International Institute of Social Studies

Erasmus

Industrialisation and economic growth, a missing link or a missing point?

Reflections about the Latin American case at the beginning of the 21st century

A Research Paper presented by:

Haroldo Montagu

(Argentina)

in partial fulfilment of the requirements for obtaining the degree of
MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

Economic of Development
(ECD)

Specialization:

Global Economy

Members of the Examining Committee:

Dr. Andrew Fischer
Dr. Howard Nicholas

The Hague, The Netherlands
December 2017

Disclaimer:

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

Postal address:

Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

Location:

Kortenaerkade 12
2518 AX The Hague
The Netherlands

Telephone: +31 70 426 0460
Fax: +31 70 426 0799

Contents

List of Tables

List of Figures

List of Acronyms

ECLAC	Economic Commission for Latin America and the Caribbean
GDP	Gross Domestic Product
GGDC	Groningen Growth and Development Centre
GVC	Global Value Chain
GPN	Global Production Network
ICT	Information and Communication Technology
ISIC	International Standard Industrial Classification
LAS	Latin American Structuralism
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
UN	United Nations
UNCTAD	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization

Acknowledgements

I want to thank my supervisor Dr. Andrew M. Fischer for his guidance during the whole process of thinking and writing this research paper. Since the inception until the final days, he challenged me with his words, written and spoken, to build not only a solid piece of work but also, and most important, to look inside myself and dare to think critically. Thanks to his help, this research paper went from a mere data analysis to, hopefully, a discussion of ideas.

I want to thank also to my second reader Dr. Howard Nicholas. His constant support, along with his patience and grace, helped me not only throughout the process of writing this research paper but also during my whole stay at ISS. After taking his courses and choosing him as reader, I must say without any doubt that he embodies the word *professor*.

On a more personal note, I thank my family in my home country, especially to my mother, whose perseverance in pushing me to study abroad is only matched by all the support and help I got from her during my days at ISS.

Finally, I want to thank the person who is constantly helping me to become a better person in all possible aspects, my partner Lucia. Her love and motivation are my fuel. Juntos a la par, siempre.

Abstract

Echoing recent analyses on deindustrialisation, in this paper I assess the apparent *delink* between manufacturing and economic growth for six Latin American countries during the first decade of the 2000s century. I frame the analysis in both Post-Keynesian and Structuralist tradition given the paramount role these schools of thought grant to industrialisation for achieving high economic growth rates. Findings show, first, that quantitative analysis based on the study of growth rates and productivities is non-conclusive to understand whether or not manufacturing kept working as an engine of growth in the region. Second, beyond the quantitative link, attention needs to be taken in the insertion of Latin America in the global production networks to understand the role that industrialisation is playing in economic growth in recent times. While deindustrialisation only reflects a statistical evolution of manufacturing shares predicted by both Post-Keynesian and Structuralism, the link between industrialisation and economic growth in Latin America in the 21st century must be understood as a new phase of peripherical industrialisation posing new and old challenges for achieving positive structural change within the region.

Keywords

Industrialization, Deindustrialization, Structural change, Economic growth, Latin America.

Relevance to Development Studies

The analysis of the link between industrialisation and economic growth was always a cornerstone of development studies. Since the industrial revolution in Europe, economic development was associated with a growing manufacturing sector. Most of the countries currently labelled as "advanced" or "developed" were once industrial powerhouses with large industrial sectors and high shares of manufacturing employment. However, in the last 50 years, things have changed. Deindustrialization, this is, a declining share of both manufacturing value-added and manufacturing employment is taking place in almost every region in the world. Latin America is not an exception to this trend and because of the region's particular insertion in the international division of labour scheme, it is worthwhile to analyse how a changing manufacturing sector is affecting economic growth.

Introduction

The link between industrialisation and economic growth in Latin America, as in other parts of the world, has regained attention in many spheres since the early 2000s. While 50 or 60 years ago this relationship was quite clear for academia and policymakers in developed and developing countries, since the 1970s, the link was first contested, later questioned and then challenged by other sectors as the main one for delivering economic growth. Dissimilar paths among regions in the world regarding the impact of industrialisation on economic growth rates, jointly with industrial failures and industrial collapses (mainly in Latin America and Africa), helped to bury studies about the link that once was believed prompted growth and development.

At the beginning of the 21st century, some things had changed. According to Storm, "…interest in and concern for industrialisation have made a comeback" (2015:666). The author frames this renewed interest in the same worries that early development economist had. The "painful failure" (Storm 2015:669) in sustaining industrial growth rates drove attention back to this topic.

Storm goes beyond and mentions a "rebirth" of industrialisation and structural transformation as fields of study. The reasons for this renewed interest is because of poor results not only regarding deindustrialisation but also structural shift towards primary goods processing activities (based on static comparative advantages). The author also points out that when manufacturing increased, it was in the form of low value-added final-assembly stages within manufacturing. *Maquiladoras* in Mexico could be the best example[1] (Storm 2015: 668).

Relevant economists like Dani Rodrik also brought back studies about the link between manufacturing and economic growth (2007, 2013, 2015) and became an advocate for manufacturing as a key sector after latecomers performances by Japan, South Korea, and China. Rodrik dedicates a vast part of his recent work to analyse the links between manufacturing and growth, and the industrial policy to achieve those targets. In praise of manufacturing, Rodrik

[1]Fischer (2015) argues that, depending on the sector, China and South East Asian countries could also be taken as examples of final-assembly manufacturing given their role within global production networks.

(2013) shows that, contrary to other sectors, in manufacturing activities exists unconditional convergence in labour productivity, regardless other particular factors or special country traits. This is, countries with higher manufacturing productivity gaps (in relation to the technological frontier) experience faster manufacturing productivity growth, no matter exogenous conditions like geography, domestic policies or else.

Like Rodrik, Alice Amsden's *The Rise of "the rest"* (2001) praised state-led industrialisation for explaining what the World Bank called a "miracle" in East Asian countries (1993), opposing the market-driven explanation. In the same line as Amsden, Ha-Joon Chang (2002, 2008) debunked the myths of free trade as the reasons behind industrial success in Europe and USA. Both authors suggest that industrial policies involving all kinds of policy tools were set under the logic of increasing manufacturing, and particularly, manufactured exports. That strategy ultimately eventuated in economic growth and proved to be effective for many nowadays considered advanced countries.

In some UN development agencies such as UNIDO (2013) and UNCTAD (2016), there has also been a particular revival about the link between manufacturing and economic growth. Regardless the fact that industrialisation is in their mandates, recent flagships from these institutions recover in a very explicit way the Structuralist tradition shifting the attention towards recent and future manufacturing challenges.

The big umbrella under which these agencies address this issue is no other than the 2030 Agenda for Sustainable Development by UN. Within the 2030 Agenda, Goal 9 explicitly advocates for an "…inclusive and sustainable industrialisation…" (UN 2015: no page). Target 9.2 goes deeper and ask for an increasing industry's share of both employment and gross domestic product. For least developed countries, the target is even more ambitious by demanding to double both shares by 2030. By including Goal 8[2] also in the picture, target 8.1 benchmarks a GDP growth rate of, at least, 7% per annum in developing countries. Given the mutual dependency of many of the Sustainable Development Goals, this might imply that for growing, the share of industry (and particularly

[2] "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" (UN 2015: no page).

manufacturing) should increase. Evidently, UN accounted for the positive link between industrialisation and economic growth and now urges developing countries to recover industrial capacity as a driver for, among other things, employment and GDP growth. Although the role of other sectors, such as services or agriculture, is mentioned in the 2030 Agenda, none of those is portrayed as vital as manufacturing for achieving sustainable economic growth.

However, and particularly for the Latin American case, the single institution which has been explicitly advocating for industrialisation and structural change as a driver for economic growth and development, both in academic and policy terms, is the Economic Commission for Latin America and the Caribbean (ECLAC 2012).

As a consequence of increasing commodity prices since the early 2000s, ECLAC has been alerting about the dangers of deindustrialisation and productive reprimarization (in output and exports) and its impact on economic growth rates (ECLAC 2011: 12). Paying homage to ECLAC's founding father Raul Prebisch, the institution's latest publications and flagship reports deal with the link between structural change and economic growth. For ECLAC, the relationship between industrialisation and growth is embedded in a deeper link between structural change and economic development.

The blooming literature coming both from academia and international institutions about the link between industrialisation and growth has been triggered, possibly, by a twofold factor. On one side, all successful development stories were, in the past and recently, because of manufacturing (Mathews 2016). On the other side, an ongoing process, since the 1970s, of falling shares of industrial output and industrial employment, commonly portrayed as deindustrialisation (Palma 2005, 2014, Felipe et al. 2014, Rodrik 2015, Tregenna 2016). This last trend is not only noticeable in developing counties but is taking place in almost every region in the world. Countries in Asia (notably China) are the only exception.

Latin America is no stranger to this trend. What is particularly striking about this case since the early 2000s is the apparently decoupling of high economic growth rates from declining manufacturing shares. Regardless the continuing shrinkage of the manufacturing sector (in output, employment and exports shares), the region has experienced relatively high economic growth rates (in GDP and GDP per capita). These trajectories mark a big contrast with previous periods in the region when, along with a declining manufacturing sector, GDP growth rates were quite low. At the same time, this poses many questions about how to describe, classify and understand structural change, manufacturing dynamics and its links to economic growth.

Under the Latin American Structuralism's (LAS) lens, economic growth in Latin America from the early 2000s onwards can't be attributed to a positive or virtuous structural change[3] (ECLAC 2012). In fact, the share of industry in total GDP and the share of manufacturing employment in total employment have been declining since then almost all over the region. Adopting his own view on structural change, Rodrik also argues that in Latin America growth-enhancing structural change has been weak recently, and structural change itself has contributed negatively to economic growth (Diao et al. 2017: 2).

However, arguing that economic growth in Latin America, from the early 2000s, is delinked from manufacturing just because manufacturing shares (either value-added, employment or even exports) are declining may lead to wrong conclusions about this issue.

Recent studies addressing the link between structural change and economic growth tend to present historical evidence focused on the manufacturing *share* and not in the *absolute value* (Szirmai and Verspagen 2015). This type of analysis can be problematic because the share could be falling even when manufacturing level value keeps increasing. Likewise, manufacturing share can be increasing even when the output value is falling. Portraying a positive structural (negative) change only because the shares are increasing (decreasing) may also lead to incorrect conclusions.

There could be a further reason beyond the analysis of the shares or levels for understanding this link. The studies dealing with this matter usually conclude, with some caveats, that manufacturing is still the engine of growth (Felipe 2009,

---

[3]According to ECLAC (2012: 26) the term 'virtuous structural change' can be defined as "…an increase in the contribution of knowledge-intensive sectors or activities to output and trade and a denser and more diversified production matrix, with higher productivity growth paths and technology spill-overs and externalities that benefit the entire system".

Szirmai 2013, Szirmai and Verspagen 2015, Weiss and Jalilian 2016), and hence deindustrialisation is detrimental to economic growth. However, these analyses do not necessarily address the recent changes in the manufacturing nature.

When these studies replicate econometrically Kaldor's laws, testing the link between manufacturing and economic growth, or when include any Structuralist insight in their calculations, manufacturing is assumed as domestically supplied or vertically integrated, and not necessarily as a part of more complex global production network (GPN). Very recent analyses by ECLAC and OECD led to think that Latin American countries' role in GPNs represents a serious challenge for achieving positive structural change within the region, and particularly for manufacturing (Hernández et al. 2014, Cadestin et al. 2016).

The objective of this paper, therefore, is twofold. In the first place, it tries to measure and understands the link between manufacturing and economic growth in the Latin American region during recent times. Secondly, it tries to conceptualise and debate around the idea of deindustrialisation for understanding the recent changes in the nature of manufacturing activities framed in the dynamics of expanding GPNs.

The main question this paper tries to answer is if there has been a delink between economic growth and manufacturing in Latin America from beginnings of the 21st century. Additionally, by answering the main question, the following sub-questions about how to understand the phenomenon labelled as *deindustrialisation* and what has been its nature in relation to economic growth, will also be addressed.

The methodology used for answering this questions is informed by both a historical/inductive approach complemented by quantitative analysis. First, I reviewed different theoretical frameworks addressing the question about the link between manufacturing and economic growth. While for some approaches increasing manufacturing promotes higher economic growth rates, for others GDP growth rate is sector-indifferent. On a general basis, there is no relevant economic literature arguing explicitly that industrialisation is detrimental to achieving high economic growth rates.

For the quantitative analysis, I relied on secondary data provided by different sources. I laid out both descriptive statistics and econometric methods to assess the phenomenon.

I tested different econometric models for describing the relationship between manufacturing and economic growth according to relevant literature. I have also included among the descriptive statistics an analysis of productivity and technological gap as suggested by the literature.

I have chosen six countries for representing the region: Argentina, Brazil, Chile, Colombia, Costa Rica and Mexico. The reason for taking these countries is because all of them share some regularities during the period of analysis. All of them registered relatively high growth rates of GDP and GDP per capita after the 2000s. Additionally, all of them exhibited declining shares but increasing levels of manufacturing employment and value-added. Last but not least, these were the only six countries with fully available data for the period I am focusing on in all the databases I used in this paper.

Regarding the data, value-added and employment by sector is taken from the 2015 version of the 10-sector database from the Groningen Growth and Development Centre (GGDC). This database became increasingly used for structural change analysis by international institutions such as OECD, UNIDO, the World Economic Forum (WEF) and the Inter-American Development Bank (IADB), as well as by scholars such as Felipe, Rodrik, Szirmai and Timmer among others.

The 10-sector database from GGDC adopts the International Standard Industrial Classification of All Economic Activities (ISIC), revision 3.1. Under ISIC's "d" letter, the database includes manufacturing activities based and non-based on natural resources, which initially poses a problem for interpreting the data. However, most databases reviewed for this research failed to include a further breakdown of manufacturing activities. When founded, the time span was not long enough to provide a historical analysis. Much less for doing time-series analysis.

Regarding capital-intensive activities like mining or oil extracting, the 10-sector database includes those within primary activities (quarrying and extracting) but also as manufacturing (refining) which helps to draw a line between primary and secondary sectors. By using this database, Diao et al. (2017: 6) raised the issue of the high labour productivity exhibited in mining and argues that it is simply an indication of the small labour share, and not necessarily an error.

Data about GDP was taken from the World Development Indicators database from World Bank, while foreign trade data was available at the Trade in Value Added (TiVA) by OECD.

The rest of the paper is divided into four chapters. In Chapter 1, I present a review of the main theoretical approaches taking into account the link between manufacturing and economic growth. I start with the Kaldorian tradition (as representative of the post-Keynesian conceptual framework) regarding manufacturing as the engine of growth. Later, I present Structuralism as the main theoretical framework exclusively created for understanding economic development challenges in Latin America. In particular, I focus on the virtuous relation between industrialisation, growth and structural change claimed by Raul Prebisch and ECLAC. Finally, I review some of the main arguments regarding why for neoclassical growth theory, industrialisation does not exhibit any particular desirable property to foster economic growth or, at least, no more than any other sector. In Chapter 2, I present descriptive statistics for displaying the main trends in manufacturing and growth in the region. I also replicate quantitative analysis methods for testing the relationship between manufacturing and economic growth for the last four decades. Based on the theoretical approaches I chose, I also include an analysis of productivity and productivity gaps to understand the link with structural change. Chapter 3 discusses some of the quantitative results of Chapter 2 and lays out a conceptual debate on how to understand and characterise deindustrialisation in Latin America and whether or not is it possible to link the phenomenon with economic growth. Conclusions are presented in Chapter IV.

Chapter 1: Theoretical framework

From a theoretical point of view, the question if industrialisation (and particularly manufacturing) leads to economic growth is not new. However, recent trends in deindustrialisation, understood as a decline in employment and value-added (in shares and levels) in many developed and developing countries help to re-emerge the debate and posed some doubts regarding that once uncontested link. At the same time, countries like India were recently presented as a successful case of economic growth driven by domestic services rather than manufacturing (Dasgupta and Singh 2006, Hobday 2013). The case of countries like India has also contributed to question the link between manufacturing and GDP growth. In the same line, Timmer and de Vries (2009), argue that in recent growth accelerations in developing countries, improvement in market services productivity resulted more important than manufacturing productivity growth.

In the light of these relatively new trends questioning the relationship between industrialisation and economic growth, it is worthwhile to cover which are the theoretical underpinnings of this link.

