DOCUMENTO DE TRABAJO N° 406

FISCAL RULES, MONETARY RULES, AND EXTERNAL SHOCKS IN A PRIMARY-EXPORT ECONOMY: A MODEL FOR LATIN-AMERICAN AND THE CARIBBEAN

Waldo Mendoza Bellido

DEPARTAMENTO DE **ECONOMÍA**

PONTIFICIA **UNIVERSIDAD CATÓLICA** DEL PERÚ

DOCUMENTO DE TRABAJO N° 406

FISCAL RULES, MONETARY RULES, AND EXTERNAL SHOCKS IN A PRIMARY-EXPORT ECONOMY: A MODEL FOR LATIN AMERICA AND THE CARIBBEAN

Waldo Mendoza Bellido

Agosto, 2015

DEPARTAMENTO
DE **ECONOMÍA**

DOCUMENTO DE TRABAJO 406
http://files.pucp.edu.pe/departamento/economia/DDD406.pdf

Av. Universitaria 1801, Lima 32 – Perú.
Teléfono: (51-1) 626-2000 anexos 4950 - 4951
Fax: (51-1) 626-2874
econo@pucp.edu.pe
www.pucp.edu.pe/departamento/economia/

Encargado de la Serie: Jorge Rojas Rojas
Departamento de Economía – Pontificia Universidad Católica del Perú,
jorge.rojas@pucp.edu.pe

Waldo Mendoza Bellido

Fiscal Rules, Monetary Rules and External Shocks in a Primary-Export Economy: A Model for Latin America and the Caribbean
Lima, Departamento de Economía, 2015
(Documento de Trabajo 406)

PALABRAS CLAVE: Reglas fiscales, reglas monetarias, choques externos, América Latina y el Caribe.

Hecho el Depósito Legal en la Biblioteca Nacional del Perú Nº 2015-11339.
ISSN 2079-8466 (Impresa)
ISSN 2079-8474 (En línea)

Impreso en Kolores Industria Gráfica E.I.R.L.
Jr. La Chasca 119, Int. 264, Lima 36, Perú.
Tiraje: 100 ejemplares

FISCAL RULES, MONETARY RULES, AND EXTERNAL SHOCKS IN A PRIMARY-EXPORT ECONOMY: A MODEL FOR LATIN AMERICA AND THE CARIBBEAN

Waldo Mendoza Bellido

RESUMEN

El desempeño macroeconómico de América Latina y el Caribe (ALC) está estrechamente vinculado a la evolución de la economía mundial. No es posible explicar la década perdida de los ochenta abstrayendo el deterioro de los términos de intercambio y el alza de la tasa de interés en el mundo desarrollado ocurridos en ese periodo. Tampoco puede entenderse la década dorada de 2002-2011 sin considerar el notable aumento de los términos de intercambio y la importante reducción de la tasa de interés externa. Por último, es imposible concebir la desaceleración del crecimiento en ALC desde 2011 desconociendo la reducción de nuestros términos de intercambio y el alza de la tasa de interés mundial.

En este artículo se modela las conexiones con el exterior de una economía pequeña, abierta, primario exportadora y dependiente del financiamiento externo, donde la política monetaria opera bajo un esquema de metas de inflación, con la tasa de referencia para los mercados interbancarios como instrumento de política; mientras que la política fiscal funciona imponiendo un límite al déficit fiscal como porcentaje del PBI.

El modelo permite evaluar los efectos de los cambios en los precios de las materias primas de exportación y en la tasa de interés mundial, así como los de la política monetaria y la política fiscal sobre la producción, el nivel de precios, el tipo de cambio y la tasa de interés local.

Clasificación JEL: E1, E5 y E6.
Palabras clave: Reglas fiscales, reglas monetarias, choques externos, América Latina y el Caribe.

ABSTRACT

The macroeconomic performance of Latin America and the Caribbean (LAC) is closely linked to the evolution of the world economy. The lost decade of the eighties cannot be explained by abstracting it from the deterioration in the terms of trade and the rising interest rates in the developed world that occurred during that period. Nor can the golden decade of 2002 to 2011 be understood without considering the significant improvement in the terms of trade and the considerable reduction in international interest rates. Finally, it is not possible to understand the slowdown in economic growth in LAC since 2011 by ignoring the deterioration of the region's terms of trade and rising global interest rates.

This article discusses the connections to the global economy of a small, open, primary-export economy dependent on external financing, where monetary policy operates under an inflation-targeting scheme; the reference rate for interbank markets is a policy instrument; and fiscal policy works by imposing a limit on the fiscal deficit as a percentage of GDP.

The model allows us to evaluate the effects of changes in the prices of export commodities and global interest rates, as well as the impact of monetary and fiscal policies on output, price level, exchange rate, and the domestic interest rate.

JEL Classification: E1, E5 and E6.
Keywords: Fiscal rules, monetary rules, external shocks, Latin America and the Caribbean.

FISCAL RULES, MONETARY RULES, AND EXTERNAL SHOCKS IN A PRIMARY-EXPORT ECONOMY: A MODEL FOR LATIN AMERICA AND THE CARIBBEAN

Waldo Mendoza Bellido[1]

INTRODUCTION

The macroeconomic performance of Latin America and the Caribbean (LAC) is closely linked to the evolution of the world economy. It is not possible to explain the lost decade of the 1980s, marked by severe recession and very high rates of inflation that reached hyperinflationary levels in some countries, by abstracting it from the deterioration in the terms of trade and the rise in the interest rate in the developing world during the period. Nor can the golden decade of 2002 to 2011, characterized by marked growth and very low inflation, be understood without considering the significant improvement in the terms of trade and the reduction of interest rates in the developing world to historically low levels. Finally, it is impossible to conceive of the slowdown in growth and the increase in inflation in LAC since 2011 by overlooking the reduction of our terms of trade and the increase in interest rates observed in that period.

In this context, the central objective of this paper is to present a macroeconomic model that is consistent with the main stylized facts on the relationship between international conditions and the LAC's macroeconomic performance.

The model has been constructed for the study of small, open economies that export raw materials and are dependent on international financing, in a framework that takes into account developments over recent decades in how monetary and fiscal policy is implemented. In the sphere of fiscal policy, an ever-increasing number of countries in the region are applying this policy on the basis of rules that impose limits on the fiscal deficit or on public debt, to the point where public spending has ceased to be an

---

[1] Professor, Department of Economics at the Pontificia Universidad Católica del Perú (PUCP). The author is especially grateful to Oscar Dancourt for his ever-pertinent comments. He also thanks Roger Gómez for his assistance, and his young colleague Janneth Leyva for her observations. Likewise, the support of the Department of Economics at the PUCP. Any remaining errors are all my own.

economic policy instrument and has become an endogenous variable. With regard to monetary policy, on the other hand, more and more central banks in LAC operate with an inflation targeting scheme (ITS) in which the policy instrument is a given short-term interest rate, the sum of money is endogenous, and the exchange rate is flexible.

This model can be used to estimate the impacts that changes in international raw material prices can have on our economies or on the international interest rate. The effects of monetary policy or fiscal policy can also be evaluated.

This paper is organized as follows. The first section presents the main stylized facts observed in LAC over the period 1980-2014 in relation to international conditions and our macroeconomic performance. The second section sets out the theoretical model. The third section employs the model to simulate the effects that the rise in the international interest rate, the decrease in the global price of raw materials, and the expansionary fiscal and monetary policy have on production, price level, interest rate, and exchange rate. The final section presents conclusions and policy implications.

1. LATIN AMERICA AND THE CARIBBEAN: INTERNATIONAL CONTEXT AND MACROECONOMIC PERFORMANCE[2]

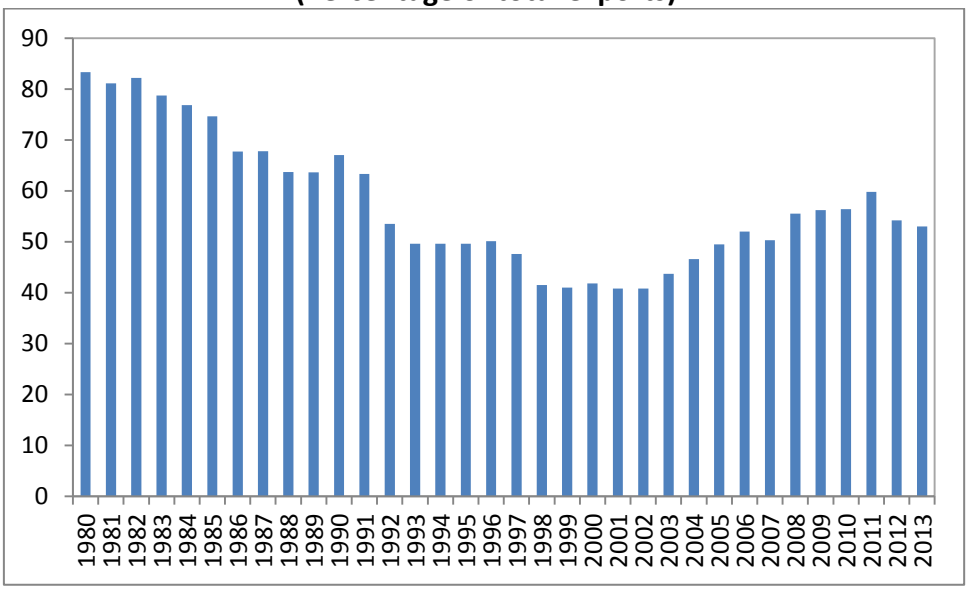
The international context for Latin America and the Caribbean

LAC has two structural features that enable a better understanding of its connections with the world.

Firstly, the region continues to be a primary export economy. As shown in Graph 1, more than 53% of LAC's exports in 2013 were primary products.

[2] See Mendoza (2013 and 2015).

Graph 1
Latin America and the Caribbean: primary exports
(Percentage of total exports)

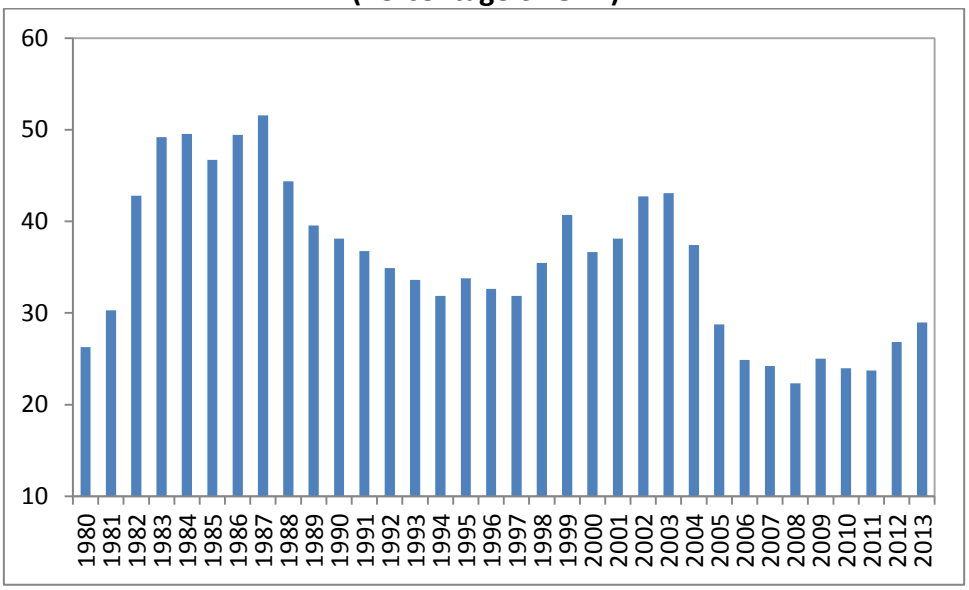


Source: CEPAL.

The primary output supply curve is much more inelastic than that of industrial products. Therefore, when there is a change in international demand for our exports, the main adjustment occurs at the level of prices rather than quantities exported. In consequence, export prices is the main commercial transmission channel between our economies and the rest of the world.

Secondly, the economies in the region have always depended on external financing. As seen in Graph 2, the region's external debt accounted for 29% of GDP in 2013, and 50% of GDP in the mid-1980s. The main implication of external financing is that the increase in the international interest rate constitutes a recessionary external shock for the region.

Graph 2
Latin America and the Caribbean: external debt
(Percentage of GDP)



Source: FMI.

The price of primary exports and the international interest rate, then, are two of the most important conveyor belts that connect us with the world. Thus, in this section, the external context for the region will be assessed on the basis of these two variables. The price of primary exports governs the dynamic of the terms of trade, as export prices are generally less volatile. The international interest rate is the most important determinant of the region's capital inflows which, in keeping with the classic study by Calvo, Leiderman and Reinhart (1993), are essentially exogenous for LAC. For this analysis we will take into consideration the period 1980-2014, limited by the statistically available information[3].

The evolution in the world price of our primary exports, or the terms of trade, and the international interest rate, or the region's capital influx, allow us to periodize the external context to which the region was subject during the period of study. The external context is good when the terms of trade increase and capital flows in. The external context is bad when the terms of trade decrease and capital flows out.

[3] Much of the information presented in this section is available in the IMF's statistical appendix (2015).

In these terms, four clearly marked periods can be found. In the first period, which runs from 1980 to 1990, the external context was terrible. In the second, 1991-2001, the external context improved, especially in terms of capital. In the third, 2002-2011, the external context was extraordinarily good. In the fourth, 2012-2014, the external context was poor, but not to the extent of 1980-1990.

The first period, 1980-1990, is the lost decade for LAC: the terms of trade fell and capital flowed out of the region. In this period, on the one hand, the primary export prices decreased by 20%, which precipitated a 15% drop in the terms of trade. On the other hand, the short —and long— term interest rates in the developed world, especially the United States, the primary trading partner of LAC, remained high. The long-term interest rate is known to depend on the short-term interest rate and the short-term expected rate. The interest rate depends on long-term interest rates of short-term and short-term expected rateThus, the short —and long— term interest rates tend to move in the same direction. These high interest rates and their consequences, such as the debt crisis, explain the significant capital flight that occurred over the period.

In the second period, 1991-2001, the international situation improved. On the one hand, though export prices continued to fall, the terms of trade recovered to a significant degree as import prices dropped. Between 1991 and 2001, the primary export prices fell by 3%, while the terms of trade increased by 16%. On the other hand, the short— and long— term interest rates in the United States started to go down, which ushered in a spell of significant capital inflow to the region.

The third period, 2002-2011, was the best, despite the international crisis of 2008-2009. In this cycle, on the one hand, the primary export prices increased by a considerable 240%, which led to a 38% increase in the terms of trade. On the other hand, interest rates in the United States continued to fall to historical lows, prompting the greatest capital inflow in the history of the region.

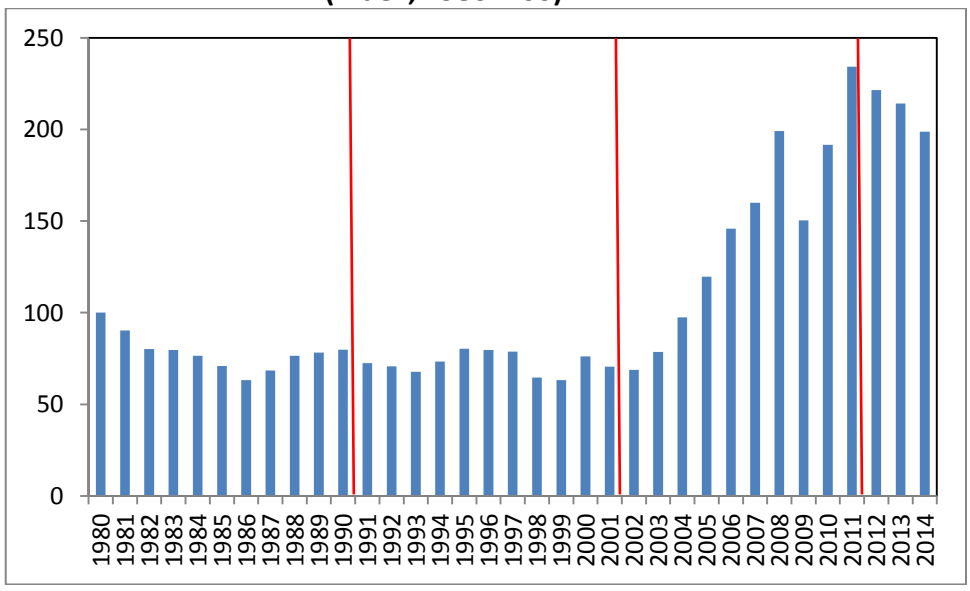
Finally, in the third period, 2012-2014, the external context deteriorated. On the trading front, the terms of trade fell by 4.2%. Financially, the increase in the long-term interest

rate and the threatened increase in the short-term interest rate in the USA served to slacken the pace of capital inflows to the region.

Graphs 3 and 4 show the trajectories of the primary export prices and the terms of trade: they fall in the first period, recover in the second, increase markedly in the third, and start to fall in the fourth.

