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OUTPUT FLUCTUATIONS AND ECONOMIC GROWTH IN LATIN AMERICA IN THE AFTERMATH OF THE GREAT RECESSION

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A Dissertation Presented

by

GONZALO HERNANDEZ JIMENEZ

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DEDICATION

To my parents, to Juanita, and to Gonzalo and Ernesto.

ABSTRACT

OUTPUT FLUCTUATIONS AND ECONOMIC GROWTH IN LATIN AMERICA IN THE AFTERMATH OF THE GREAT RECESSION

SEPTEMBER 2014

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This dissertation examines the short and long run effects of the Great Recession on Latin America. For the short run, this study evaluates (i) the existence of a business cycle co-movement between the US and Latin America, (ii) the role of the Latin American export structure as an aspect that may amplify the growth spillover effects of the output fluctuations in the US, and (iii) the terms of trade as a determinant of the short run output fluctuations in Colombia, a primary commodity exporter that resembles the assumptions of open small dependent economies. Consistent with the historical evidence, the US GDP contraction in 2009 had a more severe short-run effect on non-primary commodity exporters that have the US as a key export market. Econometric evidence also shows that Latin America, on average, faces a process of decoupling with the US. China and other developing economies have recently become more important geo-economic sources of output fluctuations for Latin America. Regarding the long run, the dissertation identifies that the Latin American economic growth has mainly been based on an export-led growth regime. In particular, this study finds that the current account as a proportion of GDP is a

positive and statistically significant correlate of economic growth. This growth regime is vulnerable to a recent development of the world economy in the aftermath of the Great Recession: shrinkage of global imbalances.

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CHAPTER 1

INTRODUCTION AND MOTIVATION

This first chapter of the dissertation has two main objectives. It attempts (i) to briefly describe some aspects of the recent Latin American economic context in order to understand why Latin America, as a subset of the developing world, is an interesting case study, and (ii) to introduce the main questions that will be studied in the following three essays regarding the long- and short-run macroeconomic effects of the Great Recession on Latin America.

For the first objective, it is worth noticing that in the last fifty years, Latin America, in contrast to economically successful regions like East Asia, has been generally characterized by macroeconomic instability and/or poor economic growth. Indeed, the region witnessed an initial industrialization in the sixties and the seventies, which was never consolidated; a "lost decade" in the eighties, as a result of the external debt crisis; and a modest growth period in the nineties that ended up in a severe financial crisis in 1999. Although this severe downturn at the end of the twentieth century was certainly the result of a pervasive capital outflow from emerging markets, this episode not only confirmed the reputation of the region regarding its instability and stagnation, but also fostered and increasing debate on the free-market economic reforms (i.e. the trade liberalization) that began being implemented in the nineties. In fact, while some economists insisted on defending the reforms packet and even supported its more rapid implementation, others portrayed the free-market economic principles of the so called "Washington Consensus" as the base of a failing development strategy for Latin America. Not surprisingly, for example, the political confrontation in the late nineties and

the beginning of the 2000's saw the appearance of a counter-reform attack as one of the main issues addressed in the rhetoric and the political platforms of the leftist movements. The left wing, in fact, gained control of many Latin American governments in that period. Nevertheless, despite the debate about the reforms as hindering elements of the Latin American development, some of these reforms, in particular those related to fiscal and monetary discipline (i.e. the independence of the central banks), were effective in improving the monetary stability of the region. For example, inflation, a major concern of the region since the seventies, reached a historical low level in the beginning of the 2000's after a declining trend that started in the nineties. It is worth noticing, however, that this stability also reflected a weak aggregate demand regime consistent with low economic growth rates.

Years 2003 to 2007 offered a different panorama. The United States, a main export market for Latin American output, left behind the impact of its recession in 2001, and the rapidly expanding Chinese economy emerged as a new engine of the world economy that increased the demand for primary commodities produced in the developing world (i.e. oil, coal, and other minerals). The price of these commodities skyrocketed, giving a name to this period: the commodity price boom. Although conservative monetary policies in some Latin American countries absorbed part of the positive terms of trade shock, the region certainly benefited from this boom in the short-run. The terms of trade shock provided, for example, a greater margin for an expansion of fiscal expenditure without affecting the fiscal deficit goals. Likewise, current account surpluses increased. This aspect meant a broader availability of financial funds to support investment. In this period, the regional economy grew at rates comparable with the

relatively favorable growth rates in the seventies, and Latin America accumulated foreign currency reserves to prevent further attacks on the capital account like those that occurred in 1999. However, in structural terms, this economic expansion was focused on capital-intensive sectors like oil and mining, and on services, particularly the financial sector. Therefore, despite the period of satisfactory economic growth, Latin American economies did not see a substantial improvement in employment rates in modern/formal sectors.

Acknowledging the tension between the region's macroeconomic achievements after the eighties and the nineties and the still challenging social and economic conditions in terms of unemployment, poverty and income inequality, The Economist, in September 2010, devoted a special report about the Latin American economy that was titled "So near and yet so far". The report is of course just an example of the increasing attention that Latin America is receiving, in part due to a more dynamic role of the developing world, but also due to particular regional aspects such as: the extended presence of leftist governments; the new position of Brazil as the sixth biggest economy in the world, after overtaking the UK; the fact that high commodity price levels in the last decade have benefited the region as an aggregate (at least in the short run) but have not substantially alleviated the poverty; and finally, regarding the apparent resilience of the region during the financial crisis in the United States in 2008.

Four years after that report, the attention is now centered on the current political and economic instability in Venezuela and Argentina, two countries that exemplify potential economic policy trade-offs. In the case of Venezuela, despite the effectiveness of its government to reduce poverty in the short-run, relative to other Latin American

economies, this country has not taken advantage of the oil price boom to start-up the conditions for a process of industrialization and diversification, which are necessary conditions (not sufficient of course) for a long-run process of development and poverty reduction. In the case of Argentina, its recent financial instability seems to be proving costly the implementation of second-best policies as subsidies and exchange rate manipulation to foster the development of the industrial sector and thus economic growth. More generally, the optimism regarding the region's resilience during the Great Recession has curbed as well. Even though it had previously been pointed out by some economists, it is clearer now that (i) the trade collapse, along with (ii) the reduction of the region's current account surpluses, rather than the immediate financial shock as a consequence of the US financial crisis, are the main external macroeconomic aspects for the region. These aspects that have recently characterized the world economy and are currently challenging the Latin American macroeconomic performance motivate this dissertation. In particular, this study assesses if Latin America may be in a vulnerable position in the aftermath of the Great Recession.

The Great Recession in 2009, following the financial crisis in the United States and other advanced economies, is an extraordinary macroeconomic event that is still reshaping the trade and financial conditions in the world. The import growth deceleration in industrialized countries, as a consequence of the income adjustment, has led to shrinkage of the global imbalances. The reduction of these global imbalances not only reflects smaller current account deficits in the advanced economies but also a lower margin for developing countries to run current account surpluses. Although this global trade/financial aspect has numerous implications in both industrialized and developing

economies, it is worth noticing that Latin America and other developing economies are under exceptional pressure since they have historically been constrained by the international markets of goods and capital. Developing countries generally resemble the assumptions of open and small economies; therefore, they are not able to exert any market power in these international markets, which means that the access for the developing world to export markets or to capital financing is mostly conditioned by the macroeconomic performance in the industrialized economies. For example, while expansionary periods in advanced economies are associated with expanding export markets for the developing world, the size of these markets shrink during recessions, which intensifies the degree of competition among developing countries to sell their products.

These aspects may certainly constitute long- and short-run difficulties for developing countries; in the long run, regarding the sustainability of their economic growth regimes, especially if these regimes have especially relied on the economic performance in industrialized economies; in the short-run, because negative income shocks in advanced economies may rapidly propagate to developing economies through a deterioration of terms of trade and/or a contraction of output as a consequence of a weaker demand in industrialized economies export market.

More specifically, for the long-run, this dissertation consists of empirically identifying whether the nature of the Latin American economic growth regime has been tradable-led or export-led growth. The term tradable-led refers to idea that a structural sectoral transformation towards the production of tradable goods, commonly industrial goods, is a necessary condition for a developing economy to achieve higher productivity

and a sustained path of economic growth. Given that this regime can be supported, in terms of the demand side, by both domestic and external markets, the deceleration of import growth in advanced economies, directly associated with the external markets, does not necessarily become a binding constraint for a developing economy under this regime. These developing economies might certainly continue a tradable-led growth regime supported by the domestic markets. However, some developing economies may have expanded their tradable sector through three strategies that involve exports as an important component. These strategies, associated with the term export-led growth, are the following (i) exporting manufacturing goods, regardless of the market destination, (ii) exporting manufacturing goods to industrialized economies, or (iii) running current account surpluses (net export-led growth). Although a detailed explanation on how these regimes operate is formally presented in the next chapter, it may be noticed that case (i) may eventually be resilient to the shrinkage of global imbalances and the deceleration of import growth in advanced countries, since economies may potentially continue their export strategy by exporting manufacturing to other developing economies. However, cases (ii) and (iii) are clearly constrained under the recent conditions in the world economy. Therefore, the identification of the main Latin American economic growth engine may provide crucial insights about the vulnerability of the long-run macroeconomic performance of the region.

Regarding the short-run, this dissertation examines the effect of the United States business cycles on Latin America's output fluctuations to evaluate if there is evidence supporting the existence of an output co-movement between these two economies. This approach acknowledges the predominant historical role of the US as an export market for

Latin American output, and the role of trade-structure aspects that may intensify a potential business cycle synchronization between Latin America and the US: (i) primary vs. non-primary commodity exports, (ii) the importance of the United States as an export market for each Latin American economy, and (iii) the role of Latin American manufacturing exports to the United States. The analysis also attempts to describe if the findings based on historical data (1961-2012) resemble the uneven performance of Latin American economies during the Great Recession in 2009. Likewise, for a more specific case of the short-run analysis, the dissertation examines the effect of terms of trade shocks on output fluctuations in a primary commodity exporter: Colombia. Primary commodity exporters are expected to be particularly affected by terms of trade shocks when the world economy decelerates. This may occur, for example, because the price elasticity of supply of primary commodities is lower than the price elasticity of supply of manufacturing goods. Therefore, income shocks in the advanced economies translate into terms of trade shocks on primary commodity exporters that may originate short-run output fluctuations.

Following this introduction, Chapter 2, titled "Latin America after the Global Crisis: The Role of Export-Led and Tradable-led Growth Regimes", deals with the evaluation of the long-run aspect of the Latin American economic performance mentioned above. It examines the relative importance of two major economic growth regimes: (i) export-led growth, and (ii) tradable-led growth in Latin America in preceding years to the Great Recession. Using a panel data analysis, the study finds that the external balance of goods and services as a proportion of GDP, associated with net export-led growth is a robust variable explaining Latin American economic growth in the period

1953-2009. This chapter also develops a simple dynamic model to help explain the main finding through investment and saving behavior. The main finding leads to the conclusion that the continuation of this growth path may be vulnerable in the aftermath of the Great Recession due to the shrinkage of global imbalances, which, as mentioned before, is one of the main aspects characterizing the current world economy. Chapter 3, titled "Latin American Export Structure and the US growth spillover effect in the Great Recession" finds that output fluctuations in Latin America are synchronized with the United States' business cycle in the period 1961-2012. Using a panel data analysis and focusing on export-structure related aspects of the Latin American economies, the study also finds that non-primary commodity exporters, and Latin American countries whose exports have mainly been destined for the US market, display an intensified output fluctuation co-movement with the US. In fact, these results address the uneven performance of Latin American economies in the Great Recession as a consequence of the real GDP contraction in the United States in 2009. Chapter 4, titled "Terms of trade and output fluctuations in Colombia", explores the importance of the terms of trade to explain output fluctuations in Colombia, a developing country where almost two thirds of the exports correspond to four commodities: oil, coal, coffee, and nickel. This chapter is motivated by: (i) the particular role of short run fluctuations in developing economies, (ii) the fact that the Colombian terms of trade are procyclical, and (iii) the discussion on economic policies toward sterilization of the effects of commodities prices. Using time series analysis for the period 1994 -2011, the study finds robust evidence indicating that changes in the terms of trade explain around one third of Colombian quarterly growth. Finally, Chapter 5 summarizes the main concluding remarks from the three main essays.

CHAPTER 2

LATIN AMERICA AFTER THE GLOBAL CRISIS: THE ROLE OF EXPORT-LED AND TRADABLE-LED GROWTH REGIMES

2.1 Introduction

Latin America (LA) has never displayed rapid and sustained economic growth. In contrast, for example, to the persistent high growth rates in East Asia since the 1960's, Latin America has witnessed two "lost decades" in the last fifty years, the first one in the 1980's, marked by severe macroeconomic instability, and the second one in the 1990's with the "Washington Consensus" as the roadmap. Not surprisingly then, information from the World Development Indicators (WDI) shows that while LA's per capita income was 50 percent higher than East Asia's in 1970, the difference between the two regions completely vanished in 2000. Even more dramatic is the comparison among Latin American and East Asian economies that make part of the specific group of developing economies in the WDI. The divergence in growth rates since the 1980's helped Developing East Asia reduce its GDP per capita gap with Developing Latin America from 14 times (in favor of LA) in 1960 to just 2 times in 2010. More recently, in part because of the commodity prices boom since 2003, the region experienced a favorable scenario in the years preceding the Great Recession. Given this performance, similar to the relatively good times in the 1960's and the 1970's, Latin America seemed to have left behind its stagnation. However, optimism that accompanied this buoyancy was finally curbed by the global financial crisis hitting in 2008.

What are Latin America's economic growth prospects in the coming years? The main attempt is to answer this question from an angle that acknowledges a combination

of two elements: (i) Latin America faces new world economy constraints after the recent global crisis, and (ii) the relevance of the external-related factors that currently characterize the world economy (or how binding these constraints are) is conditional to the nature of Latin America's economic growth.

Regarding the new world economy, this study focuses on two features that are direct consequences of the income and price adjustments following the global financial crisis, which may be particularly important to the developing world. First, there is shrinkage of global imbalances (Figure 2.1), which means that economies running current account deficits are now reducing this deficit, while economies that were running positive current account balances are now reducing their surplus. Although, on average, emerging markets and developing economies have financed the current account deficits of the advanced economies since 2000, as shown in Figure 2.1,[1] data from the World Economic Outlook describes a remarkable reduction in the trade surpluses of developing economies since 2009, with an expected downward trend over the next few years. Latin America is not an exception in this pattern. A current account surplus of 1.5 percent of GDP in 2006 is expected to become a current account deficit of 2.4 percent of GDP in 2018. A second aspect characterizing the world economy is the deceleration of industrialized countries' import growth (Figure 2.2). Imports in advanced economies as a proportion of world's GDP reached a maximum of 22 percent in 2008; however, the expected ratio is lower than 19 percent in coming years.

[1] As noted in the literature, this pattern contradicts expectations from the basic neoclassical model in which capital should flow from rich economies (with lower investment returns) to poor economies (with higher investment returns).

In relation to the relevance of these external sector-related factors for Latin America, it is important to notice that both aspects shrinkage of global imbalances and the slowdown of advanced economies imports clearly become binding constraints for Latin America if the nature of its economic growth either is based: (i) on running current account surpluses, or (ii) on exporting to advanced economies (or both). Since these two potential engines of growth involve exports or/and net exports as key elements, they have been treated in the literature as interpretations of the term export-led growth. Nevertheless, not all the variants of export-led growth would necessarily lead to a pessimistic scenario for Latin America. For example, if the positive effects of exporting on growth are destination neutral, an eventual substitution of export markets in other developing economies for markets in industrialized countries might attenuate or even offset the adverse effects of decelerating import growth in advanced economies.

As an alternative to export-led growth, it must be considered the possibility that economic growth in developing economies follows the expansion of the tradable sector, especially consisting of industrial goods, which may not only be fostered by exports or net exports but also by non-external sector determinants. In economies under this growth regime, called tradable sector-led growth, the idea of stronger domestic markets substituting for external markets might lead to the implication that shrinking in global imbalances and import growth deceleration in advanced economies should not necessarily be binding constraints for economic growth either. If this is the case for Latin America, the region might be less vulnerable than those economies more dependent on the external sector-related determinants of growth.

Since different potential growth paths lead to different implications for Latin America in the aftermath of the global financial crisis, the main approach to discuss Latin America's growth prospects consists of an econometric analysis that explores the relative importance of the export-led growth compared to that of the growth path based on the expansion of the tradable sector (tradable-led growth) in years preceding the global financial crisis. This way, this study aims to evaluate the role of external sector-related determinants of growth associated with export-led growth, in order to examine the vulnerability of these potential growth determinants in the future, given shrinkage in global imbalances and the slowdown of import growth in advanced economies. In section 4.2.2, the details of the implications that result from each growth regime are explained. Section 4.2.3 outlines the empirical strategy that is developed to explore the existence of any leading growth regime (or regimes). Since it is found that the current account balance is a robust correlate of Latin America's growth, among the regimes that are studied, Section 4.2.4 provides a discussion of a potential mechanism by which the version of the export-led growth known as net export-led growth operates. Finally, in section 4.2.5, some concluding remarks are presented.

2.2 Export-led growth vs. Tradable-led growth

Rodrik (2009) provides empirical evidence in favor of the idea that successful developing economies, achieving high rates of economic growth, have witnessed a structural change from traditional sectors to modern activities. This transformation, based on the expansion of output of tradable goods, is mainly associated with the development of the industrial sector which fosters the reallocation of labor and capital from primary

sectors to activities with higher levels of productivity.[2] This growth regime, in which the tradable sector is the engine of economic growth, leads to an optimistic point of view in the aftermath of the Great Recession, in the sense that neither shrinkage of global imbalances nor the slowdown of advanced economies imports should necessarily be binding for Latin American economies that are able to expand domestic markets in tune with the development of the tradable sector. This paper refers to this particular growth path as tradable-led growth (TRADABLE). As an alternative to the TRADABLE path, scholars use the term export-led growth to refer to economic growth in developing economies involving exports or net exports (i.e., current account surpluses) as key elements in the growth recipe. Although permanently present in the economic literature since the Mercantilists, the export-led growth path gained special attention in the literature after the take-off of the Japanese economy and the Asian Miracle in the second half of the twentieth century, and more recently in the literature on the outstanding performance of the Chinese economy in terms of economic growth since the nineties.

Tradable-led growth and export-led growth, therefore, might be seen, to some extent, as competing growth regimes, and not surprisingly then, the econometric analysis in Rodrik (2009) is presented as a "horse-race" type set of regressions that explore the relative importance of each growth path. Results in Rodrik (2009) show that the value added of industry as a proportion of GDP (proxy for the tradable sector) is a robust regressor of economic growth in developing economies after controlling for the inclusion of two variables associated with export-led growth: (i) the share of exports in GDP,

[2] In the context of several developing economies, the scope of the argument may be extended to the benefits that industrialization brings in terms of the use of underemployed economic resources (for example, labor).

which may capture a source of economic growth when mechanisms as learning by exporting or technological spillovers from exporting occur, and (ii) trade surplus as percent of GDP, which reflects a source of net demand for tradable goods. Rodrik (2009) concludes that the developing world may sustain its growth rates, in the aftermath of the Great Recession, by expanding the tradable sector along with increases in domestic demand. Given the expansion in domestic demand, neither the shrinkage in global imbalances nor deceleration in advanced economies' import growth should be seen as very serious obstacles. In spite of the fact that undervaluation of the domestic currency, one of Rodrik's milestones in the tools to achieve industrialization and economic growth, might be off the menu given the reduction of trade surpluses in developing economies, second best policies, as direct subsidies that expand the production and domestic consumption of tradable goods, might guarantee the continuation of the TRADABLE path.

It is worth noting at this point that had the share of exports in GDP been the "winner" in the "horse- race" regressions among competing growth regimes, prospects for developing economies would not have necessarily been pessimistic either. For example, Canuto et al (2010) pins down the existence of a process of decoupling between developing countries and advanced economies. Developing economies are facing, to some degree, a substitution of South-South trade for South-North trade. WDI data shows, for example, that in 1960, for each dollar that the region exported to developing economies, nine dollars were exported to high income economies. This has changed since then. Latin American exports to developing economies accounted for 35 percent of the total exports of merchandises in 2011. This type of substitution in South's trade partners

leads some economists to think that gains from exporting, mainly associated with manufactured exports, might also be obtained from exporting to other developing economies. Regarding this aspect, Hernandez and Razmi (2013) include in their "horse-race" regressions the share of manufactured exports in GDP as a potential regressor of economic growth in Asia. This variable is a proxy of a growth regime defined as manufactured export-led growth (MANUF_EXPORT), which is a particular interpretation of export-led growth where the gains from exporting occur regardless of the market destination. Results in Hernandez and Razmi (2013), however, did not support the importance of this variant of the export-led growth path in Asia.

More interestingly, Hernandez and Razmi (2013) find that another variable, the proportion of manufactured exports destined to industrialized countries, is the most robust regressor of economic growth in Asia. This interpretation of export-led growth is defined as industrialized country centered export-led growth (EXPORT_TO_INDUS). A clear implication from the analysis in Hernandez and Razmi (2013) is that gains derived from exporting are not destination neutral. This hypothesis has been studied in the literature before. For example, Pack (2001) argues that meeting specific contractual requirements in advanced economies, in a context of strong international competition, necessarily required an increase in the East Asian exporters' efficiency. Similarly, De Loecker (2007) provides econometric evidence showing that Slovenian firms exporting to high income countries benefit more, in terms of gains of productivity, than those firms with a lower proportion of exports destined to advanced economies. This suggests that developing countries able to orient its exports to markets in advanced economies benefit more from technological spillovers, quality control, economies of scale, and learning by

exporting, than those economies focused on exporting to developing markets. For the EXPORT_TO_INDUS regime, shrinkage in global imbalances is not necessarily a binding constraint but the slowdown of industrialized countries import growth clearly is.

A last interpretation of the export-led growth that would also lead toward a pessimistic implication for Latin America and the developing world is known as net export-led growth (NET_EXPORT). This interpretation refers basically to trade surpluses as a source of net demand for domestic output. An excess of exports over imports means an expansion of output, either through exportable sectors or through sectors producing importable goods. In this case, while the deceleration of advanced economies import growth does not necessarily affect the growth path, the expected reduction in trade deficits in advanced economies implies a narrower margin for developing countries to run current account surpluses. In the particular case of Latin America, a decomposition of the trade balance in (i) trade balance with developed economies and (ii) trade balance with developing economies for the period 1990-2010 shows that the average trade balance is generally driven by the trade balance with advanced economies. Furthermore, Latin America has been running a trade deficit with developing countries since the mid-nineties, and this trade deficit has been deteriorating with the exception only of year 2009, when imports fell by a greater magnitude than exports, as a consequence of the income adjustment in Latin American economies.

It is important to notice that the relationship between trade surpluses and economic growth can be interpreted in additional ways. By simple macroeconomic accounting, the current account and the capital account are two sides of the same coin. This means that a current account imbalance reflects the gap between domestic saving

and investment. For example, a country running a trade deficit must be financing the excess of imports over exports (or excess of demand for goods and services) with capital inflows. Similarly, a current account surplus means that the domestic economy finances other economies' trade deficits. Therefore, a positive change in the current account surplus means less net capital inflows, and also a larger positive gap between domestic saving and investment. The effect of less net capital inflows on economic growth might be theoretically neutral if one thinks that the source of financing is irrelevant and what matters is the ability of the economy to fund investment projects either with domestic or with external funds. The effect may, however, be positive if domestic saving is particularly important for economic growth. For example, Prasad et al. (2007) find the existence of a positive correlation between current account balances and economic growth in nonindustrial economies, a result described as surprising because it contradicts the assumption in conventional neoclassical theoretical models of developing economies as saving constrained economies. The main theoretical argument supporting the negative relationship between capital inflows and growth in Prasad et al. (2007) is that developing countries have a limited capacity to absorb foreign resources due to underdevelopment in financial institutions or due to the overvaluation of the domestic currency generated by capital inflows. Implying a positive relationship between domestic saving and growth in developing economies as well, Aghion et al. (2006) provide evidence that domestic savings are significantly associated with: (i) total factor productivity growth in poor countries, (ii) higher levels of foreign direct investment inflows, and (iii) equipment imports. Domestic saving in this case is important to attract foreign investors who are familiar with the frontier technology but need local banks to monitor local projects. In

other words, domestic saving and capital inflows complement each other. Nevertheless, in opposition to the apparent positive effect of foreign direct investment, it could be argued that net capital inflows, when these take the form of foreign direct investment directed to primary sectors, may have long run negative effects on growth due to perverse incentives against the structural change from traditional to modern activities (i.e, rent seeking economies). Finally, a current account surplus, or the excess of savings over investment, may be reflecting a higher profitability for domestic firms that may lead to higher economic growth. In this sense, for example, favorable terms of trade shocks might increase both the current account surplus and the rates of economic growth by improving the profitability of domestic firms. This aspect might be especially important during the last commodity prices boom.

To sum up, in this approach, the effects of shrinkage of global imbalances and the slowdown of import growth in advanced economies on Latin America may depend on the relative importance of four competing regimes of economic growth: (i) tradable-led growth (TRADABLE), (ii) manufactured export-led growth (MANUF_EXPORT), net export-led growth (NET_EXPORT), and industrialized country-centered export-led growth (EXPORT_TO_INDUS). The next section econometrically explores the relevance of these regimes for Latin America.

