

From Lula Growth Spectacle to the Great Recession (2003-2015): Lessons of the management of the macroeconomic tripod and macroeconomic challenges for restoring economic growth in Brazil* ♦

*José Luis Oreiro***

*Luciano D'Agostini****

Abstract: The objective of this article is twofold. First of all we will present a review of the workings of the macroeconomic policy tripod in Brazil since 1999 in order to show that this macroeconomic regime is not capable to assure macroeconomic stability in the medium/long-term due to its incapacity to avoid a persistent over-valuation of real exchange rate and a trend increase in primary expenditures/GDP which produced a return to a regime of fiscal dominance in 2015. After that we will present the foundations of a new macroeconomic policy regime for Brazil that is capable of changing the monetary-fiscal policy mix in the direction required to sustain a competitive and stable real exchange rate in the medium/long-term.

Key-Words: Macroeconomic Policy Regime, Competitive Exchange Rate, Brazilian Economy.

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** Associate Professor at Instituto de Economia, Universidade Federal do Rio de Janeiro, Brazil; and Level IB researcher at CNPq. E-mail: jose.oreiro@ie.ufrj.br.

*** From the Graduate Program in Economics at Instituto de Economia, Universidade Federal do Rio de Janeiro. E-mail: lucianodagostini@yahoo.com.br.

1- Introduction.

From 2003 to 2010 Brazilian economy experienced a period of high growth rates with moderate levels of inflation. Average growth rate of GDP was 4.06% p.y during this period and the average rate of CPI growth was 5.79% p.y. This relatively good macroeconomic performance changed dramatically after 2011. Average growth rate was reduced to 1.59% p.y in the period 2011-2014, a reduction of almost 61% in average growth compared to the previous period. At the same time inflation accelerated to 6.17% p.y. Moreover, for the period 2015-2016 market forecasts for GDP growth showed a contraction of almost 8% in real output, at the same time that average inflation should rise to 7.5% p.y.

This dramatic change in macroeconomic performance was mainly due to the stagnation of industrial output which started at the end of 2010. The combined effects of chronic exchange rate overvaluation - due to the reduction in sovereign risk premium and improvement in terms of trade - and the profit squeeze - due to the wage growth above productivity growth - resulted in a fast reduction of external competitiveness of Brazilian manufacturing sector, inducing a substitution of domestic output for imports. Moreover, the reduction of profit rate in manufacturing sector, due to the reduction in profit margins, resulted in a contraction of investment in new machines and equipment, worsening the productivity problem of Brazilian manufacturing sector.

Federal Government in Brazil tried to solve this problem by the substitution of the *macroeconomic tripod*¹ inherited from the second term of President Fernando Henrique Cardoso (1999-2002) for a new macroeconomic regime, the so-called *New Macroeconomic Matrix*. This *macroeconomic policy regime*² was characterized by an easing of fiscal and monetary policies in order to increase aggregate demand and stimulate growth and capital accumulation. From the second semester of 2011 to the first semester of 2013, nominal interest rates were reduced as well as taxes over manufactured products. The result was a very modest increase in growth rate of GDP in

¹ Some Brazilian economists - as, for example, Fernando Holanda Barbosa - prefer the term "Three pillar macroeconomic strategy" to design the macroeconomic policy regime implemented in Brazil in the second term of Fernando Henrique Cardoso government. However we will use the term "macroeconomic tripod" since it has been used for the majority of Brazilian economists. See Nassif (2015) and Serrano and Summa (2011), among others.

² Based on Herr and Kazandziska (2011), we will define macroeconomic policy regime as the set of goals, targets and instruments of macroeconomic policy and the institutional framework where macroeconomic policies are implemented.

2013 in comparison with 2012, at expense of inflation acceleration and a reduction in the primary surplus of federal government (Oreiro, 2015).

In the second semester of 2013, due to inflationary pressures, Brazilian Central Bank started a process of adjustment in monetary policy, increasing the level of nominal interest rate. This change in monetary policy resulted – combined with the uncertainty generated by the political scandal of corruption inside PETROBRAS – in a growth deceleration in 2014, when Brazilian economy showed a growth rate of only 0.1%. The combined effects of tax reduction, growth deceleration and increase in interest rates resulted in a huge worsening of fiscal position of public sector. Indeed, the primary surplus of 1.8% of GDP in 2013 was transformed into a primary deficit of almost 0.7%. Moreover the nominal deficit increases to almost 7% of GDP at the end of 2014, starting from a level of 3.26% in November of 2013.

As a result of worsening of fiscal position of public sector, Federal Government in the beginning of 2015, had started a fiscal adjustment, designed to stop the continuous increase in the ratio of public debt to GDP. This change in the fiscal policy, combined with a very tight monetary policy had contributed to worsen the growth perspectives of Brazilian economy. Real GDP had felt near 4% in 2015 and market expectations signaled to another contraction of 4% in 2016.

In order to restore growth, it is necessary to recover external competitiveness and profit margins of Brazilian manufacturing sector. This demands the implementation of a new macroeconomic regime that is capable to target real exchange rate at stable, sustained and competitive level. This would require not only a fiscal adjustment, but the elimination of the structural fiscal problem of Brazilian, that is the trend increase in primary expenditures to GDP ratio observed at least since 1999. This structural fiscal adjustment will allow a change in the economic policy mix from a combination of tight monetary policy and easy fiscal policy to a combination of easy monetary policy and tight fiscal policy, resulting in a reduction of nominal and real interest rate and a depreciation of nominal and real exchange rate. Macroeconomic tripod is incapable of accomplish these objectives. That is why a new macroeconomic policy regime is needed in Brazil.

The objective of this article is twofold. First of all we will present a review of the workings of the macroeconomic policy tripod since 1999 in order to show that this macroeconomic regime is not capable to assure macroeconomic stability in the medium/long-term due to its incapacity to avoid a persistent over-valuation of real

exchange rate and a trend increase in primary expenditures/GDP which produced a return to a regime of fiscal dominance in 2015. After that we will present the foundations of a new macroeconomic policy regime for Brazil that is capable of changing the monetary-fiscal policy mix in the direction required to sustain a competitive and stable real exchange rate in the medium/long-term.

This article has seven sections including the introduction and a final appendix.

Section two was devoted to analyze the behavior of Brazilian economy since the implementation of the macroeconomic tripod in the beginning of 1999 to the eruption of world financial crisis of 2008 after the bankruptcy of Lehman Brothers. We shall argue on this section that macroeconomic tripod was not sufficient to avoid the emergence of a fiscal crisis due to self-fulfilling prophecies and neither capable to avoid a noticeable and persistent over-valuation of real exchange rate due to the huge decrease of sovereign risk premium after 2003 and improvement in terms of trade after 2006. .

Section three is dedicated to the analysis of the reaction of Brazilian government to the world financial crisis and the effects of exchange rate over-valuation on the productive structure of Brazilian economy. In particular, we will argue that exchange rate over-valuation due to improvement in terms of trade and trend increase in primary expenditures/GDP resulted in de-industrialization and re-primarization of exports with negative effects over potential growth of Brazilian economy.

Section four analyses the policy responses of Brazilian government, now under the Presidency of Dilma Rouseff, to the deceleration of economic growth after 2011. The substitution of the macroeconomic tripod by the new macroeconomic matrix was incapable to produce a permanent increase in growth rate of GDP and manufacturing output due its incapacity to eliminate the over-valuation problem without inflation acceleration. Moreover the tax exemptions adopted under new macroeconomic matrix contributed to the worsening of fiscal position of Central Government with combined with the recession started in the last quarter of 2014 made Brazilian economy return to a regime of fiscal dominance.

Section five explores the lessons learned from the Brazilian experience with the management of the macroeconomic tripod, arguing that a real exchange rate targeting combined with a structural fiscal adjustment and a fiscal policy rule designed to stabilize real exchange rate at a competitive level are of fundamental importance for macroeconomic stability and to restore economic growth in Brazil.

Section six presents the foundations for a new macroeconomic regime for Brazil. The objectives, targets and instruments of the new regime are laid down, and it is shown that the new regime consistent in the sense of Tinbergen.

Section seven does a summing up of the arguments presented in the article.

In appendix A we present an econometric analysis about Brazil's macroeconomic performance during the period 2003-20015. The analysis reinforced the conclusions obtained in the article.

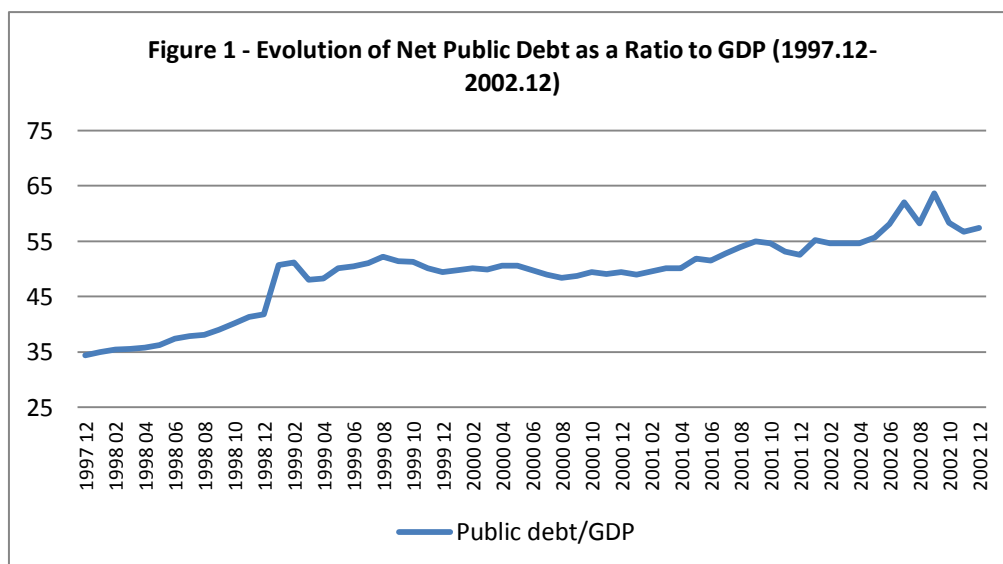
2- The behavior of the Brazilian economy from 1999 to 2008: The macroeconomic tripod and the “growth spectacle” of Lula Era.

In 1999 a new macroeconomic regime was implemented in Brazil, just after a major currency crisis which induced the substitution of the system of exchange rate bands for a system of free floating in January, putting an end to the *exchange rate anchor* designed by Gustavo Franco as President of Brazilian Central Bank as a device for controlling inflation. The new regime was the so-called *macroeconomic tripod*, though as a combination of inflation targeting for monetary policy, a flexible exchange rate system and a fiscal policy oriented to the stabilization and reduction of public debt/GDP ratio towards the achievement of point targets for primary surplus as a ratio do GDP. The theoretical foundation for the tripod was the *new macroeconomic consensus* according to which a low and stable inflation rate is the main or sole objective of macroeconomic policy (Sawyer, 2009). In order to avoid *fiscal dominance*, public debt/GDP must be stabilized or reduced by means of sufficiently large primary surplus/GDP; and to guarantee the required autonomy of monetary policy in face of an open capital account, the exchange rate regime must be one of free floating.

2.1 The operation of the *macroeconomic tripod* in Fernando Henrique Cardoso second term (1999-2002): Fiscal dominance and external fragility.

The new macroeconomic regime was implemented in the beginning of the second term of President Fernando Henrique Cardoso. The immediate objective was to stop the inflation acceleration that resulted from the sudden devaluation of nominal exchange rate in the beginning of 1999. In order to do that it was necessary to replace exchange rate by numerical targets for inflation as the nominal anchor for inflation expectations. Since at that time a large share of public debt was indexed to nominal exchange rate, the devaluation produced a huge increase in public debt/GDP (see Figure 1), increasing the

like hood of fiscal dominance in the near future, reducing inflation expectations would require a change in fiscal policy. Indeed, as we can see in figure 1, until 1998 public sector was incapable to produce primary surplus in the required magnitude to stabilize public debt, which increased from 33,4% of GDP at the end of 1997 to almost 42% of GDP one year after.



Source: IPEADATA. Authors' own elaboration.

The institutional arrangement of inflation targeting regime (hereafter ITR) in Brazil involved the definition of a center and a band for inflation, the headline inflation (measured by IPCA – “Índice de Preços ao Consumidor Amplo”) as the numerical measure of inflation and also a convergence period of one year for inflation rate to reach the target (See Oreiro and Rocha, 2011). Regarding the numerical targets, the implementation of ITR in Brazil supposed the adoption of *declining targets for inflation*, starting from 8% p.y in 1999, until to reach 3,25% p.y in 2003, as we can see in Table I. This means that ITR in Brazil was designed with a *long-run inflation target* of 3,25% p.y, and a strategy of *gradual convergence* of inflation to long-run target by means of declining short-run targets. Finally, a band of 200 b.p. was defined in order to allow monetary policy to accommodate supply shocks within the convergence period.

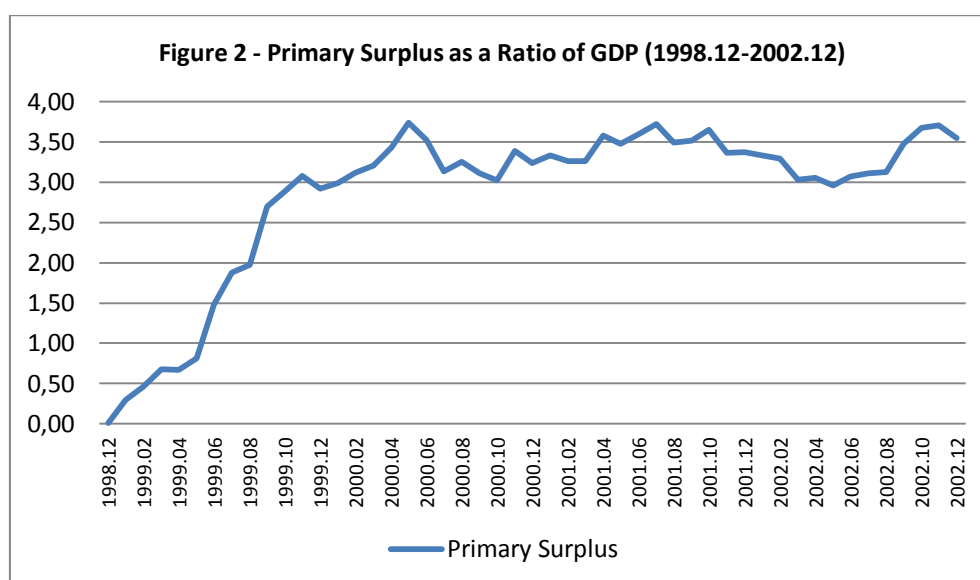
Table I: Targets for Inflation and Inflation Rate (1999-2003)

	1999	2000	2001	2002	2003
Target	8,00	6,00	4,00	3,50	3,25
Band	2,00	2,00	2,00	2,00	2,00
IPCA	8,94	5,97	7,67	12,53	9,30

Source: Amaral (2009). Authors' own elaboration.

