Cristina Fernández-Mejía
Leonardo Villar-Gómez

Temporary Resource Booms and Manufacturing Output: A Global Perspective

Abstract

This paper analyzes the effect of temporary resource booms on manufacturing industry at a global level, but emphasizing the South-American case. The main conclusions are the following: first, the world is facing a boom of booms since 2002, in which South-America plays a prominent role; second, fuel and minerals booms are more likely to be larger and longer, and to generate more Dutch disease symptoms than capital flows or agricultural products booms, and third, the negative impact over the industry tends to last two and three years after the boom has ended.

Keywords: Resource booms, deindustrialization, Dutch disease, capital flights.

JEL classification: 013, 014, 016.

Researcher and Executive Director, Fedesarrollo, respectively. This research was funded by CAF Development Bank of Latin America. Hugo Andres Carrillo and Paulo Mauricio Sanchez were dedicated and rigorous research assistants project. Adriana Arreaza-CAF was the counterpart of the project and actively participated in discussions and orientation of the study. The authors thank comments of the research team of the Bank of Mexico and of José Antonio Ocampo, Guillermo Perry, Paul Sanquinetti, Roberto Steiner, Daniel Ortega, Pablo Brassiolo and other attendees at CAF investigations seminar.

1. INTRODUCTION

In the last decade South America has benefitted from significant capital flows on account of exports of natural resources and greater access to international financial markets, which has produced significant economic growth. Nevertheless, many of the concerns analysts have been voicing for some time now regarding the sustainability of this driver of growth in an environment of reduced international liquidity and lower commodity prices have begun to materialize. One of the main questions is the role of manufacturing industry in this new environment and its potential for offsetting lower revenues from natural resources and capital.

The main question addressed by this paper is therefore whether the end of booms will be accompanied by a readjustment in relative prices (or depreciation) that might contribute to a fast recovery in manufacturing output, or in other potential export sectors, that partly offsets the fall in revenues generated by booms. Another question is whether the characteristics and consequences of booms vary according to the type of boom (agricultural products, fuel and minerals, or capital) countries have enjoyed. To answer these questions we identify the main natural resource and capital boom and post-boom periods that have occurred at a global level, and particularly in South America; describing them and establishing the effects they have had on manufacturing industry according to the sector they occurred in.

The impact of revenues associated to natural resources on manufacturing and the overall behavior of economies has been widely analyzed in economic literature. The corresponding studies can be divided into three main groups. The first group revolves around the idea of a secular decline in the terms-of-trade for commodities originally proposed by Prebisch (1959) and Singer (1950). This idea was severely questioned by later studies (e.g., Cuddington, 1992) but has been taken up again recently by Ocampo and Parra (2010) and Erten and Ocampo (2013), who not only study trends of price series, but also their cyclical components.

The second group of studies deals with the effect of so-called Dutch disease, where the works of Corden and Neary (1982), and Ismail (2010) stand out. The latter find important relations between commodity booms, the real exchange rate and poor performance in the manufacturing sector. In the same way, Spatafora and Warner (1995) identify a very strong relation between the effects of terms-of-trade and the real exchange rate. Another version of this hypothesis is that put forward by Krugman (1987), in which he highlights the long-term effects that can stem from a temporary overvaluation of the exchange rate on models with dynamic scale economies and endogenous learning processes (*learning by doing*).

The third group of works, in many ways complementary to the previous one, is based around the theory of "the curse of natural resources" proposed by Sachs and Werner (1995, 1997), in which the opportunity for technical advances in the production of primary products is limited as compared to those generated by the manufacturing industry. These works also emphasize the negative impact that revenues associated to the production of primary products normally have on the institutions and economic policy of countries that are overly reliant on them (Besley et al., 2013). This group would also include the recent *Industrial Development Report* of the UNIDO (2013), which shows that countries rich in natural resources (minerals and hydrocarbons) exhibit lower industrial development (especially in industries that are key for growth in medium-developed countries, such as electronic products, automobiles and chemicals).

Several of the abovementioned approaches highlighting the potentially negative impact on countries of revenues associated to natural resources have been challenged by works including a report by the World Bank from 2001 (De Ferranti et al., 2001) and the recent work of Cieplan (Meller et al., 2013), which emphasize instead the enormous possibilities offered by the availability of such resources. In any case, although there is no complete agreement on the long-term implications of natural resource booms on economies, there is some agreement on the fact that, if the necessary measures are not adopted, flows of

extraordinary revenues to a country will cause an appreciation in the exchange rate that affects tradable goods production, including those produced by the manufacturing industry (World Bank, 2010).[1]

It is also worth mentioning that, in line with the viewpoint of Corden and Neary (1982), revenues stemming from capital flows can have a revaluation effect that has a negative impact on manufacturing output over the long-term. In this vein, Lartey (2008) uses a model of business cycles to study the effect of capital flows on resource allocation and real exchange rate movements in emerging economies, finding that an increase in capital flows causes an increase in the demand for non-tradable goods, which translates into an appreciation of the exchange rate and a loss of international competitiveness. Thus, Athukorala and Rajapatirana (2003) also find that capital flows other than from foreign direct investment (FDI) are related to an appreciation of the exchange rate. However, the literature recognizes a certain ambiguity regarding this result because capital flows also allow for financing investment and current account deficits, favoring manufacturing output. In this regard, Kamar et al. (2010) find that FDI flows have a neutral impact on competitiveness, which in some cases can even be positive.

The approach proposed in this paper differs from the traditional Dutch disease discussion for at least three reasons. First, it does not limit itself to the problems that might be generated by revenues from natural resources and encompasses revenues associated to capital flows. Second, it not only includes price booms, but also those of quantity.[2] Third, it does not concern itself with the advantages or disadvantages of natural resources booms but with their temporary dimension; i.e., the fact that they constitute substantial temporary revenues, but leave permanent negative effects on the rest of the economy.

---

[1] The debate does not revolve around whether Dutch disease exists, but whether it should be considered a disease.

[2] Literature on the natural resources curse also generally refers to prices and quantities.

In line with the above, this paper is organized as follows: The first part defines and identifies temporary natural resource and capital booms at a global level and makes a comparison between the different types of booms. The second estimates the impact of different types of temporary booms on manufacturing output, and the last section sets out some conclusions and questions for further research.

I. TEMPORARY RESOURCE BOOMS AT A GLOBAL LEVEL: IDENTIFICATION AND CHARACTERIZATION

A. Natural Resource Exports and Private Capital Flows: Trends and Cycles

During the last 50 years, global exports of natural resources have amounted to between 3.5% and 7% of world GDP.[3] As Figure 1, panel A, shows, in said period there have been two major peaks: the first between 1974 and 1985, and the second, slightly larger than the former, from 2003 onwards. This paper attempts to focus more on episodes of this nature than on the behavior of the series as a whole.

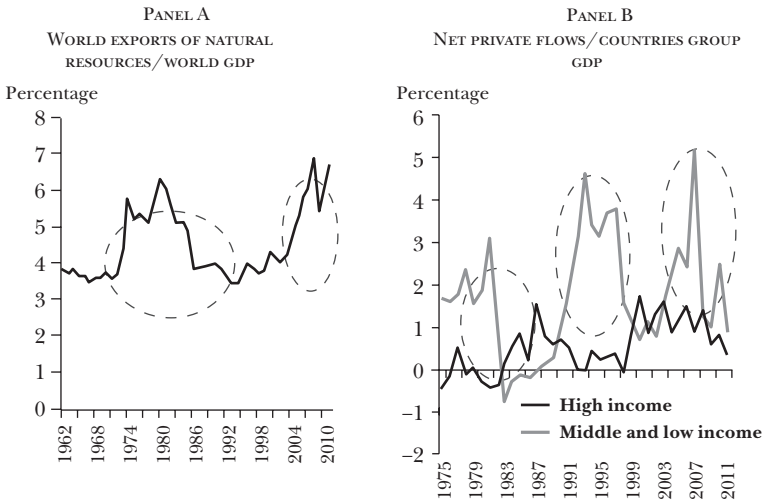
Private capital flows have also performed an increasingly important role in the global economy. According to the database of Bluedorn et al. (2013), between 1975 and 2011, gross capital flows as a percentage of GDP shifted from 5% to 25% in developed countries, and from 2.5% to 12% in developing ones. Nevertheless, as can be seen in Figure 1, panel B, the participation of net capital flows, the ones that can really have a revaluation effect on manufactured products, is relatively more stable for high-income economies than for middle and low-income countries. Three peak periods can also be identified for such flows, which, just like those of natural resources, are the main subject of this paper.

In the case of natural resources, as well as that of capital flows, these episodes tend to have a greater impact on middle and

[3] WDI World Bank.