2.3 Empirical Strategy

The relative importance of the different versions of export-led growth, and tradable-led growth is examined with the following baseline regression for the dependent variable: rate of real (chained) GDP per capita growth (*GRGDPCH*).

$$GRGDPCH_{j,t} = \alpha + \beta_0 \ln RGDPCH_{j,t-1} + \sum_{i=0}^{2} \delta_i TRADABLE_{j,t-i}$$
$$+ \sum_{i=0}^{2} \gamma_i MANUF\_EXPORT_{j,t-i} + \sum_{i=0}^{2} \lambda_i NET\_EXPORT_{j,t-i} + \sum_{i=0}^{2} \pi_i EXPORT\_TO\_INDUS_{j,t-i} + f_t + f_j + \varepsilon_{j,t}$$

On the right hand side, the specification includes: (i) the real GDP per capita (*RGDPCH*) in the previous period, to control for convergence, (ii) a proxy for the regime that is called tradable-led growth (*TRADABLE:* value added in industry as a proportion of GDP), (iii) a proxy for manufactured export-led growth (*MANUF_EXPORT:* manufactured exports as a proportion of GDP), (iv) a proxy for net export-led growth (*NET_EXPORT:* external balance of goods and services as a proportion of GDP), (v) a proxy for industrialized country centered export-led growth (*EXPORT_TO_INDUS:* manufactured exports destined to developed countries as a proportion of GDP). Finally the regression includes time and country fixed effects (f), and the error term (ε). The subscripts j and t represent countries and time, while i (= 1, 2, …) reflects lags.

Table 2.1 summarizes the expectations, discussed in the previous section, for the potential effects of the shrinkage of global imbalances and the deceleration of advanced economies' import growth depending on the particular growth regime. If Latin America's growth were based on the tradable-led growth regime, neither shrinking trade deficits in industrialized economies nor the slowdown of import demand necessarily would lead to a pessimistic scenario for the region, since policies oriented to the expansion of domestic markets might eventually foster economic growth despite adverse international markets conditions. In the case of the MANUF_EXPORT regime, prospects for growth are not necessarily bad either. South-South trade might be a substitute for South-North trade. If

net-export led growth is the relevant regime, shrinking demand in advanced economies is not necessarily bad since falling exports do not necessarily mean a reduction in the current account but shrinking trade deficits in advanced economies clearly means a narrower margin for developing economies to run trade surpluses. Finally, if economic growth is fostered by exports to industrialized economies, a constraint on running current account surpluses is not binding but shrinking demand in advanced economies reflects more limited markets in advanced economies for Latin American exports.

Data and sample definitions are described in Table 2.2. For *TRADABLE*, *MANUF_EXPORT*, and *NET_EXPORT*, statistical information was obtained from the World Bank's World Development Indicators (WDI). The definition for Industry used by the WDI includes the following activities of the International Standard Industrial Classification (ISIC): (i) Mining and Quarrying, (ii) Manufacturing, (iii) Electricity, Gas, and Water Supply, and (iv) Construction. The excluded sectors are basically Agriculture, Fishing, and Services. For the construction of *EXPORT_TO_INDUS*, data were obtained from the United Nation's COMTRADE.

The sample consists of a maximum of 33 Latin American countries (LA-33), 20 advanced economies (OECD), and time series from 1953 to 2009. In order to remove short run fluctuations, while taking into consideration the sample size constraints, this paper uses the 3-year averages of the variables of interest. In addition to the sample LA-33, three subsamples of countries are studied. First, LA-15, which consists of the largest 15 Latin American economies. The analysis focuses on this group of economies that represents approximately 98 percent of the total Latin American GDP. Countries selected for this subsample had a nominal GDP in 2006 that was higher than the median of the

entire sample. Second, primary commodity exporters, consisting of countries where the ratio primary exports/ merchandise exports was greater than the median for Latin America (75.4 percent). Primary exports include agricultural raw materials, food, fuel, and ores and metals exports. Finally, this paper examines a sample consisting of non-primary exporters (LA-33 after excluding primary commodity exporters).

Table 2.3 summarizes the main descriptive statistics for the key variables for the samples LA-33 and LA-15. Figure 3 provides the corresponding histograms for LA-15. The descriptive statistics show that the average growth rate in Latin America for both LA-33 and LA-15 is around two percent.[3] The maximum growth rate in the LA-15 sample is 10.49 percent (Trinidad and Tobago, 2007-09) and the minimum is -8.47 percent (Peru, 1989-1991). Most of the observations (76 percent) lie between the mean and the mean plus/minus one standard deviation. In the case of industry as a proportion of GDP, distributions for LA-33 and LA-15 are also quite similar in terms of maximum and minimum values, and dispersion. The only slight difference is observed in the mean, which is 33 percent for LA-15 and 29 percent for LA-33. As in the case of the dependent variable, most of the observations for industry as a proportion of GDP in LA-15 (70 percent) lie between the mean and the mean plus/minus-one standard deviation. For manufactured exports as a proportion of GDP, distributions for LA-15 and LA-33 are also similar. However, while the maximum value in LA-15 corresponds to Costa Rica (1998-2000) where manufactured exports as a proportion of GDP is 24.37 percent, the mean in LA-33 is raised by Suriname in the nineties (59 percent in the period 1992-1994, 41.39 percent in 1995-1997, and 72.78 percent in 1998-2000). An important difference in

[3] This growth rate is certainly lower than the rate in Asian economies (3 percent) studied by Hernandez and Razmi (2013)

sample distributions appears for the external balance of goods and services as a proportion of GDP. The average for this variable in LA-15 is close to zero percent. However, for LA-33, the average current account deficit is 5.7 percent of GDP. This difference is mostly explained by some Caribbean economies (Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines) that have had periods where the current account deficit has been lower than -30 percent of the GDP. Finally, the distributions for the proxy for EXPORT_TO_INDUS do not show substantial differences in the LA-15 and the LA-33 samples. The variable ranges from 1.51 percent (Guatemala, 1968-1970) to 94.48 percent for Mexico (1998-2000), not surprising for a country that has concentrated its exports to the United States for long time.

As part of the econometric strategy, first Ordinary Least Square (OLS) estimates for the baseline regression are obtained. These estimates may, however, be biased. Variables in the specification may not be orthogonal to the error term because the rate of growth might simultaneously determine the regimes. For example, a current account deficit as a proportion of GDP might be the result of a higher growth rate. Similarly, higher economic growth may foster faster industrialization, or increased manufactured exports might be preceded by higher levels of productivity achieved through economic growth. Besides this source of endogeneity, the proxies for the strategies may show persistence over time and have lagged effects on the dependent variable. Therefore, given the interest in exploring the causality running from the regimes to growth in the per capita real GDP, this study estimates dynamic panel data models based on the Arellano-Bover General Method of Moments (GMM). These GMM specifications include the lagged dependent variable. After making a particular assumption of steady state, this term

is useful to calculate the long run effect of the variables.[4] For the set of instruments, lags of the dependent variable and the third lags of the key variables are used. The Sargan test of over-identified restrictions is used to test the validity of the instruments.

Along with the baseline regressions, this paper also provides more parsimonious specifications. The simplification criterion consists of removing one by one the non-significant variables in the general model, preserving the horse-race nature of the regression in the general model. Alternative specifications are useful to examine the results in the general model after increasing the sample size and thus the degrees of freedom. Given the asymmetrical availability of data for each key variable, the specific model may relax the limits imposed on the maximum number of observations used in a common sample.

2.3.1 Econometric results

Table 2.4 reports the main results using the entire sample of Latin American countries. OLS regressions (columns (1) and (2)) do not display a clear winning regime in the "horse-race" approach. The convergence term estimate is significant and has the expected negative sign. However, the baseline GMM regression (column (3)), dealing with potential problems of endogeneity, shows that *NET_EXPORT* is the only variable with a statistically significant long run effect on growth .The convergence term in the baseline GMM is still negative and significant. Some other individual coefficients are also significant: a positive estimate for $TRADABLE_t$, a positive estimate for $MANUF\_EXPORT_{t-1}$ and a negative estimate for $MANUF\_EXPORT_{t-2}$.The specific

[4] If both lagged and contemporaneous growth rates are assumed to be the same in steady state, the long run effect of any regressor is equal to its short run estimate divided by one minus the estimate associated with the lagged dependent variable.

GMM regression (column (4)), result of eliminating one by one the variables whose estimates were not individually significant, confirms the results in the baseline GMM. The number of observations in this specific GMM regression is substantially higher than in the baseline GMM regression. NET_EXPORT is again the only regime with a positive and significant estimate of the effect on growth. Certainly, the long run effect of *NET_EXPORT* is slightly smaller than in the baseline GMM, however, Wald Statistics show that the long run coefficient of the effect of *NET_EXPORT* on growth, obtained in the specific GMM, is significant at a lower p-value. For the entire sample, LA-33, a one standard deviation variation in NET_EXPORT_{t-1} boosts economic growth by 0.37 standard deviations. This is approximately 1.18 percentage points of growth, a very important magnitude given that the mean of *GRGDPCH* in LA-33 is 1.98 percent.

In columns (5)-(10), the analysis focuses on LA-15. As mentioned before, these countries are the largest economies in Latin America and represent 98 percent of the total Latin American GDP. Both, OLS and GMM regressions validate the robustness of the coefficients for the NET_EXPORT regime. Interestingly, the long run coefficient for the NET_EXPORT regime is very similar across different specifications, ranging between 0.19 and of 0.20. Also interesting in terms of the specification is the fact that the GMM specific regression (column (8)), which was the result of removing the non-significant variables following the general to specific estimation, includes exactly the same variables whose estimates were significant in column (7). Furthermore, in comparison to the estimates obtained in columns (7)-(9), the estimates in column (10) show that none of the other regimes affect the inference on the role of the net export led-growth path. The robustness of the results holds if the standardized coefficients for the regressions for LA-

33 and LA-15 are compared. For the 15 largest Latin American economies, LA-15, a one standard deviation variation in NET_EXPORT_{t-1} boosts economic growth by 0.39 standard deviations (1.13 percentage points). The similarity in the effect for the samples LA-33 and LA-15 occurs because the difference in the long run estimates in column (4) and (10) is offset by a lower standard deviation of NET_EXPORT_{t-1} in LA-15. The standard deviation in LA-33 (9.64) is 1.7 times the standard deviation in LA-15 (5.80).

Although the GMM regressions use instruments whose validity cannot be rejected by the Sargan test, it is also worth noting that that if there were any feedback from *GRGDPCH* toward *NET_EXPORT*, a negative feedback is more likely than a positive feedback. Higher economic growth usually results in an expansion of imports that reduces current account surpluses. If this is the case, any bias in the estimate would confirm rather than reject the positive effect of *NET_EXPORT* on *GRGDPCH*. Additional descriptive statistics also point out in the direction of causality running from NET_EXPORT_{t-1} towards *GRGDPCH*. Data display a positive correlation between NET_EXPORT_{t-1} and *GRGDPCH,* while the correlation between NET_EXPORT_{t-1} and lagged per capita growth rates is absent.

The estimates are also robust to different temporal subsamples (Table 2.5). This paper divides the time frame in three periods, the first one from 1953 to 1994, the second from 1989 to 2009, and finally, from 1953 to 2003, which excludes the most recent years previous to the global economic crisis and the boom of commodity prices. The overlapping is not ideal but given the small sample size the division tries to balance the number of observations for each group of regressions in the first two subsamples.

Furthermore, the subsample 1989-2009 can be considered as the post 80's crisis period, marked by trade liberalization, and orthodox fiscal and monetary policies oriented towards macroeconomic stability. The most drastic changes in the magnitude of the long run coefficients of *NET_EXPORT* are reported in columns (2) and (3). For the period 1989-2009, the coefficient is 0.30 (1.5 times higher than the estimate for the complete time frame), and for the period 1953 to 2003, the long run estimate is lower (0.12). These regressions confirm the expectations in the sense that the net export led-growth regime has been relatively more important during the recent commodity price boom.

Since the results suggest an augmented effect of *NET_EXPORT* in Latin America during the commodity prices booms, and given that these commodities are mostly primary goods, this study explores if countries that are more dependent on primary exports also depend more on the net export-led growth regime. This study divides the LA-33 sample in two groups: primary commodity exporters and non-primary commodity exporters. Columns (1) and (2) in Table 2.6 present the estimates for the effect of NET_EXPORT_{t-1} on economic growth. Confirming the expectations, the long run estimate for primary commodity exporters is substantially higher. The net export led-growth regime seems to have a more important role in this group of Latin American countries than in non-primary commodity exporters. In both cases, however, the individual and long run estimates of NET_EXPORT_{t-1} are positive and statistically significant. As an additional test, it is included in columns (3) and (4) the proxy for the competing tradable-led growth regime. Interestingly, the estimate for $TRADABLE_t$ is positively significant for non-primary commodity exporters in the long run. Furthermore,

standardized coefficients of the independent effect of NET_EXPORT_{t-1} and $TRADABLE_t$ are approximately the same. A one standard deviation variation in each of these variables expands growth in 0.22 standard deviations (0.65 percentage points). It is clear from these regressions, that on average, the role of the net export-led growth regime is relatively more important in primary commodity exporters. However, its impact on growth is still important in non-primary commodity exporters.

Although the main interest is in identifying the most robust growth regime, export-led or tradable-led growth, in order to explore post-crisis prospects for Latin America, this study provies regressions that include some potential omitted variables: government spending as a share of GDP, saving as a proportion of GDP, a proxy for openness, terms of trade, and world growth. Only two estimates for the control variables appear as positively significant: *SAV_GDP* and *WORLD_GR* (Table 2.7). The regression controlling for *SAV_GDP* is the only case in which the coefficient for NET_EXPORT_{t-1} is slightly lower in comparison to the baseline regressions. Although the long run estimate of the effect of *WORLD_GR* is positive and statistically significant, controlling for world growth does not affect the inference on the estimate for the effect of NET_EXPORT_{t-1} on growth. Estimates for the long run effect of (i) government spending as a proportion of GDP, and (ii) terms of trade are negative and statistically significant. While the inclusion of *GG* does not undermine either the significance or the size of the effect of the NET_EXPORT regime, the inclusion of *TOT* boosts the size of the long run estimate of NET_EXPORT from 0.20 to 0.52. This result suggests a positive

correlation between terms of trade and the current account surplus in the LA-15 sample, which lowers the coefficient on the latter when regressions exclude the former variable.

Columns (4) and (5) in Table 2.7 present the results of the regressions with time dummies for the most serious downturns in Latin American growth (1984 and 1990).[5] Indeed, the time dummies capture the economic downturns in those years, and the estimates, once again, are robust.

Finally, it might be a concern that the robust estimates result from outliers. Although it has been dealt with this issue with the different subsamples (temporal and cross sectional) to some extent, Table 2.8 provides GMM regressions for LA-15 that limit the dispersion of both *GRGDPCH* and NET_EXPORT_{t-1} . First, the sample is limited to the mean of each variable plus/minus two standard deviations (column (1)), and then to the mean plus/minus 1.5 standard deviations (column (2)). These samples, therefore, exclude severe economic downturns and expansions, and high current account surpluses and deficits. The estimates are robust to these restrictions. Although the long run estimate of the effect of NET_EXPORT_{t-1} is reduced when the sample is limited to the mean of the key variables plus/minus 1.5 standard deviations, the positive and significant effect of the net export-led growth regime holds.

2. 4 The investment rate as a mechanism

The empirical analysis finds that NET_EXPORT_{t-1} is a robust growth determinant in Latin America. However, the effect of the current account on growth may not only be direct, in the sense that a greater gap between exports and imports represents an expanded demand for domestic output, but also that the effect may be indirect, if

[5] Time fixed effects are excluded for obvious reasons.

investment demand is the mediating channel. Thus, it is explored, in this section, if the investment-mechanism is a relevant aspect of the net export-led growth path followed in Latin America.

Investment becomes an obvious candidate for a mechanism since it is well known in the economic growth literature, that an implication of some endogenous growth models, in particular those that belong to the AK family of models, is that capital accumulation is positively correlated with long run growth rates.[6] The validity of that prediction has been empirically evaluated in several papers. For example, Bond et al. (2010), a comprehensive contribution, finds evidence supporting a positive relationship between the investment share (of GDP) and the long run growth rate of GDP per worker in a sample of 75 countries in the period 1960-2000. A sub-sample analysis in Bond et al. (2010) indicates, however, that their result is only robust for non-OECD countries. This nuance, that may suggest that the prediction regarding the role of capital accumulation on economic growth is conditional to the stage of economic development, may also be an important aspect for Latin American economies which seem to resemble the features of capital (not labor) constrained economies.

The attempt to identify the role of investment in the net export-led growth path consists of two steps. First, this paper tests if gross fixed capital formation as a proportion of GDP (*GFCF_PROP_GDP*) is a correlate of economic growth in Latin America. Second, this paper includes the proxy for net export led growth along with *GFCF_PROP_GDP* on the right hand side of the growth regression. Indeed, the

[6] This prediction goes in clear contradiction with exogenous growth models a la Solow, in which only an exogenous technological shock can modify the long run steady state growth rate.

empirical analysis suggests that investment as a proportion of GDP is a robust determinant of growth. Table 2.9 shows the GMM estimates of the effect of the investment share on growth. As in the previous section, lags of the dependent variable and the third lag of the investment share are used as instruments. Once again, the Sargan test is used to test the validity of the instruments. Column (1) confirms the expectation regarding the effect of the investment share on growth. The estimated long run effect (0.24) indicates that a one standard deviation change in the gross fixed capital formation as a proportion of GDP translates into a change in the growth rate equal to 0.34 percentage points. Column (2) reports the estimates for a more parsimonious specification of the regression in column (1), after removing one by one those variables whose coefficients were not significant. The estimates in column (2) are not substantially different from those in column (1). Results for the inclusion of NET_EXPORT_{t-1}, presented in column (3), are interesting for two reasons. First, they indicate that the long run effect of the investment share on growth is not severely affected by the inclusion of NET_EXPORT_{t-1} . The estimate of the long run effect of $GFCF\_PROP\_GDP$ on growth only drops from 0.28 to 0.27. Second, the long run estimate for the coefficient associated with NET_EXPORT_{t-1} falls by 45 percent, in comparison to the estimate in Table 2.4 (Column (10), when the investment share appears as a regressor. The fact that the effect of NET_EXPORT_{t-1} on growth in Table 2.4 is higher than the effect of NET_EXPORT_{t-1} controlling for investment suggests that the investment share explains an important part of the effect of NET_EXPORT_{t-1} on growth. This finding suggests

that part of the effect of NET_EXPORT_{t-1} on growth may occur through the investment share. Expansions in the current account surpluses (or reductions of the current account deficits) in $t-1$ foster capital accumulation and thus economic growth. Certainly, there is still a direct positive and statistically significant effect of NET_EXPORT_{t-1} on growth. In Table 2.10 (Column (3)), the long run estimate for the effect of NET_EXPORT_{t-1} is 0.11. This effect may be capturing output expansions that are not necessarily induced by capital accumulation but by medium run adjustments in capacity utilization when firms face the additional net demand for domestic output. Clearly, the previous findings on the growth effect NET_EXPORT_{t-1} are robust, and both the positive direct effect of NET_EXPORT_{t-1} on growth, and the positive effect of NET_EXPORT_{t-1} through the investment share lead to pessimistic implications for Latin America due to shrinkage of global imbalances in the aftermath of the Great Recession.

The results in this section lead us to another question: Why would trade surpluses boost investment? A first answer is straightforward: a greater net demand for domestic output increases expected profits, which encourage some firms to increase the scale of production in the long run. Firms, which lack excess capacity may respond to the new profit incentives by expanding capacity through investment. However, more international finance oriented may also be very important in Latin American economies. As mentioned before, by macroeconomic accounting, the current account and the capital account are two sides of the same coin. Thus, ceteris paribus, a positive current account reduces the external debt stock. The reduction in the debt stock (or greater national collateral) may lead to a reduction of the risk premium paid by investors in the domestic economy. This

reduction in the risk premium decreases interest rates payments, which are clearly associated with the investment costs. Therefore, capital accumulation and economic growth are fostered. These mechanisms obviously operate in a context defined by a particular set of assumptions. Thus, the next section presents a very simple formal model that builds on this intuition.

2.4.1 A theoretical framework

As mentioned in section 2.2, empirical results supporting a positive relationship between current account surpluses and growth contradict the standard neoclassical model of saving and investment with perfect capital mobility. The nature of the funds (domestic or external) financing investment is irrelevant in that basic framework because an excess of domestic savings would substitute for capital inflows (and vice versa). In a capital constrained economy, the model may even predict, again in contrast to the empirical evidence, that net capital inflows should be positive correlated with economic growth. An opposite view, also discussed in section 2.2, is that domestic and external funds are better understood as complements rather than as substitutes in the process of capital accumulation (Aghion et al. (2006)). In other words, domestic savings may matter in economic growth terms since they attract foreign direct investment. This explanation, however, does not necessarily predict a positive relationship between the current account and growth.

In this section, this paper attempts to describe a possibility that has not been explored in former contributions. Current account shocks, sometimes absorbed by savings, may reduce the risk premium paid by investors and thus the cost of investing. This

mechanism, which leads to capital accumulation and economic growth, does predict hence a positive relationship between the current account and growth.

The formalization starts with a set of equations describing capital accumulation in a small domestic economy.

Imagine a capital constrained economy whose aggregate production function is described by the Leontief/ fixed coefficients specification in equation (1).

$$Y = \sigma K \qquad (1)$$

where Y is the level of output, K is capital, and σ represents both the constant marginal and average product of capital. Parameter σ is also the inverse of the capital-output ratio. Given this production function, the output growth rate is described by equation (2).

$$\hat{Y} = \hat{K} \qquad (2)$$

Equation (3) describes the capital accumulation of capital, which is equal to the level of investment minus depreciation. This description makes the standard assumption that capital depreciates at a constant rate δ .

$$\dot{K} = I - \delta K \qquad (3)$$

After dividing Equation (3) by K , and using equation (2), it is obtained a capital accumulation equation in terms of the capital growth rate, and the investment share $\frac{I}{Y}$:

$$\hat{Y} = \hat{K} = \sigma \frac{I}{Y} - \delta \qquad (4)$$

Equation (4) describes the positive relationship between the investment share and economic growth discussed in the previous section.

Before defining the saving and investment functions, it is made explicit the fact that the international interest rate paid by investors (r_i) is higher than the international interest rate paid to savings (r_s). These interest rates are binding in the domestic economy. The spread ($R \geq 0$) reflects the risk premium in the domestic economy, which is specified to be a function of the level of external debt as a proportion of the level of output ($\frac{D}{Y}$), and a variable (α) that captures, for example, transaction costs, intermediation profits in the financial system and default expectations that are independent of the level of debt.

$$r_i = r_s + R \qquad (5)$$

$$R = R(\frac{D}{Y}, \alpha) \qquad (6)$$

This section uses $d = \frac{D}{Y}$ to denote external debt as a proportion of output. Another assumption is that $\frac{\partial R}{\partial d} > 0$. At the national level, a greater level of debt as a proportion of output means a higher probability of default that is taken into account in the risk premium.

The level of external debt varies when the domestic economy requires external saving to finance the gap between domestic investment and domestic savings. By macroeconomic accounting, that gap, if positive, has to be exactly the same as the surplus in the capital account which is the same as the current account deficit (ignoring official reserve transactions). Equation (7) shows the dynamics for the stock of debt. A surplus in the current account corresponds to $CA > 0$.

$$\dot{D} = -CA \qquad (7)$$

Equations (8) and (9) are the investment and savings functions (as a proportion of output) respectively:

$$\frac{I}{Y} = i = i(r_i, \theta) = i(r_s + R, \theta) \qquad (8)$$

$$\frac{S}{Y} = s = s(r_s, \gamma) \qquad (9)$$

As commonly assumed, $\frac{\partial i}{\partial r_i} < 0$ and $\frac{\partial s}{\partial r_s} > 0$. Variables θ and γ represent exogenous parameters that may represent shocks to the investment and saving functions.

Equation (10) describes the derivative of R respect to time.

$$\dot{R} = \frac{\partial R}{\partial d}\dot{d} + \frac{\partial R}{\partial \alpha}\dot{\alpha} \qquad (10)$$

$$\dot{R} = \frac{\partial R}{\partial d}\left[\frac{\dot{D}Y - \dot{Y}D}{Y^2}\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha}$$

$$\dot{R} = \frac{\partial R}{\partial d}\left[\frac{\dot{D}}{Y} - d\hat{Y}\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha}$$

$$\dot{R} = \frac{\partial R}{\partial d}\left[\frac{\dot{D}}{Y} - d\hat{Y}\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha} \qquad (11)$$

Substituing Equations (4) and (7) into (11), equation (12) is obtained.

$$\dot{R} = \frac{\partial R}{\partial d}\left[-\frac{CA}{Y} - d\hat{K}\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha} \qquad (12)$$

After using the definition for the current account in terms of saving and investment, and the saving and investment functions (equations (8) and (9)), equation (13) is obtained.

$$\dot{R} = \frac{\partial R}{\partial d}\left[i - s - d(\sigma i - \delta)\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha}$$

$$\dot{R} = \frac{\partial R}{\partial d}\left[(1 - d\sigma)i - s + \delta d\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha}$$

$$\dot{R} = \frac{\partial R}{\partial d}\left[(1 - d\sigma)i(r_s + R, \theta) - s(r_s, \gamma) + \delta d\right] + \frac{\partial R}{\partial \alpha}\dot{\alpha} \qquad (13)$$

Whether $d\sigma < 1$, R^* (level of R consistent with a constant risk premium) is stable because $\frac{\partial \dot{R}}{\partial R} = \frac{\partial R}{\partial d}\frac{\partial i}{\partial R}(1 - \sigma d) < 0$. The stability condition therefore depends on the debt-capital ratio $(\sigma d = \frac{D}{K})$.

Imagine an exogenous shock to the current account captured fully by the saving parameter (γ). This shock might be, for example, a positive terms of trade shock that increases the retained profits of the firms, or even improves the fiscal accounts in the case of governments administering an exportable good favored with a higher relative price (for example, an oil price shock).[7] At the moment when the shock occurs, the economy faces a reduction in the current account deficit (or an expansion in the current account surplus).[8] Given that the greater level of domestic savings over investment has a negative

[7] Indeed, data for Latin America display a positive correlation between terms of trade and the current account as a proportion of GDP. However, even without terms of trade shocks, a greater parameter γ may capture the idea that greater current account deficits in advanced economies mean a less narrow margin for LA to run trade surpluses. Ceteris paribus, parameter γ represents not only a positive exogenous shock on domestic saving but also a positive exogenous shock on the current account. Therefore, shrinkage in global imbalances might be examined in this model by the effect of a lower γ.

