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**PREMATURE DEINDUSTRIALIZATION  
- THE CASE OF COLOMBIA -**

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# PREMATURE DEINDUSTRIALIZATION – THE CASE OF COLOMBIA –

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## Abstract

This article intends to explain the process of premature deindustrialization based on the experience of the Colombian industrial sector. We claim that in some developing nations the loss in industrial dynamism occurred at very low levels of per capita income obey to institutional factors explained by the coordination failures theory and the big push approach. Our evidence suggests that the financial sector may play an important role as catalyst for the progress of the manufacturing industry. Coordination failures among the industries, the financial sector, and the public policy, and the lack of a catalyst institution contributed to the premature deindustrialization in Colombia.

## *I. Introduction*

During the 1970s and 1980s many industrial European countries experienced the process of deindustrialization, a loss of relative employment in the manufacturing sector, followed by a loss in the relative output in nominal terms. Research named three main causes: the efficiency gains in the manufacturing sector reflected in higher labor productivity, the economic cycles, and the change in patterns of international trade (Rowthorn, R. and J. Wells, 1987; Rowthorn, R. and R. Ramaswamy, 1997; 1999; Rowthorn and Coutts, 2004.) At the same time, deindustrialization was also experienced by third-world nations from Latin America and Africa (Dasgupta and Singh, 2006.) In those countries the industry lost dynamism in both the level of production in real terms and in the pace of job creation; however, this happened at levels of per capita income between US\$ 1,000 and US\$ 3,000 while rich countries experience deindustrialization at around US\$ 9,000.

In this article we define “premature deindustrialization” as a process observed in developing nations. Like deindustrialization in first-world countries, it is characterized by a loss in industrial dynamism distinguished by shifts in production and employment from tradable sectors (industry and agriculture) to non-tradable sectors (finance and communications). However, contrary to deindustrialization in first-world countries, this process occurs long before the manufacturing sector reaches maturity; therefore, it occurs at lower levels of income. In addition it cannot be explained by the same reasons as the deindustrialization observed in advanced nations.

Since the industry is one important engine for economic growth and because the implications of premature deindustrialization can be harmful to a country’s long term prospects, the aim of this article is to understand the factors which prompt the premature deindustrialization. This task is done by analyzing the case of a Latin American country: Colombia, during the 20<sup>th</sup> Century. We claim that premature deindustrialization may obey to institutional factors which can be explained through the coordination failures theory and the big push model.

According to these approaches: 1) young firms can subsist on their own profits, though eventually they will need fresh resources to finance technological progress. In this case the financial system has a crucial role in channel resources to be invested in industry; 2) the banking system, the economic conglomerates, and the government might all act as catalysts for industrialization; 3) premature deindustrialization may be

interpreted as the failure of the coordinating mechanisms in the economy; 4) A bank may act as catalyst when it enjoys market power because it has the incentives to assume the costs and risks needed to channel financial resources to new firms; 6) according the agency theory in the late stages of development banks may not play a central role in growth, but rather be instruments to monitoring and auditing firms, given indirect incentives for the good management; 7) historical evidence shows that often the government plays an active role in industrial development ensuring an institutional environment where the coordination costs are minimized (Da Rin and Hellman, 2002). In summary, the big push approach states that the financial system plays an important role in real sector evolution, but coordination among agents is necessary to achieve higher equilibriums like industrialization.

Hence, this thesis analyzes Colombia's premature deindustrialization as a result of failures in coordination among the industries, the financial system, and the government. On the next section the importance of industrialization is highlighted and the theory about deindustrialization is summarized. In section III the case of Colombian Industry is described while section IV depicts the coordination failures theory and the big push model as tools to explain premature deindustrialization. In section V a lineal econometric model is used to test for deindustrialization and its relation with financial variables according to the conditions extracted from a big push model. Finally, conclusions and further remarks are presented.

## *II. Industrial Development and Deindustrialization*

After the Industrial Revolution economic success has been linked to the development of the manufacturing sector. Szirmai (2009) summarizes the importance of manufacturing for growth in nine arguments that follow the Kaldorian approach: 1) there is a correlation between the degree of industrialization and per capita income in developing countries; 2) the transfer of resources from agriculture to manufacturing provides a structural change bonus because productivity is higher in the manufacturing sector than in agriculture; 3) manufacturing is assumed to be more dynamic than other sectors, thus a transfer of productive resources to manufacturing contributes to growth; 4) the transfer of resources from manufacturing to services may be cause of Baumol Effect defined as a rise of salaries in jobs that have experienced no increase of labor productivity in response to rising salaries in other jobs which did experience such labor productivity growth; 5) manufacturing offers special opportunities for capital accumulation while agriculture does not; 6) the manufacturing sector present chances for economies of scale, which are less available in agriculture or services; 7) the manufacturing sector allows for embodied and disembodied technological progress; 8) linkage and spillover effects are stronger for manufacturing than for agriculture or mining; 9) as per capita incomes rises the share of expenditure on manufactured goods increases. As a result such countries specialized in agriculture and primary production will not profit from expanding world markets for manufacturing goods.

For this reasons the manufacturing sector continues to be the main engine of growth, development and catch up for most of the developing countries, even when the service sector and the associated new technologies have been rapidly gaining importance in recent years (Dasgupta and Singh, 2006). Therefore, pursuing the progress of industrial sector understanding the keys of premature deindustrialization are crucial for the achievement of economic growth and higher standards of living in low income nations.