Figure 1

NATURAL RESOURCES EXPORTS AND PRIVATE CAPITAL FLOWS



Sources: World Bank and own calculations.
Note: Global net flows are not presented because the aggregate of the total flows are netted.

low-income countries. Table 1 shows that, although middle and low-income countries do not receive the majority of the global revenues from commodity exports and net capital flows, they have been the most vulnerable to the fluctuations in those markets: The share of such revenues (exports and capital flows) in GDP is much higher and they are more volatile. In the case of South America, the share of GDP and volatility duplicate the values observed in high-income countries throughout the period studied. With respect to the evolution of this vulnerability, it is possible to conclude that the share of natural resource exports in GDP and their volatility have increased, while the volatility of net capital flows has tended to decline across all country aggregates. Nevertheless, it should be mentioned that the decline in volatility in South America is very low when taking into account

Table 1

NATURAL RESOURCE EXPORTS AND PRIVATE CAPITAL FLOWS

	Natural resource exports					*Net private capital flows*				
	Percentage of global exports	*Share of GDP (%)*				*Percentage of global flows*	*Share of GDP (%)*			
		Average		*Deviation*			*Average*		*Deviation*	
Region	1962-2011	1962-2011	2002-2011	1962-2011	2002-2011	1980-2011[a]	1980-2011	2002-2011	1980-2011	2002-2011
High income	64	4	6	1.1	1.6	86	0.6	1.0	0.6	0.4
Middle and low income	36	8	11	1.8	2.7	14	1.7	2.1	1.5	1.3
South America	7	9	12	2.1	3.3	3	1.5	0.8	2.5	2.1

Sources: Banco de México and own calculations.
[a]Share of total gross flows during the period. The share of net flows is not used because in principle it tends to be zero.

the fact that the size of flows as a percentage of GDP has decreased significantly.[4]

The following section presents a methodology for identifying resource booms at a global level, emphasizing the South American case, and the subsequent sections analyze the results at a regional and sectoral level.

B. Methodology for Identifying Booms

To identify natural resources booms the World Bank database of World Development Indicators (WDI, 1964-2012) for 144 countries was used.[5] Export series over long-term GDP[6] were

---

[4] As Bluedorn et al. (2013) show, greater volatility could be explained by the size of the flows (or exports). In fact, when calculating the coefficient of variation(deviation/average) for natural resources (1962-2011) the results are similar among high-income countries (0.3), middle and low-income countries (0.2) and South America (0.2). Moreover, no changes are observed in the volatility coefficient in the last period (2002-2011), except for a small increase from 0.2 to 0.3 in South America. In the case of capital flows (1980-2011), the coefficient of variationis lower for middle and low-income countries (0.9) than for high-income economies (1), and it declines for both country aggregates during the last period (2002-2011) to 0.4 and 0.6, respectively. However, in the case of South America, the coefficient of variation is higher and has tended to increase (1.7, throughout the sample vs. 2.6 in the last period).

[5] The sample excludes countries such as Hong Kong, Panama, Singapore, Luxembourg, Kiribati, the Gaza Strip, Oman, Equatorial Guinea, Democratic Republic of the Congo and Bahamas, that are centers for re-exporting natural resources and whose inclusion would therefore distort the results or present statistics that do not provide logical results. Countries for which there was not sufficient information were also excluded according to the criteria that they should have at least 75% of the 25 data items (13 at the ends, increasing progressively up to 25) to be used for obtaining moving averages of the 25 order series. This means that it is necessary to have 75% of 13 data items for the ends and 75% of 25 data items for the middle of the series.

[6] Calculated for each year as trend GDP based on the Hodrick Prescott filter (1997), with parameter $\Lambda = 400$.

employed for agricultural products (foodstuffs and other commodities) and fuels and minerals, applying the criteria[7] summarized in Diagram 1, which must be met for three consecutive years[8] in order to define a boom:

1) The value of natural resource exports of a given group must be greater than four percentage points of long-term GDP (see Sachs and Warner, 1999). This criteria ensures that the booms selected are important for the economy of the country in question.

2) The value of exports over GDP of a given group must be at least one standard median deviation above the series

---

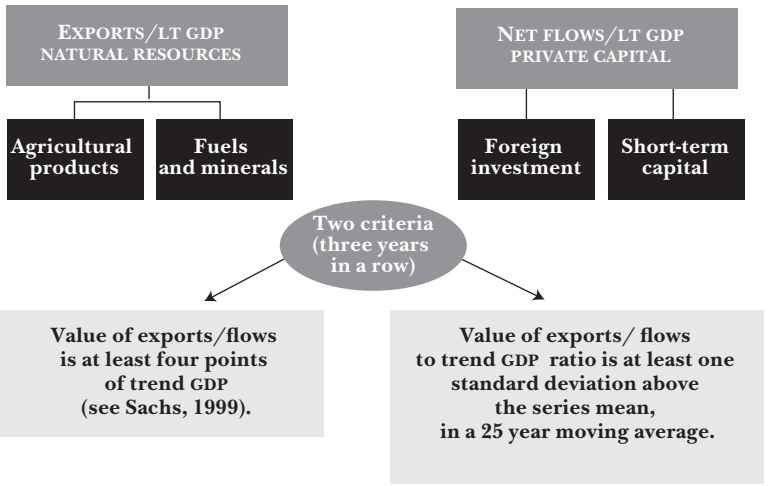
To avoid the problem presented by the filter with the first and ending observations, data from between 1960 and 1963 was eliminated from the filtered series. On the opposite end, the series was completed with IMF projections before proceeding to filter the series and the last four obervations were also eliminated from the filtered series. Parameter $\Lambda = 400$ was employed. This value is suggested for annual data by Correia et al. (1992) and Cogley and Ohanian (1991). Other authors suggest different values depending on the objectives sought (Backus and Kehoe, 1992, suggest a value of 100, and Ravn and Uhlig, 2002, a parameter of 6). However, for this exercise a parameter of 400 was chosen because it is desirable for the trend to be as linear as possible and ensure sustained falls (increases) in GDP are not interpreted as booms (end of booms).

[7] Additionally, exercises were also performed in which a third criterion was included: in the boom years the value of exports (or flows) was higher than the moving average of the series of order 25. We found that only 6% of the data did not meet this criterion, and several of these cases could accommodate the exceptions provided for bonanzas over four years (see note 8). It was decided to privilege the simplicity of the methodology and apply only the two criteria mentioned.

[8] In order to allow temporary and modest deviations, it is not necessary for intermediate year to met one out of the two established criteria or data available, as long as the data is above the median and the bonanza lasted at least four years. Large two-year booms (higher than the mean of all the sector's booms) are also included.

Diagram 1

METHODOLOGY FOR IDENTIFYING TEMPORARY BOOMS



Note: Non-fulfillment of one criteria is allowed in the year as long as the boom lasts for at least four years. Countries with at least 75% of potential data are included in order to obtain a 25-year moving average. 10 countries from the World Bank sample are excluded.

median,[9] on a 25-year moving average. This criteria excludes countries that are structurally producers of natural resources but have not undergone significant changes in the revenues they receive from that item. The use of a moving average prevents structural changes in the series, such as the so-called green revolution (*revolución verde*) in Bolivia, being captured as booms.

This exercise is also applied to the series of net private capital flows consisting of foreign direct investment and other short-term flows.[10] The database employed was that of Bluedorn,

[9] The median is used instead of the average in order to eliminate the bias created by extreme observations and the effect booms have on sample period averages.

[10] Portfolio held in bonds and stocks –less than 10% of the value of the firm–; derivatives and other private investments, including

Duttagupta, Guajardo and Topalova (2013), for the period 1980-2011.[11]

Annex 1 presents a full list of the temporary booms (natural resources and capital) found.

This methodology is comparable with other exercises in the literature for identifying natural resource booms: Sachs and Warner (1999) establish a selection criteria where exports of a given product must be at least 4% of GDP; Céspedes and Velasco (2011) apply a criteria based on an index of external prices[12] and Adler and Magud (2013) one based on the terms-of-trade.[13] A comparison between the results obtained for South America is presented in Annex 2. In general, all three methodologies tend to find booms around the peaks which Erten and Ocampo (2013) call super-cycles of commodity prices. Nevertheless, one advantage of the procedure employed in this paper as compared to other recent works is that it not only identifies booms stemming from price increases, but also from quantity booms. Although quantity booms generate greater added value, this added value is very limited in the case of natural resources. Of more importance is the fact that such booms are also temporary, while their negative effects on other sectors can be long-lasting. Leaving quantity booms out of the analysis could result in important omissions.

---

loans, deposits, bank capital and foreign trade credits, aimed at the private sector.

[11] Some countries have information since 1970.

[12] Velasco and Céspedes define a boom as an episode during which the standardized and deflated price index of a primary product reaches a level of at least 25% above its trend (centered moving average with a 50 year window). The price index was constructed for 33 countries and is weighted using the share in exports or, alternatively, the share in output.

[13] Adler and Magud (2013) define a boom as an episode in which commodity prices record an annual average increase of at least 3% and increase at least 15% from start to peak. A total of 270 episodes were identified. The boom ends when 33% of the upswing has reverted.