[8] Empirically, the effect of the NET_EXPORT regime on growth seems to be more important for negative values of *NET_EXPORT* than for positive values. These regressions are not reported but are available on request.

effect on debt accumulation, the risk premium starts falling.[9] A lower interest rate paid by investors improves the viability of investment projects and fosters capital accumulation and economic growth.

The stability condition guarantees that, once the adjustment is finished, the economy remains in a new steady state where the risk premium level is lower than the level before the shock. This stability condition only requires the assumption that the debt-capital ratio is less than 1 ($\sigma d < 1$). This inequality refers to two effects of investment on the risk premium. On the one hand, by accounting, a higher investment share has a contemporaneous negative effect on the current account as a proportion of GDP. This effect, hence, leads to a higher risk premium. On the other hand, although it might take certain time, capital accumulation and growth fostered by investment reduces the debt-output ratio and thus the risk premium. Thus, the stability condition limits the size of the latter effect and excludes the possibility, for example, that a very small positive shock on the current account may cause persistent reductions of the risk premium that automatically would take the economy to a zero risk premium level.

The empirical evidence indicates that the prediction from this simple framework is a plausible story in which the general results fit. Along with the findings on the role of the NET_EXPORT regime and the investment share on growth, the data also display a negative correlation between the current account as a proportion of GDP and the first difference of the real lending interest rate (DLNER). The estimate for the effect of NET_EXPORT on DLNER is not only negative but statistically significant and very important in magnitude. A one standard deviation change in NET_EXPORT changes the

[9] The negative effect on the risk premium might be re-enforced by a positive balance sheet effect (or greater collateral) in the domestic firms.

first difference of the real lending interest rate in -15.4 percentage points (around 95% of the standard deviation of DLENR). However, after excluding some potential outliers and limiting the sample to values of DLENR greater than -30 percent and lower than 30 percent, a one standard deviation change in NET_EXPORT changes the first difference of the real lending interest rate in -5.9 percentage points (around 64% of the standard deviation of DLENR), still a very important effect. This GMM regression must be seen as a preliminary exploration of the relationship between NET_EXPORT and DLENR. Although a complete estimation of the risk premium function would be ideal at this point, that task is beyond the scope of the analysis in this paper.

2. 5 Concluding Remarks

The aftermath of the Great Recession presents two new challenges to developing economies: shrinkage of global imbalances and a slowdown of the growth of imports in advanced economies. These constraints are not necessarily binding for economic growth; however, depending on the nature of the economic growth (tradable or export-led growth) pursued by developing countries these economies might be more or less vulnerable in the current world economy scenario. In the econometric analysis, robust evidence is provided suggesting that the engine of economic growth in Latin America has been based on a regime known in the literature as net export-led growth (NET_EXPORT). This means that economic growth is boosted by positive changes in the external balance on goods and services as a proportion of the GDP. This study provides an econometric strategy and different statistical tests that cannot reject the hypotheses that causality runs from the external balance on goods and services as a proportion of GDP towards growth, and not the other way around. The estimates for the baseline

regressions suggest that a one standard deviation variation in the current account as a proportion of GDP boosts growth by 1.18 percentage points. This magnitude is economically important, especially when compared to the mean of the per capita GDP growth rates for the sample LA-33 (1.98 percent). Given the robustness of the estimates regarding the role of the NET_EXPORT strategy in years preceding the global financial crisis, Latin American growth is currently vulnerable to the shrinkage of global imbalances.

After an examination of possible mechanisms, empirical evidence indicating that the trade surplus certainly has a direct effect on growth is found; however, a relevant part of the net export-led growth regime translates into growth through the effect on the investment share. Using a simple theoretical model, some conjectures are made about the link between the current account and the investment share in a capital constrained economy (a plausible assumption for Latin American economies). The model pins down the role of the current account in the dynamics of the risk premium paid by investors. Positive shocks to the current account reduce the risk premium and thus the interest rates paid by investors, resulting in a boost to investment. In a capital constrained economy, higher investment translates into economic growth. Thus, the model finally predicts a positive relationship between trade surpluses and economic growth.

Although different regressions for temporal and cross sectional subsamples lead us to recognize the outstanding and ubiquitous importance of the net export-led growth regime, in comparison to other interpretations of export-led growth and tradable-led growth paths, the specifications also show that the group of primary commodity exporters and the period of price commodity prices boom (2003-2009) experience larger effects of

lagged net exports on growth. Interestingly also, the tradable-led growth strategy appears as a relevant strategy in non-primary commodity exporters. In accordance to Rodrik (2009), this aspect means that the implementation of second best policies as subsidies to domestic production and domestic consumption could facilitate the continuation of the tradable-led growth strategy in Latin American non-primary commodity exporters.

The next steps in the research will be in the direction of identifying the price and quantity adjustments that, as a consequence of the trade deficit reductions in advanced economies, occur in the markets for the most important Latin American exportable and importable goods. That aspect might give us a better idea about the role of the terms of trade influencing the current account. Since developing economies are not necessarily condemned to continue the growth regime pursued in years preceding the Great Recession, and the tradable-led growth regime seems to be the least vulnerable path in coming years, it might be worth exploring the institutional and specific country characteristics that may hinder the transition from an export-led growth regime to a tradable-led growth path. The features of the current world economy make clear once again that a process of industrialization accompanied by solid domestic markets might be necessary in Latin America. However, that transformation may require an active set of macroeconomic and industrial policies that have been out of bounds for discussion for a long time in several Latin American economies.

2. 6 Tables and figures chapter 2

Table 2.1: Growth regimes

Growth Regimes in Developing Economies			Shrinking trade deficits in advanced economies necessarily bad	Shrinking demand in advanced economies necessarily bad
Tradable-led growth		*TRADABLE*	No	No
Export-led growth				
driven by:	manufactured exports	*MANUF_EXPORT*	No	No
	current account surpluses	*NET_EXPORT*	Yes	No
	exports to industrialized countries	*EXPORT_TO_INDUS*	No	Yes

Table 2.2: Data and sample definitions

CODE	DEFINITION	SOURCE	COVERAGE
GRGDPCH	Geometric growth rate of (chained) real GDP per capita	PWT 7.0	1950-2009
RGDPCH	(Chained) real GDP per capita	PWT 7.0	1950-2009
TRADABLE	Industry value added (% of GDP)	WDI	1960-2009
MANUF_EXPORT	Manufactured exports (% of GDP). Calculation based on manufactured exports (% of merchandise exports), merchandise exports (current US$), and GDP (current US$)	Authors' calculations based on WDI	1960-2009
NET EXPORT	External balance on goods and services (% of GDP)	WDI	1960-2009
EXPORT_TO_INDUS	Manufactured exports (SITC 5-8) to developed countries as a proportion of manufactured exports to World	UN COMTRADE	1962-2009
GFCF_PROP_GDP	Gross fixed capital formation as a proportion of GDP	WDI	1960-2009
GG	Government spending as a share of GDP	WDI	1960-2009
LENR	Real lending interest rate. Calculation based on nominal lending interest rates, and consumer prices inflation.	WDI	1980-2009
OPENC	Opennes [(exports+imports)/GDP]	WDI	1960-2009
SAV_GDP	Saving as a proportion of GDP	WDI	1960-2009
TOT	Terms of trade	WDI	1960-2009
DEVELOPED COUNTRIES	Australia, Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Japan, Luxembourg, Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States		
LATIN AMERICA (33 COUNTRIES)	Antigua and Barbuda, Argentina, The Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vicent and the		
LATIN AMERICA (15 COUNTRIES)	Brazil, Mexico, Argentina, Venezuela, Colombia, Chile, Peru, Ecuador, Dominican Republic, Guatemala, Costa Rica, Uruguay, El Salvador, Trinidad and Tobago, and Panama		
PRIMARY COMMODITY EXPORTERS	Argentina, Belize, Bolivia, Chile, Colombia, Cuba, Ecuador, Grenada, Guyana, Honduras, Nicaragua, Panama, Paraguay, Peru, St. Vicent and the Grenadines, Trinidad and Tobago, and Venezuela		

Table 2.3: Summary Statistics

	GRGDPCH	*TRADABLE*	*MANUF_EXPORT*	*NET_EXPORT*	*EXPORT_TO_INDUS*
LA-33					
Mean	1.98	28.77	5.44	-5.66	45.91
Median	2.07	27.65	3.40	-3.42	43.53
Maximum	10.49	58.92	72.78	28.36	98.66
Minimum	-11.09	13.94	0.01	-47.67	1.51
Std. Deviation	3.20	8.82	6.96	10.27	25.49
Observations	554	400	424	484	400
LA-15					
Mean	2.09	33.04	4.63	-0.46	41.39
Median	2.29	31.91	3.33	-1.22	41.19
Maximum	10.49	58.92	24.37	28.36	94.48
Minimum	-8.47	15.60	0.07	-19.86	1.51
Std. Deviation	2.90	8.85	5.02	6.23	22.96
Observations	285	191	227	248	216

Table 2.4: Baseline growth regressions, 1953-2009

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]	(1) OLS Baseline LA-33	(2) OLS Specific LA-33	(3) GMM Baseline LA-33	(4) GMM Specific LA-33	(5) OLS Baseline LA-15	(6) OLS Specific LA-15	(7) GMM Baseline LA-15	(8) GMM Specific LA-15	(9) GMM Specific LA-15	(10) GMM Specific LA-15
Constant	46.6747***	25.4342***			33.2758***	36.9741***				
	(4.13)	(3.94)			(2.76)	(2.75)				
$GRGDPCH_{t-1}$			0.3052***	0.2940***			0.1857***	0.2186***	0.2051***	0.2023***
			(5.13)	(6.27)			(2.66)	(3.56)	(4.62)	(4.65)
$Ln\ RGDPCH_{t-1}$	-5.1735***	-2.7434***	-7.3106***	-6.9554***	-3.5165**	-4.1250**	-4.6269***	-4.8897***	-5.5147***	-5.4427***
	(-3.78)	(-3.64)	(-5.65)	(-6.28)	(-2.47)	(-2.52)	(-3.94)	(-5.01)	(-4.94)	(-5.01)
$TRADABLE_{t}$	0.0779		0.0996*		0.1358	0.0977***	0.2304***	0.2130***		
	(0.88)		(1.72)		(1.47)	(2.75)	(3.26)	(3.28)		
$TRADABLE_{t-1}$	0.0447		-0.0576		-0.0118		-0.1443*	-0.1927***		
	(0.36)		(-0.85)		(-0.14)		(-1.69)	(-3.13)		
$TRADABLE_{t-2}$	-0.1067		0.0462		-0.0872		-0.0122			
	(-1.47)		(0.74)		(-1.02)		(-0.17)			
$MANUF\_EXPORT_{t}$	-0.0417		0.0285		-0.2078*	-0.1776*	-0.2621**	-0.2324***		
	(-0.44)		(0.42)		(-1.72)	(-1.85)	(-2.60)	(-3.26)		
$MANUF\_EXPORT_{t-1}$	0.0266		0.1566*	0.1661***	0.2011	0.2716***	0.2697*	0.1675**		
	(0.30)		(1.95)	(2.74)	(1.60)	(2.96)	(1.86)	(2.00)		
$MANUF\_EXPORT_{t-2}$	0.0425		-0.1663***	-0.1345**	0.0261		-0.0666			
	(0.80)		(-2.86)	(-2.39)	(0.20)		(-0.65)			
NET_EXPORT_{t}	-0.0619*		-0.0293		-0.0613		-0.1210**	-0.1557***	-0.0015	
	(-1.90)		(-0.85)		(-1.15)		(-2.38)	(-3.31)	(-0.0391)	
NET_EXPORT_{t-1}	0.0721		0.1204***	0.0867***	0.1856***	0.2142***	0.2291***	0.3059***	0.1578***	0.1556***
	(1.54)		(2.83)	(2.62)	(2.96)	(7.84)	(3.63)	(5.58)	(3.84)	(4.12)
NET_EXPORT_{t-2}	0.0262		0.0126		0.0660		0.0547			
	(0.50)		(0.29)		(1.24)		(0.79)			
$EXPORT\_TO\_INDUS_{t}$	0.0062		-0.0308		0.0071		-0.0298			
	(0.23)		(-1.25)		(0.22)		(-0.89)			
$EXPORT\_TO\_INDUS_{t-1}$	-0.0074		0.0254		0.0129		0.0567			
	(-0.20)		(0.84)		(0.18)		(1.47)			
$EXPORT\_TO\_INDUS_{t-2}$	-0.0004		0.0036		-0.0491	-0.0566**	-0.0220			
	(-0.0117)		(0.17)		(-0.96)	(-2.46)	(-0.85)			
Time Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Long-run coefficients (sum of the individual coefficients)										
TRADABLE	0.0158		0.1269		0.0309	0.0977***	0.0908	0.0260		
Wald statistic	0.12		2.11		0.85	7.58	2.01	0.17		
p-value	[0.73]		[0.15]		[0.36]	[0.01]	[0.16]	[0.68]		
MANUF_EXPORT	0.0274		0.0270	0.0448	0.0194	0.0940	-0.0725	-0.0831		
Wald statistic	0.12		0.15	0.85	0.05	1.77	0.54	1.47		
p-value	[0.72]		[0.70]	[0.36]	[0.82]	[0.18]	[0.46]	[0.23]		
NET_EXPORT	0.0365		0.1492*	0.1228***	0.1902***	0.2142***	0.2000***	0.1923***	0.1966***	0.1951***
Wald statistic	0.59		3.26	6.31	7.04	61.47	4.48	6.95	11.52	15.84
p-value	[0.44]		[0.07]	[0.01]	[0.01]	[0.00]	[0.03]	[0.01]	[0.00]	[0.00]
EXPORT_TO_INDUS	-0.0016		-0.0026		-0.0291	-0.0566***	0.0060			
Wald statistic	0.00		0.01		0.85	6.05	0.03			
p-value	[0.95]		[0.94]		[0.36]	[0.01]	[0.87]			
Adjusted R-squared	0.36	0.23			0.48	0.52				
J-statistic			138.39	145.43			66.52	67.34	89.01	88.83
Instrument rank			150	153			94	94	103	103
Sargan test (p-value)			0.18	0.27			0.53	0.69	0.39	0.43
Cross-sections included	29	33	27	30	14	15	14	14	15	15
Observations	243	535	181	260	143	160	113	117	188	188

[a](*t* -statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for $GRGDPCH_{t-1}$. Long run OLS estimates are simply the sum of the short-run coefficients.

Table 2.5: Growth regressions for temporal subsamples

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]			
	(1)	(2)	(3)
	GMM	GMM	GMM
	LA-15	LA-15	LA-15
	1953-1994	1989-2009	1953-2003
GRGDPCH $_{t-1}$	0.1761**	0.1307**	0.2461***
	(2.48)	(2.04)	(4.55)
Ln RGDPCH $_{t-1}$	-9.8367***	-7.3115***	-7.0844***
	(-6.03)	(-3.94)	(-5.48)
NET_EXPORT $_{t-1}$	0.1385***	0.2581***	0.0934**
	(2.93)	(4.43)	(2.13)
Time Dummies	yes	yes	yes
Country Dummies	yes	yes	yes
Long-run coefficients (sum of the individual coefficients)			
NET_EXPORT	0.1681***	0.2969***	0.1239**
Wald statistic	8.41	15.74	4.50
p-value	[0.00]	[0.00]	[0.03]
J-statistic	56.06	53.70	75.67
Instrument rank	63	58	87
Sargan test (p-value)	0.33	0.27	0.39
Cross-sections included	15	15	15
Observations	113	104	158

[a](t -statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for GRGDPCHt-1.

Table 2.6: Growth regressions for primary and non-primary commodity exporters

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]				
	(1) GMM Primary Exporters	(2) GMM Non-Primary Exporters	(3) GMM Primary Exporters	(4) GMM Non-Primary Exporters
$GRGDPCH_{t-1}$	0.3186***	0.2300***	0.3527***	0.1455***
	(7.56)	(4.89)	(8.29)	(2.98)
$Ln\ RGDPCH_{t-1}$	-6.5596***	-10.4499***	-5.9933***	-11.5931***
	(-7.41)	(-8.20)	(-6.41)	(-9.55)
NET_EXPORT_{t-1}	0.1165***	0.0609*	0.1668***	0.0599**
	(2.95)	(1.70)	(5.02)	(2.04)
$TRADABLE_t$			0.0230	0.0738**
			(0.40)	(2.31)
Time Dummies	yes	yes	yes	yes
Country Dummies	yes	yes	yes	yes
Long-run coefficients (sum of the individual coefficients)				
NET_EXPORT	0.1710***	0.0790*	0.2577***	0.0700**
Wald statistic	7.75	2.68	22.61	3.83
p-value	[0.00]	[0.10]	[0.00]	[0.05]
TRADABLE			0.0355	0.0864**
Wald statistic			0.16	4.93
p-value			[0.69]	[0.03]
J-statistic	79.77	81.46	74.50	66.81
Instrument rank	103	103	98	93
Sargan test (p-value)	0.70	0.65	0.68	0.77
Cross-sections included	17	16	16	14
Observations	187	163	143	122

[a](t-statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for GRGDPCHt-1.

Table 2.7: Robustness to additional variables

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM
	LA-15	LA-15	LA-15	LA-15	LA-15	LA-15	LA-15
	Z=GG	*Z=SAV_GDP*	*Z=OPENC*	*Z= TOT*	*Z=WORLD_GR*	*Z=DUM_84*	*Z=DUM_84_90*
$GRGDPCH_{t-1}$	0.1796***	0.1939***	0.2159***	0.2064**	0.2356***	0.2270***	0.2151***
	(4.28)	(4.05)	(4.90)	(2.38)	(6.54)	(6.92)	(6.84)
$Ln\ RGDPCH_{t-1}$	-5.2678***	-5.9440***	-5.9054***	-8.9943***	-1.2217*	-2.1072***	-2.7329***
	(-5.47)	(-5.24)	(-4.94)	(-4.20)	(-1.68)	(-3.29)	(-4.63)
NET_EXPORT_{t-1}	0.1702***	0.1258**	0.1527***	0.4110***	0.1590***	0.1512***	0.1787***
	(4.51)	(2.25)	(3.84)	(5.65)	(3.37)	(3.73)	(4.40)
Z_t	-0.1380	0.1178***	-0.0378**	-0.0121	0.5939***	-5.1259***	-3.9551***
	(-1.64)	(3.54)	(-2.20)	(-0.70)	(4.57)	(-13.02)	(-13.54)
Z_{t-1}	-0.0938	-0.0467	0.0885***	-0.0485*	0.3926***		
	(-0.87)	(-0.79)	(3.65)	(-1.83)	(2.67)		
Z_{t-2}	-0.0207	0.0178	-0.0356**	0.0139	0.0325		
	(-0.29)	(0.45)	(-2.23)	(0.97)	(0.18)		
Time Dummies	yes	yes	yes	yes	no	no	no
Country Dummies	yes	yes	yes	yes	yes	yes	yes
Long-run coefficients (sum of the individual coefficients)							
NET_EXPORT	0.2074***	0.1561**	0.1947***	0.5179***	0.2080***	0.1956***	0.2276***
Wald statistic	20.35	4.46	13.90	19.28	10.77	12.66	17.56
p-value	[0.00]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
GG	-0.3077***						
Wald statistic	12.19						
p-value	[0.00]						
SAV_GDP		0.1103*					
Wald statistic		2.78					
p-value		[0.10]					
OPENC			0.0193				
Wald statistic			0.47				
p-value			[0.49]				
TOT				-0.0588*			
Wald statistic				3.15			
p-value				[0.08]			
WORLD_GR					1.3331***		
Wald statistic					21.86		
p-value					[0.00]		
J-statistic	80.98	87.42	84.33	45.54	94.07	96.01	95.86
Instrument rank	104	104	104	51	103	103	103
Sargan test (p-value)	0.60	0.41	0.50	0.22	0.57	0.57	0.57
Cross-sections included	15	15	15	15	15	15	15
Observations	183	188	188	85	188	188	188

[a](t -statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for GRGDPCHt-1.

Table 2.8: Robustness to limited dispersion in *GRGDPCH* and *NET_EXPORT*

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]		
	(1)	(2)
	GMM	GMM
	LA-15	LA-15
	(-4%<GRGDPCH<8%)	*(-2.5%<GRGDPCH<6.5%)*
	(-12.1%<NET_EXPORT(-1)<11.1%)	*(-6.6%<NET_EXPORT(-1)<8.2%)*
$GRGDPCH_{t-1}$	0.1690***	0.0742
	(3.14)	(1.24)
$Ln\ RGDPCH_{t-1}$	-3.4886***	-3.0964***
	(-3.68)	(-2.67)
NET_EXPORT_{t-1}	0.1719***	0.1238**
	(3.81)	(2.21)
Time Dummies	yes	yes
Country Dummies	yes	yes
Long-run coefficients (sum of the individual coefficients)		
NET_EXPORT	0.2068***	0.1337**
Wald statistic	13.38	4.59
p-value	[0.00]	[0.03]
J-statistic	79.86	72.96
Instrument rank	101	89
Sargan test (p-value)	0.64	0.48
Cross-sections included	15	15
Observations	160	126

[a](*t* -statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for GRGDPCHt-1.
In column (1), boundaries correspond to the mean of each variable +/- 2 standard deviations.
In column (2), boundaries correspond to the mean of each variable +/- 1.5 standard deviations.

Table 2.9: Capital accumulation and growth

Dependent variable: *GRGDPCH* (Growth rate of real GDP per capita)[a]	(1) GMM Baseline LA-15	(2) GMM Specific LA-15	(3) GMM Specific LA-15
$GRGDPCH_{t-1}$	0.1614***	0.1179***	0.1315***
	(3.34)	(2.59)	(2.78)
$Ln\ RGDPCH_{t-1}$	-6.0425***	-6.1132***	-6.3565***
	(-4.92)	(-5.16)	(-5.18)
$GFCF\_PROP\_GDP_{t}$	0.2750***	0.2487***	0.2355***
	(6.40)	(5.88)	(5.04)
$GFCF\_PROP\_GDP_{t-1}$	-0.1000*		
	(-1.67)		
$GFCF\_PROP\_GDP_{t-2}$	0.0239		
	(0.45)		
NET_EXPORT_{t-1}			0.0945**
			(2.36)
Time Dummies	yes	yes	yes
Country Dummies	yes	yes	yes
Long-run coefficients (sum of the individual coefficients)			
GFCF_PROP_GDP	0.2372***	0.2819***	0.2711***
Wald statistic	7.02	38.92	27.59
p-value	[0.01]	[0.00]	[0.00]
NET_EXPORT			0.1088**
Wald statistic			5.37
p-value			[0.02]
J-statistic	74.40	75.45	76.56
Instrument rank	103	103	104
Sargan test (p-value)	0.79	0.81	0.78
Cross-sections included	15	15	15
Observations	174	174	174

[a](*t* -statistic), *p<0.10, **p<0.05, ***p<0.01. Long-run GMM estimates correspond to the sum of short-run coefficients divided by one minus the estimate for *GRGDPCHt-1* .