Commonly, at the beginning of the industrialization process, the manufacturing sector grows absorbing workers from less productive sector such agriculture. As development

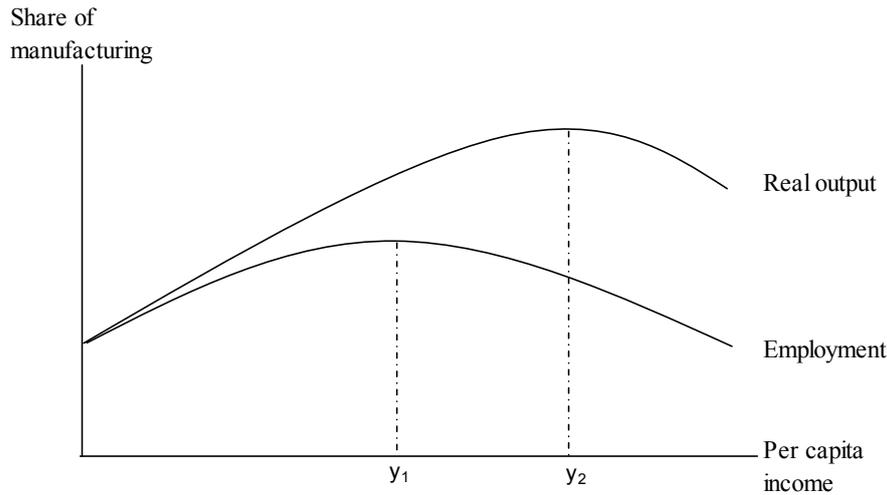
continues, however, the share of manufacturing stabilizes and then starts to fall back. At the same time there is a corresponding increase in the share of the service sector in national employment. This stage is what is called deindustrialization.

Typically deindustrialization begins with a reduction of relative employment in the manufacturing sector, followed by a reduction in relative output in nominal terms (Rowthorn and Ramaswamy, 1997). In their seminal work about deindustrialization, Rowthorn and Wells (1987) focus on the experiences of advanced OECD countries. They describe three different kinds of deindustrialization in advanced nations: positive, negative, and ambiguous. *Positive deindustrialization*, present only in highly developed economies occurs because labor productivity grows faster in manufacturing than in other sectors, leading to a decrease in the relative employment in industry. This is not reflected in unemployment figures since the less productive sectors absorb the workers displaced from manufacturing. It is positive because, in this case, deindustrialization is a consequence of industrial dynamism, a signal of development. When this type of deindustrialization occurs industry remains competitive in international markets, per capita income rises and the unemployment rate is low. On the other hand, *negative deindustrialization* is observed at moments of economic slowdown that can occur at any stage of development. In this case, other sectors do not absorb the workers laid off from the manufacturing sector and high unemployment rates and low levels of per capita income are observed. However, when the economic recession is reverted and the production recovers, negative deindustrialization stops. In this sense negative deindustrialization is a temporal event related to the economic cycle. Finally, *ambiguous deindustrialization* is related to changes in the foreign trade structure of the country when for any reason, the share of manufactured products in the net exports shifts to different sectors, and as a result labor and other resources shift as well. In this case the effect on the total level of employment is ambiguous depending on the specific trends of international trade.

Using a sample of countries industrialized between 1963 and 1994, Rowthorn and Ramaswamy (1999) found that the standard income level at the time these economies began the deindustrialization process was US\$ 9,000. This level was reached by most of the developed countries in the 1970s when the relative employment in the industrial sector started to fall going from 28% in 1970 to 18% in 1994. Typically, in terms of per capita income, the relative employment began to fall before the manufacturing output (Figure 1.)

It should be noticed that while deindustrialization always implies a decline in relative employment in the manufacturing sector, manufacturing output measured in real terms may increase. Therefore, since deindustrialization in advanced nations is mainly defined in terms of employment, the comprehension of the determinants of employment at each level of industrial development is crucial to understand the phenomenon. The factors that may alter the relative employment levels in the manufacturing sector are specialization of the economy, domestic consumption trends, the differentials in labor productivity among sectors, the paths of international trade, and investment in the industrial sector. As the manufacturing sector develops, some in-house activities, such design, catering, and transport are progressively transferred to subcontractors or service providers. In this case the fall in manufacturing employment is matched exactly by an increase in the service sector, without any harm to the overall economy. However, the experience of advanced countries shows that specialization has accounted for a small fraction of the fall in the share of manufacturing employment over the past 30 years (Rowthorn and Coutts, 2004.)

**Figure 1.** Typical deindustrialization process

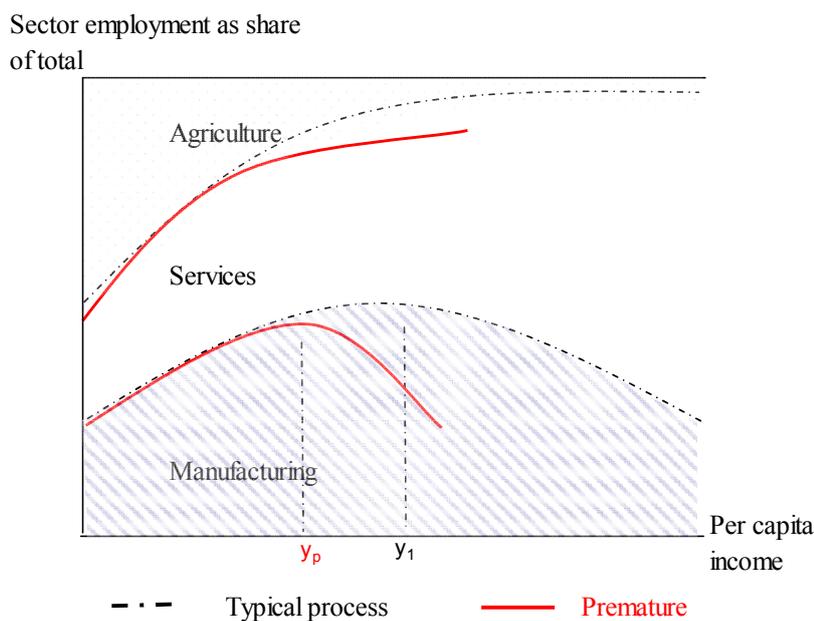


As stated by Rowthorn and Ramaswamy (1999), typically deindustrialization manifests first in employment and later in output.  $y_1$  represents a lower per capita income than  $y_2$ . While relative employment falls at  $y_1$ , real output keep raisin until it reaches  $y_2$  where it begins to decrease. According to research in some European countries  $y_1$  is around US\$9.000.

Although the main research about deindustrialization has been focused in developed countries members of the OECD, the trend is not exclusive of rich nations. Manufacture employment and manufacture product in developing countries showed similar patterns during the last decades although in most cases it was not caused by gains in manufacturing sector productivity, changes in trade patterns, or the economic cycles.

In this document the term “premature deindustrialization” is used to describe the process followed by low income nations to highlight the fact that these economies deindustrialized *before* their industries reached the point of maturity (Figure 2). In industrialized nations the turning point for manufactures occurred at a per capita income of almost US\$ 10,000 in current prices, however in some countries the same took place at levels of income lower than US\$ 3,000 (Dasgupta and Singh, 2006).