Table 2

PRICE AND QUANTITY BOOMS IN LATIN AMERICA

			Change in the index (2002-2011)			
Country	*Group*	*Product*	*Value*	*Price*	*Quantity*	*Type of boom*
Argentina	Foods	Soy, corn and wheat	2.9	0.8	1.2	Quantities
Paraguay	Foods	Soy	5.2	0.8	2.6	Quantities
Uruguay	Foods	Meat and cereals	3.1	0.1	2.6	Quantities
Chile	Foods	Copper	4.6	2.6	0.5	Price
Peru	Foods	Copper and precious metals	6.8	2.7	0.1	Price
Bolivia	Fuels	Natural gas and zinc	14.9	1.3	5.8	Quantities
Colombia	Fuels	Oil and coal	7.6	1.6	2.3	Quantities
Ecuador	Fuels	Oil	5.4	1.5	1.6	Both
Venezuela	Fuels	Oil	2.1	1.1	0.5	Price

Sources: World Bank, Comtrade and own calculations.

In the case of South America, recent agricultural product booms in Argentina, Paraguay and Uruguay, and those of fuels in Bolivia and Colombia, have consisted more of quantities than prices (see Table 2). Moreover, methodologies that only include price indicators might lead to identifying booms in times of crisis. One example of this could be Colombia's coffee boom at the end of the seventies. The procedure described here finds a boom between 1977 and 1980, while that employed by Adler and Magud (2011) identifies this boom between 1981 and 1985, right in the middle of the coffee crisis; and that of Céspedes and Velasco (2011) identify it between 1974 and 1985, a complete coffee cycle. Moreover, according to the price criteria, Venezuela could still be said to be in the oil boom in 2013, as found by Adler and Magud (2013), while our estimates find that the boom ended in 2008. In any case, and in order to make the results more robust, alternative exercises were carried out that change some of the methodology's discretional criteria, such as the minimum size that natural resource exports should have as a percentage of GDP.

C. Characteristics of Temporary Booms in a Global Context

The results from applying this methodology at a global level are shown in Table 3. In the case of natural resources, out of the 144 countries included in the sample,[14] 101 experienced booms, i.e., 67% of the countries have registered a natural resource boom at some time since 1964. In Latin America, 11 out of the 12 countries studied have enjoyed at least one boom episode. Meanwhile, the total number of natural resource booms found with the procedure employed is 231, meaning that on average each country has experienced 1.6 booms during the last 50 years. South America is the region that has had the largest share of booms per country (2.9). This is in contrast to China,

[14] At least one piece of data in a sector has sufficient information (see criteria) for calculating the median in a moving window of 25.

Table 3

INCIDENCE OF TEMPORARY BOOMS BY REGION

	Agricultural product or fuel and mineral booms (1965-2012)			*Foreign investment or short-term capital booms (1980-2011)*[1]		
	Number of countries included in the sample	*Incidence of countries with booms (%)*[1]	*Incidence of booms*[1]	*Number of countries included in the sample*	*Incidence of countries with booms*	*Incidence of booms*[1]
South America	12	92	2.9	12	92	1.4
Central America	14	79	1.5	16	88	1.6
Sub-Saharan Africa	34	68	1.4	32	63	0.8
South Asia	6	33	0.7	6	50	0.7
East Asia and the Pacific	11	73	1.9	12	92	1.5
Europe and Central Asia	17	71	1.2	17	76	1.2
Middle East and North Africa	8	63	2.1	9	67	1.1
High-income countries	42	71	1.7	38	82	1.3
Total	**144**	**71**	**1.6**	**142**	**77**	**1.2**

Sources: World Bank and own calculations.
Note: The number of booms for Sub-Saharan Africa and Asia and Central Europe might have been underestimated because in the majority of cases no information is available before 2000. The same occurs with private capital booms.
[1] Countries with boom or booms / Number of countries included in the sample.

Table 4

TIMELINE OF BOOMS

	Agricultural + fuel and minerals sector				*Foreign investment + short-term flows*			
	Number of boom years		*Boom years/ available data*		*Number of boom years*		*Boom years/ available data*	
	1964-2001	*2002-2011*	*1964-2001*	*2002-2011*	*1982-2001*	*2002-2011*	*1982-2001*	*2002-2011*
South America	68	64	10	27	43	8	10	4
Central America	22	24	4	9	35	32	7	11
Sub-Saharan Africa	48	64	8	15	34	43	3	9
South Asia	–	–	–	–	7	11	3	10
East Asia and the Pacific	30	16	8	12	48	17	13	8
Europe and Central Asia	0	66	0	23	0	59	0	19
Middle East and North Africa	62	26	19	19	8	21	4	15
High-income countries	120	134	5	17	67	73	5	10
Total	**350**	**394**	**7**	**17**	**242**	**264**	**6**	**11**

Sources: World Bank and own calculations.

India and South Korea, which have not experienced any natural resource booms during the last 45 years.

In the case of capital flow booms, the region with the highest boom indicator is Central America (1.6), followed by East Asia and the Pacific (1.5). One might initially think that the number of capital booms is lower than that of natural resources. However, it is important to take into account that the study period for capital flows is much smaller.

The results for the duration of booms in each region during the recent period as compared to previous years are presented in Table 4. The most interesting result is that the years of natural resource booms the last decade have been more numerous than in the previous 38 years and, in the case of capital flows, slightly numerous than during the two previous decades. It could be argued that the aforementioned is due to the amount of available data. Nonetheless, if the number of years in boom is divided by the available information, it is found that the probability of a country experiencing a natural resource boom in any given year during the last decade is 17% as compared to 7% in previous decades, and 11% as compared to 6% in previous years. The Middle East was the great protagonist of natural resource booms until 2001, but since then South America has become the region where it is most likely for a country to have a boom in any given year. In the case of capital flows, the region with the highest number of booms according to the information available between 1982 and 2001 was East Asia and the Pacific, while in the recent decade, Europe and Central Asia took the lead in this indicator.

As for magnitude (defined as the ratio of exports to long-term GDP minus the series mean in an average year of the boom), the largest agricultural product booms take place in Central America and the Caribbean, and in sub-Saharan Africa. For instance, the coffee boom of 1976 lasted around five years and generated 13 additional points of GDP for El Salvador, 7.5 for Nicaragua, and 5 for Costa Rica. In Colombia that boom generated four points of GDP for four years. In the mining sector, the recent copper boom generated substantial additional

revenues for some Latin American countries and in sub-Saharan Africa. Said mineral produced 15 additional points over four years in Zambia; ten additional points over three years in Chile, and six additional points over eight years in Peru. With regard to fuels, as would be expected, booms have been most intense in oil producing countries. In Brunei, for instance, oil exports reached 169% of long-term GDP in 1980 and the size of the boom, as we measured it, was 100% of GDP. The country in Latin America that has faced the largest oil shocks, taking into account the size of its economy, is Trinidad and Tobago. As for short-term capital flows, the greatest shocks have been experienced by high-income countries such as Iceland (which received additional revenues amounting to 46 points of long-term GDP over five years) and Ireland (which received additional revenues totaling 24 points of long-term GDP over three years). In foreign investment, besides tax havens, the case of Bolivia, which received 7.5 additional points of long-term GDP for eight years, stands out.

However, even more interesting than examples of countries that have experienced booms, are those of countries that have never had them. Countries traditionally used as examples of development such as Japan, India, China and Korea, have not experienced a natural resource boom in the last 45 years. On the other extreme are countries such as Malaysia, which in the last 50 years has had eight natural resource booms, and Belgium and Bolivia that faced five booms during the same period. Meanwhile, countries like Germany have never received a natural resource boom, while Jordan and Malaysia have had four, and Chile and Argentina, three.

D. Natural Resource Booms in South America

As mentioned previously, the methodology employed in this paper provides very intuitive results for South America (Table 5). It also correctly identifies the mineral booms of Chile and Peru, the oil booms of Ecuador, Colombia and Venezuela, and the sixties and seventies coffee booms of Colombia, as well as

the cereal booms of Argentina, Uruguay and Paraguay. As for capital flows, the only recent booms identified are those of foreign investment flows to Uruguay and Costa Rica.

If both natural resources and capital are taken into account, the country that has had most booms is Chile. The latter suggests a priori that well-managed booms can generate good macroeconomic results. At the other extreme of the results is Brazil, which stands out for the small number of booms identified. This is explained by its high level of diversification and limited economic openness, meaning natural resource shocks in Brazil are not as important for its economy as in other countries of the region.

A comparison of the size of booms shows that Bolivia experienced the largest ones out of the whole group of countries. In particular, with the recent fuel and minerals boom, it has been receiving 11 additional points of GDP since 2005. Although in Venezuela oil exports account for around a quarter of GDP, such share is relatively stable (the median is 22%) and therefore in terms of size the boom only occupies fourth place in South America.

