levels of economic development. That is, the manufacturing sector began to shrink at levels of per capita GDP that were a fraction of those at which the advanced economies started to deindustrialize (Rodrik 2015). Most countries in the region are turning into service economies or going back to the status of commodity-based economies without having gone through a proper experience of industrialization.

Deindustrialization, especially when it takes place much earlier than expected, should not be taken lightly. Manufacturing is considered a special sector in comparison with others as it has a number of unique characteristics. First, as Kaldor (1967) argues, the manufacturing sector has significant direct and spillover effects on the overall economy. Second, it is widely believed to encourage technological progress. Third, a number of industries in the manufacturing sector exhibit greater income elasticity of demand than primary commodities or products from the service sector. Fourth, manufacturing is considered a sector with increasing returns. Rodrik (2013) argues that there exists unconditional convergence in labor productivity in the manufacturing sector. Such characteristic is not easily observed in other sectors.

Lastly, as pointed out by Athukorala and Sen (2015), industrialization is an important driver of employment growth and reduction in poverty and inequality. The manufacturing sector has a greater potential in absorbing surplus labor compared to the primary and tertiary sector. While it provides relatively well-paid jobs for less-skilled workers which are dominant in developing countries, the service sector is characterized by its nature of duality: there exist well-paid formal jobs requiring high-skills with low employment elasticity and informal jobs requiring low-skills that pay low wages. The primary sector suffers from low employment elasticity.

Indeed, it was rapid government-led industrialization that enabled countries such as South Korea and Taiwan to catch up with early industrializers of the North. Many developing countries have hoped to replicate their industrialization experiences, with the belief that promoting key industries in the manufacturing sector would lead to economic development. In that sense, what has been witnessed in the majority of Latin American countries over recent decades has created many concerns. Deindustrialization is frequently associated with the opposite of what can be gained from industrialization, for example, negative direct and spillover effects on the rest of the economy, a decline in technological capacity, and rising income inequality with the reduction in formal employment and enlargement of the informal sector. The trend of premature deindustrialization in the region thus deserves a close attention.

What explains premature deindustrialization that has taken place in Latin American countries in recent decades? While deindustrialization is a trend that most countries are expected to go through at a particular stage of economic development, it is not easy to generalize what drives it and what is responsible for its more rapid pace. Its driving forces differ widely across countries, resulting in different deindustrialization trajectories. While there are sources of deindustrialization that are "conventional," affecting most of the countries in the world, we also observe that some of the factors are "less conventional," with an impact only on a certain number of countries. Is Latin American premature deindustrialization a natural phenomenon driven by the "conventional" deindustrialization forces? Should some parts of the puzzle be explained by the "unconventional" factors whose effects are largely limited to the majority of the countries in the region?

The purpose of this paper is therefore to analyze how each source of deindustrialization has affected the path of premature deindustrialization taken by most Latin American countries since the early 1990s. We first consider the "conventional" forces of deindustrialization: the effects of demographic trends; the influence of income trends; and the impacts of time trends caused by the continuously declining relationship between the level of economic development and the level of industrialization. We find that the deindustrialization process of Latin American countries is a partial result of the varying effects from them.

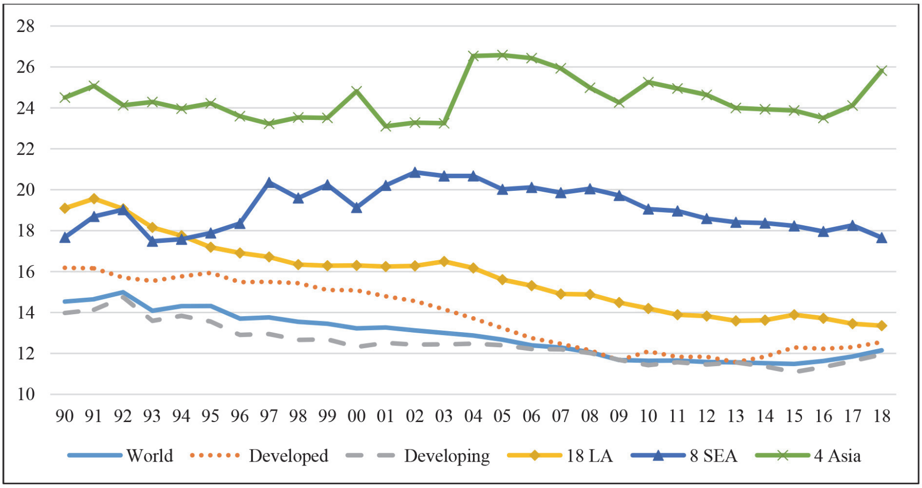
However, these "conventional" sources of deindustrialization do not provide a complete answer to the puzzle of Latin American premature deindustrialization. They apply to most of the countries in the world, thus unable to fully explain why deindustrialization began so early across the region. Therefore, in addition to the "conventional" sources of deindustrialization, we take into account the "less conventional" forces that influence only a certain group of countries: the Dutch Disease; foreign direct investment inflows; and deepening trade relations with China. These sources have weighted quite heavily on the manufacturing sector of many countries in the region. We present empirical evidence based on a panel dataset of 191 countries from 1990 to 2018 to suggest that premature deindustrialization experienced by most Latin American countries is a combined product of the varying impacts of these diverse sources of deindustrialization.

This paper is organized as follows. The second section provides an overview of the trajectories of deindustrialization in Latin America. In the third section, we outline the factors driving deindustrialization. In the fourth section, we present our empirical models and estimation results. The fifth section assesses how Latin American countries have been affected by some of the sources of deindustrialization identified in the paper. We sum up our paper and draw policy implications in the final section.

Trajectories of Deindustrialization in Latin America

Figure 1 illustrates how manufacturing value added as a percentage of GDP evolved from 1990 to 2018 in various country groups. We categorize 191 countries in the world by their level of economic development and geographical region following the classification by the World Bank (2019). An average country in the sample of 191 countries in the world experienced a steady decline in its level of industrialization during the study period. The value added generated by the manufacturing sector in an average country accounted for around 14.5% of GDP in 1990 and 12.1% in 2018.