The main literature dealing with the causal connection between industrialisation and economic growth tend to use Kaldor's seminal work about manufacturing as the engine of growth as an unavoidable reference (Felipe 2009, Szirmai et al. 2013, Weiss and Tribe 2016). In 1966 and 1967, Kaldor presented a series of reasons why he considered manufacturing as a sector with special and positive properties and externalities, especially when compared to other sectors like agriculture or domestic services. Among those virtuous properties, he included increasing returns both statics and dynamics, economies of scale and strong backward and forward linkages with other sectors (Kaldor 1966, 1967).

Kaldor's conceptual framework is embedded in what is commonly referred as *Kaldor's laws*, which are statistical regularities he found by analysing 12 advanced economies and trying to explain why England was lagging behind in terms of economic growth. Kaldor's first law argues that the positive link between GDP growth rates and manufacturing growth rates not only is a statistical correlation but a causal link going from the latter to the first. According to Weiss and Jalilian (2016), Kaldor's argument about the positive link going from manufacturing growth to GDP growth is theoretically supported by "learning by doing, technological imitation, adaptation and modification and the gains from increased specialisation as manufacturing is increasingly sub-divided into more specialised forms" (2016: 27). There's a twofold corollary out of this arguments. In the first place, lowering unit costs is not just a matter of scale or output level, but of cumulative growth in time. Secondly, these virtuous manufacturing properties are not reversible as in other sectors with static economies of scale, because even when manufacturing output declines, those skills have set a technological base for the sector (Weiss and Jalilian 2016: 27).

The causality is also explained because of the productivity growth not only present in the manufacturing sector but the one induced to other sectors too (Thirlwall 2015: 326). Also known as *the Kaldor-Verdoorn's law*, Kaldor's second proposition argues that the faster manufacturing output grows, the faster will be the rate of growth in manufacturing productivity and manufacturing employment. This proposition can also be understood as a processes where increasing manufacturing output and increasing manufacturing productivity are highly correlated and irradiate productivity spill-overs also to other non-manufacturing sectors. In other words, the relationship between aggregate demand linkages, supply-side linkages, and productivity, usually called "cumulative causation" (Mathews 2016: 614), represents a virtuous feedback between these factors that also helps to achieve high economic growth rates.

Regarding manufacturing employment, in Kaldor's framework, increasing productivity will not reduce jobs creation because manufacturing will draw low-productivity employment from non-manufacturing activities (typically primary ones as agriculture and mining).

Therefore, increasing manufacturing will increase GDP growth rates thanks to positive externalities and increasing returns, both static and dynamic. At the same time, it will also increase productivity in non-manufacturing sectors, not only because manufacturing productivity spill-overs but also because of labour transfer from low-productivity sectors to high-productivity ones, increasing economywide productivity. Finally, increasing returns and high productivity in manufacturing will not affect manufacturing employment creation, but will promote further growth in manufacturing.

Thirlwall (2015) mentions another property stressed by Kaldor himself: the impact of manufacturing in the balance of payments. Increasing manufacturing sector would help to relax the balance of payments constraint, leading to higher GDP growth rates. Thirlwall also interprets Kaldor's support of manufacturing not only regarding economic growth but also regarding the link with the balance of payment constraint in open developing economies. Referring to Kaldor's laws, Thirlwall considers exports as the primary component of autonomous demand a country faces which must show some balance with imports to achieve sustainable and high growth rates. What was later known as *Thirlwall's law*, for explaining the balance-of-payments constraints growth (Thirlwall 1979) has a direct link, not only with the Harrod trade multiplier but also with Kaldor's laws. In words of Thirlwall "[t] he level of industrial output will adjust to the level of export demand in relation to the propensity to import, through the working of the Harrod trade multiplier: the rate of growth of output will approximate to the rate of growth of exports divided by the income elasticity of demand for imports" (2015:327). Thirlwall (2015) also concludes that manufactured exports are the ones that promote a virtuous cycle of growth, particularly in the presence of newly industrialised countries with low production costs making difficult to compete in global markets. In this sense, exports with "favourable growth characteristics" (Thirlwall 2015:327) are the ones coming from the manufacturing sector.

Summing up Kaldorian tradition, the manufacturing sector is the one that pushes the rest of the sectors to grow because of its unique increasing returns and growth-enhancing properties. Higher productivity in manufacturing absorbs employment from other sectors increasing, in that way, the economywide productivity. At the same time, also because of manufacturing increasing returns, a higher number of manufacturing jobs does not necessarily drive productivity back but pushes employment in other sectors. Finally, manufacturing also promotes a sound foreign position through exports of manufactured goods. In this sense, manufacturing drives output, productivity and employment not only in the industrial sector but in the economy as a whole. In Kaldorian tradition, therefore, it is not that important the actual size of the manufacturing sector in the economy, but the rate of growth. Kaldor himself admits that an economy is "mature" when displays larger shares in services rather than in manufacturing as a reflection of equal productivity levels (1966: 3).

The argument about the virtuous link between industrialisation and economic growth can be traced even before Kaldor's work. In classic development pioneers such as Gerschenkron, Rostow, Rosenstein-Rodan, Nurske and Lewis, the idea of industrialisation driving economic growth was also present (Kregel 2016). However, the most influential development economist who created a theory and a body of concepts, especially for Latin American countries was Raul Prebisch. One of Structuralism founding father's key claims is that industrialisation is the main driver for economic growth (UN 1949: 50). In this sense, the theoretical approach for this study not only relies on Kaldorian tradition but is also informed by the Latin American Structuralism (LAS).

Manufacturing, economic growth, and also structural change were always present in the Structuralism framework. From the early 1950s, under the guidance of Raul Prebisch, ECLAC and LAS have been arguing that for Latin American countries the only alternative for achieving sustainable economic growth rates, and the way for escaping the secular deterioration of terms of trade, is increasing the level of manufacturing goods output (UN 1949). In other words, ECLAC ideas promoted industrialisation to grow. The idea of a sustainable economic growth for original Structuralism is understood basically as an economic trajectory without facing pressures coming from domestic disequilibrium (usually rendered as high inflation) nor external ones (commonly expressed as balance of payments constraints).

Industrialization for original LAS was intended for benefiting from technical progress and productivity increases, something that, was much harder to do when countries limit themselves to primary activities only.

Further structuralist economist continued enriching ECLAC's early ideas. The concept of "structural heterogeneity" (Pinto 1970) is paramount to understand the challenges that manufacturing faces in Latin America. By structural heterogeneity, Pinto refers to a national productive structure where three strata coexist at the same time: the primitive, the intermediate and the modern. Each stratum holds a different productivity and per capita income. Pinto also conveys the idea that industrialisation will tend to equalise income and productivity levels. In his words, "[t]he development of industrialisation…significantly changes that relatively simple and pronounced framework of structural heterogeneity, and by several degrees" (Pinto 1970: 304). In Pinto's view, developed countries exhibited a homogenous productive structure where all sectors registered similar levels of productivity and income per capita. Productivity, in this case, can be also seen as technical progress, and the double challenge for developing economies lies in transferring labour to sectors with higher productivity potential and, at the same time, achieve a balanced productive structure regarding productivity levels.

The link between industrialisation and economic growth was clear for Structuralism. What was embedded in that relationship, and explicitly outspoken in the long trajectory of LAS' ideas, is that this link prompted structural change. Indeed, for LAS, industrialisation was and still is a type of structural change. According to Vera, Structuralist economist's strong beliefs of industrialisation as the driver for a "more complex and rapid process of structural change" (Vera 2013: 921) came from what developing countries after WWII had experimented. Prebisch (as cited in Vera 2013: 921) argued that "…industrialization is an inescapable part of the process of change accompanying a gradual improvement in per capita income".

Whereas industrialisation, from a Structuralist lens, is materialised as an increasing share of manufacturing output in total GDP, structural change requires a deeper conceptualisation. According to a recent definition by ECLAC, "[s]tructural change means putting qualitative changes in the production structure at the centre of the growth dynamic" (2012: 16). Alternatively, ECLAC argues that "[s]tructural change entails transforming the composition of output and international trade, employment and the pattern of specialisation" (2012: 26). Structural change, then, is much more related to development than to economic growth only. However, the driver for economic growth itself, under this interpretation, still is structural change. ECLAC's recent definition of the concept involves a qualitative shift from low-productivity activities to high-productivity ones, where technical change can be materialized. The increasing of high-productivity activities will alter the productive structure shifting the shares between activities and sectors. In this sense, structural change not only involves increasing levels of productivity, closing the gap among different sectors but also with other countries. By closing the external productivity gap, a country not only would raise its competitiveness in the world but will also reduce the difference with in terms of income per capita with the most advanced regions (ECLAC 2012).

According to recent Structuralists as Cimoli and Porcile (2016: 228), LAS adopts a Schumpeterian approach regarding structural change, where innovation and technology irradiation coming from high-productivity sectors are drivers for economic development. By recognising the links between structural change, industrialisation and growth, and far from being a rhetorical aspiration, ECLAC affirms that the changes must be palpable.

However, ECLAC (2012) admits that not every structural change triggers economic growth. Structural change is virtuous when increases the share of knowledge-intensive sectors, not only in production but also in foreign trade. In the same line, a positive structural change involves productive diversification into sectors "where domestic and external demand are expanding rapidly, so that demand can be met with domestic supply and imports and exports can grow in a balanced manner without putting unsustainable pressure on the balance of payments" (ECLAC 2012:16). This last definition from ECLAC includes the need for a sustainable balance of payments position.

While Thirlwall (1979) later formalised the idea in a balance of payment-constrained growth model, Prebisch himself alerted early about the possibility of a balance of payment crisis if economic growth was not caused by industrialisation (Vera 2013: 926). Manufactured exports goods have a higher income-elasticity than primary commodities, and he urged Latin American countries to diversify their production towards manufacturing. A country whose productive sector is based on natural resources (whether oil, food or minerals) has no chance of growing faster for long periods of times. Not only because primary exports have a lower income-elasticity but also because these exports show declining terms of trade relative to manufactured ones.

There is a clear link between Post-Keynesian tradition (here informed by Kaldor and Thrilwall) and LAS (as presented by Prebisch and other ECLAC members). While Prebisch explained how and why industrialisation was key for a sustainable economic growth in Latin American countries, a couple of years later, Nicholas Kaldor did the same but for advanced countries both in Europe, Asia (Japan) and North America (USA and Canada). Kaldor's stylized facts (or *laws*), are closely related to many of the ideas regarding industrialisation and growth promoted by ECLAC. Kaldor's first law, arguing industrialisation (and particularly manufacturing) as key for economic growth, but also for structural change (Vera 2013, Storm 2015) and development (Mathews 2016), although formulated for advanced countries, is very much in line with Prebisch's ideas.

While LAS and post-Keynesians consider economic growth as sector and activity-specific phenomenon (within industry, manufacturing is the engine of growth), other schools of thought consider economic growth as sector and activity-neutral or indifferent. Within neoclassical models of growth, represented by the Solow model (1956), its augmented versions (with human capital and natural resources) and modern endogenous growth (re)formulations as in Mankiw et al. (1992), economic growth under a typical production function relies, ultimately, on an unobservable, exogenous, and controversial residual known as total factor productivity. Regardless the sector or the activity, in a neoclassical model, economic growth depends on savings and physical and human capital accumulation. The production function assumes that technological capabilities are the same across all countries or at least the same chances to access the same technology level. Therefore, different productivity levels can be attained almost immediately, regardless sector incentives. However, the main reason why in neoclassical models economic growth is considered sector indifferent is related to the aggregation problem (Palma 2005: 103). Indeed, the production function not only represents an aggregate of micro production functions from different firms but coming from different sectors and activities. In this sense, neoclassical production functions do not take into account any sector in particular. In an extensive critique of the aggregate production function, Felipe and McCombie (2013) argue that, particularly because of the many industries in the manufacturing sector, industrialisation is not regarded desirable to fuel economic growth or at least, no more desirable than any other economic sector.

In sum, the main differences between Structuralism, Post-Keynesians and neoclassical growth theory is that the first two allocate in the manufacturing sector special properties regarding increasing returns of scale, technological and productivity spill-overs to other sectors while at the same time promotes direct and indirect employment creation. On the contrary, neoclassical growth theory does not allocate any particular asset in industrialisation as the sector delivering economic growth, although it does not say necessarily that is detrimental to growth. In this sense, as Palma (2005) refers, regarding to growth is neutral or indifferent.

Therefore, according to the theoretical approaches displayed above, we will rely on both Kaldorian and LAS framework for analysing the link between industrialization and economic growth. These schools of thoughts place a special emphasis on the role manufacturing plays, not only in economic growth but also in external sustainability and structural change. All these body of concepts will be helpful for address our objectives and answer the research questions.

Chapter 2:
Economic Growth and Manufacturing in Latin America

This chapter presents quantitative analyses of the relevant variables involved in the study of economic growth and manufacturing, according to the theoretical framework chosen. The first part shows the major trends regarding the evolution of economic growth, manufacturing and productivity, the key analytical variables, for our country sample. The second part deals with an econometric analysis for replicating Kaldor's first law in a fixed effects model as well as on a time series basis for the countries in our sample. The third part replicates, based on a productivity growth decomposition method introduced by McMillan and Rodrik (2011) and Diao et al. (2017) for understanding the role of structural change in productivity and growth. The fourth and final part depicts the external technological gap for Latin American countries aiming to understand if this gap whether has contributed or not to achieve positive structural change.

2.1 Major trends

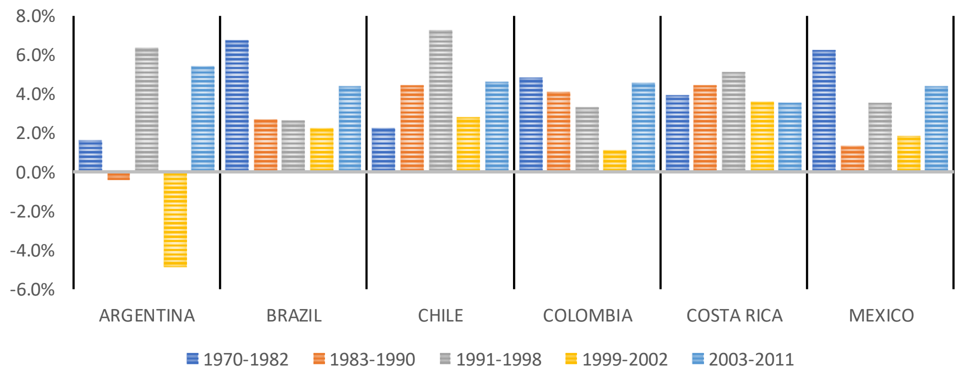
Economic growth in Latin American countries in the first decade of the 21st century was relatively high when compared with other periods of time. Without taking into account "the lost half-decade" (ECLAC 2012:24), this is, the severe economic depression many countries in the region experienced between 1998 and 2002[4], GDP growth rates were, in some cases, the highest since the 1970s. From the year 2003, economic growth gained momentum, and most of the counties achieved not only high, but less volatile growth rates than in other periods. Both internal (income policies, increasing social spending) and external factors (better terms of trade, low international interest rates) contributed to reaching those high growth rates (ECLAC 2012: 24).

The global financial crisis, which in the region erupted from the second part of the year 2008, put on hold those high and less volatile growth rates. However, even when the annual GDP growth rates since 2009 are counted, the average

[4] In our sample, the starting year for GDP contraction is 1999 instead of 1998.

growth rate for the period 2003-2011, still is high in historical terms. The next figure shows the evolution of the average annual growth rates by country since the 1970s.

Figure 1. Average real GDP growth rates



Source: author's calculations based on ECLAC online database. http://estadisticas.cepal.org/cepalstat/portada.html?idioma=english. Accessed on October 15th, 2017.