E. Comparison of Booms by Sector

The results from applying the methodology can be analyzed by sector of specialization: agricultural products, fuels and minerals, short-term capital flows, and investment flows. Among natural resources, instinct indicates that this differentiation could be crucial when analyzing the effects of booms on industry. According to the World Bank (2010), the different effects of booms can be explained by the fact that the characteristics distinguishing commodities from other kinds of goods are more pronounced in the case of minerals and fuels than for agricultural products. Some of these specific characteristics mentioned in the report are: *i)* their highly volatile prices; *ii)* high initial investment requirements, discouraging private investment and meaning a large amount of the companies

are state owned[15] and, in the case of mining, in foreign hands; *iii)* the fact they are not renewable, and *iv)* their production often takes place in specific geographical enclaves. Among capital flows, foreign direct investment tends to be more stable and more actively involves purchasing national assets, which can create different effects when analyzing the impact on the value-added in manufacturing.

Some of these differences become evident when carrying out a simple characterization of booms. As can be seen in Table 6, in general, the fuel and minerals sector has been characterized by longer and larger booms, while the agricultural products sector has exhibited smaller-sized booms (in terms of the exports indicator minus the median of the series of exports/GDP) and their duration has been shorter. The latter can be partly explained by the so-called cobweb theory[16] (Kaldor, 1934). Furthermore, mineral booms in South America have also been long and large.

Figure 2 shows the number of booms for each type of good over the last 50 years. According to the Figure, there is currently a kind of boom of booms in which the fuel, mineral sector and short-term capital have played an important role. Upon analyzing these results in terms of the size of booms to world GDP (Figure 3), the cycles observed become more pronounced and it becomes evident that fuel and minerals sector and short-term capital flow booms are the largest. In addition, capital flows are frequently received by larger economies, and a higher number of countries, and therefore become more important when they are seen in terms of size as compared to how they appear in terms of the number of booms.

---

[15] Céspedes and Velasco (2012) provide the theoretical framework for analyzing how natural resources shocks affect the economy and mention that the results are sensitive to whoever is the owner of the resources: the workers (in the case of some agricultural products) or the government (mainly in the case of fuels).

[16] In a world of perfect competition and elastic supply (such as that of agricultural products), the quantities self-regulate in line with price signals from the preceding period, and the path followed by price and quantity take the shape of a cobweb.

Table 5

CHARACTERISTICS OF BOOMS IN LATIN AMERICA

	Agricultural products			*Fuels and minerals*			*Short-term capital flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
Argentina	1977	7	2.7				1993	2	10.7	1999	2	5.6
	2007	6	2.5				1997	2	6.1			
Bolivia	1994	5	1.6	1974	10	4.4				1998	8	7.5
				2005	8	11.1						
Brazil	1964	2	2.1				1994	3	7.0			
Chile	1994	5	1.8	1979	3	4.9	1992	3	5.9	1996	4	2.9
				1988	2	3.0	1996	2	4.5			
				2006	3	10.2						
Colombia	1964	2	2.5	2008	5	4.5	1981	2	3.8			
	1977	4	4.1				1994	3	5.2			

Ecuador	1964	2	5.1	1980	6	4.4	1990	3	7.7			
	1994	5	4.7	2008	4	6.9						
	2011	2	1.8	2011	2	4.9						
Paraguay	1989	2	7.1	2010	3	9.6	1981	2	5.1			
	2001	3	4.1									
	2007	2	9.2									
Peru	1964	3	2.6	1979	7	5.3				1994	4	5.1
	1994	4	1.3	2005	8	5.8						
	2008	5	1.0									
Uruguay	1980	4	3.4							2006	5	3.2
	1996	3	1.5									
	2008	5	3.1									
Venezuela				1979	4	11.9				1997	2	5.3
				2005	4	8.9						

Table 6

SECTORAL DIFFERENCES BETWEEN BOOMS BY TYPE OF RESOURCE

	Total			*South America*		
	Numer of booms	*Duration of boom (years)*	*Size of boom (percentage of GDP)*	*Numer of booms*	*Duration of boom (years)*	*Size of boom (percentage of GDP)*
Foods and materials	133	3.5	4.1	20	3.8	3.2
Minerals and fuels	101	4.0	8.5	15	4.7	7.2
Short-term capital flows	80	2.7	8.8	9	2.4	6.3
Investment flows	88	3.4	6.9	8	3.9	6.4
Weighted average	402	3.5	6.7	52	3.7	5.3

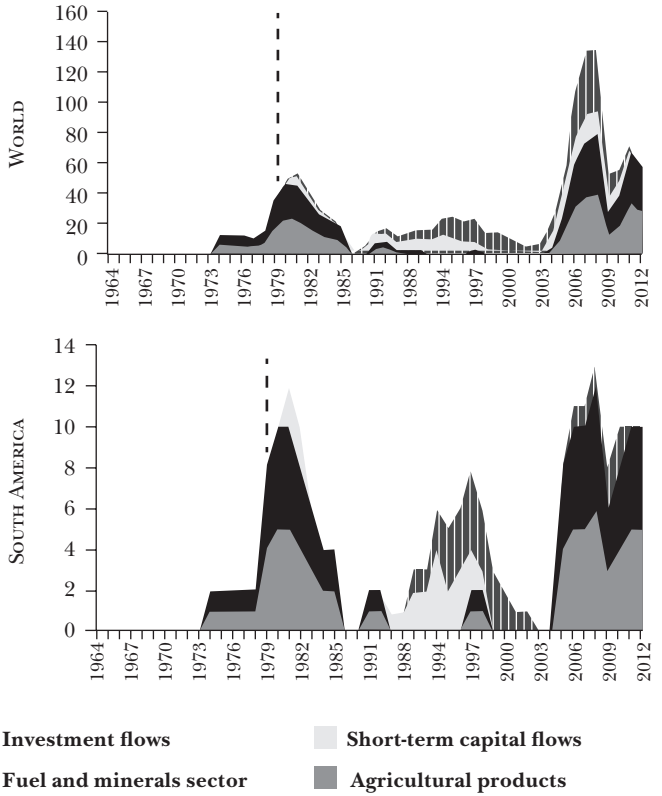
Source: World Bank and own calculations.

Furthermore, the group of figures above shows how South America is also currently undergoing a real natural resources boom of booms with minerals and fuels playing a prominent role.[17] Once again, the results in terms of size intensify the cycles and illustrate the size of capital flows that the region experienced during the mid-nineties.

[17] These results are not significantly affected when they are divided by the number of countries included in the sample due to the fact data series for South America are sufficiently long and the number of countries included in the sample does not change significantly over time.

Figure 2

NUMBER OF BOOMS, 1964-2012 AND PRIVATE CAPITAL FLOWS



Sources: World Bank and own calculations.
Dotted line: start of capital flow data.

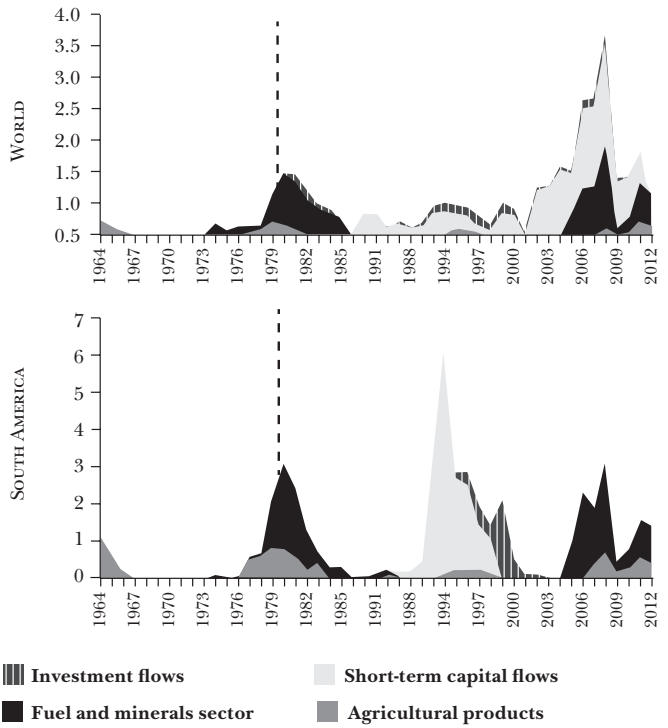
It can be concluded that:

- Natural resource booms are very important for South America, especially in recent times.
- Although capital booms have been relatively less frequent in the region, they were very important in the mid-nineties. These booms have generally played a procyclical role with respect to natural resource booms.

Figure 3

BOOMS MAGNITUDE

(as countries group GDP percentage)



Sources: World Bank and own calculations.
Dotted line: start of capital flow data.

- There are reasons for thinking that the type of product an economy specializes in explains the differences in the characteristics of booms and their expected impact on the economy.
- In general, fuel and minerals booms (as opposed to those of agricultural products) have tended to be long and large. Capital booms are also large, but short.