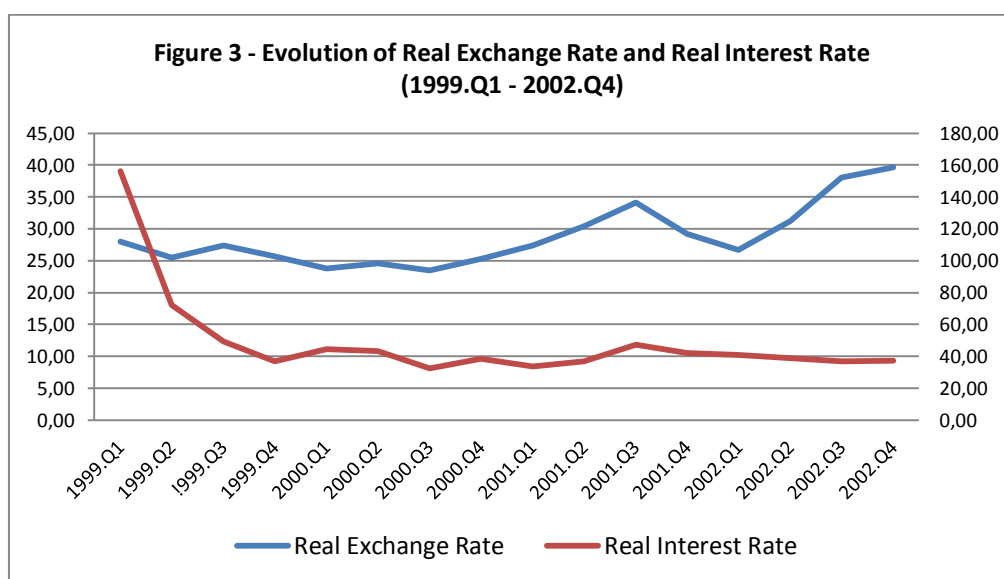
Turning back to fiscal policy, there is a structural break in the mid of 1999. As we can see in figure 2, the primary surplus as a ratio to GDP increased from 0,29% in January to 1,48% in June and then continue to increase until reaching 3% at the end of the year. From that moment on, primary surplus fluctuated around 3,5% of GDP. This fiscal effort was enough to stabilize public debt around 50% of GDP until the first semester of 2001.

This remarkable change in the conduct of fiscal policy was the result of the adoption of targets for primary surplus by the Ministry of Finance. The initial value of the target was set at 3.5% of GDP, value that was considered at that time enough to stabilize the public debt/GDP ratio.



Source: IPEADATA. Authors' own elaboration.

The implementation of the macroeconomic tripod allowed an immediate reduction of real interest rate³ from almost 40% p.y in the beginning of 1999 to more or less 10% p.y at the end of the year. Until the end of Fernando Henrique Cardoso second term real interest rate will remain stable around 10% p.y, despite the growing inflationary pressures after mid-2001. Indeed, as we can see in Table I, inflation rises to 7,67% p.y in 2001, becoming higher than the maximum value (6,5%) allowed by the ITR for that year. The same problem occurred in 2002, when inflation rise to 12,53% p.y, surpassing the maximum value of 5,5% for that year.



Source: Central Bank of Brazil. Authors' own elaboration.

This strange behavior for the real interest rate deserves some explanation. According to the internal logic of ITR, if expected inflation is higher than the target rate, then Central Bank should rise short term nominal interest rate in order to produce an increase in real interest rate above the so-called neutral or natural level. However, despite the strong increase in inflation rates after mid-2001, the real interest rate remained constant. This behavior was probably the result of the re-emergence of the problem of *fiscal dominance* in the second semester of 2001. Due to the effects of economic crisis in Argentina – one of the most important trade partners of Brazil – and the effects of the energy rationing – the so-called “apagão” – growth of real GDP was reduced from 4.36% in 2000 to 1.51% in 2001. This reduction in growth rate of GDP

³ We calculate the real interest rate by deflating the short term interest rate (selic) by the accumulated variation of IPCA in the last 12 months, using the standard formula: $(1 + r) = \frac{(1 + i)}{(1 + \pi)}$, where r is the real rate, i is the nominal rate and π is the inflation rate.

increased the primary surplus that is required to stabilize the public debt/GDP from 3.7% of GDP in January of 2001 to 5,03% of GDP in December of that year (Oreiro, 2004 A, p.92). An increase in real interest rate during the second semester of 2001 would make required primary surplus even greater, probably near 6% of GDP. President Fernando Henrique Cardoso did not have the political support to produce another increase in primary surplus, even more in an economy that was in recession and after a huge devaluation of nominal exchange rate in the beginning of 1999. The solution was to accommodate monetary policy, adjusting short term nominal interest rate just to keep real interest rate constant in face of inflation acceleration. Since monetary policy cannot be adjusted in the proper way to maintain inflation at the target level due to the incapacity of Ministry of Finance to make the required adjustment in the fiscal policy, then Brazil was under a regime of *fiscal dominance*⁴.

Why fiscal dominance re-emerged in Brazil in the mid-2001, two years after a major fiscal adjustment that increased primary surplus from almost zero to 3,5% of GDP? The answer must be found in the *composition of public debt*. In the period 2001-2003 the share of public debt that was indexed by *nominal exchange rate* fluctuated from 37 to 50%, and the share that was indexed by *nominal interest rate*, the so-called *Letras Financeiras do Tesouro (LFTs)*, fluctuated from 40 to 35% (See Amaral and Oreiro, 2008, p. 499). The existence of exchange rate indexed bonds made fiscal solvency dependent on capital flows. In the case of a capital flight, as the one that occurred in 2002, nominal exchange rate would depreciate, increasing the market value of public debt and hence the level of primary surplus that is required to stabilize public debt/GDP ratio. Even if Central Bank reacted to capital flight by means of an increase in nominal interest rate, the presence of LFTs in the public debt would operate in a way to automatically increase the interest payments, thereby increasing the required level of primary surplus. Macroeconomic tripod was incapable to prevent the emergence of fiscal dominance due to the perverse logic of public debt management.

⁴ According to Ornelas and Portugal (2011, p.2): "The economy is under fiscal dominance when the fiscal authority independently determines the current and future budget, defining the share of revenues from bonds and seigniorage (...) Therefore, as the fiscal authority's deficit cannot be financed only by the issuance of new bonds, the monetary authority may be coerced to issue currency and to put up with some inflation"

Fiscal dominance was reinforced by the external fragility of Brazilian economy in that period. Despite the increase in exports after the adoption of a free floating exchange rate regime, the external debt as a ratio to exports remained above 3.5 until the end of Fernando Henrique Cardoso second term (See Table I). Moreover, Brazilian economy exhibited a high level of current account deficit (higher than 4% of GDP until first quarter of 2002) and a low level of international reserves as a ratio to external debt. The high level of Brazilian external debt and current account deficit together with a low level of international reserves made possible a *debt crisis* triggered by self-fulfilling prophecies (See Romer, 2006, pp.607-613). Indeed, as external investors feared a default in the case of Luis Inacio Lula da Silva won the Presidential elections at the end of 2002, a capital flight occurred, resulting in a huge devaluation of exchange rate (see figure 3). The devaluation in exchange rate resulted in a huge increase in the public debt/GDP ratio due to the composition of public debt. The increase in public debt/GDP increased the primary surplus that was required to stabilize public debt⁵, reinforcing fiscal dominance and increasing the probability of default. This movement reinforced the capital flight and exchange rate devaluation, creating a clear positive feedback mechanism.

Table II : Indicators of External Fragility (1999-2002)

	External Debt/GDP	External Debt/Exports	External Debt/Reserves	Current Account/GDP
1999.Q1	30,14%	445,34%	648,36%	-4,50%
1999.Q2	34,65%	482,15%	555,20%	-4,92%
1999.Q3	40,20%	512,24%	562,00%	-4,85%
1999.Q4	45,00%	502,94%	664,43%	-4,72%
2000.Q1	43,86%	484,94%	618,72%	-4,31%
2000.Q2	40,81%	449,19%	821,82%	-4,17%
2000.Q3	39,66%	427,36%	739,36%	-3,95%
2000.Q4	39,22%	428,71%	715,39%	-4,02%
2001.Q1	34,95%	359,16%	593,18%	-4,61%
2001.Q2	36,98%	359,04%	556,68%	-4,73%
2002.Q3	40,34%	372,93%	540,58%	-4,90%
2001.Q4	41,13%	360,57%	585,33%	-4,55%
2002.Q1	42,70%	374,22%	574,00%	-4,01%
2002.Q2	45,82%	403,03%	521,53%	-3,83%
2002.Q3	45,90%	371,07%	554,63%	-2,85%
2002.Q4	46,72%	349,08%	557,10%	-1,71%

Source: Central Bank of Brazil – DEPEC. Authors' own elaboration.

⁵ According to Oreiro (2004 A), the primary surplus required to stabilize public debt/GDP ratio increased from 5.01 in January to 5.9 in September of 2002.

Due to fiscal dominance and external fragility, Brazil's macroeconomic performance after the implementation of the tripod was very disappointing. As we can see in Table III below, the average growth rate of real GDP from the last quarter of 1999 to last quarter of 2002 was only 1.3% p.y. Estimation of output gap using HP filter showed that during this period growth of real GDP is below potential. Indeed the average output gap was -0,56%. Last but not least, average inflation was 7.68% p.y, far above the limits defined by the ITR for 2001 and 2002.

Table III: Macroeconomic Performance of Brazilian Economy (1999-2002)

	Growth of Real GDP	Output Gap	Inflation
1999.Q4	-0,80	1,32	8,94
2000.Q1	1,42	5,55	6,92
2000.Q2	2,45	-3,33	6,51
2000.Q3	2,20	-0,60	7,77
2000.Q4	2,43	1,91	5,97
2001.Q1	3,16	2,74	6,44
2001.Q2	1,87	-2,66	7,35
2001.Q3	1,73	-2,01	6,46
2001.Q4	0,53	-2,22	7,67
2002.Q1	-0,51	-0,88	7,75
2002.Q2	1,00	-5,20	7,66
2002.Q3	2,11	-1,10	7,93
2002.Q4	-0,72	-0,76	12,53
Average	1,30	-0,56	7,68

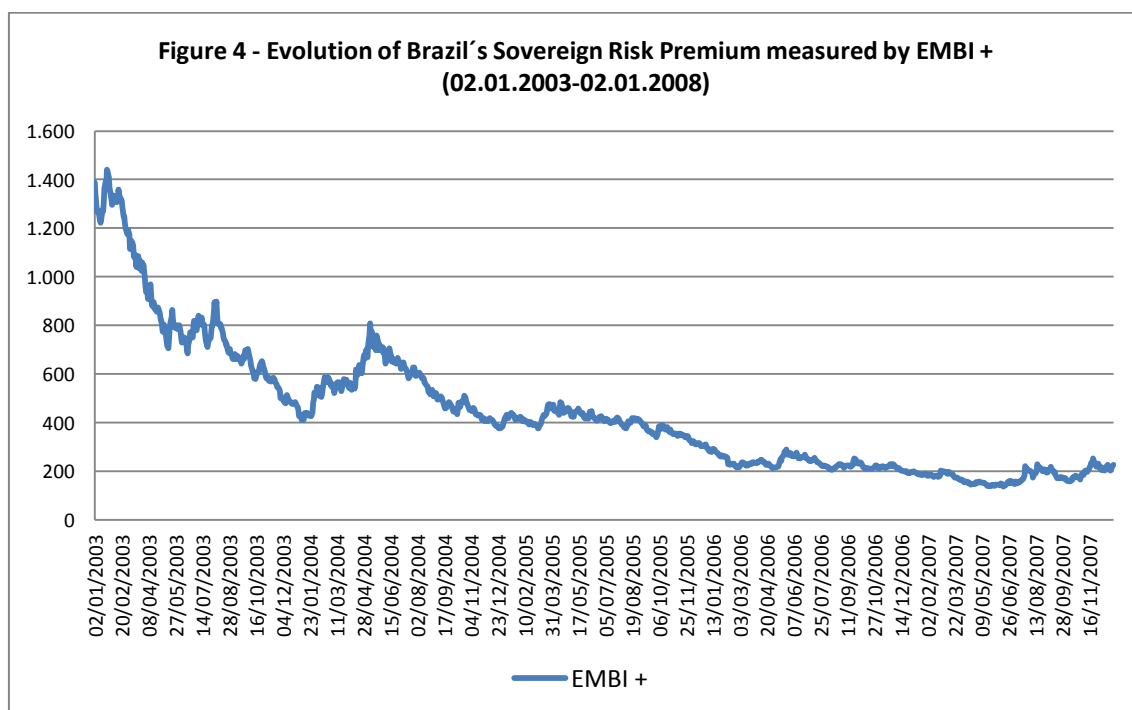
Source: Central Bank of Brazil. Authors' own elaboration.

2.2 The Emergence of Flexible Macroeconomic Tripod and the Growth Spectacle of Lula Era (2003-2008).

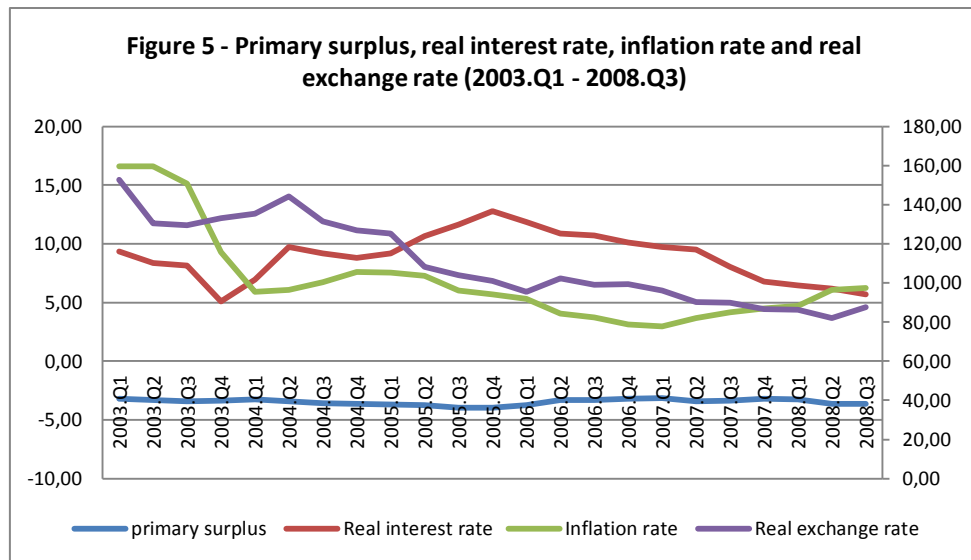
At the end of 2002, Luiz Inacio Lula da Silva from *Partido dos Trabalhadores* (PT) was elected President of Brazil. Despite the expectations of left-wing economists in Brazil, Lula decided to maintain the *macroeconomic tripod* inherited from Fernando Henrique Cardoso administration. The appointment of Henrique Meirelles as chairman of Brazilian Central Bank and Antonio Palocci as Minister of Finance was interpreted by financial markets as a clear compromise of Lula with the operation of the Tripod. Primary surplus was maintained at more or less 3.5% of GDP and Central Bank had

freedom to increase short term nominal interest rate in face of the inflation acceleration observed in the beginning of 2003. These developments lead to a reversal of expectation of default on external debt, producing a remarkable reduction on EMBI+ for Brazilian bonds (see Figure 4) and making exchange rate appreciate (figure 5). The appreciation of exchange rate allowed a gradual reduction in inflation rate at the end of 2003.

Due to the huge increase of inflation rate at the end of 2002 and beginning of 2003 – caused by the strong devaluation of exchange rate that resulted from the capital flight in the mid-2002 – the *National Monetary Council* (“Conselho Monetário Nacional”, hereafter CMN) had decided to change the inflation target for the years 2003 and 2004. The target for 2003 was set at 4,0% and for 2004 was set at 5,5%. For the years 2005 and 2006 the target was set at 4,5% p.y. Together with a change in the target inflation, CMN had decided to increase the band for inflation from 2,0 to 2,5%. These changes meant the CMN under Lula government decided to adopt a more flexible version of ITR, starting a gradual flexibilization of the macroeconomic tripod that will be reinforced after 2006. This flexibilization in ITR, combined with the exchange rate appreciation, allowed the Central Bank to ease monetary policy, reducing real interest rate to its lowest level in the last quarter of 2003.