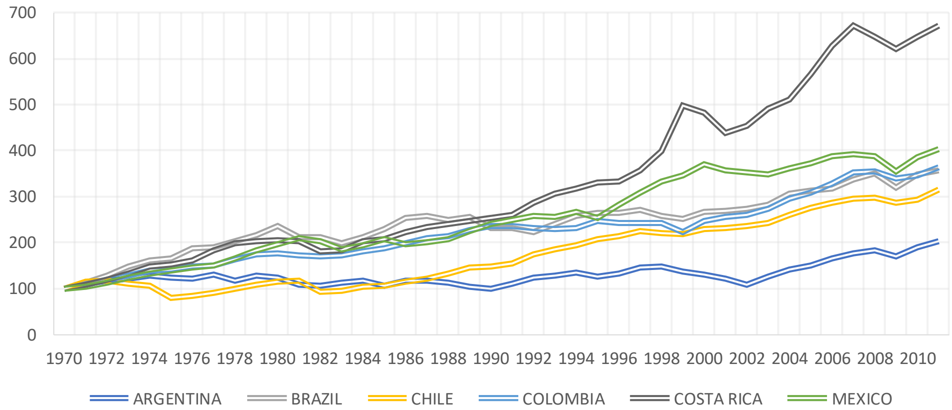
Understanding the evolution of manufacturing on this period entails a broader analysis, and requires to study not only manufacturing value added but also, manufacturing employment.

Regarding manufacturing value added level, as it is shown in Figure 2 panel a, all countries exhibited an upward trend without exceptions. While Costa Rica is the country that shows the higher growth in terms of manufacturing value-added, Argentina exhibits almost no signs of increasing the level until the early 2000s. However, after that, it managed to almost doubled its manufacturing value-added in about a decade. All other countries doubled or tripled their value-added in the last four decades.

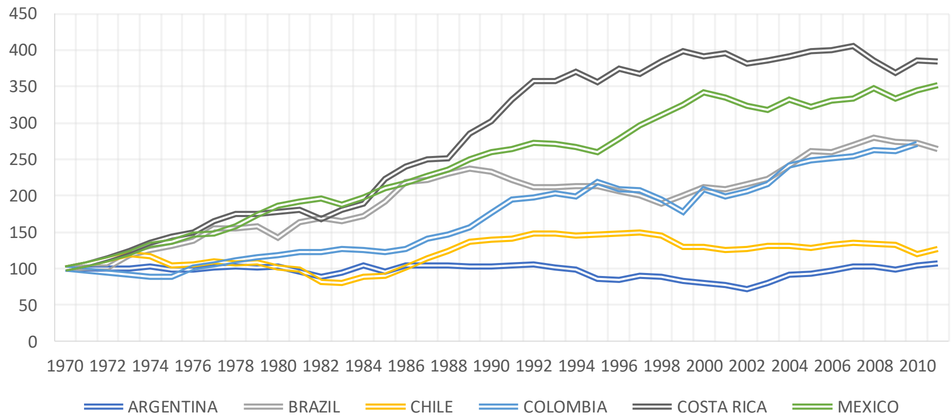
Regarding manufacturing employment in Figure 2 panel b, once again Costa Rica followed by Mexico are the countries that more than tripled their level in the last forty years. On the contrary, Argentina and Chile exhibit a very steady level of manufacturing jobs. Argentina, particularly, is the only country that has registered a prolonged fall in the number of jobs. Indeed, for almost 20 years (from the early 1980s to early 2000s) there was a trend of constant shrinkage in the number of manufacturing jobs. During the 2000s decade the country barely recovered the level registered 40 years before. Similarly, Chile shows a slightly stagnant manufacturing employment creation since the mid-1980s. The rest of the countries managed to double or to triple their number of manufacturing jobs.

Figure 2. Manufacturing value-added and employment *(1970=100)*

a. Value-added



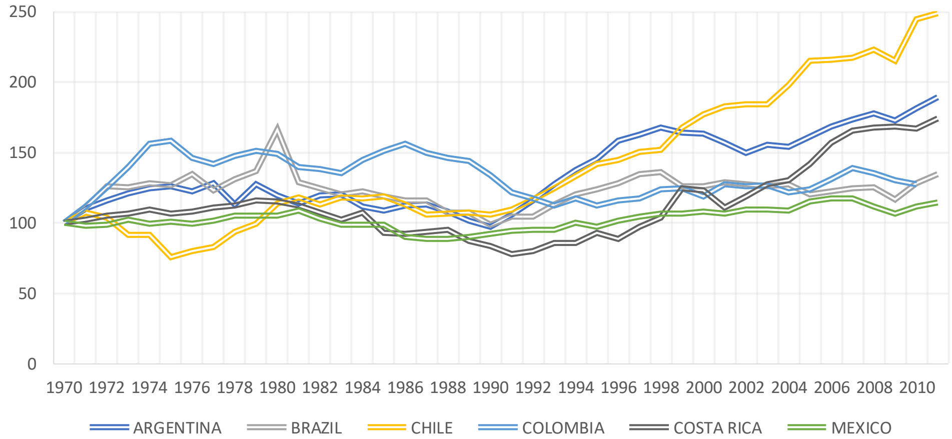
b. employment



Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015).

Out of this last figure, it is relatively easy to estimate that, in terms of manufacturing labour productivity, the performance of these countries exhibit no big changes. However, as in some cases, the value-added has increased more than the level of employment, labour productivity shows an upward trend for a number of countries, particularly in the 2000s decade. Figure 3 shows that Chile, Argentina and Costa Rica are the ones exhibiting the higher increases since the 1970s, while Mexico (given the rise in the manufacturing employment level) displays the lower growth.

Figure 3. Manufacturing labour productivity *(1970=100)*



Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015).

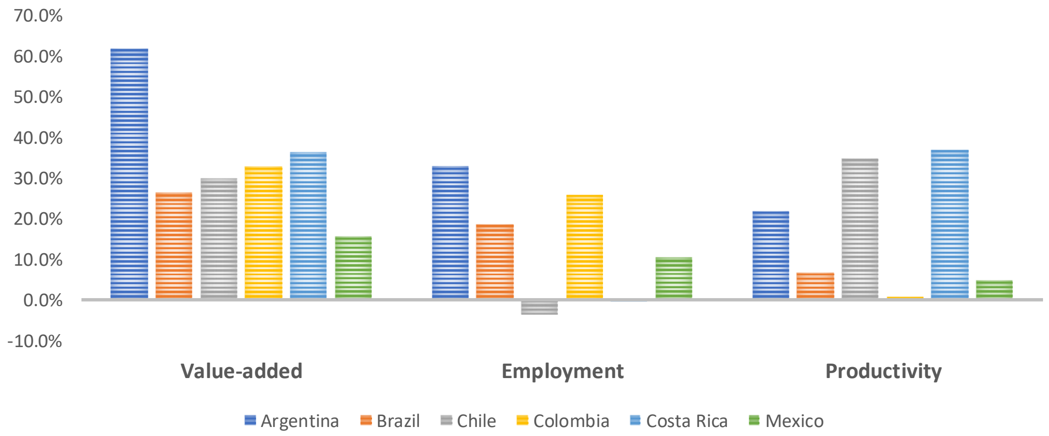
When focusing on the last period, from 2003 to 2011, the manufacturing value-added, employment and productivity show, in Figure 4, a dissimilar path among the countries. While in Argentina, Brazil and Mexico the total increases in manufacturing value-added combined both rises in employment and productivity, in Chile and Costa Rica value-added increases were given entirely by productivity growth, offsetting employment creation. On the contrary, Colombia's increase in manufacturing value-added was almost entirely given by employment while productivity has not grown

Manufacturing shares tell a different story regarding trends. Since their peaks back in the 1970s or 1980s up to 2011, all countries in the sample exhibit declines in their manufacturing shares of both value-added and employment. As it is shown in Figure 5 panel a, almost all countries display a downward trend in the value-added share. The highest shrinkage in this share is between 5 or 6 percentage points from the 1970s to the last observation for Argentina, Brazil, Chile and Colombia. The decline in Mexico is close 1.5 percentage points, while in Costa Rica there have not been many changes in the shares since the 1970s.

Regarding employment (Figure 5 panel b), all countries show a falling share. In this case, the declines are bigger than in the value-added share. Countries like Argentina and Chile's almost halved their employment shares during the last four decades. Brazil and Colombia, on the contrary, after their peaks, exhibits a relatively stable share.

Figure 4. Manufacturing value added, employment and productivity 2003-2011

(cumulative real growth rate)

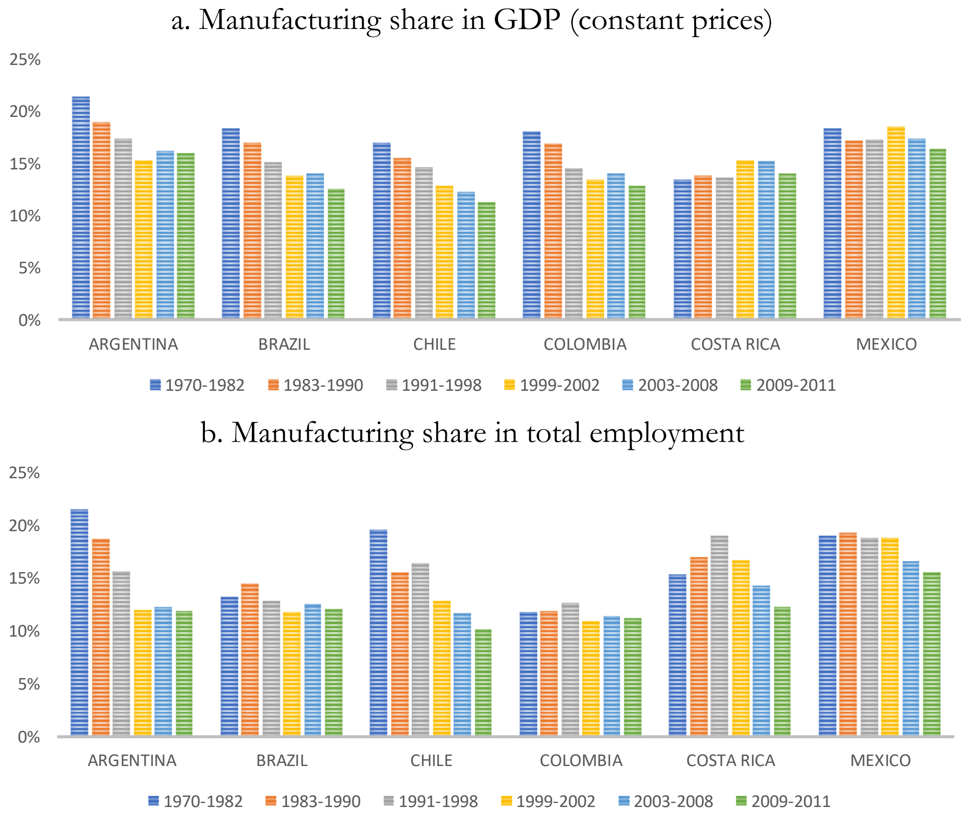


Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015).

The fall only in the shares and not in the absolute values is a major difference with other regions where the decline was in both indicators (Tregenna 2016). Not only USA and once industrial powers in Europe such as UK or Germany have registered a decline in manufacturing workers, but also Asian industrial latecomers as Japan and South Korea have seen reduced the manufacturing payroll at some point in time between the 1970s and the end of the 2000s. Because of the falling shares, but increasing levels, authors like Grigera (2012) have questioned whether deindustrialisation is really a trend in Latin American countries or not.

In sum, during the 2000s these countries registered the highest levels, but the lowest shares, of manufacturing employment and value-added. Also during those years, GDP growth rates were relatively high when compared to the last 40 years. Manufacturing productivity, measured as the value-added divided by the number of jobs reported a steady trend, although in the last decade some countries exhibited increases mainly, because of value-added growing faster than employment.

Figure 5. Shares of Manufacturing value-added and employment



Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015) and the ECLAC online database http://estadisticas.cepal.org/cepal-stat/portada.html?idioma=english.
Accessed on October 30th, 2017

2.2 Testing the link between economic growth and manufacturing

2.2.1 What does Kaldor' s first law tell (and what does not)?

The trends regarding economic growth and manufacturing dynamics described above allow us to introduce a more detailed analysis about the link this paper deals with.

The most straightforward and replicated way of describing the link between manufacturing and economic growth has been testing Kaldor's first law (Szirmai et al. 2013, Weiss and Tribe 2016). This "law", both a statistical regularity and a causal effect (Kaldor 1966, 1967 and Thirlwall 2015) states, as it was discussed in Chapter 1, that manufacturing and GDP growth rates register a positive link and, the faster the manufacturing sector grows, the higher GDP growth rates a country would register.

As we mentioned in the theoretical review, Kaldor's laws can be understood as the cornerstone of the classic developmental ideas of early theorists. The author himself underpinned its ideas not only by conceptualising the benefits of industrialisation but also by testing empirical evidence. Kaldor (1966, 1967) ran a cross-section regression for twelve developed countries' manufacturing and GDP growth rates between 1953-4 and 1963-4 and yield positive and statistically significant results regarding the link between these two variables. The coefficient obtained by Kaldor himself was around 0.61%. This meant that the contribution of the manufacturing growth rate to the overall economy growth rate was higher than the manufacturing share itself. This is a major statement because, under a kaldorian framework, even if the manufacturing share is not as big as other shares, what it is important is that the coefficient that depicts the link between the sector and the GDP growth holds a higher value than the sector share. Kaldor himself considered "factually incorrect" (1966:8) the proposition that links the size of a sector (in relation to the whole economy) and economic growth rate. This marks a difference with early Structuralism's ideas regarding the importance of a balanced productive structure and the relative sectoral shares and relative productivities. However, not only Kaldor but recent Structuralists stressed the fact that productivity growth and technological progress are not necessarily restricted only to manufacturing activities (Cimoli and Correa 2005).

However, many critiques can be argued regarding Kaldor's relationship stated in his first law. Firstly, as it was already mentioned, the fact of being a highly correlated link, doesn't imply necessarily any causation. Growth in manufacturing is a part of the GDP growth rate which can create an endogeneity problem.

Secondly, Kaldor's first law can be understood in a context-specific demographic transition. When looking at the twelve countries, Kaldor included in his sample, according to World Bank data, ten of them registered an urban population share between 50% (Norway) and 70% (United States) in the 1960s[5]. If

[5] United Kingdom and Belgium are the two countries from Kaldor's sample that shows the highest urban population shares, 77% and 93%, respectively at that time.

manufacturing can be considered as a typical urban activity, holding a sizeable non-urban population gives chances for employment to be drawn from low-productivity activities, typically located in non-urban areas, to high-productivity ones, usually located in urban areas, and expanding overall productivity and economic growth. Kaldor himself claimed that differences in GDP growth rates could not be attributed to changes in the working population only. However, he argued that countries with a remaining relatively high labour force located in agricultural activities will catch-up faster than the ones where there is not enough labour force available for the manufacturing sector (1967: 35-36). In fact, a high share of manufacturing workforce could act, in Kaldor's view, as a constraint for productivity increases. Under this hypothesis, Kaldor's first law could explain China's outstanding economic performance in terms of economic growth for the last decades. China's migration from rural to urban areas provides abundantly available workforce in order to raise manufacturing (and overall economy) productivity.

This would not be the case for Latin America in recent times. According to ECLAC data, the countries in our sample, during the 2000s, registered an urban population share of almost 90%. Because of this, it can be argued that, even when manufacturing yields all the positive impacts already mentioned in Chapter 1, not many employments can be absorbed from primary activities given the large share of population and employment already allocated in urban areas. Additionally, even when non-urban population proportion was quite reduced, unemployment shares in the region also registered a considerably fall during this period while working population share increased.

A third a final critique of Kaldor's first law is that in the last decades, along with GDP growth rates, the services sector grew faster than manufacturing. This relationship would also yield a positive link between services growth and GDP growth[6]. In this sense, Szirmai (2013) argues that rich countries exhibit larger services sector shares because of higher income elasticities for services than for manufacturing. Hence, statistically, services sector shares would not necessarily register a low correlation with per capita income levels. This point was raised by

[6] Kaldor (1966) himself found a regression coefficient close to one between GDP growth rate and services growth rate for in his original sample. He interpreted that the causal relationship in this case goes the other way around, this is, from GDP to services.

Baumol when describing the increasing demand for domestic services an economy holds while its income per capita keeps growing. Baumol (cited in Szirmai 2013: 65) described a structural change *burden* referred to the decrease in economywide productivity countries experience in growth episodes. As income elasticity for domestic services is higher than for manufactured goods, domestic services' value-added grows faster than manufacturing and, as services register lower productivity than other sectors, total productivity decreases when a country economy is growing (Felipe 2009: 125, Szirmai 2013: 65).

A services sector larger than a manufacturing one, however, does not contradict Kaldor's claims regarding the growth-enhancing properties of the latter, but it is simply a consequence of a maturing economy (Kaldor 1966). However, the idea of manufacturing productivity as the one delivering economic growth has been contested. Timmer et al. (2009, 2015) show, by introducing a new method of productivity accountability, that recent growth acceleration episodes in developing countries were driven by productivity increases in the services sector, rather than in manufacturing. The authors, however, claim no causality (2009: 180) between the relationship between these findings and economic growth.

