Regional South-South trade and the Dutch Disease: The case of Latin American commodity exporters

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Abstract:
Commodity price booms are feared to cause Dutch Disease effects in commodity dependent countries. In this paper we introduce two channels through which exports towards regional partners might be less affected by the Dutch Disease. The first channel relates to higher shares of technologically more sophisticated products in intra-regional South-South trade, which are less sensitive to cost and price changes. The second channel refers to trade barriers and market entry costs of extra-regional competitors which face disadvantages in the regional market. The two channels are tested empirically via a panel data analysis of manufacturing exports in commodity dependent Latin American countries between 1996 and 2018. The evolution of exports to regional export partners is compared with those to the main extra-regional export partners. Our results indicate that Dutch Disease effects are strongest for exports to extra-regional trade partners and manufacturing products with a low level of technology. We find evidence for supporting both channels. The results indicate that technological upgrading and regional trade integration could mitigate the contraction of the manufacturing sector during commodity price booms.

Keywords: Dutch Disease; export diversification; regional trade; Latin America; manufacturing exports

1. Introduction

The manufacturing sector stands at the center of economic development due to its potential for economies of scale, technological learning, linkages to other sectors and employment creation (van Wijnbergen 1984; Krugman 1987; Hidalgo et al. 2007). It continues to be considered the most promising sector for economic development in countries of the Global South (Szirmai 2012; Haraguchi et al. 2017; Su and Yao 2017; Gabriel and de Santana Ribeiro 2019). Yet, many countries in the Global South suffer from premature de-industrialization in terms of declining manufacturing output and employment shares (Tregenna 2015; Rodrik 2016). In commodity abundant countries, this phenomenon could be exacerbated by the Dutch Disease (Corden and Neary 1982; Corden 1984). On the other hand, several publications and international reports which study the composition of export patterns in Africa and Latin America emphasize that intra-regional exports often contain higher shares of manufacturing content than extra-regional exports (e.g. Yeats 1997; Bekerman and Rikap 2010; UNECA 2015). Consequently, regional trade can contribute to strengthen manufacturing production and exportation. Even though there already exists a large literature focusing on Dutch Disease effects in resource abundant developing countries, to the best of our knowledge, it has not been analyzed if the composition of trade partners to which the exports are directed has an impact on the magnitude of Dutch Disease effects.

This paper aims to link the Dutch Disease literature with the literature on regional trade. For the purpose of this paper, we identify regional trade as trade that takes places within a geographical region and between countries of a similar level of economic development, in this case South-South trade in Latin America. We propose two channels through which the composition of trade partners might influence the magnitude of Dutch Disease effects. For both channels, the theoretical consideration indicates that a contraction of manufacturing exports due to Dutch Disease effects might less likely occur in exports to regional trade partners than to partners from outside the region. The first channel, the technological sophistication channel, departs from the observation that regional exports contain a higher share of technologically more sophisticated products and that technologically advanced products have a lower cost and price elasticity than low-tech manufacturing products. Thus, when the Dutch Disease appreciates the real exchange rate and production costs of manufacturing exporters increase, more sophisticated exports are less adversely affected. These less affected exports are mostly directed towards regional trade partners. Secondly, what we call the trade barrier and market entry cost channel, explains why exports to fellow regional trade partners might be less likely replaced by extra-regional competitors. According to the theory of the Dutch Disease, manufacturing exports to all trade partners would lose competitiveness in the commodity price boom and thus be replaced by exports from other countries. The main competitors are extra-regional more industrialized exporters, but these face relatively higher costs due to market entry costs and trade barriers like transport costs and the exclusion from regional trade agreements. Consequently, exports from a commodity dependent country towards regional trade partners face a lower loss of relative competitiveness than exports to extra-regional trade partners and therefore may remain more stable.

Against this theoretical background the paper studies if regional trade mitigates Dutch Disease effects on manufacturing exports. In the third section, the performance of manufacturing exports from commodity dependent Latin American countries from 1996 – 2018 is analyzed empirically. Via fixed effects panel data analysis, the impact of commodity price changes on manufacturing exports is examined. The effect on exports towards fellow Latin American countries is compared to the effect on exports to the major extra-regional trade partners. The expected result is that manufacturing exports towards extra-regional trade partners are more adversely affected by rising commodity prices. The adverse effects on exports towards regional trade partners are estimated to be mitigated by the technological sophistication channel and the trade barrier and market entry cost channel.

Our results point towards the possibilities of technological upgrading and regional trade integration to mitigate the contraction of the manufacturing sector during commodity price booms. We find evidence for supporting both channels as Dutch Disease effects are strongest for exports to extra-regional trade partners and products with a low level of technology. Both channels and the underlying considerations will be elaborated in more detail in the following section. Section three introduces the research design. The results of the analysis are presented in the fourth section and discussed in the fifth section, before section six concludes the paper.

2. Theoretical considerations

In this theoretical section we introduce two channels which provide explanatory power for the mitigation of Dutch Disease effects via trade with regional trade partners. The departure point is the basic model of the theory of the Dutch Disease by Corden and Neary (1982). In a three-sector economy, with a booming commodity sector, the tradable manufacturing sector and the non-tradable services sector, a windfall in commodity revenues leads to an increase in foreign monetary inflows. This external financial inflow causes the resource movement and the spending effect. The first effect implies that production factors shift away from the manufacturing and services sectors towards the booming commodity sector, which offers higher wages and capital rents. The spending effect consists in the increase of demand for tradable and non-tradable goods and services caused by financial inflows. This additional demand can be fulfilled via an increase in imports for the tradable sector. For the non-tradable sector, this is not possible and excess demand leads to higher prices in the non-tradable sector. The rise of prices for non-tradables in relation to tradables can also be described as a real exchange rate appreciation. Both effects, the appreciation of the real exchange rate and the shift of productive factors away from the manufacturing sector, imply higher costs for manufacturing producers (Corden and Neary 1982). Thereby, they lose international competitiveness and manufacturing exports decline. This shift is considered to be economically problematic. In comparison to the commodity sector and the services sector, manufacturing has more potentials for economies of scale, technological learning, linkages to other sectors and employment creation (van Wijnbergen 1984; Krugman 1987; Hidalgo et al. 2007). Therefore, it accounts for higher future growth perspectives (Siliverstovs and Herzer 2007; Murshed and Serino 2011) which are also associated with better terms of trade development (Prebisch 1950; Singer 1950). At the same time, a concentration on the commodity and non-tradable service sector might reduce the diversification of the export basket (Benavente 2016; Bahar and Santos 2018). There is empirical evidence that at the initial stages of development, diversification is associated with higher growth rates in per capita income (e.g., Al-Marhubi 2000; Imbs and Wacziarg 2003; Hesse 2009; Lederman and Maloney 2009).

The Dutch Disease is expected to have a stronger influence on developing economies than on developed economies (Cherif 2013). A competitive real exchange rate is crucial for the export performance in the former economies, while it has less impact in developed economies (Freund and Pierola 2012). Equally, Bussière et al. (2020) point out that the quantity of exports of a country is generally negatively affected by an appreciation of the real exchange rate and that this effect is stronger for emerging market economies than for industrialized countries. Therefore, rising relative production costs deriving from the Dutch Disease are a serious threat to manufacturing exports in Latin American countries.