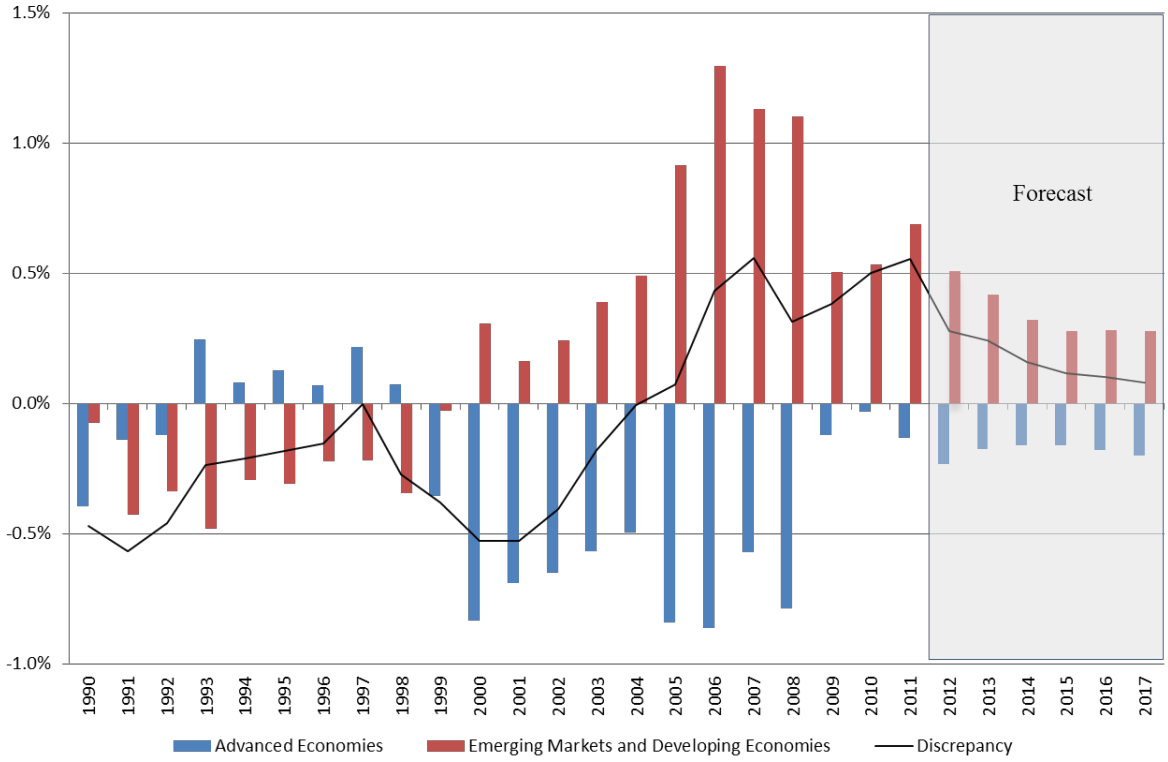

Figure 2.1: Global imbalances (current account balance as a percentage of World GDP). Source: World Economic Outlook – IMF (October 2012)

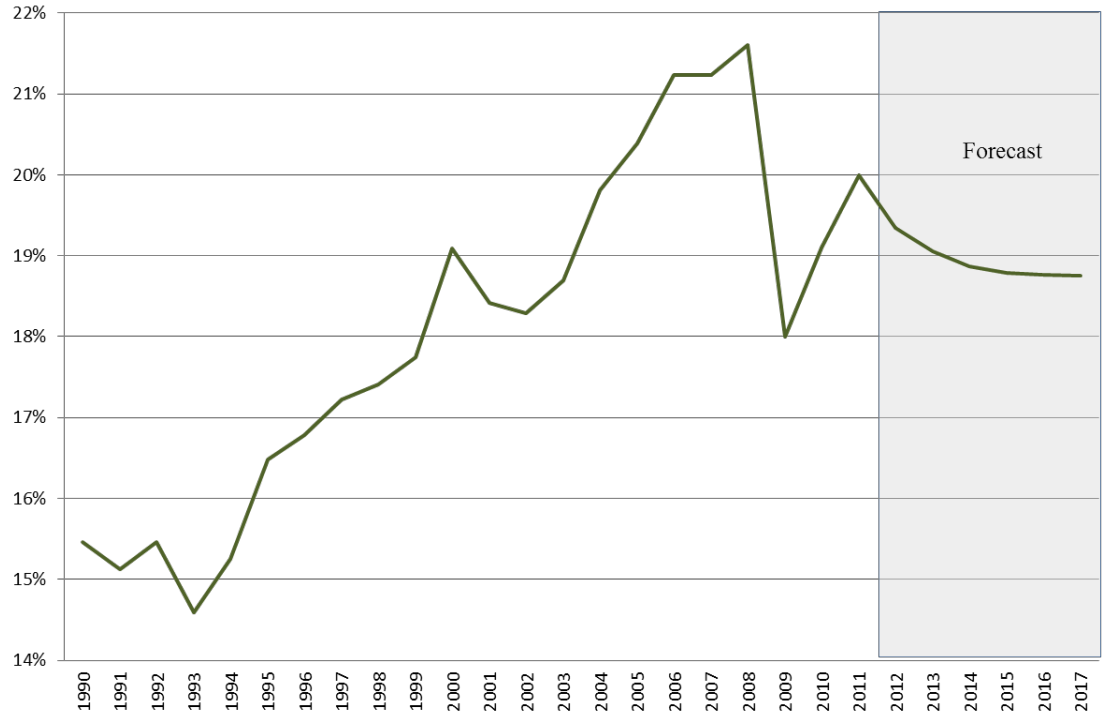

Figure 2.2: Imports by advanced economies (as a percentage of World GDP). Source: World Economic Outlook – IMF (October 2012)

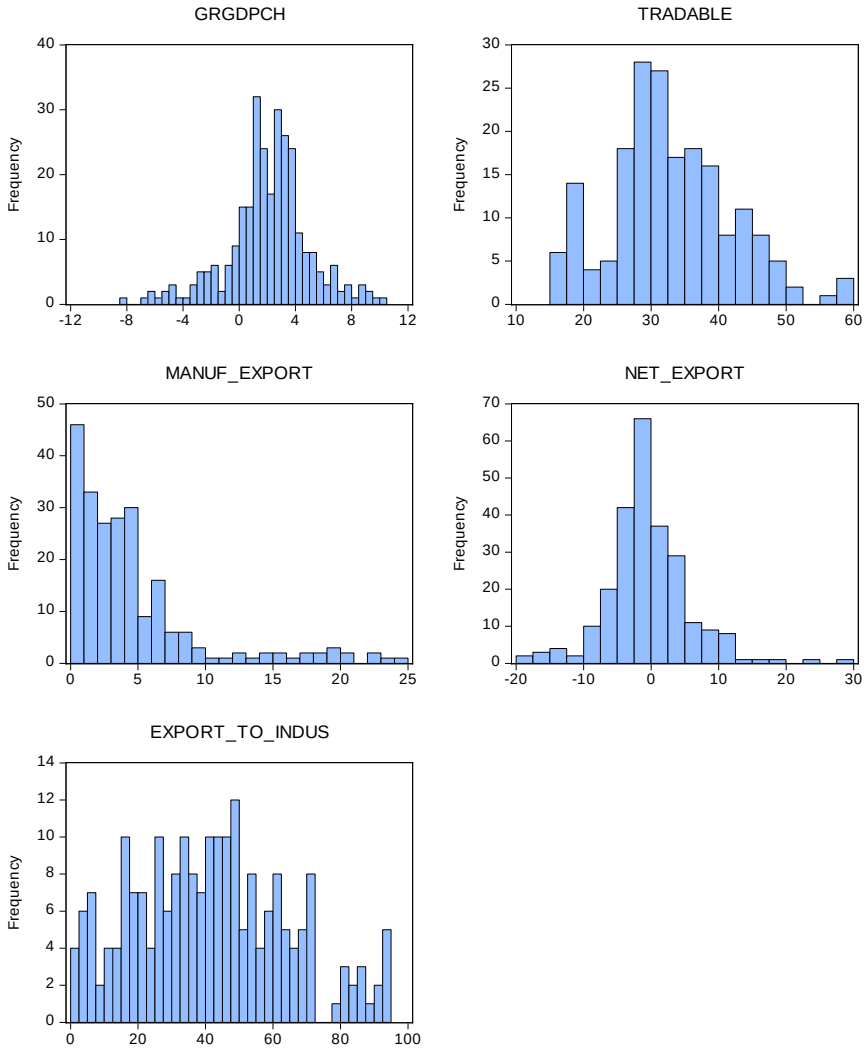

Figure 2.3: Histograms of main variables of interest (LA-15, 1953-2009)

CHAPTER 3

LATIN AMERICAN EXPORT STRUCTURE AND THE US GROWTH SPILLOVER EFFECT IN THE GREAT RECESSION

3.1 Motivation and Background

The most recent recession in the United States following the financial crisis was expected to have an immediate spillover effect on Latin American economies given the importance of the US market for Latin America's output. In fact, the downturn[10] was rapidly reflected in the region's average annual real GDP growth rate in 2009 (-1.8 percent). [11] In comparison to other groups of developing countries, selected by the World Development Indicators (WDI), only developing economies in Europe and Central Asia witnessed a more severe GDP contraction in the same year (-4.8 percent).[12] However, the distribution of annual growth rates in Latin America in 2009 was not uniform. While Mexico witnessed a severe GDP decline (-6 percent), Colombia, Uruguay, Dominican Republic, and Panama, for example, displayed positive annual growth rates ranging from 1.7 percent (Colombia) to 3.9 percent (Panama). Given (i) the trade collapse in the last recession, (ii) the potential growth spillover effect of the United States on the region, and (iii) the pervasive role of external factors in the Latin American business cycles, this paper empirically investigates if export-structure related factors that may historically explain a potential output fluctuation co-movement between Latin America and the United States may

[10] The US annual real GDP growth rate was -3.2 percent in 2009 (the deepest contraction since the Great Depression). Data from the World Development Indicators (WDI)

[11] Data from the World Development Indicators (WDI)

[12] In fact, the annual growth rates for developing economies in other regions were positive: East Asia and Pacific (7.5 percent), Middle East and North Africa (3.4 percent), Sub-Saharan Africa (2.1 percent).

also provide some preliminary insights on the uneven Latin American short-run performance during the Great Recession.

The trade collapse and the vulnerability of the trade linkage between the US and the Latin American economies were the main reason for the fears of a negative performance in the region. Merchandise exports to the US in 2006, for example, accounted for 38 percent of total Latin American exports.[13] In terms of GDP, the importance of the US market is also noticeable. The average ratio of exports to US to GDP for the region was 11 percent in 2006. Other potential threats, such as capital outflows, which were propagation channels in past critical moments for the region, were downgraded given the specific nature of this crisis, originated in the advanced economies, not in the developing world, in contrast to other crises, for example, during the Asian Crisis, or even during the Latin American debt crisis in the eighties. Furthermore, global imbalances favored the financial security of the developing world for several years preceding the crisis. In particular, Latin America had been running current account surpluses before the crisis, and had favorable terms of trade since 2003, along with an outstanding accumulation of foreign assets, and fiscal and monetary discipline. These were key elements supporting the financial stability in the region. Economists have addressed the role of these aspects in cushioning the region from a more severe financial shock despite the deterioration of the world economy financial conditions.[14] However, for Ocampo (2009), who also acknowledges the positive external balance sheets in Latin America, it is the trade channel, not the

[13] Calculations were based on United Nations- COMTRADE data for the 15 largest Latin American economies.

[14] For example, Corbo and Schmidt-Hebbel (2011) describe that during the 1990s and the 2000s, Latin America adopted a set of macroeconomic policies (exchange-rate floats and larger international reserves, among others) which reduced the vulnerability of the region, in comparison to previous financial shocks.

financial one, which seems to be the main mechanism transmitting the income shocks in the North toward the South during the Great Recession. A comparison of the world trade volumes in 2010 with those in the period 1986-2008 leads Ocampo (2011) to suggest that international trade is the weakest link in the recovery after the crisis among three channels through which the developing world was affected: (i) remittances, (ii) the financial shock, and (iii) the trade shock.[15]

Regarding the examination of a potential growth spillover effect from the US on Latin America, this paper is motivated by the literature on business cycles co-movement between countries. In general, empirical contributions on business cycles co-movements have paid more attention to large samples of countries than to particular regional analyses.[16] However, an increasing number of studies explore the business cycles co-movements between the developing and the developed world. These studies are usually framed in the context of the North-South coupling or decoupling (Akin and Kose, 2008; Walti, 2011; Kose, Otrok, and Prasad, 2012). For example, Akin and Kose (2008), which include Latin America in their sample of Southern countries, find evidence suggesting that a medium-run growth spillover effect of the Northern economic activity on the Emerging South has declined during a period identified (by the authors) as the globalization period (1986-2005). Nevertheless, the region Asia and Pacific seems to lead the general results. For their sample of Latin American economies, while the effect from the North on aggregate Latin American growth is positive and significant during the globalization period, and

[15] Levchenko, Lewis, and Tesar (2010) also observe that the collapse of the international trade is a key aspect of the recent recession, and show that this collapse is more serious than in previous US downturns.

[16] Kose, Otrok, and Whiteman (2003) argue that this fact is explained by the convenience of having larger samples to obtain robust estimates in the econometric analysis.

it is negative and significant for the pre-globalization period, the effects from the Emerging South are not statistically significant in any of the temporal subsamples. For a different group of developing economies, Kim, Lee and Park (2011) suggest, however, that the nature of the co-movement North-South is more complex. The authors find, for example, that China and emerging East Asian countries are increasingly more responsive to G7 shocks while G7 countries are more responsive to shocks originated in China and East Asia as well. It is worth noting that contrary to this case, the reverse causality is hardly an issue in the potential output fluctuations co-movement between Latin America and the US since Latin American economies resemble the assumptions of small economies in comparison to the US.

The focus in this paper on the United States, as an external-related source of the Latin American output fluctuations, is also motivated by the literature that highlights the role of external determinants of the Latin American business cycles (Izquierdo, Romero, and Talvi, 2007; Osterholm and Zettelmeyer, 2008; Hernandez, 2013). Osterholm and Zettelmeyer (2008), for example, provide evidence supporting the idea that the region is highly sensitive to external shocks. The study suggests that from 50 to 60 percent of the variation in Latin American annual GDP growth is accounted by external shocks. Furthermore, in the spirit of the specific relationship between the United States and Latin America, Canova (2005) finds that the role of domestic shocks in producing output fluctuations in Latin America is minor in comparison to role of the US shocks. Moreover, the role of external shocks seems to be common for the region. For instance, Aiolfi, Catao, and Timmermann (2011) observe a noticeable commonality of cyclical fluctuations across Argentina, Brazil,

Chile and Mexico, and highlight the importance of external global factors in explaining the common regional cycle.

The trade collapse during the Great Recession and the potential growth spillover effect on Latin America from the US, as part of the role of external-related determinants of the Latin American output fluctuations, may be understood in a common context, given the vast literature on the determinants of business cycles synchronization (Kose and Yi, 2001; Baxter and Kouparitsas, 2003; Baxter and Kouparitsas, 2005; Calderon, Chong, and Stein, 2006; Di Giovanni and Levchenko, 2010; Ng, 2010; Artis and Okubo, 2011; Jansen and Stokman, 2011). A long standing result in this literature is the predominant role of trade. For example, Baxter and Kouparitsas (2005) find that bilateral trade between countries is the only robust determinant of business cycles co-movement; Di Giovanni and Levchenko (2010) claim that countries that trade more with each other display a higher business cycle correlation; Fidrmuc and Korhonen (2010), studying the effects of the global financial crisis on emerging economies, find a significant correlation between trade and GDP growth rates between emerging Asian countries and OECD countries.

Given the importance of the trade channel in the literature on business cycle, and the role of the US as the most important export market for the region (on average), studies on Latin American economies must highlight the role of the United States in the definition of North. This aspect is clear, for example, in some contributions that focus on the Mexican case (Herrera, 2004; Miles and Vijverberg, 2011). Herrera (2004) finds, in fact, that Mexico and the United States share a common trend and a common cycle according to a time series analysis for the period 1993-2001. More recently, Miles and Vijverberg (2011) provide evidence supporting

Mexico's business cycles synchronization with the US in the post- North American Free Trade Agreement (NAFTA) years. However, the particular case of Mexico, under this strong commercial integration, certainly may not be representative of the general story for Latin America.

Finally, in spite of the acknowledged role of the US economy in the Latin American output fluctuations, literature on the role of the trade structure in the synchronization of the business cycles between Latin America and the US is not abundant. One exception is the contribution by Torres and Vela (2003), who suggest that trade integration, led by the manufacturing sector, is the main factor of convergence of the Mexican and the US business cycles. Another exception, although pointing in a different direction, is the work by Fiess (2007), a case study for Central America, which suggests that trade intensity and intra-industry trade are weakly correlated with the degree of business cycle synchronization.[17] Nevertheless, the evaluation of the short-run effects of the Great Recession on the Latin American economies, using an approach that builds on the literature on output fluctuations co-movement between Latin America and the US, with special attention on the trade-related mechanisms is missing in the literature.[18]

This paper proceeds by exploring four aspects with an econometric panel data analysis: (i) the correlation between Latin American and US output fluctuations, (ii) the role of primary and non-primary commodity exports, and the role of the

[17] This conclusion is, however, based on a simple correlation.

[18] Levy (2011) offers a wide description of different aggregates associated with the macroeconomic downturn (i.e. current account shocks, financial fragility, fiscal and monetary domestic policies). Interestingly, for the particular purpose of this paper, the report highlights the heterogeneity of the region's countries in terms of export markets destination. Nevertheless, the scope of this report is basically descriptive.

dependence on the US export market, as amplifiers of a potential short-run growth spillover effect, (iii) if what a country exports to the US at the sectoral level matters in terms of the growth spillover effect, and finally (iv) if the observed Latin American performance in 2009 resembles the implications of the statistical analysis based on historical data. Following the literature on North-South decoupling, the analysis of the business cycle co-movement between Latin America and the United States controls for other geo-economic sources of output fluctuations. Although the US has been the most important engine for the world economy after World War II, and historically the most important trade partner for Latin American economies, the relative importance of the US as a source of external demand for Latin American output varies across countries, and may have certainly changed in time. The econometric specification hence controls for the increasing relative influence of other developing economies, China among them, as other potential gravity centers for Latin America. The next two sections develop the empirical strategy, section 3.4 provides a simple description to illustrate the econometric results in terms of the Latin American performance in 2009, and section 3.5 concludes.

3.2 Data and Econometric Strategy

The following baseline regression is used in order to examine the direct and contemporaneous effect of US short-run output fluctuations on the dependent variable: real GDP annual growth rate in Latin American economies (*GRGDP*):

$$GRGDP_{jt} = \alpha + \phi GRGDP_{jt-1} + \beta USA_t + \gamma ADV_t + \delta CHN_t + \lambda DEV_t + f_j + \varepsilon_{jt}$$

The right hand side includes the lagged dependent variable $(GRGDP_{jt-1})$, controlling for persistence in the annual growth rates, and the key variable in this

study: the US real GDP annual growth rate (*USA*). Moreover, Equation (1) includes the real GDP annual growth rates of three groups of economies: (i) Other advanced economies (*ADV*), (ii) China (*CHN*), and (iii) Developing economies, excluding China and Latin America (*DEV*). As discussed in Section 3.1, it is important to notice that this specification controls for the indirect effects of the US business cycles on Latin America through other economies. The omission of these other potential geo-economic sources of output fluctuations might lead to a biased estimate of the effect of the US GDP growth rates (β). For example, given the strong positive correlation between US and other advanced economies' GDP growth rates,[19] the omission of *ADV* may cause an upward bias of the estimate of β if *ADV* and *USA* are positively correlated with Latin America's annual growth rates. Equation (1) also includes country fixed effects (f_j) and the error term (ε_{jt}). Time fixed effects are obviously not included in this specification since the growth rates of the potential geo-economic sources are not different across Latin American economies.

The sample of Latin American economies includes 15 countries (LA-15): Brazil, Mexico, Argentina, Venezuela, Colombia, Chile, Peru, Ecuador, Dominican Republic, Guatemala, Costa Rica, Uruguay, El Salvador, Trinidad and Tobago, and Panama (ordered from largest to smallest size, according to the nominal GDP in US dollars in 2006). The total GDP of these economies correspond to 98 percent of the total Latin American GDP. Most of the excluded economies are Caribbean countries whose weights in the total Latin American GDP are quite small. The dataset also consists of a group of 20 Other Advanced Economies (or Non-USA advanced

[19] The simple correlation of the annual GDP growth rates of the United States and Other Advanced Economies is 0.69 for the period 1961-2012.

economies) whose annual GDP growth rate is *ADV* in Equation (1). These economies have been OECD members for more than forty years, and are part of the high-income OECD countries group defined by the World Development Indicators.[20] In regard to the Developing Economies (excluding China and Latin America), it is worth noticing that these economies are a subset of countries from the Non-USA advanced economies. The real GDP used in the calculation of *DEV* is simply the world's real GDP after subtracting (i) US' real GDP, (ii) Other Advanced Economies' real GDP, (iii) Latin American real GDP, and (iv) China's real GDP. The World Development Indicators are the source for the economies' real GDP used in this study.

In addition to LA-15, Equation (1) is estimated to explore the effect of the US output fluctuations in two groups of subsamples: (i) "primary commodity" exporters and "non-primary commodity" exporters, and (ii) "high export to the US" countries and "low export to the US" countries. As mentioned in Section 3.1, the econometric analysis attempts to examine the role of the Latin American export structure, and specifically the role of exports oriented to the United States, as mechanisms of an eventual synchronization between the US and the Latin American annual growth rates. The definition of primary commodity exporters is based on the ratio of primary exports to merchandise exports. Primary exports include the following categories: (i) agricultural raw materials, (ii) food, (iii) fuel, and (iv) ores and metal exports. For those Latin American countries classified as primary commodity exporters, the mean ratio in the period 1960-2012 was above the median ratio for the entire group of 15 Latin American economies in the same period (75 percent). The information from

[20] Since New Zealand's GDP in constant 2005 US$ is not available from 1960 to 1976 in the World Development Indicators, this is the only country that was excluded in the analysis despite New Zealand having been an OECD member since 1973, and it is a high-income OECD economy according to the WDI.

1960 to 2012 to calculate the annual growth rates for the different groups of countries, and the ratio of primary exports to merchandise exports was obtained from the World Development Indicators (WDI). For the second subsample, the definition of a "high" or a "low export to the US" country is based on the ratio of exports to the US to GDP (*EXPUS_GDP*). Countries classified as "high export to US" have a mean ratio of exports to the US to GDP for the period 1960-2012 above the median for Latin America (4.42 percent) The United Nations COMTRADE dataset is the source of the information on exports from each Latin American economy to the US. Also in relation to the dataset, the empirical examination uses the COMTRADE data at the sectoral level, which reports exports to the United States for 9 different sectors according to the Standard International Trade Classification (SITC). Table 3.1 summarizes the data definitions of the key variables and the respective sources

Besides its representativity, the LA-15 sample displays a remarkable level of heterogeneity regarding trade related aspects as export destination and the importance of primary commodity exports. Table 3.2 provides a picture of the main export markets of LA-15 in 2006. The economies were classified as primary or non-primary commodity exporters according to the ratio of primary exports to merchandise exports. In order to rank and list the most important export markets, Table 3.2 reports the ratio of exports to trade partner as a proportion of total exports. Listed markets for each LA-15 economy add up at least 50 percent of the total exports in the particular Latin American economy. It is interesting to notice, for example, that only exports to the United States from countries like Mexico, Dominican Republic, Trinidad and Tobago, Ecuador, El Salvador, and Venezuela, account for more than 50 percent of their individual total exports. Among these countries, while some of them (Ecuador,

Trinidad and Tobago, and Venezuela) are primary commodity exporters, basically oil exporters, others (Dominican Republic, El Salvador, and Mexico) export manufacturing goods. On the other hand, Argentina, Brazil, Chile, and Uruguay display a relatively lower degree of market concentration, although the US is still a main export market. Not surprisingly, some of the economies with more listed trade partners (Argentina, Brazil, Chile), which add up to at least 50 percent of the total exports, have China as the most important export destination in the group of developing economies outside the region. Furthermore, Costa Rica and Peru, which have the US as the most important export market, have China in the list of main export markets as well. This composition of export markets highlighting the presence of China is certainly a recent aspect for Latin American economies. Figure 1, which displays the ratios of (i) Latin American exports to high-income economies to GDP and (ii) Latin American exports to developing economies outside the region to GDP, shows, for example, that in 1960, exports to high-income economies accounted for 11 percent of the Latin American GDP, while exports to developing economies outside the region corresponded to 0.28 percent of the GDP. Figure 3.1 also shows that although trade liberalization has contributed to the increase of total exports as a proportion of GDP, exports to developing economies have been growing faster than exports to high-income economies. In 2006, exports to high-income countries accounted for 17.5 percent of LA's GDP (1.6 times the ratio in 1960), while exports to developing economies outside the region accounted for 2.4 percent of the Latin American GDP (8.3 times the ratio in 1960). However, as mentioned before, the role of the United States as an export destination of Latin American exports is still pervasive.

The coefficients in the baseline regression (equation (1)) are first estimated by Ordinary Least Squares (OLS), and then by General Method of Moments (GMM) estimators (Arellano-Bover and Arellano-Bond). The GMM estimators deal with a potential non-orthogonality of the error term, especially, in this case, as a result of the inclusion of the lagged dependent variable $(GRGDP_{jt-1})$. It may be warranted here to remember that it is reasonable to assume that reverse causality, as another potential source of endogeneity, is not likely to be a serious problem in this specification. Since Latin American countries are small economies in comparison to the US, Other Advanced Economies, China, and Developing Economies (excluding China and Latin America), the regressors *USA*, *ADV*, *CHN*, and *DEV* may be assumed as exogenous. For example, while a growth spillover effect from the US on Latin America is expected to occur, changes in the growth rates of a particular Latin American country are not likely to affect the US growth rates.

Figures 3.2 and 3.3 display the histograms of the annual growth rates for the sample of 15 Latin American economies and the US annual growth rates for the period 1961-2012 respectively. The average annual growth rate of the sample of Latin American economies is 3.9 percent, and the standard deviation is 4.4 percentage points. The distribution of Latin American countries' growth rates ranges from a minimum value of -13.4 percent (Panama, 1988) to a maximum value of 18.3 percent (Venezuela, 2004). For the United States, the average growth rate is 3 percent with a standard deviation of 2.2 percentage points. The distribution of US growth rates shows a minimum value of -3.2 percent, not surprisingly for year 2009, and a maximum value of 6.9 percent (1984). For both distributions, around 80 percent of the total numbers of observations lie between the mean and the mean plus/minus 2

standard deviations. Finally, in terms of this brief and preliminary examination of the data, the simple correlation between the annual growth rates of Latin America and the annual growth rates of: (i) United States (*USA*), (ii) Other Advanced Economies (*ADV*), (iii) China (*CHN*), and (iv) Developing Economies, excluding China and Latin America (*DEV*) seems to confirm the importance of controlling for other potential sources of output fluctuations in the formal econometric analysis since several of the annual growth rates of different groups of countries are strongly correlated. The three most remarkable correlations are between (i) *USA* and *ADV* (0.69), (ii) *ADV* and *DEV* (0.65), and (ii) the *USA* and *DEV* (0.47). It is worth noticing that the statistical inference, in particular regarding the statistical significance test on the estimates, may be affected as a result of these correlations among the right hand side variables. However, this should be considered as strength in the econometric results since estimates in the baseline regression are significant in spite of, not because of, the variance inflation (greater standard errors) that is created in the presence of muticollinearity.

3.3 Estimates

3.3.1 Baseline Regressions

Table 3.3 reports the results based on the baseline regression that estimates the co-movement between the annual real GDP growth in the Latin American economies and the annual real GDP growth in the United States, after controlling for other potential geo-economic sources of output fluctuations. This table includes: OLS estimates (Column (1)), and OLS estimates with country fixed effects (Column (2)). Given that Latin American countries resemble the assumption of open small economies in relation to the United States, and other large economies, the estimate

associated with *USA* may be interpreted as the direct effect of US output fluctuations on the Latin American growth rates. However, as mentioned in the last section, GMM estimations are used to test the robustness of the OLS results and also to control for the possibility of non-orthogonal error terms due to the inclusion of the lagged dependent variable in the right hand side of the regression. Columns (3)-(5) in Table 3.3 report the Arellano-Bover General Method of Moments (GMM) and Arellano- Bond GMM estimates respectively, which use the lags of the right hand side variables and higher order lags of the dependent variable to instrument the contemporaneous growth rates and the lagged dependent variable $GRGDP_{jt-1}$.