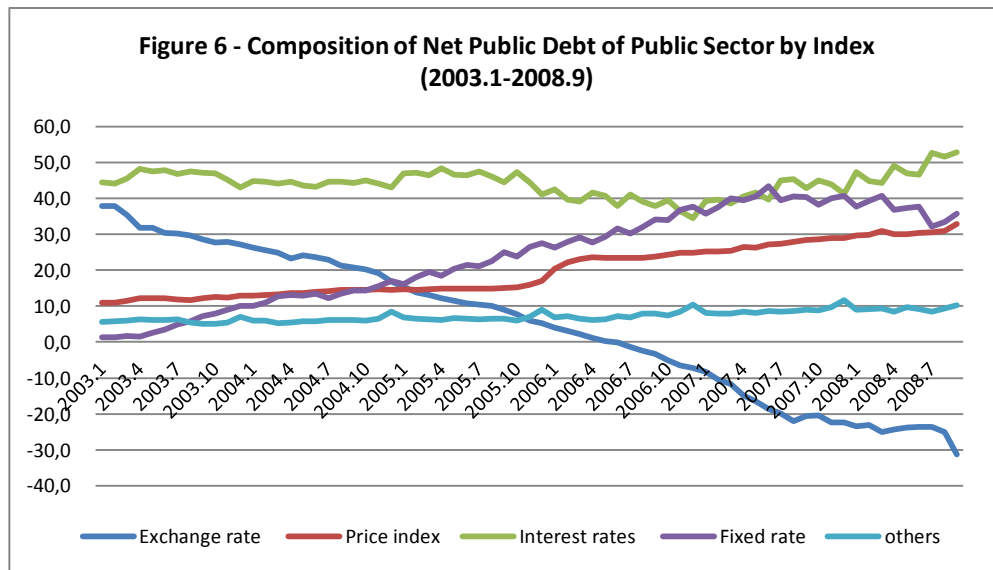
Source: Central Bank of Brazil. Authors' own elaboration.



Source: Central Bank of Brazil. Authors' own elaboration.

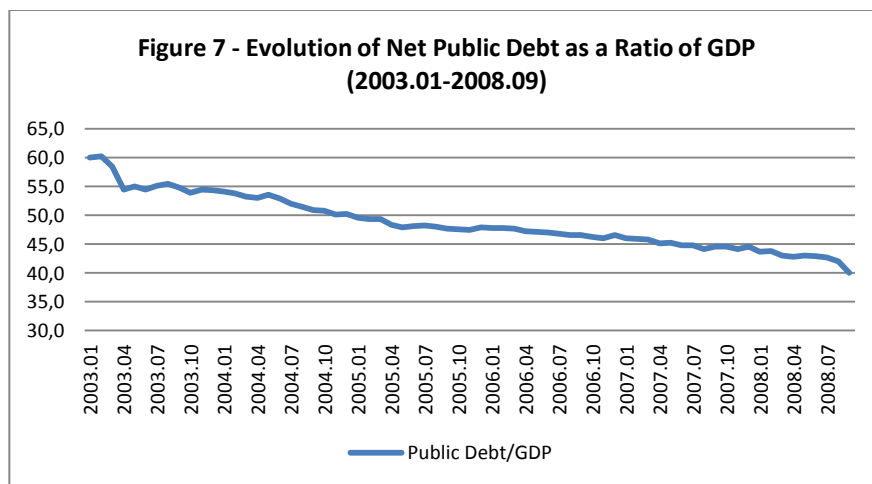
We saw in last section that the major problems for the operation of Macroeconomic Tripod under Fernando Henrique Cardoso government were fiscal dominance and external fragility. Both problems were solved under Lula government, the first one due to a change in the *public debt management*, the other due to the *boost in exports* after 2003.

In the beginning of 2003, National Treasury ("Tesouro Nacional") started a policy of reducing the share of public debt that was indexed by nominal exchange rate. These bonds were gradually substituted for fixed rate bonds (See figure 6). This means that the conditions for a self-fulfilling debt crisis, as the one that happened in 2002, were slowly being erased. In the mid of 2006, due to the accumulation of foreign reserves, Brazilian government became a net external creditor, meaning that a devaluation caused by a capital flight will decrease market value of public debt in domestic currency, thus making impossible the occurrence of a self-fulfilling debt crisis. Fiscal dominance was removed from the horizon in the near term.



Source: Central Bank of Brazil. Authors' own elaboration.

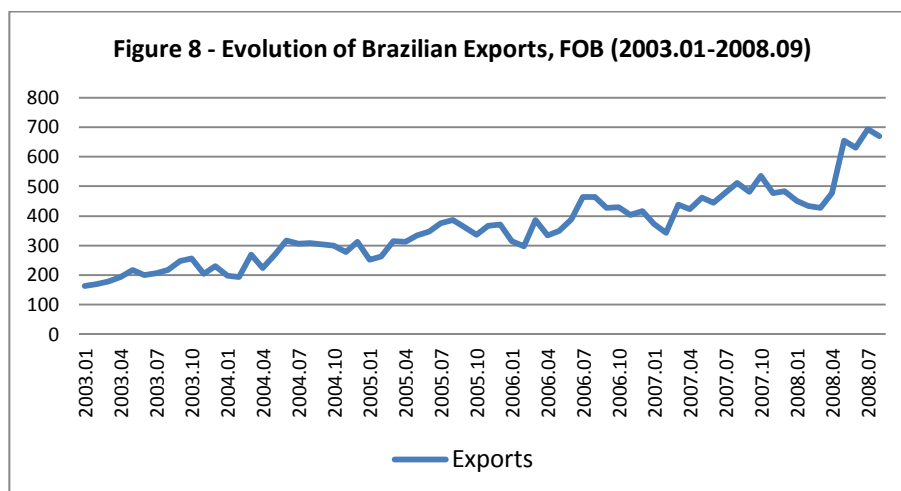
The combined effects of the change in the composition of public debt toward a higher share of fixed rate bonds (and a lower share of exchange rate indexed bonds), exchange rate appreciation and reduction of real interest rate produced a sharp decline in the (net) public debt/GDP ratio (figure 7), reducing the probability of default and allowing the emergence of a regime of *monetary dominance*.



Source: IPEADATA. Authors' own elaboration.

The external fragility of Brazilian Economy observed in the second term of Fernando Henrique Cardoso government begun to be reduced after 2003 due to a huge increasing in the value of exports. As we can see in figure 8 below, from January of 2003 to September of 2008, the value of Brazilian exports in American dollars had increased 316.05% or 63.21% p.y during the period. This number is much higher (more

than four times higher) than the more modest 78.01% of increase observed from January of 1999 to December of 2002.



Source: IPEADATA. Authors' own elaboration. Note: 1999.01=100.

The impact of this huge increase in exports can be seen in the indicators of external fragility presented in Table IV. Regarding the current account, the deficit of 0.89% of GDP in the first quarter of 2003 was transformed into a surplus of 1.71% of GDP in the first quarter of 2005, a net change of 2.6% of GDP in only two years. The debt to exports ratio was reduced from 340% to 200% in the same period. Last but not least, reserves as a ratio of exports increased from 19.7% in the beginning of 2003 to 30.7% in the first quarter of 2005, an increase of 55.8% in two years. From 2005 to 2008, all indicators of external fragility except current account/GDP continue to improve. The operation of macroeconomic tripod was no longer restricted by financial fragility as it were during Fernando Henrique Cardoso second term.

Table IV – Indicators of External Fragility (2003.Q1-2008.Q3)

	Debt/GDP	Debt/Exports	Reserves/Debt	C.A/GDP
2003.Q1	41,5%	340%	19,7%	-0,89%
2003.Q2	41,3%	320%	21,9%	0,18%
2003.Q3	40,6%	320%	24%	0,59%
2003.Q4	38,8%	290%	22,9%	0,67%
2004.Q1	37,0%	280%	24,2%	0,9%
2004.Q2	34,0%	250%	24,2%	1,24%
2004.Q3	31,9%	220%	24,5%	1,5%
2004.Q4	30,3%	210%	26,3%	1,7%
2005.Q1	28,2%	200%	30,7%	1,71%
2005.Q2	22,1%	180%	31,3%	1,56%
2005.Q3	19,2%	160%	31,1%	1,49%
2005.Q4	17,9%	140%	31,7%	1,52%
2006.Q1	17,9%	140%	35,9%	1,32%
2006.Q2	16,0%	120%	40%	1,11%
2006.Q3	15,4%	120%	46%	1,21%
2006.Q4	15,9%	130%	49,7%	1,18%
2007.Q1	15,8%	130%	60,2%	0,99%
2007.Q2	15,7%	130%	76,9%	1,01%
2007.Q3	15,1%	130%	83,4%	0,45%
2007.Q4	14,1%	120%	93,3%	0,03%
2008.Q1	14%	120%	96,8%	-0,73%
2008.Q2	13,6%	120%	97,7%	-1,27%
2008.Q3	13,2%	110%	98,2%	-1,67%

Source: Central Bank of Brazil. Authors' own elaboration.

Despite the improvement in the macroeconomic performance in the first term of Lula government, real interest rate was still in very high levels. As a matter of fact, short term real interest rate hit a level of 12.8% p.y in the last quarter of 2005 (Figure 4), making accumulated inflation in 2006 (3.14%) to become lower than the target of 4.5% for that year. On the other hand, real interest rate at a very high level, combined with the reduction of the country risk premium as measured by EMBI+, resulted in exchange rate appreciation due to simple arbitrage. From the first quarter of 2003 to the last quarter of 2005, real exchange rate appreciated 33.98%. According to some studies about exchange rate misalignment, as the one of Oreiro, Punzo and Araujo (2012), real exchange rate in Brazil started to become overvalued in second quarter of 2004, reaching a level of 18% of overvaluation in the last quarter of 2007. The overvaluation of real exchange rate begun to reduce the current account surplus as a ratio to GDP,

which had fallen from 1.71% in the first quarter of 2005 to 0.99% in the first quarter of 2007, a reduction of 0.72% of GDP in only two years.

The substitution of Antonio Palocci for Guido Mantega in the Ministry of Finance in March of 2006 gave start to a process of gradual flexibilization in the operation of macroeconomic tripod, i.e. a gradual easing of fiscal and monetary policy. From March 2006 to September of 2008 the macroeconomic tripod was flexibilized by means of a reduction in the primary surplus as a ratio to GDP, the end of declining targets for inflation and the mass accumulation of international reserves by Brazilian Central Bank. As a matter of fact, primary surplus as a ratio to GDP fallen from 3.61% of GDP in the average of period 2003/01-2006/03 to 3.41% of GDP in the average of period 2006/04-2008/09. In 2006 the CMN had set the target inflation in 4.5% p.y, holding it at this level from that moment on. Finally, Central Bank of Brazil began to make *sterilized interventions* in exchange rate market by means of buying an enormous quantity of international reserves and sterilizing its effects over high powered money by selling Treasury bonds in Repurchase Agreements (Repo) operations. As can be seen in Table V, international reserves had grown at a rate of 50.7% in 2006 and 97.98% in 2007, reaching more than US\$ 206 Billion in September of 2008; while Repo increased from 1.7% of GDP in 2005 to 10.4% of GDP in 2008 (Table VI).

Table V: Change of International Reserves

	$\Delta\%$
2003	27%
2004	-1%
2005	0%
2006	51%
2007	98%
2008	10% (*)

Source: Central Bank of Brazil. Authors' own elaboration. (*) Until September.

Table VI – Evolution of Repurchase Agreement Operations (2002-2008)

	Repo (in R\$ millions)	Repo as % of GDP
2002	77089	4,40%
2003	65810	3,80%
2004	58892	2,90%
2005	37168	1,70%
2006	77367	3,20%
2007	187416	6,70%
2008	325155	10,40%

Source: Central Bank of Brazil. Authors' own elaboration. Note: measured in December of each year.

This huge accumulation of international reserves meant that the free floating exchange rate regime was substituted by a *de facto* **managed exchange rate regime**, although without an explicit or even an implicit target for nominal exchange rate. The objective of the new exchange rate regime seemed to be to reduce and eventually stop the process of real exchange rate appreciation⁶. Indeed, the pace of exchange rate appreciation was greatly reduced after 2006. Between the first quarter of 2003 to last quarter of 2005, real exchange rate depreciated 33.98%, this rhythm of appreciation was reduced to just 8.06% in the period 2006.Q1 to 2008.Q3.

Another important element in the process of flexibilization of the Tripod is *wage policy*, more precisely, the policy for minimum wage. Between January of 1999 and February of 2006, minimum wage had an increase of 30.87% in real terms or an average real increase of 4.44% during this period. From March of 2006 to February of 2008, however, minimum wage had a real increase of 16.82%, i.e. a real increase of 8.4% p.y. during the entire period, almost twice of the increase observed in the last period. This

⁶ At this point a theoretical discussion is needed. According to the policy trilemma of Robert Mundell it is impossible to have at the same time capital mobility, autonomous monetary policy and managed exchange rate. Since Brazil had an open capital account and an inflation targeting regime, then a managed exchange rate was not a policy option. In this setting making sterilized interventions in exchange rate markets could only be ineffective over the level of nominal exchange rate (See Garcia, 2011). The first problem with this trilemma is that it does not consider the possibility of some sort of compromise between these options. For instance, a country may decide to impose some capital controls in order to have an autonomous monetary policy with a managed exchange rate (Bresser-Pereira, Oreiro and Marconi, 2014, p. 152). Besides that, emerging countries like Brazil are very far to have perfect capital mobility in Mundell's sense. Capital account in Brazil is better characterized by imperfect capital mobility, due to the remaining capital controls (for instance, domestic currency, the REAL, is not convertible) and imperfect substitution between domestic and foreign bonds. Under these circumstances it is perfectly possible for the Central Bank to control the quantity of money (or interest rate) and nominal exchange rate at the same time (See Montiel, 2011, chapters 6-8).

acceleration of the rate of increase in minimum wage was due to a wage rule that President Lula negotiated with Labor Unions in 2007. According to this rule, the rate of increase in minimum wage from one year to the other will be equal to the rate of inflation observed in the last year plus the growth rate of real GDP observed two years before. The implicit objective of such a rule was to induce an increase in the wage share, due to the fact that real wages are expected to increase at rate higher than labor productivity. This should produce an improvement in income distribution and also boost effective demand through the effect of increasing wage share over consumption expenditures. The increased consumption expenditures should induce capital accumulation by private sector due to the traditional accelerator effect. The final result should be an increase in investment rate and hence an increase of growth rate of potential output.

All these elements allowed us to conclude that the *flexible tripod* implemented in the period 2006-2008 had more objectives than only price stability as the *macroeconomic tripod* of Fernando Henrique Cardoso second term. Indeed, flexible tripod should achieve also a higher rate of growth (due to income redistribution effects of minimum wage policy), stability of real exchange rate and a higher wage share.

The macroeconomic performance of Brazilian economy in the period 2003-2008 was far superior than the one observed in the second term of President Fernando Henrique Cardoso (hereafter FHC II). As we can see in Table VII, average growth rate of real GDP was increased to 4.1% (compared to 1.3% of FHC II) and the average inflation was reduced to 6.91% (compared to 7.68% of FHC II). If during FHC II Brazilian economy had grown below potential (output gap was -0.56%), in Lula era Brazilian economy grown above potential (0.26% of output gap).