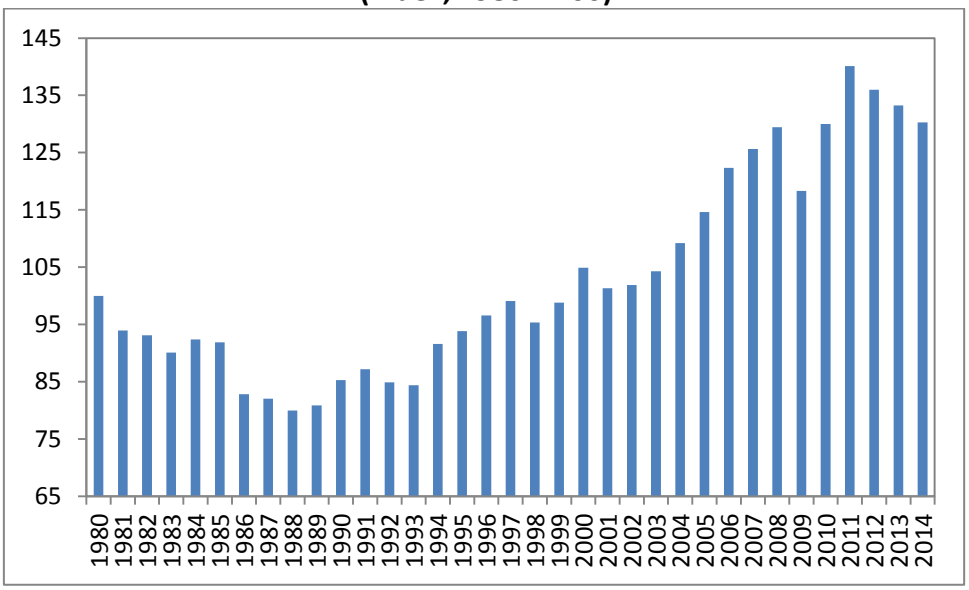
As regards international prices, as these are exogenous to the region, it can be said that we were very unlucky in the first period, luckier in the second, extraordinarily lucky in the third, and unlucky in the fourth.

Graph 3
Latin America and the Caribbean: primary export prices
(Index, 1980=100)



Source: CEPAL.

Graph 4
Latin America and the Caribbean: terms of trade of goods
(Index, 1980 = 100)



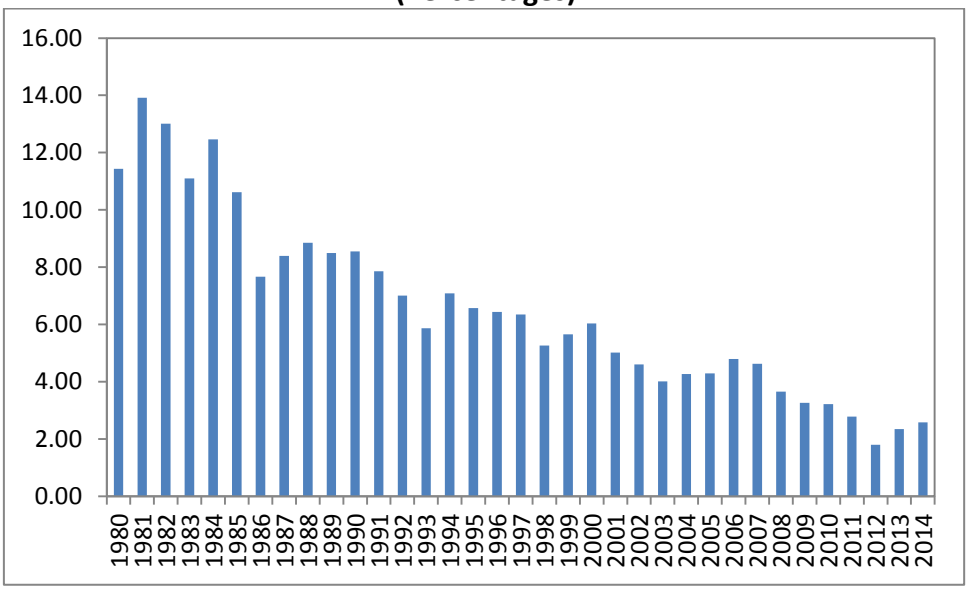
Source: CEPAL.

On the financial front, Graphs 5, 6 and 7 show a very similar dynamic.

In the first period, the short- and long-term interest rates in the United States were high, and capital flowed out of LAC. In the second period, the interest rates started to fall and capital began to return to the region. In the third period, interest rates reached their lowest historical levels, while capital inflows were the lowest they had been in the history of the region. In the fourth period, the long-term interest rates began to rise in response to the Fed's announcement that the policy interest rate would increase at some point in 2015 due to the slowdown in the inflow of capital to the region.

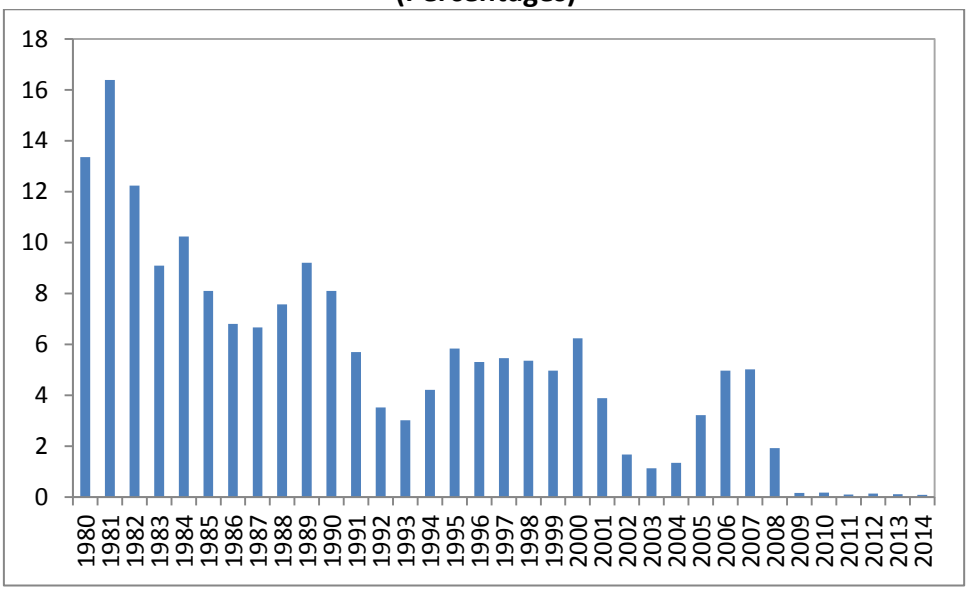
In terms of international financial conditions, we can also be said to have been desperately unlucky in the first period, luckier in the second, enviably lucky in the third, and unlucky in the period 2012-2014.

Graph 5
10-Year US treasury rate
(Percentages)



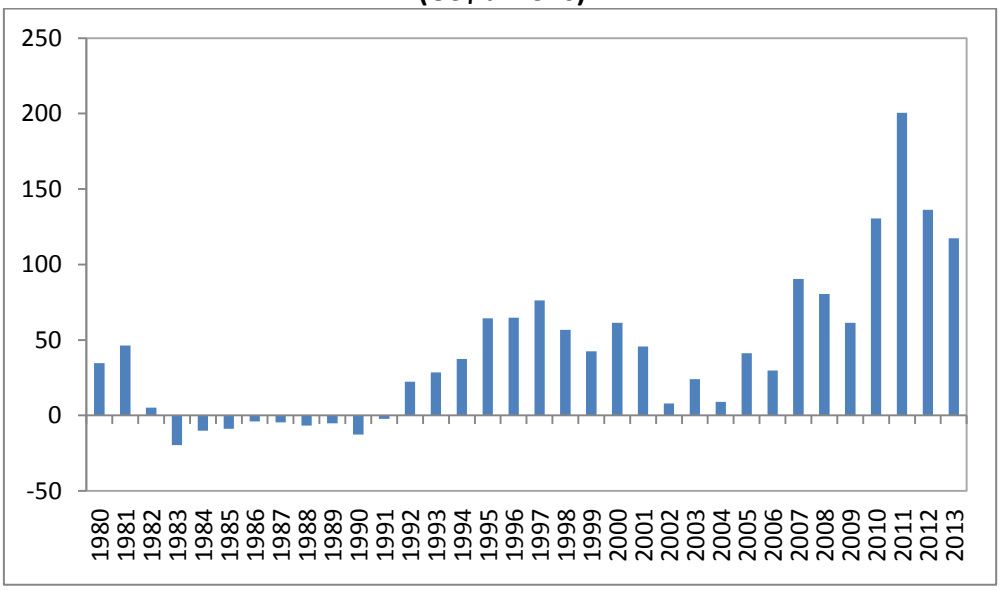
Source: Federal Reserve Bank of St.Louis

Graph 6
Federal funds rate
(Percentages)



Source: Fed.

Graph 7
Latin America and the Caribbean: net inflow of private capital
(US$billions)



Source: FMI.

In summary, on both the international price and financial capital fronts, the external context for LAC was deplorable between 1980 and 1990, better between 1991 and 2001, much better between 2002 and 2011, and poor between 2012 and 2014.

What is the relationship between the above mentioned external context and LAC's macroeconomic performance? We seek to answer that question in the next section.

The macroeconomic performance of the LAC

We judge the region's macroeconomic performance based on the evolution of the two most important macroeconomic performances: level of economic activity and inflation.

We will show how the region's macroeconomic performance is closely related to the evolution of the most important variables that connect us with the world economy: primary export prices and international interest rates.

The empirical evidence for this connection is abundant. The studies by Calvo, Leiderman and Reinhart (1993) and Izquierdo, Romero and Talvi (2008), can be cited, in which attention is drawn to the important role of the external sector in LAC's macroeconomic

performance. Of the most recent works, the IMF (2014) found that in the period 1999-2013, external, real, and financial factors explain almost all economic fluctuations in the emerging economies. Moreover, Gruss (2014), in a sample of thirteen LAC countries for the period 1970-2013, observed a close relationship between the evolution in the GDP and the price of raw materials for export. Finally, Magud and Sosa (2015), with the aid of a large database that combines macroeconomic information for 16,000 listed companies in 38 emerging countries in the period 1990-2013, find that the main determinant of private investment in LAC is the price of raw materials for export.

When primary export prices increase, the level of local economic activity tends to grow and inflation usually falls, so the task of the central banks and finance ministries becomes much more simple.

Firstly, the primary sector attracts private, local, and, especially, foreign investment, which enables an increase in this sector's production and exportation, contributing to upturned GDP growth through the multiplier effect.

Secondly, the profits of primary product-producing companies increase, resulting in them paying more taxes, with which the government can increase public spending and revive the economy without affecting the health of public finances.

Thirdly, the increased availability of dollars, mainly due to the improved prices of primary products for export as well as increased foreign investment, reduces the nominal exchange rate, which contributes to price stability.

Fourthly, as employment and profits in the primary sector rise, the consumption of employees and employers in this sector increases due to goods produced in the non-primary sector of the economy, thus pushing up demand and expanding the dynamism of this sector.

If this increase in the international price of primary products is accompanied by a drop in global interest rates, the external context for the region is optimal.

Firstly, when the interest rate in the developed world decreases, financial capital flows out of core countries towards the periphery. When capital flows into our region, part of it goes to the banks, boosting credit,[4] consumption, and investment, and part goes to the stock exchanges, thus stimulating them by pushing up the price of financial assets, which in turn spurs investment and, through the wealth effect, private sector consumption. The upturn in consumption and investment revives the economy.

Moreover, many primary products, such as minerals and agricultural commodities, have become assets that form part of the portfolios of large-scale investors, as documented in Arezkia, Loungania, Van Der Ploeg, and Venablesc (2014). When interest rates decrease, these investors set aside financial assets and seek out primary products, which also contributes to the rise in their prices.

In addition, when international interest rates fall countries that have accumulated external debts benefit, as interest payments on the public and private debt go down and more leeway is provided for increased public and private spending.

Finally, the increase in capital brought about by the decrease in the international interest rate pushes down the price of the dollar, which causes local prices to fall.

In summary, a positive international context serves to revive the economy, reducing the exchange rate and the price level. An unfavorable external context causes recession, devaluation, and inflation.

We will now turn to the figures for LAC in this regard.

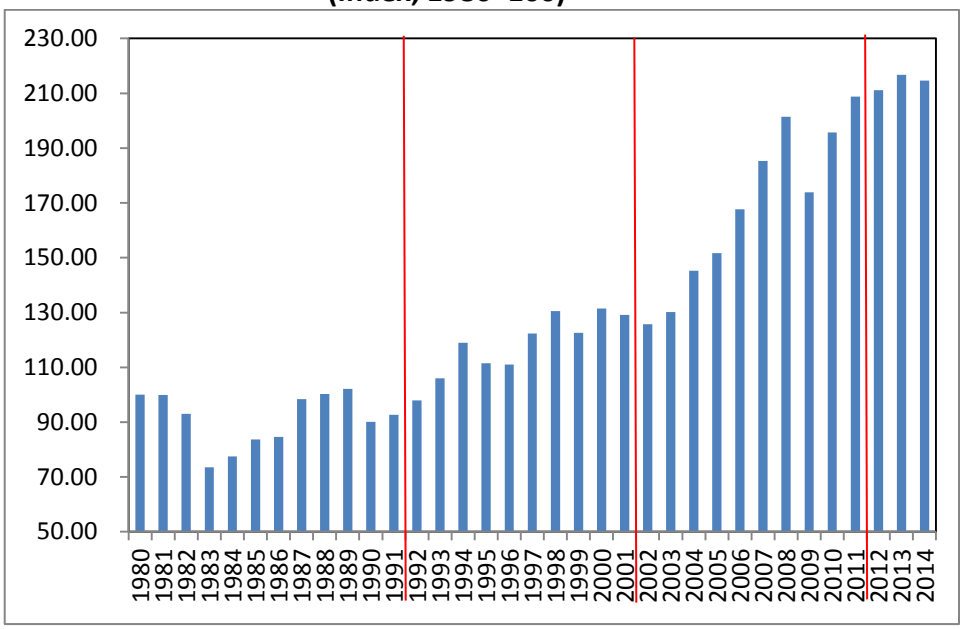
For the above mentioned reasons, private investment is the component of demand that is most directly impacted by the world economy. Good international prices and low interest rates revive the economy; low prices and high international interest rates bring it down.

---

[4] In the case of semi-dollarized economies such as Peru, Argentina, and Bolivia, this capital can take the form of external credit in dollars taken on by local banks, which they use to directly fund bank loans in foreign currency.

Graph 9 shows the stagnation in investment in the period 1980-1990, its recovery in the period 1991-2001, its significant growth in the period 2002-2011, with a brief interruption in 2009, and its sharp slowdown in recent years. The average annual growth rate of investment was -1.2% in the period 1981-1990, climbed to 3.4% in the period 1991-2001, stood at 5.8% in the golden period of 2002-2011, and fell to 0.8% in the period 2012-2014.

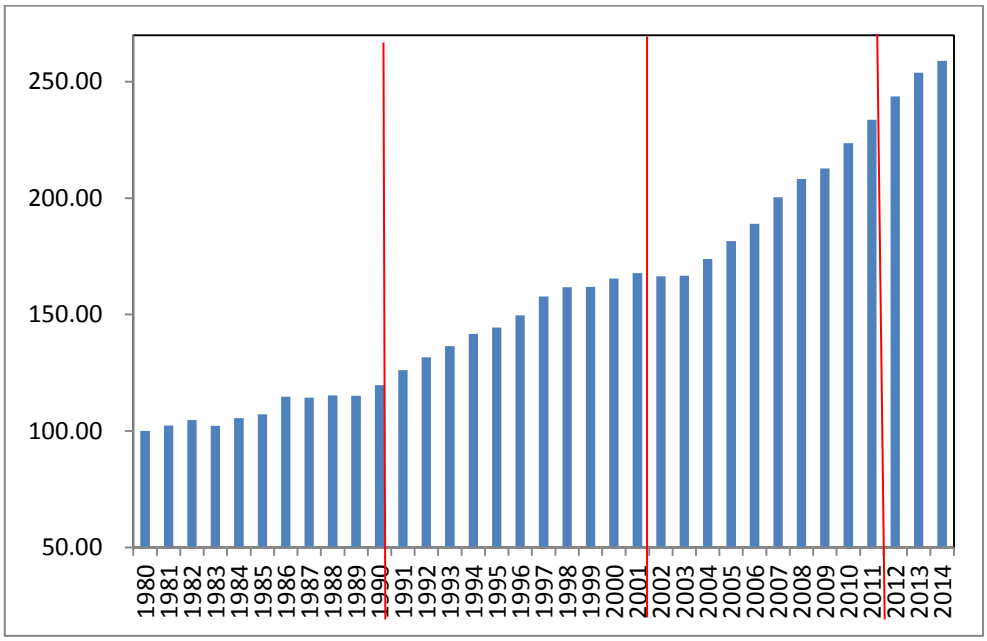
Graph 9
Latin America and the Caribbean: Investment
(Index, 1980=100)



Source: FMI.

The dynamic of consumption, displayed in Graph 10, has been similar. Consumption remained largely stagnant in 1980-1990, rose slightly in 1991-2001, soared in the golden decade, and has slowed down in recent years. The average annual growth rate of consumption was -1.8% in the period 1980-1990, climbed to 2.9% in the period 1991-2001, stood at 3.8% in the golden period of 2002-2011, and dropped to 3.1% in the period 2012-2014.

Graph 10
Latin America and the Caribbean: consumption
(Index, 1980=100)



Source: FMI.