An average developed country also exhibited a trend of deindustrialization overall between 1990 and 2018. Many developed countries had already embarked on the process of deindustrialization in the 1970s. An average developed country recorded about 16.1% for its ratio of manufacturing value added to GDP in 1990 and 12.6% in 2018. An average developing country entered the 1990s with the lowest level of industrialization among the country groups in Figure 1. Its manufacturing value added as a percentage of GDP was around 14.0% in 1990. Following a steady deindustrializing trend, its ratio of manufacturing value added to GDP was found to be 11.9% in 2018.

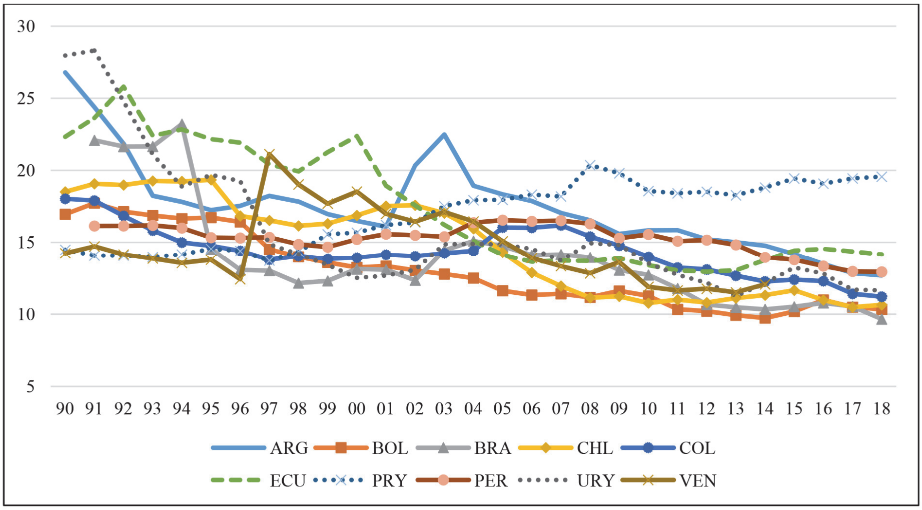


Source: Authors' Calculations Based on World Development Indicators (2020)

Fig. 1 Evolution of manufacturing value added as a percentage of GDP (%) (Different country groups)

At an aggregate level, 18 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela) experienced deindustrialization. An average Latin American country's manufacturing value added as a percentage of GDP continuously declined over the study period, falling from 19.1% in 1990 to 13.4% in 2018. The rate at which deindustrialization took place during the study period was much higher for the Latin American group than the other country groups.

It is noteworthy that 8 Southeast Asian countries (Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam) on average exhibited a rather interesting trend, with their average manufacturing value added as a percentage of GDP increasing until the early 2000s and decreasing since then. 4 Asian countries (China, Japan, Singapore and South Korea) overall kept their ratio of manufacturing value added to GDP surprisingly well. The highly sustained average level of industrialization, which ranges from 23.2% to 26.5% is unique. The Southeast Asian and Asian groups certainly depart from the general trend.



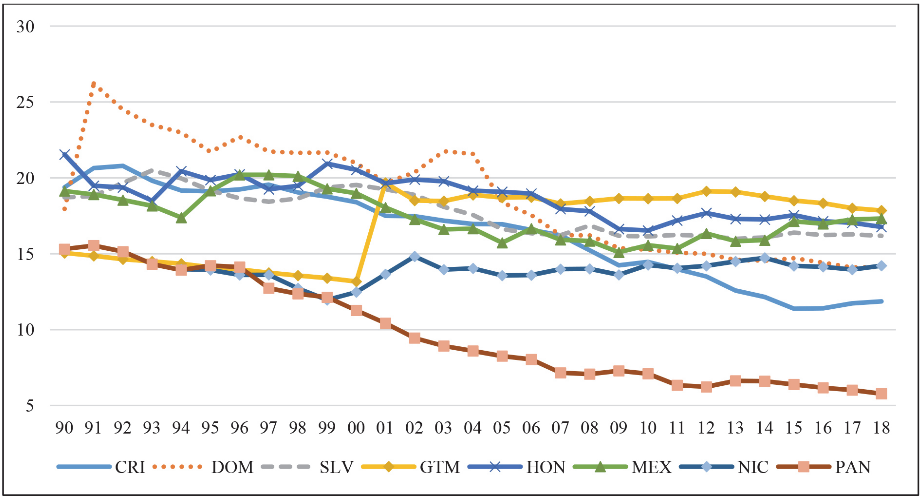
Source: World Development Indicators (2020)

Fig. 2 Evolution of manufacturing value added as a percentage of GDP (%) (South American countries)

We now have a closer look at individual countries' deindustrialization trajectories within Latin America. Figure 2 and 3 show how manufacturing value added as a percentage of GDP evolved in the South American group and the Central American group from 1990 to 2018. Different production and export and import profiles between South American and Central American countries suggest that it is necessary to separate them when assessing their deindustrialization trajectories.

As can be seen in Figure 2, those countries that were relatively more industrialized than others in 1990, such as Argentina, Brazil, Ecuador, and Uruguay experienced a drastic decline in the level of deindustrialization during the study period. Manufacturing value added as a percentage of GDP more than halved from the starting period to the ending period in Argentina, Brazil, and Uruguay, from 26.8% to 12.7% in Argentina, from 22.1% to 9.7% in Brazil, and from 28.0% to 11.7% in Uruguay.

Those who began the 1990s with relatively lower contribution of manufacturing value added to GDP exhibited a similar trend. There is no single South American country that recorded higher manufacturing value added as a percentage of GDP in 2018 than in 1990 except Paraguay. Paraguay appears to be the only anomalous exception that deviates from the general pattern of South American countries. Despite the relatively wide cross-country variation in the level of industrialization in 1990, these countries became much more identical in 2018.



Source: World Development Indicators (2020)

Fig. 3 Evolution of manufacturing value added as a percentage of GDP (%) (Central American countries)

Figure 3 shows that Central American countries on average experienced deindustrialization from 1990 to 2018, although to a lesser degree compared to the South American group. Quite notably, Guatemala and Nicaragua managed to end the study period with a higher level of industrialization than that recorded at the beginning of the study period. Mexico and El Salvador did not witness significant changes in their levels of industrialization. The contribution of the manufacturing sector to GDP shrank less than 2% in these countries from 1990 to 2018.