The growth performance of Brazilian economy in this period – called “growth spectacle” by President Lula – allowed a remarkable reduction in unemployment rate. Indeed, President Lula first term had started with an unemployment rate of 12.5%. After reaching a peak of 13.10% of labor force in the first quarter of 2004, unemployment rate began to fall, reaching 7.5% of labor force in the third quarter of 2008.

In table VII we can also see that the macroeconomic performance under flexible tripod was clear superior than the one observed under “pure” macro tripod inherited from FHC II. As a matter of fact, growth rate is higher (5.75% p.y compared to 2.6%

p.y), average inflation is lower (4.41% p.y compared to 9.2% p.y) and also unemployment rate (9.16% compared to 11.18%).

Table VII - Macroeconomic Performance of Brazilian Economy (2003-2008)

	Growth of Real GDP	Output Gap	Inflation	Unemployment
2003.Q1	-3,20	1,26	16,57	12,50
2003.Q2	-3,34	-2,28	16,57	12,80
2003.Q3	-1,92	0,03	15,14	13,00
2003.Q4	3,66	1,75	9,30	11,70
2004.Q1	5,79	3,84	5,89	13,10
2004.Q2	5,97	-3,05	6,06	11,20
2004.Q3	5,10	1,94	6,70	10,50
2004.Q4	4,08	3,70	7,60	10,20
2005.Q1	4,33	4,73	7,54	10,80
2005.Q2	3,34	-3,34	7,27	9,50
2005.Q3	3,90	0,63	6,04	9,60
2005.Q4	3,47	0,87	5,69	9,30
2006.Q1	3,52	3,15	5,32	10,40
2006.Q2	4,61	-4,74	4,03	10,80
2006.Q3	5,20	-2,78	3,70	9,80
2006.Q4	6,06	0,28	3,14	9,30
2007.Q1	7,51	3,25	2,96	10,20
2007.Q2	7,49	-3,39	3,69	9,50
2007.Q3	6,95	-0,27	4,15	8,70
2007.Q4	6,25	-0,40	4,46	8,00
2008.Q1	5,66	1,88	4,73	8,50
2008.Q2	4,48	-3,01	6,06	8,10
2008.Q3	5,50	1,85	6,25	7,50
(2003-2008)	4,10	0,26	6,91	10,22
(2003-2005)	2,60	0,84	9,20	11,18
(2006-2008)	5,75	-0,38	4,41	9,16

Source: Central Bank of Brazil. Authors' own elaboration.

What is the cause of growth acceleration under Lula government? The main cause of growth acceleration is the astonishing increase of 316.05% in the value of exports during this period. The growth of exports not only represents a source of growth of autonomous demand – capable by its own to increase the growth rate of GDP – but also allowed a substantial improvement in the indicators of external fragility, allowing a reduction in *sovereign risk premium* (as measured by EMBI+ index, see figure 4) and thus a decrease in equilibrium value of real interest rate (see section 3). As a matter of

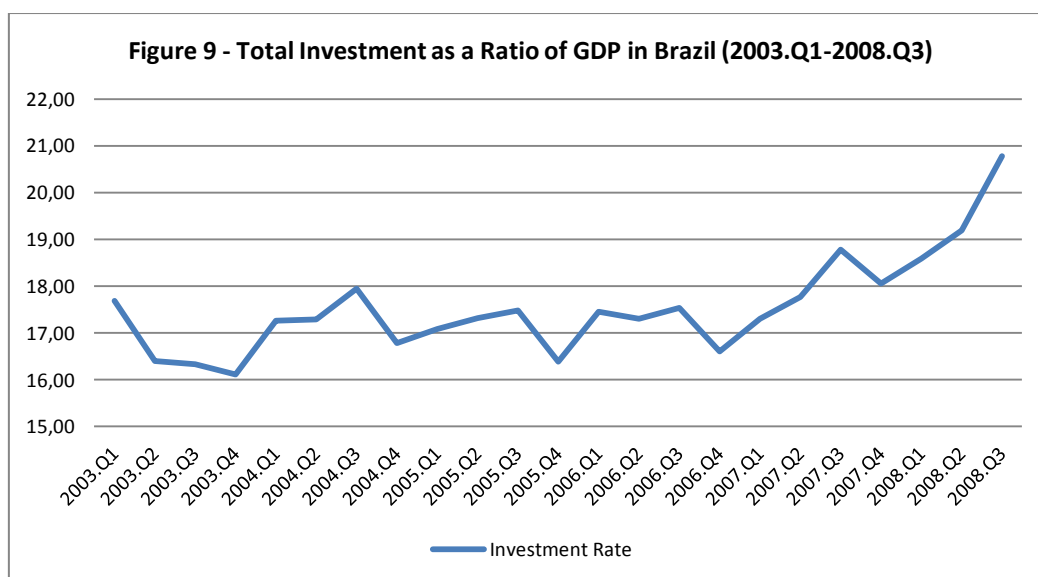
fact, as we can see in Table VIII, average real interest rate was reduced from 12.31% in the period 1999-2002 to 8.95% in the period 2003-2008. After the adoption of the so-called flexible tripod, the reduction was even greater, to 8.72% in the period 2006-2008 compared to 9.16% in the period 2003-2005.

Table VIII – Short-Term Real Interest Rate

Period	Average Real Rate
1999-2002	12,31%
2003-2005	9,16%
2006-2008	8,72%
2003-2008	8,95%

Source: Central Bank of Brazil. Authors' own elaboration.

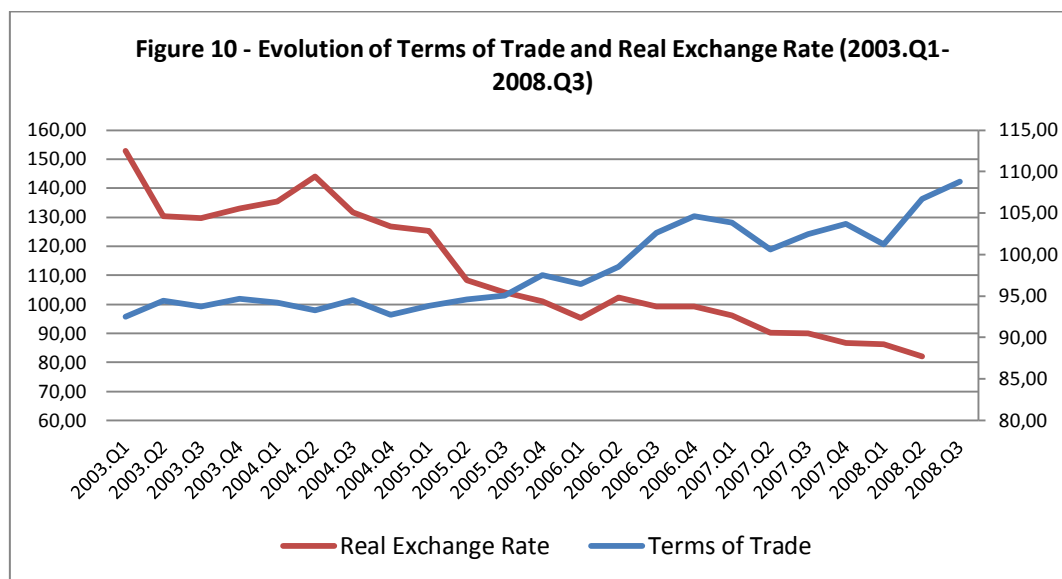
The reduction in the safe real rate of interest allowed a reduction in the cost of capital that, combined with the expansion of aggregate demand due to the massive increase of exports, induced a *boost* of investment as we can see in figure 9.



Source: Central Bank of Brazil. Authors' own elaboration. Note: At current prices.

It is important to notice that export performance of Brazilian economy until third quarter of 2005 was not due to an improvement in the *Terms of Trade*. As we can see in Figure 10, from the first quarter of 2003 until third quarter of 2005, the index of terms of trade remained almost constant (left axis) around a level of 95. A modest improvement of 12.79% in terms of trade would only begin in the first quarter of 2006,

when the index of terms of trade increased from 96.45 to 108.75 at the end of the period⁷.



Source: Central Bank of Brazil. Authors' own elaboration.

The export performance of Brazilian Economy from first quarter of 2003 to last quarter of 2005 was mostly due to the level of real exchange rate, that remained under-valued at least the end of 2004 (See Oreiro, Punzo and Araujo, 2012, p. 926), and the strong growth of world economy during this period. These factors, combined with the improvement in terms of trade after 2006, resulted in a huge increase in the quantum of exports, either in primary as in manufacturing and semi-manufacturing products, as we can see in Table IX.

⁷ It is noteworthy to see in figure 10 that until the third quarter of 2005, real exchange rate appreciation can't be the result of the improvement in the *terms of trade*. As a matter of fact, during this period terms of trade remained practically constant, but real exchange rate appreciated almost 38%. Exchange rate appreciation is mainly due to the strong reduction in country risk premium occurred in this period (see Figure 4).

Table IX – Evolution of Quantum and Prices of Exports in Brazil (2003-2008)

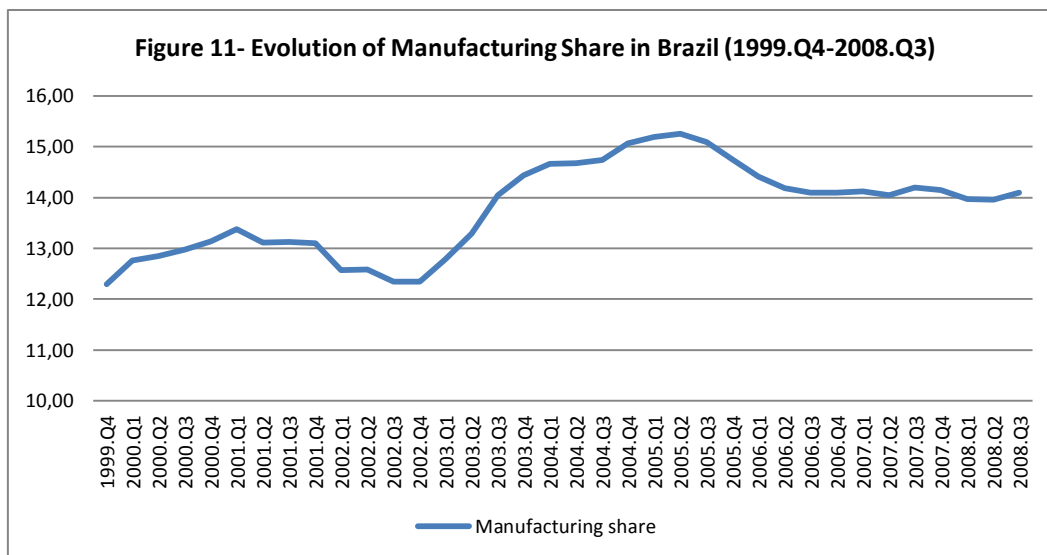
	Quantum	Prices
Primary	44.2%	139.1%
Manufactured	40.0%	66,5%
Semi-Manufactured	17.7%	110,01%

Source: FUNCEX. Authors' own elaboration.

Minsky once stated that “stability is destabilizing”. In the case of Brazilian economy, however, may be it is more precise to say that “growth is destabilizing”. As a matter of fact, during the period 2003-2008 the growth acceleration in Brazil was followed by a huge appreciation of real exchange rate (Figure 10). If, on one hand, exchange rate appreciation allowed a sharp decrease in the rate of inflation, that reached 3.14% in 2006; then, on the other hand, it induced a change in the current account from a *surplus* of 1.71% of GDP in the first quarter to 2005 to a *deficit* of 1.67% of GDP in the third quarter of 2008 (See Table IV). Once again Brazil returned to the *Growth with Foreign Savings Model* that characterized Fernando Henrique Cardoso government (1995-2002)⁸.

Up to third quarter of 2008, real exchange rate appreciation did not seem to produce any serious harm to the performance of Brazilian manufacturing sector. As we can see in figure 11 bellow, the manufacturing share in GDP increased from 12.34% in the last quarter of 2002 to 14.09% in the third quarter of 2008. However, compared to the third quarter of 2005, manufacturing share had fallen almost 1.0% of GDP, from 15.09% to 14.09%. It is noteworthy that this decreasing in the manufacturing share occurred almost at the same time of the reversion in the current account from surplus to deficit and the growth acceleration in period 2006-2008 (see tables IV and VII). These are clear signs that manufacturing sector was losing its dynamism due to the behavior of real exchange rate. Sooner or later these problems in the manufacturing sector will cause a permanent reduction on the growth rate of Brazilian economy.

⁸ For an exposition and critique of the *Growth with Foreign Savings Model* see Bresser-Pereira, Oreiro and Marconi (2014, chapter 8).



Source: IPEADATA. Authors' own elaboration. Note: Moving average of last four quarters.

Another consequence of real exchange rate over-valuation and improvement in the terms of trade was a change in the composition of exports towards primary products. As we can see in Table X bellow, the share of primary products in the value of exports increased from 29.46% in 2003 to 37.88% in 2008. At the same time, the share of manufactured products was reduced from 55.30% to 48.07%. Brazilian economy seemed to becoming again a primary-export economy.

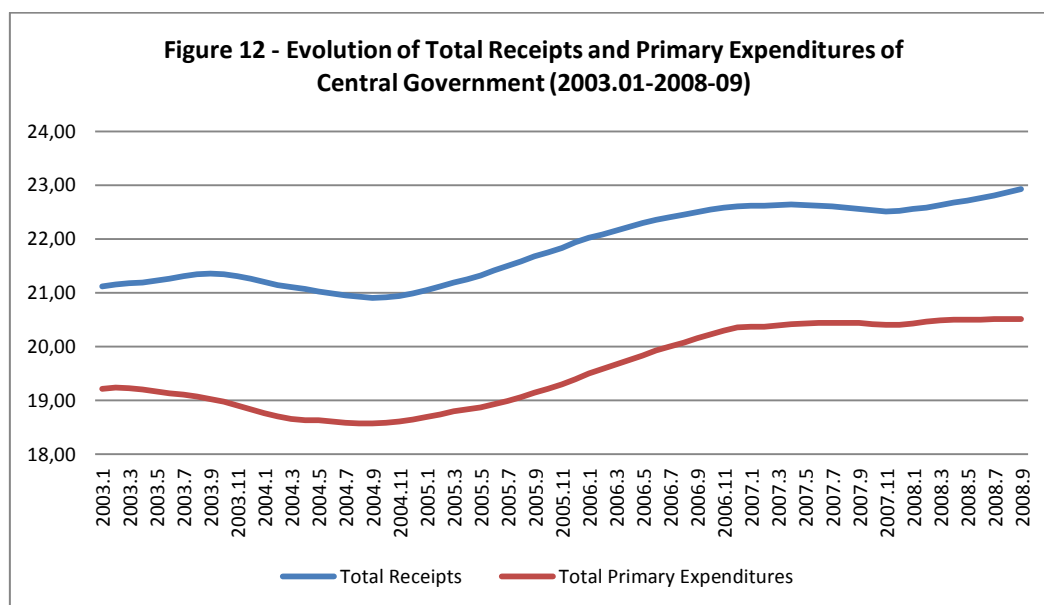
Table X – Composition of Brazilian Exports (2003-2008)

	2003	2004	2005	2006	2007	2008
Primary	29.46%	29.99%	29.92%	29.87%	32.79%	37.88%
Manufactured	55.30%	55,87%	56.32%	55.64%	53.35%	48.07%
Semi- Manufactured	15.22%	14.12%	13.75%	14.48%	13.85%	14.04%

Source: FUNCEX. Authors' own elaboration.