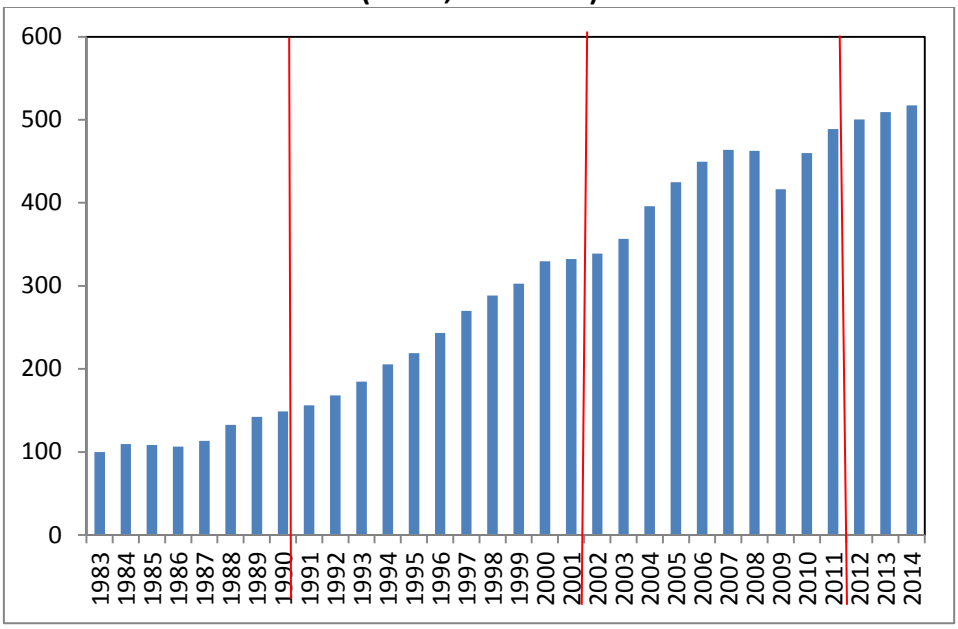
The dynamic of exports in the region, chiefly primary products, has been somewhat different to that of investment and consumption. The maturity stage of investment projects in the primary sector, especially in mining, oil, and gas, tends to be very long. For this reason, a contemporaneous connection between international prices, investment, and exports cannot be expected.

Large foreign investments in the primary export sectors were made in the 1990s, having emerged from the lost decade of the 1990s and the hyperinflation, depression, balance of payment crisis, and public debt crisis that characterized it. The restoration of normality in the region was an important contributor to the surge in foreign investment and exports in that decade.

As can be seen in Graph 11, the growth in exports was low in the first period, rose sharply in the second, continued to grow albeit at a slower pace in the golden decade — with a brief lull in 2009, and stagnated in the period 2012-2014. The average annual

growth rate of the export volume was -5.9% in the period 1983-1990[5], climbed to a sizable 7.8% in the period 1991-2001, stood at 4.2% in the golden period of 2002-2011, and was just 1.7% in the period 2012-2014.

Graph 11
Latin America and the Caribbean: exports of goods
(Index, 1983=100)



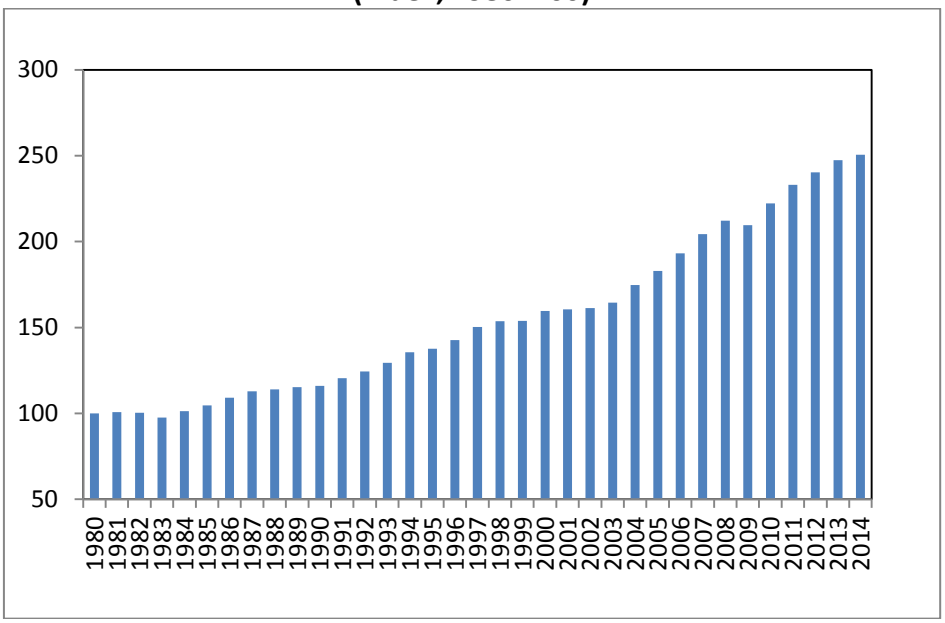
Source: FMI.

The GDP dynamic, as can be seen in Graph 12, holds true to the behavior of the abovementioned aggregate demand components: stagnation in 1980-1990, recovery in 1991-2001, sharp growth in the golden decade, and slowdown in recent years. The average growth rate of GDP between 1980 and 1990 was 1.5%; 3% between 1991 and 2001; 4.1% in the golden decade; and 2.1% between 2012 and 2014.

In this final period, the economies of Argentina and Venezuela have deteriorated beyond what can be attributed to international conditions. In 2014 Argentina's GDP grew by only 0.5%, while that of Venezuela plummeted by 4%, and in 2015, according to the IMF (2015), the GDP of these countries will fall by 0.3 and 7%, respectively. Explanations, then, must be sought beyond changes in international conditions, in the sphere of the macroeconomic policy and development model of these countries.

[5] There are no figures available for the period 1980-1982.

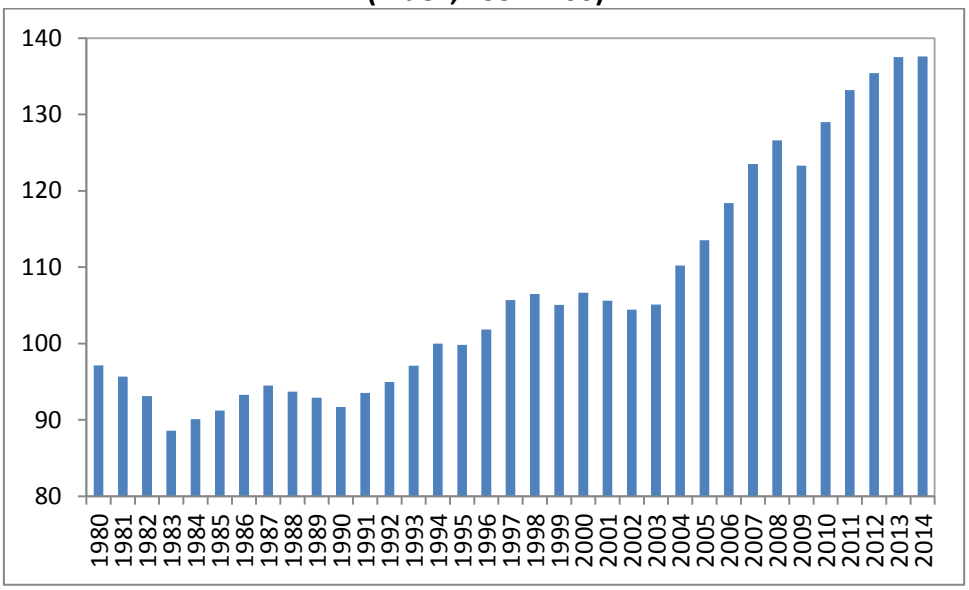
Graph 12
Latin America and the Caribbean: GDP
(Index, 1980=100)



Source: FMI.

Graph 13 shows the evolution of real GDP per capita in LAC. This indicator summarizes international conditions in our macroeconomic performance very well. In the lost decade, between 1980 and 1990, the GDP per capita fell by 6%. Between 1991 and 2001, the GDP per capita increased by 13%. In the golden decade, between 2002 and 2011, this indicator rose by a considerable 28%. Between 2012 and 2014, the GDP per capita increased by just 2%.

Graph 13
Latin America and the Caribbean: GDP per capita
(Index, 1994=100)



Source: FMI[6].

In summary, the evolution of economic activity in LAC is closely linked to the evolution of the two most important transmission channels that connect us to the international economy: terms of trade and capital inflows.

Now we will consider the influence of the international situation on inflation.

Inflation in small and open economies, as are most of the economies of LAC, progresses at the pace of local currency depreciation, while depreciation is strongly influenced by the international situation. Moreover, when inflation rates are very high, as in the 1980s, the traditional link between output gap and inflation is practically imperceptible; what really stands out is the relationship between inflation and depreciation.

The main transmission channel between international conditions and the behavior of inflation is the price of the dollar. When capital flows in or when the terms of trade increase, the price of the dollar tends to fall, along with the price level; and when capital flows out or the terms of trade decrease, the exchange rate and prices begin to rise.

---

6 Excluding Costa Rica, Dominica, Nicaragua, Suriname, and Trinidad and Tobago.

In the period 1980-1990, capital flight and the deterioration in the terms of trade inflicted enormous depreciatory forces upon local currency, which led to a rise in the rate of inflation —to hyperinflationary levels in countries such as Bolivia, Argentina, and Peru.

In this period, as can be seen Graph 14, the rate of devaluation[7] in LAC increased rapidly, from the annual figure of 48% recorded in 1981; to 287% by the middle of the decade; and to 1,193% per year in 1990. The rate of devaluation in Argentina increased from 140% in 1981 to 1,052% in 1990; that of Bolivia from 0% in 1981 to 13,932% in 1985; and that of Peru from 46% in 1981 to 6,947% in 1990.

Evidently, fighting inflation against a backdrop of capital flight and reduced terms of trade, which pushes up the rate of depreciation, is no easy task.

Indeed, as can be seen Graph 15, in this period the rate of inflation in LAC was increasing rapidly, from an annual figure of 54% recorded in 1980 to 136% by the middle of the decade, and to 496% per year in 1990. The inflation rate in Argentina increased from 88% in 1980 to 1,344% in 1990; that of Bolivia from 24% in 1981 to 8,171% in 1985; and that of Peru from 61% in 1981 to 7,650% in 1990.

In the second period, 1991-2001, when capital started to enter our region and when the terms of trade started to recover, the foreign currency price stopped increasing, prompting a sharp downturn in inflation. This outcome was also influenced by the fact that many central banks acquired the autonomy to stop issuing in order to finance government expenditure.

The rate of devaluation in the region plummeted from 217% in 1991 to just 12% in 2001. In that period, the rates of devaluation in Bolivia, Brazil, and Peru fell from 13%, 495%, and 311% to 7%, 28%, and 0.1%, respectively. In the case of Argentina the rate of

[7] With respect to local currency, the terms "depreciation" and "devaluation" are used interchangeably. In both cases we refer to an increase in the nominal exchange rate, which is the number of local currency units per foreign currency unit.

devaluation was zero over the period, as a fixed exchange-rate regime of one peso to the dollar had been implemented.

Concurrently, the annual rate of inflation dropped from 142% in 1991, to 38% in the middle of the decade, and to just 7% in 2001. Inflation, between 1991 and 2001, fell from 84% to 1.5% in Argentina; from 562% to 8% in Brazil; from 15% to 1% in Bolivia; and from 139% to 0.1% in Peru.

In the period 2002-2011, the stabilization of the exchange rate and the institutional changes that have afforded most LAC central banks considerable autonomy, as well as circumscribing, in general, their responsibilities to allow them to concentrate on controlling inflation, has allowed the construction of an environment in which inflation is no longer a problem.

The obvious exceptions have been Argentina and Venezuela, where the rates of devaluation and inflation have been systematically above the average for Latin America. In this period, while the average rate of inflation in LAC was 7%, that of Argentina was 12% and that of Venezuela was 24%. The average rates of depreciation in Argentina and Venezuela in this period were 24% and 22%, respectively, while the rate of depreciation in the region was 3.3%.

In the final period, 2012-2014, the decrease in the terms of trade and the reduced influx of capital pushed up the rate of depreciation of the local currencies, thus explaining the upturn in the rate of inflation in the region, from 6.1% in 2012 to 9.3% in 2014. In the same period, the rate of depreciation in the region increased from 8.3% in 2012 to 12.5% in 2014.

The cases of Argentina and Venezuela have also been exceptional in the sphere of inflation. In the period 2012-2014, inflation rose in these countries and the risk of it escalating to hyperinflation, like in the 1980s, was very real. Inappropriate monetary policy, in the context of haphazard general economic policy exacerbated by the change in international conditions, has precipitated an increase in the pace of devaluation of local currencies.

In the case of Argentina, which has a dual exchange rate system where the official rate coexists alongside the parallel or "blue" rate, the increase has been considerable in recent years. In 2012 the official exchange rate rose by 14% and the parallel rate by 44%, while in 2014 they increased by 31% and 36%, respectively. In early 2015, the parallel exchange rate was 60% higher than the official rate.

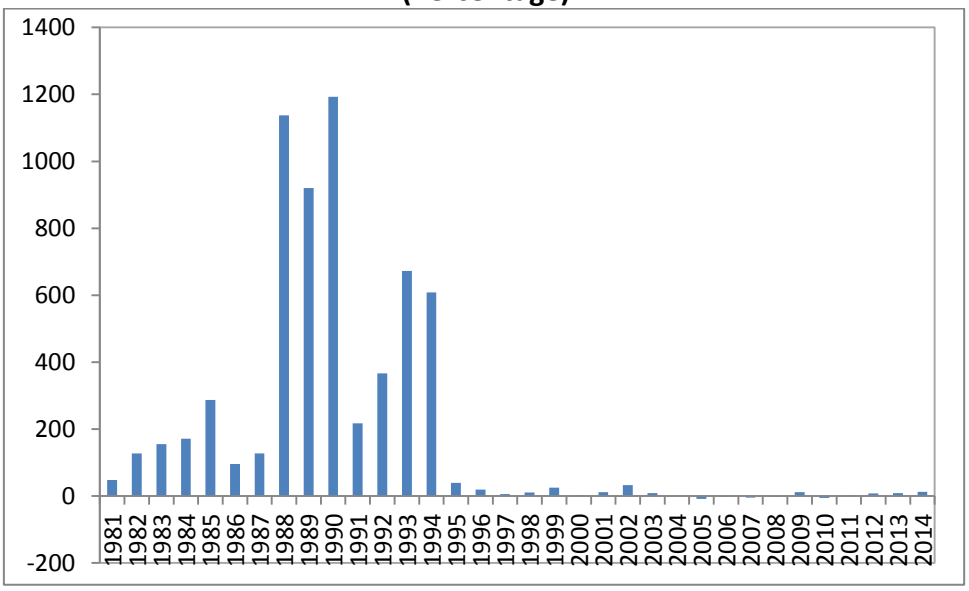
In Venezuela, there were four exchange rates in 2015. The official exchange rate, applicable to the importation of essential products; the Alternative Foreign Exchange System (Sistema Cambiario Alternativo de Divisas, SICAD) type I, for company transactions; SICAD type II, for banks and state and privately-owned companies; and the parallel, or black exchange rate.

In Venezuela, the devaluation of the official exchange rate was zero in 2012, 47% in 2013, and remained frozen at time of writing (first half of 2015). However, the creation of the SICAD I in March 2013 and the SICAD II in February 2014 has in fact meant a substantial increase in the price of the dollar. In early 2015, while the official exchange rate was 6.3 bolívares to the dollar, the SICAD I rate was 12 bolívares while the SICAD II was 50 bolívares.

These major increases in the price of the dollar have pushed up inflation in Argentina and Venezuela. Between 2012 and 2014, inflation increased from 10.8% to 23.9% in Argentina and from 20.1% to 68.5% in Venezuela. The IMF (2015) estimates inflation of close to 100% in Venezuela for 2015.

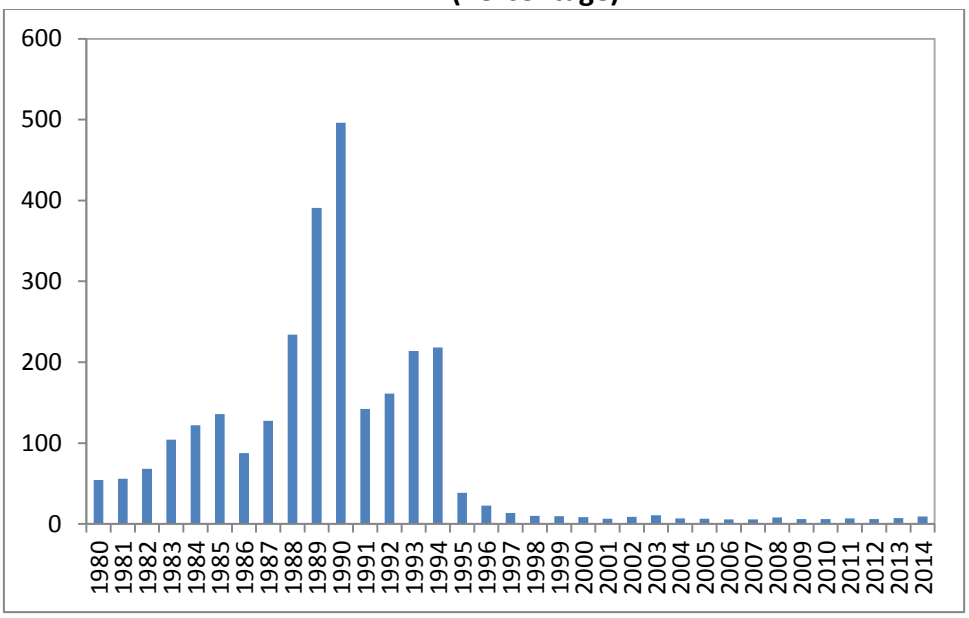
Stagflation, inflation with recession, is what these countries are experiencing.