**Figure 2.** Typical deindustrialization vs. premature deindustrialization



Premature deindustrialization endangers the economic welfare of the developing nations since it represents a pathological state that makes the economy unable to achieve its full potential.

### *III. Premature Deindustrialization: The Case of Colombia*

The economic growth in Latin America during the 20<sup>th</sup> Century was driven mainly by the industrial sector. Libanio (2006) shows how in the largest Latin American economies manufacturing has been the engine of growth because of the sector's significant increasing returns.<sup>1</sup> Notwithstanding, from mid 1970s many Latin American countries experienced a loss in industrial dynamism: between 1970 and 2001 the participation of manufacturing in the added value declined on average 11 percentage points, from 26.9% to 15.6% (Echavarría and Villamizar, 2006).<sup>2</sup>

In Colombia, one of the seven largest economies in Latin America, the industry was mostly developed after World War I using resources accumulated by coffee and tobacco exports. The sector grew slowly but steadily until mid 1970s when it stagnated. The Colombian industrialization process happened in three main stages: First, between 1900 and 1930, booming coffee and tobacco exports, railroad construction, gold mining, the electrification of main cities, the strengthening of the state and human capital availability contributed to launch the industrial sector.<sup>3</sup> Second between 1930 and 1945 during early import substitution industrialization (ISI), the industrial policy, the increase of domestic consumption of manufactured products and the rapid urbanization favored the fast growing of the manufactures. Total manufacturing value added grew on average 8.1% per year while total GDP grew on average 3.3%. This growth was based on import substitution of manufactured raw materials (rubber, chemical products, and steel) and the rising of labor productivity as small and large factories merged. Finally, during the third stage between 1945 and 1967, the late import substitution, industrial policy switched towards the promotion of capital intensive industries. Trade and non trade barriers, foreign investment promotion, and domestic credit became the usual instruments. These policies increased the manufacturing sector's contribution to total GDP (from 14% in 1945 to 22% in 1967) although they also lead to negative effects: 1) it changed the financial structure of firms discouraging the issue of new stocks; 2) it imposed controls over interest rates to the point to turn them negative; 3) the economy became more dependent on imported capital goods. As a result by the late 1960s the country was facing a balance of payments crisis caused by vulnerability in coffee prices and real exchange cycles (Pombo, 2002).

In the following years, the economic policy changed in terms of foreign trade and exchange rates. Capital controls, restrictions on imports, and diversification of exports were adopted resulting in an increase of manufacturing exports at a rate of 30% per year between 1967 and 1974. In the late 1970s Colombia experienced the Dutch disease. The boom in the coffee exports adversely affected other sectors of the economy since it caused a large increase in foreign exchange, which increased the value of the peso and

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<sup>1</sup> In his study, Libanio test the Kaldor's growth laws using panel data for the seven largest economies in Latin America: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela, during the period 1985-2001.

<sup>2</sup> The process was particularly strong in Brazil where the participation of manufacturing in the added value declined from 29.3% in 1970 to 14% in 2001, Argentina (from 31.5% to 17%), Chile (from 25.9% to 15.8%), Ecuador (from 17.6% to 11.7%), and Peru (from 21.8% to 16%).

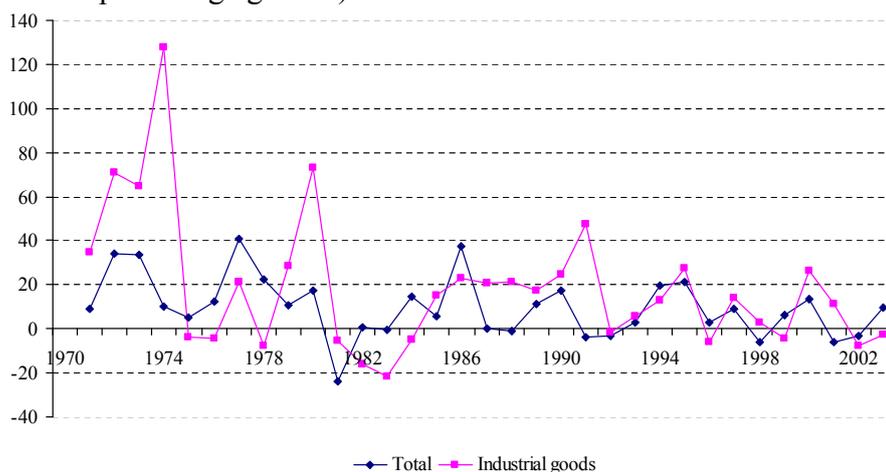
<sup>3</sup> By 1930 the manufacturing industry contribution to total GDP in Colombia was 6.6%, in stark contrast with Argentina 22%, Brazil 11.7%, and Mexico 14.2%.

the price of domestic goods. As a result, Colombian manufactured products became less competitive bringing down the growth rate of exports of manufactured goods (Figure 3).

In 1982 the foreign credit flows to Latin America were shortened, the international interest rates rose, and the external debt service increased adding up to the domestic financial crisis from early 1980s, it results in a large macroeconomic disequilibrium that ended up in the signing of the macroeconomic adjustment program monitored by the IMF in 1984. Henceforth, modern industrial policy became more relaxed. Adjustment costs were high in terms of employment while foreign loan resources were directed to public investment rather than sector development. Government expenditure was cut, industrial subsidies reduced, and loans granted by public financial institutions diminished.<sup>4</sup>

From 1991 the Colombian economy faced fundamental changes in different aspects. Under a new constitution, the government launched an economic liberalization program that covered foreign trade policy, exchange rate regime, capital flows controls, central bank independence, privatizations, job market, and pension regimes. Gradually most of the industrial promotion instruments were eliminated. Currently Colombia is an importer of industrial goods because of the inability to produce competitively manufactured items.