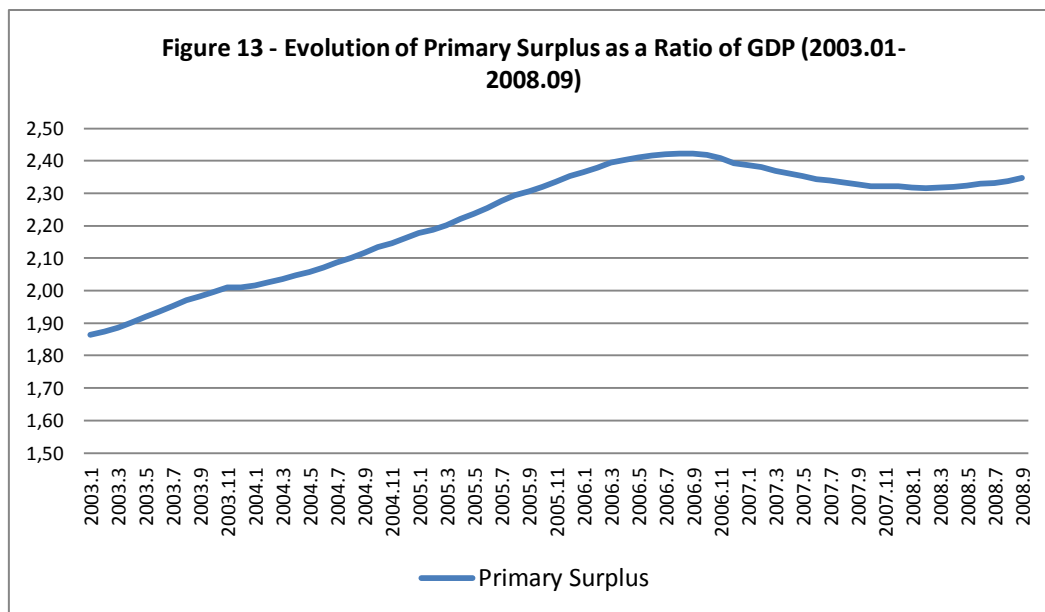
Besides the appreciation of real exchange rate, another weakness of Brazilian economy during this period is the growing trend of primary expenditures of central government as a ratio to GDP. As we can see in figure 12 below, primary expenditures increased from an average of 19.23% of GDP in January of 2003 to 20.51% of GDP in September of 2008, an increase of more than 2% of GDP in just five years. Due to fast economic growth observed in this period, the increase in primary expenditures as a ratio to GDP was matched by an increase of 1.78% of GDP in total receipts, from 21.15% of GDP in January of 2003 to 22.93% of GDP in September of 2008. The increase in total

receipts in a rate almost as large as primary expenditures allowed *Central Government* to sustain its primary surplus above 2% of GDP at the end of the period 2003-2008 (figure 13), avoiding a return to a regime of fiscal dominance.



Source: Central Bank of Brazil. Authors' own elaboration. Note: Moving average of the last 12 months.

The trend growth of primary expenditures as a ratio to GDP observed in this period was a clear announce of the existence of *structural fiscal problem*. First of all, a situation where primary expenditures were growing at a rate bigger than real GDP was unsustainable in the long run, since primary expenditures/GDP ratio would reach 100% in finite time. In second place, even it was possible to sustain an increase in the primary expenditures/GDP for a long time without any major problems, the maintenance of a primary surplus/GDP in the level required for the stabilization/reduction of public debt/GDP would demand that total receipts of central government should also grow at a rate higher than GDP, in order for total receipts/GDP to match the increase in the primary expenditures/GDP. Since in the long run it is reasonable to suppose that the elasticity of total receipts to GDP is equal to one; than such a path for total receipts would require a continuous increase in tax burden, which is also unsustainable.



Source: Central Bank of Brazil. Authors' own elaboration. Note: Moving average of the last 12 months

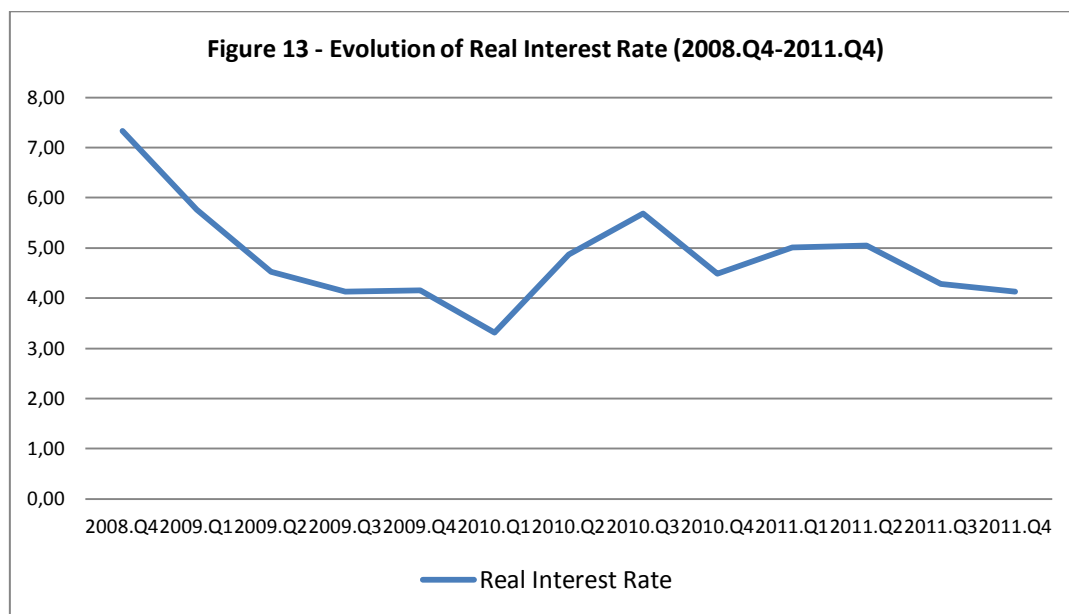
Summing up, Brazilian economy at the third quarter of 2008 had two major problems. A growing *over-valuation of real exchange rate* that was beginning to reduce the dynamism of manufacturing sector and a *structural fiscal problem* that could produce a return to the regime of *fiscal dominance* in the medium run.

3 - From 2008 Financial Crisis to Recovery and Stagnation: Dutch disease and deindustrialization of Brazilian economy (2008-2011).

The world financial crisis of 2008 started after the bankruptcy of Lehman Brothers in 15 of September of that year produced a new round of flexibilization of macroeconomic tripod. Facing a fall of almost 30% of industrial output and 14% in GDP occurred in the last quarter of 2008 (Oreiro and Araújo, 2009), Brazilian government reacted by means of a *strong fiscal expansion*⁹, followed some months after by a considerable easing of monetary policy. At the same time, public banks (*Banco do Brasil* and *Caixa Econômica Federal*) made a considerable increase in their credit lines in order to solve the credit crunch appeared after the collapse of international financial markets in September 2008. The combined effects of fiscal, monetary and credit expansion allowed Brazilian economy to recover quickly from 2008 crisis, exhibiting a growth rate of 7.6% of GDP in 2010.

⁹ According to data of National Treasury, between 2008 and 2009, primary expenditures of federal government increased R\$ 74.28 billion, an increase of 14.91% in nominal terms.

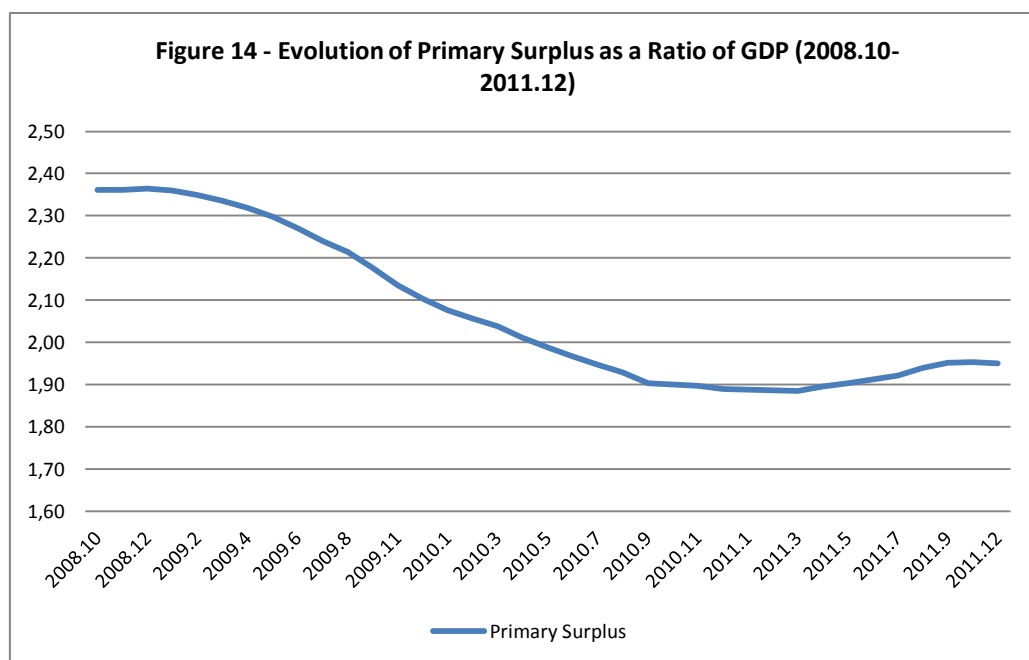
The easing of monetary policy had begun only in January of 2009, almost four months after the bankruptcy of Lehman Brothers¹⁰. As we can see in figure 13 below, real interest rate fallen from 7.33 % p.y in the last quarter of 2008 to 4.13% in the third quarter of 2009, a decrease of more than 300 b.p. The easing of monetary policy would continue up to the first quarter of 2010, when real interest rate reached 3.31% p.y, the lowest level since 1995.



Source: Central Bank of Brazil. Authors's own elaboration.

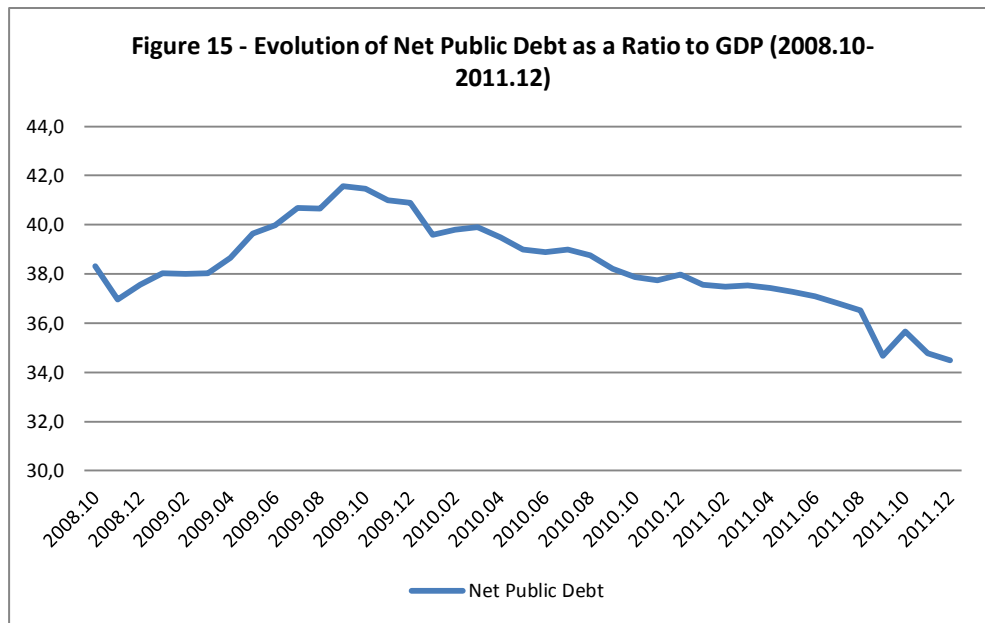
At the same time that Central Bank of Brazil was conducting an easing of monetary policy, Ministry of Finance conducted an easing of fiscal policy by means of reducing the primary surplus as a ratio to GDP (figure 14). As we can see in figure 14 below, the 12 month-moving average of primary surplus/GDP ratio was reduced from 2.36% of GDP in October of 2008 to 1.9% of GDP in September of 2010.

¹⁰ Despite the flexibilization of Inflation Targeting Regime in 2006, Central Bank of Brazil continued to exhibit a very strong inflation aversion until 2011, what explain its almost irrational reluctance in reducing short-term interest rate in the last quarter of 2008 in face of world financial crisis (See Oreiro and Basilio, 2011, p.252-254).



Source: Central Bank of Brazil. Authors' own elaboration. Note: Moving average of last 12 months.

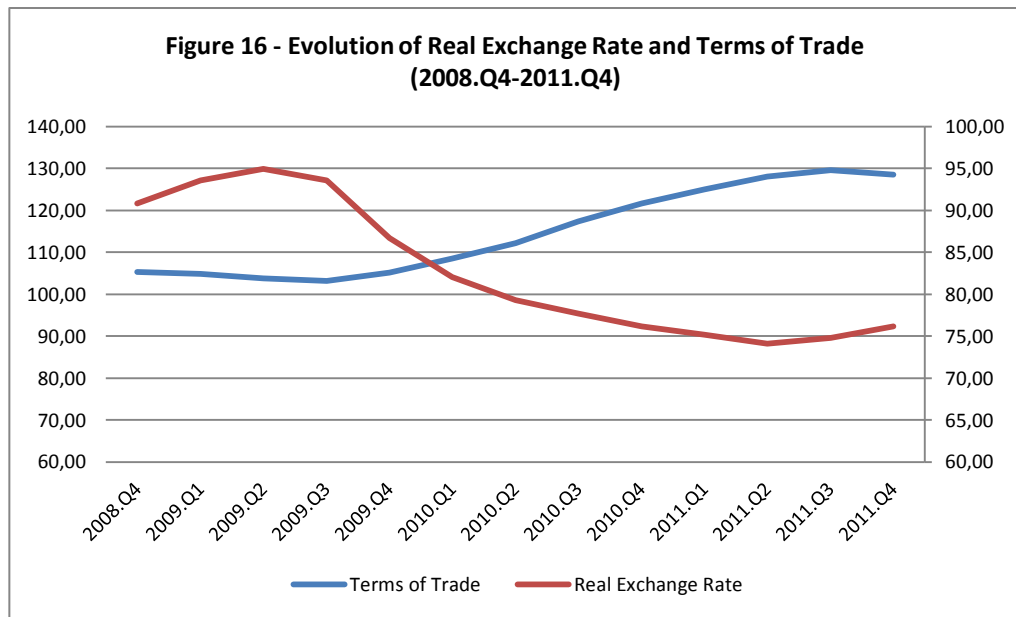
Despite fiscal expansion engineered by the Ministry of Finance in order to couple with the effects of world financial crisis over Brazilian economy, the net public debt as a ratio to GDP had continued falling (figure 15), showing that the primary surplus generated by Public Sector was higher than the level required to stabilize public debt. The strong reduction of real interest rate due to monetary policy easing together with the growth acceleration in 2010 had reduced the required level of primary surplus/GDP below the effective level. In other words, *fiscal space* in Brazil had increased in the period 2008-2011, allowing a *simultaneous* reduction of primary surplus and public debt (as a ratio to GDP).