Graph 14
Latin America and the Caribbean: devaluation
(Percentage)



Source: Banco Mundial[8]. 2014: estimated.

Graph 15
Latin America and the Caribbean: inflation
(Percentage)



Source: FMI.

8 Not including Antigua and Barbuda, Barbados, Dominica, Ecuador, Grenada, Saint Kitts and Nevis, Saint Lucia, Panama, and Saint Vincent and the Grenadines.

In summary, when the international context is favorable for LAC, the GFP tends to grow more quickly and inflation tends to fall. And when the external context gets worse, growth slows and inflation goes up.

Evidently, this dynamic will be mediated by the macroeconomic policy responses. The countries that manage to accumulate fiscal and financial resources during the stage of economic expansion, which generally coincides with the cycles of high international prices and low inflation rates around the world, could initiate expansionary and counter-cyclical monetary and fiscal policies in response to the presence of adverse recessionary external shocks. That is, in countries with counter-cyclical macroeconomic policies, economic fluctuations must be lower and the long-term performance better.

During the 1980s and 1990s, the capacity for macroeconomic response to international crises was very weak, as the resources for exercising a countercyclical macroeconomic policy were not in place. However, during the crisis of 2008-2009, it was possible to respond to the crisis appropriately and to emerge from it quickly.

And what was the relative performance of the LAC countries between 1980 and 2014? What are the best —and worst— performing countries?

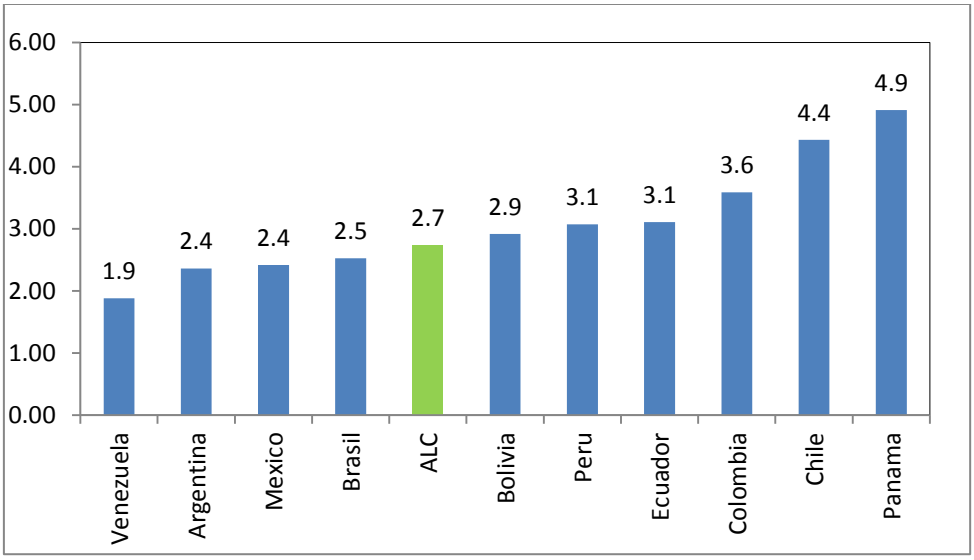
In comparative terms for the period 1980-2014, judging macroeconomic performance on the basis of GDP growth and inflation, the performance ranking is as follows.

In terms of GDP, Panama is the best-performing country, with an annual growth rate of 4.9%, followed by Chile, which grew by 4.4% per year. The worst-performing country is Venezuela, which grew by just 1.9% per year, followed by Argentina and Mexico, both of which had annual growth rates of 2.4%.

If we judge on the basis of inflation, Panama also proves to be the best-performing country, with annual inflation of just 2%, followed by Chile, at 10% per year. The worst-performing countries are Brazil, with average annual inflation of 118%, followed by Argentina, where average inflation in the period was 77% per year.

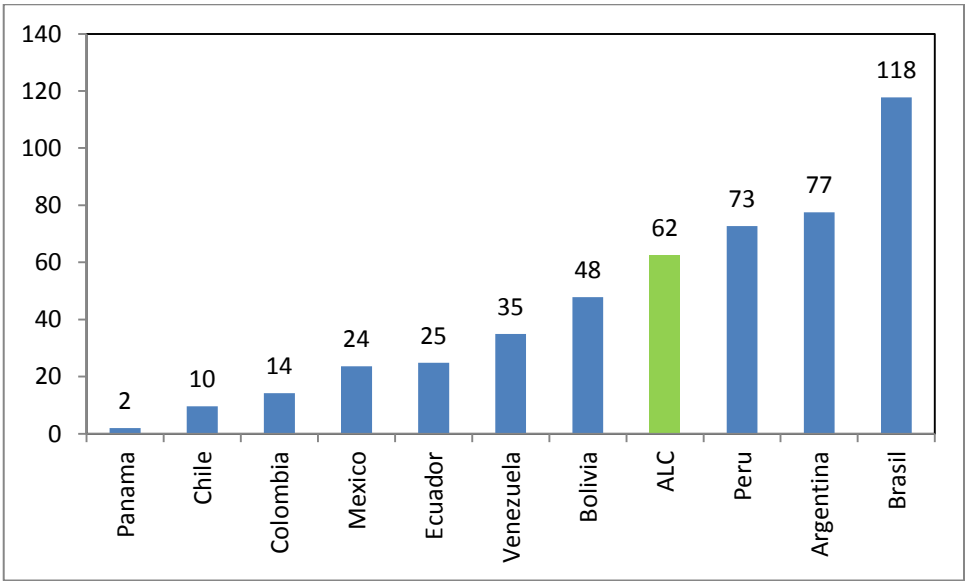
Panama and Chile, on the one hand, and Venezuela and Argentina, on the other, are the countries that warrant in-depth study as examples of success and failure, respectively.

Graph 16
Latin America and the Caribbean, 1980-2014: comparative macroeconomic performance
(Average annual growth rate)



Source: FMI.

Graph 17
Latin America and the Caribbean, 1980-2014: comparative macroeconomic performance
(Average annual inflation rate)



Source: FMI.

These are the main stylized facts that characterize the macroeconomy of LAC.

Presented below is a macroeconomic model that seeks to reproduce the description of the connections between the international context and macroeconomic performance in our region.

2. THE MODEL

This model reproduces two important features of LAC economies.

Firstly, these economies are small, open, primary exporters, and are dependent on external financing.

Secondly, a new macroeconomic policy scheme has been applied across the region. In the sphere of fiscal policy, the number of countries working on the basis of rules that impose limits on the fiscal deficit or on public debt is ever-increasing. As to monetary policy, many central banks in the region operate with an inflation targeting scheme (ITS) in which the policy instrument is the short-term interest rate, the sum of money is endogenous, and the exchange rate is flexible.

The general framework of the model is inspired by the new Keynesian school, marked by the work of Clarida, Galí and Gertler (1999) and initiated by Taylor (1993). The primary exporter category replicates the classic work of Díaz Alejandro (1966), formalized by Krugman and Taylor (1978) and adapted by Dancourt (2009) for the Peruvian case.

The structure of the model does not depart from the micro-foundations (technological preferences or assets of the economic agents). It is made up of linear behavioral equations that can be obtained based on the optimum behavior of the agents, and reasonably reproduce the main stylized facts of LAC.

The model is expressed in terms of aggregate supply and demand, follows the textbook approach and is adapted to the modern macroeconomics expounded by Romer (2000,

2013), Walsh (2002), and Carlin and Soskice (2005, 2015). The background to this model can be found in Mendoza (2011 and 2015).

The goods market is comprised of two production sectors. There is an industrial goods production sector, Keynesian, in which production adapts to demand, part of which originates in the raw material export sector. The sector operates at full capacity and produces for export only. Public expenditure is endogenous, as there is a policy rule that imposes a limit on the fiscal deficit as a percentage of GDP. Monetary policy is channeled through a policy rule whereby the central bank puts up the interest rate when the price level is above target. There is free movement of capital, external and domestic assets are perfect substitutes, and the exchange rate is flexible. The exchange rate is determined in an uncovered interest arbitrage equation in which the local interest rate is equal to the international one, adjusted for expected depreciation. By combining goods market equilibrium, the monetary policy rule, and the arbitrage equation, the aggregate demand curve is arrived at.

As to aggregate demand, the price level in this open economy responds to the expected level, the state of the economy expressed in the output gap, and the nominal exchange rate.

It is a short-term model, understood as a state in which price and exchange rate expectations remain constant.

After finding the short-term equilibrium by combining the aggregate supply and demand, the model is used to evaluate the effects of the increase in the international exchange rate, the decrease in the international price of raw materials, and expansionary macroeconomic policies on production, price levels, the exchange rate, and the interest rate.

Aggregate demand

a. The goods market

This economy has two production sectors, similar to those of Diaz Alejandro (1966). There is a sector that produces raw materials only for exportation, which operates at full capacity; and an industrial sector, Keynesian, that operates at idle capacity, producing for the local market, for exportation, and competes with imported substitute goods. Because of the character of the small economy, international prices of raw materials and industrial goods are exogenous.

The connection between both sectors can be extensive. In Díaz Alejandro (1966), and Krugman and Taylor (1978), employees and employers in the raw materials sector consume industrial goods. An increase in the price of raw materials revives industry because it raises consumption among employees and employers in the raw materials sector. However, this type of connection may be weak in LAC insofar as the raw materials sector is not labor intensive and much of the benefits are repatriated, given that almost all investments in this sector are non-residential.

In this paper, the connection between both sectors arises out of other channels, such as those approached by Dancourt (2009). On the one hand, the government collects income tax from the raw materials sector and spends it on industry. On the other hand, the price of raw materials for export is an important factor behind the demand for investment in industry.

In the industrial goods sector, the adjustment mechanism is Keynesian. Production (Y) is adjusted to demand (D), which depends on consumption (C), private investment (I), public spending (G) and net exports of industrial goods (XN).

$$Y = D = C + I + G + XN \quad (1)$$

Consumption, in the presence of liquidity constraints in the financial system, is associated with available income and an autonomous component that gathers all influences on consumption other than disposable income. Available income (Y_d) is the

difference between income or output (Y) and taxes (T), as a proportion of the level of industrial economic activity ($T = tY$). Only one type of taxes is considered, income tax t with the same rate applied to both salaries and profits.

Thus, available income is defined as $Y_d = Y - T = Y - tY = (1 - t)Y$, and private consumption is represented in Equation (2).

$$C = C_0 + c(1 - t)Y \qquad (2)$$

Private investment inversely depends on the local interest rate (r)[9] and the international interest rate (r^*), directly on the international export price of raw materials, expressed in terms of domestic goods $(E - P)P_x^*$[10], and also has an autonomous component that brings together the other influences. The presence of two interest rates reflects the fact that local firms in LAC can obtain financing for their investments in the local market, in local currency, or in the foreign market, in foreign currency. It can also reflect the dollarization of the banking system in countries such as Peru or Bolivia.

The presence of the international price of raw materials reproduces the stylized fact found by Magud and Sosa (2015) in relation to the positive correlation between private investment and the international price of raw material exports in LAC. The idea is that the raw materials sector, such as the mining industry, creates demand for the industrial sector, such as the construction industry. As posited by Dancourt (2009), if the purchase of existing mines is the alternative to opening new ones, and if the prices of the mines change with the external prices of metals, then the investment could be a function of the real prices of raw materials.

---

9 Strictly speaking, investment responds to the real local interest rate (the nominal interest rate adjusted for expected inflation). We will assume that expected inflation is zero, so the real interest rate does not differ from the nominal one.

10 To guarantee the strictly linear character of this model, throughout the article many variables are expressed as linear approximations. For example, in this case, we employ the linear approximation from the real exchange rate $\frac{E}{P} \cong E - P$. E is the nominal exchange rate and P the industrial price level. P_X^* is the international price of raw materials for export.

$$I = I_0 - br - b^* r^* + b^x (E - P) P_x^* \quad (3)$$

On the other hand, fiscal policy in LAC is formulated on the basis of fiscal rules that set limits for the deficit, spending, and public debt. Without sacrificing the generality of the rules, we will model one in which the fiscal policy operates on the basis of a fiscal deficit target such as percentage of GDP(α).

The fiscal deficit (DF) is the difference between total expenditure and revenue in the public sector. Expenditure and revenue are measured in terms of industrial goods. Expenditure is divided into non-financial or primary (salaries, expenditure on physical infrastructure, expenditure on goods and services) G, and financial. The latter is made up of interest on the public debt in local currency, which is equivalent to the interest rate in local currency multiplied by the stock of public debt in local currency rB^g; and the interest on the public debt in foreign currency, equivalent to the real exchange rate $E - P$, multiplied by the international interest rate r^* and the stock of external public debt $B^{*g}, (E - P) r^* B^{*g}$. Revenue comes from income tax applied to industry tY and the raw material exportation sector$t(E - P) P_x^* X_0$, where $X_0$is the volume of raw material exports, which is exogenous, as this sector operates at full capacity. The income tax rate t is applicable to employees and employers of the economy's productive sectors on an equal basis.

As the fiscal deficit is limited by a percentage of α industrial production, the corresponding equation is given by[11].

$$DF = G + rB^g + (E - P) r^* B^{*g} - tY - t(E - P) P_x^* X_0 = \alpha Y$$

In consequence, primary public spending is endogenous and is a direct function of the tax rate (t), the fiscal deficit target (α), the level of industrial economic activity (Y), and

[11] Strictly speaking, the exact definition of fiscal deficit in terms of industrial goods is given by$DF = G + r(B^g - P) + (E - P) r^* B^{*g} - tY - t(E - P) P_x^* = \alpha Y$. In this equation, it can be appreciated that an increase in the price level, as well as other effects, "dilutes" the balance of the internal public debt($B^g - P$). The simplification of the measurement of interest on the public debt in local currency is necessary to maintain the linear nature of the model. Using this simplification, we arrive at a linear aggregate demand curve; though we gain in simplicity, we lose a little in rigor.

revenue from raw material exports; and an inverse function of interest payments on the public debt in local and foreign currency. For the sake of simplicity, we will assume that the volumes of public debt in local and foreign currency are given[12]. As before, we measure the real exchange rate as $(E - P)$ to preserve the model's linear character.

$$G = (t + \alpha)Y + t(E - P)P_x^* X_0 - rB^g - (E - P)r^* B^{*g} \qquad (4)$$

Finally, net exports of industrial goods are directly dependent on international GDPY^*, due to their influence on the volume of industrial exports, and on the real exchange rate $(E + P^* - P)$[13], which reflect the competitiveness of the economy; and inversely on the available revenue, due to its effect on imports, given a marginal propensity to import (m).

$$XN = a_0 Y^* + a_1(E + P^* - P) - m(1 - t)Y \qquad (5)$$

By replacing the values of consumption, private investment, public spending, and net exports in (1), the equilibrium in the industrial goods market is given by,

$$\begin{aligned} Y = D = A_0 &+ c(1 - t)Y - (b + B^g)r - b^* r^* + (t + \alpha)Y \\ &+ (b^x P_x^* + tP_x^* X_0 + a_1 - r^* B^{*g})(E - P) \\ &- m(1 - t)Y \end{aligned}$$

Which can also be expressed as,

$$\begin{aligned} Y = k[A_0 &- (b + B^g)r - b^* r^* \\ &+ (b^x P_x^* + tP_x^* X_0 + a_1 - r^* B^{*g})(E - P)] \end{aligned}$$

---

12 As in the typical short-term Hicks IS-LM models, we do not make a connection between flows and stocks, between investment and stock of capital, between money and wealth, and between fiscal deficit and public debt.

13 The real exchange rate that explains the behavior of net exports includes, as applicable, the international price of industrial goods,$(E + P^* - P)$, while that which determines non-financial public spending is the real exchange rate, which only accounts for the internal price$(E - P)$.

Or as,

$$Y = k[A_0 - (b + B^g)r - b^*r^* + a_e(E - P)] \quad (6)$$

Where $k = \frac{1}{(1-t)(s+m)-\alpha}$ is the Keynesian multiplier, whose value is positive for realistic values of its parameters, and $s = 1 - c$ is the marginal propensity to save. The marginal propensity to consume is the sum of the propensity to consume domestic goods and the propensity to consume imported goods ($c = c_n + m$). This Keynesian multiplier differs from the version that appears in the textbooks. Firstly, it considers the fiscal deficit target. Secondly the increase in the tax rate raises rather than reducing the multiplier, as is normally the case. Moreover, $A_0 = C_0 + I_0 + a_0Y^* + a_1P^*$ is the autonomous component of the aggregate demand. Finally, $a_e = b^xP_x^* + tP_x^*X_0 + a_1 - r^*B^{*g}$, is the effect of the real exchange rate on the demand for industrial goods.