In general, the outcomes from OLS estimations, with and without country-fixed effects (Columns (1) and (2)), are quite similar in magnitude and statistical significance. Moreover, the estimates seem to be robust to the GMM estimation (Columns (3) to (5)). Consistent with the expectation that was discussed in Section 3.1, the estimate for the direct effect of the US output fluctuations on Latin American economies' annual GDP growth rates is positive and statistically significant in the GMM regressions, although it is not significant in the OLS regression with country dummy variables. For *USA*, the statistically significant estimates range from 0.16 (OLS with country fixed effects) to 0.19 (Arellano-Bover GMM). For the Arellano-Bond GMM estimate (0.17), the magnitude means that a one standard variation in the annual GDP growth rates in *USA* translates into 0.08 standard deviations of the Latin American growth rates. This effect corresponds to 0.4 percentage points of annual growth, which is around 10 percent of the mean of *GRGDP* (3.9 percent). This effect is noticeable since the baseline econometric specification is only focusing on external geo-economic sources of output fluctuations. Estimates associated with *DEV* (other

developing economies) are positive and statistically significant at the one percent level in both OLS and GMM regressions. Furthermore, the effect associated with *DEV* is relatively more important than the effect associated with *USA*. A one standard variation of *DEV* would translate into a 0.6 percentage point variation in *GRGDP* (0.14 standard deviations). In the case of Other Advanced Economies and China as sources of Latin American output fluctuations, the estimates are positive but not significant. These general results suggest that both *USA* and *DEV* have been direct sources of the Latin American output fluctuations in the period 1961-2012, and highlight the relative role of the rest of developing countries in comparison to the United States.

3.3.2 Temporal Asymmetries and Export Structure

Examining the robustness of the estimates in temporal subsamples may provide interesting clarifying details. For example, it is reasonable to expect that the relative modest effect of *USA* in the time frame 1961-2012 is in part a response to a recent decoupling between Latin American economies and the US, characterized by the outstanding macroeconomic performance of China and other developing economies in the last years. This hypothesis suggests that geo-economic sources of Latin American output fluctuations may have changed over time due to the appearance of new world demand engines. As a preliminary approach, two temporal subsamples are considered to evaluate the baseline regression: (i) 1977-2012, and (ii) 1961-2000. The first time frame was determined according to the Chinese's annual growth rates time series, which display the beginning of an upward trend in growth rates, and lower volatility since 1977. Furthermore, 1976 was the last year when China witnessed a negative annual growth rate. Although the overlapping is not ideal,

the time period 1961-2000 fulfill two requirements: (i) to exclude the commodity price boom of the last decade that resulted in part from the emergence of the Chinese economy as a new world economy engine, and (ii) to attempt to balance the number of observations with the number of observations in the first temporal subsample given the short time frame in the panel dataset.

The results provide in fact some additional details. Table 3.4 reports the Arellano-Bond GMM estimates for the baseline regression for the two temporal subsamples. The effect of *USA* is only statistically significant in the period 1961-2000. Indeed, in comparison to the estimate for the entire sample, the magnitude increases from 0.17 to 0.28. In terms of standardized coefficients, a one standard deviation variation of *USA*, in the period 1961-2000, translates now into 0.6 percentage points of growth, an effect that is 50 percent higher than the effect estimated for the entire sample. For the same period (1961-2000), none of the other groups of countries' annual growth rates appear as positive and significant correlates of the Latin American output fluctuations. This result confirms the non-challenged role of the United States as an external source of output fluctuations in Latin America before China and other developing economies had a more active role in the world economy. Moreover, for *DEV*, the estimate is negative and significant in the period 1961-2000 (Column (2)).

Contrary to the results for the period 1961-2000, the estimates for 1977-2012 display China and other developing economies as winners of the horse-race regression for the different external geo-economic sources of Latin American output

fluctuations.[21] The estimate of the effect of USA is not significant, although close to the ten percent significance threshold. For this more recent time frame, a one standard variation of *CHN* translates into 0.4 percentage points of growth. It is worth noticing that this magnitude is similar to the effect of *USA* on the annual growth rates in Latin America in the entire time frame. Table 3.4 also shows that an increasing relative importance of China is not the only remarkable aspect in the results for the period 1977-2012; the effect of *DEV* turns to be positive, significant, and important in magnitude. A one standard deviation variation in *DEV* corresponds to 0.15 standard deviations of the annual growth rates in Latin America. This change corresponds to 0.6 percentage points of annual growth, a magnitude comparable to the effect of *USA* in the period 1961-2000. Figures 3.4, 3.5, 3.6, and 3.7 display the estimates of the effects of *USA*, *ADV*, *CHN* and *DEV* by using rolling window regressions for a window size of 36 years. This window size is meant to be able to capture the sample 1977-2012. However, other window sizes were examined. Results were very similar. The dynamic of these coefficients is consistent with the temporal sub-samples analysis. More recent years certainly seem to be characterized by a stronger South-South coupling while the influence of *USA* on the LA's annual growth rates is declining.

Estimates of the annual GDP growth rates correlations between the US and Latin America may also be sensitive to different types of exporting structures in Latin American countries regarding the role of primary commodity exports. For example, since the income elasticity of demand for primary goods is usually lower than the

[21] Since 1979 is known as the year in when China began its trade openness, the period 1979-2012 was also examined. The Arellano-Bond estimates of the effects of *USA*, *ADV*, *CHN* and *DEV* are 0.15, -001, 020, and 0.33 respectively. The significance test results are very similar to those for the period 1977-2012.

income elasticity for industrial goods, short-run variations in income in a large economy may affect relatively more the export demand in non-primary commodity exporters.[22] Therefore, this mechanism may lead to a stronger synchronization of annual growth rates between the large and the small economy if the small economy is less dependent on primary commodities. Certainly, as described in the last section, Latin American countries, in general, have historically been primary commodity exporters. In fact, this aspect reflects the lack of industrialization, and the slow structural transformation toward high-productivity sectors in the region. However, the distribution of the ratio of primary exports to merchandise exports among Latin American economies has a noticeable variance suggesting that the export structure does vary among Latin American economies. The mean of the ratio primary exports to merchandise exports for each country in the Latin American sample ranges from 0.45 (Dominican Republic) to 0.95 (Ecuador). Table 3.4, then, also reports the Arellano-Bond estimates of the baseline regression for (i) primary commodity exporters (Ecuador, Venezuela, Chile, Peru, Panama, Trinidad and Tobago, Colombia, and Argentina), and (ii) non primary commodity exporters (Guatemala, Uruguay, Costa Rica, Brasil, El Salvador, Mexico, and Dominican Republic). As expected, for the key variable, annual growth rates in non-primary commodity Latin American exporters are more synchronized with the US annual growth rates. In fact, while the estimate for the effect of *USA* is not significant in the sample of primary commodity exporters, the estimate for non-primary commodity exporters (0.35) is more than twice the estimate for the entire sample (0.17). A one standard deviation

[22] This mechanism is certainly more complex and may involve, for example, differences in the the price elasticity of supply. A formal theoretical framework is beyond the scope of this study; however, a future work on this topic might be interesting.

variation of *USA* leads to a 0.19 standard deviations change in the non-primary Latin American exporters' annual growth rates. This change corresponds to 0.8 percentage points. Since the standard deviation of annual growth rates in the entire sample and the sample of non-primary commodity exporters is quite similar, the standardized effect is twice the estimated effect for all the 15 countries as well. The only additional regressor whose coefficient appears as positive and statistically significant is *DEV*. Indeed, the estimate associated with *DEV* is significant in both subsamples; however, the magnitude of the effect is greater in the case of primary commodity exporters. A one standard deviation variation in *DEV* translates into 0.4 percentage points of annual growth in non-primary commodity exporters, while the effect doubles in primary commodity exporters.

In general the econometric analysis based on the temporal and export-structure subsamples provide two main findings regarding the question on the co-movement of short-run output fluctuations between the US and Latin America that were not explicit in the baseline regression for the entire sample. First, the United States was relatively a more important geo-economic source of Latin American output fluctuations in years previous to 2000's. Second, non-primary commodity Latin American exporters display a more synchronized output fluctuations co-movement with the US.

3.3.3 Exporting to the US

While Section 3.3.2 dealt with the potential uneven effects of the US output fluctuations on the Latin American annual growth rates, both in time and regarding two different export structures, this section attempts to answer a straightforward question that pins down the importance of exports to US in explaining previous results: Do Latin American countries that export more to the United States exhibit a

stronger co-movement of output fluctuations with the US? As mentioned in the Section 3.1, a vast literature has identified the key role of bilateral trade as the main mechanism that links output fluctuations in a pair of countries (or groups of countries). However, in the context of a Center-Periphery relationship, where an individual Latin American country (small economy) hardly affects the business cycles in the United States (large economy), the role of bilateral trade as an amplifier of output fluctuation may be simplified to the role of exporting to the large economy. Economies that depend more on the US export market may be more sensitive to US-originated income shocks. This question is tackled by three strategies. First, the baseline regression is estimated for two new subsamples: (i) "high-export to US" countries, and (ii) "low-export to US" countries. In order to define the subsamples, the distribution of the ratio of exports to US to GDP (lagged two years) across Latin America is used. The distribution of this ratio ranges from Argentina (0.9 percent) to Trinidad Tobago (27 percent). The sample of "high-export to US" countries include besides Trinidad and Tobago: Mexico (11 percent), Costa Rica (10.7 percent), Dominican Republic (10.5 percent), Guatemala (5 percent), and two well-known South-American oil exporters, Venezuela (11 percent) and Ecuador (7 percent).

The second strategy consists of including in the baseline regression an interaction term between the US annual growth rates and the second order lag of the ratio of exports to US to GDP: $\gamma(USA_t * EXPUS\_GDP_{jt-2})$. Therefore, the total effect of *USA* now corresponds to $\beta + \gamma * EXPUS\_GDP_{jt-2}$. This specification means that the effect estimated in the original baseline regression may be amplified or dampened by the ratio of exports to US to GDP. Although this specification makes explicit the role of exporting to the US as a potential amplifier of the output fluctuations co-

movement between the US and the Latin American economies, the specification will certainly be affected by the multicollinearity between *USA* and the new interaction term. However, it is still possible to explore the robustness of the effect associated with the US annual growth rates if at least one of the two terms suffering from the potential variance inflation remains statistically significant.

Finally, the third strategy attempts to expand on the insights that the interaction term may provide. This time, the interaction term uses sectoral level information, following the Standard International Trade Classification (SITC), to identify if particular US-oriented exporting sectors have a relatively more important role as a mechanism linking the annual growth rates between the US and Latin America. The SITC classification consists of nine main sectors: Food and Live Animals (SITC 0), Beverages and Tobacco (SITC 1), Crude Materials, Inedible, Except Fuels (SITC 2), Mineral Fuels, Lubricants and Related Materials (SITC 3), Animal and Vegetable OILS, Fats, and Waxes (SITC 4), Chemicals and Related Products (SITC 5), Manufactured Goods Classified Chiefly by Material (SITC 6), Machinery and Transport Equipment (SITC 7), and Miscellaneous Manufactured Articles (SITC 8). SITC 9 is a residual account for Commodities and Transactions not Classified Elsewhere in the SITC. Therefore, for example, the interaction term $USA_t * EXPUS\_1\_GDP_{jt-2}$ includes the ratio of exports of Beverages and Tobacco to the US as a proportion of GDP rather than the ratio of total exports to US to GDP. The nine sectoral interaction terms are: $USA_t * EXPUS\_0\_GDP_{jt-2}$, $USA_t * EXPUS\_1\_GDP_{jt-2}, \ldots USA_t * EXPUS\_8\_GDP_{jt-2}$ for each SITC sector respectively.

Regarding the first strategy, Table 3.5 reports the Arellano-Bond GMM estimates for the two subsamples ("high-export to US" and "low-export to US") and their intersection with the entire time frame sample and the subsamples examined in Section 3.3.2 (1961-2000, 1977-2012, primary commodity exporters, and non-primary commodity exporters). It is worth noticing, in particular for the last intersection, that "high-export to US" countries are mostly non-primary commodity exporters, while low-US exports economies are usually primary commodity exporters. For the effect of *USA*, results in Table 3.5 are not conclusive when the entire time frame is used. However, the estimate is positive significant in three subsamples: (i) low- export to US and the period 1961-2000 (Column (3)), (ii) high-export to US and the period 1961-2000 (Column (8)), and (iii) high- export to US that are non-primary commodity exporters (Column (10)). The magnitude of the estimates in the first two cases are very similar to the results found for the temporal subsample 1961-2000 without the distinction of high or low exports to the US. However, the coefficient for the third case is 0.45, higher in comparison to the coefficient in the column (4) of Table 3.4 (0.35). A one standard deviation change in *USA* translates now into a one percentage point of annual growth in Latin America (0.22 standard deviations of *GRGDP*). In regard to the other groups of countries, the results are also consistent with the findings in previous sections. However, the results make clear that the estimate for *CHN* is positive and statistically significant in the period 1977-2012, mostly for countries that are less dependent on the US as an export market in relation to their GDP (Column (2)). In the case of *DEV*, the estimates also show a robust and significant positive effect in the entire sample (Columns (1) and (6)), mostly explained by the temporal subsample 1977-2012 (Columns (2) and (7)). Especially

for primary commodity exporters, with a high ratio of exports to US to GDP, the role of DEV has been particularly important, although the coefficient for primary commodity exporters with a low ratio of exports to US to GDP is close to be significant at the 10 percent level (Column (4)).

Table 3.6 shows the estimates after implementing the second strategy consisting of including the aggregate interaction term $\gamma * USA * EXPUS\_GDP_{jt-2}$ in the baseline regression. The estimates for *USA* are not statistically significant probably due to multicollinearity; however, the interaction term is positive and significant in two subsamples that had earlier reported a significant effect of *USA*: (i) entire time frame, and (ii) non-primary commodity exporters. In terms of annual growth rates, a one standard deviation variation in the interaction term corresponds to 0.6 and 0.9 percentage points of Latin America's growth rates for the entire time frame and for the group of non-primary commodity exporters respectively. This effect, in comparison to the estimates of the coefficients associated with *USA* in the original baseline regression (Table 3.3) certainly suggest an amplified effect in the output fluctuations co-movement as a result of exporting to the United States. More interestingly, the effect of the interaction term is also positive and significant for the recent years (period 1977-2012). It is worth mentioning that this is a period for which the estimates for *USA* had not been significant in previous results. A one standard deviation variation in the interaction term translates into 0.6 percentage points of Latin America's annual rates of growth. The effects of *CHN* and DEV are robust and consistent with previous estimations.

Finally, results for the third strategy, which examines the role of exporting to the US at the sectoral level as an amplifier of the output synchronization between

Latin America and the US, are reported in Table 3.7. The interaction terms for the sectors SITC 1 (Column (2)), SITC 2 (Column (3)), and SITC 5 to 8 (Columns (6) to (9)) are positive and statistically significant, indicating a possible amplifying effect from these sectors (sector 5 to 8 have usually been associated with manufacturing). However, Figure 3.8 provides a comparison of the effects of a one standard deviation variation in these six sectoral interaction terms on the annual percentage growth rates in Latin America. This figure, which also includes the effect of the aggregate interaction term (including all the exports to the United States as a proportion of GDP), makes clear that the most important amplifying effect is associated with the sector SITC 6, which correspond to manufacturing exports to the United States (Manufactured goods classified chiefly by material). The standardized coefficient, associated with the sector SITC 6, is more than twice the coefficient associated with the aggregate interaction term. This result clearly complements and confirms the previous findings that highlighted the output fluctuations co-movement between the US and Latin American non-primary commodity exporters.

3.4 Latin American performance in 2009

The econometric results based on historical data are consistent with the Latin American uneven performance in 2009. Figure 3.9 shows the average annual GDP growth rates for Latin America in 2009[23] for six groups of countries defined by the export-structure indicators used in section 3.3.[24] The average annual growth rates have been organized from the lowest (left) to the highest (right) in Figure 3.9. In fact,

[23] The UN-COMTRADE dataset does not report Venezuelan exports to the United States in 2007, and the World Development Indicators do not report the annual GDP growth rate for Argentina in 2009. In order to preserve the comparability of the groups, this last section only refers to the 13 remaining Latin American economies.

[24] Categories were defined with the same ratios used in the econometric analysis (ratios for year 2007 in this case)

consistent with the results in section 3.3, (i) non-primary commodity exporters, (ii) countries more US market specialized, and (iii) countries where the manufacturing exports destined to the US market are high as proportion of the GDP witnessed, on average, lower annual GDP growth rates in 2009 than the alternative groups. Likewise, Figures 3.10 to 3.12 show the scatter plots describing the simple correlation between the annual growth rates in 2009 and those export-structure indicators in year 2007. These figures display (i) a positive correlation between the ratio of primary commodity exports to merchandise exports in 2007 and the annual growth rates in 2009, (ii) a negative correlation between the ratio of exports to US to GDP in 2007 and the annual growth rates in 2009, and (iii) a negative correlation between the ratio of manufacturing exports to the US to GDP in 2007 and the annual growth rates in 2009. Mexico and Costa Rica seem to be good examples of a perfect combination of features leading to a strong transmission of the US shock in 2009, and hence a negative annual growth rate: relatively low exports of primary goods, relatively high exports oriented to the US, and relatively high manufacturing exports oriented to the US. Although the annual growth rates for these two countries in 2009 diverge, there are also quantitative differences regarding their export-structure indicators. For example, while manufacturing exports to the US as a proportion of GDP is 1.7 percent for Mexico, the same ratio is 0.9 percent for Costa Rica. Among the countries that faced less dramatic consequences of the US output shock in 2009, Colombia, Uruguay, and Panama, for example, seem to follow the general implications from the econometric results as well. These three countries are primary commodity exporters, with a low ratio of total export to US to GDP, and a low ratio of manufacturing exports to US to GDP.

None of the countries with an annual growth rate below the Latin American median (0.5 percent) faced the combination of at least two of the favorable export-related indicators in terms of the performance in 2009; however, Dominican Republic is a case that clearly deviates from the general pattern. This is the only non-primary commodity, US export market destined, with a high proportion of manufacturing exports oriented to the US market that grew above the Latin American median.[25]. This country might be an interesting case study to examine, in future work, given its relative resilience in 2009.

3.5 Concluding Remarks

This paper contributes to the literature in two main aspects. First, it identifies and measures the business cycle synchronization between Latin America and the United States. Second, it provides evidence suggesting that this synchronization may be amplified by elements related to the Latin American exporting structure: (i) primary vs. non-primary commodity exports, (ii) the importance of the United States as an export market, and (iii) the role of manufacturing exports to the United States. This approach is useful to have a better understanding of the uneven performance, in terms of annual GDP growth rates, of Latin American economies during the Great Recession in 2009.

The econometric evidence in this paper suggests the existence of an output fluctuation co-movement between the United States and Latin America. The estimates for the effect of a one standard deviation variation in the US' annual GDP growth rates on the annual GDP growth rates in Latin America range from 0.4 percentage

[25] Dominican Republic had been growing at rates above the 8 percent from 2005 to 2007.

points of annual growth, for the entire sample (LA-15) to a 1 percentage point, for a subsample including countries that are non-primary commodity exporters with a high ratio of exports oriented to the United States as a proportion of GDP. These magnitudes are noticeable since the average Latin American annual growth rates, for LA-15, and for non-primary commodity exporters with a high proportion of GDP exported to the United States, are 3.9 percent and 3.2 percent respectively. These results control for other external geo-economic sources of the Latin American business cycle: Other Advanced Economies, China, and Other Developing Economies. Interestingly, a temporal subsample analysis suggests a transition in the main external source of Latin American output fluctuations from the United States toward China and Other Developing Economies in the most recent years. However, this evidence, supporting the idea of business cycle decoupling among South-North economies, is attenuated when the regressions control for the role of exporting to the US as a potential amplifier of the business cycle synchronization, through an interaction term between annual US GDP growth rates and the ratio of exports to US to GDP. In fact, the estimate associated with this interaction term, for the period 1977-2012, is positive and statistically significant while the effects from China and Other Developing Economies are positive and statistically significant as well.

The particular co-movement between non-primary commodity Latin American exporters and the United States, especially for “high-export to US” Latin American countries, may be a consequence of mechanisms regarding the export demand for Latin American output in the United States. In a basic Center-Periphery context, where the US is a large economy while each individual Latin American economy is a small one, US income shocks may unevenly translate into Latin American output

shocks depending on the export structure. For example, if the income elasticity of US demand is higher for non-primary goods than for primary ones (i.e. oil and minerals), the external demand for the former is more sensitive to US income shocks than the external demand for latter. In this case, non-primary commodity exporters would witness a more severe shock during a US recession than primary commodity exporters. However, another possibility is that given that the non-primary commodity export supply is more elastic than the primary commodity one, non-primary commodity exporters face a more rapid output adjustment as a consequence of the US income shock. A theoretical model including these aspects, and certainly the indirect effects of the price adjustments (i.e. effects on terms of trade) on the Latin American output is a task for future research. Empirically, as a step forward to continue the evaluation of this hypothesis, the interaction term between annual US GDP growth rates and the ratio of exports to US to GDP was disaggregated into 9 sectors, according to the Standard International Trade Classification (SITC). Indeed the results of implementing this econometric strategy suggest that Latin American economies with a higher level of manufacturing exports as a proportion of the GDP display a stronger co-movement with the United States.

Finally, as a very interesting preliminary result, the uneven distribution of Latin American annual growth rates in 2009 resembles the findings based on historical data. On average (i) non-primary commodity exporters, (ii) countries with a higher ratio of exports to US to GDP, and (iii) countries with a higher ratio of manufacturing exports to US to GDP, witnessed lower annual growth rates than the alternative groups of economies.

3.6 Tables and figures chapter 3

Table 3.1: Data and Sample definitions

CODE	DEFINITION	SOURCE	COVERAGE
GRGDP	Annual growth rate of real GDP	Authors' calculations based on WDI	1961-2012
USA	Annual growth rate of United States' real GDP	Authors' calculations based on WDI	1961-2012
ADV	Annual growth rate of 20 advanced economies' real GDP	Authors' calculations based on WDI	1961-2012
CHN	Annual growth rate of China's real GDP	Authors' calculations based on WDI	1961-2012
DEV	Annual growth rate of non-advanced economies' real GDP (excluding Latin America and China)	Authors' calculations based on WDI	1961-2012
EXPUS_GDP	Total exports (SITC from 0 to 9) destined for the United States as a proportion of GDP	Authors' calculations based on WDI (for GDP) and UN-COMTRADE (for sectorial exports to the US)	1960-2012
OTHER ADVANCED ECONOMIES (20 countries, excluding USA)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom.		
LATIN AMERICA (15 countries)	Brazil, Mexico, Argentina, Venezuela, Colombia, Chile, Peru, Ecuador, Dominican Republic, Guatemala, Costa Rica, Uruguay, El Salvador, Trinidad and Tobago, and Panama		
PRIMARY COMMODITY EXPORTERS	Argentina, Chile, Colombia, Ecuador, Panama, Peru, Trinidad and Tobago, and Venezuela		

Table 3.2: Main export markets for LA-15

LA-15 countries	Primary commodity exporter	Exports to trade partner as a proportion of total exports (percentage points) Summary statistics		Main export markets and exports to trade partner as a proportion of total exports (percentage points)					
Argentina	yes	Mean	0.6	Brazil	17.7	China	7.6		
		Median	0.04	Chile	9.6	Spain	4.0		
		St. dev.	1.8	USA	9.0	Mexico	3.3		
Brazil	no	Mean	0.5	USA	17.6	Netherlands	4.2	Chile	2.9
		Median	0.03	Argentina	8.6	Germany	4.1	Japan	2.8
		St. dev.	1.5	China	6.1	Mexico	3.3	Italy	2.8
Chile	yes	Mean	0.6	USA	15.4	Netherlands	6.9		
		Median	0.005	Japan	11.0	Rep. of Korea	6.3		
		St. dev.	1.9	China	8.9	Italy	5.1		
Colombia	yes	Mean	0.6	USA	40.8				
		Median	0.007	Venezuela	11.5				
		St. dev.	3.2						
Costa Rica	no	Mean	0.8	USA	42.4				
		Median	0.01	China	7.7				
		St. dev.	3.9						
Dominican Republic	no	Mean	0.8	USA	66.7				
		Median	0.007						
		St. dev.	6.1						
Ecuador	yes	Mean	0.7	USA	53.7				
		Median	0.007						
		St. dev.	4.6						
El Salvador	no	Mean	0.9	USA	52.9				
		Median	0.008						
		St. dev.	5.3						
Guatemala	no	Mean	0.8	USA	31.4				
		Median	0.02	El Salvador	15.3				
		St. dev.	3.4	Honduras	9.7				
Mexico	no	Mean	0.5	USA	84.8				
		Median	0.001						
		St. dev.	6.0						
Panama	yes	Mean	0.9	Venezuela	19.7	Guatemala	5.5		
		Median	0.07	Colombia	16.0				
		St. dev.	2.7	USA	8.8				
Peru	yes	Mean	0.6	USA	21.9	Japan	6.2		
		Median	0.008	China	11.5	Brazil	4.1		
		St. dev.	2.1	Chile	7.2				
Trinidad and Tobago	yes	Mean	0.8	USA	58.1				
		Median	0.009						
		St. dev.	5.3						
Uruguay	no	Mean	0.6	Brazil	14.9	Russia	5.7		
		Median	0.03	USA	13.8	Chile	4.2		
		St. dev.	1.9	Argentina	7.7	Germany	4.2		
Venezuela	yes	Mean	1.0	USA	51.0				
		Median	0.008						
		St. dev.	5.3						

Table 3.3: Baseline regressions, 1961-2012

Dependent variable: *GRGDP* (Annual growth rate of real GDP per capita)[a]					
	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	GMM Arellano-Bover	GMM Arellano-Bover	GMM Arellano-Bond
		with country dummies		with country dummies	
	LA-15	LA-15	LA-15	LA-15	LA-15
$GRGDP_{t-1}$	0.353***	0.325***	0.334***	0.323***	0.303***
	(7.88)	(6.02)	(11.28)	(10.56)	(8.47)
USA_t	0.181*	0.176	0.163*	0.188**	0.167*
	(1.79)	(1.53)	(1.76)	(1.98)	(1.71)
ADV_t	0.048	0.058	0.078	0.038	0.024
	(0.43)	(0.67)	(0.62)	(0.29)	(0.17)
CHN_t	0.012	0.013	0.039	0.035	0.029
	(0.40)	(0.44)	(1.28)	(1.12)	(0.90)
DEV_t	0.357***	0.356***	0.351***	0.354***	0.338***
	(3.45)	(4.84)	(3.80)	(3.75)	(3.31)
Sargan test (p-value)			0.01	0.04	0.05
AR(1) test			-3.46	-3.44	-3.48
p-value			0.00	0.00	0.00
AR(2) test			-1.31	-1.35	-1.34
p-value			0.19	0.18	0.18
Observations	729	729	729	729	684

[a](t -statistic), *p<0.10, **p<0.05, ***p<0.01.