Source: Central Bank of Brazil. Authors' own elaboration.

Just after the bankruptcy of Lehman Brothers, nominal exchange rate in Brazil had suffered a huge depreciation due to the precautionary demand for foreign currency by domestic residents in order to fulfill their commitments in future and derivative markets (See Oreiro and Basilio, 2011). This movement of nominal exchange rate produced a temporary reversal of the tendency for exchange rate over-valuation observed in the period 2003-2008 (see Figure 16). In the third quarter of 2009, however, real exchange rate started again to appreciate. As matter of fact, from 2009.Q3 to 2011.Q4 real exchange rate had an appreciation of 19%, reaching its lowest level since 2003.

We have seen that in the period 2003.Q1 to 2008.Q9 appreciation of real exchange rate in Brazil was due to the combined effects of reduction in sovereign risk premium (up to the end of 2005) and improvements in terms of trade (from the beginning of 2006 on). Now the real exchange rate appreciation appeared to be mainly the result of improvement in terms of trade. As we can see in Figure 16, terms of trade increased 24% between the third quarter of 2009 to the last quarter of 2011.



Source: Central Bank of Brazil. Authors' own elaboration. Terms of trade are measured in the left axis, right axis measures real exchange rate.

In order to face the real exchange rate appreciation problem, Central Bank of Brazil continued its policy of *intervention* in exchange markets buying additional quantity of international reserves. As we can see in Table XI, international reserves increased at an average rate of 22.01% p.y in the period 2009-2011, reaching a value of US\$ 352 billion at the end of 2011, an increase of almost 82% between 2008 and 2011.

Table XI – Evolution of International Reserves (2009-2011)

Year	Δ%
2009	23,08%
2010	20,98%
2011	21,98%
Average	22,01%

Source: Central Bank of Brazil. Authors' own elaboration.

These interventions on foreign exchange market, however, are not fully sterilized. As we can see in Table XII, the stock of Repo in R\$ million and as a share of GDP had increased in 2009, but decreased strongly in 2010, showing that Central Bank of Brazil had increased the stock of high powered money to finance the acquisition of international reserves. These developments were possible because the world financial

crisis induced an easing of monetary policy in Brazil that resulted in a sharp decrease of nominal short-term interest rate.

Table XII – Evolution of Repo operations (2009-2011)

	Repo (in R\$ millions)	Repo as % of GDP
2009	427800	12,85%
2010	259200	6,67%
2011	311900	7,13%

Source: Valor Econômico (2014) and Central Bank of Brazil. Authors' own elaboration.

In last section we saw that one of the characteristics of the *flexible tripod* was the institutionalization of a minimum wage policy that aimed to induce an increase in wage share in Brazil. As a matter of fact, in 2007 an agreement between President Lula and labor unions enforced a formal rule for minimum wage, according to which minimum wage will increase each year at a rate equal to last year inflation (measured by CPI) plus the growth rate of real GDP observed two years ago. This rule resulted in a strong real increase in minimum wage as we can see in Table XIII.

Table XIII – Evolution of Minimum Wage (2009-2011)

Period	Minimum Wage at t-1	Minimum Wage at t	$\Delta\%$	Real Increase
02/2009	R\$ 415,00	R\$ 465,00	12,05%	5,79%
01/2010	R\$ 465,00	R\$ 510,00	9,68%	6,02%
03/2011	R\$ 510,00	R\$ 545,00	6,86%	0,37%

Source: Ministry of Labor. Authors' own elaboration.

How was the macroeconomic performance of Brazil after to world financial crisis? As we can see in Table XIV the world financial crisis has a modest and temporary effect over Brazilian macroeconomic performance. From 2008.Q4 to 2009.Q3 real GDP growth was reduced, causing an increase in unemployment rate above 10% of labor force. From 2009.Q4 on, the combined effects of fiscal, monetary and credit expansion produced a fast acceleration of GDP growth, reaching almost 8% p.y in the last quarter of 2010. Labor market reacted also very fast to aggregate demand stimulus, making unemployment rate to fall back at the level observed in the last quarter of 2008. Even inflation continued at low levels for Brazilian experience until the last

quarter of 2010. This exceptionally good macroeconomic performance allowed the election of Dilma Rouseff from Labor Party (Partido dos Trabalhadores) as President of Brazil in November of 2010, as successor of Luis Inacio Lula da Silva.

Table XIV – Evolution of Brazilian Macroeconomic Performance (2008.Q4-2011.Q4)

	Growth (1)	Output Gap	Inflation (2)	Unemployment (3)
2008.Q4	6,17	4,41	5,90	8,30
2009.Q1	4,80	1,89	5,61	10,80
2009.Q2	2,99	-8,56	4,80	10,30
2009.Q3	0,95	-5,36	4,34	10,10
2009.Q4	2,06	-2,29	4,31	8,50
2010.Q1	3,62	2,47	5,17	9,60
2010.Q2	6,85	-4,16	4,84	9,50
2010.Q3	9,22	-0,69	4,70	8,70
2010.Q4	7,97	2,05	5,91	7,40
2011.Q1	6,95	5,07	6,30	9,00
2011.Q2	6,19	-1,65	6,71	8,70
2011.Q3	4,51	2,35	7,31	8,50
2011.Q4	3,91	2,02	6,50	6,90
Average	5,09	-0,19	5,57	8,95

Source: Central Bank of Brazil. Authors' own elaboration. Notes: (1) 12-month moving average of real GDP growth; (2) Accumulated variation of IPCA in the last 12 months; (3) Unemployment rate at major metropolitan areas.

The combined effects of improvement in Terms of Trade and Reserve Accumulation allowed Brazilian economy to maintain a good performance in the external fragility indicators despite the over-valuation of real exchange rate. As we can see in Table XV, external debt as a ratio of GDP and as a ratio of exports reached very comfortable levels, clearly indicating a situation of solvency of external accounts. International reserves were larger than external debt, indicating that Brazilian economy had also a very comfortable liquidity position.

The behavior of current account/GDP ratio indicated a clear and growing over-valuation or real exchange rate. In only two years, from 2008.Q4 to 2010.Q4, current account/GDP deficit almost double, increasing from 1.81% of GDP to 3.43% of GDP. Since the increase in current account deficit was followed by a huge improvement in terms of trade (see figure 16), this could only be the result of substitution of domestic

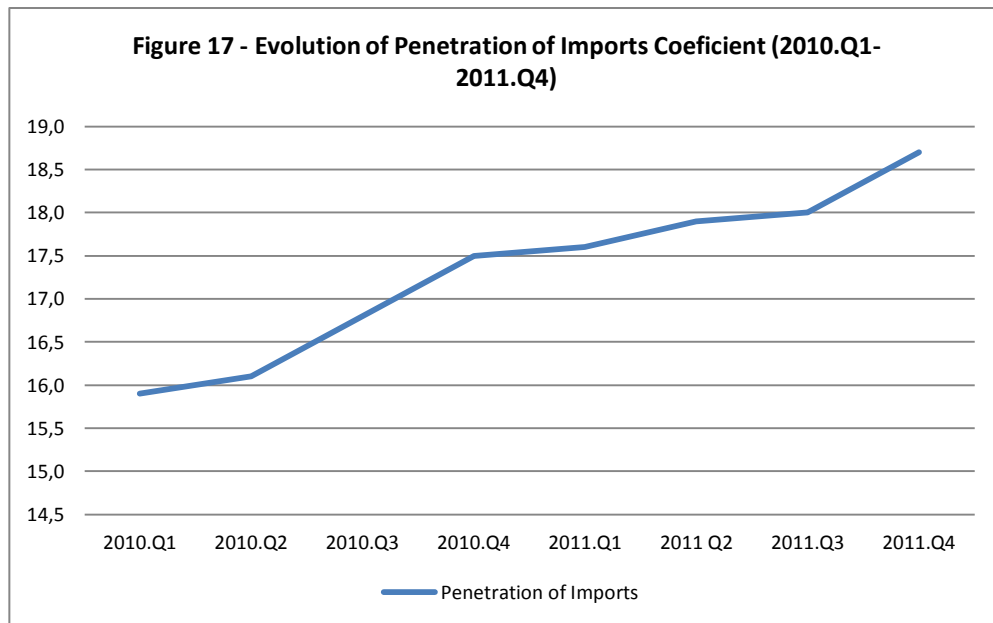
production for imports in the manufacturing sector. The first symptoms of *Dutch Disease* were beginning to appear in Brazilian economy.

Table XV – Indicators of External Fragility (2008.Q4-2011.Q4)

Período	External Debt/GDP	External Debt/Exports	Reserves/External Debt	CA/GDP
2008.Q4	12,00%	100,00%	104,30%	-1,81%
2009.Q1	12,40%	100,00%	105,10%	-1,50%
2009.Q2	13,50%	110,00%	104,70%	-1,24%
2009.Q3	13,60%	130,00%	109,40%	-1,17%
2009.Q4	12,20%	130,00%	120,60%	-1,57%
2010.Q1	11,50%	130,00%	115,30%	-2,11%
2010.Q2	0.112	130,00%	110,70%	-2,75%
2010.Q3	11,70%	130,00%	111,10%	-3,23%
2010.Q4	12,00%	130,00%	112,40%	-3,43%
2011.Q1	12,40%	130,00%	114,90%	-3,36%
2011.Q2	12,60%	130,00%	115,10%	-3,14%
2011.Q3	12,40%	120,00%	117,30%	-3,03%
2011.Q4	12,00%	120,00%	118,00%	-2,95%
Average	12,36%	122,31%	112,22%	-2,41%

Source: Central Bank of Brazil. Authors' own elaboration.

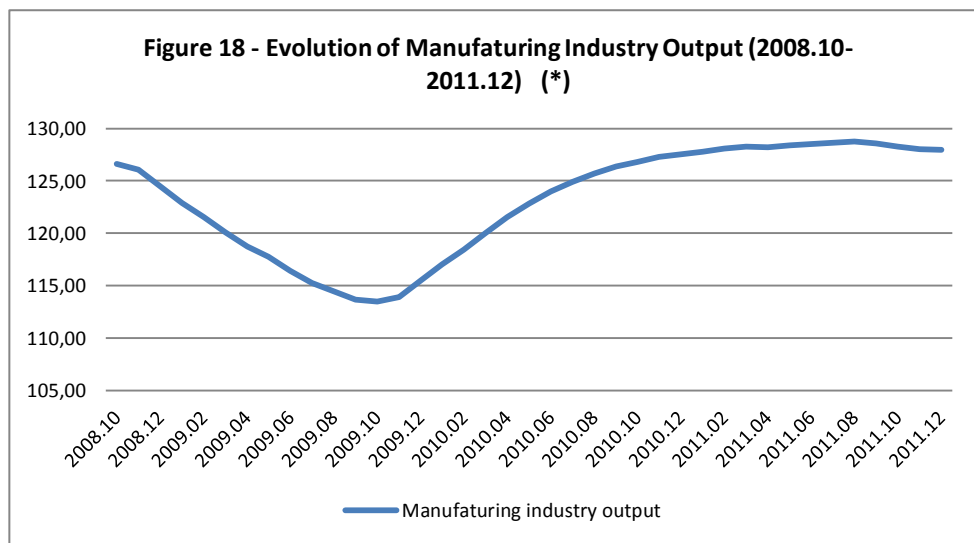
The process of substitution of domestic production for imports can be visualized in figure 17; that showed the share of domestic consumption that is supplied by imports, the so-called import penetration coefficient. As we can see, from the first quarter of 2010 to the last quarter of 2011, the coefficient of import penetration increased from 15.9% to 18.7%, an increase of 17.61% in the value of the coefficient in less than two years.



Source: IPEADATA. Authors' own elaboration.

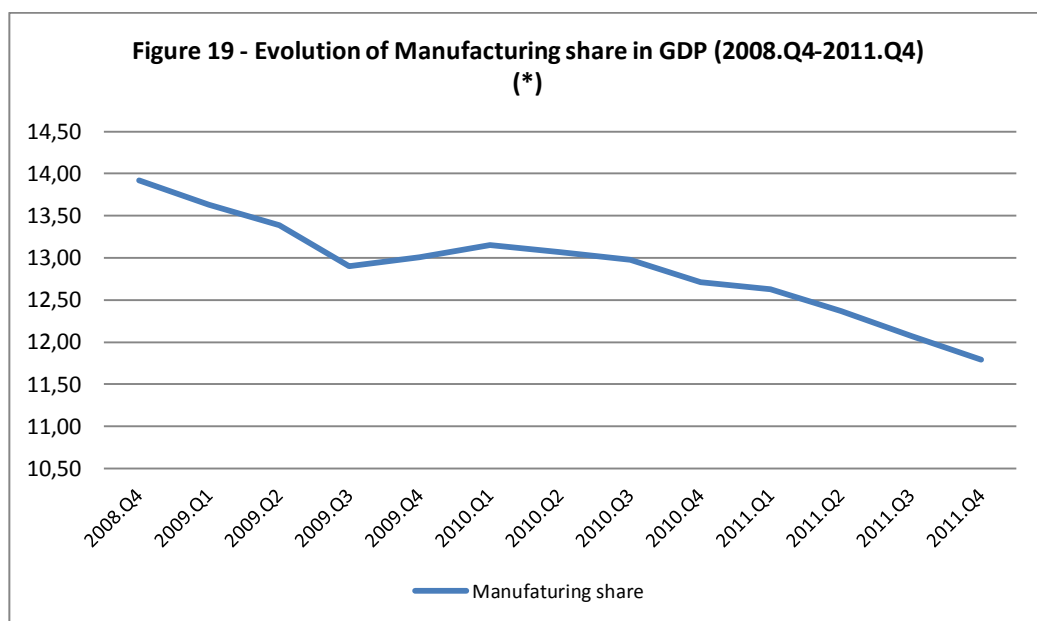
The substitution of domestic production for imports in Brazilian manufacturing industry caused a stagnation of manufacturing output from the beginning of 2011 on. As we can see in figure 18, after a quickly recover of the effects of world financial crisis, output of manufacturing industry remained roughly constant at the beginning of 2011, despite Brazilian economy was still growing at a higher, although declining, rate (see table XII). Manufacturing industry was clearly losing dynamism due to over-valuation of real exchange rate. Dutch disease was becoming to cause a negative structural change in Brazilian economy, reducing the manufacturing share in GDP. A second wave of de-industrialization had begun¹¹.

¹¹ See Oreiro and Feijó (2010) for an account of de-industrialization of Brazilian economy.



Source: IPEADATA. Authors' own elaboration. Note (*): 12 month-moving average of real output.