Because of the particular issue of a growing services share and the chance for this sector to be the one pushing overall economic growth, many studies assessed empirically, under Kaldorian tradition, this proposition. For example, Felipe et al. (2007) ran Kaldor-type regressions (cross-section and time-series) for 17 Asian countries (including China) for the period 1980-2004, and their results show that services growth registers a higher elasticity to GDP than manufacturing[7]. In the same study, when including industry (instead of manufacturing), however, elasticity for this sector resulted higher than the one for services. Contrary to this evidence, Szirmai and Verspagen (2015), use four different panel data methods[8] for regressing manufacturing on GDP growth for a sample of 88 countries (developed and developing) between 1950 and 2005. Instead of using manufacturing and services growth rates (as in Kaldor's original work) these au-

[7] Felipe et al. (2007) uses elasticities because both left-hand side and right-hand side variables are in logs.
[8] Fixed effects, random effects, Hausman-Taylor method and a between specification.

thors rely on GDP ratios as regressors, controlling by population, trade openness and climate, among other variables. Results report positive and highly significant coefficients regarding the link of the manufacturing share in GDP growth (only in three out of four specifications), while services share proved to have no statistical significance in all four specifications. Szirmai (2013) argues, however, that it is hard to test Kaldor's laws using regression analysis because of the richer the country, the bigger the demand for services. So, even when services could act as a "brake for growth" (Szirmai 2013:66) sector shares would not be necessarily negatively correlated with GDP growth rates.

This last critique regarding the correlation between different sectors and the GDP is very related to the first two ones. Arguing that either manufacturing growth or services growth causes GDP growth is a strong conclusion that cannot be derived only from econometric methods used by Kaldor and others. Kaldor himself raised this point (1967: 11).

In the Latin American case, given that in the 2000s most of the employment is allocated in the services sector and not in manufacturing, it does not seem very likely that much employment can be drawn from primary activities to absorb productivity gains derived from manufacturing. In the same line, the services share in total GDP in Latin American countries is also higher than any other sector meaning that the correlation between services growth rates and GDP growth rates is much stronger than with any other sector.

2.2.2 Empirical estimation of Kaldor's first law for six Latin American countries

Taking into account the critiques mentioned above, and not focusing on causal relationships, Kaldor's first law still is useful to help to describe the link between manufacturing and economic growth quantitatively. Also, given the theoretical framework of this study, it is important to test if many of Kaldor's interpretations derived from his empirics are valid for other countries and other time periods.

Given the number of countries included in our sample (6), it is not possible to run a cross-section regression as Kaldor did. Therefore we ran fixed effects models for panel data and time-series regressions for each country for the period 1970-2011. We tested the three specifications Kaldor presented for backing the engine of growth argument. While Kaldor based his original analysis on a cross-section regression, some issues have been raised about how to interpret time-series analysis for one single country. As noted by Thirlwall (2015) and Dasgupta and Singh (2006), Kaldor's first law is best tested on cross-section analysis rather than time-series because the latter is not exempted from business cycle movements to achieve a long-term relationship between the two variables. However, many authors have run time-series regressions and fixed effects models for testing Kaldor's laws. Once again, Felipe (1998) and Felipe et al. (2007) can be mentioned as examples of this approach for testing Kaldor's laws with methods beyond cross-section regressions. [9]

The first model we tested appears in Kaldor's original work from 1966. We included, however, multiplicative time dummies for testing if during a particular period of Latin American economic history the link between manufacturing and economic growth has been different from other periods. The model, hence, has the following specification:

$$rGDP_t = \alpha + \beta_1(rMANUF_t) + \beta_2 D_i + \beta_3(rMANUF_t * D_i) + \mu_t \qquad (1)$$

Where:

$rGDP_t$ is the real annual growth rate of GDP

$rMANUF_t$ is the real annual growth rate of manufacturing value-added

D_i is a categorical dummy for periods 1970 to 1982 (base category), 1983 to 1990, 1991 to 1998, 1999 to 2002, 2003 to 2008 and 2009 to 2011.[10]

and μ_t is the error term.

The second model tested is also inspired by Kaldorian tradition, and Kaldor himself ran the specification in a cross-section regression (1966: 33). According to Kaldor, "[w]e find the rate of economic growth to be correlated with the *excess* of rate of growth of manufacturing output over the rate of growth of the non-manufacturing sectors" (1967:10-11, italics mine). This means that the higher

[9] See McCombie and Thirlwall (1994) for a list of time-series tests of Kaldor's laws.
[10] This periodization tries to capture different economic cycles in the region. 1970-1982 marks the end of the ISI period until the debt crisis. 1983-1990 represents the lost decade. Washington Consensus period is framed here between 1991 and 1998. From 1999 to 2002 all the countries in the sample registered the lowest GDP growth rates since early 1990s. The last period (2003-2011) shows relatively high and sustained (except for 2009) GDP growth rates and is the period we are focusing on.

the difference between both rates of growth (manufacturing and non-manufacturing), the faster the GDP will grow. It is another way to portray the importance of manufacturing on economic growth.

Felipe (1998) followed this idea and ran time-series and pooled data models for five Asian countries. The independent variable was no longer the rate of growth of manufacturing value-added alone (as in Kaldor's first specification), but the difference between the rate of growth of manufacturing value-added and the rate of growth of non-manufacturing value-added.

We replicate Felipe's regression in a simpler way but, as in Model 1, including multiplicative interaction dummies. Model 2, then, has the following specification:

$$rGDP_t = \alpha + \beta_1(rMANUF_t - rNONMANUF_t) + \beta_2 D_i + \beta_3(rMANUF_t - rNONMANUF_t * D_i) + \mu_t \qquad (2)$$

Where everything is the same as in Model 1 and $rNONMANUF_t$ is the real annual growth rate of non-manufacturing value-added. The difference between manufacturing and non-manufacturing value-added represents the *excess* variable.

The third and last specification is also present in Kaldor (1966: 33) and in Felipe's time-series and pooled data regressions for Asian countries (1998). According to the growth-enhancing properties of manufacturing on the rest of the economy, is expected that regressing the manufacturing value-added growth rate over the non-manufacturing value-added growth rate would also yield a positive and statistically significant coefficient as in Model 1. Therefore, the Model 3 follows the next specification.

$$rNONMANUF_t = \alpha + \beta_1 rMANUF_t + \beta_2 D_t + \beta_3(rMANUF_t * D_t) + \mu_t \qquad (3)$$

Where all the variables were already defined above for Models 1 and 2.

Table 1 presents the results for the three fixed effect models.[11] In all three models, the independent variables presented, as expected, a positive sign and a high statistical significance. The excess variable in Model 2 reported the highest coefficient out of the three models, 0.75, but small R squares. Model 1, Kaldor's

[11] Stationary test for the series and the time series regressions outputs for the three models ran for individual countries, can be found in Annex 1 and 2, respectively.

first law, reported a coefficient close to 0.64. According to this model, for each 1 percentage point rise in the manufacturing growth rate, GDP growth rate increases, holding everything else constant, 0.64%.

Table 1. Fixed effects models
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing value-added growth rate
Manufacturing value added growth rate	0.638***		0.469***
	(0.021)		(0.046)
Excess growth rate		0.751***	
		(0.073)	
Interaction period dummies			
1983-1990	0.003	-0.379	0.030
	(0.062)	(0.419)	(0.044)
1991-1998	-0.018	-0.466*	0.043
	(0.093)	(0.230)	(0.038)
1999-2002	-0.334	-0.588***	-0.247
	(0.174)	(0.121)	(0.153)
2003-2011	-0.176	-0.408**	-0.074
	(0.105)	(0.145)	(0.087)
Constant	0.017***	0.049***	0.028***
	(0.002)	(0.007)	(0.004)
Time dummies	yes	yes	Yes
Observations	251	251	251
Countries	6	6	6
R2-overall	0.766	0.324	0.614
R2-between	0.584	0.0258	0.387
R2-within	0.770	0.333	0.618
Rho	0.0429	0.0390	0.0322

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates.
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Interestingly, interaction dummies reported statistical significance only in Model 2 for the three periods. In Model 1 and 2, most interaction dummies, though not been statistically significant, showed negative signs which would have been interpreted as a less positive relationship between the two variables.

Particularly, following the idea of a delink between manufacturing and economic growth during the 2000s, a negative and highly statistically significant coefficient would have been expected for the last period interaction dummy. Only Model 2, showed results like this. However, a bigger (more negative) interaction dummy coefficient for the last period than for previous periods would have also been expected for assessing the mentioned decoupling.

Table 2 shows the coefficients for the interaction dummies for the period 2003-2011 only, for each country as reported by the time series regressions in the three models. Only in Brazil interactions dummies for the last period displayed statistically significant and negative coefficients in all three models. This can be interpreted as a sign that in Brazil, the link between manufacturing and GDP growth rates was less potent during the period 2003-2011. Argentina and Colombia, though negative, reported coefficients not statistically different from zero. In Chile, Costa Rica and Mexico, at least in one of the three models, this coefficient showed a negative sign and statistical significance.

Table 2. Interaction dummies for the period 2003-2011, by country

Coefficients from time series models

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing value-added growth rate
Argentina	0.262	-0.373	-0.023
	(0.356)	(0.352)	(0.292)
Brazil	-0.312***	-0.682***	-0.249**
	(0.072)	(0.210)	(0.095)
Chile	-0.967	-1.396**	-0.043
	(0.647)	(0.551)	(0.237)
Colombia	-0.102	-0.043	0.000
	(0.090)	(0.152)	(0.103)
Costa Rica	-0.386*	-0.545	-0.396**
	(0.193)	(0.546)	(0.160)
Mexico	-0.211	-0.035***	0.006
	(0.180)	(0.012)	(0.232)

Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In sum, results coming out of this three models reported an expected positive sign between the dependent and independent variables, as in Kaldor's original works. Without implying any causality whatsoever, we can say that during four decades the long-term relationship between the variables remained statistically significant and it was not much altered in time. In this sense, the multiplicative interaction dummies trying to capture any specificity reported non-conclusive results (except in Brazil) given the non-statistical significance, regardless the negative sign most of them showed.

Coming back to the research question of this paper, out of this three models we cannot conclude that the link between manufacturing growth rate and GDP growth rate was less intense during the first decade of the 21st century. By testing growth rates versus growth rates, results showed the same link through time.

2.2.3 Structural change and technological gap

As we stated in the theoretical framework, structural change is embedded in the relationship between productivity and economic growth. Productivity growth plays a vital role in both Kaldorian tradition and LAS. Far from being labour-saving is output-enhancing, not only regarding manufacturing output but for total GDP also. We found similarities in these approaches regarding the need for productivity increases in manufacturing and high value-added activities to promote a positive structural change and, therefore, faster rates of GDP growth. In both approaches manufacturing productivity would push productivity in other sectors, basically, by labour transfers from low-productivity sectors to high-productivity ones.

According to both Kaldor and LAS, when high-productivity sectors absorb labour from low-productivity ones, economywide productivity increases inducing a positive structural change that may end up in higher economic growth rates. To analyse the relationship between productivity and structural change we have decomposed economywide productivity following the method presented in McMillan and Rodrik (2011) and Diao et al. (2017). Productivity increases can be the result of two dynamics. First, productivity can grow in any given sector because of technological change. This would be, according to the authors, the *within* productivity. Second, productivity can also grow if high-productivity sectors absorb labour from low-productivity sectors, increasing economywide productivity. This is what the authors label as *structural change* because employment reallocation contributes positively to productivity.[12]

The authors argue that this type of productivity decomposition analysis is better than the study of a single sector productivity (they mention manufacturing explicitly) because productivity growth in a given sector could be the result of a decreasing share of employment. If this is the case, the displaced jobs may end up absorbed by low-productivity sectors turning economywide productivity down (Diao et al. 2017: 10).

Following McMillan and Rodrik (2011), the productivity decomposition is represented arithmetically by the following expression:

$$\Delta Y_t = \sum_{i=n} \theta_{i,t-k} \Delta y_{i,t} + \sum_{i=n} y_{i,t} \Delta\theta_{i,t} \quad (4)$$

Where:

ΔY_t is the change in economy wide productivity

$\theta_{i,t-k}$ is the share of employment in sector *i* at the moment *t-k*

$\Delta y_{i,t}$ is the change in productivity of sector *i* between moments *t* and *k*

$y_{i,t}$ is the productivity level of sector *i* at the moment *t*

and

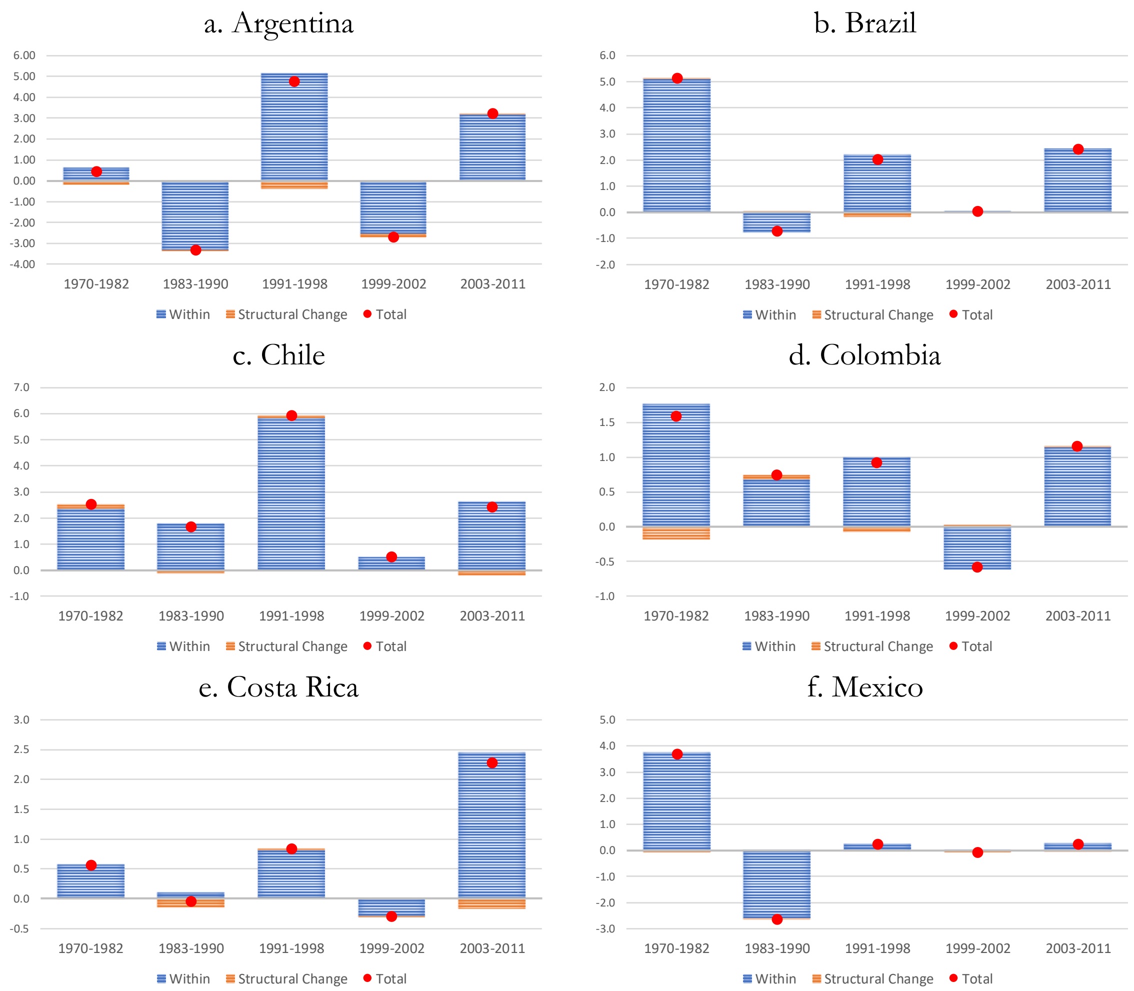
$\Delta\theta_{i,t}$ is the change in the share of employment in sector *i* between moments *t* and *k*

In Figure 6, we show the productivity decomposition for our sample to test how the structural change component has contributed to the economywide productivity changes over the last four decades. Two main conclusions came out of this type of analysis. First of all, except in Costa Rica, economywide productivity registered a moderate increase during the last period. In Mexico, however, there were no major changes regarding this variable in the last twenty years. Second, and most important, the structural change component in all countries and in all periods of time is almost non-existent or, even worst, negative. All the

[12] By presenting this method, the authors pose a critique to the productivity decomposition accountability introduced by Timmer and de Vries (2015) because of allegedly counterintuitive interpretations regarding the structural change component (Diao et al. 2017: 9).

productivity increases in these countries were driven by the within component. This goes back to the point regarding most of the jobs already allocated in low-productivity sectors and high productivity sectors (as manufacturing), reducing their employment share. When productivity increases lead to economic growth, a bigger dynamism from the structural change component would have been expected. This was not the case for Latin America.