Out of 8 Central American countries in the sample, Costa Rica and Panama experienced the most dramatic decline of the manufacturing sector. Costa Rica's manufacturing value added as a percentage of GDP fell from 19.4% in 1991 to 11.9% in 2018. In the same period, Panama's ratio of manufacturing value added to GDP decreased from 15.3% to 5.8%. It started the 1990s with one of the lowest levels of industrialization in Latin America and enhanced its status as the least industrialized country in the region.

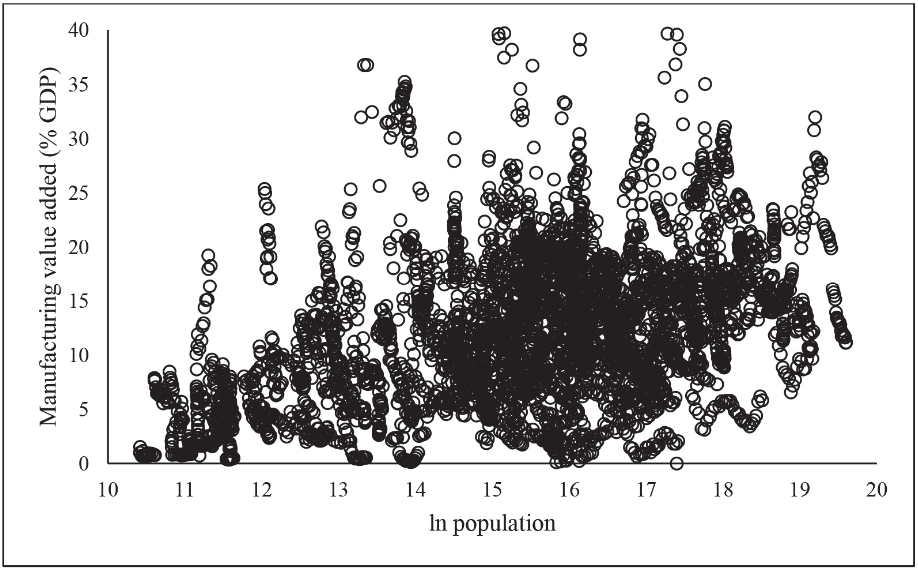
The relatively gentle deindustrialization process taken place in the majority of Central American countries is probably due to their production structure that significantly differs from that of many South American countries. The majority of Central American countries established processing zones aimed at producing labor-intensive goods for export to the United States in the 1980s. This was done so in order to take advantage of the abundance of low-wage labor in the region and its geographical proximity to the United States.

Having examined the recent trends in the manufacturing sector across the region, one may find it difficult to believe that Latin America was the undisputed manufacturing powerhouse of the South during the 1960. Ever since the trend of deindustrialization began to appear in the 1980s, it has not lost its momentum. Meanwhile, Southeast Asian countries, for example, have been maintaining their levels of industrialization quite intact. It is probably fair to say that a switching of position between the two country groups has taken place over the past decades.

Sources of Deindustrialization

We first examine the contribution of demographic and income factors in shaping a country's process of deindustrialization. These two sources of deindustrialization are closely linked to the stages of economic development. According to Clark (1957), as the level of economic development increases, the demand for manufactured goods increases while agricultural products are relatively less sought for, resulting in industrialization. However, there exists an inverted-U relationship between the level of economic development and the level of manufacturing (Rowthorn 1994; Palma 2005; Rodrik 2015). As per capita GDP increases, the value added contribution of the manufacturing sector to the economy first rises. It then stabilizes at a certain level of per capita GDP and eventually begins to fall, demonstrating the inverted-U relationship between per capita GDP and the ratio of manufacturing value added to GDP.

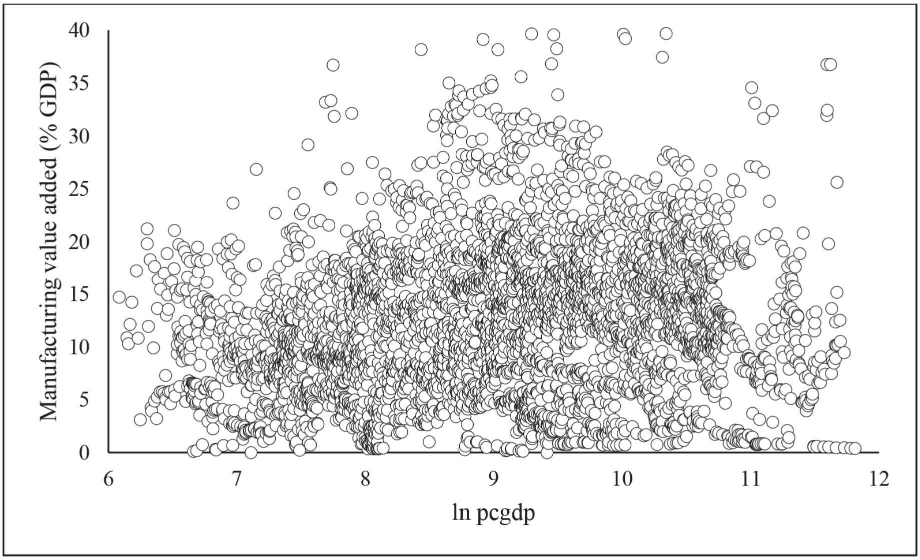
According to Goodfriend and McDermott (1995), population growth and the market size are important preconditions for industrialization. Population must attain a critical level for the manufacturing sector to take off, as it may be too small to support the use of specialized intermediate inputs at the early stage of industrialization. Rising population pushes the scale of operation to a critical point, at which time the manufacturing sector becomes viable. Once the manufacturing sector takes off, continuing population growth enables the industries of the manufacturing sector to benefit more from increasing returns. That is, as countries become larger, they can produce output at a lower cost per unit (Brigulio 1998). Of course, however big an economy is, there is always a point from which the positive effect of population growth on manufacturing value added as a percentage of GDP begins to decline, as evidenced in Rodrik (2015).