The recessionary or expansionary character of the increase in the real exchange rate depends on this component, a_e. The element $b^xP_x^*$ is the positive effect of the increase in the real exchange rate on private investment, due to its effect on the real price of raw material exports, which we will call the *investment effect*. The component $tP_x^*X_0$ is the positive effect of the increase in the real exchange rate on public spending, due to its effect on taxes accrued from raw material exports, which we will call the *tax-raising effect*. The parameter a_1 is the *competitiveness effect*, and represents the positive effect of an increase in the real exchange rate on the balance of trade: the so-called *Marshall-Lerner effect*—. Finally, the component $-r^*B^{*g}$ records the public sector *balance sheet effect*, which shows that when the real exchange rate rises, so too does the payment of interest on the external public debt and, thus, the primary expenditure of the public sector and the demand for industrial goods go down.

In consequence, an increase in the real exchange rate, $(E - P)$, may be expansionary or recessionary depending on whether the sum of the investment, tax-raising, and competitiveness effects, $b^xP_x^* + tP_x^*X_0 + a_1$, is greater or lesser than the balance sheet

effect, $-r^* B^{*g}$.[14] This is an empirical issue which remains to be clarified. There is a need for an update to Díaz Alejandro's (1966) study for 21st century LAC. At present, in the short term, does an increase in the real exchange rate cause the level of economic activity to rise or fall?

The evidence to this end are inconclusive. In the work of Galindo, Izquierdo, and Montero (2007), carried out using a panel of nine Latin American countries[15] based on information for different years in the nineties, a positive competitiveness effect and a negative balance sheet effect are found, as would be expected, while the total effect is imprecise as it depends on the degree of dollarization of the economies. The balance sheet effect prevails in the highly dollarized economies, while the competitiveness effect prevails in the least dollarized.

Under these conditions, it is by no means arbitrary to assume in the model that the total effect of the real exchange rate on the level of economic activity, in the short term, is null. That is, the investment, tax-raising, and competitive effects are offset by the balance-sheet effect.

This assumption does not imply that $a_e = 0$ in Equation (6). In this equation, if the partial derivative of production is calculated with respect to the real exchange rate and to a_e, , we arrive at the following expression,

$$dY = ka_{e0}d(E - P) + k(E - P)_0 da_e.$$

Where a_{e0} is the partial derivative of production with respect to the real exchange rate *in the initial situation* or starting point of the comparative static exercise and $(E - P)_0$is the initial, or starting-point, real exchange rate. In mathematical terms, these are initial parameters of the comparative static exercises, so remain constant throughout these exercises.

---

[14] Here we circumscribe the balance sheet effect to the public sector. It could also be extended to the private sector without altering the model's fundamental conclusions.

[15] Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Peru, Mexico, and Uruguay.

The assumption that the real exchange rate does not affect production in the short term implies that $a_{e0} = 0,$, so, in the previous expression, $ka_{e0}d(E - P) = 0$. That is, a movement of the real exchange rate, *given* a_{eo}, which is equal to zero, does *not* affect production.

But, *given* the real exchange rate in the initial situation, $(E - P)_0$, a modification of a component ofa_e, such as r^*, P_x^*, t or X_0, *does* affect production. Thus, $k(E - P)_0 da_e \neq 0$ is accomplished.

We therefore keep the component a_e in the equations, but we will proceed in the manner described above after completing the comparative static exercise[16].

Equation (6), expressed in the plane (Y , r), is the IS curve, which contains the different combinations of production and interest rates that keep the industrial goods market in equilibrium.

$$r = \frac{[A_0 - b^* r^* + a_e(E - P)]}{(b + B^g)} - \frac{Y}{k(b + B^g)} \qquad (7)$$

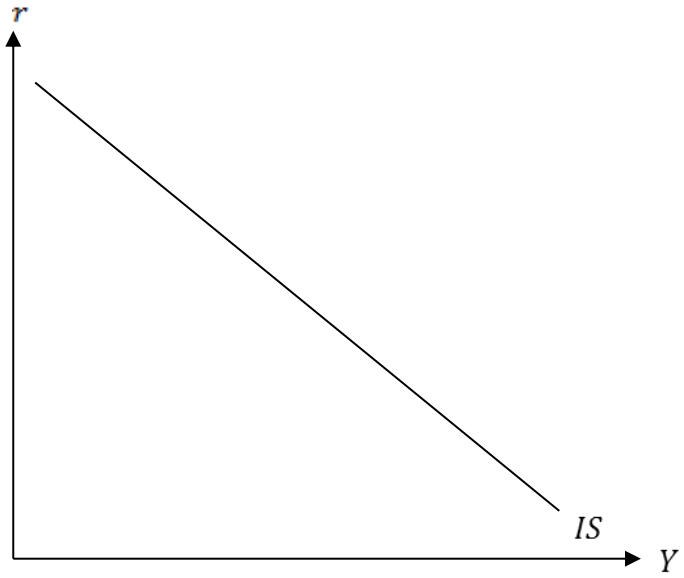
The slope of this curve is negative. When the interest rate increases, as is normal, private investment contracts, and, as the interest on the internal public debt goes up, non-financial public spending goes down. Both forces push down demand and, as a consequence, production. The increase in the interest rate, then, has an additional recessionary impact that is not usually accounted for.

---

16 The model is sufficiently flexible to work with the case of expansionary devaluation ($a_e > 0$) or of contractionary devaluation ($a_e < 0$). The option selected here is more simple as it does not take into account the effects of the real exchange rate on industrial production, so the nominal exchange rate and the price level are not parameters of the IS. The case of expansionary devaluation is a little more complex, because the expansionary effects of the real exchange rate must be factored into the IS. In both cases, the aggregate demand curve has a negative slope. The case of recessionary devaluation is much more convoluted, because the aggregate demand curve can prove to have a positive slope and, in this case, because the aggregate supply curve also has a positive slope. Thus, the model's stability conditions must be specified.

$$\left.\frac{dr}{dY}\right|_{IS} = -\frac{1}{k(b + B^g)} < 0$$

Figure 1
The IS curve



b. The monetary policy rule and the money market

In an inflation targeting scheme (ITS), the interest rate depends on an exogenous component, the natural interest rate, or on stationary equilibrium, which in the context of a small and open economy is equivalent to the international interest rate[17], as well as on another component associated with the difference between the observed price and the target price established by the central bank[18]. This reaction function, represented in Equation (8), we call the monetary policy rule (RPM)[19]. In this paper, we model the case

[17] On this, see Mendoza (2015).

[18] In reality, the central banks in LAC that have an ITS are guided by an inflation target, with upward and downward margins of tolerance. As this model is presented in terms of price levels and not inflation rates, we refer to price levels and the central bank's target price level. Conceptually, there are no substantial differences between both presentations.

[19] The monetary policy rules are inspired by the work of Taylor (1993). The well-known Taylor Rule is a model of the behavior of central banks that alter the interest rate according to the position of the inflation rate in relation to the target inflation rate, or to the production level as compared to its potential level.

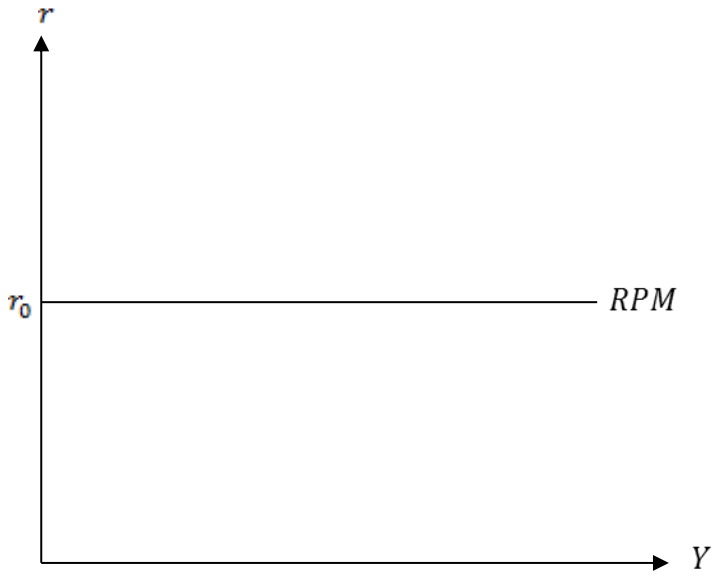
of a central bank that follows a rigid ITS, as its sole objective is price stability. In a flexible ITS, the decision to alter the interest rate also takes the GDP gap into account.

$$r = r^* + r_1(P - P^m) \qquad (8)$$

The slope of this line, on the plane (Y, r), is null.

$$\left.\frac{dr}{dY}\right|_{RPM} = 0$$

Figure 1
The monetary policy rule



The RPM is not a substitute for the monetary market. In the monetary market, in equilibrium, the real monetary supply (m^s), that is, the nominal monetary supply (M^s) deflated by the price level (P)[20], $(M^s - P)$, must be equal to the real monetary

[20] We use the approximation $m^s = \frac{M^s}{P} = M^s - P$.

demand(m^d). The nominal monetary supply[21] comes from international reserves (B^{*bcr}) and the stock of domestic bonds held by the central bank, also known as internal credit (B^b). Real monetary production is a direct function of production and an inverse function of the interest rate. In equilibrium,

$$m^s = M^s - P = B^{*bcr} + B^b - P = m^d = b_0 Y - b_1 r$$

The RPM modifies the adjustment mechanism in the money market. In a regime with a floating exchange rate, the nominal monetary supply is traditionally exogenous and the interest rate is the adjustment variable to keep the money market in equilibrium. In an ITS, the money supply is endogenous and the adjustment variable to keep the equilibrium in the money market is the stock of bonds in local currency (the internal credit). This is represented in the equation (9).

$$B^b = -B^{*bcr} + P + b_0 Y - b_1 r \tag{9}$$

This equation, expressed on the plane (Y, r), constitutes the LM curve of this economy, represented in Equation (10). It is the combination of production and interest rates that keep the money market in equilibrium.

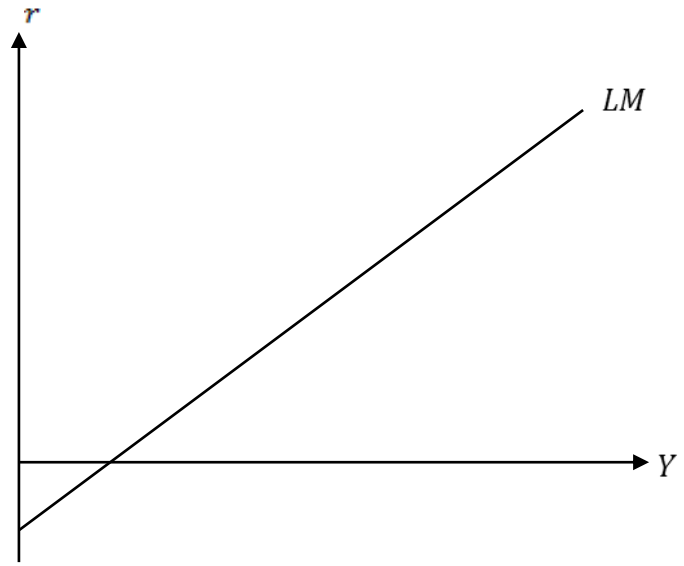
$$r = -\frac{B^b + B^{*bcr} - P}{b_1} + \frac{b_0}{b_1} Y \tag{10}$$

The slope of this curve is positive.

$$\left.\frac{dr}{dY}\right|_{LM} = \frac{b_0}{b_1} > 0$$

[21] Strictly speaking, the primary issuance or high-powered money, given that there are no banks in this model.

Figure 2
La LM curve



c. The uncovered interest arbitrage

Finally, with free movement of capital, when local and external assets are perfect substitutes and when there is uncovered interest arbitrage, in a flexible exchange-rate regime, the local interest rate is equal to the international rate (r^*) adjusted for expected depreciation ($E^e - E$), where E^e is the expected exchange rate, considered exogenous[22]. We call this relationship the *arbitrage equation* (EA), which is represented with Equation (11).

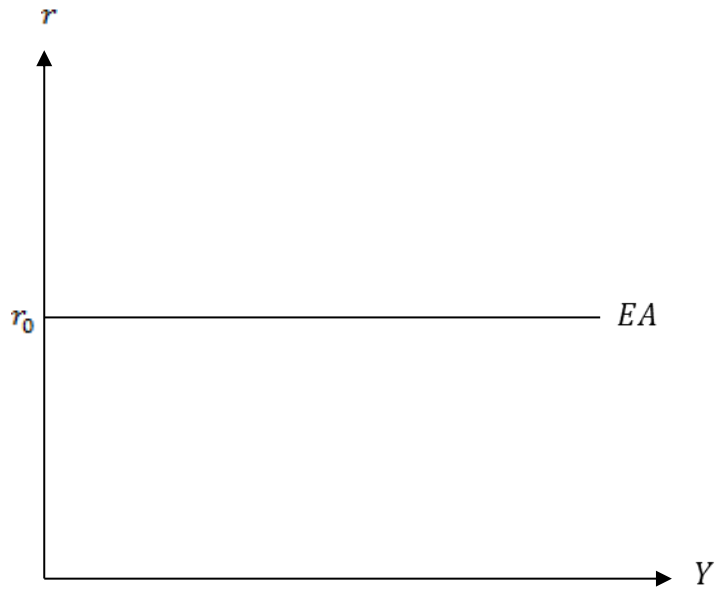
$$r = r^* + (E^e - E) \qquad (11)$$

The slope of this curve on the plane (Y, r), as well as that of the RPM, is null.

$$\left.\frac{dr}{dY}\right|_{EA} = 0$$

[22] The expected depreciation rate is given by $\frac{E^e - E}{E}$. So that the model maintains its linear nature, expected depreciation is approximated by $E^e - E$.

Figure 4
The arbitrage equation



From this expression it is deduced that the nominal exchange rate is a direct function of its expected value and the differential between the international and local interest rates.

$$E = E^e + (r^* - r) \qquad (12)$$

Finally, by including Equation (8) in (12) and then by replacing the expression obtained, along with Equation (8), in the equation of equilibrium in the goods market, Equation (6), the equation that relates the level of economic activity with its determinants is obtained, on the aggregate demand side.

$$Y = k\{A_0 - (b + B^g + b^*)r^* + a_e[E^e - r_1(P - P^m) - P] + (b + B^g)r_1(P^m - P)\}$$

The presence of the real exchange rate can be noted in the above equation, $E - P = e_0$, as $E^e - r_1(P - P^m) - P = E^e + r^* - r^* - r_1(P - P^m) - P = E^e + r^* - r - P = E - P = e_0$.

By replacing this expression we get,

$$\mathrm{Y} = \mathrm{k}[\mathrm{A}_0 - (\mathrm{b} + \mathrm{B}^{\mathrm{g}} + \mathrm{b}^*)\mathrm{r}^* + \mathrm{a}_{\mathrm{e}}\mathrm{e}_0 + (\mathrm{b} + \mathrm{B}^{\mathrm{g}})\mathrm{r}_1(\mathrm{P}^{\mathrm{m}} - \mathrm{P})] \quad (13)$$

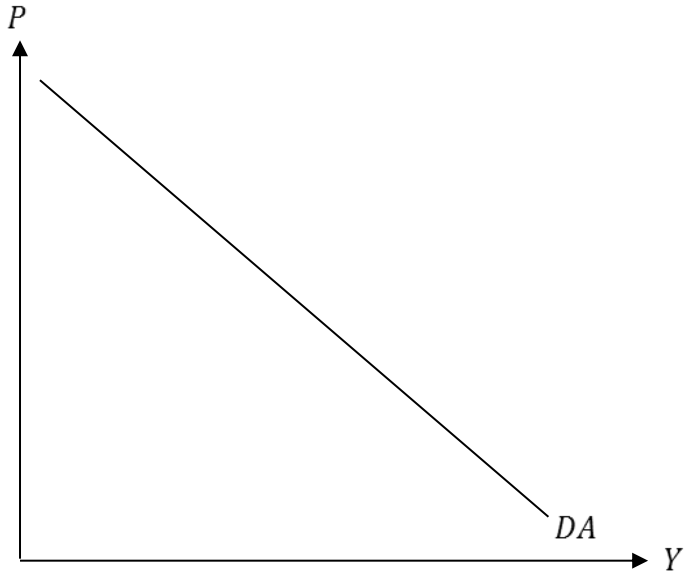
That is, the equation that records all determinants of the level of economic activity on the aggregate demand side. This formulation enables the appropriate use of the assumption that for a given initial a_e, equal to zero, an alteration of the real exchange rate,$(E - P)$, prompted by the modification of any of the determinants, of E or of P, will not affect industrial production.

By rearranging this expression to plot it on the plane (Y, P), we obtain the aggregate demand curve of this model of an open, primary-exporting economy, with a floating exchange rate, operating with a limit upon the fiscal deficit of a percentage of GDP and an inflation targeting scheme.

$$P = \frac{1}{(b + B^g)r_1}[A_0 + (b + B^g)r_1P^m - (b + B^g + b^*)r^* + a_e e_0] - \frac{Y}{k(b + B^g)r_1} \quad (14)$$

The aggregate demand curve is represented in Figure 5.