Table 3.4: Regressions for temporal subsamples, and for primary vs. non-primary commodity exporters

Dependent variable: *GRGDP* (Annual growth rate of real GDP per capita)[a]				
	(1)	(2)	(3)	(4)
	GMM	GMM	GMM	GMM
	1977-2012	1961-2000	Primary	Non-primary
$GRGDP_{t-1}$	0.347***	0.236***	0.299***	0.283***
	(8.86)	(5.57)	(5.95)	(5.71)
USA_t	0.185	0.283***	-0.004	0.354***
	(1.54)	(2.65)	(-0.02)	(2.88)
ADV_t	-0.032	0.273	0.014	0.024
	(-0.20)	(1.39)	(0.07)	(0.14)
CHN_t	0.151**	0.001	0.049	0.009
	(2.48)	(0.04)	(1.02)	(0.23)
DEV_t	0.350***	-0.360**	0.442***	0.230*
	(3.41)	(-2.19)	(2.85)	(1.80)
Sargan test (p-value)	0.10	0.04	0.09	0.43
AR(1) test	-3.33	-3.44	-2.66	-2.26
p-value	0.00	0.00	0.00	0.02
AR(2) test	-1.92	-1.25	-1.78	0.67
p-value	0.05	0.21	0.07	0.51
Observations	504	510	362	322

[a](t-statistic), *p<0.10, **p<0.05, ***p<0.01. Arellano-Bond GMM regressions. Variables

Table 3.5: Regressions for "Low-export to US" and "High-export to US" countries

Dependent variable: *GRGDP* (Annual growth rate of real GDP per capita)[a]										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Exports to US/GDP:	Low	Low	Low	Low	Low	High	High	High	High	High
	1961-2012	1977-2012	1961-2000	Primary	Non-primary	1961-2012	1977-2012	1961-2000	Primary	Non-primary
$GRGDP_{t-1}$	0.342***	0.350***	0.273***	0.290***	0.450***	0.219***	0.327***	0.133**	0.301***	0.097
	(7.12)	(6.51)	(4.85)	(4.51)	(6.49)	(4.21)	(5.58)	(2.17)	(3.74)	(1.47)
USA_t	0.159	0.160	0.289*	0.129	0.181	0.170	0.206	0.270*	-0.214	0.448***
	(1.17)	(0.93)	(1.87)	(0.68)	(1.00)	(1.24)	(1.24)	(1.89)	(-0.92)	(2.80)
ADV_t	-0.032	-0.088	0.244	-0.161	0.182	0.065	0.019	0.278	0.276	-0.045
	(-0.16)	(-0.37)	(0.86)	(-0.58)	(0.70)	(0.33)	(0.09)	(1.06)	(0.81)	(-0.20)
CHN_t	0.089**	0.252***	0.059	0.095	0.078	-0.039	0.036	-0.064	-0.023	-0.041
	(2.00)	(2.85)	(1.23)	(1.52)	(1.32)	(-0.87)	(0.43)	(-1.43)	(-0.30)	(-0.78)
DEV_t	0.293**	0.311**	-0.442*	0.330	0.215	0.409***	0.400***	-0.260	0.622**	0.236
	(2.04)	(2.09)	(-1.84)	(1.64)	(1.13)	(2.85)	(2.81)	(-1.17)	(2.53)	(1.42)
Sargan test (p-value)	0.05	0.12	0.06	0.15	0.22	0.36	0.36	0.37	0.43	0.2
AR(1) test	-2.63	-2.49	-2.60	-2.07	-1.69	-2.30	-2.16	-2.32	-1.65	-1.72
p-value	0.01	0.01	0.01	0.04	0.09	0.02	0.03	0.02	0.10	0.08
AR(2) test	-1.08	-1.38	-1.33	-1.70	1.33	-1.12	-1.48	-0.90	-0.84	-1.44
p-value	0.28	0.17	0.18	0.09	0.18	0.26	0.14	0.37	0.40	0.15
Observations	362	266	272	224	138	322	238	238.00	138.00	184.00

[a](t-statistic), *p<0.10, **p<0.05, ***p<0.01. Arellano-Bond GMM regressions.

Table 3.6: Regressions including the interaction term $USA_t * EXPUS\_GDP_{jt-2}$

Dependent variable: *GRGDP* (Annual growth rate of real GDP per capita)[a]	(1) GMM 1961-2012	(2) GMM 1977-2012	(3) GMM 1961-2000	(4) GMM Primary	(5) GMM Non-primary
$GRGDP_{t-1}$	0.318***	0.331***	0.245***	0.283***	0.354***
	(8.46)	(8.19)	(5.35)	(5.51)	(6.79)
USA_t	0.026	0.038	0.192	-0.140	0.164
	(0.23)	(0.27)	(1.45)	(-0.79)	(1.17)
ADV_t	0.051	-0.030	0.247	-0.032	0.078
	(0.34)	(-0.18)	(1.19)	(-0.14)	(0.45)
CHN_t	0.045	0.148**	-0.006	0.087	0.004
	(1.11)	(2.38)	(-0.13)	(1.44)	(0.08)
DEV_t	0.328***	0.328***	-0.303*	0.445***	0.162
	(3.20)	(3.10)	(-1.83)	(2.85)	(1.37)
$USA*EXPUS\_GDP_{t-2}$	1.807**	2.115**	1.042	1.524	3.986***
	(2.35)	(2.07)	(1.19)	(1.53)	(3.17)
Sargan test (p-value)	0.03	0.07	0.02	0.10	0.03
AR(1) test	-3.27	-3.15	-3.29	-2.56	-2.20
p-value	0.00	0.00	0.00	0.01	0.03
AR(2) test	-1.67	-1.73	-1.64	-1.86	0.65
p-value	0.09	0.08	0.10	0.06	0.51
Observations	578	473	409	324	254

[a](t -statistic), *p<0.10, **p<0.05, ***p<0.01. Arellano-Bond GMM regressions.

Table 3.7: Regressions including the sectoral interaction terms $USA_t * EXPUS\_GDP_{jt-2}$, 1961-2012

Dependent variable: *GRGDP* (Annual growth rate of real GDP per capita)[a]									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Z=	EXPUS_0_GDP	EXPUS_1_GDP	EXPUS_2_GDP	EXPUS_3_GDP	EXPUS_4_GDP	EXPUS_5_GDP	EXPUS_6_GDP	EXPUS_7_GDP	EXPUS_8_GDP
$GRGDP_{t-1}$	0.326***	0.317***	0.327***	0.308***	0.163***	0.300***	0.297***	0.319***	0.344***
	(8.68)	(7.69)	(8.68)	(7.40)	(3.54)	(7.59)	(7.83)	(7.85)	(8.54)
USA_t	0.094	-0.004	0.026	0.021	-0.103	0.080	-0.092	0.105	0.153
	(0.78)	(-0.03)	(0.21)	(0.17)	(-0.69)	(0.67)	(-0.78)	(0.85)	(1.28)
ADV_t	0.047	0.098	0.071	0.153	0.582***	0.046	-0.032	0.096	-0.008
	(0.31)	(0.58)	(0.47)	(0.91)	(2.96)	(0.28)	(-0.21)	(0.57)	(-0.05)
CHN_t	0.038	0.115*	0.046	0.079	0.145**	0.069	0.075*	0.093*	0.105*
	(0.92)	(1.93)	(1.11)	(1.48)	(2.39)	(1.37)	(1.71)	(1.66)	(1.78)
DEV_t	0.357***	0.284***	0.329***	0.335***	0.074	0.274***	0.307***	0.261**	0.312***
	(3.47)	(2.66)	(3.20)	(3.09)	(0.58)	(2.58)	(3.00)	(2.38)	(2.94)
$USA*Z_{t-2}$	3.102	125.049**	47.295**	0.495	-395.438	21.187***	52.930***	5.733*	8.351*
	(1.10)	(2.13)	(2.02)	(0.58)	(-0.67)	(3.66)	(5.19)	(1.91)	(1.88)
Sargan test (p-value)	0.03	0.04	0.02	0.06	0.02	0.08	0.03	0.07	0.06
AR(1) test	-3.28	-3.18	-3.32	-2.92	-2.65	-3.16	-3.28	-3.03	-3.18
p-value	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00
AR(2) test	-1.58	-1.44	-1.68	-1.59	-0.92	-1.48	-1.88	-1.32	-1.71
p-value	0.12	0.15	0.09	0.11	0.36	0.14	0.06	0.19	0.09
Observations	574	464	559	448	354	507	542	475	489

[a](t -statistic), *p<0.10, **p<0.05, ***p<0.01. Arellano-Bond GMM regressions.

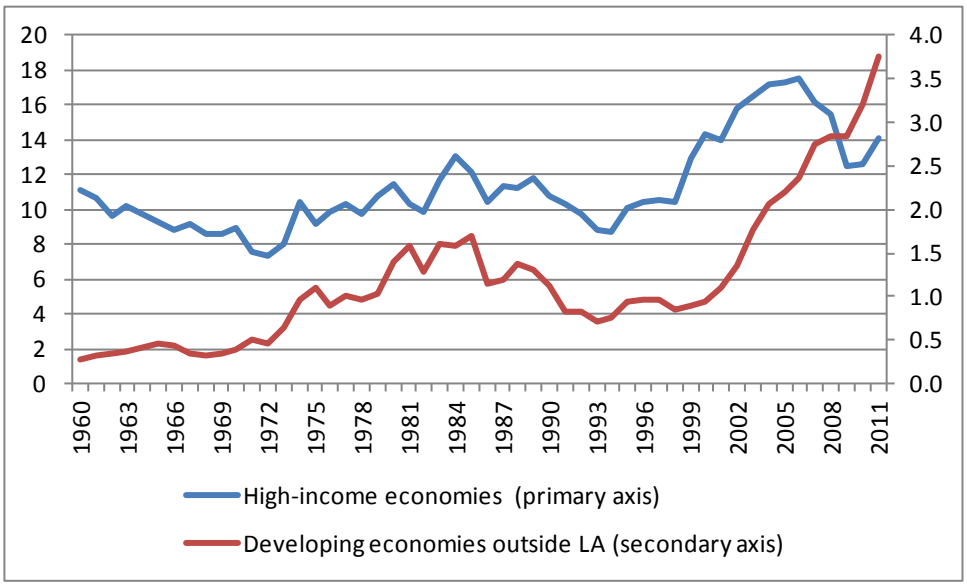

Figure 3.1: Latin American exports to High-Income Economies and Developing Economies outside the region (as a proportion of GDP, percentage points), 1960-2011. WDI and author's calculations.

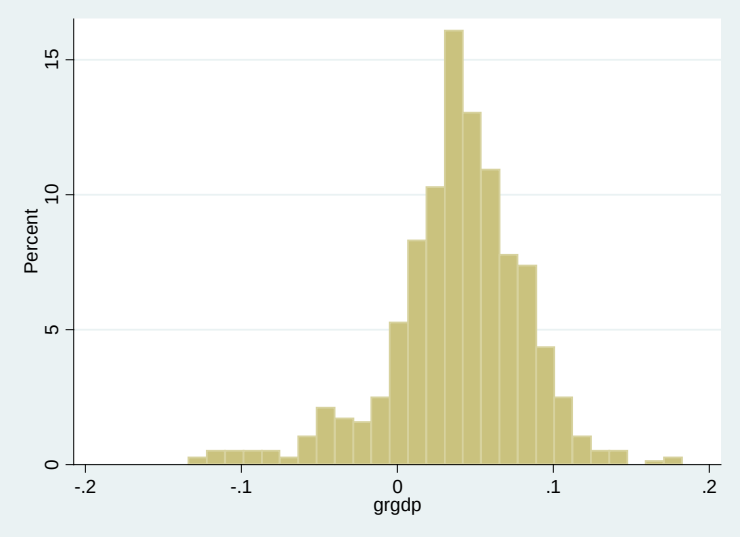

Figure 3.2: Histogram of the annual growth rates of GDP, LA-15, 1961-2012

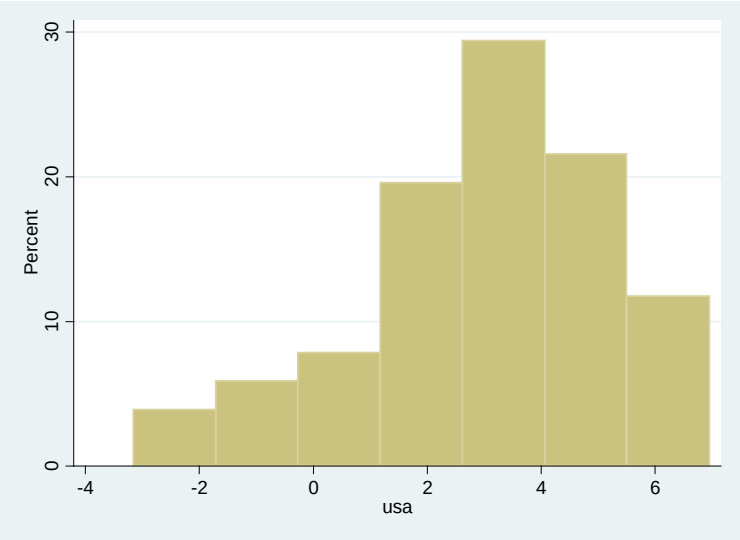

Figure 3.3: Histogram of the annual growth rates of US'GDP, 1961-2012

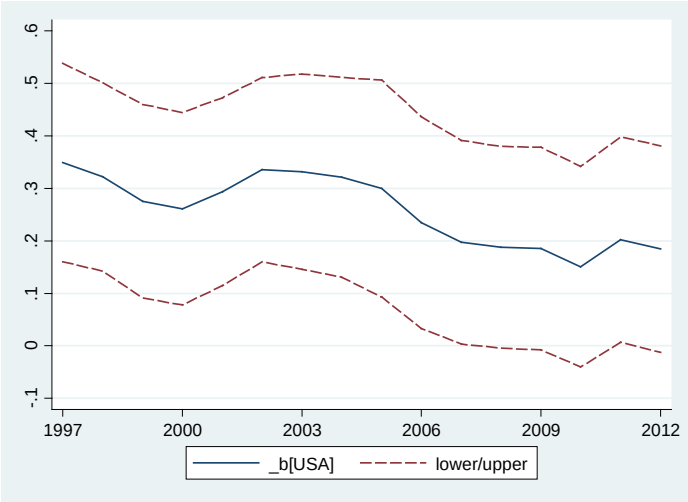

Figure 3.4: Estimate of the effect of USA (Rolling window regression, 36 years) on GRGDP. Lower/Upper defined by the 90 percent confidence interval. Year in the x-axis is the maximum year in the window.

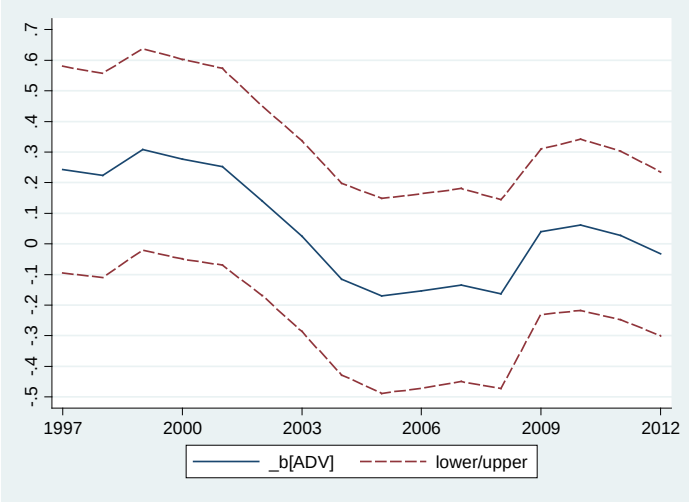

Figure 3.5: Estimate of the effect of ADV (Rolling window regression, 36 years) on GRGDP. Lower/Upper defined by the 90 percent confidence interval. Year in the x-axis is the maximum year in the window.

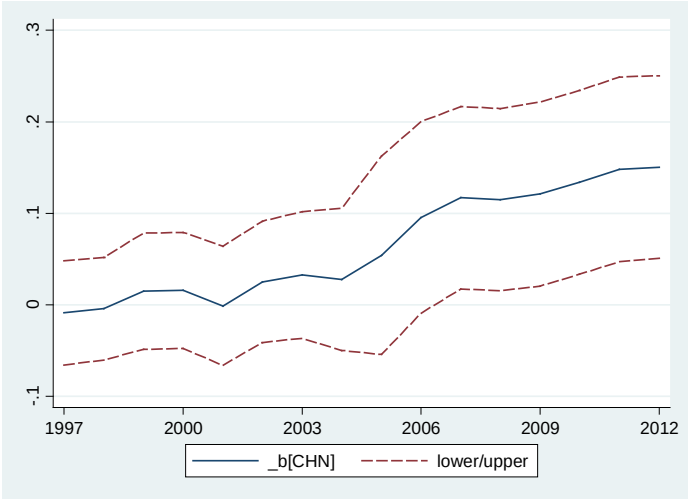

Figure 3.6: Estimate of the effect of CHN (Rolling window regression, 36 years) on GRGDP. Lower/Upper defined by the 90 percent confidence interval. Year in the x-axis is the maximum year in the window.

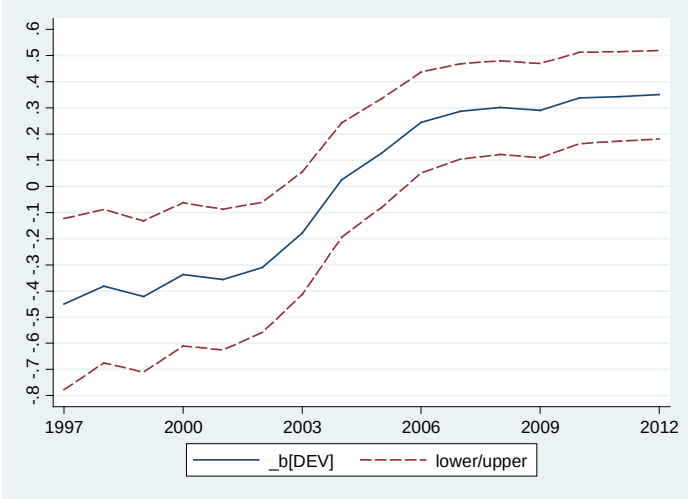

Figure 3.7: Estimate of the effect of DEV (Rolling window regression, 36 years) on GRGDP. Lower/Upper defined by the 90 percent confidence interval. Year in the x-axis is the maximum year in the window.

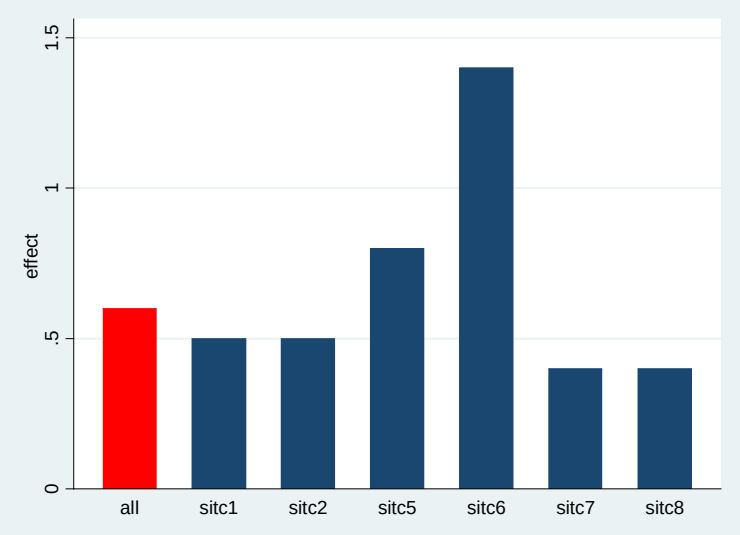

Figure 3.8: Effect of a one standard deviation variation in the interaction term $USA_t * EXPUS\_GDP_{jt-2}$, for selected SITC sectors, on Latin American annual growth rates (percentage points)

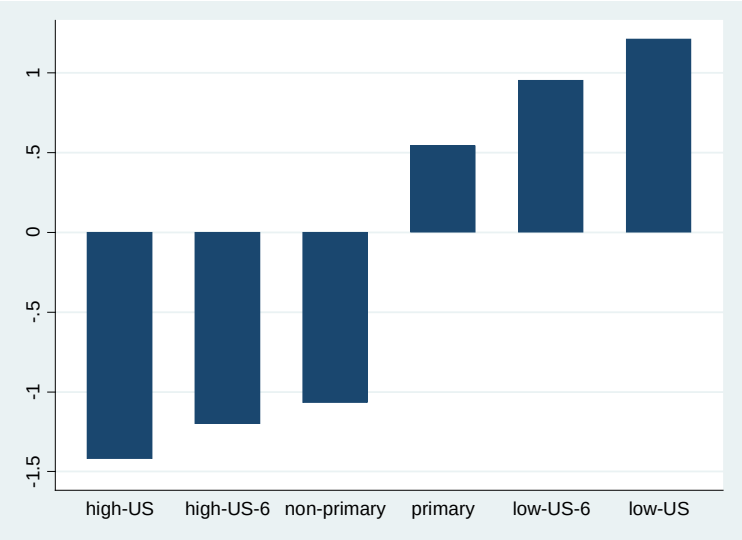

Figure 3.9: Average annual growth rate in 2009 for selected groups of Latin American economies (percentage points)

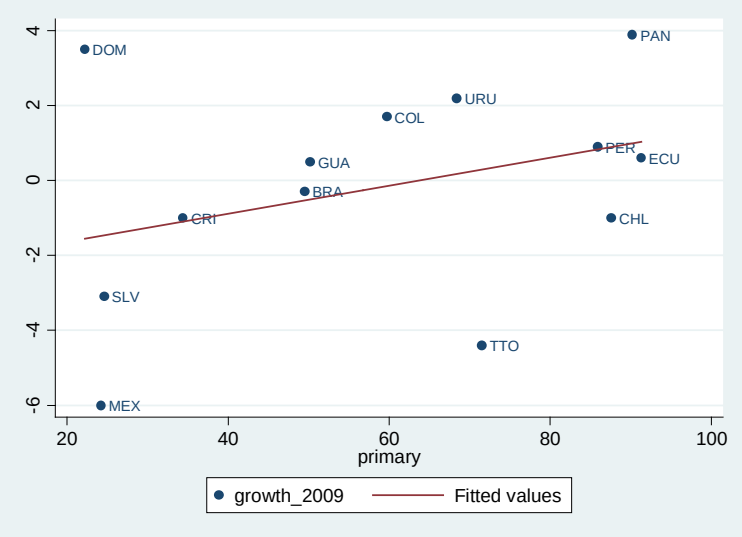

Figure 3.10: Scatter plot of Primary commodity exports/merchandise exports versus Annual growth rates in selected Latin American economies in 2009 (percentage points)

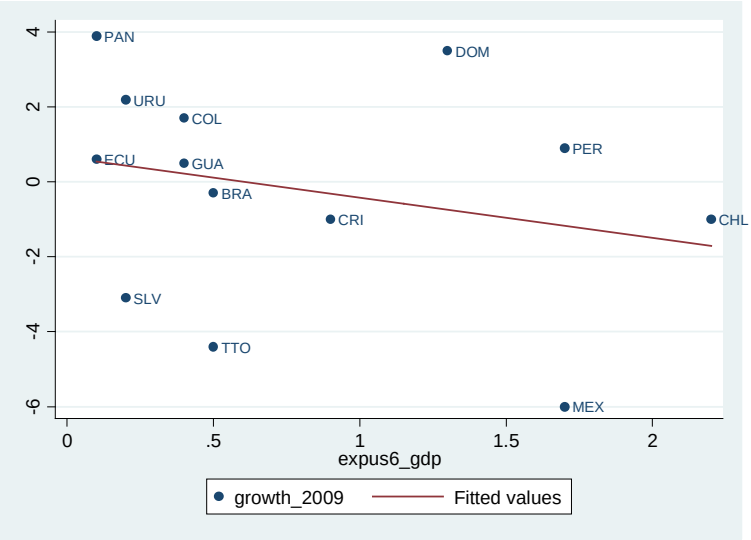

Figure 3.11: Scatter plot of Manufacturing Exports (SITC- 6) as a proportion of GDP vs. Annual growth rates in selected Latin American economies in 2009 (percentage points)

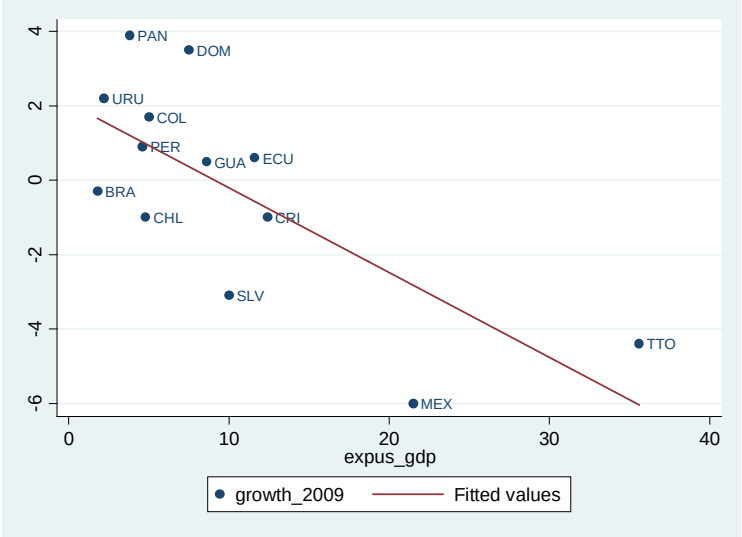

Figure 3.12: Scatter plot of Total Exports to US as a proportion of GDP vs. Annual growth rates in selected Latin American economies in 2009 (percentage points

CHAPTER 4

TERMS OF TRADE AND OUTPUT FLUCUATIONS IN COLOMBIA

4.1 Introduction

The role of short run output fluctuations in developing economies is particularly important. Developing countries are usually more exposed than developed economies to the effects of macroeconomic ups and downs. In addition, welfare implications may be asymmetrical depending on the degree of development. Some examples for a possible uneven effect are: first, that developing economies lack the proper social safety nets to mitigate the impact of bad phases on the poorest population; second, poverty and unemployment in developing countries make people less capable of smoothing their consumption when temporary shocks appear;[26] and third, the more variable tax base may constrain both the ability of the public sector to implement long run projects necessary to remove the obstacles that hinder the development of these economies as well as the responsiveness of short run fiscal policy.