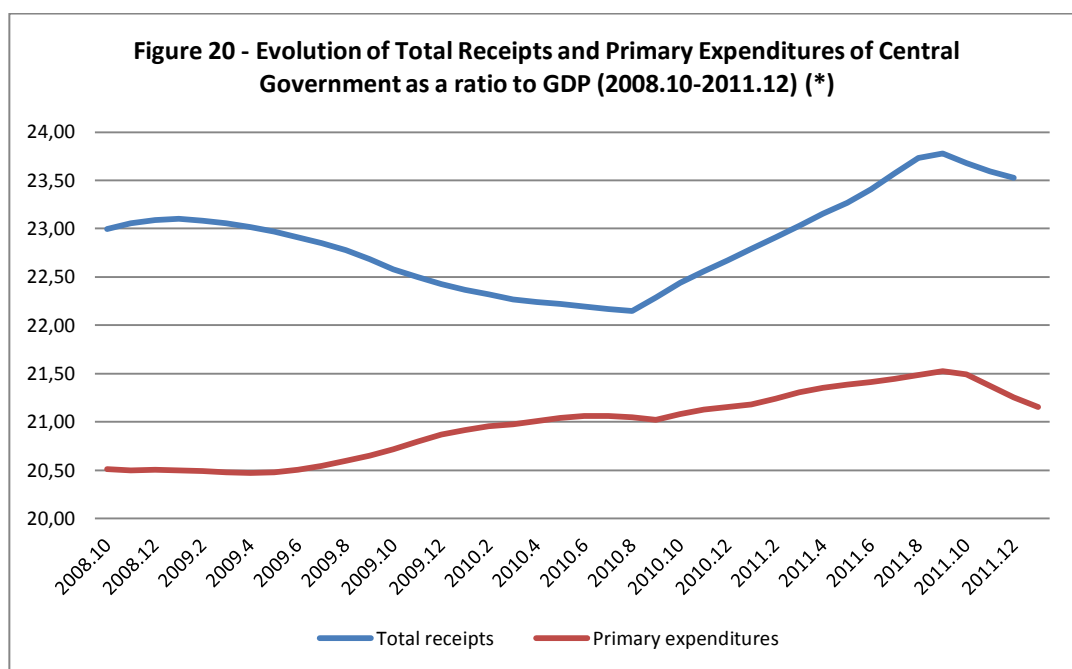
The strength of de-industrialization of Brazilian economy could be seen at figure 19. From 2008.Q4 to 2011.Q4 manufacturing share in GDP had fallen from 13.92% to 11.8%, a decrease of 15.23% in the manufacturing share in only three years.



Source: Central Bank of Brazil. Authors' own elaboration. Note (*): 12 month moving-average.

Regarding fiscal position of Central Government, primary expenditures as a ratio to GDP continued to rise in period 2008.Q4 to 2011.Q4. As matter of fact from October

of 2008 to September of 2011, the moving average of primary expenditures as a ratio to GDP increased from 20.51% to 21.53% (see figure 20). Total receipts as a share of GDP decreased until the beginning of second semester of 2010 as a result of temporary tax reductions that are implemented by federal government in 2009 as a component of the anti-cyclical fiscal policy adopted by Brazilian Government after the bankruptcy of Lehman Brothers. The growth acceleration in 2010 allowed a quickly recover of total receipts/GDP, that reached a value of 23.78% in September of 2011.



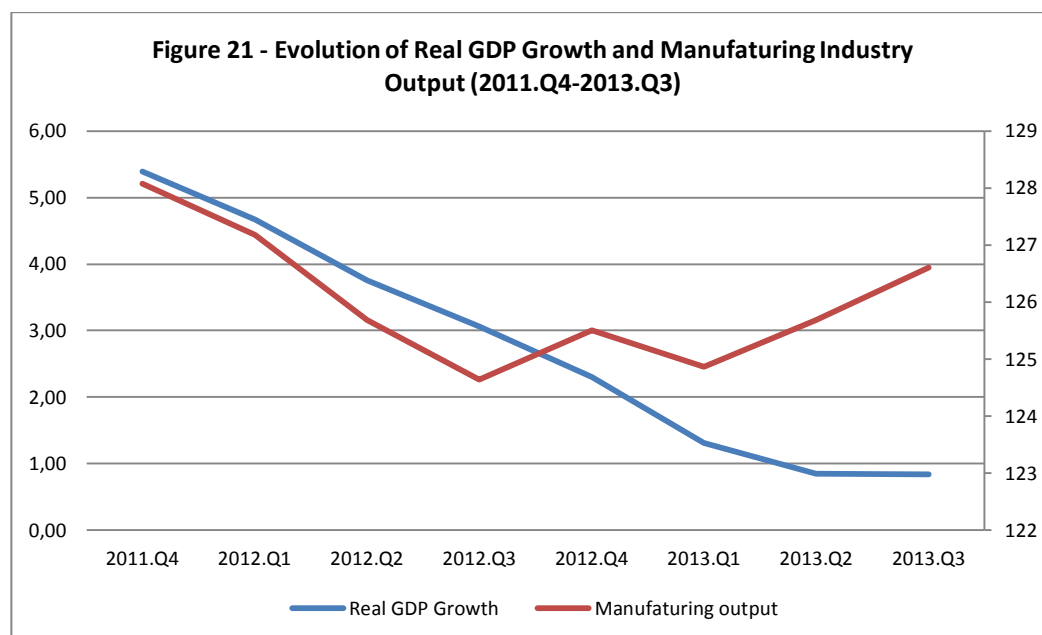
Source: Central Bank of Brazil. Authors' own elaboration. Note (*): 12 month moving average.

The government of President Dilma Rouseff tried to stop the process of continuous increasing in the primary expenditures/GDP at the beginning of 2011 by means of a fiscal adjustment. As we can see in figure 20, primary expenditures/GDP began to fall at the last quarter of 2011. This movement, however, will be only a *temporary detour* in the path of primary expenditures/GDP. The structural fiscal problem was not solved by President Dilma government. This would cause a return of fiscal dominance in the years to come.

4 - From stagnation to depression (2011-2015): the failure of the new macroeconomic matrix, the end of commodity boom and fiscal crisis.

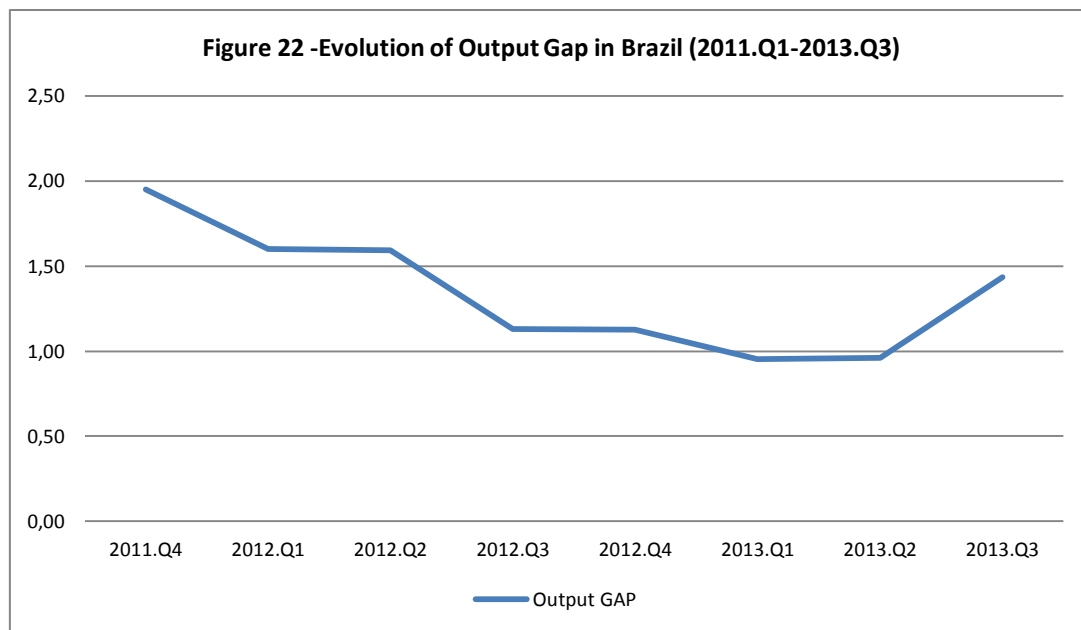
4.1 From Growth Euphoria to Stagnation (2011-2013)

From the last quarter of 2011 until the third quarter of 2013, Brazilian economy had experienced a strong growth deceleration. As we can see in Figure 21, the 12 month moving average of real GDP growth fallen from 5.39% p.y in the last quarter of 2011 to 0.84% p.y in the third quarter of 2013. Moreover, the 12 month moving average of output in manufacturing industry had fallen 1.55% during this period (Figure 21). After a quick recover of 2008 financial crisis, production of manufacturing industry in Brazil stagnated, and this situation was slowing down GDP growth.



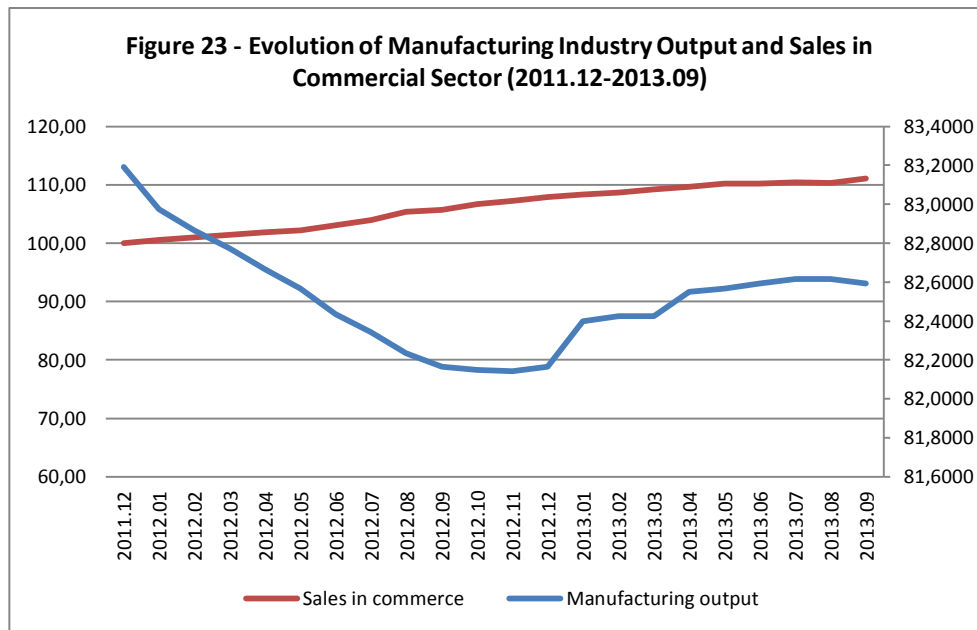
Source: IPEADATA. Authors' own elaboration. Note: right axis measures manufacturing industry output, left axis measures real GDP growth.

The slowdown in economic growth was not due to a *cyclical downturn* caused by a Keynesian problem of insufficiency of aggregate demand. As we can see in Figure 22, during this period the *output gap* was positive, showing that Brazilian economy was growing above its *potential* or *natural growth rate*. The problem seemed to be a structural one: the potential growth rate was being reduced.



Source: Central Bank of Brazil. Authors' own elaboration. Note: 12 month moving average of output gap series.

Another way to see that growth deceleration was not due to a fall of aggregate demand is to compare the behavior of sales in the commercial sector with the behavior of manufacturing industry output. As we can see in figure 23, although manufacturing output was declining up to the end of 2012, sales in the commercial sector were growing at a robust average rate of 5.62% p.y in real terms. Thus the problem did not seem to be *insufficiency of aggregate demand*, but the revealed incapacity of Brazilian industrial firms *to had access to effective demand*. This means that stagnation of Brazilian economy was more likely to be the effect of real exchange rate appreciation over competitiveness of Brazilian manufacturing industry both in external and domestic markets (See Bresser-Pereira, Oreiro and Marconi, 2014, chapter 6).

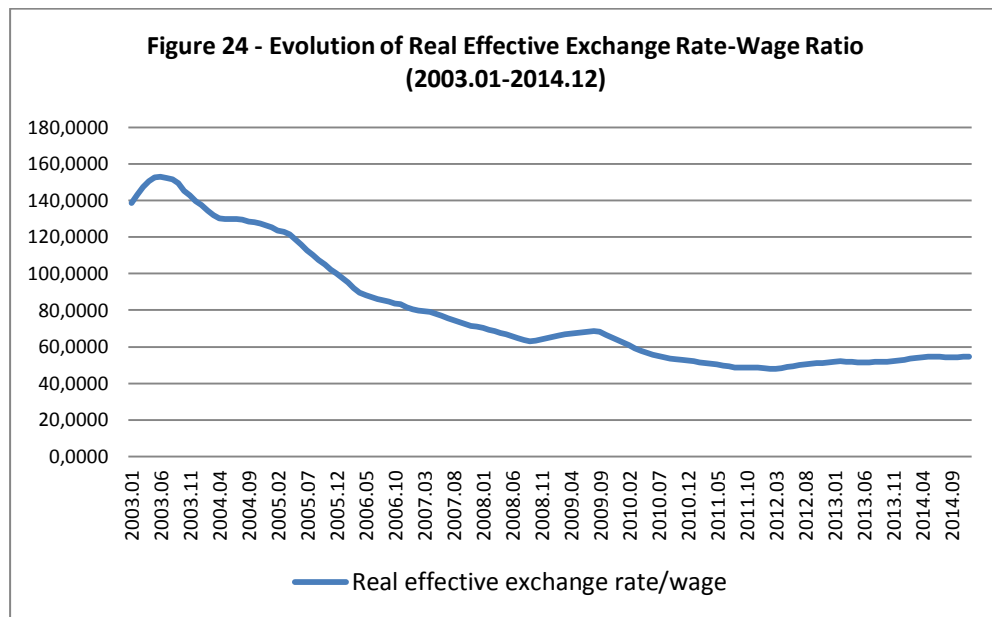


Source: IPEADATA. Authors' own elaboration. Note: Right axis measures manufacturing industry output; left axis measures sales in commercial sector.

The nature of Brazilian stagnation problem can be seen in Figure 24 below, where it is presented the evolution of the 12 month moving average of Real Effective Exchange Rate/Wage ratio from January of 2003 to December of 2014. As we can see, since the beginning of President Lula government, Brazilian manufacturing sector was losing external competitiveness and profit margins due to the combined effect of real exchange rate appreciation and increasing wages. This process was stopped, but not reversed, under President Dilma Rouseff government.

In the last sections we saw that Real Exchange rate appreciation in Brazil during President Lula government was due to the combined effects of decreasing in sovereign risk premium – due to the improvement in the External Fragility indicators and the substitution of a Fiscal Dominance Regime for a Monetary Dominance Regime – and improvement in Terms of Trade. The increase in wages was the result of the minimum wage policy and the trend fall in unemployment rate during Lula government. Both real exchange rate appreciation and increase in wages made Brazilian industrial firms to loose external competitiveness and profit margins, what resulted in a process of substitution of domestic production for imports, thus increasing the import penetration

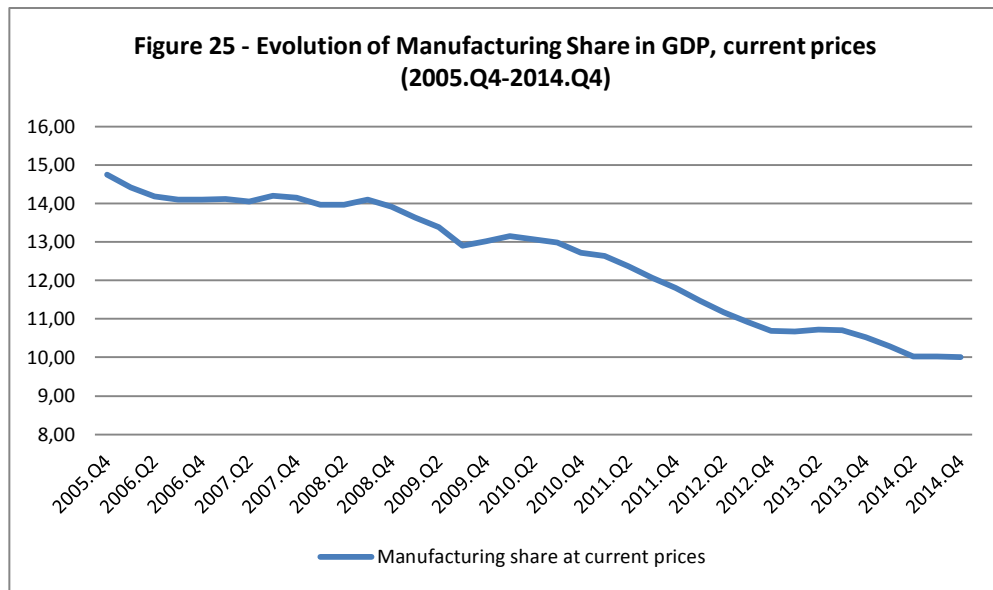
coefficient¹². The substitution of domestic production for imports explain why manufacturing industry output stagnates while domestic demand expands, allowing sales in the commercial sector to increase at a robust rate.