Figure 6. Economywide productivity decomposition
(in percentage points)



Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015) and the ECLAC online database http://estadisticas.cepal.org/cepalstat/portada.html?idioma=english. Accessed on October 30th, 2017

This analysis also helps to build the argument regarding structural change (or high productivity sectors) not driving the economic growth process, neither in the last period nor the last forty years.

If we consider manufacturing as a high-productivity sector, the shrinkage of this sector has contributed negatively to productivity increases delinking this evolution from the economic growth process.

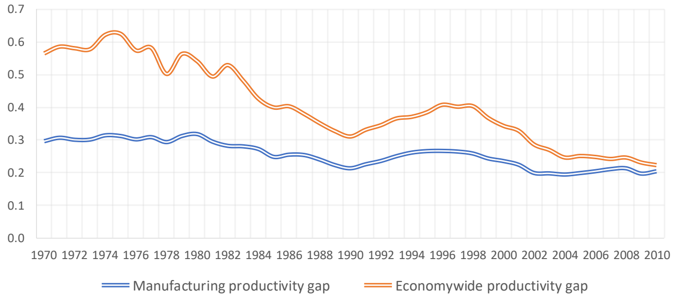
For concluding this section, we analyse manufacturing productivity compared to the technological frontier. In Figure 3, we showed the relatively stagnant trend, at least for some countries, in manufacturing productivity during the last years but we did not compare it with other advanced regions. In this sense, LAS argues that there should be increases in manufacturing sectors domestically, but also relative to other countries, especially, the centres. Otherwise, productivity in manufacturing and overall productivity would lag from the most advanced ones. In this sense, according to ECLAC (2010: 91), the technological gap can be proxied to the relative productivity between a country and the country registering the technological frontier (or the highest productivity).

The set of graphs from Figure 7 shows the evolution of the relative manufacturing productivity and economywide productivity with respect to the United States as a proxy of the technological gap with the country at the technological frontier. All six countries in the sample not only share an almost stagnant manufacturing productivity gap during four decades but an increasing economywide productivity gap. This last gap has converged to the manufacturing productivity but not as expected in both Kaldorian and LAS approaches, but the other way around. Manufacturing gap remained stable, and there are no signs of irradiation to other sectors given the widening gap in total productivity.

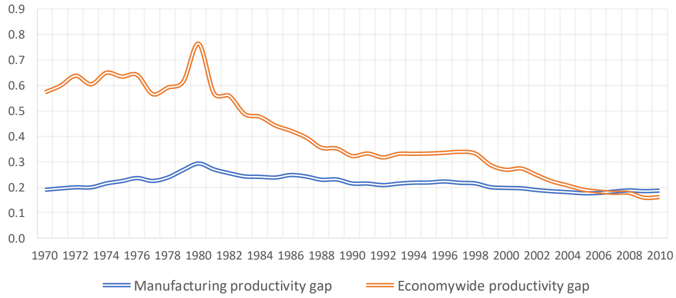
Manufacturing productivity gap remained not only still, but, in low levels, between 15% to 35% of US productivity. Although stagnant, could not offset labour productivity falls in the rest of the economy compared to the most advanced ones. This means that, even when in mature economies productivity stagnated or fell, in Latin America the decline was even higher, therefore, widening the technological gap.

Figure 7. Technological gap
Relative productivity with respect to the United States
(USA = 1)

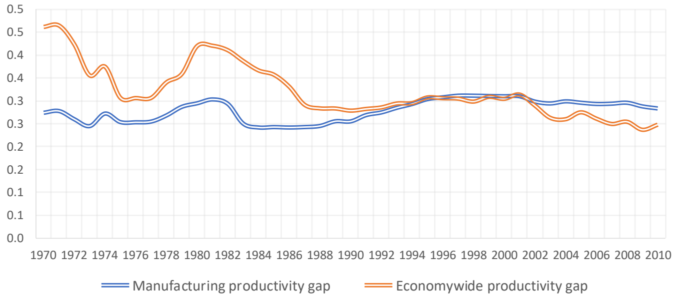
a. Argentina



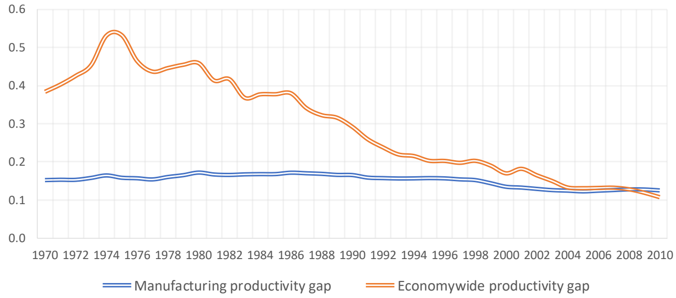
b. Brazil



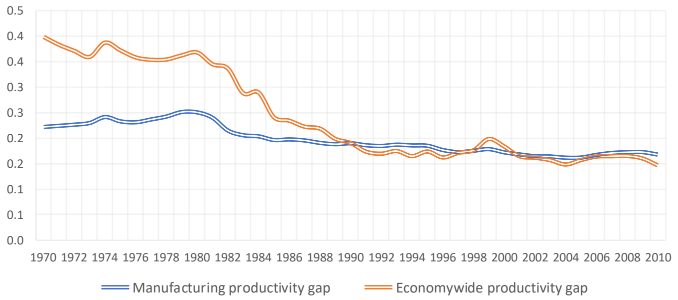
c. Chile



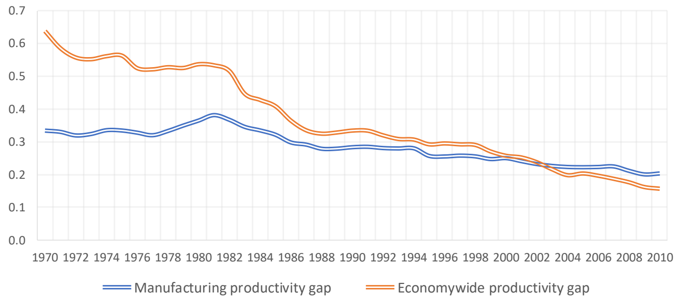
d. Colombia



e. Costa Rica



f. Mexico



Source: author's calculations based on Timmer, M. P., de Vries, G. J., & de Vries, K. (2015), ECLAC online database http://estadisticas.cepal.org/cepalstat/portada.html?idioma=english. Accessed on October 30th, 2017 and the World Development Indicators database. https://data.worldbank.org/. Accessed on October 30th, 2017.

When taking productivity and linking it to both industrialisation and growth, some caveats are better to warn about. Average labour productivity, either across manufacturing, other sectors or for the whole economy, is usually expressed as the outcome of a monetary estimate. Indeed, productivity results from dividing sectoral value-added over the number of employees in that sector. Therefore, through productivity we can proxy how many value units of output can produce a unit of labour. Of course, value units are expressed in monetary terms (either nominal or constant prices). However, including a monetary value as an indicator of how competitive is an industry may result in a distorted image of the true sectoral competitiveness. Kaldor raised this point by arguing that productivity, particularly in domestic services, is a "meaningless notion" (1967: 21) because production can be measured without taking into account economies of scale. Kaldor exemplifies this by saying that nobody would claim as a productivity rise if a store clerk sells two items, instead of one, to the same costumer. With this simple example, Kaldor reinforced his argument regarding what really drives productivity in tertiary sector is the productivity in manufactured goods and this was seen as another reason for supporting manufacturing growth as a driver of economy-wide growth. Fischer (2011) also warns about taking productivity measured in monetary terms as a good indicator of competitiveness, effort or reward. The problem about expressing productivity in monetary terms (where wages and prices are included in the numerator) leads to the think that one employee is more productive than other just because the first earn a higher salary, even though they produce the same units of output (Fischer 2011: 523). Fischer labels this as the "fallacy of productivity reductionism" (2011: 521), and his critique is oriented, among other things, towards productivity-enhancing policy recommendations as a recipe for achieving a positive structural transformation without addressing a deeper understanding of the globalised world. Especially, regarding the way transnational companies transcend country borders for keeping productivity gains within the limits of their headquarters (usually located in the Global North). Taking into account this critique, we should take these last two analysis as indicative of a trend of structural technological lagging and not as an actual sign of a country's international competitiveness.

Chapter 3: Changes in the nature of (de)industrialisation and economic growth in Latin America

After results presented in Chapter 2, it is possible to conclude that, although the link between manufacturing and economic growth has been statistically relevant during the last forty years, in the first decade of the 21st century, the link was not particularly significant or at least no more important than in another period. Three different econometric specifications linking manufacturing growth rate with GDP growth rate have reported overall meaningful results but, focusing on the last years of the sample through interaction dummies, results were not as expected. This is, we cannot conclude if the link was weaker or not during the 2000s. Additionally, the (allegedly virtuous) structural change component of the productivity decomposition method we tried has reported a non-significant or even negative contribution to overall productivity increase. However, once again, the structural change contribution during the 2000s was not different from other periods of time. Finally, the manufacturing productivity gap remained stagnant, and we cannot conclude that this played a role decoupling industrialisation from economic growth. On the contrary, economywide productivity did widen its gap regarding advanced countries.

The non-conclusive quantitative analysis along with the lower shares of manufacturing trigger a puzzle regarding the link we are assessing. According to virtually all studies in the field, Latin America has experienced a process of deindustrialisation and negative structural change since the 2000s (Palma 2014, Felipe et al. 2014, Tregenna 2016, Diao et al. 2017). Deindustrialization in these studies is defined as a sustained declining share of either manufacturing value-added in terms of GDP, manufacturing employment in total employment, or both. Some of the quantitative analysis from Chapter 2 also confirms the asseveration.

Given the theoretical framework presented in Chapter 1 concluding that both for LAS as for Post-Keynesian, deindustrialization is detrimental for economic growth, followed by the non-conclusive quantitative evidence presented in Chapter 2, and the consensus of characterizing Latin America as a deindustrialized region, a further inquiry about this concept is needed in order to understand its nature.

3.1 Growth and deindustrialisation, an inverted-U shape tale?

"Deindustrialization is an ambiguous term and is used by different writers in different senses or at least with different overtones" (Cairncross 1978: 5). Although it may seem rather old, Cairncross' remark on deindustrialisation is still valid given the many interpretations the word has taken in recent times. *Deindustrialization*, as an economic concept, is not new. It was first introduced by Singh in 1977 referring to UK's industrial decline at the beginning of the 1970s. Industrial decay was perceived then as a loss in the number of manufacturing jobs but not necessarily in manufacturing output or share in GDP. Singh's analysis compared the UK with other western powers (as Kaldor had done ten years before), and even when most of the countries mentioned in his study had lost manufacturing size, UK had suffered from the largest decline. Regardless the causes of the decay, deindustrialisation was regarded by the author as bad economic performance because of competitiveness loss both in domestic as in global markets (Singh 1977: 134).

In the 1970s and 1980s, deindustrialisation trends started to grow bigger especially in Europe and USA, where not only manufacturing employment was in decline (in number of jobs and as a share of total employment), but also the manufacturing value added in terms of GDP. Except for some countries in Asia, many once industrial powerhouses began to register this double decline. However, as income per capita levels continued to grow in these countries, deindustrialisation was not perceived necessarily as a problem.

Because of the mentioned deindustrialisation dynamic (where the manufacturing shares fall but income keeps increasing), Rowthorn and Wells introduced the idea of "positive de-industrialisation" (1987: 5). This characterisation could, initially, pose some challenges to LAS and Kaldorian approaches regarding the positive link these schools claim between manufacturing and economic growth. Positive deindustrialisation occurs when high productivity in manufacturing displaces employment to other sectors as services (without increasing unemployment rate) even when the manufacturing output is growing. The authors contend that this could only happen in countries with full employment where economic growth is sustained, in other words, a developed economy. On the other extreme, according to the same authors, there is "negative de-industrialisation" (1987: 6) where, regardless the development status of a country, manufacturing employment declines either for lower output or lower productivity levels. This would be the case, according to the authors, where unemployment rises as a consequence of a bad economic performance. These two theoretical categories are, of course, opposite to each other and between them there are many cases in the middle. Where does Latin America stand between those extremes from the early 2000s? A quick look at unemployment rates, income per capita and sector shares would say that the region found itself closer to what Rowthorn and Wells called "positive deindustrialization". However, is there such thing as a *positive deindustrialisation* for developing countries?

From a Kaldorian approach there is, nevertheless, economic maturity. In the seminal speech by Kaldor in 1966 about manufacturing as the engine of growth, he described the transition from economic "immaturity" to "maturity" as the shift from primary to secondary activities. In other words, the transfer of employment and output from agriculture (or mining) to industry. The concept of "maturity", economically speaking, has switched over time. Closer to our days we could argue that mature economies are no longer the ones that transfer employment from primary to secondary sectors, but the ones that made the shift from secondary to high-productivity tertiary activities.

For Kaldor, maturity meant that "real income per head has reached broadly the same level in the different sectors of the economy" (1966:3) which in LAS' view can be considered as a balanced productive structure. However, in Rowthorn and wells' perspective, maturity is beyond a balanced productive structure (especially regarding employment) and is a case of positive deindustrialisation. In this sense, when tertiary sector surpasses the secondary one, an economy has reached "maturity".[13]

[13]Rowthorn and Wells' idea about positive deindustrialization is very much associated to Kaldor's concept of "premature maturity" (1966: 4). Kaldor argues that because UK had achieved higher industrialization levels before than any other country, it got harder to keep increasing manufacturing employment rates.

Rowthron (cited in Palma 2005: 75) reinforced the idea about a positive deindustrialisation. In the light of the post-industrial society, deindustrialisation understood as a falling share of manufacturing output was, somehow, a mature economy's characteristic, a developed country's trait. In other words, it was a not necessarily detrimental to economic development. To clear this point, Rowthorn conceived an inverted-U shape relationship between manufacturing employment as the share of total employment and income per capita. As income per capita grows, manufacturing employment also increases. After the turning point of the inverted-U line, income per capita continues to grow, but now with a lower share of manufacturing employment[14]. As a corollary, in a modern and mature economy, while income per capita keeps growing, a shrinking manufacturing employment share is not necessarily a concern.

In a series of articles, Palma (2005, 2008, 2014) updated Rowthorn's original inverted-U shape hypothesis between manufacturing employment share and income per capita until the year 2000. The author ran five cross-section regressions between manufacturing employment and income per capita for 105 countries. Each regression belongs to a decade: the 1960s, the 1970s, the 1980s, the 1990s, and the last one for the year 2000. His results not only show the inverted-U relationship between those two variables (Rowthorn's stylized fact) in each period but also how the turning point in that relationship is declining. This is, deindustrialisation in manufacturing employment have been hitting countries at a lower income per capita level each decade. This manufacturing dynamics later coined the term "premature deindustrialisation"[15] (Dasgupta and Singh 2006: 8).

Premature deindustrialisation has a negative connotation and depicts how deindustrialisation begins even when an economy has not reached an advanced country income per capita status. This approach, however, conveys a problem in itself because the income per capita level where deindustrialisation starts is an average of many different countries, different industrial experiences and different pathways for achieving economic maturity. Countries with different characteristics and productive structures would exhibit, at least, different

[14] In Rowthorn's hypothesis it is assumed that tertiary sector (mainly services) absorbs former manufacturing jobs and unemployment doesn't increase.

[15] Palma also refer to this as "downward deindustrialization" (2005: 92).

deindustrialisation starting and turning points in terms of income per capita. In this sense, comparing the income per capita of Brazil with Germany or China may not be suitable for understanding the phenomenon in Latin America.