**Figure 3.** Exports, Colombia 1965-2003  
(Annual percentage growth)

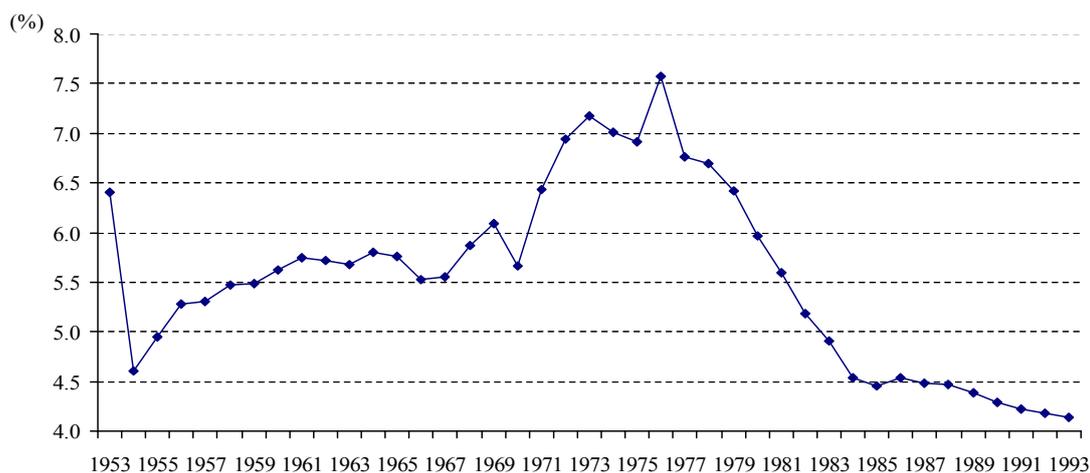


Data source: DANE, DNP.

Four different works found evidence of deindustrialization in Colombia (Echavarría and Villamizar, 2006; Cardenas, 2007; Melendez, Seim, and Medina, 2003; and Langebaek and Vasquez, 2007). According to the available data, in terms of employment Colombian deindustrialization took place around 1973 when manufacturing employment started a declining trend (Figure 4). In terms of output deindustrialization was first observed after 1974 when the share of manufacturing output in total GDP reached its maximum at 23% (Figure 5).

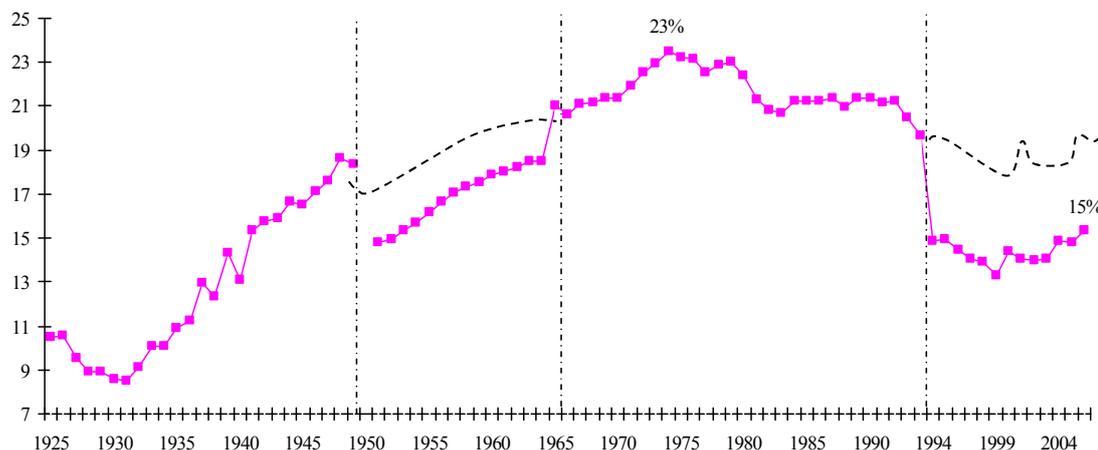
**Figure 4.** Manufacturing employment, Colombia 1953-1993  
(As a share of total employment)

<sup>4</sup> In 1986, a new coffee boom began. This time the Colombian government imposed a windfall tax on coffee receipts restraining domestic spending and purchases of exports. This policy counteracted the Dutch disease effect and its consequences over industrial output.



Data source: GRECO, DANE.

**Figure 5.** Manufacturing output, Colombia 1925-2006  
(As a share of total output)

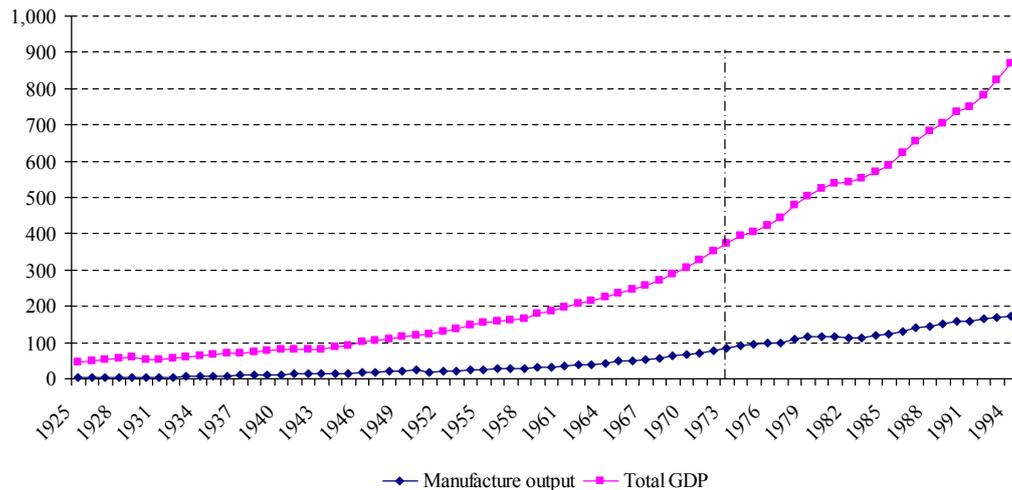


Data source: DANE, ECLAC, Banco de la Republica de Colombia.

Note: Series of GDP by sector are discontinuous because of methodological changes. For 1950-1964 and from 1994 onwards, changes in the classification within economic sectors which did not affect the total GDP make the relative manufacturing output seems to be lower. Also from 1994 the category of “final goods and services” used for the calculation of total GDP was broadened, affecting the temporal consistency of the series. Dashed lines represent a simulation of the data assuming no methodological changes occurred.