IMPACT OF BOOMS ON MANUFACTURING'S SHARE OF GDP: DETAILS OF THE ESTIMATION

The econometric estimations aim to examine the effects of booms on the performance of manufacturing using information from all the countries and taking advantage of the structure of panel data. After carrying out the statistical tests, the estimator of Driscoll and Kray (1998) of fixed effects with standard errors that are robust to the heteroskedasticity, contemporaneous and serial correlation of this type of data, is used (Hoechle, 2007). According with that suggested by the latter, it is desirable to have relatively long panels in order for the estimator to be more robust, given its asymptotic properties. The database was therefore restricted to countries for which there would be at least 30 pieces of available data for making the corresponding regressions. In general terms, the equation is estimated is as follows:

$$y_{i,t} = cte + tamalimat_{i,t} + tammincom_{i,t} + tamfdk_{i,t} + tamfdi_{i,t} + postalimat_{i,t} + postmincom_{i,t} + postfdkcp_{i,t} + postfdi_{i,t} + controls_{i,t} + e_{i,t},$$

where $y_{i,t}$ is the value added in manufacturing as a percentage of GDP. *cte* is the constant; $tamalimmat_{i,t}$, $tammincom_{i,t}$, $tamfdkcp_{i,t}$, and $tamfdi_{i,t}$ are variables that take a value of 0 if country i is not in boom during year t or the value of the boom in that year (measured as the value of the series minus the mean / long-term GDP, in the case of agricultural products, fuel and minerals, short-term capital flows and investment flows) if country i experiences a boom. Variables with the prefix *post* correspond to the post-boom periods that take a value of 0 if country i is not in a post-boom period during year t or the average value of the boom. Post-boom periods are calculated as

the three subsequent years after the boom ends for all sectors except for short-term capital flows, where the results two years after the boom were found to be most significant. The variables $controls_{i,t}$ include GDP per capita in constant terms, the same variable squared (to capture the effect on manufacturing of the level of development, which is assumed to be decreasing) and the value of exports and capital flows to verify whether it is booms or regular flows of resources that are having an impact on the value added in manufacturing. $e_{i,t}$ is the random error component.

Two groups of regressions are presented. The first group is made for 1980-2011 and includes variables for all capital booms. The second is for the period 1965-2012 and only uses variables for natural resources (those for capital flows are not available for the whole period). The Federal Reserve funds rate is added to the regressions to control for capital flows, while this variable is in turn controlled by US economic growth to prevent the equation capturing the effect of GDP growth in that country as a result of its counter-cyclical monetary policy.

II. EFFECTS OF BOOMS ON THE ADDED-VALUE IN MANUFACTURING

To analyze the effect of booms on manufacturing output, an equation was estimated that uses the ratio of value added in manufacturing to long-term GDP[18] as a dependent variable and the size of booms and corresponding post-boom periods multiplied by the size of the respective booms, and an indicator for the countries' level of development as independent variables (see Box 1).

Table 7 shows the estimates for a group of 20 countries in the period between 1980 and 2011. One of the most interesting results obtained is the different effects of the booms: the contemporary impact of fuel and mineral booms is negative, while the effect of agricultural product booms tend to be positive and those of capital flows is not significant. The aforementioned might be explained by the characteristics mentioned in the previous section. *Dutch disease* effects tend to be greater for the fuel and minerals sector due to the inelasticity of supply, the greater discretion governments usually exercise with regards to revenues associated with the booms, and the few links the sector has with manufacturing industry. In the case of capital flows, the potentially negative effects of a revaluation are offset by the positive impact of financing on the industry.

However, the most outstanding effect obtained by the exercise is that related to post-boom periods. During the three years following the boom (two years in the case of capital booms) there is still a significant negative impact on manufacturing, highlighting how difficult it is for industry to recovery from the shocks it suffers during boom periods, especially those that will probably be generated by the appreciation of the local currency.

---

[18] This ratio is calculated in constant local currency, preventing exchange rate movements from affecting the value of the variable. Nigeria and the Democratic Republic of the Congo, which presented non-intuitive values in WDI data series, were excluded from the analysis.

Table 7

ESTIMATE OF THE VALUE-ADDED IN MANUFACTURING / LONG-TERM GDP (1980-2011)

		Total of the sample				*Middle and low-income countries*[1]			
		(1)		*(2)*		*(3)*		*(4)*	
Boom magnitude	Foods	0.23[a]	(1.83)			0.30	(1.66)	0.22[b]	(2.44)
	Fuels and minerals	−0.39[c]	(−3.57)	−0.46[c]	(−4.19)	−0.41[c]	(−3.80)	−0.50[c]	(−4.75)
	Short-term capital flows	0.01	(0.17)			−0.02	(−0.18)		
	Investment flows	0.03	(0.43)			0.44[b]	2.49	0.42[c]	(3.00)
Post-booms	Foods	−0.17	(−1.61)	−0.25[b]	(−2.22)	−0.01	(−0.07)		
	Fuels and minerals	−0.39[c]	(−3.80)	−0.42[c]	(−3.86)	−0.34[c]	(−3.72)	−0.36[c]	(−4.82)
	Short-term capital flows	−0.09	(−1.74)			−0.22[b]	(−2.43)	−0.22[b]	(−2.83)
	Investment flows	−0.14[b]	(−2.17)	−0.12[b]	(−2.40)	−0.07	(−0.49)		

Controls	GDP per capita	−0.70[c]	(−4.01)	−0.61[c]	(−5.39)	4.44[c]	(4.22)	4.78[c]	(4.58)
	GDP per capita[2]	0.01[c]	(5.23)	0.01[c]	(6.03)	--0.30[c]	(−3.16)	−0.33[c]	(−3.52)
	NR exports/LT GDP	−0.06	(−1.00)			−0.07	(−0.83)		
	Capital flows/ LT GDP	−0.04	(−1.53)			−0.07[a]	(1.87)	−0.08[b]	(−2.76)
	Trend	0.01	(0.50)			−0.08[b]	(−2.64)	−0.09[b]	(−2.76)
	Constant	−6.43	(−0.12)	20.72[c]	(19.97)	167.97[c]	2.87	183.36[c]	(2.96)
Indicators	Observations	606		606		242		242	
	Groups	20.00		20.00		8.00		8.00	
	R within	0.23		0.22		0.38		0.38	
	F	111.94		23.67		102.84		29.24	

Sources: World Bank and own calculations.
Note: Driscoll and Kray, fixed effects (1980-2011).
[1]Excludes Middle Eastern and North African countries.
[a] $p < 0.1$, [b] $p < 0.05$, [c] $p < 0.01$.

In fact, if the economies were totally flexible, a boom would imply a simple reallocation of productive sectors associated to the appreciation of the currency, which would revert once the boom ended. However, the results found here indicate that once the boom ends the revenues derived from it revert rapidly (and the currency probably depreciates again), but the process of recovery in manufacturing industry is much slower.

The real exchange rate is one of the variables that might explain the limited capacity of industry to recover rapidly. An exercise which analyzes the average performance of the real exchange rate two years before a boom, during a boom, and two years after booms, finds that currencies appreciate during booms, but during the two years after they do not adjust rapidly to their new equilibrium level, and can even continue to appreciate (Table 8). More important is the fact that exchange rate effects, and those related to prices in general, tend to have a considerable lag and cause substantial inertia in the production of different types of goods.

The above does not mean to say that there are no other factors limiting the ability of industry to recover. Among such factors it is worth mentioning: the loss of position on the learning curve (Krugman, 1987), the difficulty of reallocating factors across sectors and the problems that emerge while attempting to recover markets for manufacturing products. In the case of capital flows, the impact can also be understood as the end of the financing effect.

As can be seen in Table 7, among the post-boom impacts, that of the fuel and mineral sector is the largest, followed by investment flows. The effect is not significant for foods. It is essential to keep in mind that these coefficients refer to each point of the annual average size of the boom, i.e., a boom that generates five additional points of annual GDP would on average cause around two points less in the value of manufactures as a percentage of long-term GDP during the boom and in the three years following it.

Another aspect worth pointing out involves the impact that exports of natural resources have on GDP, besides that which

Table 8

BEHAVIOR OF THE REAL EXCHANGE RATE DURING BOOM CYCLES

Averages	*Change in the growth rate of the real exchange rate during the boom*	*Change in the growth rate of the real exchange rate during the post-boom*	*Change in the growth rate of the real exchange rate between pre and post-boom*
Agricultural products	6.0[b]	–1.5	3.1
Fuels and minerals	5.3[a]	1.8	7.8
Aggregate natural resources	6.1[b]	2.0	8.5
Short-term flows	7.3[c]	3.1	11.7[b]
Investment flows	4.5[b]	1.0	6.6
Aggregate capital flows	6.5[c]	2.3	9.2[a]

Sources: World Bank, Bluedorn et al. (2013) and own calculations.
Levels of significance obtained with *t*-statistic: [a] $p < 0.1$, [b] $p < 0.05$, [c] $p < 0.01$.

takes place through booms. The regressions include this control variable but it was not statistically significant, indicating that booms, rather than the stable flow of resources, tend to be associated with an impact on the value added in manufacturing. Moreover, the fact that this variable is not significant ensures that the effect captured from the booms is not the result of a simple reallocation of shares in GDP. In the case of capital flows, the variable expressed as a percentage of long-term GDP is significant, but its coefficient is modest, and much smaller in size than the other coefficients in the equation.