Indeed, the empirical literature finds evidence that manufacturing exports decline due to Dutch Disease effects. Harding and Venables (2016) study the effect of commodity exports on different non-commodity exports for 41 countries over the period from 1970 to 2006. They find evidence that non-resource exports are displaced and that manufacturing exports show a stronger adverse reaction than other non-commodity exports. For one additional dollar of non-resource exports, manufacturing exports decline by 46 cents. Stijns (2003) uses worldwide trade data to examine the reaction of manufacturing exports in energy exporting countries to rising energy prices. His result is close to the one by Harding and Venables (2016) as a one percent increase in energy prices leads to a contraction of manufacturing exports by approximately half a percent. Bahar and Santos (2018) analyze the effect of strongly rising commodity prices on the concentration of non-commodity exports in a sample of 128 countries from 1984 to 2010. They derive the result that the diversification of non-commodity exports declines. Labor intensive exports are most adversely affected, specifically in Latin America. Especially for Latin America and the commodity price boom also studied in this paper, Albrieu (2012) points out that there has been an appreciation of the real exchange rate in commodity dependent countries. This appreciation had however no negative effect on manufacturing exports.

Departing from these theoretical and empirical observations that the Dutch Disease might have adverse effects on manufacturing exports we derive how the composition of trade partners might affect the magnitude of these Dutch Disease effects. Therefore, we developed two channels that provide theoretical explanations why trade with regional trade partners could mitigate the Dutch Disease.

The first channel is the technological sophistication channel. In developing countries, intra-regional exports tend to have a higher level of technological sophistication than exports to industrialized countries. In intra-regional exports, the share of primary products is relatively lower, whereas the share of manufacturing products is higher. This has been observed for the member countries of MERCOSUR (Yeats 1997; Snoeck et al. 2009; Bekerman and Rikap 2010; Mordecki Pupko and Piaggio Talice 2011) as well as for intra-African trade (UNECA 2015). At the same time, within manufacturing exports, technological sophistication is higher for exports to intra-regional trade partners. This can be observed for Latin American commodity exporters, as illustrated in figure 1. It shows a much larger proportion, particularly of medium-tech manufacturing, in regional trade to both, commodity and non-commodity dependent countries. In contrast, the traditional pattern of trade between Southern and Northern economies is shaped by Southern economies exchanging raw material exports for manufacturing imports (ECLAC 1960; 2021). For the export structure of the Latin American boom economies, this pattern is reflected in figure 1.

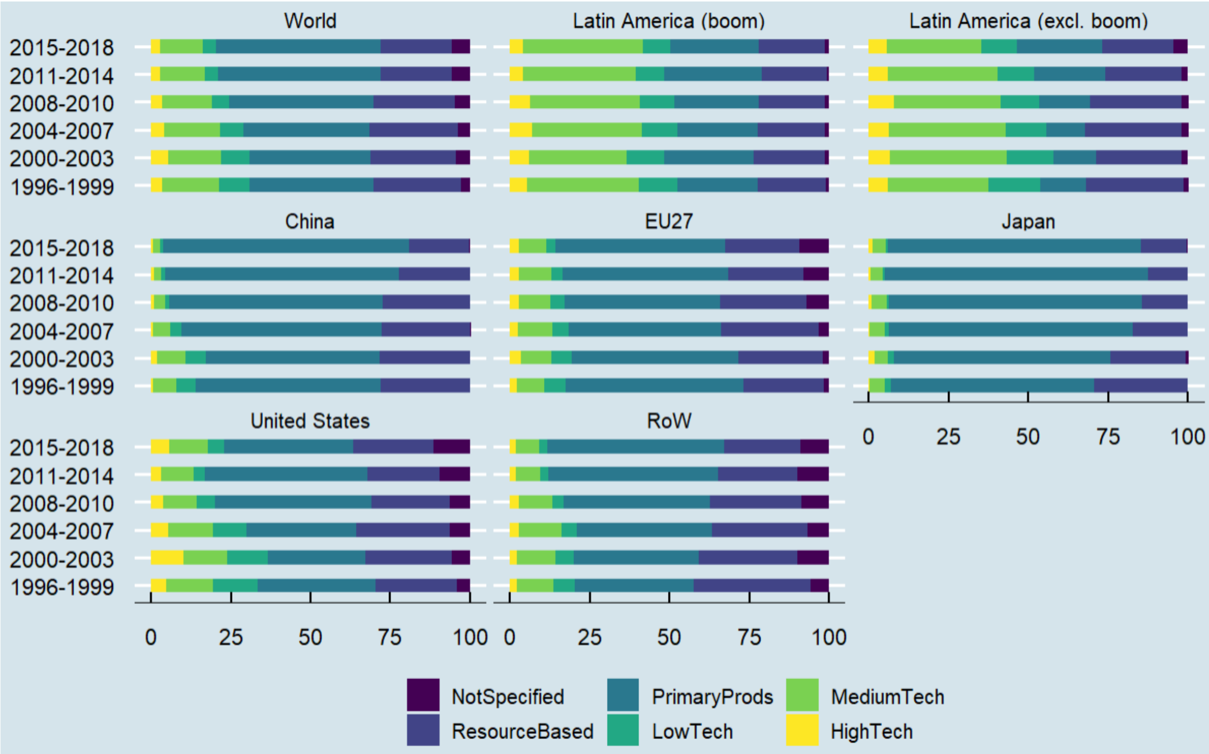

Figure 1: Evolution of technological export structure of Latin American boom economies to different export destinations (1996 – 2018, shares of total exports to partner (region)).

Source: Elaboration by the authors, based on The Growth Lab at Harvard University (2019).

Note: (1) Export structure according to Lall (2000) classification, (2) boom economies: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, and Venezuela. Due to limitations in data availability, Venezuela is removed from the group of exporters but kept in the group of importing economies.

There are several possible explanations for why the proportion of technologically more sophisticated manufacturing is higher in regional exports than in exports towards the rest of the world. Not all of them have received sufficient attention in the literature. Some explanations focus on the reduction of regional tariffs and trade facilitation. Many economies in Latin America are integrated with each other through a preferential trade agreement (PTA) (Dingemans and Ross 2012). According to the International Trade Outlook for Latin America and the Caribbean 2020, the average applied tariff on regional trade in Latin America is 2%, much lower than the most favored nation (MFN) tariff of 7%. The report further estimates that 78% of intra-regional trade falls under a tariff-free regime (ECLAC 2021).

Preferential tariffs are feared to cause trade diversion. Trade diversion is caused when more competitive imports from outside the region are replaced by less competitive imports within the region. This is possible because they have a cost advantage due to a lower regional tariff. According to authors such as Yeats (1997), trade diversion is rated to be negative, because the expansion of the manufacturing sector does not occur due to a comparative advantage. The negative effects imply decreased rents for all market participants, including the exporting country. Bekerman and Rikap (2010) have analyzed the phenomenon of trade diversion in the early 2000s from a different perspective. According to their findings, scale economies and technological learning effects have led in some cases to the creation of a dynamic comparative advantage towards both, the trade bloc (MERCOSUR) itself and later towards external partners. Hence, the regional market has been an initial export platform for the expansion of the manufacturing sector. This is further enhanced by investment strategies of extra-regional multinational companies to produce within regional borders in order to access the local markets with a lower tariff rate (ECLAC 2021).