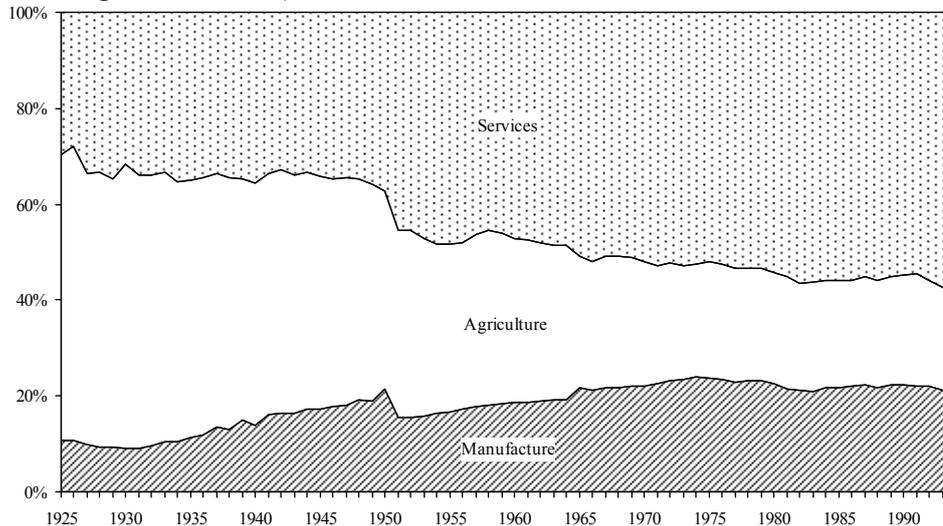
Until 1973 the industry grew steadily every year more than GDP, but from that year onwards the divergence between total GDP and industrial output became notorious (Figure 6). In 1970 the industrial sector constituted the 25.7% of GDP but by 2003 the share fell to the level observed in 1948 (12.3%). At the same time, agriculture declined while the service sector grew from 46% to 56% in the same period. The proportion of consumer goods in the industrial added value fell from 58% in the period 1940-1949 to 41% in the period 1990-1995. In addition, when comparing the relative performance of the three main sectors in Colombian economy, manufacturing appears to be stagnated since late 1960s (Figure 7.)

**Figure 6.** Divergent trends of real total output and real manufacturing output  
(At constant prices of 1975)



Data Source: GRECO – Banco de la Republica de Colombia, DANE.

**Figure 7.** Total real GDP by economic sector (Constant prices of 1975)



Data source: DANE, ECLAC, Banco de la Republica de Colombia.

It is remarkable how Colombian employment and per capita income trends resemble the deindustrialization process depicted in Figures 1 and 2. According to the evidence showed above, however, Colombian deindustrialization did not correspond to the patterns described by the seminal works (Rowthorn and Wells, 1987; Rowthorn and Ramaswamy, 1997.)

First, as Figure 8 shows, employment and manufacturing output began to decline in 1976 and 1979 respectively at a per capita income of US\$ 605 and US\$ 1,028. These levels are far below those at which the deindustrialization was first observed in advanced economies (around US\$ 9,000).

**Figure 8.** Employment and output of the manufacturing sector as function of per capita income (in US Dollars)<sup>5</sup>

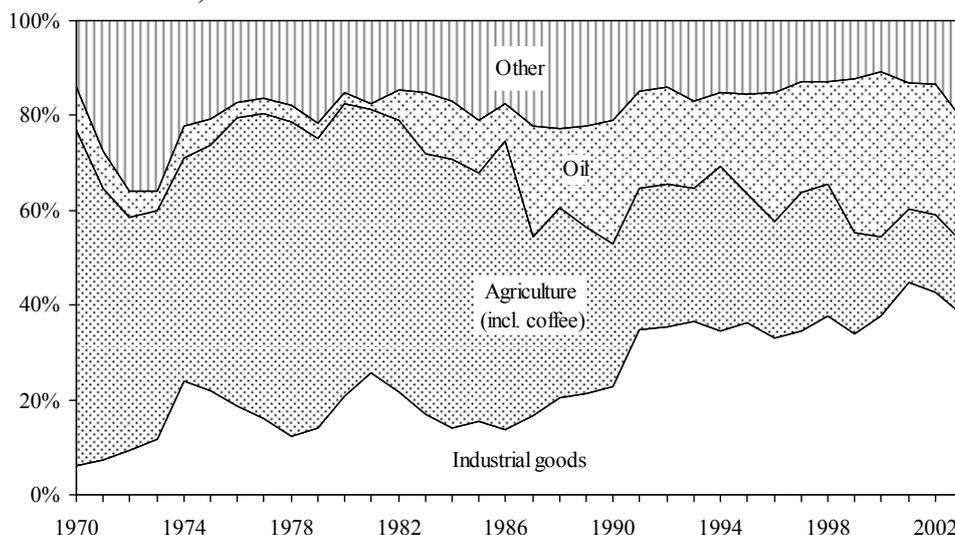
<sup>5</sup> Relative manufacturing employment and output are calculated as follows:



Source: GRECO – Banco de la Republica de Colombia, DANE.

Second, the deindustrialization process in Colombia was not accompanied by a high development of other sector therefore it is not a case of positive deindustrialization. In the same sense, it was not related to the economic cycles thus its character is not temporal so it does not correspond to a case of negative deindustrialization either.

**Figure 9.** Colombian exports by sector, 1970-2003  
(In million of US\$)



Data source: DANE, DNP.

Finally, it did not obey to change in trade patterns although the structure of exports in Colombia changed over the last decades. From early 1970s the rate of growth declined for industrial and non-industrial goods as a result of the appreciating exchange rate and the reallocation of economic resources to agriculture during the coffee boom; the dependence on domestic demand, the industry’s failure to diversify, the low levels of investment, and some tax policies also contributed to this tendency. However, from mid

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$$\text{relative employment} = 100 \times \frac{\text{emp. in manufactures}}{\text{occupied population}}, \text{ and } \text{relative output} = 100 \times \frac{\text{manufacturing output}}{\text{total real GDP}}$$

1980s the value of exported industrial goods as a percentage of total exports has been increasing in relation to traditional agricultural goods, including coffee (Figure 9).

The evidence presented so far indicates that the case of Colombian industrial sector constitutes an example of premature deindustrialization: 1) it is observed in a developing nation at low levels of per capita income; 2) it is represented by a loss in industrial dynamism characterized by shifts in production and employment from tradable sectors to non-tradable sectors; and 3) it cannot be explained by the same reasons as the deindustrialization observed in advanced nations.