In the light of this inverted-U relationship between manufacturing share and income per capita, we could interpret from a strictly Kaldorian approach that before the turning point, manufacturing is in fact "the engine of growth". Manufacturing employment grows, and also income does. However, once the tipping point is reached, economies are no longer pulled by manufacturing. Income level continues to grow but no longer because of manufacturing as the main driver. At least, that is the most straightforward interpretation of the inverted-u shape logic between any variable and economic growth.

Many authors followed Rowthorn and Wells, and Palma's inverted-U shape hypothesis. Amongst the most important ones, Felipe et al. (2014), using a bigger sample until the year 2010, ran similar regressions to assess deindustrialisation starting point. Differently from predecessors, these authors introduce manufacturing value-added share of total GDP also for testing whether the inverted-U hypothesis is also noticed in this variable or if it is only in manufacturing employment. Results with the value-added share are similar to the ones with the manufacturing employment share in the sense that the relationship outcome also depicts an inverted-u shape curve. However, the authors present an interesting conclusion not always underline in this literature. After testing manufacturing peak shares and levels of income per capita, the authors conclude that "there is a strong positive relationship between the maximum manufacturing employment share that an economy achieved in the last 40 years and its per capita GDP today" (Felipe et al. 2014:5). While their sample includes countries such as Argentina, Brazil, and Mexico, it is not clear that this relationship holds particularly for the region or if Latin America is, once again, lost in the world average. Most Latin American countries peaked their manufacturing employment shares, on average, 30 or 40 years ago but their income per capita still is far from mature economies' incomes. This lead to the question if manufacturing peak in Latin America is (using the authors' words) a good predictor of prosperity, particularly, after decades of deindustrialisation.

One of the latest economists who addressed the issue of deindustrialisation is Dani Rodrik, who also poses deindustrialisation as a mature economy's attribute. He mentions deindustrialisation as the "common fate for countries that are growing" (Rodrik 2015: 12). Describing premature deindustrialisation in a very drastic way, Rodrik mentions that "countries are running out of industrialisation opportunities sooner and at much lower levels of income compared to the experience of early industrialisers" (Rodrik 2015: 1). According to Rodrik's panel-data regressions, premature deindustrialisation in Latin America is getting worst decade by decade. The manufacturing share of total employment, as well as the manufacturing value-added share in total GDP, shrank at a higher rate than in other regions. In the same study, the author shows that in the 2000-2012 period the region exhibited the worst performance ever along the last 60 years and all over the world.

All the studies mentioned above depict a non-linear relationship between economic growth (whether GDP or GDP per capita) and the share of manufacturing. Results usually coming from fixed effects models portray an inverted-u relationship between these two variables and show that there is a turning point where, while income keeps increasing, the share of manufacturing starts to fall. That point is later benchmarked, and it is used for telling whether a country is premature or not.

An inverted-u shape line between industrialisation and growth, like the one presented above by such different economists, such as Palma and Rodrik, brings many doubts about how to interpret results coming from this analysis. First of all, the share of manufacturing employment may not be the best indicator to understand deindustrialisation or even to contend that a country has been deindustrialising. From both Kaldorian and LAS approaches it is expected a declining share of manufacturing employment along with economic growth. Once manufacturing already has absorbed labour force from primary sectors, leading to an increase in economy-wide productivity, further increases in manufacturing productivity would lead to a declining manufacturing share. Under these theoretical frameworks, manufacturing productivity increases necessarily delivers a lower share of manufacturing employment. An increasing share of manufacturing employment, under this conditions, would lower productivity, which would kill the growth-enhancing properties of industrialisation.

An inverted-U shape, in manufacturing employment or value-added share was an outcome predicted by both Kaldor and LAS. Label this phenomenon as *deindustrialisation* may illustrate a statistical reallocation of manufacturing employment and output (and hence productivities), but tell little about the link with economic growth. It is true, however, that premature deindustrialisation may indeed imply a problem for Latin America. Reducing the share of high-productivity economic activities before reaching certain level of income per capita could act as a break for growth.

All the studies revisited about deindustrialisation or premature deindustrialisation, however, seem to omit (or at least not explicitly argue) the changes in the global manufacturing process. As Baldwin (2011) points out, manufacturing in the 1970s is quite different from the one in 2000s. Far from being a single commodity entirely designed and produced by a local factory, off-shoring industrialisation has been taking the command of the manufacturing process increasingly since the mid-1980s, which poses a new dimension for the analysis of industrialisation and economic growth.

3.2 Deindustrialization *versus* peripheral industrialisation

The recent and vast evidence about deindustrialisation and premature deindustrialisation in Latin America lead to think not only on its causes but, especially in the context on this paper, why it is apparently delinked from economic growth. Understanding the phenomenon implies going beyond the mere analysis of shares, levels and turning points. It is also needed to include in the analysis the changes in the nature of manufacturing and the role played by Latin American countries in the global production networks during the last decades.

A mainstream view disputes Structuralism regarding how to understand this phenomenon. The first one argues that from the mid-1980s and especially during the 1990s there has been a paradigm shift regarding industrialisation given by a new globalisation era and some developing countries could not just adapt to the opportunities this change had brought (Baldwin 2011: 10). The new paradigm, and the new form of industrialisation is imposed by the Global Value Chains (GVC) logic. In this line of thought, industrialisation failures are given by an ever deeper fragmentation of the production stages along with higher levels of specialisation (in inputs) than three or four decades before. Deindustrialization, in this sense, is due to the difficulties developing countries face in successfully joining an international supply chain. Industrialization failures, therefore, are because manufacturing is stuck in a vertically-integrated Fordist-type firm, making it impossible to join a GVC successfully. Baldwin refers to this new era as "globalisation's 2^{nd} unbundling", where the main characteristic is no longer the reduction of transport costs (as in the 1st globalisation), but the information and communication technology (ICT) revolution, allowing to split the different stages of production successfully (2011: 21). Thanks to this new unbundling, the main transference is no longer about physical goods bringing distant countries closer, but the managerial, design, production organisation and R&D know-how coming from headquarters to offshored factories. From a neoclassical perspective, this would follow the doctrine of comparative advantages and would locate labour-intensive production (factories) where is abundant and cheap, while intellectual labour is located in the headquarters. In fact, for this approach, industrialisation no longer drives economic growth because now manufacturing (and particularly exporting manufactured goods) is no longer the sign of "having arrived" as it happened with late-industrializers like South Korea or Japan (Baldwin 2011: 10). On the contrary, manufacturing in the last decades only shows in which stage of the supply chain any country is inserted. In this sense, Baldwin also argues that manufacturing became easier than in the past but, at the same time, that is the reason why is no longer important in terms of growth and development (2011: 10).

This view on GVCs portrays, however, the idea of a country successfully (and autonomously) picking in which stage of the supply chain wants to be inserted. Building an industry is harder than joining a supply chain (Baldwin 2011: 6), therefore, the problem for policymakers is no longer where to find demand for their final goods, but which GVC to join. This approach also lead to believe that once the country is specialized in one particular segment of the GVC, it could later upgrade to higher stages, technologically more advanced, enhancing industrial development and economic growth.

From a Structuralist point of view, the changing nature of manufacturing is rooted in the functioning of a world system where there is still a hegemonic centre and a periphery. Far from being a paradigm shift, it is a new manifestation of the classic peripheral problems in terms of development vulnerabilities and technological lagging as in the global system described by Prebisch seventy years ago (Fischer 2015: 704). And, as in Prebisch, one of the main peripheral problems is more present than ever: productivity gains from technological progress are still accrued to the centres. In this sense, the role of Latin America in GVCs is just a new phase of an ongoing peripherical industrialisation where still persists a technological lagging and a transmuted subordination to the centres (Fischer 2015: 726).

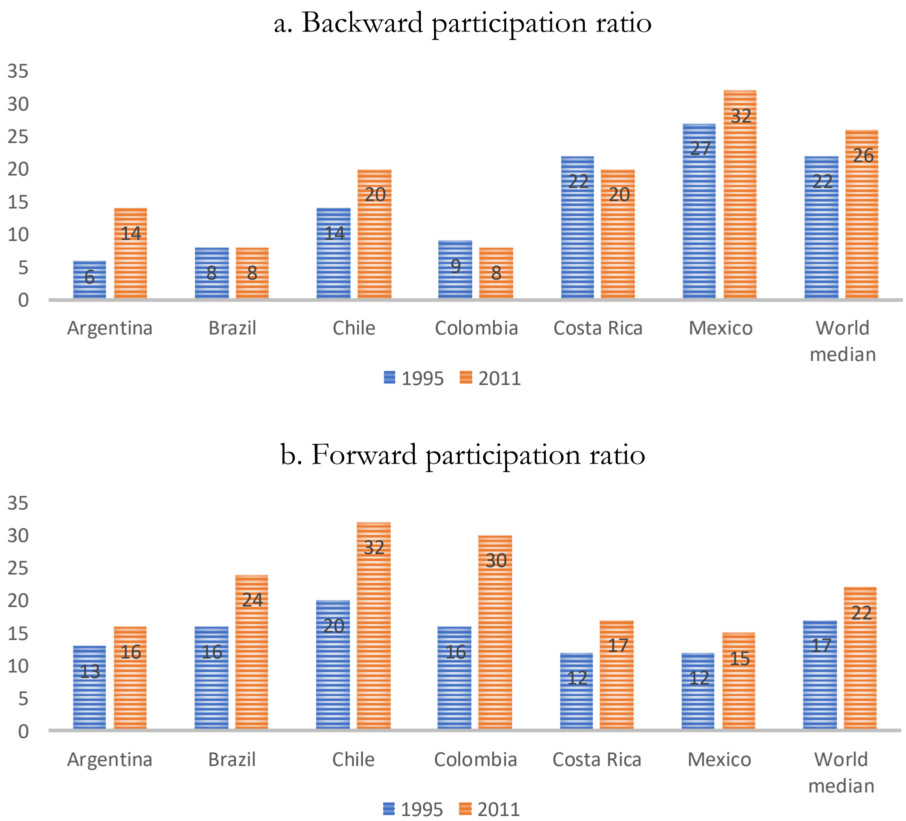
Far from romanticising GVCs as the new alternative for (re)industrialisation where countries can freely pick the production segments they want to join, Structuralism contends this transmutation is based on a hierarchical power-based relation which allocates developing countries (the periphery) in the lower segments of the production stages (Barcena 2014: 11). In this sense, Fischer argues that the only countries that successfully upgraded their position in GVCs and became centres are some of the Asian late-industrialisers as South Korea or Taiwan (2015: 712). It would not be the case of China given that, depending on the industry, still is considered to be in lower stages within the GVCs, but compensating with scale gains rather than thru mark-ups (Fischer 2015: 711).

Latin America's participation in GVCs during the 2000s, according to recent studies by the OECD (Cadestin et al. 2016), has been increasing although still is lower than in other developing regions of the world. In OECD's analysis, a county's insertion in GVCs is measured by two ways. First, the share of foreign value included in its own gross exports (*backward GVC participation ratio*). Second, for the share of its own exports' value-added contained in its trade partners' exports (*forward GVC participation ratio*). Figure 8 shows the change from 1995 to 2011 in both ratios for the six Latin American countries included in our sample.

The first thing to notice about this evolution is the increase, on average, in both the backward (panel a) and the backward (panel b) participation ratios from 1995 to 2011. Secondly, according to the data available, the insertion of Latin American countries in GVCs is rather dissimilar. When both ratios are added, countries like Chile and Mexico exhibit a higher participation than the world median in GVCs. On the contrary Argentina, Colombia and Brazil, show a smaller insertion than the world median. Costa Rica, is the only country that has not increased its participation as much as the others, and while the country's sum of ratios was relatively high in 1995, in 2011 it took some distance from the world median. Thirdly, the forward ratios tend to be higher than the backward ones (except for Costa Rica and Mexico). This, initially, could represent a positive sign given that is bigger the value-added contained in a trade partner's goods than the other way around. However, according to OECD, most of the value-added is concentrated in natural resource-based inputs (Cadestin et al. 2016: 4).

Figure 8. Global Value Chains participation ratios

Share of total gross exports



Source: author's elaboration based on Cadestin et al. (2016).
The world median includes 62 countries.

Even in the cases where it is clear how to interpret these ratios, there are still some doubts about what is desirable for a country regarding economic growth and development. For example, a high backward ratio might indicate that a country imports a high share of what later is contained in its exports. The case of Mexico's *maquiladoras* would fit this description, where not only the backward ratio is high, but the forward is low as a sign of the low value-added included in their exports. Although not reported in the graph, China registers the same backward ratio as Mexico. This is, in 2011, the share of foreign value-added in both countries' total exports accounted for 32%. At the same time, as the OECD mentions, the case of Chile showing a high forward ratio is just a sign of all the cooper the country exports (Cadestin et al. 2016: 13). Therefore, it is not so much about the size of the ratios but what is inside them.

For a better understanding of the role of manufacturing in the GVCs framework, a detailed analysis of the different sectors is shown in Figure 9. Instead of reporting backward and forward ratios, which can lead to wrong interpretations, out of the same database we built the share of foreign valued added embedded in the gross exports by sector[16].

Among the countries with the higher share of foreign value-added, Mexico reports the highest, followed by Costa Rica. This was already shown in the forward ratio graph. However, that ratio included all type of exports, not only manufactured ones.

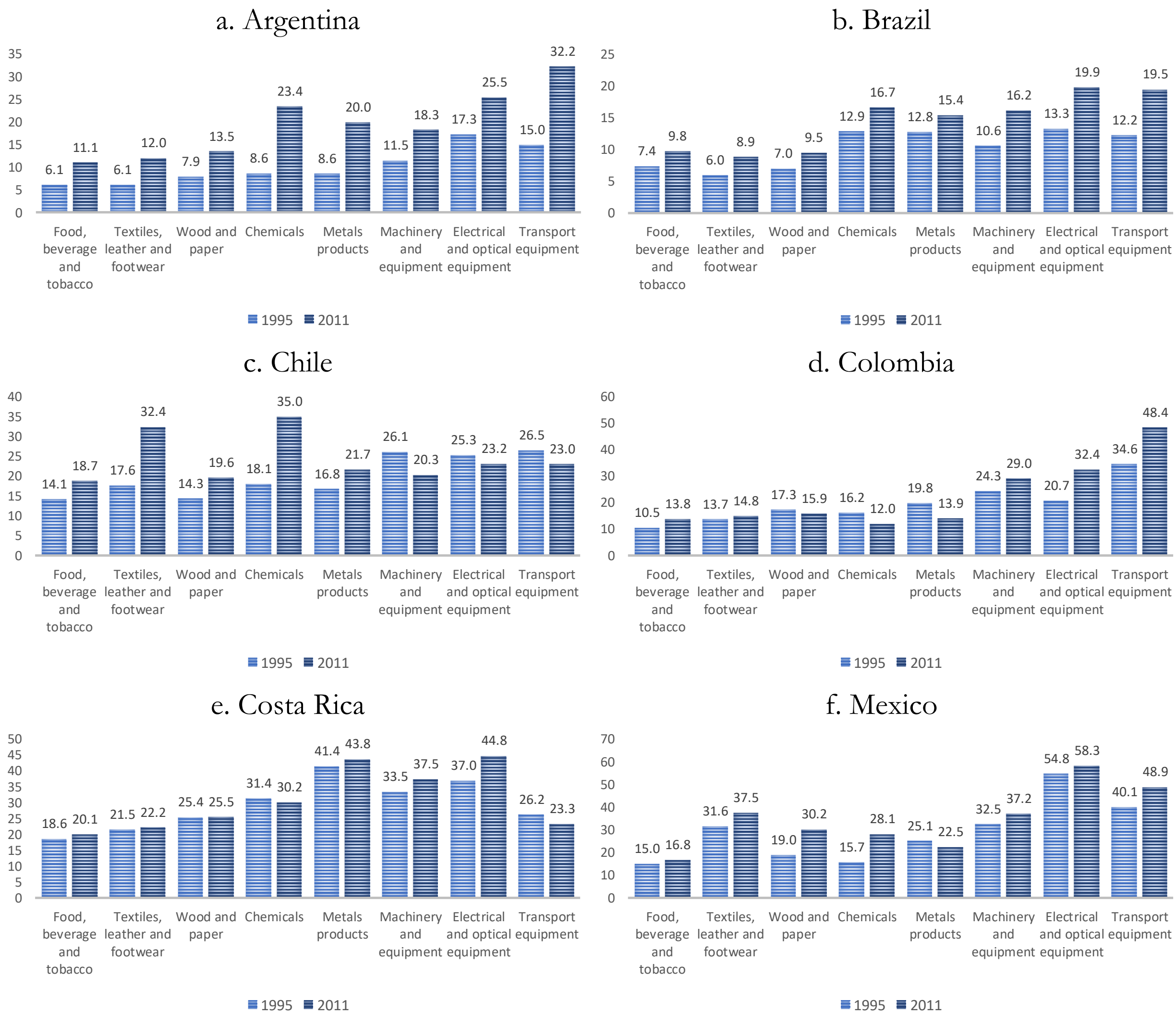
Within manufacturing, certain sectors like electrical and optical equipment or transport equipment, show a high share of foreign value-added in all countries. On the contrary, as expected, food, beverages and tobacco report, also in all countries, a low share. On average, in the most technologically advanced sectors the increases in the value-added share was bigger than in less technological sophisticated sectors. However, between 1995 and 2011, the foreign value-added embedded in gross exports increased in almost all countries and in almost all manufacturing sectors.