While non-tariff measures still persist in the region and are compatible with an ad valorem equivalent of almost double the amount of the applied tariff, they are much lower for heavy industry than for agricultural products or the light manufacturing sector (ECLAC 2021). This could possibly explain a higher competitive advantage of technologically more sophisticated products in regional trade. In contrast, non-primary products of higher value addition face non-tariff barriers in extra-regional markets of industrialized economies. Companies from the Global South often encounter difficulties when complying with product standards of multinational companies that govern global value chains (GVCs) or with sanitary and phytosanitary standards in end user markets in the Global North (Geyer 2019).

A good example for intra-regionally traded more sophisticated products is that manufacturing exports between the largest economies in the region; Argentina, Brazil and Mexico can be largely attributed to GVC production, such as the automotive sector (ECLAC 2021; Calzada Olvera and Spinola 2022). According to a value-added analysis of ECLAC (2021), a relatively large share of the regionally exported value-added is finally consumed within the region. This validates further competitive advantages of regional exports in Latin America, mentioned by Calzada Olvera and Spinola (2022, 15): “[G]eographical and cultural proximity, wage structure, technological capacities and industrial activities are similar, and thus complex products are more likely to be competitive in terms of quality and cost”.

After having established that exports to regional trade partners contain a larger share of technologically more advanced products, this paragraph lays down why these products are less likely to respond to Dutch Disease effects. Both, cost- and price elasticities are lower for more sophisticated products. Firstly, products’ cost elasticities decline with increasing technological sophistication. For more sophisticated products, companies can set higher mark-up prices. In the case of a rise in production costs, these companies do not have to pass-through the whole cost increase to the prices of their products but can reduce the mark-up to keep the price stable (Berman et al. 2012; N. Chen and Juvenal 2014). In the particular case of real exchange rate appreciations in developing countries, there is an additional explanation why cost elasticities decline with technological sophistication. More sophisticated products contain more imported inputs. Therefore, a lower share of the production cost is created domestically. The appreciation consequently affects a smaller share of the production costs which reduces the overall effect of the real exchange rate appreciation (Ahmed et al. 2015; Goda et al. 2021). Secondly, the price elasticity of products also declines with a rising degree of technological sophistication. It can be explained by the lower degree of substitutability of these products, reducing the competition they face (Carlin et al. 2001). In the context of higher production costs due to the Dutch Disease, external demand is less affected due to these lower elasticities.

In addition, the resource movement effect of the Dutch Disease might be less pronounced for more sophisticated products. Workers who produce technologically advanced products have generally a higher skill level (Arif 2021) and receive higher wages (Dalmazzo 2002; Cirera et al. 2022). In comparison to workers in other industries, they would obtain relatively fewer financial benefits from switching to a job in the booming sector. Additionally, more sophisticated industries are more productive (Cirera et al. 2022), so they generate more profits and returns to capital (Grifell-Tatjé and Lovell 1999). This implies, that in comparison to investments in other sectors, capital flight towards the booming sector is less attractive. For both production factors, labor and capital, the RME thus affects technologically more sophisticated industries less.

The combined effect of the lower price and cost elasticity and the less pronounced RME is that exports of more sophisticated products are less adversely affected by Dutch Disease effects. Goda et al. (2021) show empirically that in Latin American countries low-tech exports are affected negatively by a real exchange rate appreciation, while medium- and high-tech exports show no significant effect. Against this background it is assumed that manufacturing exports to regional trade partners are less affected by Dutch Disease effects, as firstly, exports to these trade partners have a higher degree of technological sophistication and secondly, technologically more advanced products have a lower responsivity towards Dutch Disease effects.

The second channel, called technological sophistication channel, states that exports to regional trade partners face less risk of replacement by extra-regional competitors. This channel relies on the assumptions that trade is not completely liberalized and that there are considerable costs to enter the market of a country to which a company did not export before (Bernard and Jensen 2004; Das et al. 2007). These costs derive from the establishment of trade relations and distribution infrastructure (Burstein et al. 2003; Corsetti and Dedola 2005; Das et al. 2007; N. Chen and Juvenal 2014), the adaptation of products and services to local needs, and requirements as well as tariff and non-tariff barriers, such as product standards, product approval and customs procedures (Maskus et al. 2005; M. X. Chen et al. 2008). In line with these arguments, Ruta (2017) provides empirical evidence that trade agreements also support the formation of GVC linkages between member countries. Furthermore, when assuming that the market to enter lies within another region, transport costs might be higher for companies from external countries than for countries from the same region (Moreira et al. 2008). Companies from these latter countries might furthermore have an advantage in bargaining power as they share cultural commonalities with the destination market (Calzada Olvera and Spinola 2022). When regional economies share a lower tariff with each other than with economies outside the region, such as in a free trade area or a customs union, the lower tariff gives the regional export sector an advantage over competition from extra-regional exports.

This assumption of market entry costs and trade barriers is in the following introduced into our theoretical framework of Dutch Disease and regional trade. The manufacturing exports of the exporting country become more expensive due to Dutch Disease effects. As a result, in extra-regional destination markets they are replaced by competitors that do not face a commodity boom which can sell the products at a lower price. For regional trade, the aforementioned market entry costs and trade barriers diminish the cost advantage for extra-regional competitors. Consequently, exports to regional trade partners decline less than exports to extra-regional trade partners.

Summing up our newly introduced theoretical arguments, in times of a commodity price boom, the technological sophistication channel and the trade barrier channel should diminish the passthrough of adverse Dutch Disease effects on manufacturing exports towards regional trade partners in comparison to extra-regional trade partners.

3. Research design

In this section, we test our theoretical considerations empirically. To answer the research question if commodity price increases have less adverse effects on manufacturing exports towards regional trade partners than towards extra-regional trade partners, we carry out a panel data analysis of bilateral manufacturing exports from commodity dependent Latin American economies over the period from 1996 to 2018. This sample includes low- medium and high-tech manufacturing exports from seven countries to 16 regional trade partners and the major 21 extra-regional trade partners. The following subsection explains why these countries and years were selected and how our theoretical assumptions are reflected in this environment. The second subsection presents the estimation method.

3.1 Data

Economies in Latin America provide a particularly useful case for the analysis of the relation between the Dutch Disease and regional trade. Like in Africa, in Latin America there are many commodity-dependent economies which struggle to industrialize or face deindustrialization (Diao et al. 2019). At the same time, in comparison to Africa, intra-regional trade has played a larger role in Latin America during the commodity price boom. It accounted for 22% of total trade, while in Africa it was only 10% (in 2009) (Barka 2012). This relatively high share of intra-regional trade allows for a comparison of exports to regional trade partners with those to extra-regional trade partners.

Our observation period lasts from 1996 to 2018. The importance of international trade increased considerably with the foundation of the WTO in 1995 (Goldstein et al. 2007; Chang and Lee 2011; Larch et al. 2019). By starting the observation period in 1996, the whole development under this new world trade order is covered. Furthermore, this period includes the 2003 to 2013 commodity price boom. It had an extraordinarily long duration and implied considerable price upswings for a large variety of commodities. Due to these attributes it was the most pronounced commodity price boom many Latin American countries ever experienced (Erten and Ocampo 2013). Consequently, it represents a suitable case for the study of Dutch Disease effects in the region. By ending the observation period in 2018, years before and after the 2003 to 2013 commodity price boom are included, so that effects of commodity price increases are easier to separate from simultaneous developments which are not caused by the commodity price boom.