Figure 3
Aggregate demand



This aggregate demand curve, in the context of the model presented, has a negative slope. The reason is that, because of the monetary policy, the price increase leads to a rise in the interest rate, which pushes down private investment, primary public expenditure and, as a result, industrial production. In assuming that the real exchange rate does not affect the level of economic activity, we have broken the link between production and price levels through the real exchange rate.

$$\left.\frac{dP}{dY}\right|_{DA} = -\frac{1}{k(b + B^{g})r_1} < 0$$

Aggregate supply

With respect to aggregate supply, a production function of constant marginal returns is assumed, with labor as the sole factor of production. The price of industrial goods depends on the unit cost of production, that of labor. The price of labor, nominal wages, in turn, is a function of expected price (P^e), of the output gap —the difference between the observed and potential output $(Y - \bar{Y})$— and the nominal exchange rate. The presence of the expected price is because the expectation about the price is an important element taken into account in bargaining between employees and

employers, is a determinant of nominal wages and, accordingly, of the unit cost of production. The output gap, on the one hand, expresses how the state of the economy —boom or bust— influences nominal wages. During the boom stage, ($Y - \bar{Y} > 0$) nominal wages go up, and, consequently, so do unit costs and prices, while during the bust wages and prices fall. Finally, it is assumed that nominal wages depend directly on the nominal exchange rate, because the consumer basket of employees contains imported goods. When the exchange rate rises, so too does the overall price level, while real wages fall, which prompts wage-earners to demand higher nominal wages.[23]

In consequence, the aggregate supply equation of this economy is given by,

$$P = P^e + \lambda(Y - \bar{Y}) + \beta E; 0 < \beta < 1. \quad (15)$$

The parameter λ measures the level of sensitivity of the price of industrial goods with respect to the state of the economy, while the parameter β measures the sensitivity of the price level with respect to the nominal exchange rate. This parameter is positive and less than one, so that an increase in the nominal exchange rate is also an increase in the real exchange rate.

Because the exchange rate is an endogenous variable, its appearance as a parameter of the aggregate supply curve would not be appropriate. Thus, the presentation of its determinants is preferable. To this end, we appeal to the Equations (8) and (12), from which we derive the following expression.

$$E = E^e + r^* - r = E^e + r^* - r^* - r_1(P - P^m)$$

That is,

$$E = E^e - r_1(P - P^m) \quad (16)$$

[23] The channels of influence of the nominal exchange rate on the price level can be multiple. The influence may be due to the existence of imported inputs, or because there are imported final goods. In relation to this, see Dornbusch and Krugman (1976).

It should be noted that in this expression the international interest rate is not a determinant of the nominal exchange rate. This is because a movement in the international exchange rate is as forceful as that of the local interest rate, so that the interest rate differential, $r^* - r$, is not altered. And it is this interest rate differential, along with the expected exchange rate, that determines the nominal exchange rate.

On the other hand, if we endogenize the expected exchange rate, variables such as the international exchange rate or the price of commodities exports would be direct determinants of the nominal exchange rate, and thus parameters of the aggregate demand curve[24].

By replacing Equation (16) in Equation (15), we arrive at the following aggregate supply curve.

$$P = \varepsilon[P^e + \beta E^e + \beta r_1 P^m - \lambda \bar{Y}\ ] + \varepsilon\lambda Y \qquad (17)$$

Where: $0 < \varepsilon = \frac{1}{1+\beta r_1} < 1$.

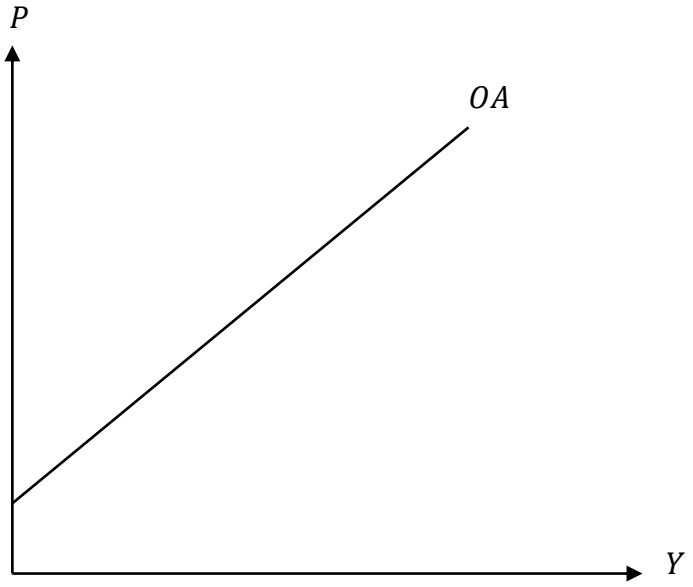
An increase in production, given the potential output, increases the output gap, the nominal wage, the unit cost, and, thus, the price level. Thus, the short term aggregate supply curve represented in Figure 6 has a positive slope.

$$\left.\frac{dP}{dY}\right|_{OA} = \lambda > 0$$

[24] It could be postulated that the expected exchange rate is the same as the stationary equilibrium value (see Dancourt 2009). In Mendoza's model (2015, chapter 13), at stationary equilibrium level, an increase in the international interest rate or a reduction in the international price of raw materials pushes up the stationary equilibrium exchange rate and, as a consequence, the expected exchange rate would rise. In this case, the exogenous variables alluded to would be parameters of the short term aggregate supply curve. However, in our model, for a complete procedure, it would also be necessary to endogenize the expected price, which renders the task more difficult.

Figure 4

Aggregate supply



Aggregate supply and demand

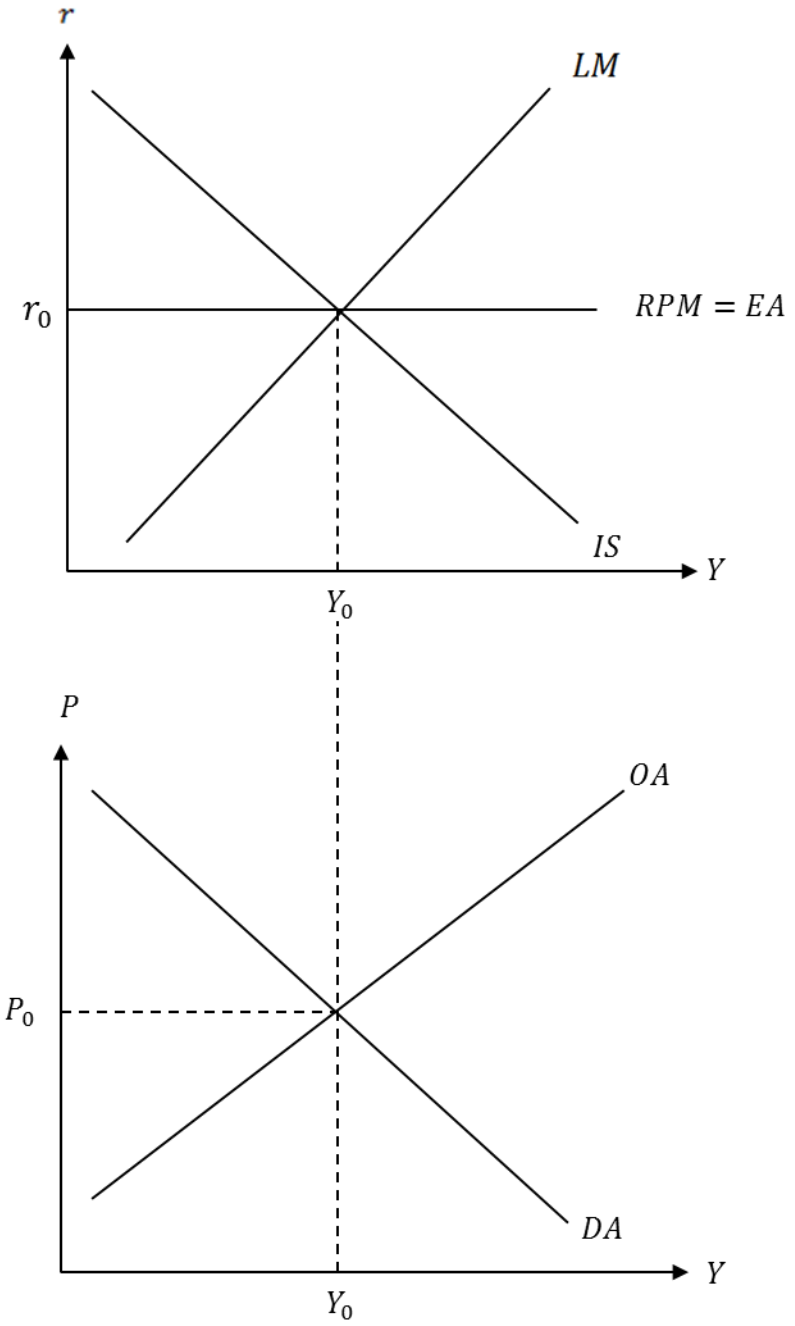
The complete model is given by the following aggregate supply and demand equations.

$$P = \frac{1}{(b + B^g)r_1}[A_0 + (b + B^g)r_1 P^m - (b + B^g + b^*)r^* + a_e e_0] - \frac{Y}{k(b + B^g)r_1} \tag{14}$$

$$P = \varepsilon[P^e + \beta E^e + \beta r_1 P^m - \lambda \bar{Y}] + \varepsilon\lambda Y \tag{17}$$

Figure 7 presents the general equilibrium of the model. The upper part shows the IS-LM-RPM-EA model, and the lower part the DA and OA equations. The exchange rate flexibility guarantees that the RPM and the EA always overlap.

Figure 5
General equilibrium



The endogenous variables of this model are production, the interest rate, the nominal exchange rate, the price level, and the stock of bonds in local currency.

The exogenous variables that are economic policy instruments are the central bank's target price, the international reserves, the tax rate, and the fiscal deficit target. The non-instrumental exogenous variables are potential GDP, the expected exchange rate, the expected price, the international interest rate, the international GDP, the

international price of industrial goods, the international price and volume of raw material exports, and autonomous expenditure.

As the model is linear, the short-term equilibrium values of production and the price level can be found from the equations of aggregate supply and demand: Equations (14) and (15), respectively.

$$\begin{aligned} Y^{eq} = \frac{k}{1+\varepsilon\lambda k(b+B^g)r_1}[&A_0 - (b^* + b + B^g)r^* \\ &+ \varepsilon(b+B^g)r_1P^m + a_e e_0 \\ &+ \varepsilon(b+B^g)r_1(\lambda\bar{Y} - P^e - \beta E^e)] \end{aligned} \tag{18}$$

$$\begin{aligned} P^{eq} = \frac{\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}[&P^e + \beta E^e - \lambda\bar{Y} \\ &+ \lambda k[A_0 - (b^* + b + B^g)r^* + a_e e_0] \\ &+ [\beta + \lambda k(b+B^g)]r_1P^m\ ] \end{aligned} \tag{19}$$

Production increases when there is a positive international context (external GDP or the international price of industrial goods goes up, which can be seen in the component A_0, or the international price of raw material exports goes up, which is contained in a_e, or the international interest rate goes down), an expansionary monetary policy (increase in the central bank's target price), an expansionary fiscal policy (increase in the fiscal target or the tax rate[25]), or when there is a favorable supply shock (higher potential production or lower expected price).

All that increases production also increases the price level, except for favorable supply shocks, which push up production and push down the price level.

It can be seen that the stock of international reserves, despite being a monetary policy instrument, does not feature as an explanatory variable of production and the price level.

[25] That an increase in the tax rate revives the economy will come as a surprise. In reality, this is but an extension to the classic balanced budget theory in which an increase in public spending, when financed by higher taxes, revives the economy.

This is because in the ITS, where the aim is to administer the short-term interest rate, the intervention in the exchange market must necessarily be *sterilized*. That is, the intervention in the exchange rate market, which alters the volume of international reserves and thus the nominal money supply, has to be compensated with a bond market intervention, such that $dB^{*bcr} = -dB^{b}$, so the nominal monetary supply is not altered. Otherwise, the local exchange rate would be affected, which must respond only to the determinants expressed in Equation (8).

If the central bank buys dollars, the stock of international reserves increases and the nominal money supply goes up. This supply increase would put pressure on the interest rate reduction. But in the ITS, the interest rate has other determinants. Therefore, in order for the interest rate not to fall, the monetary authority has to sterilize, and reduce the money supply to the same degree in which it was increased with the purchase of dollars, by selling bonds in the local currency. This operation has no effect on production or the exchange rate.

Having established the equilibrium price in Equation (19), the equilibrium interest rate can be found through the equation (8).

$$r^{eq} = \left[\frac{1 - \varepsilon\lambda k \mathrm{r}_1 b^*}{1 + \varepsilon\lambda k(b + B^g)r_1}\right] r^* - \left[\frac{\varepsilon}{1 + \varepsilon\lambda k(b + B^g)r_1}\right] r_1 P^m + \frac{r_1 \varepsilon}{1 + \varepsilon\lambda k(b + B^g)r_1}[P^e + \beta E^e - \lambda\bar{Y} + \lambda k(A_0 + a_e e_0)] \quad (20)$$

In Equation (20), it can be seen that the equilibrium interest rate is a direct function of the international interest rate[26], the expected price, the expected exchange rate, autonomous expenditure, and the international price of raw materials; and an inverse function of the central bank's target price and of potential output.

[26] We are assuming that the direct effect of the international interest rate on the local interest rate, originating in the monetary policy rule, is greater than the indirect effect, as a result of the recession caused by the higher international interest rate, which reduces the price level and induces the central bank to lower the interest rate.

By replacing Equation (20) in (12), the nominal short term equilibrium exchange rate is found.

$$E^{eq} = \left[\frac{\varepsilon + \varepsilon\lambda k(b + B^g)r_1}{1 + \varepsilon\lambda k(b + B^g)r_1}\right]E^e + \left[\frac{\varepsilon\lambda k r_1(b + B^g + b^*)}{1 + \varepsilon\lambda k(b + B^g)r_1}\right]r^* + \left[\frac{\varepsilon}{1 + \varepsilon\lambda k(b + B^g)r_1}\right]r_1 P^m - \frac{r_1\varepsilon}{1 + \varepsilon\lambda k(b + B^g)r_1}[P^e - \lambda\bar{Y} + \lambda k(A_0 + a_e e_0)] \quad (21)$$

The nominal exchange rate is a direct function of the expected exchange rate, the international interest rate, the target price, and potential output; and an inverse function of the expected price, autonomous expenditure, international GDP, and the external price of international goods and raw materials.

Finally, if the price, production, and the equilibrium interest rate are known, the equilibrium value of the stock of bonds held by the central bank can also be found, by inserting and (20) into (9)[27].

The reduced form of the complete model is composed of the system of equations. On the basis of these, the short-term effects of the exogenous variables on the endogenous variables can be determined.

$$Y^{eq} = \frac{k}{1 + \varepsilon\lambda k(b + B^g)r_1}[A_0 - (b^* + b + B^g)r^* + \varepsilon(b + B^g)r_1 P^m + a_e e_0 + \varepsilon(b + B^g)r_1(\lambda\bar{Y} - P^e - \beta E^e)] \quad (18)$$

[27] This is a different endogenous variable from the others. It is influenced by the other endogenous variables but does not influence them in turn. The value it achieves is of no consequence to the remaining endogenous variables. For this reason we afford it little attention. In particular, we omit it from the mathematical results of the other comparative static exercises.

$$P^{eq} = \frac{\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}[P^e + \beta E^e - \lambda\bar{Y} + \lambda k[A_0 - (b^* + b + B^g)r^* + a_e e_0] + [\beta + \lambda k(b+B^g)]r_1 P^m] \quad (19)$$

$$r^{eq} = \left[\frac{1-\varepsilon\lambda k r_1 b^*}{1+\varepsilon\lambda k(b+B^g)r_1}\right]r^* - \left[\frac{\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}\right]r_1 P^m + \frac{r_1\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}[P^e + \beta E^e - \lambda\bar{Y} + \lambda k(A_0 + a_e e_0)] \quad (20)$$

$$E^{eq} = \left[\frac{\varepsilon+\varepsilon\lambda k(b+B^g)r_1}{1+\varepsilon\lambda k(b+B^g)r_1}\right]E^e + \left[\frac{\varepsilon\lambda k r_1(b+B^g+b^*)}{1+\varepsilon\lambda k(b+B^g)r_1}\right]r^* + \left[\frac{\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}\right]r_1 P^m - \frac{r_1\varepsilon}{1+\varepsilon\lambda k(b+B^g)r_1}[P^e - \lambda\bar{Y} + \lambda k(A_0 + a_e e_0)] \quad (21)$$

3. EXTERNAL SHOCKS, MACROECONOMIC POLICIES, AND MACROECONOMIC PERFORMANCE

In this section we will observe very high consistency between the model's theoretical predictions and the facts described in Section 1. In this section it was found that in the period 1980-2014, the macroeconomic performance of LAC was closely linked with the behavior of the international interest rate and the international price of raw materials.

What effect does the increase in the international interest rate and the decrease in the international price of raw materials have on the economies of LAC?

Complementarity, we will also evaluate the effects of monetary and fiscal policy on the model's endogenous variables.

The rise in the international interest rate

The increase in the international interest rate has the following effects. Firstly, as this is also the natural or stationary equilibrium interest rate in the monetary policy rule, the local interest rate goes up. The increase in this rate reduces private investment and, on increasing interest on the public debt in local currency, curbs public spending, pushing down demand in the goods market. Secondly, the highest international interest rate increases interest on the public debt in foreign currency, further curbing public spending and the demand for goods all the more. Finally, the increase in the international interest rate also directly affects investment and demand. All these forces bring about a fall in demand and, in consequence, in the level of industrial economic activity.