Source: World Development Indicators (2020)

Fig. 4 Population and manufacturing value added as a percentage of GDP

We plot manufacturing value added as a percentage of GDP versus the natural logarithm of population for 191 countries from 1990 to 2018 in Figure 4. Our scatterplot confirms that there is overall a positive relationship between the two variables. However, if we draw a predicted trend line, population increases the level of industrialization at a decreasing rate. Employing the same sample, we also plot manufacturing value added as a percentage of GDP versus the natural logarithm of per capita GDP in Figure 5. We observe that there is a certain point of per capita GDP from which manufacturing value added as a percentage of GDP begins to decline.



Source: World Development Indicators (2020)

Fig. 5 Per capita GDP and manufacturing value added as a percentage of GDP

In addition to the abovementioned deindustrialization sources driven by the demographic and income trends, Rowthorn (1994) and Palma (2005) find that time trends also affect a country's level of industrialization. First, a declining relationship between the level of economic development and the level of industrialization is observed over time. Second, there is a decline over time in the level of economic development corresponding to the turning point of the inverted-U curve between the level of economic development and the level of industrialization. That is, the inverted-U relationship is not stable over time. The turning point of the inverted-U curve becomes lower and comes at lower levels of economic development with time.

In addition to the abovementioned "conventional" deindustrialization forces that influence most parts of the world, Palma (2005) identifies some "less unconventional" sources of deindustrialization. One of them is the so-called Dutch Disease effect. What differentiates the Dutch Disease effect from the previous sources of deindustrialization is that it affects only a certain group of countries. Its effect is limited to those abundant in natural resources that generate a considerable trade surplus from their exports and finance their trade deficits in manufacturing with it. These countries tend to experience more rapid deindustrialization than expected.

Matsuyama (1992) analyzes how dependence on the primary sector leads to the shrinkage of the manufacturing sector. According to his theoretical framework based on a two-sector economy, a trade surplus in the primary sector should eventually mean deindustrialization. Sachs and Warner (1995) extend this model and divide the economy into three sectors: a tradable natural resource sector; a tradable manufacturing sector; and a non-tradable sector. A large positive shock in the tradable natural resource sector leads to exchange rate appreciation, which drives higher demand for non-tradable goods and results in the shift of factors of production from the tradable manufacturing sector to the tradable natural resource sector. Consequently, the tradable manufacturing sector shrinks, while the tradable natural resource sector and the non-tradable sector expand.

It appears that the Dutch Disease mechanism has much contributed to the recent deindustrialization trajectories of a number of Latin American countries. Especially, those South American countries abundant in natural resources have been heavily affected by the Dutch Disease effect, especially so during the commodity boom since the early 2000s. However, its effect has been limited in an average Central American country.

In addition to the Dutch Disease effect, recent changes in the international economic environment have increasingly become of much significance to many countries' deindustrialization paths in a number of different dimensions. Many countries over the world, especially those in the developing world went through liberalization reforms which were coincided with the entry of China into the world market in the 1990s. We therefore take into account their effects on the level of industrialization of a country. Inflows of foreign direct investment (FDI) and the emergence of China as a key player in the international trade scene coupled with the growth of intra-industry have left mixed implications for the manufacturing sector of many countries.

FDI is believed to have varying effects on a country's level of industrialization. Although it is widely recognized that FDI has a potential to generate technological transfers and employment in the manufacturing sector, some are quite skeptical about its effect, pointing out that it can even undermine industrialization in the developing world. Cardoso and Faletto (1979) argue that initial dependence on FDI undermined Latin American industrialization in the long run. Schrank (2008) adds that dependence on foreign capital prevents developing economies from reaching its peak level of industrialization by negatively affecting the required domestic capabilities for industrialization in the long run.

Paus and Gallagher (2008) present empirical evidence that FDI has been ineffective in promoting diversified industrialization in Mexico and Costa Rica, two of the countries that have enjoyed the highest levels of FDI in Latin America. Brady et al. (2011) find a negative relationship between inward FDI flows and the industrial employment share in Latin American countries from 1980 to 2006. In a similar vein, Bogliaccini (2013) shows that FDI stock as a percentage of GDP is negatively associated with employment in industry in Latin America for the 1980-2000 period.

There is ample literature on the impact of the rise of China on the manufacturing sector of different parts of the world (IDB, 2006; Jenkins, 2009; Gallagher and Porzecanski 2011; Jenkins and Barbosa 2012; Kim and Lee 2014). The rapid growth and structural transformation of China synchronized with its effort to be integrated into the world trade system since the early 1990s leaves important implications for the manufacturing sector of the majority of countries in the world. As the world's second largest economy in terms of GDP and the world's largest exporter, the degree of the presence of China is felt in almost all countries' manufacturing sector.

One can expect that a higher share of China in a country's total exports and imports should overall negatively influence its manufacturing sector. A scrutiny of the composition of Chinese imports and exports reveals that China mainly imports primary commodities and intermediate goods and exports intermediate goods and final manufactured goods. Especially, China seems to export almost all types of manufacturing activities in terms of skills contents required.

The rapid growth of trade between China and Latin America has attracted considerable scholarly attention (Li 2007; Jenkins 2012). The rise of China as a key trading partner has posed serious challenges to Latin American manufacturers on two fronts. On one side, the growth of imported Chinese manufactured goods has been dramatic across the region. For almost all Latin American countries, China is among the top three importers. The penetration of Chinese manufactured products, which constitute most of the imports from China, is a matter of growing concern, putting competitive pressures on local manufacturers targeting the domestic market.

On the other side, China has become an important market for several Latin American commodity exporters, generating an unprecedented demand for primary products, ever since resource constraints began in China in the late 1990s. Its rapid industrial development has boosted demand for primary commodities such as copper, iron ore, nickel, and soybeans that some South American countries are rich in. The concern is that this commodity boom driven by China has been contributing to an incentive structure that fuels a process of deindustrialization.