We classify countries to have experienced a commodity price boom when they benefitted from a considerable amelioration (over 10%) of their terms of trade during the 2003 to 2013 commodity price boom (Ocampo 2017). According to this classification, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, and Venezuela are the countries in the region which experienced a commodity price boom, for reasons of simplification subsequently called “boom economies”. Due to low data quality and the very particular economic development over the past decade, Venezuela is excluded as an exporting economy but kept as importing economy in the sample.

For the other boom economies, we divide export partners into two groups: 1) to regional trade partners and 2) to extra-regional trade partners. Regional trade partners are countries from mainland Latin America. Extra-regional trade partners include the main export destinations of the Latin American boom economies that are not located within Latin America and the Caribbean. This classification is based on the export values in the base year 1996 and the end of the observation period in 2018. It includes all destinations which account for at least 0.5% of the share of aggregated exports of the Latin American boom economies in both years. In sum, the included trade partners account for 87.9% of the aggregated boom economies' exports in 1996 and 84.6% of the exports in 2018. A list with the included trade partners can be found in Annex 2. For each of the included boom economies, the other seven fellow boom economies as well as nine non-boom Latin American countries and 21 extra-regional economies are included as trade partners. This equals 37 trade partners per exporter and for the whole data set a total of 259 observations per year.
The dataset is unbalanced because of some missing values in the dependent variables. However, as the total number of missing values is far below 5% for each of these variables, we don't consider this to be overly problematic. Missing export data does further not seem to be caused by economic or political disruptions.

Manufacturing exports are chosen to be the variable of interest as manufacturing is the most emblematic export sector and considered to be most promising for economic development in countries of the Global South (Szirmai 2012; Haraguchi et al. 2017; Su and Yao 2017; Gabriel and de Santana Ribeiro 2019). Manufacturing export data is retrieved from The Growth Lab at Harvard University (2019). According to Lall (2000)[1], this data is disaggregated into low-, medium- and high-technology manufacturing. Resource based manufacturing is excluded because it is closely linked to commodity prices and might thereby be affected by price effects of the boom. Furthermore, low- to high-technology exports play a bigger role for technological learning than resource based exports (Oqubay and Ohno 2019). The manufacturing export data is transformed from current into constant 2015 USD with the United States GDP deflator from World Bank.

Data for the explanatory variable, the commodity price index is taken from the IMF commodity terms of trade database, further described in Gruss and Kebhaj (2019). It pictures the evolution of the prices of each country's individual export commodities, accounting for changes in the export structure by applying rolling weights. In comparison to other indicators for a country's commodity revenues, like commodity exports or commodity production, the use of commodity prices has the advantage that these can be taken as exogenous. Thereby, endogeneity issues

[1] For more details about the product classification, see annex 1.

are avoided. A complete list of the data sources for all used variables can be found in Annex 3.

3.2 Method

For our empirical estimations we apply a fixed effects model. This approach is also adopted by a large part of the literature in the field (e.g., Amuedo-Dorantes and Pozo 2004; Korhonen and Juurikkala 2009; Ismail 2010; Wong and Petreski 2014; Amiri et al. 2019). Our explanatory variable is an index variable (commodity price index). This variable is constructed for each country individually and provides the basis for price evolution comparison within the country but not for a comparison between countries. As the initial value in the base year differs by country, the same numbers in different countries are not comparable. We are therefore obliged to apply a fixed effects model rather than a random effects model or a pooled regression. While some other authors use a Generalized Method of Moments (GMM) approach (e.g., Rajan and Subramanian 2008; Lartey 2011; Apergis et al. 2014; Behzadan et al. 2017; Anyanwu et al. 2021), in this case a fixed effects model is better suited due to the relatively long time period and the use of the interaction term of year and time dummies which would lead to too many instruments in a GMM model (Roodman 2009).

With the fixed effects model, we test the following hypothesis, based on the predefined two channels, with our export data of Latin American boom economies:

Manufacturing exports to regional trade partners are less negatively affected by Dutch Disease effects than manufacturing exports to extra-regional trade partners. This derives from the larger share of more sophisticated manufacturing exports towards regional trade partners, which are less cost and price sensitive. Additionally, trade barriers and market entry costs reduce the loss of cost competitiveness relative to extra-regional trade partners what implies a lower reduction of exports.

The following equations are applied to test the hypothesis:

1. $[lt; mt; ht; lmht]exp_{i,j,t} = \alpha_0 ComPrice_{it} + \alpha_1 X + \omega_{i,t} + \mu_{i,j} + \epsilon_{i,j,t}$
2. $[lt; mt; ht; lmht]exp_{i,j,t} = \alpha_0 ComPrice_{it} + a_1 ComPrice_{it} * TPDummy + \alpha_2 X + \omega_{i,t} + \mu_{i,j} + \epsilon_{i,j,t}$

In our data, exports are classified according to their technological sophistication. In equation (1), $[lt; mt; ht; lmht]exp_{i,j,t}$ describes low-tech (lt), medium-tech (mt), and high-tech (ht), as well as the aggregated low-, medium- and high-tech ($lmht$) manufacturing exports from country i to trade partner j in year t. These different types of exports are estimated by each exporting country's individual commodity price index ($ComPrice_{it}$) and the control variables in vector X. ω is the interaction of the year dummy with the exporter dummy, μ is the individual fixed effect of the exporter-trade partner combinations and ϵ is the error term. The interaction term of the exporter dummy with the year dummy is included because the groups of the fixed effects are not the exporters, but the exporter - trade partner combinations. Including the interaction of year and exporter dummies allows to control for the time specific effects of each exporting country. Equation (1) tests the basic theory of the Dutch Disease that rising commodity prices cause a reduction of manufacturing exports. Distinguishing between the four different dependent variables allows us to test if low-, medium-, high-tech, and aggregated manufacturing exports are affected to a similar extent.

Building on the determination of the Dutch Disease effects via the first equation, the second equation aims to test our hypothesis. The commodity price is interacted with dummies for regional and extra-regional trade partners. Thereby, the effect of commodity price rises on exports to these different groups of trade partners can be differentiated. Our hypothesis is not rejected if a_1 in equation (2) is significant and greater than 0. This implies that manufacturing exports to regional trade partners are significantly more positively affected by rises in commodity prices than manufacturing exports to regional trade partners. In the case of equation (1), also the second estimation is repeated with low-, medium- and high-tech exports as dependent variables to find out if the overall trends on manufacturing exports hold for all subsegments equally or if technological sophistication leads to heterogeneous results. Given that the dependent variables contain zeros in some observations, all export data is transformed with the inverse hyperbolic sine (IHS) transformation to be able to apply logarithms to the regression (Aihounton and Henningsen 2021; Norton 2022). All independent variables, except for the dummy variables, are logarithmized. Standard errors are clustered on the exporter-trade partner level (Cameron and Miller 2015).