Manufactured exports can give us an indication of the type of industrialisation the region is building. Barbosa and Jenkins (cited in Fischer 2015: 713) posed the idea of a hollowed industry, where Latin American countries are positioning in assembly type industries following the *maquiladoras* example in Mexico.

[16] In Figure A.1 in the Annex we show the shares of domestic value added embodied in foreign exports as share of gross exports by sector, which are considerably lower than the shares reported in Figure 9 for all countries and in all sectors.

Challenging the concept of deindustrialisation for Latin America, Storm also mentions the idea of a hollowed industry by arguing instead a "drastic intra-industry restructuring" oriented towards natural resources-based processing industries and assembly manufacturing (2015: 668).

Figure 9. Foreign value-added share of manufactured gross exports by sector
in %



Source: author's calculations based Trade in Value Added (TiVA) database. http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1. Accessed on November 5th, 2017

In the same line as Storm, Palma also considers that this kind of industries has acted as a "poor engine of growth" (2010: 35) in Latin America. Far from being a new problem, he contends that manufacturing, and particularly manufactured exports, has never played a significant role in the region, not because of how much but, precisely, what kind of goods countries have been exporting (2010: 32).

Chapter 4: Conclusion

This research paper aimed to understand the link between industrialisation and growth in Latin American countries during the first decade of the 21st century. The study echoed recent analyses reaffirming, both conceptually and quantitively, not only the idea of manufacturing as an engine of growth but also deindustrialisation as a problem for developing countries, precisely, because of its economic growth implications.

We addressed, then, the question of the apparent decoupling between manufacturing and economic growth, given the historically low manufacturing shares (in value added and employment) many countries in Latin America registered from the early 2000s, along with relatively high growth rates during the same period.

For such endeavour, Structuralist and Post-Keynesian theoretical approaches were useful for framing and underpinning the analysis. Both schools of thought contend manufacturing as a critical sector for fostering growth and development in a country, mainly because of the manufacturing growth-enhancing properties regarding productivity, employment and, therefore, structural change.

Descriptive statistics confirmed the major trends regarding the falling manufacturing shares (in value added and employment), although the trend is quite irregular between the countries in the sample. However, there is not a single country in the 2000s showing a higher share that in the past, given that manufacturing peaked, for most of the region, during the 1970s.

At the same time, data showed that while the manufacturing shares were falling, the growth rates in manufacturing in all countries kept increasing, and in some cases even faster than in previous periods. This dynamic of shares falling and absolute values increasing brought doubts about the allegedly delink we are focusing on, and regarding characterise the phenomenon as deindustrialisation.

To shed some light on this issue, we estimated fixed effects models to test the statistical regularity proposed by Kaldor in 1966, and followed by many others, commonly known as "Kaldor's first law". We run three basic specifications originally presented by Kaldor underpinning the importance of manufacturing growth in the economic growth process. Differently from Kaldor's original specifications, the models included time interaction dummies to test whether or not the link between manufacturing and economic growth was less strong in the 2000s, as it was stated in our research question. Results confirmed the long-term statistical regularity since the 1970s, but no statistically relevant difference in the last period. Only in an OLS time-series regression for Brazil the interaction dummy for the period 2003-2011 showed a negative sign and statistical significance in all three specifications. Chile, Colombia and Costa Rica, reported statistically significant negative coefficients in at least one of the three models.

A second part of the quantitative analysis consisted in understanding the relationship between productivity and structural change. We decomposed economywide productivity following a method introduced by McMillan and Rodrik (2011) to test the role of a declining share of manufacturing in total productivity during the 2000s. Results showed that the structural change component accounted for an insignificant amount of economy-wide productivity growth. Thus, productivity increases were given almost exclusively for the within component in some sectors, and there were few or no signs of productivity irradiation to the rest of the economy. In countries like Chile and Costa Rica, the structural change component registered, although small, a negative contribution. As it was also showed in the analysis, far from being a new phenomenon, insignificant or even negative structural change has been a part of Latin America productivity trend since the 1970s.

Closing the quantitative chapter, we estimated the external technological gap proxied by the relative productivity between the countries in our sample and the productivity frontier (here represented by the United States). While manufacturing gap remained stagnant, and in low levels (between 15% and 35% of US productivity) since the 1970s, economywide productivity gap widened, confirming the negative structural change performance, not only internal but also external, in all six countries.

Quantitative analysis proved to be insufficient for answering the research question. The link between manufacturing and economic growth, according to our estimations did not show any particular change during the 2000s, although some countries reported a weaker relationship individually. Structural change played a negative role, but not so different from other periods in the past. Finally, the manufacturing technological gap remained stable for the last four decades, but could not prevent the sustained decline since the 1970s in the economywide productivity gap.

Given this non-conclusive quantitative results, in the light of the question and objectives of this study, we addressed the debate about deindustrialisation from a conceptual point of view. We echoed recent analysis alerting about the negative implications of deindustrialisation on economic growth.

Most of the evidence presented by relevant economists suggests deindustrialisation, and particularly premature deindustrialisation, as a danger, especially for developing countries. However, all the studies revisited showed an emphasis in the analysis of the shares trying to find an empirical and conceptual relationship with economic growth. These studies depict deindustrialisation as an inverted-u shape relation between the share of manufacturing employment (mainly) and value added and the GDP per capita. This non-linear relationship can be found through different periods of time since the 1960s until the 2000s, and that is why some authors argue about the ongoing problem of deindustrialisation. In these analyses, Latin America is portrayed as one of the worst cases of deindustrialisation given the sustained decline in the shares. Among the causes for this behaviour, studies usually stressed outsourcing of low and high skill manufacturing jobs reclassified now as services, self-inflicted deindustrialisation policies (fostering sectors with static returns or based on static comparative advantages), or even dutch-disease (Palma 2005).

However, what is missing in most of these analysis (or at least not presented as a major determinant of deindustrialisation) are the changes in the nature of the manufacturing process started globally in the mid-1980s and hitting Latin America (literally and metaphorically) especially in the 1990s with the arriving of the Washington Consensus policies.

While the manufacturing process always has included (inside or outside headquarters) R&D, design, marketing and related high value-added activities, the gap between those and the actual assembly process widened dramatically since the 1970s (Hallward-Driemeier and Nayyar 2017). In other words, the distance between the core and non-core stages in the manufacturing process not only has increased geographically but also regarding the value contained in the commodity. This changing nature was possible thanks to the ICT revolution, which reinforced the international supply chains also known as GVCs.

According to the literature revisited for this paper (Hernández et al. 2014, Cadestin et al. 2016), since the 1990s, the Latin American region increased their involvement in the GVCs. By 2011, GVCs indicators presented in Chapter 3 showed a participation higher than the world median for countries like Chile, Costa Rica and Mexico, and smaller for the rest of the sample. The position of the region, however, is allocated in the lower stage of the GPNs: unprocessed primary exports and exports of manufactured goods with a high share of foreign value added.

Regarding manufacturing, specifically, another manifestation of this downgraded insertion is the increasing share of foreign value added in the Latin American countries' exports. This share is low in natural resource-based manufactured goods like food, textiles, wood and chemicals, but is particularly high in the most technologically advanced sectors within manufacturing like electrical and optical equipment, machinery and transport. The high (and increasing since the 1990s) share of foreign value added in sophisticated exports seems to be a regularity not only in Mexico's *maquiladoras* but it is present in all the countries from our sample.

This type of insertion within GVCs poses a serious challenge regarding economic growth. Specializing in low value-added stages of the production process not only may delink manufacturing from economic growth but also lock the country in a segment from which would be difficult to upgrade given the power-based relationships the GVCs are built on. GVCs are not called 'chains' for nothing.

Far from representing a paradigm shift (Baldwin 2011), or a new phenomenon (Blinder 2006), the manufacturing changing nature can be understood under the Structuralism lens. According to Fischer (2015), Prebisch's centre-periphery approach is still valid to recognise the changing nature of manufacturing. Given that technological and industrial lagging cannot be fully understood without taking into account the transforming nature of the centres to accrue productivity gains from the peripheries (Fischer 2015: 726).

Voices claiming the end of manufacturing as a determinant for economic growth, as a synonym for deindustrialisation, should consider, instead, referring as a new phase of peripherical industrialisation where, as in the past, benefits from technical progress are captured by the developed world, as Prebisch predicted 70 years ago. Not taking into account this dynamic is missing the point we refer in the title of this study.

The link between manufacturing and economic growth, therefore, is not necessarily broken in Latin America. However, recent changes in the industrialisation process may continue decoupling manufacturing from GDP growth if the countries within the region do not upgrade their positions within GVCs. Of course, this is not an easy task and only a few countries (mainly in Asia) were able to achieve it successfully. The rest of the developing world (and particularly Latin America) is still being, somehow, locked by the chains of peripherical industrialisation.

Industrialization is now more difficult to achieve than before, and not the other way around as Baldwin (2011) argues. At least if we consider an industrialisation triggering economic growth and positive structural change, or in other words, manufacturing as the engine of growth.

References

Amsden, A.H. (2001) *The Rise of "the Rest": Challenges to the West from Late-Industrializing Economies*. Oxford: Oxford University Press.

Baldwin, R. (2011) 'Trade and Industrialisation After Globalisation's 2nd Unbundling: How Building and Joining A Supply Chain are Different and Why it Matters', NBER working papers, No. w17716.

Barcena, A. (2014) 'Foreword', in R.A. Hernandez, J.M. Martinez and N. Mulder (eds) *Global Value Chains and World Trade. Prospects and Challenges for Latin America.* pp. 11-14. Santiago: Economic Commission for Latin America and the Caribbean (ECLAC).

Blinder, A.S. (2006) 'Offshoring: The Next Industrial Revolution?'*, Foreign Affairs* 85(2): 113-128.

Cadestin, C., J. Gourdon and P. Kowalski (2016) 'Participation in Global Value Chains in Latin America', OECD Trade Policy Papers, No. 192. Paris: OECD publishing.

Cairncross, A. (1978) 'What is De-Industrialisation?', in F. Blackaby (ed.) *De-Industrialisation,* pp. 5-17. London: Heinemann Educational Books.

Chang, H.J. (2008) *Bad Samaritans : The Myth of Free Trade and the Secret History of Capitalism.* New York, NY : Bloomsbury Press,.

Chang, H.J. (2002) *Kicking Away the Ladder. Development Strategy in Historical Perspective.* London: Anthem Press.

Cimoli, M. and N. Correa (2005) 'Trade Openness and Technology Gaps in Latin America: A "low-Growth Trap', in J. A. Ocampo (ed.) *Beyond Reforms. Structural Dynamics and Macroeconomic Vulnerability,* pp. 45-70. Washington: Stanford University Press.

Cimoli, M. and J. Porcile (2016) 'Latin American Structuralism: The Co- Evolution of Technology, Structural Change and Economic Growth', in E. Reinert, J. Ghosh and R. Kattel (eds) *Handbook of Alternative Theories of Economic Development,* pp. 228-239. Cheltenham, UK: Edward Elgar Publishing.

Dasgupta, S. and A. Singh (2006) 'Manufacturing, Services and Premature De-Industrialisation in Developing Countries: A Kaldorian Empirical Analysis', CBR Research Programme on Enterprise and Innovation, No. 327Centre for Business Research University Of Cambridge.

Diao, X., M. McMillan and D. Rodrik (2017) 'The Recent Growth Boom in Developing Economies: A Structural Change Perspective', NBER working papers, No. w23132National Bureau of Economic Research.

Economic Commission for Latin America and the Caribbean (ECLAC) (2012) *Structural Change for Equality: An Integrated Approach to Development. Thirty-Four Session of ECLAC.* CEPAL: Naciones Unidas Comisión Económica para América Latina y el Caribe.

Economic Commission for Latin America and the Caribbean (ECLAC) (2011) *Economic Survey of Latin America and the Caribbean 2010-2011: International Integration and Macroeconomic Policy Challenges Amid Global Economic Turmoil.* Santiago de Chile: United Nations.

Economic Commission for Latin America and the Caribbean (ECLAC) (2010) 'Time for Equality. Closing Gaps, Opening Trails', No. LC/G.2432(SES.33/3). Santiago: United Nations.

Felipe, J. (2009) *Inclusive Growth, Full Employment and Structural Change. Implications and Policies for Developing Asia.* London: Anthem Press.

Felipe, J., M. León-Ledesma, M. Lanzafame and G. Estrada (2007) 'Sectoral Engines of Growth in Developing Asia: Stylized Facts and Implications', ERD Working Paper No. 107. Manila: Asian Development Bank.

Felipe, J. (1998) 'The Role of the Manufacturing Sector in Southeast Asian Development: A Test of Kaldor's First Law', *Journal of Post Keynesian Economics* 20(3): 463-485.

Felipe, J. and J.S.L. McCombie (2013) *The Aggregate Production Function and the Measurement of Technical Change.* Edward Elgar Publishing.

Felipe, J., A. Mehta and C. Rhee (2014) 'Manufacturing Matters...but It's the Jobs that Count', ADB Economic working papers, No. 420. Manila: Asian Development Bank.

Fischer, A.M. (2015) 'The End of Peripheries? on the Enduring Relevance of Structuralism for Understanding Contemporary Global Development', *Development and Change* 46(4): 700.

Fischer, A.M. (2011) 'Beware the Fallacy of Productivity Reductionism', *The European Journal of Development Research* 23(4): 521-526.

Grigera, J. (2012) 'Deindustrialisation as an Argentinean Peculiarity', *Revista de Estudios Marítimos y Sociales* (5): 185-195.

Hallward-Driemeier, M. and G. Nayyar (2017) *Trouble in the Making? the Future of Manufacturing-Led Development.* Washington, DC: World Bank.

Hernández, R.A., J.M. Martínez and N. Mulder (eds) (2014) *Global Value Chains and World Trade: Prospects and Challenges for Latin America.* Santiago: Economic Commission for Latin America and the Caribbean (ECLAC).

Hobday, M. (2013) 'Learning from Asia's Success: Beyond Simplistic 'Lesson-Making'', in A. Szirmai, W. Naudé and L. Alcorta (eds) *Pathways to Industrialization in the Twenty-First Century,* pp. 131-154. Oxford: Oxford University Press.

Kaldor, N. (1966) *Causes of the Slow Rate of Economic Growth of the United Kingdom: An Inaugural Lecture.* Cambridge University Press.

Kaldor, N. (1967) *Strategic Factors in Economic Development.* Ithaca : New York State School of Industrial and Labor Relations, Cornell University,.

Kregel, J. (2016) 'The Effective Demand Approach to Economic Development', in E. Reinert, J. Ghosh and R. Kattel (eds) *Handbook of Alternative Theories of Economic Development,* pp. 504-518. Cheltenham, UK: Edward Elgar Publishing.

Mankiw, N.G., D. Romer and D.N. Weil (1992) 'A Contribution to the Empirics of Economic Growth'*, The Quarterly Journal of Economics* 107(2): 407-437.

Mathews, J. (2016) 'Latecomer Industrialization', in E. Reinert, J. Ghosh and R. Kattel (eds) *Handbook of Alternative Theories of Economic Development,* Cheltenham, UK: Edward Elgar Publishing.

McCombie, J.S.L. and A.P. Thirlwall (1994) *Economic Growth and the Balance-of-Payments Constraint.* New York: St. Martin's Press.

McMillan, M.S. and D. Rodrik (2011) 'Globalization, Structural Change and Productivity Growth', NBER working papers, No. w17143. National Bureau of Economic Research.