After all, when examining the implications of the presence of China in a country's exports and imports on its manufacturing sector, what ultimately matters is the nature of trade relations between the given country and China. The China effect may be felt differently in different countries in the world, given a significant degree of heterogeneity in the characteristics of their trade relations with China and their own production and trade structures.

Considering the export structure of China, any country's imports from China are mainly intermediate and final manufactured goods. However, different countries export different types of goods to China. In the case of a number of Latin American countries whose dependence on China for exports has been quite high, their exports have mainly been primary commodities, thereby dictating the nature of the trade relations between China and them to be largely inter-industry.

In contrast, the trade relations between Southeast Asian economies and China are largely characterized by the existence of a significant volume of intra-industry trade in manufacturing. One should note that the production sharing between the two sides is a part of the web of interlocking regional value chains. Their close integration with China based on intra-industry trade is largely complemented by its other trade links of similar nature with neighboring Asian countries such as Korea and Japan. Regional production sharing in manufacturing based on the division of labor across national borders is now what defines trade in Asia.

Empirical Results

In order to empirically examine what determines a country's level of industrialization, we construct a number of regression models based on pooled ordinary least squares with year and regional dummies with a panel dataset of 191 countries for the 1991-2018 period. Throughout our empirical analysis, the level of industrialization is represented by manufacturing value added as a percentage of GDP (World Development Indicators 2020).

Table 1 Determinants of the level of industrialization 1990-2018

Dependent variable: Manufacturing value added as a percentage of GDP				
	(1)	(2)	(3)	(4)
ln pop	5.34***	6.03***	6.00***	6.34***
	(0.49)	(0.49)	(0.49)	(0.49)
$(\ln pop)^2$	-0.12***	-0.14***	-0.14***	-0.15***
	(0.02)	(0.02)	(0.02)	(0.02)
ln pcgdp	14.21***	12.83***	18.92***	20.83***
	(1.10)	(1.10)	(1.83)	(1.60)
$(\ln pcgdp)^2$	-0.71***	-0.64***	-0.98***	-1.08***
	(0.06)	(0.06)	(0.10)	(0.09)
2000s	-1.82***	-1.58***	37.36***	-1.54***
	(0.22)	(0.21)	(10.43)	(0.21)
2010s	-3.32***	-3.16***	36.01***	-3.12***
	(0.23)	(0.23)	(11.52)	(0.23)
nr		-0.14***	-0.14***	2.42***
		(0.01)	(0.01)	(0.39)
ln pcgdp∗2000s			-9.05***	
			(2.37)	
$(\ln pcgdp)^2$∗2000s			0.52***	
			(0.13)	
ln pcgdp∗2010s			-8.91***	
			(2.59)	
$(\ln pcgdp)^2$∗2010s			0.50***	
			(0.14)	
ln pcgdp∗nr				-0.59***
				(0.39)
$(\ln pcgdp)^2$∗nr				0.03***
				(0.00)
Regional dummies	Yes	Yes	Yes	Yes
Observations	4784	4565	4565	4565
R^2	0.31	0.34	0.34	0.35

*statistically significant at 10% level, ** at 5% level, and *** at 1% level

In column (1), we test if the relationship between population and the level of industrialization and that between per capita GDP and the level of industrialization exhibit an inverted-U shape. We include the natural logarithm of population and its squared term and the natural logarithm of per capita GDP and its squared term in our regression (World Development Indicators 2020). We also introduce period dummies and regional dummies to the regression. There are three period dummies: 1990s; 2000s; and 2010s and seven regional dummies: East Asia and Pacific;

Europe and Central Asia; Latin America and Caribbean; North America; South Asia; and Sub-Saharan Africa.

Regression results presented in column (1) confirm the presence of the two inverted-U relationships that are graphically illustrated in Figures 4 and 5. In addition, we find that the average level of industrialization decreases with time, confirming the declining relationship between the level of economic development and the level of industrialization over time suggested by Rowthorn (1994) and Palma (2005).

In column (2), we estimate the effect of natural resource abundance on the level of industrialization. Our proxy for natural resource endowment is a country's total natural resource rents as a percentage of GDP (World Development Indicators 2020). Total natural resource rents are the sum of oil, natural gas, coal, mineral, and forest rents. The rent from a particular commodity is defined as the difference between its world price and average extraction cost both expressed in current US dollars. Natural resource rents mainly depend on the stock of natural resources and exogenous world prices, thus enabling us to bypass problems that may arise from endogeneity. Regression results in column (2) suggest that the Dutch Disease effect is likely to be present for a number of countries rich in natural resources.

Column (3) allows us to observe if there is a decline in the level of economic development corresponding to the turning point of the inverted-U curve between the level of economic development and the level of industrialization. Our interaction terms between per capita GDP and the period dummies and the per capita GDP squared term and the period dummies confirm that the turning point of the inverted-U curve indeed shifts over time, consistent with the findings of Palma (2005).

Figure 6 graphically illustrates our findings in columns (1) and (3). The level of industrialization associated with each level of per capita GDP decreases over time and the per capita GDP level from which manufacturing value added in GDP begins to decline also does. The turning point of the inverted-U curve becomes lower and comes at much lower levels of economic development over time.