The control variable in vector X is trade partner's GDP. On the one hand, it represents the market size of the destination economy. Larger markets provide a larger market potential. For companies this implies potentially larger economies of scale and better sales opportunities. Theoretically, this larger market could also be reached by exporting to various small and medium sized economies. However, due to market entry costs, exporting to few larger economies is rated to be more efficient (Martin and Sunley 1996; Bernard and Jensen 2004; Goda and Sánchez 2022). On the other hand, changes in the trade partners' GDP are associated with changes in its demand. For both reasons, a rise in trade partner's GDP is expected to have a positive effect on manufacturing exports towards this economy. Data for trade partners' GDP originates from the World Bank World Development Indicators. As the data set for current GDP has more data than the constant data set, we manually calculated the constant 2015 values by using the GDP deflator.

For robustness tests, foreign direct investment (FDI) and preferential trade agreements (PTAs) are added to the estimation as control variables. Countries in Latin America like developing countries in general, rely strongly on FDI to realize industrialization. Due to a lack of domestic capital, FDI is required to provide the necessary capital for investments in the manufacturing sector. This investment is crucial for the production of internationally competitive manufacturing export products. Consequently, FDI is estimated to have a positive effect on manufacturing exports (Javorcik 2004; Harding and Javorcik 2012; Fons-Rosen et al. 2017; Abebe et al. 2022). Unfortunately, data for sectorial FDI in the manufacturing sector is not available for all studied exporters for the whole period. Therefore, we use general FDI inflows for this variable which entails the disadvantage that many foreign investments during the commodity price boom were directed towards the commodity sectors (ECLAC 2016). Data for FDI is taken from the World Bank World Development Indicators.

PTAs grant a relative advantage to the exporting economies towards the individual trade partners with whom they are involved in a PTA in contrast to trade partners that do not have a PTA with that trade partner. The competitive advantage results from lower tariff or non-tariff barriers to the export destination's market. Consequently, we expect that having a PTA, similar to being a regional trade partner, has a positive effect on the mitigation of Dutch Disease effects. Data for PTAs is taken from the World Trade Organization.

4. Results

In a first step, the effect of commodity price changes on manufacturing exports is estimated to establish if there exists an overall Dutch Disease effect for our sample. The results in column one of table 1 show that this is indeed the case as a one percent rise in commodity prices causes a decline of aggregated low-, medium-, and high-tech exports (LMH-tech) by two percent. This is a statistically significant effect. A one percent variation in trade partner's GDP is likewise statistically significant and leads to a one percent increase of exports. As expected, this effect is significant and positive as a rising GDP implies higher demand from the trade partner. The other columns of table 1 show the disaggregated effects of commodity price changes on low-, medium-, and high-tech exports. Even though the effect of rising commodity prices has a negative effect on all three levels of technological sophistication, the strength and significance of the effects varies. As hypothesized, commodity price changes have a stronger and more significant effect on low-tech exports (-5.79%) than on medium- (-1.68%) and high-tech exports (-1.93%). However, the effect on high-tech exports is stronger than on medium-tech exports. As intra-regional exports contain a lower share of low-tech exports than extra-regional exports, we expect those extra-regional exports to contract stronger in reaction to commodity price increases. The results in table 2 underline this theoretical expectation.

Table 1: Effect of commodity prices on low-, medium-, and high-tech exports

	LMH-tech Exports	Low-tech Exports	Medium-tech Exports	High-tech Exports
Log Commodity Price	-2.035**	-5.790***	-1.678	-1.935*
	(0.816)	(0.879)	(1.154)	(1.159)
Log Trade Partner GDP	1.009***	1.244***	1.098***	1.073***
	(0.122)	(0.161)	(0.178)	(0.235)
Observations	5,804	5,880	5,868	5,818
R-squared	259	0.849	0.856	0.810
Number of groups	0.885	259	259	259
Country*Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Effect of commodity prices on LMH-tech exports in different regions

LMH-tech Exports to:	Extra-regional trade partners	Regional trade partners
Log Commodity Price	-3.589***	0.282
	(1.153)	(0.965)
Log Trade Partner GDP	1.060***	0.910***
	(0.175)	(0.140)
Observations	3,294	2,510
R-squared	0.864	0.931
Number of groups	147	112
Country*Year FE	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When looking at the aggregated LMH-tech exports to different trade partners separately (table 2), commodity price increases only have a significant negative effect on exports to extra-regional trade partners, with a 3.59% decline. For regional trade partners, the effect of commodity price increases is even positive, though not significant. The estimations presented in table

3, examine if there are significant differences between the two groups of trade partners concerning the effects of commodity price changes on exports. Therefore, exports to both groups of trade partners are estimated in one estimation.

Table 3: Difference in the effect of commodity price changes on exports (LMH-tech, low-, medium-, high-tech) to different trade partners

	LMH-tech Exports	Low-tech Exports	Medium-tech Exports	High-tech Exports
Log Commodity Price	-1.828**	-5.496***	-1.870	-2.604**
	(0.828)	(0.912)	(1.175)	(1.236)
Extra-regional * Log Commodity Price	-0.224*	-0.329**	0.213	0.724***
	(0.131)	(0.158)	(0.200)	(0.262)
Log Trade Partner GDP	0.991***	1.220***	1.114***	1.131***
	(0.121)	(0.165)	(0.181)	(0.237)
Observations	5,804	5,880	5,868	5,818
R-squared	0.885	0.850	0.856	0.811
Number of groups	259	259	259	259
Country*Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The log commodity price without interaction term indicates the overall effect of commodity price changes on exports of the different categories, not taking trade partners into account. The interaction term of extra-regional trade partners with the commodity price indicates in how far the effects of commodity price changes affect exports to extra-regional trade partners differently in comparison to regional trade partners which are the reference group. For aggregated exports LMH-tech exports, those directed towards extra-regional trade partners are significantly more negatively affected by Dutch Disease effects than those to regional trade partners. Looking at the disaggregated categories of low-, medium, and high-tech separately, this effect derives mainly from low-tech exports for which a stronger and more significant effect is found. For medium-tech, exports to extra-regional trade partners are less affected by the Dutch Disease, but the effect is not significant. For high-tech exports, this positive effect becomes stronger and statistically significant.

Robustness tests

To test the robustness of our results we re-run the estimations that led to the results presented in table 3 adding FDI as further control variables and changing the interaction dummy from extra-regional to trade partners which have a PTA.

Table 4: Robustness checks

	LMH-tech Exports		Low-tech Exports		Medium-tech Exports		High-tech Exports	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Commodity Price	-1.938**	-1.868**	-5.688***	-5.823***	-1.510	-1.822	-1.817	-2.842**
	(0.818)	(0.883)	(0.886)	(0.959)	(1.154)	(1.234)	(1.166)	(1.310)
Extra-regional *		-0.224*		-0.329**		0.213		0.724***
Log Commodity Price		(0.131)		(0.158)		(0.200)		(0.262)
Trade Partner GDP	0.992***	0.991***	1.226***	1.220***	1.068***	1.114***	1.052***	1.131***
	(0.119)	(0.121)	(0.163)	(0.165)	(0.178)	(0.181)	(0.236)	(0.237)
FDI inflow		-0.0450		-0.366***		0.0543		-0.267
		(0.103)		(0.0821)		(0.172)		(0.201)
PTA *	-0.0442**		-0.0458*		-0.0757**		-0.0538	
Log Commodity Price	(0.0194)		(0.0270)		(0.0325)		(0.0402)	
Observations	5,804	5,804	5,880	5,880	5,868	5,868	5,818	5,818
R-squared	0.885	0.885	0.849	0.850	0.856	0.856	0.810	0.811
Number of groups	259	259	259	259	259	259	259	259
Country*Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Focusing firstly on the results for the addition of FDI as an additional control variable, columns 2, 4, 6, and 8 of table 4 point out that the values for the other variables remain stable and FDI itself has only a significant negative effect on low-tech exports. The negative sign of this effect is unexpected as FDI should lead to a rise in exports. One possible explanation could be that FDI inflows lead to an increase of the real exchange rate which would lower the competitiveness of the domestic industry. In addition, due to limitations of data availability, we could not distinguish between FDI into different sectors. As commodity prices increase, the commodity sector might attract a higher share of FDI than the manufacturing sector.