The above exercise was repeated, excluding high-income countries, and Middle Eastern and North African countries, most of which are oil producers. The results are shown in estimates 3 and 4 of Table 7 and are very similar to those obtained

with the whole sample. Nevertheless, the coefficients for the post-boom periods tend to be higher for capital flows.

To support the above exercise, and include the cumulative booms from the seventies, an exercise was carried out that made the same estimation since 1965. The results of the latter are presented in Table 9. The effects of capital flows are not included there because the corresponding data only starts to be published consistently after 1980. To address the absence of these variables, the series are controlled by the Federal Reserve funds rate and US real economic growth, ensuring that the Federal Reserve rate captures the effect of capital flows and not the impact of us anticyclical policy.

As seen by comparing Table 9 with Table 7, exercises on a longer period of analysis (1965-2012 vs. 1980-2012) result in significant changes in the results: the incorporation of the value of exports/GDP as a control variable leads to statistically significant results and the contemporary impact of natural resource booms is no longer significant. However, the persistence of the negative impact in the post-boom period is seen once again, although less pronounced, in the cases of fuel and mineral exports. The aforementioned might suggest that the negative effect of these booms on manufacturing has tended to increase during the last 30 years. Once again, the exercise is repeated excluding high-income, North African and Middle Eastern countries from the sample. Said exercise shows how the negative effect of post mineral and fuel booms on manufacturing industry is stronger for developing countries.

III. CONCLUSIONS AND NEXT STEPS

The main conclusions that can be made from the above analysis are:

- The world is undergoing a boom of booms at a global level, in which South America is playing a prominent role.
- Booms, more than stable income derived from natural

Table 9

ESTIMATE OF THE VALUE-ADDED IN MANUFACTURING / LONG-TERM GDP (1965-2012)

		Total of the sample				*Middle and low-income countries*[1]			
		(1)		*(2)*		*(3)*		*(4)*	
Boom magnitude	Foods	0.36[c]	(4.15)	0.37[c]	(4.75)	0.26[c]	(3.40)	0.31[c]	(5.18)
	Fuels and minerals	0.04	(0.70)			−0.12	(−1.49)		
Post-booms	Foods	−0.093	(−1.10)			0.04	(0.73)		
	Fuels and minerals	−0.06[a]	(−1.82)	−0.06[b]	(−2.20)	−0.16[c]	(−6.10)	−0.13[c]	(−3.46)
Controls	GDP per capita	0.82[c]	(8.65)	0.81[c]	(8.35)	8.65[c]	(7.88)	8.52[c]	(7.41)
	GDP per capita[2]	−0.01[c]	(−6.94)	−0.01[c]	(−6.86)	−0.71[c]	(−6.58)	−0.70[c]	(−6.22)
	Federal Reserve	0.12[c]	(3.77)	0.13[c]	(5.29)	0.04[a]	(1.75)		
	US GDP growth	0.04	(1.64)			0.03	(0.93)		
	NR exports/LT GDP	−0.16[c]	(−5.05)	−0.15[c]	(−6.82)	−0.09[c]	(−2.73)	−0.12[c]	(−4.23)
	Trend	−0.01	(−0.39)			−0.10[c]	(−6.10)	−0.11[c]	(−7.08)
	Constant	23.78	(0.92)	13.79[c]	(17.25)	203.13[c]	(6.50)	219.27[c]	(7.59)
Indicators	Observations	1,625		1,625		1,001		1,001	
	Groups	40.00		40.00		24.00		24.00	
	R within	0.14		0.14		0.31		0.30	
	F	120.52		95.63		44.68		27.91	

Sources: World Bank and own calculations.
[1] Excludes Middle Eastern and North African countries.
[a] $p < 0.1$, [b] $p < 0.05$, [c] $p < 0.01$.

resource exports or capital flows, tend to generate negative impacts on the share of manufacturing industry in long-term GDP. Such effects persist after the booms have ended.

- Fuel and mineral booms are likely to be longer and larger, generate more Dutch disease symptoms and have more persistent effects on manufacturing industry.

- Capital flow booms tend to be large but short. The contemporary effects of these booms on manufacturing are likely to be neutral, which possibly explains why the revaluation effect is offset by greater financing in favor of industry. Nevertheless, the end of these booms also brings a period where manufacturing industry's share in long-term GDP is low.

- Agricultural products booms are likely to have a positive contemporary effect on industry, which might be explained by the elasticity of supply, the lower discretion governments usually exercise with regards revenues associated to the booms and the greater links the sector has with manufacturing industry. The foods post-boom is not significant.

APPENDIX 1

Appendix 1

BOOMS BY REGION

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
South Asia												
Cambodia										2007	2.0	3.0
China										1993	6.0	3.9
Fiji										2004	5	7.5
Indonesia	1977	4.0	2.4	1980	6.0	9.9						
	1994	4.0	1.5									
	2008	5.0	1.4									
Laos										1994	4.0	7.0
Malaysia	1964	2.0	7.2	1964	2.0	5.9	1984	2.0	6.0	1991	7.0	4.6
	1979	3.0	8.1	1979	7.0	7.9	1992	2.0	8.9			
	2011	2.0	4.3	2006	3.0	5.3	1995	2.0	7.7			
				2011	2.0	5.4						
Papua New Guinea	1992	2.0	8.0				2006	2.0	8.1			
							2009	2.0	11.1			

Phillipines	1974	8.0	1.6				1994	4.0	9.7			
Solomon Islands							1988	3.0	3.2	2008	3.0	17.0
Thailand	1964	2.0	5.4				1991	6.0	9.9	1998	2.0	2.7
	1979	4.0	2.9									
	1995	2.0	2.6									
	2008	5.0	2.7									
Tonga	1991	5.0	2.9									
Vanuatu							2003	3.0	9.6	1991	7.0	7.3
	2011	2.0	3.3	2005	4.0	4.3				1995	3.0	6.8
Europe and Central Asia												
Albania				2011	2.0	3.2				2007	4.0	5.0
Armenia				2010	3.0	3.5				2006	4.0	4.9
Azerbaijan				2007	5.0	28.4				2003	2.0	11.3
Belarus	2010	3.0	1.8	2006	3.0	9.5				2007	2.0	3.0
				2011	2.0	10.1						
Bulgaria	2008	5.0	3.3	2006	3.0	9.4	2006	3.0	13.4	2004	5.0	16.6
				2011	2.0	7.7						
Georgia							2007	2.0	7.9	2006	3.0	9.5

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
Kazakhstan				2006	3.0	16.0						
Kyrgyz Republic	2010	2.0	2.6	2011	2.0	2.9						
Lavia	2007	2.0	2.6	2011	2.0	2.9	2005	3.0	15.8	2006	2.0	4.6
Lithuania	2007	3.0	6.7	2004	5.0	5.0	2006	2.0	9.8	2006	3.0	2.3
				2011	2.0	6.8						
Macedonia FYR							2008	2.0	3.5	2006	3.0	4.6
Moldova							2007	2.0	11.0	2007	2.0	8.8
Romania				2006	3.0	1.8	2005	4.0	6.8	2004	5.0	5.8
Russia Federation				2006	3.0	8.3						
Turkey							2010	2.0	3.9			
Ukranie	2008	5.0	3.7							2005	4.0	5.8
Central America												
Antigua and Barbuda							1996	2.0	8.3	1987	5.0	6.5
										2003	5.0	15.2
Belize	1984	2.0	26.0	2007	5.0	3.7	2002	3.0	12.1	2004	5.0	4.8

Costa Rica	1976	6.0	5.2							6.0	3.0	2.1
	1993	6.0	6.9									
Dominica	1991	4.0	3.8				1999	2.0	7.3	1994	2.0	10.4
										2008	2.0	4.7
Dominican Republic										1999	3.0	2.1
El Salvador	1976	5.0	12.9							2007	2.0	4.2
	1995	5.0	4.6									
	2011	2.0	1.6									
Grenada										2007	2.0	9.8
Guatemala	1965	2.0	2.9				2000	2.0	3.3			
	1977	5.0	5.4									
Honduras	1965	2.0	4.9				1980	2.0	5.8	2004	5.0	2.3
	1978	3.0	5.1									
	1995	7.0	5.7									
Jamaica				1978	5.0	2.2						
				2006	3.0	3.3						
Mexico				1980	6.0	7.6	1991	3.0	7.7			
				2005	4.0	2.0						
Nicaragua	1976	6.0	7.4							1997	4.0	3.1
	2010	3.0	8.8									