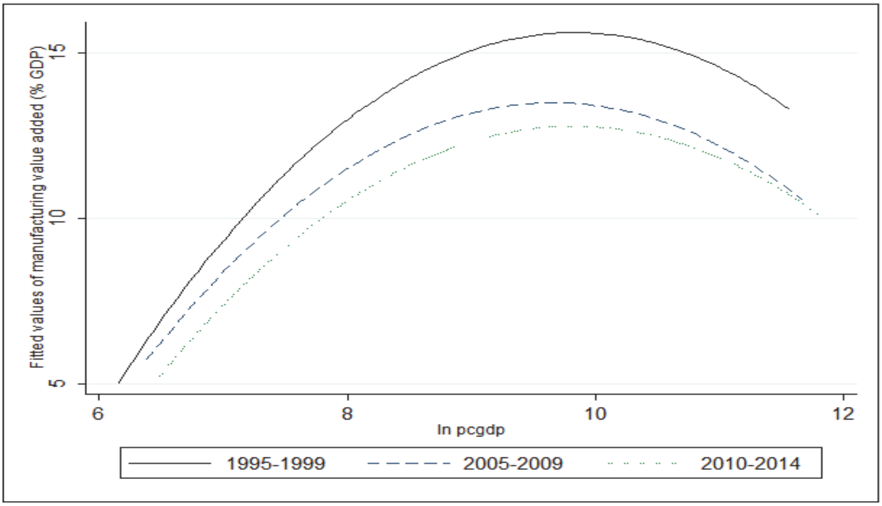


Fig. 6 Fitted values of manufacturing value added by selected time periods

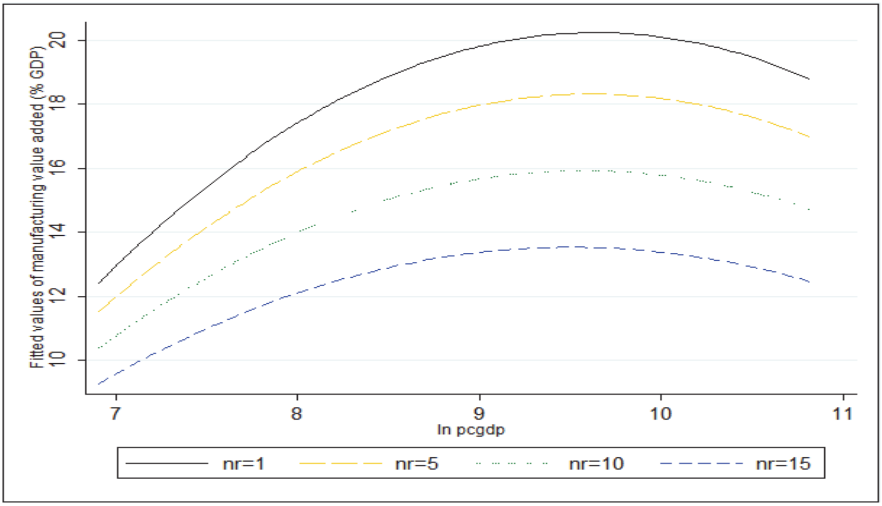


Fig. 7 Fitted values of manufacturing value added by selected levels of *nr*

We find in column (4) that natural resource abundance is also a contributing factor to the early deindustrialization of several countries. A higher level of natural resource rents not only results in a lower level of industrialization associated with each level of economic development but also causes the turning point of the inverted-U curve between the level of economic development and the level of industrialization to be reached at a lower level of per capita GDP. This implies that deindustrialization is likely to occur at a more rapid pace for those abundant in natural resources. We illustrate in Figure 7 how the Dutch Disease mechanism leads to premature deindustrialization at selected levels of *nr* showing our simulation results based on the regression built from our sample.

In Table 2, we estimate the effects of FDI inflows and the presence of China on a country's level of industrialization. Column (1) adds four variables to our regression model in column (2) in Table 1. First, we include a variable that measures the net inflows of FDI as a percentage of GDP in a country (World Development Indicators 2020). We then account for the influence of China by including two variables, *China exp* and *China imp*, that measure Chinese share in a country's total exports and imports (Authors' calculations based on United Nations Comtrade Database 2020).

Lastly, given the additional need to capture the effect of trade composition with China, we introduce a variable that calculates trade-weighted Grubel-Lloyd index at SITC one-digit level with China. Trade-weighted Grubel-Lloyd index with China, *China GL* is 0 when there is no intra-industry trade at all between a given country and China and 1 if the trade relations between the two countries are predominantly of the intra-industry nature.

A country's *China GL* is calculated using the equation below:

$$China\ GL_i = \sum (1 - \frac{|X_{ij} - M_{ij}|}{X_{ij} + M_{ij}})(\frac{X_{ij} + M_{ij}}{X_i + M_i})$$

where X_{ij} is country *i*'s exports to China in industry *j*, M_{ij} is country *i*'s imports from China in industry *j*.

Table 2 Determinants of the level of industrialization 1990-2018

Dependent variable: Manufacturing value added as a percentage of GDP				
	(1)	(2)	(3)	(4)
ln pop	7.73***	7.57***	7.72***	7.82***
	(0.64)	(0.66)	(0.64)	(0.65)
$(\ln pop)^2$	-0.21***	-0.21***	-0.21***	-0.21***
	(0.02)	(0.02)	(0.02)	(0.02)
ln pcgdp	17.66***	16.53***	17.61***	17.58***
	(1.22)	(1.48)	(1.22)	(1.22)
$(\ln pcgdp)^2$	-0.95***	-0.89***	-0.95***	-0.95***
	(0.07)	(0.08)	(0.07)	(0.07)
2000s	-0.43*	-0.44*	-0.47**	-0.47**
	(0.24)	(0.24)	(0.24)	(0.24)
2010s	-1.21***	-1.21***	-1.28***	-1.27***
	(0.28)	(0.28)	(0.28)	(0.28)
nr	-0.04***	-0.04***	-0.04***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
FDI inflow	-0.02***	-0.02***	-0.02***	-0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
China exp	-0.11***	-0.11***	-0.13***	-0.11***
	(0.01)	(0.01)	(0.01)	(0.01)
China imp	-0.12***	-0.12***	-0.13***	-0.14***
	(0.02)	(0.02)	(0.02)	(0.02)
China GL	8.33***	-64.01*	6.87***	7.24***
	(0.64)	(38.57)	(0.74)	(0.82)
ln pcgdp*China GL		15.05*		
		(8.16)		
$(\ln pcgdp)^2$*China GL		-0.77*		
		(0.43)		
China exp*China GL			0.24***	
			(0.06)	
China imp*China GL				0.14**
				(0.07)
Regional dummies	Yes	Yes	Yes	Yes
Observations	3159	3159	3159	3159
R^2	0.42	0.42	0.42	0.42

*statistically significant at 10% level, ** at 5% level, and *** at 1% level

China has turned into a center of production networks in Asia and a manufacturing point for re-exports. As mentioned earlier, if a country records a high level of *China GL*, it is likely to mean that its trade links with other Asian countries are also characterized by the existence of a significant degree of intra-industry trade.