Changing the regional dummy for a dummy of PTAs has a major effect on the results. While the regional dummy showed that regional trade partners are less negatively affected by rising commodity prices (for LMH-tech and low-tech exports), the existence of a PTA leads to more severe negative effects in all categories but high-tech exports. This result is unexpected as the trade barrier channel predicts that the exporter faces less competition in countries in which it encounters less trade barriers. Consequently, the preferential treatment of a PTA should lead to a lower decline in exports due to Dutch Disease effects. A possible interpretation could however be that regional closeness which goes hand in hand with a similar level of economic development, low transportation costs, similar culture and other soft factors might have a more beneficial effect on exports in the occurrence of Dutch Disease effects than the beneficial tariffs of a PTA. Additionally, the simple dummy variable only provides information if the PTA is in force but does not provide any information about how beneficial the PTA is and if it is utilized.

5. Discussion

The results in section 4 presented some interesting insights regarding the question if trade with regional trade partners mitigates Dutch Disease effects. Table 5 provides an overview of the main findings and how these can be interpreted regarding our hypotheses.

Table 5: Results and their interpretation

Result	Table	Reference to hypothesis	Interpretation
Rising commodity prices lead to a decline in manufacturing exports	1	In line with classical Dutch Disease theory	Confirms that DD is relevant in country sample
Low-tech exports are more affected than more sophisticated exports	1	In line with theory about cost- and price elasticity	Confirms assumption of technological sophistication channel
In separate analysis: DD effects only significant for extra-regional exports	2	In line with our hypothesis	Regional trade less affected by DD effects, possible explanations: technological sophistication channel and trade barrier channel
In aggregated analysis: Regional trade significantly less negatively affected than extra-regional trade for LMH-tech exports and low-tech exports	3	In line with our hypothesis	The trade barrier and the technological sophistication channel can explain these results
In aggregated analysis: Extra-regional trade significantly less negatively affected than regional trade for high-tech exports	3	Contradicts our hypothesis	Possible explanation: very low values of high-tech exports might lead to unreliable results

First, we observe a substantial and significant Dutch Disease-like effect of rising commodity prices on manufacturing exports for the analyzed sample and time period. Consequently, it can be stated that the Dutch Disease is a relevant phenomenon in our country sample. Furthermore, it underlines why it is important to understand through which channels the Dutch Disease manifests as well as to identify possible mitigations of the Dutch Disease. This paper hypothesizes that exporting to regional trade partners might be one option of Dutch Disease mitigation. That low-tech exports are affected strongest by Dutch Disease effects further contributes to this hypothesis as regional exports contain a higher share of more sophisticated products and should thus be less affected. The large difference in the effect of commodity prices on these export categories as presented in table 2 could be explained by the higher cost and price sensitivity of low-tech exports in comparison to medium- and high-tech exports. At first sight, it seems surprising that the effect on high-tech exports is stronger and statistically more significant than on medium-tech exports. However, as illustrated in figure 1, high-tech exports only play a marginal role in the export structure of the boom economies. Another possible explanation is that some exports, classified as high-tech, actually reflect assembly activities within GVCs and therefore incorporate less technology than indicated. Consequently, at least for the South American boom economies, medium-tech exports might be the more suitable indicator for more sophisticated exports.

The results in table 2 show that in aggregated manufacturing categories, Dutch Disease effects only occur in exports to extra-regional trade partners but not in regional trade, when the two categories of trade partners are analyzed separately. When estimating if there is a significant difference in the effect of commodity prices on the sub-categories of exports towards the different trade partner groups (table 3), regional trade is likewise significantly less negatively affected for LMH-tech exports. This effect mainly derives from the larger difference between regional and extra-regional trade in low-tech exports.

This result is in line with our hypothesis that exports to regional trade partners are less affected by the Dutch Disease. The technological sophistication channel provides an explanation for the less negative effect on aggregated LMH-tech exports as regional trade contains a lower share of the most affected low-tech exports. On a disaggregated level it does however not provide an explanation why regional trade is less adversely affected for low-tech exports, but not for medium- and high-tech exports. This outcome can instead be explained by the trade barrier channel which mitigates the loss of competitiveness for regional exports and therefore their contraction. As medium- and high-tech exports are less cost and price sensitive and less affected by Dutch Disease effects, the loss of competitiveness in these categories, no matter to which trade partner, is not as pronounced. Therefore, a mitigation via the trade barrier and market entry cost channel might only have a marginal effect which does not lead to significant differences.

That we find a positive significant difference between exports to extra-regional trade partners and regional trade partners for high-tech exports is puzzling and not in line with our theoretical expectations. However, as stated earlier, our exporting countries have very low shares of high-tech products in their exports. This implies firstly, that due to the low quantities, data for high-tech exports might be less reliable. Secondly, as also stated above, high-tech exports are currently not very important for commodity dependent Latin American countries, so that this result might be less relevant than the results for low- and medium-tech exports. In addition, high-tech exports might be more involved in GVCs than exports of a lower technological sophistication. When involving a higher share of imported intermediate products, these products might be affected differently by an exchange rate appreciation.

6. Conclusion

This paper brings together the literature about the Dutch Disease and regional trade. Two channels are introduced through which regional trade might mitigate Dutch Disease effects during a commodity price boom. The technological sophistication channel states that more sophisticated exports are less affected by the Dutch Disease due to lower cost- and price sensitivity. As regional trade contains a higher degree of technological sophistication, it should thus be less affected by the Dutch Disease. The trade barrier channel states that the relative loss of competitiveness of regional exports in relation to exports from extra-regional competitors due to the Dutch Disease might be reduced by market entry costs and trade barriers these extra-regional competitors face.

These theoretical considerations are tested empirically with data from bilateral manufacturing exports from commodity dependent Latin American countries from 1996 to 2018. The results show firstly that there is a strong negative Dutch Disease effect of rising commodity prices on manufacturing exports and that this effect is stronger than the effect of changes in trade partners' demand. Secondly, the Dutch Disease effect is most pronounced for low-tech exports, as the technological sophistication channel predicts. This favorable position for regional trade converts into significantly lower Dutch Disease effects in manufacturing exports to regional trade partners in relation to extra-regional trade partners. These lower effects are found for aggregated manufacturing exports and especially for low-tech exports, but not for medium- and high-tech exports, what is in line with the trade barrier channel. Consequently, we find evidence for our hypothesis that regional trade mitigates adverse Dutch Disease effects.