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
St. Kitts and Nevis										1989	2.0	21.6
										2000	2.0	8.2
St. Lucia	1990	3.0	6.2				2007	2.0	8.6	1990	2.0	5.7
										2006	3.0	13.2
St. Vincent and the Granadines	1999	3.0	2.9				1991	2.0	6.1	1993	2.0	8.9
										1997	2.0	15.9
South America												
Argentina	1977	7.0	2.7				1993	2.0	10.7	1999	2.0	5.6
	2007	6.0	2.5				1997	2.0	6.1			
Bolivia	1994	5.0	1.6	1974	10.0	4.4				1995	8.0	7.5
				2005	8.0	11.1						
Brazil	1964	2.0	2.1				1994	3.0	7.0			
Chile	1994	5.0	1.8	1979	3.0	4.9	1992	3.0	5.9	1996	4.0	2.9
				1988	2.0	3.0	1996	2.0	4.5			

				2006	3.0	10.2						
Colombia	1964	2.0	2.5	2008	5.0	4.5	1981	2.0	3.8			
	1977	4.0	4.0				1994	3.0	5.2			
Ecuador	1964	2.0	5.1	1980	6.0	4.4	1990	3.0	7.7			
	1994	5.0	4.7	2005	4.0	6.9						
	2011	2.0	1.8	2011	2.0	4.9						
Guyana										1992	4.0	14.8
										2009	2.0	4.0
Paraguay	1989	2.0	7.1	2010	3.0	9.6	1981	2.0	5.1			
	2001	3.0	4.1									
	2007	2.0	9.2									
Peru	1964	3.0	2.6	1979	7.0	5.3				1994	4.0	5.1
	1994	4.0	1.3	2005	8.0	5.8						
	2008	5.0	1.0									
Suriname	1995	5.0	6.6	1997	2.0	22.2						
Uruguay	1980	4.0	3.4							2006	5.0	3.2
	1996	3.0	1.5									
	2008	5.0	3.1									
Venezuela				1979	4.0	11.9				1997	2.0	5.3
				2005	4.0	8.9						

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
East Asia and the Pacific												
Maldives							2005	4.0	5.4	2004	7.0	2.8
Nepal							1991	5.0	4.6			
Pakistan	1964	4.0	2.6									
	1979	3.0	1.6									
Sri Lanka	1964	3.0	8.0				1993	2.0	4.9			
	1977	5.0	3.4									
Sub-Saharan Africa												
Angola										1998	4.0	7.6
Benin							1981	2.0	10.8	1989	4.0	4.6
Botswana										2002	5.0	5.0
Burkina Faso	2010	2.0	10.4									
Cabo Verde										1995	2.0	4.4
										2006	3.0	8.5
Cameroon	1964	2.0	4.5	2006	2.0	5.5						
	1978	2.0	2.8									
	2008	4.0	6.2									

Central Africanan Republic	1998	2.0	1.5							
	2007	2.0	1.8							
Cote d'Ivoire	1964	2.0	13.4	2005	5.0	7.5				
	2010	2.0	4.1							
Ethiopia	2010	3.0	1.8							
Gabon	1964	2.0	20.0	2007	2.0	22.4				
Ghana	1974	5.0	6.3	1976	3.0	1.5		2007	4.0	4.9
				2011	2.0	13.7				
Guinea								2007	2.0	7.1
Kenya	1994	5.0	2.6							
Lesotho								1995	5.0	30.7
Madagascar	1975	6.0	2.7							
	1994	3.0	3.1							
Malawi	1977	5.0	5.0							
	1990	2.0	7.4							
	1996	2.0	4.7							
Mauritania								2007	2.0	3.3
Mauritius	1995	3.0	3.2							

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
Mozambique	2011	2.0	1.7	2004	4.0	9.0				1998	2.0	6.2
										2001	3.0	2.9
Namibia	2010	3.0	1.2							2007	4.0	2.5
Niger	1965	3.0	1.5	2010	3.0	7.7				2008	2.0	9.6
	2008	2.0	2.5									
Nigeria	1964	4.0	4.1	1974	6.0	9.5		2.0	9.9		6.0	4.1
Senegal				1974	8.0	3.3	2007	2.0	5.0			
				1996	2.0	2.9						
Seychelles	1978	3.0	6.0							2006	5.0	4.9
	2000	5.0	7.9									
Sierra Leone										2004	4.0	3.9
South Africa				2006	7.0	3.6	1976	4.0	6.3			
							2006	2.0	5.8			
Middle East and North Africa												
Algeria				1979	6.0	9.8						
				2005	4.0	17.9						
Djibouti										2006	4.0	15.1

Egypt	1973	5.0	2.3	1980	6.0	5.2				2005	4.0	4.3
				1988	2.0	3.0						
				2005	4.0	3.2						
Jordan	1979	4.0	1.2	1988	5.0	2.0	1991	2.0	30.2	2005	4.0	9.5
	1993	5.0	2.7				1994	2.0	7.6			
							2007	3.0	6.9			
Morocco	1964	3.0	2.8	1974	2.0	7.0						
	1994	4.0	2.7	1979	3.0	3.9						
Syrian Arab Republic							1980	4.0	8.2			
							1993	2.0	5.2			
Tunisia	1972	3.0	1.9				1979	7.0	7.5	2006	3.0	4.0
	2006	3.0	1.0				2007	5.0	3.1			
High-income countries												
Australia	1964	3.0	3.0	1989	4.0	1.2	1986	4.0	1.4			
	1965	3.0	1.0	2008	5.0	5.2						
Bahrain				2007	2.0	17.5	1993	2.0	25.7	1991	2.0	12.9
										1995	2.0	16.4
Barbados	1967	2.0	13.3				1980	2.0	6.3	2005	6.0	9.6
	1974	2.0	6.7				1999	3.0	7.2			
	1995	3.0	1.3				2004	2.0	6.7			

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
Belgium	1978	4.0	1.4	1979	5.0	2.9						
	1994	3.0	1.0	2004	5.0	4.4						
	2007	2.0	2.0	2011	2.0	5.3						
Brunei Darussalam				1979	6.0	55.1						
Canada	1979	3.0	0.8	1974	3.0	1.3	2009	3.0	4.4			
	1994	4.0	0.7	1979	3.0	1.6						
				2005	4.0	3.9						
Croatia				2006	3.0	1.7				2006	3.0	4.9
Cyprus	1990	2.0	1.7				1989	2.0	3.9	1999	3.0	3.0
	1995	2.0	2.1									
Czech Republic	2011	2.0	1.6	2010	3.0	1.9						
Denmark	1964	3.0	4.0				1987	2.0	4.0			
	1978	4.0	1.7				2009	2.0	11.1			
	1990	3.0	1.0									
Estonia				2006	6.0	5.3						
Finland	1964	3.0	3.4				1987	4.0	7.7			
	1979	3.0	2.1				2008	4.0	14.6			

Francia							2009	2.0	5.6			
Greece				2011	2.0	3.6	1998	2.0	4.2			
Greenland	1987	4.0	12.3	1988	2.0	9.5						
Hungría	1979	5.0	3.3	1980	5.0	1.8	1993	3.0	8.2	1995	4.0	4.3
	2008	5.0	2.1				2004	3.0	5.6			
Islandia	1964	3.0	15.2	2007	6.0	7.6	2004	5.0	46.1			
	1978	4.0	7.0									
	1987	6.0	3.4									
Irlanda	1975	7.0	4.0				2004	3.0	24.4	1999	5.0	9.0
Israel	1976	6.0	1.0				1995	3.0	6.4			
Italia							2007	3.0	4.3			
Korea, Rep.	1965	2.0	3.7									
Kuwait				1979	3.0	47.2				1994	2.0	6.2
				2006	3.0	24.5						
Malta				2010	3.0	16.8				1999	2.0	10.1
										2006	2.0	13.5
Monaco										2002	3.0	2.9
Netherlands	1978	2.0	2.9	1976	10.0	3.9	2010	2.0	10.6			
	1994	3.0	2.2	2006	7.0	4.3						
	2011	2.0	4.7									

	Agricultural products			*Fuels and Minerals*			*Short-term flows*			*Investment flows*		
	Start	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*	*Start*	*Duration*	*Magnitude*
New Zealand	1979	4.0	3.4				2004	4.0	6.2	1995	3.0	3.6
	1995	2.0	2.3									
	2011	2.0	2.9									
Norway	1964	3.0	1.8	1979	4.0	5.5	1986	3.0	5.4			
				2005	4.0	8.2						
				2011	2.0	4.6						
Poland	2008	5.0	1.4				2008	3.0	4.6			
Portugal							1981	2.0	7.5			
							2006	2.0	6.5			
Slovak Republic	2011	2.0	1.9	2006	3.0	2.1						
				2011	2.0	3.1						
Saudi Arab				2005	4.0	16.5				1981	4.0	6.1
				2011	2.0	15.3				2006	4.0	4.9
Slovenia				2006	3.0	2.8						
				2010	3.0	3.2						