#### ***IV. Explaining Premature Deindustrialization: Coordination Failures and the Big Push Approach***

The occurrence of premature deindustrialization risks the future prospects for development of many poor nations since it makes the economy unable to achieve its full potential. Although a deep understanding of this process is needed in order to reverse the long term negative effects over the economy and formulate the adequate public policy, its causes are not yet fully understood. This article claims that given the structural difference between rich industrialized nations and developing countries, the explanation of premature deindustrialization can be found in the institutional factors particular to each economy. This section analyzes the Colombian premature deindustrialization using the theory of coordination failures and the big push approach since this methodology can explain the way in which an economy can be trapped in a low equilibrium like a low degree of industrial development.

From a game theory perspective, the theory of *Coordination Failures* assumes that different economic phenomena (like premature deindustrialization) might be seen as the result of the inability to coordinate the choices of different members of the economy (Herings, 2001). Although a direct intervention from the government can be seen as the natural tool to overcome the coordination issues, it is not necessarily the best response to coordination failures. Because governments have their own incentives and the same informational constraints as other agents, governmental intervention may result in distortions that can produce negative effects. However the government can act as a facilitator for the creation of institutions directed to solve coordination failures. The final objective of the state should be to identify strategic complementarities and accordingly create the institutional environment for those to work, that is: to enforce property rights, to maintain a good rule of law and effective contract implementation, to minimize the risk of expropriation, rent seeking and corruption, to achieve an accountable provision of public goods, and to facilitate the existence of a healthy financial system to channel resources between different sectors (Aoki, Kim, and Okuno-Fujiwara, 1996; Kahn, 2007).

On the other hand, according to *the Big Push approach* simultaneous industrialization of many sectors of the economy can be profitable for them all, even when no sector can cope with industrializing alone. The Big push effect may act in different ways: 1) helping to develop the domestic market because the industrialization of one sector may contribute to increase the size of the market for products in other sectors;<sup>6</sup> 2) producing spillovers of demand and income which can cause coordination of investment across sectors; and 3) promoting the investment in intermediate goods, such infrastructure. As

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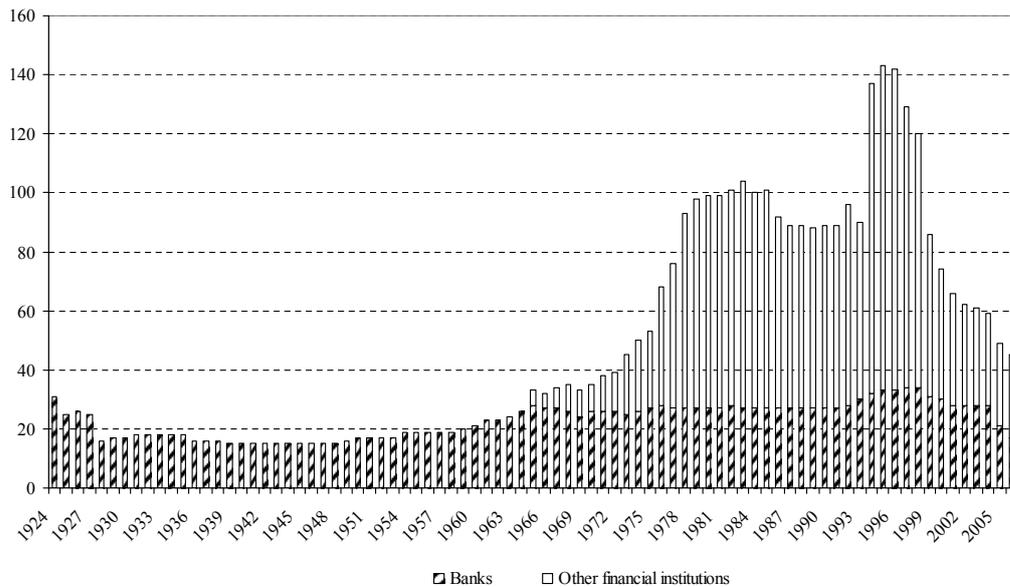
<sup>6</sup> It is because of complementarities among sectors that industrialization in one sector can increase spending in others. Several activities are mutually complementary if carrying out one of them increases the marginal profitability of the other (Milgrom and Roberts, 1992).

the costs of industrialization are largely fixed, each industrializing firm that acquires intermediate goods contributes to defray the fixed costs. The Big Push mechanism works when industrialized firms do not capture on their own profits the total contribution of their own investments. When a fraction of these gains goes to other firms a chain of spillovers is created securing profitability for them all. The effects are positive when individually unprofitable industrialization has a spillover effect on others which makes overall investment profitable (Murphy, Schleifer and Vishny, 1989).

Da Rin and Hellman (2002) show that the main challenge for achieving rapid economic growth in continental Europe during the 19th century was the coordination of industrial activity and banks. Banks act as catalysts for industrialization in emerging economies. Using the cases of Belgium from 1830 to 1850, Germany from 1850 to 1870, and Italy from 1894 to 1914, they found that banks played an important role in these countries during industrialization. In every case, a small number of banks provided the bulk of resources for investment to the industry generating rapid economic growth. The banks invested in complementary sectors so they together pioneered new markets and industries. At the same time, the banks were oligopolies with market. Using a big push type model, Da Rin and Hellman prove that 1) banks will only play a catalytic role if they are large enough to invest in a critical mass of firms; 2) only banks with enough market power are able to retrieve the costs of mobilizing resources between the critical mass; 3) the costs faced by banks are reduced if they are allowed to own equity; and 4) universal banks will find it easier to promote investments in new industries.