These results highlight the relevance of regional trade for commodity dependent developing countries. During a commodity price boom, further regional integration might help to mitigate undesired Dutch Disease effects. Additionally, the results highlight that technological upgrading can as well reduce the vulnerability of the manufacturing sector to commodity price changes. For commodity dependent countries in Latin America, which struggle to industrialize and suffer from premature de-industrialization, these results present a strong case for industrial upgrading strategies which aim at moving from low-tech to medium- and high-tech exports. Strengthening regional trade integration can help to achieve this aim.

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Annex

Annex 1: Technological classification of exports (SITC 3-digit, revision 2)

PRIMARY PRODUCTS (PP)	RESOURCE BASED MANUFACTURES	LOW TECHNOLOGY MANUFACTURES
001 LIVE ANIMALS FOR FOOD	**RB 1: AGRO-BASED**	**LT1: TEXTILE, GARMENT AND FOOTWEAR**
011 MEAT FRESH,CHILLD,FROZEN	012 MEAT DRIED,SALTED,SMOKED	
022 MILK AND CREAM	014 MEAT PREPD,PRSVD,NES ETC	
025 EGGS,BIRDS,FRESH,PRSRVD	023 BUTTER	611 LEATHER
034 FISH,FRESH,CHILLED,FROZN	024 CHEESE AND CURD	612 LEATHER ETC MANUFACTURES
036 SHELL FISH FRESH,FROZEN	035 FISH SALTED,DRIED,SMOKED	613 FUR SKINS TANNED,DRESSED
041 WHEAT ETC UNMILLED	037 FISH ETC PREPD,PRSVD NES	651 TEXTILE YARN
042 RICE	046 WHEAT ETC MEAL OR FLOUR	652 COTTON FABRICS,WOVEN
043 BARLEY UNMILLED	047 OTHER CEREAL MEALS,FLOUR	654 OTH WOVEN TEXTILE FABRIC
044 MAIZE UNMILLED	048 CEREAL ETC PREPARATIONS	655 KNITTED,ETC FABRICS
045 CEREALS NES UNMILLED	056 VEGTBLES ETC PRSVD,PREPD	656 LACE,RIBBONS,TULLE,ETC
054 VEG ETC FRSH,SMPLY PRSVD	058 FRUIT PRESERVED,PREPARED	657 SPECIAL TXTL FABRC,PRODS
057 FRUIT,NUTS,FRESH,DRIED	061 SUGAR AND HONEY	658 TEXTILE ARTICLES NES
071 COFFEE AND SUBSTITUTES	062 SUGAR CANDY NON-CHOCLATE	659 FLOOR COVERINGS,ETC
072 COCOA	073 CHOCOLATE AND PRODUCTS	831 TRAVEL GOODS,HANDBAGS
074 TEA AND MATE	098 EDIBLE PRODCTS,PREPS NES	842 MENS OUTERWEAR NOT KNIT
075 SPICES	111 NON-ALCOHL BEVERAGES NES	843 WOMENS OUTERWEAR NONKNIT
081 FEEDING STUFF FOR ANIMLS	112 ALCOHOLIC BEVERAGES	844 UNDER GARMENTS NOT KNIT
091 MARGARINE AND SHORTENING	122 TOBACCO,MANUFACTURED	845 OUTERWEAR KNIT NONELASTC
121 TOBACCO UNMNFCTRD,REFUSE	233 RUBBER,SYNTHTIC,RECLAIMD	846 UNDER GARMENTS KNITTED
211 HIDES,SKINS,EXC FURS,RAW	247 OTH WOOD ROUGH,SQUARED	847 TEXTILE CLTHNG ACCES NES
212 FURSKINS,RAW	248 WOOD SHAPED,SLEEPERS	848 HEADGEAR,NONTXTL CLOTHNG
222 SEEDS FOR'SOFT'FIXED OIL	251 PULP AND WASTE PAPER	851 FOOTWEAR
223 SEEDS FOR OTH FIXED OILS	264 JUTE,OTH TEX BAST FIBRES	
232 NATURAL RUBBER,GUMS	265 VEG FIBRE,EXCL COTN,JUTE	**LT2: OTHER PRODUCTS**
244 CORK,NATURAL,RAW,WASTE	269 WASTE OF TEXTILE FABRICS	
245 FUEL WOOD NES, CHARCOAL	423 FIXED VEG OILS,SOFT	642 PAPER,ETC,PRECUT,ARTS OF
246 PULPWOOD,CHIPS,WOODWASTE	424 FIXED VEG OIL NONSOFT	665 GLASSWARE
261 SILK	431 PROCESD ANML VEG OIL,ETC	666 POTTERY
263 COTTON	621 MATERIALS OF RUBBER	673 IRON,STEEL SHAPES ETC
268 WOOL(EXC TOPS),ANML HAIR	625 RUBBER TYRES, TUBES ETC	674 IRN,STL UNIV,PLATE,SHEET
271 FERTILIZERS,CRUDE	628 RUBBER ARTICLES NES	675 IRON,STEEL HOOP,STRIP
273 STONE,SAND AND GRAVEL	633 CORK MANUFACTURES	676 RAILWY RAILS ETC IRN,STL
274 SULPHUR,UNRSTD IRN PYRTE	634 VENEERS,PLYWOOD,ETC	677 IRN,STL WIRE(EXCL W ROD)
277 NATURAL ABRASIVES NES	635 WOOD MANUFACTURES NES	679 IRN,STL CASTINGS UNWORKD
278 OTHER CRUDE MINERALS	641 PAPER AND PAPERBOARD	691 STRUCTURES AND PARTS NES
291 CRUDE ANIMAL MTRIALS NES	**RB 2: OTHER**	692 METAL TANKS,BOXES,ETC
292 CRUDE VEG MATERIALS NES	281 IRON ORE,CONCENTRATES	693 WIRE PRODUCTS NON ELECTR
322 COAL,LIGNITE AND PEAT	282 IRON AND STEEL SCRAP	694 STL,COPPR NAILS,NUTS,ETC
333 CRUDE PETROLEUM	286 URANIUM,THORIUM ORE,CONC	695 TOOLS
341 GAS,NATURAL AND MANUFCTD	287 BASE METAL ORES,CONC NES	696 CUTLERY
681 SILVER,PLATINUM,ETC	288 NONFERR METAL SCRAP NES	697 BASE MTL HOUSEHOLD EQUIP
682 COPPER EXC CEMENT COPPER	289 PREC MTAL ORES,WASTE NES	699 BASE METAL MFRS NES
683 NICKEL	323 BRIQUETS,COKE,SEMI-COKE	821 FURNITURE,PARTS THEREOF
684 ALUMINIUM	334 PETROLEUM PRODUCTS,REFIN	893 ARTICLES OF PLASTIC NES
685 LEAD	335 RESIDUAL PETRLM PROD NES	894 TOYS,SPORTING GOODS,ETC
686 ZINC	411 ANIMAL OILS AND FATS	895 OFFICE SUPPLIES NES
687 TIN	511 HYDROCARBONS NES,DERIVS	897 GOLD,SILVER WARE,JEWELRY
	514 NITROGEN-FNCTN COMPOUNDS	898 MUSICAL INSTRUMENTS,PTS
	515 ORG-INORG COMPOUNDS ETC	899 OTHER MANUFACTURED GOODS
	516 OTHER ORGANIC CHEMICALS	
	522 INORG ELEMNTS,OXIDES,ETC	
	523 OTHR INORG CHEMICALS ETC	
	531 SYNT DYE,NAT INDGO,LAKES	
	532 DYES NES,TANNING PROD	
	551 ESSENTL OILS,PERFUME,ETC	
	592 STARCH,INULIN,GLUTEN,ETC	
	661 LIME,CEMENT,BLDG PRODS	
	662 CLAY,REFRACTORY BLDG PRD	
	663 MINERAL MANUFCTURES NES	
	664 GLASS	
	667 PEARL,PREC-,SEMI-P STONE	
	688 URANIUM,THORIUM,ALLOYS	
	689 NON-FER BASE METALS NES	