Regression results reported in column (1) point to the overall negative impact of FDI inflows on a country's level of manufacturing. A higher dependence on China for exports and imports is found to be negatively associated with manufacturing value added as a percentage of GDP in an average country of our sample. Finally, a higher intensity of intra-industry trade with China is found to be positively related to the dependent variable.

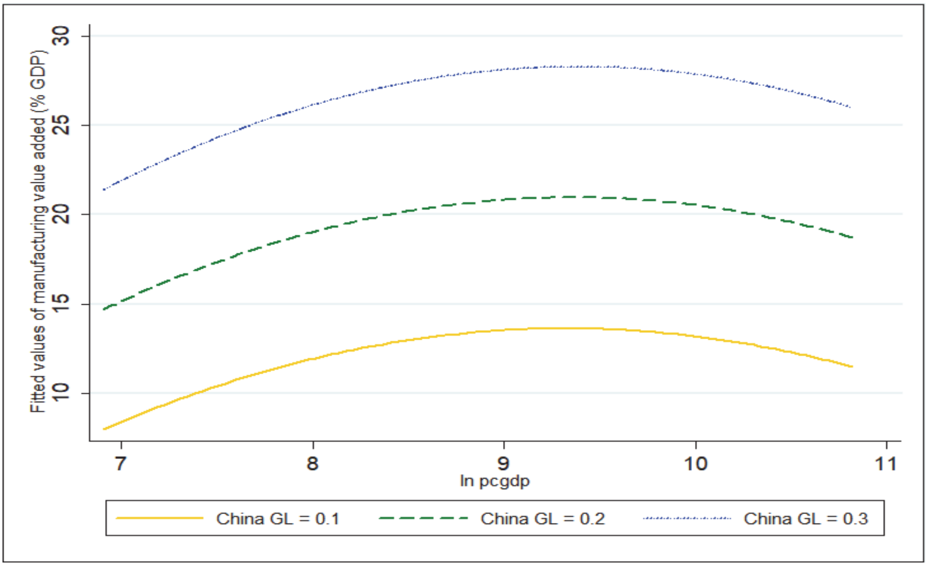


Fig. 8 Fitted values of manufacturing value added by selected levels of *China GL*

In column (2), we find that a higher intensity of intra-industry trade with China appears to shift the turning point of the inverted-U curve between the level of economic development and the level of industrialization. We graphically depict our simulation results at different levels of *China GL* in Figure 8 based on the regression. A higher level of trade-weighted Grubel-Lloyd index with China leads to an increase in per capita GDP corresponding to the turning point of the inverted-U curve. In other words, if it is intra-industry trade that dominates a country's trade with China, the country's point at which deindustrialization begins may come at a higher level of per capita GDP. That is, deindustrialization may occur at a slower pace for those who are integrated with the Chinese economy more in terms of intra-industry trade.

Columns (3) and (4) show that the negative effects of having a higher Chinese share in a country's total exports and imports on the level manufacturing can be alleviated when there is a significant intensity of intra-industry trade with China. The interaction terms between *China exp* and *China GL* and *China exp* and *China GL* are both statistically significant.

The Latin American Experience

In this section, we assess how the abovementioned forces of deindustrialization have caused the early decline of the manufacturing sector in the majority of Latin American countries. First of all, the Dutch Disease mechanism was clearly at work for a number of countries in South America during the study period, especially during the commodity boom between the early 2000s to early 2010s. It seems evident from Table 3 that countries such as Bolivia, Chile, Ecuador and Venezuela relied heavily on natural resources for their export income. It is noteworthy that the level of dependence on natural resources is markedly higher for an average South American country than an average Central American country, suggesting that the Dutch

Disease effect did not have a pronounced effect on the manufacturing sector of Central American countries.

Table 3 Evolution of natural resource rents as a percentage of GDP (%)

	90-94	95-99	00-04	05-09	10-14	15-17
Argentina	1.4	1.3	4.0	5.0	3.5	1.3
Bolivia	4.1	3.0	5.2	12.9	12.5	6.1
Brazil	1.9	1.4	3.2	5.0	4.6	3.2
Chile	8.1	6.3	8.0	18.1	16.5	11.3
Colombia	4.0	3.1	4.8	6.8	7.8	4.0
Costa Rica	2.6	2.1	1.0	1.3	1.3	1.1
Dominican Republic	0.9	0.5	0.9	1.7	1.1	2.0
Ecuador	8.5	7.0	11.2	16.3	13.5	4.7
El Salvador	0.8	0.7	0.5	0.5	0.9	0.9
Guatemala	1.6	1.4	1.5	1.8	2.6	2.0
Honduras	2.6	2.2	1.4	1.9	2.4	2.1
Mexico	4.0	2.9	3.4	5.8	6.1	2.6
Nicaragua	4.1	1.7	1.2	1.6	4.3	3.4
Panama	0.2	0.2	0.1	0.1	0.3	0.2
Paraguay	2.5	2.1	1.8	1.6	1.6	1.6
Peru	3.6	1.6	2.0	10.0	9.9	7.6
Uruguay	0.5	0.4	0.4	1.2	1.5	1.7
Venezuela	19.5	15.6	20.0	23.3	17.1	

Source: World Development Indicators (2020)

Our calculations based on data from the United Nations Comtrade Database (2020) suggest that the China effect played a formidable role in the premature deindustrialization of many Latin American countries. The volume of bilateral trade between China and 18 Latin American countries increased substantially over the study period. The Latin American side exported only about $2.5 billion to China in 1995, but exports amounted to $94 billion in 2017. Imports from China recorded approximately $2.5 billion in 1995, but they reached $169 billion in 2017.

Chinese share in total exports and imports of Latin American countries were also on the rise. In 1995, Chinese share in total exports and imports of 18 Latin American countries was merely 1%. In 2017, however, exports to China captured 10% share in the region's total exports and 18% in its total imports. At the country level, the share of China in total exports was 27% for Chile, 26% for Peru, 21% for Brazil, 18% for Uruguay, and 7% for Argentina in 2017. However, China is still not a major export destination for Central American countries. For example, only about 1% of total Costa Rican and Salvadorian exports went to China in 2017. Chinese share in Guatemala and Honduras's total exports was around 2%.