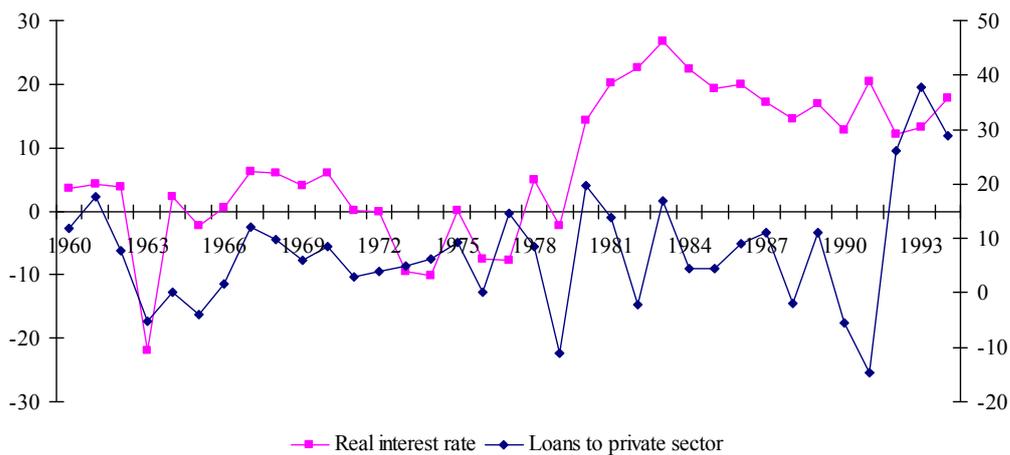
Coordination failures and the lack of a catalyst for the take off of the industry can be the explanations for the premature deindustrialization. At the beginning of the 20th Century, Colombia was mainly rural so that agriculture was heavily supported by state policy and most of the investment, which was speculative, was directed to agriculture, mining, and the construction of a few roads (Kalmanovitz and Avella, 1998). As seen before under certain conditions banks can act as catalyst for industrial development. In general, in early industrialization stages, banks need to be large and have market power in order to be willing to incur in coordination costs. However, several governmental policies were designed to limit the market power of banks, limits on interest rates were imposed, and during the 1960s most of the industrial loans were made by public institutions. As a result, at the beginning of the Colombian industrialization process large banks with particular monopolistic power did not exist (Figure 10). Moreover, nearly 80% of the total funds required by the industry between 1925 and 1950 came from the own firms' profits. By 1950 most of the credit was driven directly through the Central Bank or indirectly through institutions created specifically to carry out this task, their resources came from the public budget and from forced investments on businesses and pension funds. Industrial credit banks developed slowly mainly from 1976 with a poor ability to direct credit to the industry, but in spite of the government's attempts to broaden the credit supply for the priority sectors, Colombia experienced a restricted access to financial resources over the last century. As a consequence, Colombian firms relied on non-distributed profits rather than in banking credit to finance their own progress (Echavarria and Villamizar, 2006).

**Figure 10.** Number of financial institutions, Colombia 1924 – 2006



Source: ASOBANCARIA

Figure 11. Loans to private sector and real interest rate (Annual growth)



Data Source: DANE, Banco de la República de Colombia, Asobancaria

Figure 11 shows the relationship between the growth of the real interest rate and the change in loans of banks to the private sector. From late 70's the interest rates were at high levels while the resources directed to the private sector were kept low. Larger firms enjoy more access to capital while small firms have to rely on credit from their own suppliers or from informal creditors unable to guarantee a stable flow of resources. In general, the use of financial instruments among real sector firms was low and because the capital market was not deeply developed, the issue of bonds or actions was not a common practice among the firms. According to Arbeláez and Echavarría (2001) international comparisons present the Colombian financial sector as small, inefficient, and restrictive. Colombia is below the Latin American average in variables such as banking assets as a share of GDP and the banking concentration index. The total credit received by the private sector in Colombia is half of that of South Korea, and one tenth of the United States.

The poor development of the capital market in Colombia has been explained by high transaction costs and poor information caused by the negative incentives derived from governmental policies, few guarantees to bond holders in case of bankruptcy, and a lack of auditing of the companies. The state intervention in the financial system changed the structure of corporate firms, and the permanent control of interest rates discouraged the issue of stocks, promoting firms' external indebtedness. Facing subsidized credit, firms chose to buy liquid assets and to engage in mergers (Cardenas, 2004; Echavarria and Villamizar, 2006).

So far the facts support the argument that coordination failures and the lack of a catalyst institution to push the development of the industry contribute to the premature deindustrialization in Colombia. The next section provides some empirical evidence.

## V. Empirical Evidence

This section follows the model used by Rowthorn and Wells to test for deindustrialization and to find causalities between financial sector variables and industrial sector variables in Colombia. The data was obtained from the Colombian Central Bank and the National Planning Department (DNP) databases. Most of them are available for the period 1955-1993.

The model estimated by Ordinary Least Squares here is represented by  $M=f(y, U, F)$ .  $M$  is the variable describing the manufacturing sector,  $y$  the per capita income,  $U$  the unemployment rate, and  $F$  the variable related to the financial system. According to the specification,  $M$  can be measured as relative manufacturing output or relative manufacturing employment, while  $F$  will represent the credit flow to the private sector as a share of GDP, the growth of the real interest rate, or the number of financial institutions.

The data was constructed using the following dependent variables: 1) *Relative manufacturing output* measured as a percentage of the total real GDP. Data is available from 1925 to 1993 yet it is discontinuous because of methodological changes in 1950 and 1964. To correct the series, a dummy variable was introduced only for the break years; 2) *Relative manufacturing employment* measured as a percentage of the total occupied population. The following are the independent variables: 1) *Real per capita GDP* at constant prices of 1975. It is expected to have positive sign; 2) *Square of the real per capita GDP* which is expected to have negative sign; 3) *Unemployment* measured as the percentage of the economic active population that was not occupied. It is used to control for the economic cycle. It is expected to have a negative sign; 4) *Loans to private sector* measured in real terms. Since the more financial resources are available the more employment and output the firms should produce, it is expected to have positive sign. It is used as a proxy variable of the coordination between agents to provide resources to the industry; 5) *Real lending interest rate*. Because a low interest rate makes the firms more willing to invest and growth it is expected to have negative sign; 6) *Number of financial institutions*. Available from 1925 shows the number of banks and other lending institutions and their evolution over time. In a competitive environment with a large number of banks none of them are willing to assume the risk to support industrialization according to the Big Push approach. Therefore the expected sign is negative.