In the monetary policy rule, the local interest rate increases by the same magnitude as the international interest rate. Therefore, in the arbitrage equation, the differential between the local and international interest rates is not altered, and as a result the nominal interest rate remains constant.

The lower industrial production reduces the output gap, and the lower gap leads to a fall in the price level. Given the reduction in the price level, the monetary authority, through its policy rule, reduces the local interest rate. This fall in the interest rate - as well as its expansionary effects on demand, because it increases private investment and public spending - triggers capital outflow that ends up increasing the nominal exchange rate.

It is reasonable to expect that the reduction in the local interest rate, arising out of the lower price level, will not be of a greater magnitude than the initial rise caused by the higher international interest rate. Thus, the net effect of the higher international interest rate is an increase in the local interest rate.

On the other hand, the increase in the nominal exchange rate increases the industrial price level and the real exchange rate. The higher real exchange rate, because of the investment, tax-raising, and competitiveness effects, pushes up demand, but this

increase in demand, given the assumption adopted in this article, is entirely canceled out by the balance sheet effect, which causes public spending to fall. The increase in the real exchange rate, then, does not affect the demand for industrial goods.

In summary, in the short term, an increase in international demand causes an economic downturn, a fall in the price level, and an increase in the local interest rate and the nominal exchange rate.

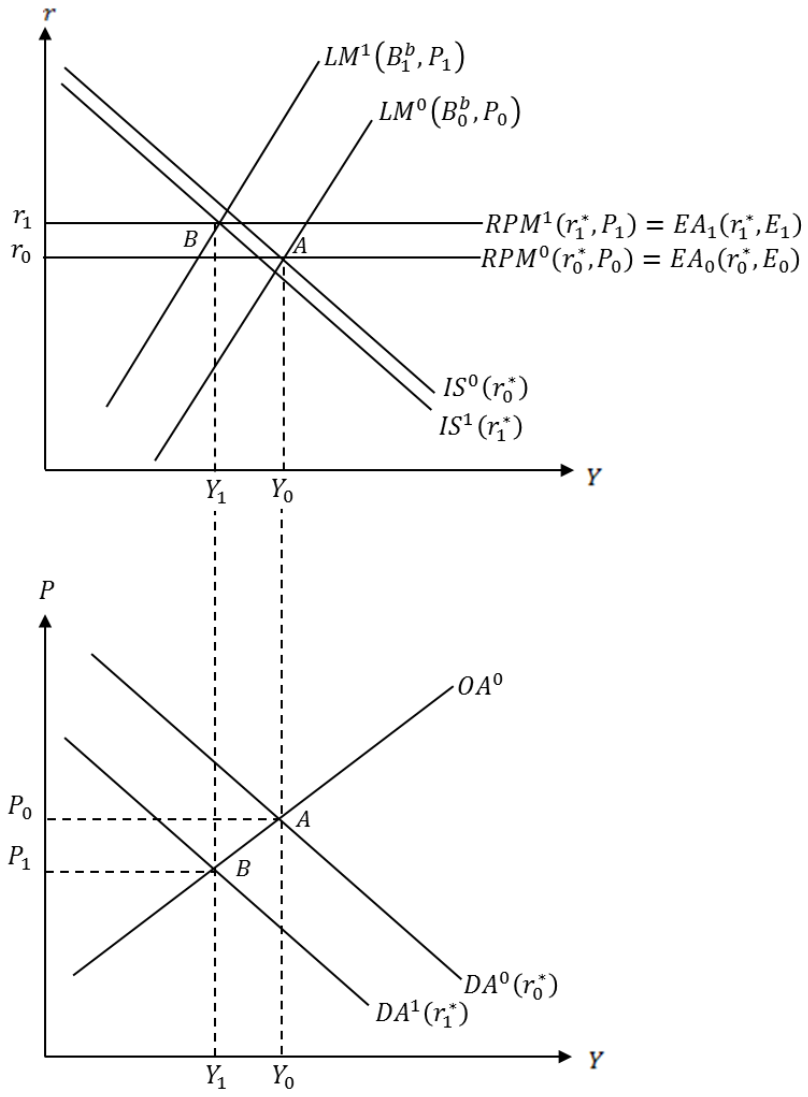
This result, that the increase in the international interest rate causes an economic downturn, is consistent with the stylized facts of LAC described in Section 1, but is in stark contradiction to the predictions deduced from the Mundell-Fleming models. These models predict that the increase in the external interest rate revives the domestic economy. This result is because the Mundell-Fleming model does not factor in the external interest rate as a determinant of investment and public spending, but only the competitiveness effect of the increase in the real exchange rate. These models do not take into consideration that local firms can obtain financing abroad at the prevailing international interest rate, and that part of the government debt is in dollars, the payment of which is also agreed at the international rate. In these models, an increase in the international interest rate pushes up the nominal interest rate due to the uncovered interest rate parity. The higher nominal exchange rate, given the price level, means a higher real exchange rate. The higher real exchange rate improves the balance of trade, demand, and, thus, production.

The visual effects of the higher external interest rate are shown in Figure 8. In the lower panel, which shows aggregate supply and demand, the recessionary nature of the higher international interest rate causes the aggregate demand to shift to the left, and, in turn, production and the price level to reduce. The aggregate supply curve does not shift as the international interest rate is not an argument of this curve for the reasons set out earlier.

In the upper panel, the IS curve shifts to the left as a result of the increase in the international interest rate. Given the assumption that the real exchange rate has no

effect on industrial production, the nominal exchange rate and the price level do not appear as parameters of the IS. On the other hand, the EA shifts upwards due to the net effect of the rise in the international interest rate (EA upwards) and the rise on the exchange rate (EA downwards). The RPM also moves upwards, as a net result of the increase in the international interest rate (RPM upwards) and the decrease in the price level (RPM downwards). Finally, the LM shifts to the left due to the net effect of the drop in the price level (LM rightwards) and the lower stock of bonds in local currency held by the central bank (LM leftwards).

Figure 8
Increase in the international interest rate



From the system comprised of Equations (18) - (21), we obtain the mathematical results of the exercise[28].

$$dY = -\frac{k(b^* + b + B^g + e_0 B^{*g})}{1 + \varepsilon\lambda k(b + B^g) r_1} dr^* < 0 \qquad 1$$

$$dP = -\frac{\varepsilon\lambda k(b^* + b + B^g + e_0 B^{*g})}{1 + \varepsilon\lambda k(b + B^g) r_1} dr^* < 0$$

$$dr = \left[1 - \frac{r_1 \varepsilon\lambda k(b^* + b + B^g + e_0 B^{*g})}{1 + \varepsilon\lambda k(b + B^g) r_1}\right] dr^* > 0$$

$$dE = \frac{r_1 \varepsilon\lambda k(b^* + b + B^g + e_0 B^{*g})}{1 + \varepsilon\lambda k(b + B^g) r_1} dr^* > 0$$

The only ambiguous result is that of the local interest rate. In the corresponding mathematical expression, a direct effect is seen to operate on the local interest rate that causes an increase of the same degree as the international interest rate, the "1" that appears within the bracket; and another indirect effect stemming from the lower price level and the consequent reduction in the local price level. We are assuming that the direct effect dominates the indirect effect, due to which an increase in the international interest rate leads to an increase in the local interest rate. For the same reason, the increase in the local interest rate must be a fraction of the increase in the international interest rate.

Fall in the international price of raw materials.

The fall in the international price of raw material exports causes, on the one hand, a decrease in private investment (it should be recalled that in our model, private investment depends on the price of raw material exports), and, on the other hand, as the value of traditional exports falls in terms of domestic goods, tax-raising is reduced

[28] In all the exercises, we ignore the mathematical effect of the exogenous variables on the stock of bonds in local currency held by the central bank, which is one of the model's endogenous variables. As explained earlier, this variable is affected by the other endogenous variables but does not affect any of them in return.

and, as a consequence, so too is public spending. The consequent reduction in demand causes production to fall.

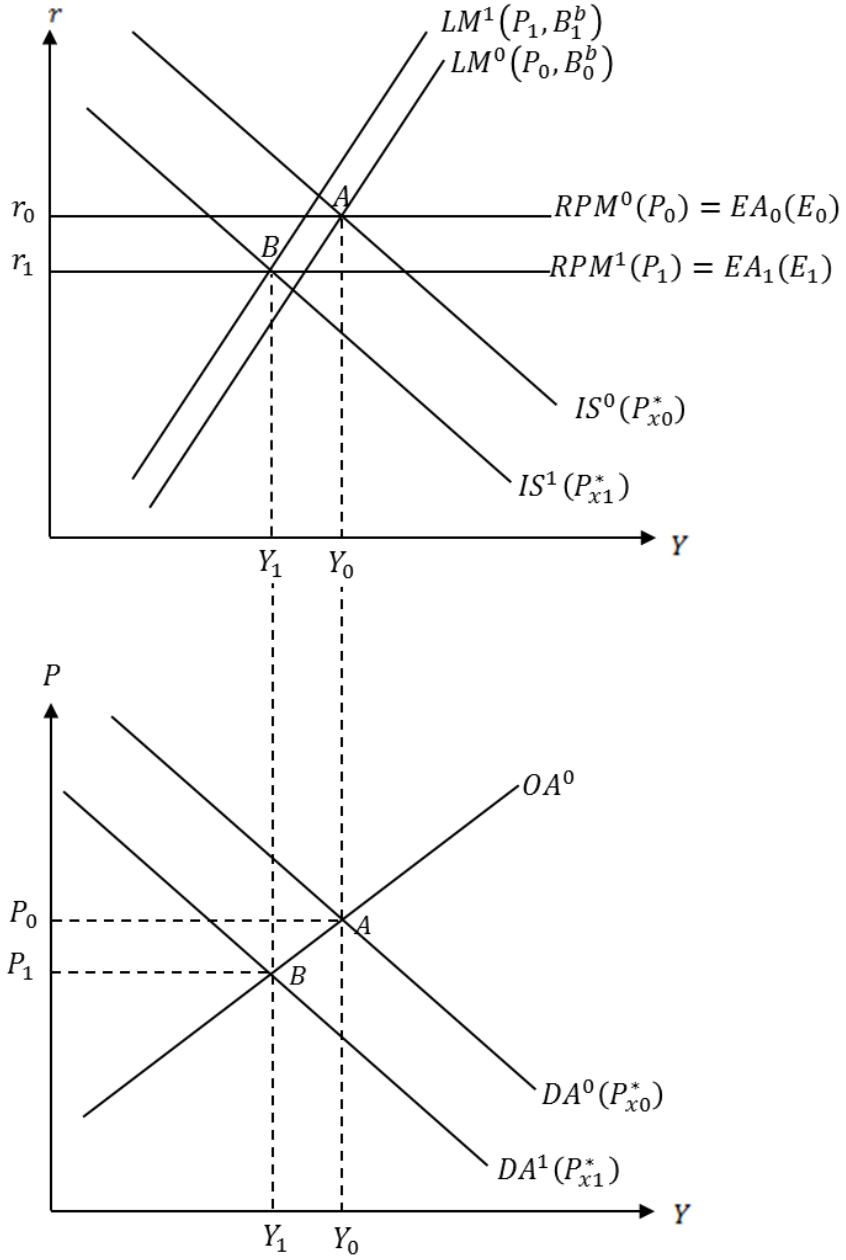
The decrease in production reduces the output gap, which leads to a decrease in the price level. Given the reduction in the price level, the monetary authority, through its policy rule, decreases the interest rate. This fall in the local interest rate —as well as its expansionary effects on demand, because it increases private investment and public spending— triggers capital outflow that ends up increasing the nominal exchange rate. The increase in the exchange rate pushes up the industrial price level and the real exchange rate, which, given the assumption adopted, has no effect on production. The price fall originating in the industrial downturn is stronger than the increase resulting from the higher nominal exchange rate.

In summary, a fall in the international price of raw material exports causes an economic downturn, a fall in the price level and the local interest rate, and an increase in the nominal exchange rate.

The effects of the fall in the international price of raw materials can be seen in Figure 9. In the lower panel, which shows aggregate supply and demand, the fall in the international price of raw material exports causes the aggregate demand to shift to the left, and, in turn, the production and the price level to reduce.

In the upper panel, the IS curve shifts to the left due to the effect of the fall in the international price of raw materials. Given the assumption that the real exchange rate has no effect on industrial production, neither the nominal exchange rate nor the price level are parameters of the IS curve. On the other hand, the EA shifts downwards as a result of the increase in the exchange rate, while the RPM also shifts downwards, due to the reduction in the price level. Finally, the LM shifts to the left due to the net effect of the drop in the price level (LM rightwards) and the lower stock of bonds in local currency held by the central bank (LM leftwards).

Figure 9
Fall in the international price of raw materials.



From the system comprised of Equations (18) - (21), we obtain the mathematical results of the exercise.

$$dY = \frac{ke_0(b^x + tX_0)}{1 + \varepsilon\lambda k(b + B^g)r_1} dP_x^* < 0 \qquad 2$$

$$dP = \frac{\varepsilon\lambda k e_0 (b^x + tX_0)}{1 + \varepsilon\lambda k (b + B^g) r_1} dP_x^* < 0$$

$$dr = \frac{r_1 \varepsilon\lambda k e_0 (b^x + tX_0)}{1 + \varepsilon\lambda k (b + B^g) r_1} dP_x^* < 0$$

$$dE = -\frac{r_1 \varepsilon\lambda k e_0 (b^x + tX_0)}{1 + \varepsilon\lambda k (b + B^g) r_1} dP_x^* > 0$$

Expansionary monetary policy

In the context of this model, where the local interest rate is an endogenous variable (the central bank modifies the interest rate when the price deviates from the target price or when a movement in the international interest rate occurs), the expansionary monetary policy is expressed in the rise in the target price set by the central bank.

In the sphere of aggregate demand, in the monetary policy rule, an increase in the target price induces the central bank to lower the interest rate. The reduction in the interest rate has multiple effects. Firstly, private investment goes up. Secondly, as the interest on the public debt in local currency is reduced, primary public expenditure increases. Higher investment and higher public spending revive industrial production. Thirdly, in uncovered interest rate parity, a lower local interest rate causes financial capital outflows and an increase in the nominal exchange rate. The higher nominal exchange rate increases the industrial price level and the real exchange rate. This has a number of consequences for the goods market. Firstly, because of the Marshall-Lerner effect, net exports go up. Secondly, because of the tax-raising effect, public spending goes up. Thirdly, because of the investment effect, private investment increases. Finally, because of the balance sheet effect, public spending falls. Because we have assumed that in the short term the total effect of the real exchange rate on the demand for goods is null, all these effects cancel each other out.

The increase in the level of industrial economic activity increases the output gap, which causes a rise in the price level, in addition to that produced by the higher nominal exchange rate. The increase in the price level has two consequences. In the first instance, it causes the real exchange rate to fall, which does not affect industrial

production. In the second instance, it induces, in the monetary policy rule, an increase in the interest rate, which weakens the growth in private investment and public spending, and causes a decrease in the nominal exchange rate.

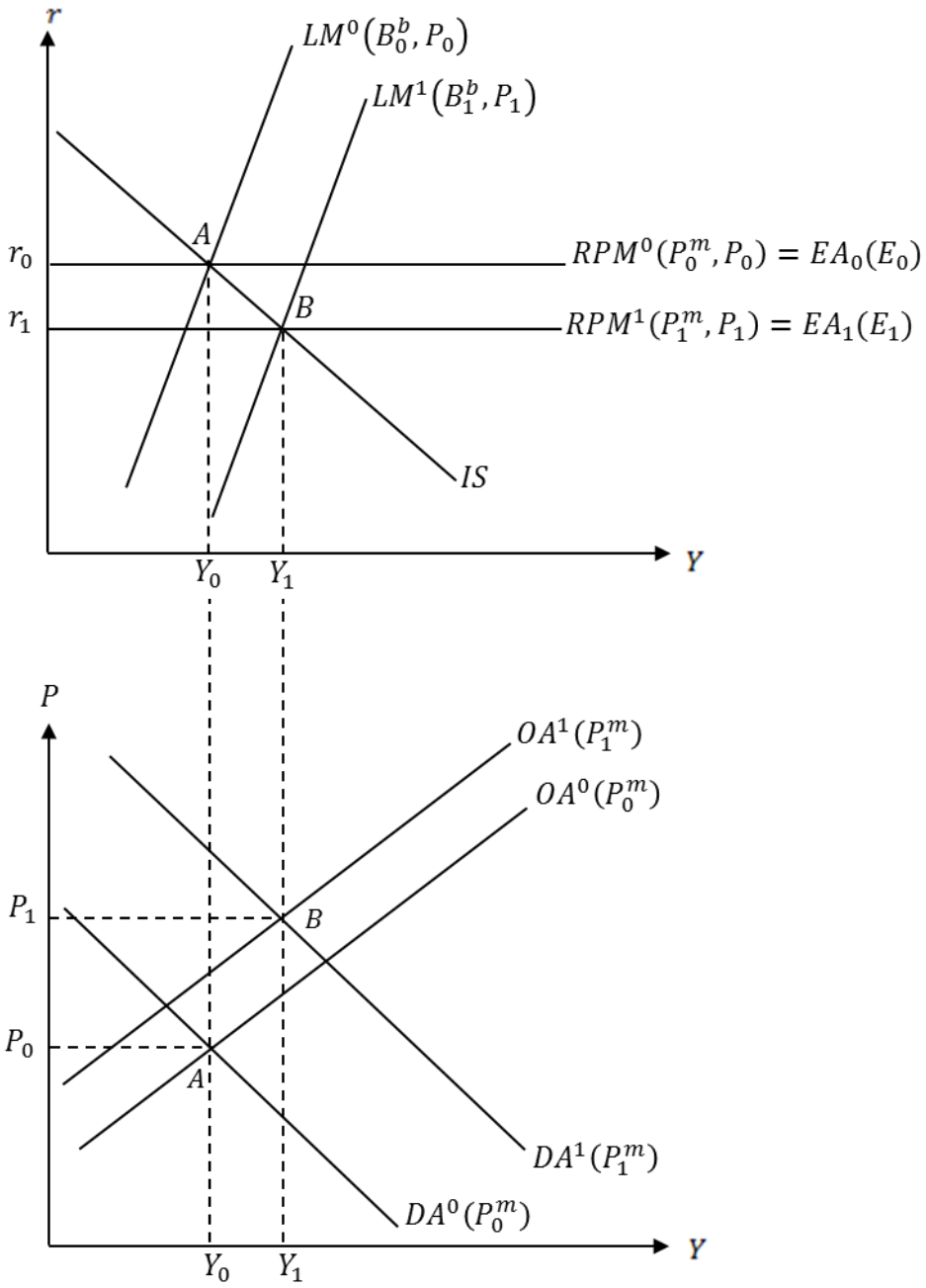
However, these latter effects, due to being derivatives, are less potent than the former, which are dominant.