Imports from China grew at a much faster rate than exports to China for the majority of the countries in the region. In 2017, Chinese share in total imports exceeded 20% in a number of countries in South America and 10% in most of Central American countries. The adverse effect of the presence of China was therefore more seriously felt in several South American countries who had stronger ties with China both in terms of exports and imports.

We now present in Table 4 trade-weighted Grubel-Lloyd index between some of the larger economies in Latin America, China, the United States and Brazil in 2014, following the SITC three-digit classification. One can see that the nature of trade relations between the Latin American side and China is almost entirely of inter-industry. In contrast, a reasonable degree of intra-industry trade is observed between the Latin American side and the United States. We can also see that Brazil is involved in a considerable degree of intra-industry trade with Mexico and Uruguay, suggesting that the intensity of intra-industry trade between Latin American countries is substantial.

Table 4 Pairwise Weighted Grubel-Lloyd index in 2014

	China	United States	Brazil
Brazil	0.03	0.33	
Colombia	0.00	0.12	0.15
Mexico	0.05	0.46	0.38
Peru	0.01	0.22	0.07
Uruguay	0.01	0.07	0.33

Source: Authors' Calculations Based on United Nations Comtrade Database (2020)

Let us compare the Latin American case with that of Southeast Asia in terms of the region's trade relations with China. A number of Southeast Asian countries are becoming increasingly integrated with China through the development of regional production networks in manufacturing. It is thus possible that China does not necessarily pose a serious threat to the manufacturing sector of a handful of Southeast Asian economies. As can be seen in Table 5, there exists a substantial degree of intra-industry trade between Southeast Asian countries and China. Their trade relations with Japan and Thailand are of similar nature, pointing to the presence of a division of labor at the regional level. In this context, the negative impact of Chinese presence in a country's exports and imports can be alleviated to a significant degree.

Table 5 Pairwise Weighted Grubel-Lloyd index in 2014

	China	Japan	United States	Thailand
Indonesia	0.14	0.18	0.13	0.34
Malaysia	0.46	0.31	0.46	0.49
Philippines	0.27	0.29	0.29	0.33
Thailand	0.31	0.39	0.31	
Vietnam	0.21	0.28	0.09	0.27

Source: Authors' Calculations Based on United Nations Comtrade Database (2020)

Policy Implications

The "conventional" sources of deindustrialization: the inverted-U relationship between population and the level of industrialization; the inverted-U relationship between the level of economic development and the level of industrialization; and the continuously declining relationship between the level of economic development and the level of industrialization, only provide a partial answer to the puzzle about why the majority of Latin American countries experienced premature deindustrialization from 1990 to 2018.

After all, it appears that the global economic environment has been changing in a way that Latin American manufacturing is destined to falter, as illustrated in Figure 9. It is not an exaggeration to say that the major changes made in the international trade scene over the past decades have mostly been shaped by China's rapid growth along its integration into the world trade system. It is China that intensified the Dutch Disease effect driving the commodity boom and saturated the world manufactured goods market with almost all types of products.

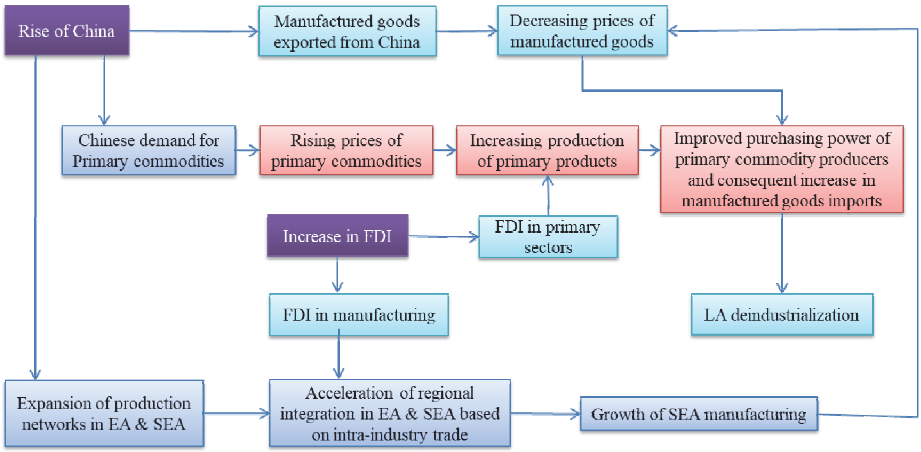


Fig. 9 Recent changes in global economic environment

While a number of countries, such as those in Southeast Asia have undoubtedly gained much momentum in their manufacturing sector from the emergence of China, the manufacturing sector of most Latin American economies has struggled due to what Palma (2011) calls the "Asian double squeeze." On the one hand, low-income Southeast Asian countries have mastered labor-intensive manufacturing techniques. On the other hand, Latin American manufacturing found it difficult to compete with technologically-advanced East Asian countries.

Indeed, Southeast Asian countries with abundant labor and significantly low wages easily defeated Latin American manufacturing in labor-intensive goods markets, although Central American countries relatively fared well, given their *maquila* activities making use of the proximity to the United States. The rapid growth of China as a producer has given an additional boost to the Asian double squeeze. China is capable of competing in any manufactured goods categories, leaving much less room for Latin American manufactured products, regardless of the level of sophistication. As Jenkins (2009) points out, Chinese exports are not predominantly of low-technology manufactured goods, contrary to some popular perceptions. There is a significant volume of manufactured exports that require medium and high skills.

In this context, what options do Latin American economies have? It may be plausible to be integrated into regional production networks that already exist. The most obvious choice would be the North American value chains championed by the United States. What they could also try is to approach the East Asian production network via aggressive Free Trade Agreements with the countries in the region. Forming a Latin American production network enhancing current ties among the economies within the region may open new opportunities for Latin American manufacturing.

Simultaneously, much should be done about avoiding the Dutch Disease that has been around for too long in Latin America. The most practical option seems to be finding some niche products that can make maximum use of its already available resources. Developing upstream and downstream manufacturing activities related to commodity extracting or processing may be considered.

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