The first specification estimates the equation 1, where  $e_m$  represents the share of manufacturing employment in total employment and  $i$  the real interest rate:

$$\textcircled{1} e_m = \alpha + \beta \log y + \gamma(\log y)^2 + \delta U + \phi i + \varepsilon$$

When the relative manufacturing employment,  $e_m$ , is used as dependent variable and the interest rate as financial system independent variable, it can be seen that the growth of the interest rate has a negative relation to the number of workers in the manufacturing sector (Table 1). Besides, the real per capita income  $y$  has a positive sign while  $y^2$  square version has a negative sign. This indicates that the economy grew and then declined, which may be reflecting the premature deindustrialization process. The results of this estimation suggest that when the real interest rate is high, deindustrialization is more likely. Finally, unemployment has a positive sign although it was expected the opposite. Rigidities in the Colombian labor market and particularly in the industrial sector can explain this result. Because of the nature of the labor laws, a slowdown in the economic activity does not necessarily translate in unemployment. Inflexible laws make very costly for the firms to adjust their level of employment facing changes in demand.

A second specification estimates equation 2 for the period 1955-1993, where  $e_m$  represents the share of manufacturing employment in total employment and  $numfin$  the number of financial institutions:

$$\textcircled{2} e_m = \alpha + \beta \log y + \gamma (\log y)^2 + \delta U + \phi numfin + \varepsilon$$

The results show that when analyzed for the whole period the number of financial institutions is positively related to the manufacturing employment. This contradicts the Big Push approach forecast (Table 1).

Table 1. Results (a)

Dependent Variable: Share of manufacturing employment in total employment ( $e_m$ )

| Specification                    | ①                     | ②                    |
|----------------------------------|-----------------------|----------------------|
| Intercept                        | -1052.44<br>(-5.43)** | -283.14<br>(-1.40)** |
| Real per capita income           | 220.85<br>(5.51)**    | 68.02<br>(1.64)*     |
| Square of real per capita income | -11.52<br>(-5.57)**   | -4.00<br>(-1.89)**   |
| Unemployment                     | 0.08<br>(2.09)*       | 0.32<br>(7.21)*      |
| Interest Rate                    | -0.03<br>(-3.00)**    |                      |
| Number of financial institutions |                       | 0.04<br>(4.49)**     |
| Number of observations           | 39                    | 41                   |
| R-squared                        | 0.83                  | 0.82                 |
| Adjusted R-squared               | 0.81                  | 0.80                 |
| F-statistic                      | 41.73                 | 41.47                |

t-Statistic are in parentheses.

\*\* significant at 1%, \* significant at 5%

However, usually the big push approach fits better the case of the early development of the economy, while the theory of agency is suitable to explain the following stages. To test this, the third specification estimates equation 3 for the period 1941-1975, where

$y_m$  represents the manufacturing output as a share of the total and  $numfin$  the number of financial institutions:

$$\textcircled{3} \quad y_m = \alpha + \beta \log y + \gamma (\log y)^2 + \delta U + \phi numfin + \varepsilon$$

In this case, the coefficients and the variable representing the financial sector have the expected sign. According to this result, during 1941-1975 the number of banks had a negative relation to the growth of the manufacturing sector, supporting the Big Push theory (Table 2).

Table 2. Results (b)

Dependent Variable: Manufacturing output as a share of the total ( $y_m$ )

| Specification                    | ③                  |
|----------------------------------|--------------------|
| Intercept                        | -32.26<br>(-1.67)* |
| Real per capita income           | 5.32<br>(2.53)**   |
| Square of real per capita income | -0.02<br>(-0.13)*  |
| Unemployment                     | 0.01<br>(0.82)*    |
| Number of financial institutions | -3.29<br>(2.13)*   |
| Number of observations           | 35                 |
| R-squared                        | 0.74               |
| Adjusted R-squared               | 0.73               |
| F-statistic                      | 46.59              |

t-Statistic are in parentheses.

\*\* significant at 1%, \* significant at 5%

## VI. Conclusions and Further Remarks

The aim of this article is to explain the process of premature deindustrialization based on the case of the Colombian industrial sector. We define premature deindustrialization as the event observed in low income nations with immature industrial sectors that experience a loss in industrial dynamism characterized by shifts in production and employment from tradable sectors to non-tradable sectors. This process can not be explained by the same reasons as the deindustrialization observed in advanced nations, and occurs long before reaching high levels of per capita income.

We argue that premature deindustrialization is a low equilibrium induced by coordination failures. In particular Colombian institutions failed at directing financial resources to the industry and consequently the sector stagnated by 1970s. This occurred at a per capita income as low as US\$ 1,028 while in countries like Britain the deindustrialization process started when the per capita income was around US\$ 9,000 driven mainly by a rising productivity in the industrial sector and the change in trade

patterns. For low income countries the premature deindustrialization is harmful to their long-term prospects to achieve economic growth.

The Big Push approach as described by Da Rin and Hellman shows that in order to industrialize a nation an investor must exist. When this investor is a bank, it must be large and have enough market power to find profitable to coordinate the investments among sectors by choosing the firms recipient of the loans and the lending interest rate. Moreover, it must be well networked to reach a different set of complementary firms, influencing their investment decisions. These are the appropriate incentives to coordinate investments and to direct resources to the new firms. It is expected that such a bank chooses the most profitable activities to develop, inducing a Big Push effect. As a consequence, many productive firms will develop. In an environment with imperfect information, uncertainty, and an immature financial system, this type of bank acts as catalyst for the industrialization because it reduces the costs derived from the coordination. Our findings indicate that in Colombia the lack of an institution with such a role was the source of the coordination failures that led the country to the premature deindustrialization.

The empirical analysis shows that in Colombia the financial variables are related to the industrial development. Our econometric estimations show a strong negative relation between the ability of the industrial sector to generate employment and the real interest rate. Thus, at high real lending rates as those observed in Colombia, deindustrialization is more likely to be observed. In addition, the results reflect the rigidities in the labor market. A slowdown in the economic activity does not necessarily translate in unemployment because inflexible laws make very costly for the firms to adjust their level of employment facing changes in demand. Finally, there is evidence that the number of banks had a negative relation to the growth of the manufacturing sector, supporting the Big Push theory.

Further data panel analysis using cross country information from third-world countries and emerging economies is needed to find stronger causalities that explain the premature deindustrialization. Furthermore, more steps should be directed to the study of the effects of the informal economy on premature deindustrialization. In most developing countries, the informal sector generates an important proportion of employment therefore the tendencies on this sector may determine the future of the industrial development.

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