Spain				2004	4.0	8.7			
Sweden				1988	3.0	10.2			
Switzerland				2008	4.0	13.7			
Trinidad and Tobago	1974	9.0	26.6				1993	2.0	3.7
	2005	4.0	32.6				1997	2.0	7.1
United Arab Emirates				1993	3.0	9.9			
United Kingdom	1980	6.0	2.7	1987	2.0	5.6			
				1999	2.0	7.2			
United States				2002	7.0	2.9			

APPENDIX 2

Appendix 2

THE RESULTS COMPARED WITH OTHER METHODOLOGIES

	Fernández-Villar (2013)						*Velasco-Céspedes (2012)*				*Adler and Magud*	
	Agricultural products		*Fuels and minerals*		*Natural resources aggregate*		*Output*		*Exports*			
	Start	*End*	*Start*	*End*	*Start*	*End*	*Start*	*End*	*Start*	*End*	*Start*	*End*
Argentina	1977	1983			1977	1981	1973	1985	1974	1985	1971	1974
	2007	2012			2005	2012	2003	2009	2005	2009	1990	1998
											2003	2012
Bolivia	1994	1998	1974	1983	1974	1981	1973	1985	1973	1992	1973	1974
			2005	2012	2006	2012	2003	2009	2005	2008	1979	1980
											1984	1985
											2003	2012
Brazil	1965	1965			2006	2012	1973	1981			2006	2012
							2007	2009				
Chile	1994	1998	1979	1981	1979	1980	1970	1983	1979	1980	1979	1980
			1988	1989	1988	1989	2006	2009	2006	2009	1987	1991
			2006	2008	2006	2008					1994	1995
											1962	2012
Colombia	1964	1965	2008	2012	1964	1965	1973	1985	1974	1987	1976	1977
	1977	1980			1977	1980	2005	2009	2005	2009	1981	1986
					1995	1997					1995	2003
					2008	2012					2004	2012

Ecuador	1964	1965	1980	1985	1980	1981	1974	1985	1974	1985	1973	1976
	1994	1998	2005	2008	1994	1997	2005	2009	2006	2009	1977	1985
	2011	2012	2011	2012	2006	2008					2002	2012
					2011	2012						
Paraguay	1989	1990	2010	2012	2007	2011	1973	1974	1973	1974	1988	1990
	2001	2003					1979	1981			2002	2004
	2007	2008									2008	2012
Peru	1964	1966	1979	1983			1974	1985	1973	1984	1973	1974
	1994	1997	2005	2011			2005	2009	2006	2009	1979	1989
	2008	2012									1990	1992
											1994	1998
											2003	2012
Uruguay	1980	1983			1980	1983	1977	1980	1977	1981	1971	1973
	1996	1998			2008	2012					1986	1989
	2008	2012										
Venezuela			1979	1980	1979	1982	1973	1985	1974	1985	1989	1990
			2005	2008	2005	2008	1990	1992	1990	1992	1995	1996
							2004	2009	2004	2009	1999	2000
											2003	2012

References

Adler, G., and N. Magud (2013), *Four Decades of Terms-of-trade Booms: Saving-investment Patterns and a New Metric of Income Windfall*, IMF Working Paper, No. WP/13/103.

Athukorala, Prema-Chandra, and Sarath Rajapatirana (2003), "Capital Inflows and the Real Exchange Rate: A Comparative Study of Asia and Latin America," *The World Economy,* Wiley Blackwell, Vol. 26, No. 4, pp. 613-637.

Backus, D., and P. Kehoe (1992), "International Evidence on the Historical Properties of Business Cycles," *American Economic Review,* Vol. 82, No. 4, pp. 864-888.

Besley, T., A. Jensen and T. Persson (2013), *State Capacities and Natural Resources,* in the process of being revised <https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=IIPF69&PAPER_ID=375>.

World Bank (2010), *Natural Resources in Latin America and the Caribbean beyond Booms and Busts?*, World Bank Flagship Report.

Bluedorn J., R. Duttagupta, J. Guajardo and P. Topalova (2013), *Capital Flows Are Fickle: Anytime, Anywhere*, IMF Working Papers, No. WP/13/183.

Céspedes, L. F., and A. Velasco (2011), *Was This Time Different?: Fiscal Policy in Commodity Republics*, Monetary and Economic Department BIS Working Papers, No. 365, November.

Céspedes, L.F., and A. Velasco (2012), *Macroeconomic Performance during Commodity Price Booms and Busts*, NBER Working Paper Series, No. 18569, <http://www.nber.org/papers/w18569>.

Cooley, T., and L. Ohanian (1991), "The Cyclical Behavior of Prices," *Journal of Monetary Economics,* Vol. 28, No. 1, pp. 25-60.

Correia, I., J. Neves and S. Rebelo (1992), "Business Cycles from 1850-1950: New Facts about Old Data," *European Economic Review,* Vol. 36, No. 2/3, pp. 459-467.

Corden W. M., and J. P. Neary (1982), "Booming Sector and De-industrialization in a Small Open Economy," *Economic Journal,* Vol. 92, December, pp. 825-848.

Cuddington, J. T. (1992), "Long-run Trends in 26 Primary Commodity Prices: A Disaggregated Look at the Prebisch-Singer Hypothesis," *Journal of Development Economics,* Vol. 39, No. 2, October, pp. 207-227.

De Ferranti, D., G. Perry, D. Lederman and W. Maloney (2001), *From Natural Resources to the Knowledge Economy: Trade and Job Quality,* World Bank.

Driscoll, J. C., and A. C. Kraay (1998), "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data," *Review of Economics and Statistics,* Vol. 80, pp. 549–560.

Erten, B., and J. A. Ocampo (2013), "Super Cycles of Commodity Prices since the Mid-nineteenth Century", *World Development,* Vol. 44, pp. 14–30.

Hodrick, R. J., and E. C. Prescott (1997), "Postwar U.S. Business Cycles: An Empirical Investigation," *Journal of Money, Credit, and Banking,* Vol. 29, pp. 1-16.

Hoechle, Daniel (2007), "Robust Standard Errors for Panel Regressions with Cross-sectional Dependence," *Stata Journal,* Vol. 7, No. 3.

Ismail, K. (2010), *The Structural Manifestation of the 'Dutch Disease:' The Case of Oil Exporting Countries,* IMF Working Paper, No. WP/10/103, April.

Izquierdo, A., and E. Talvi (2011), *One Region, Two Speeds?: Challenges of the New Economic Order for Latin America and the Caribbean,* IBD.

Ilzetzki, Ethan, Carmen Reinharty and Kenneth Rogoff (2008) *Exchange Rate Arrangements Entering the 21st Century: Which Anchor Will Hold?,* unpublished manuscript and data available online: <http://personal.lse.ac.uk/ilzetzki/index.htm/Data.htm>.

Kaldor, Nicholas (1934), "A Classificatory Note on the Determinateness of Equilibrium," *Review of Economic Studies*, Vol. I, pp. 122-136.

Kamar B, D. Bakardzhieva and S. Ben Naceur (2010), *The Impact of Capital and Foreign Exchange Flows on the Competitiveness of Developing Countries*, IMF Working Paper, July.

Krugman, P. (1987), "The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes on Trade in the Presence of Dynamic Scale Economies," *Journal of Development Economics,* Vol. 27.

Lartey, E.K.K. (2008), "Capital Inflows, Resource Allocation and the Real Exchange Rate," *International Finance,* Vol. 11, pp. 131-152.

Meller, P., D. Poniachik and I. Zenteno (2013), *América Latina y la bendición de los recursos naturales,* Cieplan.

Ocampo, J. A., and M. Parra (2010), "The Terms of Trade for Commodities since the Mid-nineteenth Century," *Journal of Iberian and Latin American Economic History/Revista de Historia Económica,* Vol. 28, No. 1, pp. 11–43.

Prebisch, Raul (1959), "Commercial Policies in the Underdeveloped Countries," *The American Economic Review, Papers and Proceedings,* Vol. 49, No. 2, pp. 251-273.

Ravn, M., and H. Uhlig (2002), "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations," *The Review of Economics and Statistics,* Vol. 84, No. 2, pp. 371-376.

Sachs, Jeffrey D., and Andrew M. Warner (1995), *Natural Resource and Economic Growth*, NBER Working Paper.

Sachs, J. D., and Andrew M. Warner (1997), *Natural Resource and Economic Growth.* revised version, Harvard Institute for International Development, Cambridge, Massachusetts.

Sachs, J. D., and A. M. Warner (1999), "The Big Rush, Natural Resource Booms And Growth," *Journal of Development Economics*, Vol. 59, No. 1, June, pp. 43-76.

Singer, Hans W. (1950), "The Distribution of Gains between Investing and Borrowing Countries," *The American Economic Review*, Vol. 40, No. 2, pp. 473-485.

Spatafora, N., and A. Warner (1995), *Macroeconomic Effects of Terms-of-trade Shocks: The Case of Oil-exporting Countries*, Policy Research Working Paper Series, No. 1410, World Bank.