MEDUIM TECHNOLOGY MANUFACTURES

MT 1: AUTOMOTIVE

781 PASS MOTOR VEH EXC BUSES
782 LORRIES,SPCL MTR VEH NES
783 ROAD MOTOR VEHICLES NES
784 MOTOR VEH PRTS,ACCES NES
785 CYCLES,ETC MOTRZD OR NOT

MT 2: PROCESS

266 SYNTHETIC FIBRES TO SPIN
267 OTHER MAN-MADE FIBRES
512 ALCOHOLS,PHENOLS ETC
513 CARBOXYLIC ACIDS ETC
533 PIGMENTS,PAINTS,ETC
553 PERFUMERY,COSMETICS,ETC
554 SOAP,CLEANSING ETC PREPS
562 FERTILIZERS,MANUFACTURED
572 EXPLOSIVES,PYROTECH PROD
582 PROD OF CONDENSATION ETC
583 POLYMERIZATION ETC PRODS
584 CELLULOSE DERIVATIVS ETC
585 PLASTIC MATERIAL NES
591 PESTICIDES,DISINFECTANTS
598 MISCEL CHEM PRODUCTS NES
653 WOVN MAN-MADE FIB FABRIC
671 PIG IRON ETC.
672 IRON,STEEL PRIMARY FORMS
678 IRON,STL TUBES,PIPES,ETC
786 TRAILERS,NONMOTR VEH,NES
791 RAILWAY VEHICLES
882 PHOTO,CINEMA SUPPLIES

MT 3: ENGINEERING

711 STEAM BOILERS & AUX PLNT
713 INTRNL COMBUS PSTN ENGIN
714 ENGINES AND MOTORS NES
721 AGRIC MACHY,EXC TRACTORS
722 TRACTORS NON-ROAD
723 CIVIL ENGNEERG EQUIP ETC
724 TEXTILE,LEATHER MACHNRY
725 PAPER ETC MILL MACHINERY
726 PRINTG,BKBINDG MACHY,PTS
727 FOOD MACHRY NON-DOMESTIC
728 OTH MACHY FOR SPCL INDUS
736 METALWORKING MACH-TOOLS
737 METALWORKING MACHNRY NES
741 HEATING,COOLING EQUIPMNT
742 PUMPS FOR LIQUIDS ETC
743 PUMPS NES,CENTRFUGES ETC
744 MECHANICAL HANDLING EQU
745 NONELEC MACHY,TOOLS NES
749 NONELEC MACH PTS,ACC NES
762 RADIO BROADCAST RECEIVRS
763 SOUND RECORDRS,PHONOGRPH
772 SWITCHGEAR ETC,PARTS NES
773 ELECTR DISTRIBUTNG EQUIP
775 HOUSEHOLD TYPE EQUIP NES
793 SHIPS AND BOATS ETC
812 PLUMBG,HEATNG,LGHTNG EQU
872 MEDICAL INSTRUMENTS NES
873 METERS AND COUNTERS NES
884 OPTICAL GOODS NES
885 WATCHES AND CLOCKS
951 WAR FIREARMS,AMMUNITION

HIGH TECHNOLOGY MANUFACTURES

HT 1: ELECTRONIC AND ELECTRICAL

716 ROTATING ELECTRIC PLANT
718 OTH POWER GENERATG MACHY
751 OFFICE MACHINES
752 AUTOMTIC DATA PROC EQUIP
759 OFFICE,ADP MCH PTS,ACCES
761 TELEVISION RECEIVERS
764 TELECOM EQPT,PTS,ACC NES
771 ELECTRIC POWER MACHY NES
774 ELECTRO-MEDCL,XRAY EQUIP
776 TRANSISTORS, VALVES, ETC.
778 ELECTRICAL MACHINERY NES

HT 2: OTHER

524 RADIOACTIVE ETC MATERIAL
541 MEDICINAL,PHARM PRODUCTS
712 STEAM ENGINES,TURBINES
792 AIRCRAFT ETC
871 OPTICAL INSTRUMENTS
874 MEASURNG,CONTROLNG INSTR
881 PHOTO APPARAT,EQUIPT NES

Source: Copied from Lall (2000: 34f.).

“Note: Excludes ‘special transactions’ like electric current, cinema film, printed matter, special transactions, gold, works of art, coins, pets.

Source: Constructed by author based on Pavitt (1984) and OECD (1994).” (Lall 2000:35.)

ANNEX 2: List of trade partners

Regional Boom	Regional non-boom	Extra-regional		
Argentina	Costa Rica	Belgium	Hong Kong	Singapore
Bolivia	El Salvador	Canada	Indonesia	Thailand
Brazil	Guatemala	Switzerland	Iran	United States of America
Chile	Honduras	China	Italy	
Colombia	Mexico	Germany	Japan	
Ecuador	Nicaragua	Egypt	South Korea	
Peru	Panama	Spain	Malaysia	
Venezuela*	Paraguay	France	Netherlands	
	Uruguay	United Kingdom	Russia	

Source: Elaboration by the authors, data from the Atlas of Economic Complexity (The Growth Lab at Harvard University n.d.).

Note: Extra-regional according to all non-regional export partners above a share of 0.5% of the booming economies' exports in 1996, excluding Taiwan.

* Venezuela was removed as exporting economy but kept as importing economy in the sample.

ANNEX 3: Data references

Variable	Description	Data source
Low-tech, medium-tech and high-tech manufacturing data	Bilateral manufacturing export data is retrieved by matching data from the Growth Lab at Harvard University with a product key according to the Lall (2000) classification of the technological content of exports. Constant values are manually calculated with the GDP deflator.	The Growth Lab at Harvard University & Lall (2000)
LMH-tech manufacturing data	The sum of low- medium- and high-tech manufacturing exports manually calculated.	The Growth Lab at Harvard University & Lall (2000)
Trade partner's GDP (constant 2015 US$)	Manually calculated with WDI data and GDP deflator – less gaps than constant WDI GDP	World Development Indicators (WDI)
Commodity Terms of Trade	Commodity Export Price Index, Individual Commodites Weighted by Ratio of Exports to Total Commodity Exports Historical, Annual (1962 - present), Rolling Weights, Index (2012 = 100)	IMF commodity terms of trade database
FDI	Foreign direct investment, net inflows (% of GDP)	World Development Indicators (WDI)
GDP deflator (constant 2015 $)		World Bank
Preferential trade agreements	Dummy for any active preferential trade agreement in goods	World Trade Organization