Palma, J.G., 2014. De-Industrialization, 'Premature' De-Industrialization and the Dutch-Disease. *Revista NECAT,* **3**(5), pp. 7-23.

Palma, J.G. (2008) 'Deindustrialisation, Premature Deindustrialisation, and the Dutch Disease', in L.E. Blume and S.N. Durlauf (eds) *The New Palgrave: A Dictionary of Economics,* (2nd. edn). pp. 401-410. Basingstoke: Palgrave Macmillan.

Palma, J.G. (2005) 'Four Sources of 'de- Industrialisation' and a New Concept of the "Dutch Disease"', in J. A. Ocampo (ed.) *Beyond Reforms: Structural Dynamics and Macroeconomic Vulnerability,* pp. 71-116. New York: Stanford University Press and World Bank.

Palma, J.G. (2010) 'Why has Productivity Growth Stagnated in most Latin-American Countries since the Neo-Liberal Reforms?'. Cambridge Working Papers in Economics No.1030: University of Cambridge.

Pinto, A. (1970) 'Nature and Implications of the "structural Heterogeneity" of Latin America'*, El trimestre económico* 37(1). Reprinted in Bielschowsky, R. (comp.) *ECLAC Thinking, Selected Texts (1948-1998).* UN (2016)

Rodrik, D. (2007) 'Industrial Development: Some Stylized Facts and Policy Directions', 'Industrial Development: Some Stylized Facts and Policy Directions', *Industrial Development for the 21 St Century: Sustainable Development Perspectives,* pp. 7-28. New York: Department of Economic and Social Affairs, United Nations.

Rodrik, D. (2015) 'Premature Deindustrialization', *IAS Economic working papers* No. 107.

Rodrik, D. (2013) 'Unconditional Convergence in Manufacturing', *The Quarterly Journal of Economics* 128(1): 165-204.

Rowthorn, R.E. and J.R. Wells (1987) *De-Industrialization and Foreign Trade.* Cambridge: Cambridge University Press.

Singh, A. (1977) 'UK Industry and the World Economy: A Case of De-Industrialisation?', *Cambridge Journal of Economics* 1(2): 113-136.

Solow, R.M. (1956) 'A Contribution to the Theory of Economic Growth', *The Quarterly Journal of Economics* 70(1): 65-94.

Storm, S. (2015) 'Structural Change', *Development and Change* 46(4): 666-699.

Szirmai, A. (2013) 'Manufacturing and Economic Development', in A. Szirmai, W. Naudé and L. Alcorta (eds) *Pathways to Industrialization in the Twenty-First Century. New Challenges and Emerging Paradigms,* pp. 53-75. Oxford: Oxford University Press.

Szirmai, A., W. Naudé and L. Alcorta (eds) (2013) *Pathways to Industrialization in the Twenty-First Century: New Challenges and Emerging Paradigms.* Oxford: Oxford University Press.

Szirmai, A. and B. Verspagen (2015) 'Manufacturing and Economic Growth in Developing Countries, 1950–2005', *Structural Change and Economic Dynamics* 34(C): 46-59.

Thirlwall, A.P. (2015) 'A Plain Man's Guide to Kaldor's Growth Laws', in A.P. Thirlwall (ed.) *Essays on Keynesian and Kaldorian Economics,* pp. 326-338. Hampshire: Palgrave Macmillan.

Thirlwall, A. (1979) 'The Balance of Payments Constraint as an Explanation of International Growth Rate Differences', *BNL Quarterly Review* 32(128): 45-53.

Timmer, M. P., de Vries, G. J., & de Vries, K. (2015) 'Patterns of Structural Change in Developing Countries', in J. Weiss and M. Tribe (eds) *Routledge Handbook of Industry and Development.* pp. 65-83. New York: Routledge.

Timmer, M.P. and G.J.d. Vries (2009) 'Structural Change and Growth Accelerations in Asia and Latin America: A New Sectoral Data Set', *Cliometrica, Journal of Historical Economics and Econometric History* 3(2): 165-190.

Tregenna, F. (2016) 'Deindustrialization and Premature Deindustrialization', in E. Reinert, J. Ghosh and R. Kattel (eds) *Handbook of Alternative Theories of Economic Development,* pp. 710-728. Cheltenham, UK: Edward Elgar Publishing.

United Nations (UN) (2015) 'Transforming our World: The 2030 Agenda for Sustainable Development', No. A/RES/70/1. United Nations.

United Nations Conference on Trade and Development (2016) 'Trade and Development Report, 2016'. Geneva: United Nations.

United Nations (UN) (1949) 'Economic Survey for Latin America 1948', No. E/CN.12/89. Santiago: United Nations Publications. Reprinted in Bielschowsky, R. (comp.) *ECLAC Thinking, Selected Texts (1948-1998).* UN (2016).

United Nations Industrial Development Organization (UNIDO) (2013) 'Industrial Development Report'. Vienna, Austria: United Nations

Vera, L. (2013) 'Some Useful Concepts for Development Economics in the Tradition of Latin American Structuralism.'*, The American journal of economics and sociology* 72(4): 917-948.

Weiss, J. and H. Jalilian (2016) 'Manufacturing as an Engine of Growth', in J. Weiss and M. Tribe (eds) *Routledge Handbook of Industry and Development,* pp. 26-37. New York: Routledge.

Weiss, J. and M. Tribe (eds) (2016) *Routledge Handbook of Industry and Development.* New York: Routledge.

World Bank (1993) 'The East Asian Miracle: Economic Growth and Public Policy'. Washington, DC: World Bank.

Annex

1) Stationary tests

The first step for running this time series models was checking for the stationarity of the variables. In order to do so, we performed the Augmented Dickey-Fuller test (ADF) with no constant, no time trend and no lags to each variable to see if they follow a unit-root process or, on the contrary, the variable is generated by a stationary process. For avoiding spurious correlation, the condition is that all series must be stationary, this is, the series must have the same mean and variance at any point in time.

In all cases, the null hypothesis of a unit root was rejected at all significance levels. The ADF test, then, allows us to reject the null hypothesis of variables containing a unit-root at all significance levels.

Table A1.1
Country: Argentina
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
Manufacturing growth rate	-5.252				Reject null hypothesis
GDP growth rate	-5.302	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-5.564				Reject null hypothesis

Table A.2
Country: Brazil
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
Manufacturing growth rate	-3.942				Reject null hypothesis
GDP growth rate	-5.111	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-6.532				Reject null hypothesis

Table A1.3
Country: Chile
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
Manufacturing growth rate	-4.626				Reject null hypothesis
GDP growth rate	-5.314	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-5.655				Reject null hypothesis

Table A1.4
Country: Colombia
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
GDP growth rate	-4.385				Reject null hypothesis
Manufacturing growth rate	-5.296	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-5.186				Reject null hypothesis

Table A1.5
Country: Costa Rica
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
GDP growth rate	-4.147				Reject null hypothesis
Manufacturing growth rate	-4.684	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-5.494				Reject null hypothesis

Table A1.6
Country: Mexico
Augmented Dicky-Fuller Test for Unit Root
Null Hypothesis: series containing Unit Roots

	Test statistic	Critical values 1%	5%	10%	Outcome (at all levels of significance)
GDP growth rate	-4.639				Reject null hypothesis
Manufacturing growth rate	-5.011	-3.641	-2.955	-2.611	Reject null hypothesis
Manufacturing excess growth rate	-3.943				Reject null hypothesis

2) Time-series regression for Model 1, Model 2 and Model 3

Table A2.1
Time series models
Country: Argentina
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.574***		0.376***
	(0.084)		(0.053)
Excess growth rate		0.678***	
		(0.217)	
Interaction period dummies			
1983-1990	0.159	0.400	0.115
	(0.101)	(0.299)	(0.095)
1991-1998	0.209*	0.552*	0.061
	(0.109)	(0.291)	(0.068)
1999-2002	0.790***	-2.348***	0.913***
	(0.271)	(0.751)	(0.289)
2003-2011	0.262	-0.373	-0.023
	(0.356)	(0.352)	(0.292)
Constant	0.011	0.024**	0.018***
	(0.008)	(0.011)	(0.005)
Observations	42	42	42
R-squared	0.877	0.672	0.864
F	53.00	18.41	37.27

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2.2
Time series models
Country: Brazil
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.687***		0.509***
	(0.037)		(0.064)
Excess growth rate		1.054***	
		(0.166)	
Interaction period dummies			
1983-1990	-0.079	0.146	0.020
	(0.068)	(0.234)	(0.074)
1991-1998	-0.436**	-0.689***	-0.179*
	(0.171)	(0.234)	(0.094)
1999-2002	-0.449***	-0.819***	-0.370***
	(0.063)	(0.183)	(0.078)
2003-2011	-0.312***	-0.682***	-0.249**
	(0.072)	(0.210)	(0.095)
Constant	0.021***	0.078***	0.020
	(0.005)	(0.009)	(0.074)
Observations	42	42	42
R-squared	0.906	0.762	0.886
F	66.95	14.44	65.07

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2.3
Time series models
Country: Chile
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.625***		0.381***
	(0.035)		(0.044)
Excess growth rate		0.788***	
		(0.156)	
Interaction period dummies			
1983-1990	0.153	-1.208***	0.238
	(0.372)	(0.352)	(0.609)
1991-1998	-0.148	-0.351	-0.043
	(0.097)	(0.292)	(0.079)
1999-2002	0.266	-0.438	0.068
	(0.242)	(0.520)	(0.227)
2003-2011	-0.967	-1.396**	-0.043
	(0.647)	(0.551)	(0.237)
Constant	0.021***	0.043***	0.029***
	(0.007)	(0.014)	(0.009)
Observations	42	42	42
R-squared	0.807	0.605	0.530
F	54.74	5.047	15.14

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2.4
Time series models
Country: Colombia
Period: 1970-2010

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.485***		0.274***
	(0.066)		(0.095)
Excess growth rate		0.508***	
		(0.117)	
Interaction period dummies			
1983-1990	-0.056	-0.394*	-0.151
	(0.239)	(0.229)	(0.337)
1991-1998	0.065	-0.591*	0.158
	(0.132)	(0.339)	(0.353)
1999-2002	-0.059	-0.082	-0.028
	(0.092)	(0.202)	(0.196)
2003-2011	-0.102	-0.043	0.000
	(0.090)	(0.152)	(0.103)
Constant	0.027***	0.051***	0.037***
	(0.004)	(0.004)	(0.007)
Observations	41	41	41
R-squared	0.826	0.600	0.572
F	31.21	8.560	9.045

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2.5
Time series models
Country: Costa Rica
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.666***		0.643***
	(0.065)		(0.081)
Excess growth rate		0.722	
		(0.504)	
Interaction period dummies			
1983-1990	-0.202	-0.310	-0.180
	(0.163)	(0.552)	(0.116)
1991-1998	-0.060	0.071	-0.019
	(0.129)	(0.625)	(0.121)
1999-2002	-0.655***	-0.712	-0.645***
	(0.065)	(0.504)	(0.082)
2003-2011	-0.386*	-0.545	-0.396**
	(0.193)	(0.546)	(0.160)
Constant	0.005	0.032*	0.006
	(0.005)	(0.016)	(0.008)
Observations	42	42	42
R-squared	0.798	0.243	0.768
F	18.26	3.265	19.14

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

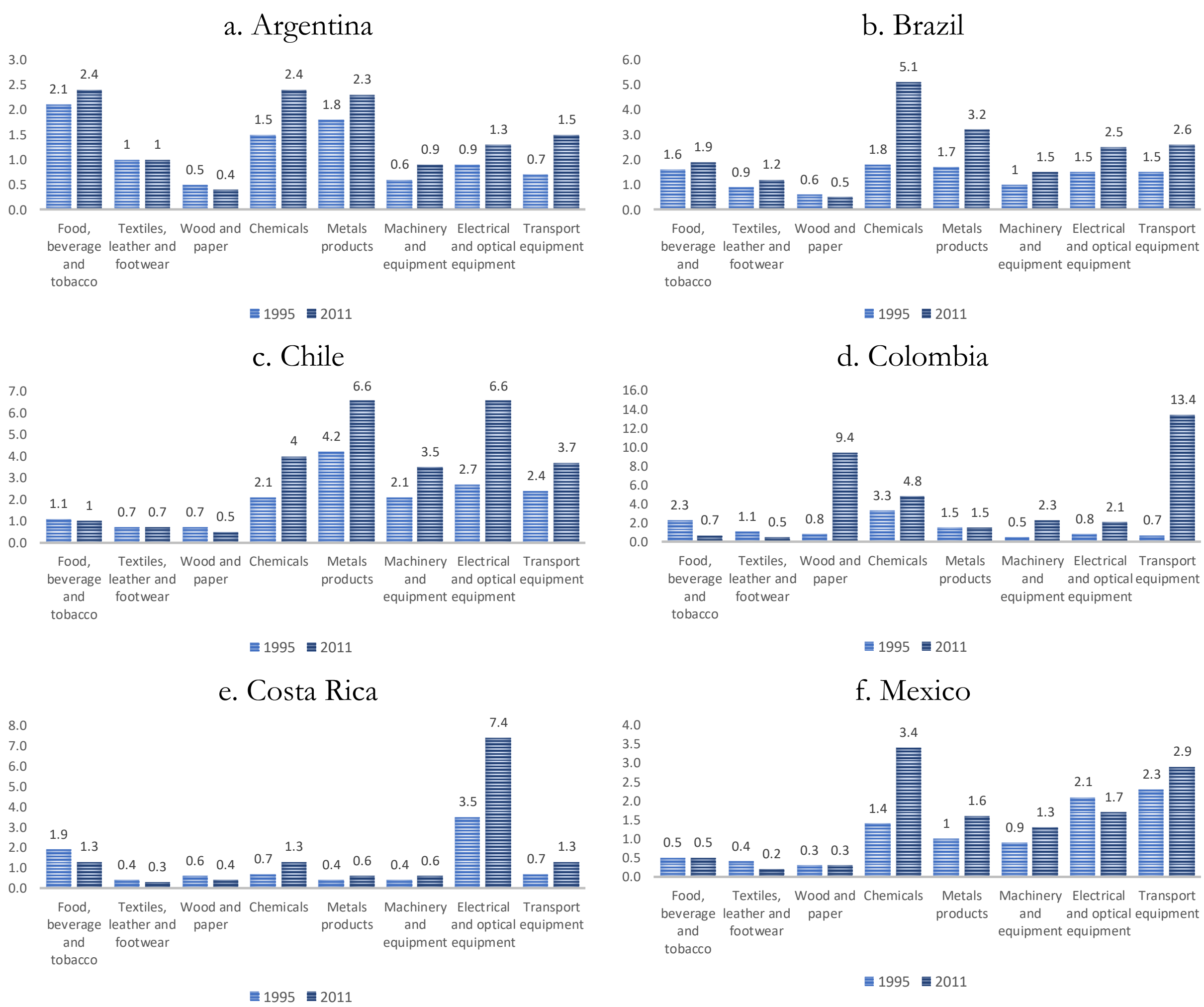
Table A2.6
Time series models
Country: Mexico
Period: 1970-2011

	Model 1	Model 2	Model 3
Dependent Variable	GDP Growth rate	GDP growth rate	Non-manufacturing Value-added growth rate
Manufacturing value-added growth rate	0.739***		0.571***
	(0.058)		(0.117)
Excess growth rate		0.392	
		(0.355)	
Interaction period dummies			
1983-1990	-0.174**	-0.061***	-0.120
	(0.075)	(0.011)	(0.133)
1991-1998	-0.146	-0.031**	-0.027
	(0.244)	(0.015)	(0.335)
1999-2002	-0.246**	-0.036***	-0.164
	(0.092)	(0.009)	(0.152)
2003-2011	-0.211	-0.035***	0.006
	(0.180)	(0.012)	(0.232)
Constant	0.016***	0.392	0.030***
	(0.004)	(0.355)	(0.009)
Observations	42	42	42
R-squared	0.858	0.463	0.737
F	52.09	15.45	30.25

Excess growth rate is defined as the difference between manufacturing and non-manufacturing value-added growth rates
Interaction period dummies combine time dummies for each period multiplied by the independent variable for each model.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure A.1. Domestic value-added embodied in foreign exports as share of gross exports

in %



Source: author's own calculations based Trade in Value Added (TiVA) database. http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1. Accessed on November 5th, 2017