This study focuses on the terms of trade to explain these output fluctuations. This decision is motivated by the literature on development macroeconomics based on a small open economy framework (for example, Agénor and Montiel, 2008). In particular, the dependent economy model and its three goods variant (exportable, importable and nontradable) assumes that the small economy faces an infinitely elastic global demand for its goods, and an infinitely elastic supply of imported goods.[27] This means that prices of exports and imports are determined in the

[26] Economic theory usually assumes that more volatile consumption decreases individuals' utility in the presence of risk aversion and incomplete financial markets.

[27] For this study, the dependent economy with three goods seems to be a more convenient framework than the Mundell-Fleming model, where the terms of trade, when variable, are endogenous. The endogeneity in the Mundell-Fleming model

international markets where the domestic economy has no market power. The framework predicts that external shocks to terms of trade may be an important source of output fluctuations in the domestic economy. An improvement in the terms of trade, say, because of a boom in commodity prices, works as an incentive to expand output in the sectors that face a higher price. However, the shock may result also in an appreciation of the real exchange rate that increases real wages in the sectors that produce importable goods. Therefore, the initial aggregate output increase might be offset by the loss of competitiveness in the sector that produces importable goods (Dutch Disease). The same mechanism may be easily extended to other exportable goods. The net result, however, depends theoretically on critical assumptions regarding the labour markets and the degree of price flexibility (market clearing conditions). The most common assumption is that the nontradable sector clears due to the variation of prices rather than by an adjustment in output. Furthermore, whether these effects are displayed in the short run will depend not only on the type of market adjustment but also on its speed, the reaction of the economic policy authorities to changes in this relative price, the degree of openness, the degree of specialization in exportable goods, and the exchange rate regime, among other elements.

Some facts justify the selection of Colombia as a study case. First, recent Colombian exporting structure seems to support the role of exogenous terms of trade as in the three goods model. Annual data for 2010 show that most of the Colombian

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occurs because there is some degree of producer market power in the exportable good. The price of the exportable good may be altered by internal conditions (that is, domestic demand) even if the economy is a price taker regarding the importable goods. Likewise, the two goods dependent economy model (traded and nontraded) has its own limitation: both exportable and importable goods are aggregated in a composite good (the traded good). Therefore, the variability of the terms of trade is not defined and cannot be the origin of macroeconomic fluctuations. See (for example, Greenwood, 1984; Buiter, 1988) for other dependent economy model specifications.

exports (62%) are concentrated in four commodities where Colombian market power is negligible: petroleum and derivatives (42%), coal (14%), coffee (5%), and nickel (1%). Second, quarterly information for the period 1994-2011 reports a positive correlation between quarterly variations in terms of trade and quarterly growth of GDP equal to 0.35. This magnitude is important relative to other studies for developing economies (see section 4.2). Finally, the period 1994-2011 depicts high variability in both the terms of trade and GDP. This variability is useful to test the validity of the results from the time series analysis.

Although this work is limited to aggregate results, there are other channels that can illustrate the relevance of terms of trade in the Colombian economic performance in the short run. Let's take again a commodity price boom as an example. Once the commodity' prices rise, extra profits will be generated for the firms linked directly or indirectly to the production of those commodities. Thus, this shock fosters the expansion of consumption and output in other sectors. In addition, a higher level of wealth allows investors to access financial credit more easily. This credit is available due to the greater availability of foreign currency that relaxes the monetary constraints. Therefore, the process boosts credit, investment, consumption, and also profits for the financial system that nowadays accounts for around 18 per cent of total Colombian value added. This mechanism is clearly plausible in Colombia where there has been a large accumulation of international reserves, and where, despite the Central Bank's inflation targeting policy, some interventions have been made to curb the appreciation of the exchange rate.

Another reason for the procyclical terms of trade in Colombia may have its origins in the public sector. Around 60 per cent of the total volume of exported oil is exported by Ecopetrol (National Enterprise of Petroleum). Some of the revenues

obtained by this institution make up part of the revenues of the nonfinancial Public Sector. In addition, it is reasonable to expect that a commodity price boom, increasing profits of the firms, and stimulating the economy, will also expand tax revenues. The result is not necessarily a fiscal surplus. For instance, Kaminsky (2010) finds evidence of a procyclical fiscal policy in middle income countries when terms of trade shocks occur.[28]

Regarding international trade, after the United States and the European Community, Venezuela and Ecuador are the most important markets for Colombian exports. These two countries are oil exporters and net buyers of Colombian manufactures. This means that a commodity price boom that increases the income of these commercial partners may also increase the demand for Colombian products. However, preliminary evidence shows that the Colombian current account is not positively correlated with the terms of trade.[29]

This paper is a step forward in resolving the theoretically ambiguous relationship between terms of trade and output. Specifically, this paper presents a time series analysis that examines the relationship between quarterly growth of the GDP and quarterly variations in terms of trade. For that purpose, a price index for the four main exportable commodities is constructed, and this study uses a simple econometric methodology (Box-Jenkins) that is consistent with: the exogeneity of the Colombian terms of trade, the noncointegration between GDP and terms of trade, and the stationarity of the key variables. The study offers different robustness tests, starting with the inclusion of relevant control variables whose absence may cause a potential

[28] See (for example, Tornell and Lane, 1999; Frankel, 2010) for institutional aspects explaining procyclical public expenditure in developing economies. For Latin America, see (for example, Medina, 2010).

[29] See (for example, Obsfeld, 1982; Svensson and Razon, 1983; Kent and Cashin, 2003) for a discussion about the effects of the terms of trade on the current account.

bias in the estimate for terms of trade. For example, real and nominal exchanges rates are two of such control variables because a negative effect of the variations in the terms of trade on short run output fluctuations could be associated with a Dutch disease mechanism. Nevertheless, it is not clear a priori either that positive terms of trade shocks result in an appreciation or that an appreciation is going to decrease aggregate output unambiguously. First, nontraded goods production could increase with the shock while the expansion of the real income would be adjusted by a change of output rather than by a change of prices. Second, an eventual appreciation of the nominal exchange rate, given a larger supply of foreign currency, could have expansionary effects on output just as a nominal devaluation may have contractionary effects. In a seminal theoretical model, Krugman and Taylor (1978) describe this possibility.[30] Among different mechanisms presented by the authors, one of them, following the Kaleckian tradition, states that an appreciation may redistribute income from profits and rent to wages. The reduction in the price of imported inputs is automatically translated into a reduction in the price of the home goods, which increases real wages. Because the marginal propensity to consume is higher for workers than for capitalists, the redistribution from wages to profits increases aggregate demand and domestic output.

[30] See (for example Lizondo and Montiel, 1989) for a deep overview of the theory on contractionary effects of devaluation applied to developing countries. Razmi (2007) extends the theoretical framework of Krugman and Taylor (1978). This extension, including the role of transnational corporations and the type of commercial partners for exports (developing or industrialized economy), suggests that the likelihood of contractionary short-run effects of devaluation may be greater for developing economies. As an opposite example, Reinhart and Reinhart (1991) finds that a devaluation is expansionay in the short run in Colombia in a simulation based model with a Neokeynesian structure.

The empirical strategy in section 4.3 is thus essential to evaluate the direct effect of changes in the terms of trade after taking into account eventual indirect effects through other variables. Concluding remarks are presented in section 4.4.

4.2 Related Literature

Empirical evidence on the effects of the terms of trade on output fluctuations in developing economies may be classified in three groups: (1) studies that describe a correlation between business cycles and cycles in terms of trade as a stylized fact; (2) simulation based models; and (3) vector autoregression models (VARs). Agénor et al. (2000), an influential work in the first category of papers, find, for instance, a strong positive correlation for Colombia, Korea and Mexico between the cyclical components of the industrial output and the terms of trade (with both the Hodrick Prescott and the Band-Pass methodologies using quarterly data). Also in this group of papers, Parra (2008), with quarterly data from 1994 to 2007, reports a correlation equal to 0.24 for Colombia, and Mahadeva and Gómez (2009), a positive correlation between the terms of trade and real GDP per capita for Colombia equal to 0.32 (using annual data for 1970-2007).[31] However, this type of stylized facts becomes more persuasive when it is used either for the calibration of simulated based models or for the specification of an econometric model.

For instance, Mendoza (1995), a seminal work in the second category, not only reports a positive correlation between terms of trade and GDP but also claims that his intertemporal model predicts that terms of trade shocks may explain from 37 to 56 per cent of the actual variability of GDP in developing countries. This outcome depends of course on the particular setup of his three goods model (exportable,

[31] See (for example, Rand and Tarp, 2002) for a description of stylized facts of the business cycles in developing countries.

importable, and nontraded goods). In that framework, the dominant effect that explains the short run effect of the terms of trade on output is basically that terms of trade gains induce an increase in the marginal profitability of the exportable sector which fosters an investment boom in that sector. Investment corresponds to an international and domestic reallocation of capital where the importable goods sector is the only source of domestic capital (not the nontraded sector). On the other hand, labour supply is inelastic in traded-sector industries, and the labour supply response in the nontraded sector is assumed as negligible. After the short run impact, adjustment mechanisms start to work to drive the economy to the long run equilibrium that is by assumption equal to the initial equilibrium. The adjustment of the real exchange rate toward its long run equilibrium reduces the short run interest rate differential, and thus, the foreign capital that entered the domestic economy during the investment boom goes out. As expected, the initial GDP boom weakens.

Although Mendoza's framework presents a plausible scenario for the positive correlation between the terms of trade and GDP in the short run, different theoretical assumptions could obviously tell a different story. Indeed, empirically, in his own sample, some countries displayed a negative correlation: Egypt (-0.455), Philippines (-0.285), Algeria (-0.234), Zaire (-0.107) and Tunisia (-0.309). These cases are not, however, covered by the general equilibrium model in his paper.

Kose and Riezman (1999) and Kose (2002) are other examples of how conditioned empirical evidence may be by the particular theoretical setup. Kose and Riezman (1999), developing a general equilibrium model for a small open African economy with two sectors (exportable primary goods and nontraded goods), finds that world price shocks can explain around 45 per cent of output fluctuations, basically because both the primary good and the nontraded sectors use imported capital goods as factors

of production. Therefore, a decline in the international prices of imports leads to an expansion of aggregate output. On the other hand, Kose (2002) finds that disturbances in the prices of capital goods and intermediate goods may account for 87.6 per cent of the output variability. The greater effect in this case occurs because the author focuses on main exports and imports prices (which are more volatile than terms of trade in relation to productivity shocks), and the role of intermediate inputs in the nontraded sector, which, according to his open small economy model, does not face any limit on the supply of capital.

The third group of studies have used VAR techniques to examine the effects of terms of trade on output fluctuations in developing countries (for example, Hoffmaister et al., 1998; Hoffmaister and Roldos, 2001; Ahmed, 2003; Broda, 2004; Izquierdo 2007; Raddatz, 2007). These analyses are usually based on long run theoretical models whose reduced forms become specific structural VARs. For instance, Hoffmaister et al. (1998) make explicit that the terms of trade shocks act through the price of intermediate inputs, assuming that a positive change in this price behaves as negative technological progress. This way, positive terms of trade shocks are positive supply shocks that relax the intermediate inputs constraint.

Regardless of the specifics of the technique, most of the literature suggests a positive effect of terms of trade on output fluctuations in developing countries. However, some of the documented literature undermines the role of international prices. For example, Broda (2004) affirms that his evidence contradicts that from Mendoza (1995). Broda, working with a sample of 75 developing countries with annual data from 1973 to 1996, finds that the contribution of terms of trade shocks accounts for less than 10 per cent of actual real GDP volatility in countries with flexible exchange regime. Similarly, Ahmed (2003), that studied the economic

fluctuations of six Latin American economies (Argentina, Brazil, Chile, Colombia, Mexico and Venezuela), concludes that the terms of trade shocks might explain (although not significantly in statistical terms) less than 8 per cent of domestic output fluctuations.

The terms of trade have also been used as a control variable in explaining the relationship between the short run fluctuations of GDP and other variables in Latin American countries (for example, Barro, 1979; Edwards, 1983; Edwards, 1986). Consistent with the studies described before, the effect is usually positive. However, Edwards (1983) finds that the estimate of the effect of terms of trade on output is only significant for Chile and Mexico, and not significant for Brazil, Colombia, and Peru. Furthermore, Edwards (1986), who tests if a devaluation of the nominal exchange rate may display contractionary effects in the short run, concludes that the terms of trade effect on real output in developing countries is negligible.

To the author's knowledge, no previous study quantifies the importance of the terms of trade in explaining output fluctuations in the recent Colombian context whose own specific features, and its status as a developing economy, may allow the use of a simple but powerful econometric tool to pursue that quantification and to test its robustness. Given that the background literature contains several cases of positive, negative and null effects of the terms of trade, the question examined in the Colombian case is fundamentally empirical.

4.3 Empirical strategy

This section aims to offer a parsimonious model for Colombia for the period 1994-2011 to describe its output fluctuations, to estimate the partial effect of the terms of trade on GDP variations, and to test the significance of that estimate, using quarterly data.

This period of analysis was selected for several reasons. First, the data are available without substantial methodological changes in the national accounts and the balance of payments.[32] Second, the analysis excludes one of the most important structural break points in the Colombian economic policy: the trade liberalization in the early nineties. Third, the period includes: the commodities prices boom that started in 2003, the subsequent downturn at the end of 2008 (for the Colombian terms of trade), and a recovery starting in 2009. In the same way, this period also includes the sharpest recession known in Colombian economic history (year 1999) and a period of high growth (2003-2007) (figure 4.1).

Regarding the statistical procedure, this paper follows the Box-Jenkins technique for a univariate model. The type of model that is estimated is usually known in the literature as ARMAX, a model for stationary series with three components: (1) the autoregressive part (AR), (2) the moving average part (MA), and (3) the set of other explanatory variables (X). The general model is thus:

$$y_t = \alpha + \sum_{p=1}^{n} \lambda_p y_{t-p} + \sum_{q=1}^{n} \theta_q \mu_{t-q} + \sum_{m=0}^{n} \gamma_{i,m} X_{i,t-m} + \mu_t \qquad (1)$$

Where y represents the dependent variable (a stationary series of the GDP in this paper), t indexes time, μ is the error term, X is the set of explanatory variables (stationary, and that includes the terms of trade), and: α, λ, θ, and γ, the parameters to estimate.

There are several reasons that justify the specification in equation (1) given that GDP and terms of trade are not cointegrated First, stationary series reduce the

[32] Although the information was obtained directly from the National Department of Statistics (Dane), the International Financial Statistics (IFS) dataset does not report quarterly GDP data for Colombia in years before 1994.

possibility of spurious correlations due to similar trends between the dependent and an explanatory variable. Second, the Wold Decomposition shows that any stationary process can be approached through the combination of both the autoregressive and the moving average models. Third, the combination of both components contributes to the parsimony of the model, once the autocorrelation of the errors that would affect the significance tests is taken into account. Finally, the use of an ARMA model allows one to control for any possible persistence of the output fluctuations.[33] In addition to the estimation of the contemporaneous effect, this specification allows the estimation of the total effect of terms of trade on GDP over time.

Besides the ARMA specification and the terms of trade, control variables must be considered in the set of explanatory variables. The main reason is that their omission may result in a biased estimate for the effect of terms of trade. From the aggregate demand side,[34] robustness tests include two groups of monetary variables: lending interest rates, and exchange rates.. Interest rates may be important in the determination of the investment component, which explains most of the variability in GDP, and may also be responsive to changes in the terms of trade through the relaxation of balance of payment constraints. On the other hand, the inclusion of the nominal and real exchange rates permits to test not only the robustness of the effect of the terms of trade but also to examine if the short run effect of a depreciation (or an appreciation) of the exchange rate is contractionary (or expansionary). Finally, the quarterly growth of the United States GDP (GDPUS), and the net financial flows (inflows minus outflows) in the Colombian balance of payments (NFF) will also be

[33] See (for example, Nelson and Plosser, 1982; Campbell and Mankiw, 1987; Blanchard and Quah, 1989) for the discussion about the persistence of the output fluctuations.

[34] See (for example, Shapiro and Watson, 1998) divides the source of output fluctuations in demand and supply components.

treated as control variables. Both variables might also be correlated simultaneously with the terms of trade and Colombian GDP.

The specification leaves aside technological shocks, which are an important element in the real business cycles literature.[35] There are some reasons that justify this decision. First, given the volatility of the quarterly data, it is unlikely the existence of technological shocks that are correlated with the terms of trade and that can explain variations of GDP quarter to quarter (even if some amplifiers are considered). Second, proxies of technical change, like total factor productivity, are not usually reliable, especially in developing countries. Third, despite the fact that a clear identification is impossible, the ARMA specification is already controlling for the new information (innovations) through its moving average term, including non-observable shocks that affect output.[36]

Likewise, the study omits the role of the expectations of economic agents and also the management of these expectations as an instrument of economic policy, for example, through monetary policy. This is a limitation of the study despite the difficulty of having a good proxy for that variable.

[35] See (for example, Mankiw, 1989) for a criticism over the real business cycle theory and (Holland and Scott, 1998) for an empirical defense of the technical change explaining the business cycle in the United Kingdom.

[36] As another supply side shock, although not correlated with the terms of trade, but eventually helpful to understand the nature of the Colombian business cycle, the climate phenomenon El Niño was revised in a previous analysis not reported in this paper. Using the multivariate ENSO index (El Niño/Southern Oscillation Phenomenon) (www.esrl.noaa.gov), different alternative definitions were considered to create a dummy variable. For example: if the quarter was in the warm phase or not, if the quarter was in a warm phase with an index that was one standard deviation higher than the average or not, or if the absolute value of the index was relatively high to its average. No clear relationship between El Niño and GDP for the period of analysis was found.

While further research can explore whether particular variables may improve the fitness of the model, the main purpose of the study is not to obtain a forecasting model, but to evaluate the role of the terms of trade.

4.3.1 Variables and Data Description

The quarterly data for real GDP, seasonally adjusted, was obtained from the Departamento Administrativo Nacional de Estadística (National Department of Statistics in Colombia). The dependent variable is the first difference of the logarithm of GDP (DLGDP) for Colombia, approximately quarterly growth of the GDP (figure 4.2). This transformation is necessary for two reasons: it defines the variable in terms of output fluctuations, and it accomplishes the stationarity requirement in the Box-Jenkins technique. According to different tests, weak stationarity of DLGDP is verified by rejecting the null hypothesis that this series has a unit root.

As an alternative definition of output fluctuations, the cyclical component of the GDP is estimated through the Hodrick-Prescott filter (GDPCYCLE). This series is also stationary.

Two definitions for the terms of trade are used in this paper. The first was constructed with statistical information from the balance of payments and the wholesale imports price index from the Colombian Central Bank (Banco de la República de Colombia). This definition, called TOTCL, corresponds to the ratio ($\frac{PXCL}{PI}$), where the denominator is the wholesale imports price index and the numerator is a Laspeyres index[37] for the basket of the most important Colombian exportable commodities (oil, coal, coffee and nickel). This study uses the variable DLTOTCL (first difference of logarithm of TOTCL). The second definition is called

[37] A Paasche index was also calculated but it did not exhibit a substantial difference from the Laspeyres one.

TOTT, available also from the Colombian Central Bank, which corresponds to the ratio between the wholesale exports price index and the wholesale imports price index ($\frac{PX}{PI}$). The transformed variable is called DLTOTT (first difference of logarithm of TOTT).

As a preliminary graphical diagnostic of the key relationship in this paper, Figures 4.3 and 4.4 present the correlation between the output fluctuations and the variations in the terms of trade in Colombia. Figure 4.3 depicts the simple correlation (the correlation coefficient is 0.35). Figure 4.4 shows the correlation between the cyclical components of GDP and TOTCL (the correlation coefficient is 0.48). Besides the positive correlation, both scatter plots suggest that these correlation coefficients are not augmented by potential outliers. Most of the observations in the sample follow the same pattern described by the simple OLS regression between DLGDP and DLTOTCL in figure 4.3, and between GDPCYCLE and TOTCLCYCLE in figure 4.4.

This empirical analysis assumes, based on the dependent economy framework, and the construction of the series related to terms of trade, that the terms of trade are exogenous and that they cause the output fluctuations, not the other way around. Although this is a very plausible assumption for Colombia as described in the introduction, a Granger causality test was performed. The test suggests the no rejection of this assumption (table 4.1).

This diagnostic test also suggests that DLTOTCL does not Granger cause DLGDP (although the p values are relatively smaller than those in the other hypothesis in table 4.1). More formal empirical results on the relationship DLTOTCL and DLGDP will be presented in the following section. In addition to the terms of trade definitions above, four more related prices are used (as alternative to TOTCL) in

the right hand side of the regressions: a Laspeyres index for the prices of oil, coal, coffee and nickel (PXCL), the oil prices (OILPR), the wholesale imports price index (PI), and the wholesale exports price index (PX). The transformed and stationary variables are called DLPXCL, DLOILPR, DLPIIFS and DLPXIFS respectively.

Four stationary control variables are included in the right hand side of the regression. The first is the first difference of the nominal lending interest rate (DNIR) which was obtained from International Financial Statistics (IFS) and corresponds to a weighted average of effective rates for the whole banking system including all types of credit. As an alternative, the first difference of the real interest rate was calculated using the inflation in the producer price index (DRIR).

The second variable is DLNER, the nominal depreciation of the exchange rate (the first difference of the logarithm of the nominal exchange rate). DLNER corresponds to quarterly depreciation of the exchange rate when the value is positive. Likewise, this study also uses the first difference of the logarithm of the real exchange rate (DLRER).

The third variable is the first difference of the net financial flows (inflows minus outflows in the Colombian balance of payments). Although interest rates and exchanges rates should capture the role of financial flows to some extent, this variable is included as a potential omitted variable.

Finally, the econometric analysis controls for the quarterly growth of United States GDP (DLGDPUS). This series are available in the IFS. United States is the destination for approximately 40 per cent of the total Colombian exports and 70 per cent of the Colombian exported oil.

Control variables could be correlated among themselves, for instance, changes in the structure of interest rates along with some degree of capital mobility may put

pressure on the exchange rates and such correlation could affect the respective significance tests. However, the key issue in this paper is a possible bias that may exist if these control variables are omitted given their simultaneous correlation with terms and trade and output fluctuations.

4.3.2 Econometric Results

The specification of the ARMA component of the model was based on the correlogram for the dependent variable, and a set of regressions that evaluate the significance of the estimated coefficients for the ARMA elements (DLGDP as the left hand side variable). Both the autocorrelation and the partial correlation functions suggest a specification around the ARMA (3, 3). However, the set of regressions (even including a fourth lag with an eventual economic interpretation) permits to find a robust and parsimonious specification. Therefore, this analysis uses a parsimonious version of the ARMA (2, 3) without including the first lag for the autoregressive component and without the first and second lags for the moving average. The estimates in the ARMA (2, 3) are robust to the inclusion of the terms of trade and the control variables. The number of lags is reasonable to interpret the effects on the dependent variable in the short run. Given the quarterly data, the second lag in the autoregressive component refers to a half year lag.

Table 4.2 (column 1) reports positive and significant estimates for the ARMA coefficients. While the estimates for the moving average coefficient can be associated with the effect of the statistical innovations, the estimate in the autoregressive part suggests the existence of an important degree of persistence in the Colombian GDP fluctuations. All the estimates for this ARMA model are significant at least at the 5 per cent level. The ARMA model can explain 17 per cent of the total variation in the dependent variable. The Durbin h statistic, the p value of the Chi-Square test Breusch-

Godfrey for the residual, and the correlogram of the residual suggest the absence of autocorrelation. Furthermore, given the assumption of weak stationarity, DLGDP does not face heteroskedasticity. This means that the t-statistics and the p-values used to establish significance at the 1, 5 and 10 per cent are reliable.

Column 3 corresponds to the regression including DLTOTCL:

$$DLGDP_t = \alpha + \gamma_1 DLTOTCL + \lambda_2 DLGDP_{t-2} + \theta_3 \mu_{t-3} + \mu_t \qquad (2)$$

The estimate for the effect of DLTOTCL on DLGDP is significantly positive at the 1 per cent level. The magnitude of the estimate for the contemporaneous effect means that a 1 per cent increase in the growth of the terms of trade increases by 0.02 per cent the quarterly growth of GDP (holding other variables constant). This magnitude is important. One standard deviation in DLTOTCL (equal to 13.22 per cent) will change the quarterly growth of GDP by 0.28 per cent. This change is around 23 per cent of one standard deviation in the quarterly growth of GDP (column 4). Once the persistence effect is calculated, the same standard deviation of DTOTLC is associated with a change around 34 per cent of one standard deviation in the quarterly growth of the GDP. Therefore, one third of the quarterly variability in GDP is driven by the terms of trade for the four most important Colombian commodities.