In summary, an expansionary monetary policy in the short term reduces the interest rate and increases the level of economic activity, the exchange rate, and the price level.

Figure 10 reproduces these results. In the lower part, the expansionary monetary policy shifts the aggregate demand curve to the right and the aggregate supply curve to the left, because the target price is also a parameter of the aggregate supply curve. As a result, production and industrial prices rise, and the point of equilibrium shifts from A to B. It should be noted, on the basis of the aggregate demand and supply equations, (14) and (17), respectively, that the shift in the aggregate demand curve is stronger than that of aggregate supply. Thus, production increases.

In the upper part, the RPM shifts downwards as a net effect of the rise in the target price (RPM downwards) and on the rise in the price level (RPM upwards). The EA shifts downwards, due to the increase in the nominal exchange rate. The LM shifts to the right, as a consequence of the higher internal credit (LM rightwards) and the increase in the price level (LM leftwards). Finally, the IS stays in its original location as neither the nominal exchange rate nor the price level are parameters of this curve, due to the assumption that the real exchange rate does not affect industrial production. In the new equilibrium, B, the interest rate is lower and the exchange rate and production are higher, in comparison with the initial situation.

Figure 10
Expansionary monetary policy



We obtain the mathematical results from the equations in their reduced form. It should be noted that the price level rises at a fraction of the increase in the target price, as $\varepsilon\beta < 1$. For this reason, the equilibrium interest rate falls because, in Equation (8), the increase in the price level is less than the rise in the target price.

$$dY = \frac{k\varepsilon(b + B^g)r_1}{1 + \varepsilon\lambda k(b + B^g)r_1} dP^m > 0$$

$$dP = \frac{\varepsilon\big(\beta + \lambda k(b + B^g)\big)r_1}{1 + \varepsilon\lambda k(b + B^g)r_1} dP^m > 0$$

$$dr = -\frac{\varepsilon r_1}{1 + \varepsilon\lambda k(b + B^g)r_1} dP^m < 0$$

$$dE = \frac{\varepsilon r_1}{1 + \varepsilon\lambda k(b + B^g)r_1} dP^m > 0$$

Expansionary fiscal policy

An expansionary monetary policy, expressed in this model as an increase in the fiscal deficit target, has the following effects.

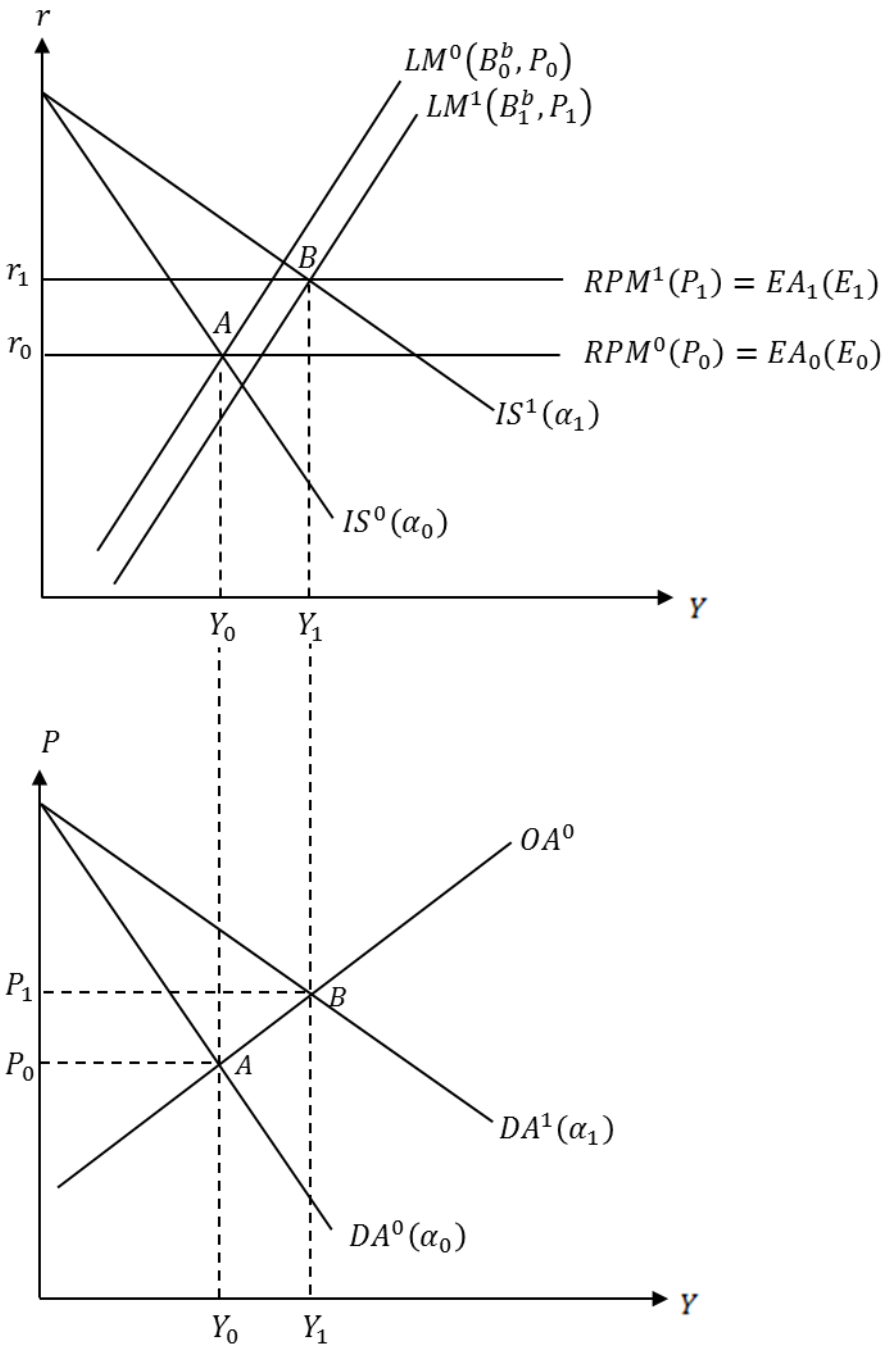
The increase in the fiscal target enables an increase in primary public spending. The greater public spending increases demand and, thus, the level of industrial economic activity. The increase in production prompts a positive output gap that leads to an increase in the price level.

As the price level increases beyond its target level, the central bank puts up the interest rate, due to which private investment and public spending fall. These effects on demand weaken, but do not eliminate, the expansionary effect of higher public spending. Finally, the higher interest rate also prompts a fall in the exchange rate. The lower exchange rate pushes down the industrial price level and the consequent fall in the real exchange rate has no effect on the demand for industrial goods. The decrease in industrial prices is less potent that their increase prompted by the revival.

In summary, the higher fiscal target pushes up production, prices, and the exchange rate, and pushes down the nominal exchange rate. The reduction in the nominal exchange rate and the increase in the price level cause the real exchange rate to fall.

In Figure 11, these results are reproduced. In the lower part, the higher fiscal deficit shifts aggregate demand to the right and increases production and the price level. In the upper part, the higher fiscal deficit moves the IS to the right. The decline in the exchange rate, on increasing expected depreciation, shifts the EA upwards. The increase in the price level also shifts the RPM upwards. The LM moves rightwards as a combined effect of the price rise and the increase in bonds held by the central bank. In the new equilibrium, B, production and the interest rate are higher, and the exchange rate is lower.

Figure 11
Expansionary fiscal policy



As before, we obtain the short-term mathematical results from the equations in their reduced form, (18)-(21).

$$dY = \frac{k}{1 + \varepsilon\lambda k(b + B^g)r_1} Y_0 d\alpha > 0$$

$$dP = \frac{\varepsilon\lambda k}{1 + \varepsilon\lambda k(b + B^g)r_1} Y_0 d\alpha > 0$$

$$dr = \frac{r_1\varepsilon\lambda k}{1 + \varepsilon\lambda k(b + B^g)r_1} Y_0 d\alpha > 0$$

$$dE = -\frac{r_1\varepsilon\lambda k}{1 + \varepsilon\lambda k(b + B^g)r_1} Y_0 d\alpha < 0$$

Where Y_0 is the industrial output in the initial equilibrium?

4. CONCLUSION

We have presented a macroeconomic model that seeks to reflect the central characteristics of the LAC economies. These economies are small, open, primary exporters and dependent on external financing, in which the monetary policy operates with a floating exchange-rate regime and an inflation targeting system, with the reference rate for interbank markets as a policy instrument and the endogenous amount of money, while the fiscal policy functions by imposing a limit on the fiscal deficit as a percentage of GDP.

The model reproduces the external origin of the cycles of boom and bust in the region. The boom periods coincide with high international prices of raw materials and low international interest rates, such as the golden period of 2002-2011. Meanwhile, the bust periods or slowdowns in economic growth coincide with increases in the international interest rate and falls in our prices of raw materials for export, as occurred in the 1980s and in 2012-2014.

The article serves as a small demonstration of how the old models and methods can still be useful in responding to contemporary macroeconomic questions. The old comparative statics method has become an obsolete tool for many, but, in certain respects, such as this, it aids in a clear understanding of the connections between the LAC and world economies.

References

Arezkia, Rabah, Prakash Loungania, Rick Van Der Ploeg & Anthony Venablesc
(2014) Understanding international commodity price fluctuations. Editorial, *Journal of International Money and Finance* 42, 1-8.

Calvo, Guillermo, Leonardo Leiderman & Carmen Reinhart
(1993) Capital inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors. *Staff papers, IMF*, *40*(1), 108-151.

Carlin, Wendy & David Soskice
(2015) *Macroeconomics: Institutions, Instability, and the Financial System*. Oxford University Press, Oxford.

(2005) The 3-Equation New Keynesian Model-A Graphical Exposition. *Contributions to Macroeconomics*, *5*(1), 1-36.

Clarida, Richard, Jordi Gali & Mark Gertler
(1999) The Science of Monetary Policy: A New Keynesian Perspective. *Journal of Economic Literature*, *XXXVII* (4), 1661-1707.

Comisión Económica para América Latina y el Caribe (CEPAL)
2015 CEPALSTAT Base de datos y publicaciones estadísticas, Naciones Unidas.

Dancourt, Oscar
(2009) *Choques externos y política monetaria*. Revista Economía, *XXXII* (64), 127-173. Departamento de Economía de la PUCP. Lima

Díaz Alejandro, Carlos
(1966) *Exchange-Rate Devaluation In A Semi-Industrialized Country. The Experience of Argentina, 1955–1961*. Massachusetts: The MIT Press.

Dornbusch, Rudiger & Paul Krugman
(1976) Flexible Exchange Rates in the Short Run. *Brooking Papers on Economic Activity* N° 3, 537-584.

Fondo Monetario Internacional
(2015) *World Economic Outlook Database,* April. Washington DC.

(2014) *World Economic Outlook, Recovery Strengthens, Remains Uneven*, April, Washington DC.

Galindo, Arturo, Alejandro Izquierdo & José Manuel Montero
(2007) Real Exchange rate, dollarization and industrial employment in Latin America. *Emerging Markets Review* 8 (4), 284-298.

Gruss, Bertrand
(2014) *After the Boom-Commodity Prices and Economic Growth in Latin America and the Caribbean*. IMF Working Paper154.

Izquierdo, Alejandro; Randall, Romero & Ernesto Talvi
(2008) *Booms and Busts in Latin America: The Role of External Factors*, Inter-American Development Bank, Working Paper N° 631.

Krugman, Paul & Lance Taylor
(1978) Contractionary effects of devaluation. *Journal of International Economics* 8(3), 451-456.

Magud, Nicolás & Sebastián Sosa
(2015) Investing in emerging markets. We Are not in Kansas Anymore...Or Are we? IMF Working Paper N° 77.

Mendoza, Waldo
(2015) *Macroeconomía Intermedia para América Latina*. Segunda edición revisada. Fondo Editorial de la Pontificia Universidad Católica del Perú. Lima.

(2013) Milagro peruano: ¿Buena suerte o buenas políticas? *Revista Economía*, *XXXVI*, (72).

(2011) Dinámica macroeconómica con metas de inflación y déficit fiscal. *El Trimestre Económico*, *LXXVIII* (2), 310, 469-86.

Romer, David
(2013) *Short-Run Fluctuations*. Documento de Trabajo, Universidad de California.

(2000) Keynesian Macroeconomics without the LM Curve. *Journal of Economic Perspectives*, *14*(2), 149-169.

Taylor, John
(1993) Discretion versus Policy Rules in Practice. *Carnegie-Rochester Conference Series on Public Policy*, 39, 195-214.

Walsh, Carl
(2002) Teaching Inflation Targeting: an Analysis for Intermediate Macro. *Journal of Economic Education*, *33*(4), 333-346.

ÚLTIMAS PUBLICACIONES DE LOS PROFESORES
DEL DEPARTAMENTO DE ECONOMÍA

Libros

Luis García Núñez
2015 *Econometría 1*. Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Waldo Mendoza
2015 *Macroeconomía intermedia para América Latina. Segunda edición.* Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Ivan Rivera
2014 *Principios de Microeconomía. Un enfoque de sentido común*. Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Máximo Vega-Centeno
2014 *Del desarrollo esquivo al desarrollo sostenible.* Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

José Carlos Orihuela y José Ignacio Távara (Edt.)
2014 *Pensamiento económico y cambio social: Homenaje Javier Iguíñiz.* Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Jorge Rojas
2014 *El sistema privado de pensiones en el Perú.* Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Waldo Mendoza
2014 *Cómo investigan los economistas. Guía para elaborar y desarrollar un proyecto de investigación*. Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Carlos Contreras (Edt.)
2014 *El Perú desde las aulas de Ciencias Sociales de la PUCP.* Lima, Facultad de Ciencias Sociales, Pontificia Universidad Católica del Perú.

Waldo Mendoza
2014 *Macroeconomía intermedia para América Latina.* Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Carlos Conteras (Edt.)
2014 *Historia Mínima del Perú.* México, El Colegio de México.

Ismael Muñoz
2014 *Inclusión social: Enfoques, políticas y gestión pública en el Perú*. Lima, Fondo Editorial, Pontificia Universidad Católica del Perú.

Serie: Documentos de Trabajo

No. 405 "A Stochastic Volatility Model with GH Skew Student's t-Distribution: Application to Latin American Stock Returns". Patricia Lengua Lafosse, Cristian Bayes y Gabriel Rodríguez. Julio, 2015.

No. 404 "Data-Dependent Methods for the Lag Length Selection in Unit Root Tests with Structural Change". Ricardo Quineche Uribe y Gabriel Rodríguez. Julio, 2015.

No. 403 "Modeling Latin-American Stock Markets Volatility: Varying Probabilities and Mean Reversion in a Random Level Shifts Model". Gabriel Rodríguez. Junio, 2015.

No. 402 "Inequality, Economic Growth and Structural Change: Theoretical Links and Evidence from Latin American Countries". Mario D. Tello. Junio, 2015.

No. 401 "Regulación económica de industrias de redes: ¿contractual o administrative?". Gonzalo Ruiz. Mayo, 2015.

No. 400 "Univariate Autoregressive Conditional Heteroskedasticity Models: An Application to the Peruvian Stock Market Returns". Paul Bedon y Gabriel Rodríguez. Marzo, 2015.

No. 399 "Consensus Building and its Incidence on Policy: The "National Agreement" in Peru". Javier Iguiñiz. Marzo, 2015.

No. 398 "Contratos, Curva de Phillips y Política Monetaria". Felix Jiménez. Febrero, 2015.

No. 397 "The consumption of household goods, bargaining power, and their relationship with a conditional cash transfer program in Peru". Luis García. Enero, 2015.

No. 396 "Demanda y oferta agregada en presencia de políticas monetarias no convencionales". Waldo Mendoza. Enero, 2015.

Departamento de Economía - Pontificia Universidad Católica del Perú
Av. Universitaria 1801, Lima 32 – Perú.
Telf. 626-2000 anexos 4950 - 4951
http://www.pucp.edu.pe/economia