The terms of trade effect holds when the definition of the terms of trade is extended to include the unit value of all the Colombian exports (DLTOTT) (column 1, table 4.3). The estimate is higher but the standard deviation of DLTOTT is lower (5.79%). The regressor still explains around 27 per cent of one standard deviation of the GDP growth (column 2, table 4.3). Table 4.3 (columns 5, 6, 7 and 8) and table 4.4 (using cyclical components) also offer evidence confirming that prices of the four

most important Colombian export goods, in particular oil, are the ones that lead the short-run effect on output.

4.3.3 Robustness tests

The results in section 4.3.2 are robust to the inclusion of the control variables: lending interest rates, exchange rates, net financial flows, and quarterly growth of US GDP (table 4.5). The estimate for DLTOTCL not only remains significant at 1 per cent in most of the regressions (at 5 per cent in column 4) but also its magnitude is stable.

In order to expose the results to a stronger robustness test, lagged control variables are included. These variables were found independently significant when running a regression for DLGDP. These variables are: DNIR and DLGDPUS (both lagged two quarters). Once these variables are included, only DNIR (-2) remains significant (columns 1 and 3, table 4.6). The estimates for standardised DLTOTCL are still robust and the total effect, including persistence, explains 30 per cent of GDP variability (column 4).

Results for standardised variables (column 4, table 4.6) also report a theoretically consistent negative effect of DNIR (-2), which is significant and important in magnitude. Although the estimate is not robust when ARMA components are removed, the inclusion of DNIR (-2) increases the R^2 from 0.17 to 0.39. Although it is true that the purpose of this paper is not to evaluate either the model's forecasting properties or the robustness in the estimate for the effect of DNIR (-2), the negative estimate, along with a higher R^2, may be reflecting that DNIR is acting through investment which is the aggregate demand component whose variations explain most of the short run variation in GDP. Although investment is one fourth of the Colombian GDP while consumption is two thirds, investment is the most

volatile component of the GDP (its standard deviation is 8 times greater than consumption's). An initial exploration of the channels in aggregate demand relevant to understanding more deeply the significant and robust effect of terms of trade on output fluctuations in Colombia (table 4.7) suggest that investment (DLI) is the main channel. One standard deviation in DLTOTCL seems to explain one third of the variability in investment (only for the contemporaneous effect). Future research will be oriented toward examining what type of investment terms of trade shocks are fostering in the short run. This might also require a better understanding of the mechanisms through which terms of trade may affect the credit markets and interest rates. The next channel suggested in table 7, but apparently less responsive, is public expenditure (DLG). Finally, the current account (DLX for exports and DLM for imports) does not seem to be correlated with terms of trade in the short run.

4.4 Concluding remarks

Although it is sometimes claimed that a positive correlation between the terms of trade and aggregate output can be established a priori, a vast literature describes the complexity in the relationship of these two variables. First, not only a positive but also a negative correlation has been found in some developing countries. Second, the usual theoretical framework used to describe open small economies permits outcomes in which the relationship can be negative or null. A lot depends on the plausibility of the assumptions made for a particular economy and the way in which domestic markets adjust after external shocks. The idea of an ambiguous effect has lately been part of a debate in Colombia about the perverse effects of the terms of trade and the well-known Dutch Disease. This outcome that is commonly associated with the long run might also act in the short run depending on how fast possible contractionary effects of a commodity price boom can be transmitted.

This study finds that the estimate of the impact of the terms of trade on GDP is not only significantly positive but also very important in magnitude. Around one third of one standard deviation of quarterly GDP growth is explained by one standard deviation in the growth of the terms of trade. The results are robust to different specifications that include: price components of the terms of trade, alternative definitions of business cycles, and control variables whose omission might lead to a biased estimate.

In addition, depreciation of the nominal exchange rate does not seem to have a significant short run effect as stated by the contractionary devaluation hypothesis. This might be important when analysing potential new policies, costly or distortionary, oriented toward controlling the appreciation of the nominal exchange rate that Colombia and other developing countries have been lately experiencing. Likewise, this short run dynamic might complement analysis that suggests that devaluation is a useful tool for growth. On the other hand, this paper finds preliminary evidence that supports the negative effect of the lending interest rate on output fluctuations.

In summary, this paper finds robust evidence, supporting the hypothesis that the terms of trade have an important role in the determination of the short-run variations of the Colombian GDP over the period 1994-2011. Results from simple specifications for stationary series justified by time series tests (cointegration and Granger) along with the particular features of the Colombian economy suggest that the terms of trade are exogenous and a source of the output fluctuations as described in the three goods model for a dependent economy. At least in the short run, evidence does not indicate that eventual negative effects of the terms of trade (Dutch Disease), if they exist, can offset the positive effects on aggregate output.

Preliminary evidence also indicates that investment may be the most important demand component driving the aggregate outcome. One limitation of this study is the use of aggregate data. Therefore, a future extension would be to study the relationship between terms of trade and investment demand disaggregated by components and by industrial sectors to determine the foundation of the observed fast adjustment of the external shocks in the short run. Future research related to this finding will also explore short run effects of terms of trade fluctuations on credit markets, interest rates, and investment in Colombia. These studies would allow evaluating in more detail the mechanisms behind the quick investment and output responses to external shocks.

4. 5 Tables and figures chapter 4

Table 4.1: Granger causality test

	Lag length 1	Lag length 2	Lag length 3	Lag length 4
Null Hypothesis: DLGDP does not Granger cause DLTOTCL				
p-value	0.80	0.79	0.82	0.52
observations	60	59	58	57
Null Hypothesis: DLTOTCL does not Granger cause DLGDP				
p-value	0.15	0.41	0.33	0.22
observations	60	59	58	57

Table 4.2: Terms of trade and output fluctuations I

Dependent variable: DLGDP (Quarterly growth rate of real GDP)

	(1)	(2)	(3)	(4) Standardized Variable
Constant	0.0082***	0.0075***	0.0082***	
	(3.00)	(4.87)	(2.72)	
AR(2)	0.3273***		0.3227***	0.3227***
	(3.14)		(2.96)	(2.96)
MA(3)	0.3377**		0.3659**	0.3659**
	(2.40)		(2.56)	(2.56)
$DLTOTCL_t$		0.0339***	0.0215***	0.2315***
		(3.95)	(4.08)	(4.08)
Total effect (including persistence)			0.0318*** [10.24]	0.3418*** [10.24]
R^2	0.17	0.12	0.26	0.26
Adjusted R^2	0.14	0.11	0.22	0.22
Durbin-Watson Stat.		1.96		
Durbin h	0.71		0.14	0.14
Prob. Chi-Square (Breusch-Godfrey)	0.20		0.32	
S.E. of regression	0.01		0.01	
Akaike info criterion	-6.06		-6.04	
Schwarz criterion	-5.96		-5.90	
F-statistic (p-value)	0.00	0.00	0.00	
Observations	67	61	59	59

(*t*-statistic), *p<0.10, **p<0.05, ***p<0.01, [Chi-square]
Least Squares and MA derivatives that use accurate numeric methods.
Consistent standard errors.

Table 4.3: Terms of trade and output fluctuations II (alternative definitions)

Dependent variable: DLGDP (Quarterly growth rate of real GDP)

	(1)	(2) St. Var.	(3)	(4)	(5)	(6)	(7)	(8)	(9) St. Var.
$DLTOTT_t$	0.0364*	0.1715*							
	(1.69)	(1.69)							
$DLPX_t$			0.0253		0.0365*				
			(1.33)		(1.69)				
$DLPI_t$				0.0028	-0.0367		0.0197		
				(0.09)	(-1.03)		(0.61)		
$DLPXCL_t$						0.0252***	0.0260***		
						(4.29)	(3.96)		
$DLOILPR_t$								0.0147***	0.2043***
								(3.29)	(3.29)
Total effect (including persistence)	0.0566 [2.37]	0.2664 [2.37]				0.0377*** [11.96]		0.0219*** [7.24]	0.3052*** [7.24]
R^2	0.20	0.20	0.19	0.17	0.20	0.27	0.28	0.25	0.25
Adjusted R^2	0.16	0.16	0.15	0.13	0.15	0.23	0.22	0.21	0.21
Durbin h	0.15	0.15	0.47	0.75	0.08	0.28	0.50	0.65	0.65
Prob. Chi-Square (Breusch-Godfrey)	0.22		0.23	0.20	0.22	0.33	0.33	0.31	
S.E. of regression	0.01		0.01	0.01	0.01	0.01	0.01	0.01	
Akaike info criterion	-6.07		-6.06	-6.03	-6.04	-6.06	-6.03	-6.03	
Schwarz criterion	-5.94		-5.93	-5.90	-5.88	-5.92	-5.85	-5.89	
F-statistic (p-value)	0.00		0.00	0.01	0.01	0.00	0.00	0.00	
Observations	67	67	67	67	67	59	59	59	59

(t-statistic), *p<0.10, **p<0.05, ***p<0.01, [Chi-square]
Least Squares and MA derivatives that use accurate numeric methods. Consistent standard errors.
ARMA component included in all the regressions but not reported.

Table 4.4: Terms of Trade and Output Fluctuations III (cyclical components)

Dependent variable: GDP (cyclical component)

	Estimate	Adjusted R2	Durbin h.	Prob. Chi-Square (Breusch-Godfrey)	S.E. of regression (x100.000)	Akaike info criterion	Schwarz criterion	F-statistic (p-value)	Observations
$TOTCL_t$	542217** (2.42)	0.75	0.59	0.80	5.7	29.41	29.58	0.00	61
$TOTT_t$	2170543** (2.36)	0.74	0.73	0.85	5.3	29.29	29.45	0.00	69
PX_t	14030* (1.95)	0.74	0.72	0.66	5.4	29.31	29.47	0.00	69
PI_t	-105.4 (-0.01)	0.72	0.89	0.72	5.6	29.36	29.52	0.00	69
$PXCL_t$	5928*** (3.00)	0.74	0.53	0.75	5.6	29.39	29.56	0.00	61
$OILPR_t$	12718** (2.64)	0.74	0.59	0.75	5.7	29.41	29.6	0.00	61

(*t* -statistic), *p<0.10, **p<0.05, ***p<0.01
Least Squares and MA derivatives that use accurate numeric methods.
Consistent standard errors. AR(1) MA(2) MA(3) included but not reported.

Table 4.5: Robustness to additional variables I

Dependent variable: DLGDP (Quarterly growth rate of real GDP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.0082***	0.0082***	0.0081***	0.0079**	0.0081***	0.0086***	0.0078**
	(2.72)	(2.72)	(2.70)	(2.60)	(2.71)	(3.07)	(2.66)
AR(2)	0.3227***	0.3204**	0.3231***	0.3356***	0.3241***	0.3105***	0.2855**
	(2.96)	(2.29)	(2.90)	(3.12)	(3.06)	(3.00)	(2.44)
MA(3)	0.3659**	0.3624**	0.3626**	0.3657**	0.3581***	0.3627**	0.3843**
	(2.56)	(2.19)	(2.50)	(2.52)	(2.53)	(2.42)	(2.58)
$DLTOTCL_t$	0.0215***	0.0221***	0.0217***	0.0279**	0.0226***	0.0237***	0.0201***
	(4.08)	(3.86)	(4.11)	(2.57)	(4.02)	(2.69)	(3.63)
$DNIR_t$		0.0144					
		(0.23)					
$DRIR_t$			-0.0008				
			(-0.29)				
$DLNER_t$				0.0234			
				(0.77)			
$DLRER_t$					0.0127		
					(0.56)		
DLGDPUS						-0.0878	
						(-0.32)	
DNFF							0.0000
							(0.48)
R^2	0.26	0.26	0.26	0.27	0.26	0.26	0.26
Adjusted R^2	0.22	0.21	0.20	0.21	0.21	0.21	0.20
Durbin h	0.14	n.a	0.15	0.27	0.26	0.25	0.41
Prob. Chi-Square (Breusch-Godfrey)	0.32	0.29	0.34	0.36	0.33	0.29	0.35
S.E. of regression	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Akaike info criterion	-6.04	-6.00	-6.01	-6.02	-6.01	-6.01	-6.00
Schwarz criterion	-5.90	-5.83	-5.94	-5.84	-5.84	-5.83	-5.93
F-statistic (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	59	59	59	59	59	59	58

(t-statistic), *p<0.10, **p<0.05, ***p<0.01, [Chi-square]

Least Squares and MA derivatives that use accurate numeric methods. Consistent standard errors.

Table 4.6: Robustness to additional variables II (Including lags)

Dependent variable: DLGDP (Quarterly growth rate of real GDP)

	(1)	(2)	(3)	(4) st. var.	(5) no ARMA	(6) no ARMA st. var.
$DLTOTCL_t$	0.0182***	0.0189***	0.0146**	0.1961***	0.0319***	0.3432***
	(3.81)	(3.08)	(2.33)	(3.81)	(4.05)	(4.05)
$DNIR_{t-2}$	-0.1777**		-0.1813***	-0.3552**	-0.1251	-0.2500
	(-2.61)		(-2.72)	(-2.61)	(-1.28)	(-1.28)
$DLGDPUS_{t-2}$		-0.1762	-0.2637			
		(-1.19)	(-1.61)			
Total effect DLTOTCL (including persistence)				0.3076*** [8.46]		
Total effect DNIRt-2 (including persistence)				-0.5573** [4.96]		
R^2	0.39	0.27	0.41	0.39	0.18	0.18
Adjusted R^2	0.34	0.21	0.35	0.34	0.15	0.15
Durbin-Watson Stat.					2.09	2.09
Durbin h	-2.33	0.34	-1.77	-1.77		
Prob. Chi-Square (Breusch-Godfrey)	0.43	0.24	0.42			
S.E. of regression	0.01	0.01	0.01		0.01	
Akaike info criterion	-6.20	-6.02	-6.19			
Schwarz criterion	-6.02	-5.84	-5.98			
F-statistic (p-value)	0.00	0.00	0.00	0.00	0.00	0.00
Observations	59	59	59	59	61	61

(*t* -statistic), *p<0.10, **p<0.05, ***p<0.01, [Chi-square]

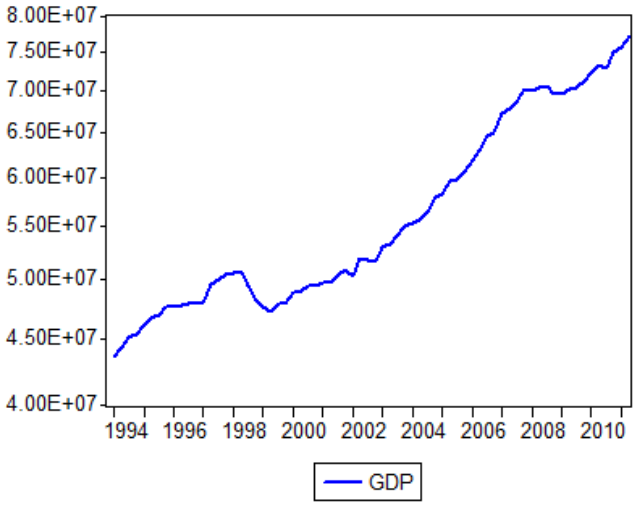
Least Squares and MA derivatives that use accurate numeric methods. Consistent standard errors.

Constant, AR(2) and MA(3) elements were included but not reported in (1) to (4)

Table 4.7: Terms of trade and aggregate demand Components (OLS regressions)

Dependent variable:	(1) DLC	(2) DLI	(3) DLG	(4) DLX	(5) DLM	(6) DLI
Constant	0.0068***	0.0086	0.011***	0.0099**	0.0129**	0.0037
	(4.53)	(0.82)	(4.18)	(2.36)	(2.04)	(0.36)
$DLTOTCL_t$	0.0130	0.2096***	0.0330**	-0.0296	0.0972	0.1939***
	(1.36)	(3.30)	(2.22)	(-0.74)	(1.65)	(3.22)
$DNIR_{t-2}$						-1.0042
						(-1.65)
R^2	0.02	0.10	0.04	0.01	0.06	0.19
Adjusted R^2	0.004	0.09	0.03	-0.003	0.05	0.16
Durbin-Watson Stat.	1.33	2.05	1.93	1.98	1.42	2.25
S.E. of regression	0.01	0.09	0.03	0.03	0.05	0.08
F-statistic (p-value)	0.26	0.01	0.11	0.37	0.05	0.00
Observations	61	61	61	61	61	61

(t-statistic), *p<0.10, **p<0.05, ***p<0.01



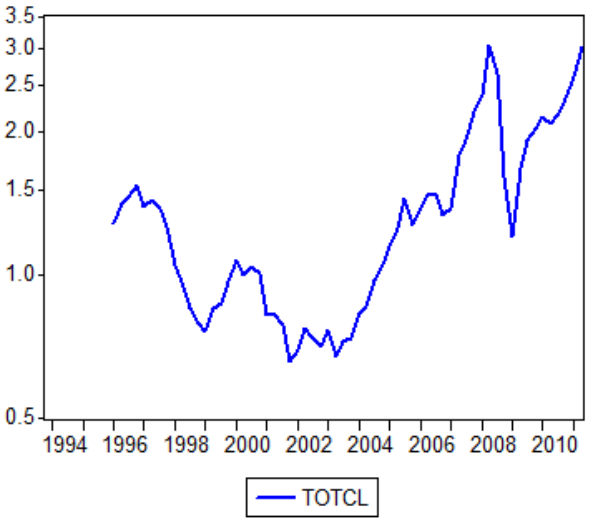


Figure 4.1: Real GDP and terms of trade (logarithmic scaling)

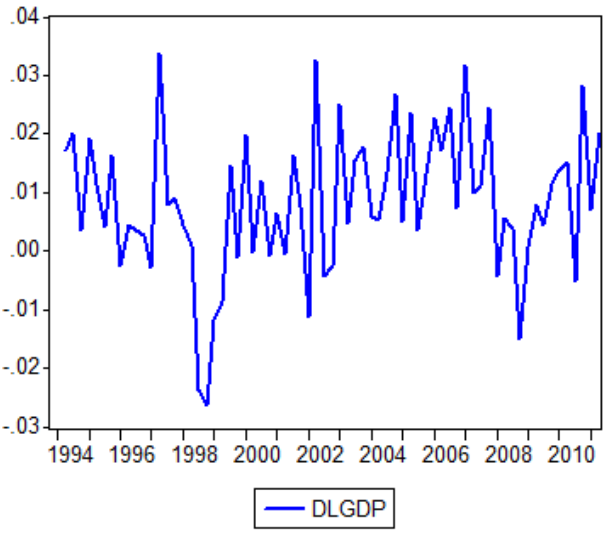


Figure 4.2: First difference of the logarithm of the GDP

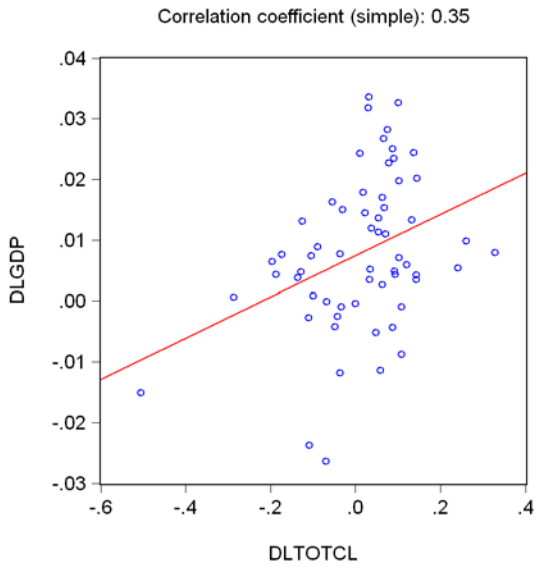


Figure 4.3: Correlation DLGDP vs. DLTOTCL

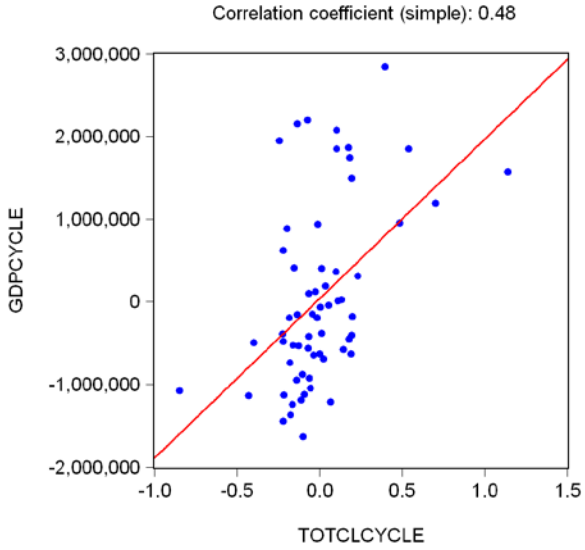


Figure 4.4: Correlation cyclical components of GDP and TOTCL

CHAPTER 5

CONCLUSION

This dissertation has addressed several questions regarding the long- and short-run macroeconomic effects of the Great Recession in 2009 on Latin America. Regarding the long-run: (i) has economic growth in Latin America followed a tradable-led or export-led growth regime in the last sixty years? and (ii) since the Great Recession changed the trade/financial conditions of the world economy through the import growth deceleration in advanced economies and shrinkage of global imbalances, how may these new features of the world economy affect the continuation of the main Latin American growth regime?

In terms of the short-run: (i) is there evidence about the existence of an output co-movement between the United States and Latin America in the last sixty years? (ii) is this synchronization intensified by the relative importance of the United States as an export market? (iii) is this co-movement stronger for primary or for non-primary commodity exporters? (iv) do the results on business cycle synchronization, based on historical data, resemble the uneven performance of the Latin American economies during the Great Recession in 2009? (v) what is the role of terms of trade shocks to explain output fluctuations in a primary commodity Latin American exporter: Colombia?

The main answers to these questions are the following. First, this dissertation finds that economic growth in Latin America, in the period 1953-2009, has mainly been based on one interpretation of the term export-led growth: net-export led growth. After evaluating the relative role of several potential growth regimes, this study provides robust statistical evidence suggesting that current account surpluses are a positive and significant correlate of medium- long-run growth rates in Latin America.

Although the mechanisms may be numerous, the study suggests than in addition to the idea that current account surpluses simply reflect an increase of net demand for domestic output, current account surpluses may also be associated with lower interest rates paid by investors, which leads to capital accumulation and growth in a capital constrained developing economy. Indeed, current account surpluses may work as collateral allowing the developing economy to have a better access to the international market of financial capital. Given the role of the net-export led growth regime, shrinkage in global imbalances, as a result of the income adjustments in advanced economies, certainly becomes a binding constraint for economic growth in Latin America. In fact, smaller current account deficits in industrialized economies and a lower margin for developing economies to run current account surpluses are two sides of the same coin. Unless Latin America pursues a different growth regime, this time, for example, based on the expansion of domestic markets, its long run performance is vulnerable in the aftermath of the Great Recession.

Second, regarding the short-run context, this study finds evidence supporting the presence of an output co-movement between the United States and Latin America. This co-movement is particularly important before China's economic activity became an important correlate of the Latin American output fluctuations in the second half of the first decade of the 2000's. The econometric analysis, focusing on trade-related and structure-related aspects of Latin America, also finds that non-primary commodity exporters, in particular those that export manufacturing goods to the United States, display a stronger synchronization of business cycles with the northern economy. Interestingly, the findings, based on historical data (1961-2012) resemble the uneven performance of Latin American economies in 2009. The contraction of the US GDP in 2009 seems to have had a greater growth spillover effect on Latin American non-

primary commodity exporters and on countries whose exports are mainly oriented to the United States. Finally, the dissertation finds that terms of the trade explain around one third of the output fluctuations in Colombia, a primary commodity exporter that faces exogenous terms of trade. This result is consistent with the idea that following an income shock in advanced economies price adjustments in exports are relatively more important than export adjustments for primary commodity exporters. In a very simple supply and demand background, this aspect may occur because the export supply of primary commodities is inelastic.

To sum up, this dissertation evaluates the role of external-related factors on the Latin American macroeconomic performance associated with the trade collapse, the deceleration of import growth in advanced economies, and shrinkage in global imbalances, all of them features that currently characterize the world economy as a consequence of the Great Recession. These external-related factors are particularly important in Latin American economies since these economies resemble the assumptions of open-small-dependent economies with negligible market power in the advanced economies markets.

Some straightforward ideas motivated by this dissertation may be explored in future research. For example: (i) to develop a more clear identification strategy to evaluate the role of current account surpluses as a correlate of economic growth in Latin America. Although chapter 2 presents several arguments suggesting that the causality runs from the proxy of net-export led growth (current account surplus as a proportion of GDP) toward economic growth (i.e. Granger causality tests, stylized facts on the relationship between economic growth and current account deficits), it may be worth thinking of a good instrumental variable for this proxy, (ii) even though it was out beyond the scope of Chapter 3 to present a theoretical framework

describing the uneven effects of income shocks in an advanced economy on primary vs. non-primary exporters that resemble the assumption of open-small developing economies, a theoretical framework may help clarify, for example, the role of the income elasticity of demand in different advanced economies markets, and the role of the price elasticity of the export supply in primary and non-primary exporters. It would also be interesting to use the econometric specification in Chapter 2 to show if terms of trade are relatively more important for primary Latin American commodity exporters than for countries specialized in manufacturing goods in the determination of the output co-movement with advanced economies. Finally, the results in Chapter 3, suggesting the presence of business cycles synchronization between Latin America and other developing economies, also suggest the existence of some commonality in the output fluctuations in the developing world that may be revisited. This task requires the evaluation of other mechanisms (i.e. financial) that have been ignored in this study.

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