Source: IPEADATA. Authors' own elaboration.

The stagnation of manufacturing industry output combined with a strong expansion of domestic demand resulted in the continuation of de-industrialization of Brazilian economy, measured by the manufacturing share in GDP (Figure 25). Due to the fact that manufacturing industry is the source of increasing returns, this structural change resulted in a reduction of potential growth rate. The de-industrialization of Brazilian economy must not be under-estimated. As we can see in Figure 25, from 2008.Q4 to 2014.Q4, the 12-month moving average of manufacturing share in GDP had fallen 32.13%, from 14.75% to 10.01%.

¹² The substitution of domestic production for imports continued under President Dilma Rouseff government first term. Indeed, according to IPEADATA, the import penetration coefficient increased from 17.6% in the first quarter of 2011 to 21.5% in the last quarter of 2014.



Source: Brazilian Central Bank. Author's own elaboration.

The process of re-primarization of exports that started in 2006, continued after 2008 world financial crisis. As we can see in Table XVI, the share of primary products in the value of exports increased from 37.88% in 2008 to 48.83% in 2011, the first year of President Dilma Rousseff government. In the same period, the share of manufactured products decreased from 48.08% to 36.80%. Primary products had now the largest share of Brazilian exports.

Table XVI – Composition of Brazilian Exports (2008-2014)

	2008	2009	2010	2011	2012	2013	2014
Primary	37,88%	41,36%	45,51%	48,83%	47,83%	47,79%	50,06%
Manufactured	48,08%	44,96%	40,23%	36,80%	38,24%	39,30%	36,65%
Semi- Manufactured	14,04%	13,68%	14,26%	14,37%	13,93%	12,91%	13,28%

Source: FUNCEX. Authors' own elaboration.

Re-primarization of exports signaled for a clear reduction in the growth rate that is compatible with the equilibrium in the balance of payments (Thirwall, 2002). This was another channel by which over-valuation of real exchange rate was reducing the potential or natural growth rate of Brazilian economy¹³.

¹³ For an empirical analysis of the impact of real exchange rate over income elasticities of exports and imports see Marconi, Araujo and Oreiro (2015).

4.2 The Rise and Failure of New Macroeconomic Matrix (2011-2013).

Facing deceleration of GDP growth and a stagnation of industrial output since 2011, Brazilian government answered in the same way it done in 2008, by means of a new round of easing monetary and fiscal policy, trying to boost aggregate demand. Regarding monetary policy, Brazilian Central Bank reduced short term interest rate (over-selic) from 12.41% in august of 2011 to 7.1% in October of 2012. Due to the behavior of inflation rate, that was declining until the end of 2011 (see Table XVII), real short-term interest rate remained more or less at a constant level of 4.9% until the first quarter of 2012. From the second quarter of 2012 on, the combination of declining short-term interest rate with rising inflation rate; produced a remarkable reduction of real interest rate, which reached 2,29% p.y in the third quarter of 2012, its lowest level since the implementation of the macroeconomic tripod in 1999.

Table XVII – Evolution of Nominal Interest Rate, Inflation and Real Interest Rate in Brazil (2011.Q3-2012.Q2)

	Nominal interest rate (% p.y)	Inflation (% p.y)	Real interest rate (% p.y)
2011.Q3	12,16	7,31	4,85
2011.Q4	11,40	6,50	4,90
2012.Q1	10,17	5,24	4,93
2012.Q2	8,73	4,92	3,81
2012.Q3	7,57	5,28	2,29

Source: Central Bank of Brazil and IPEADATA. Authors' own elaboration.

Note: Nominal interest rate is the annualized three month average of Selic/Over.

One of the objectives of easing monetary policy was to induce a depreciation of nominal exchange rate in order to reduce or even eliminate the over-valuation of real exchange rate. This means that monetary policy in Brazil clearly incorporated as one of its objectives to stabilize the real exchange rate, but without an explicit commitment with a target for nominal or real level of exchange rate. In order to avoid a conflict between the stabilization of real exchange rate and inflation targeting, Central Bank of Brazil choose to make an informal spreading of the convergence period from one year to the “relevant period for monetary policy to operate”, which means, in practice, that monetary authority has no commitment with any definite period for inflation to converge for the center of the target (4.5% p.y), although annual inflation must be lower than the ceiling defined by CMN (6.5% p.y). This means that in order to make possible

an adjustment of Real Exchange rate, Central Bank of Brazil would tolerate a higher inflation rate, between 5.0% and 5.5% p.y, instead of 4.5% p.y. A higher real exchange rate was been traded for a higher inflation rate.

Along with easing of monetary policy, Brazilian Central Bank tried to continue its intervention in foreign exchange markets by means of buying international reserves. As we can see in Table XVIII below, from 2011 to 2012, Central Bank continue to increase international reserves at a rate of almost 20% p.y as it was done in previous years (see Table XI). From 2012 on, however, the rate of reserve accumulation slowed down and then reversed in 2014. Clearly, the policy of reserve accumulation was now reaching its limits.

Table XVIII – Evolution of International Reserves (2011-2014)

	Reserves (US\$ million)	Δ%
2011	297696	
2012	355075	19,27%
2013	373417	5,17%
2014	360936	-3,34%

Source: Central Bank of Brazil. Author's own elaboration. Note: Reserves in January of each year.

From 2011 to 2012, reserve accumulation required a large increase in REPO operations as we can see in Table XIX in order to avoid a decrease in short term interest rate greater than the one desired by Brazilian Central Bank. At the end of 2013, REPO operations were near 10% of GDP, representing almost 20% of gross public debt. The large size of international reserves together with the size and cost of REPO operations were making the continuation of reserve accumulation a very costly policy for Brazilian Government. Due to the increasing fiscal difficulties that National Treasury started to face after 2013, the intervention in foreign exchange market by means of reserve accumulation would be stopped in 2014¹⁴.

¹⁴ Another problem was the resilience of inflation near 6% p.y in the period 2011-2013. If average inflation was 5.15% in the second term of President Lula, in the period of 2011 to 2013, average inflation rose to 6.08% p.y. After the popular protests of 2013, the political conditions in Brazil made impossible for the government to tolerate greater inflation acceleration, making Central Bank to give up the attempt of adjusting real exchange rate to a more competitive level.

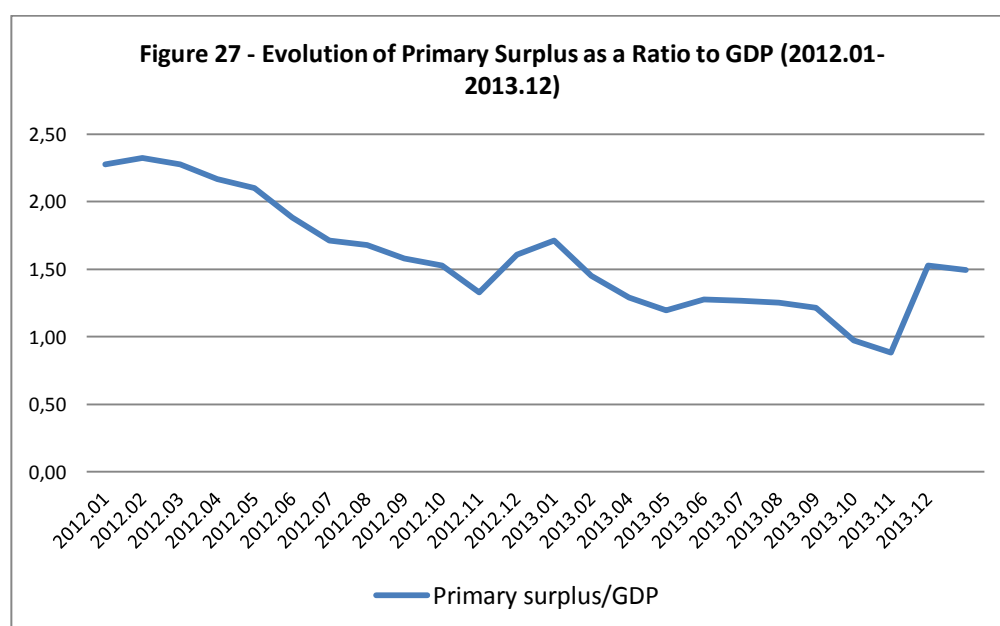
Table XIX: Evolution of REPO operations (2011-2014)

	Repo (in R\$ millions)	Repo as % of GDP
2011	311900	7,13%
2012	497300	10,55%
2013	508000	9,85%
2014	889600	16,11%

Source: Valor Econômico (2014) and Central Bank of Brazil. Authors' own elaboration.

Regarding the fiscal policy, Ministry of Finance decided that a reduction of the primary surplus/GDP was both possible and required. The reduction of real interest rate due to easing of monetary policy had reduced the primary surplus/GDP that was required to stabilize (net) public debt as a ratio to GDP. This means that *fiscal space* was created, allowing an easing of fiscal policy. Besides that, growth deceleration observed after 2011 signaled a weakness of aggregate demand that would demand some fiscal stimulus. The issue was not if a fiscal stimulus was needed, but what form the fiscal stimulus must have.

The decision of the Minister of Finance, Guido Mantega, was to use the fiscal space to promote a semi-permanent round of tax reduction for both productive sector (mainly automobile industry) and consumers instead of an increase in Public Investment, as it was defended by the Vice-Minister, Nelson Barbosa. The impact of this decision over the path of primary surplus can be seen in figure 27 below.



Source: Central Bank of Brazil. Authors' own elaboration.

This combination of easing monetary and fiscal policy was named by Economic Policy Secretary, Marcio Holland, as *New Macroeconomic Matrix* in an interview to Valor Econômico at December of 2012 (Valor Econômico, 2012). For financial markets and many economists this was the official announcement of the end of *Macroeconomic Tripod*, even in its more flexible version that arose after 2006.

The declared objective of the new macroeconomic regime according to the Finance Minister Guido Mantega¹⁵ was to produce a change in the combination of interest rate and exchange rate towards a lower nominal and real interest rate and a more competitive real exchange rate in order to (i) boost capital accumulation and economic growth in the medium term; (ii) stimulate manufacturing industry and revert the de-industrialization of Brazilian economy.

How was the performance of the so-called New Macroeconomic Matrix? Brazil's macroeconomic performance during this period can be seen in Table XX below. Compared to the after 2008 financial crisis (2008.Q4-2011.Q4), the performance of Brazilian economy was clearly worse except for unemployment rate (see tables XIV and XX for a comparison). Growth almost stagnated, reaching an average of only 1.73% p.y. Despite growth deceleration, output gap was positive on average during this period, indicating that Brazilian economy was growing above potential and also that growth potential was reduced. Regarding inflation, it was observed a modest increase from an average of 5.57% p.y in the period 2008.Q4-2011.Q4 to 5.79% p.y in the period 2012.Q1 to 2013.Q4. Regarding the situation of manufacturing industry, output increased in 2013 compared to 2012, but it did not returned to the average observed at the end of 2011 (Figure 23). As a consequence, de-industrialization continued its course with manufacturing share reaching 10.29% in the first quarter of 2014 (Figure 25).

¹⁵ See <http://jornalggn.com.br/blog/luisnassif/o-primeiro-ano-da-nova-matriz-economica-por-mantega>.

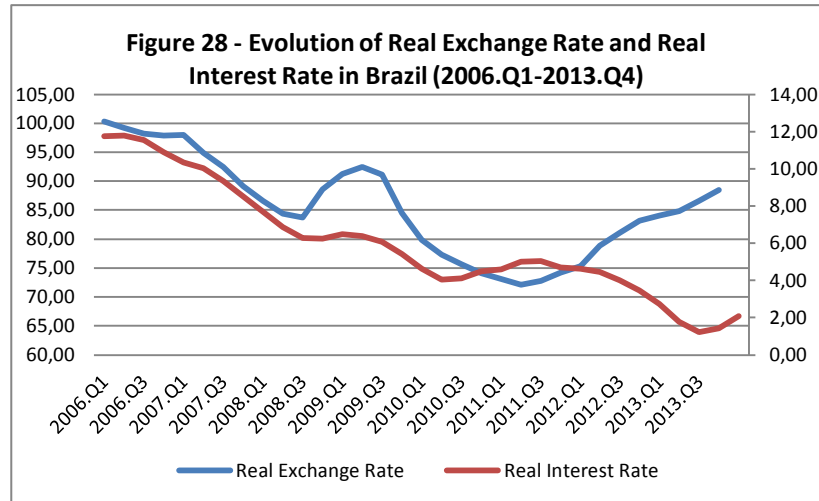
Table XX – Evolution of Macroeconomic Performance under *New Macroeconomic Matrix* (2012.Q1-2013.Q4)

	Growth	Output Gap	Inflation	Unemployment
2012.Q1	4,06	3,67	5,24	9,10
2012.Q2	2,56	-1,67	4,92	9,00
2012.Q3	1,72	0,49	5,28	9,10
2012.Q4	0,88	2,01	5,84	7,60
2013.Q1	0,08	2,99	6,59	8,80
2013.Q2	0,73	-1,65	6,70	9,10
2013.Q3	1,67	2,40	5,86	8,10
2013.Q4	2,15	2,41	5,91	7,50
Average	1,73	1,33	5,79	8,54

Source: Central Bank of Brazil. Authors' own elaboration.

The failure of *new macroeconomic matrix* can be partially explained by the behavior of real exchange rate. As we can see in figure 28 below, under *new macroeconomic matrix* real exchange rate depreciated but this movement was not enough to restore real exchange rate at the level observed in the beginning of 2006, when it looked to be at a very comfortable level for both manufacturing industry and current account. Compared to the level observed in 2006.Q1, real exchange rate remained with an over-valuation of 12.23% in the last quarter of 2013.

The surprising feature of the period under new macroeconomic matrix was the revealed incapacity of a remarkable low level for real short-term interest rate to stimulate economic growth. As we can see in figure 28, real interest rate fell from an average of 4.71% p.y in the last quarter of 2011 to only 1.23% p.y in the third quarter of 2013, the lowest level ever observed in Brazil since the implementation of the macroeconomic Tripod.



Source: Central Bank of Brazil. Authors' own elaboration. Note: For both series we calculated the 12-month moving average.

This puzzle can be solved if we look to the behavior of the Return on Equity (ROE) which is a measure of the profit rate. As we can see on Table XXI, ROE for the largest Brazilian firms that trade shares in the Stock Exchange (BOVESPA) fallen from 16.5% p.y in 2010 to only 4.3% in 2014. Moreover, from 2012 on, ROE was at a clear lower level than Selic/Over, the safe rate of interest in Brazilian economy. This *profit squeeze* was clearly the consequence of the combined effect of real exchange rate appreciation and increasing real wages over profit margins of Brazilian firms (see Rocca, 2015).

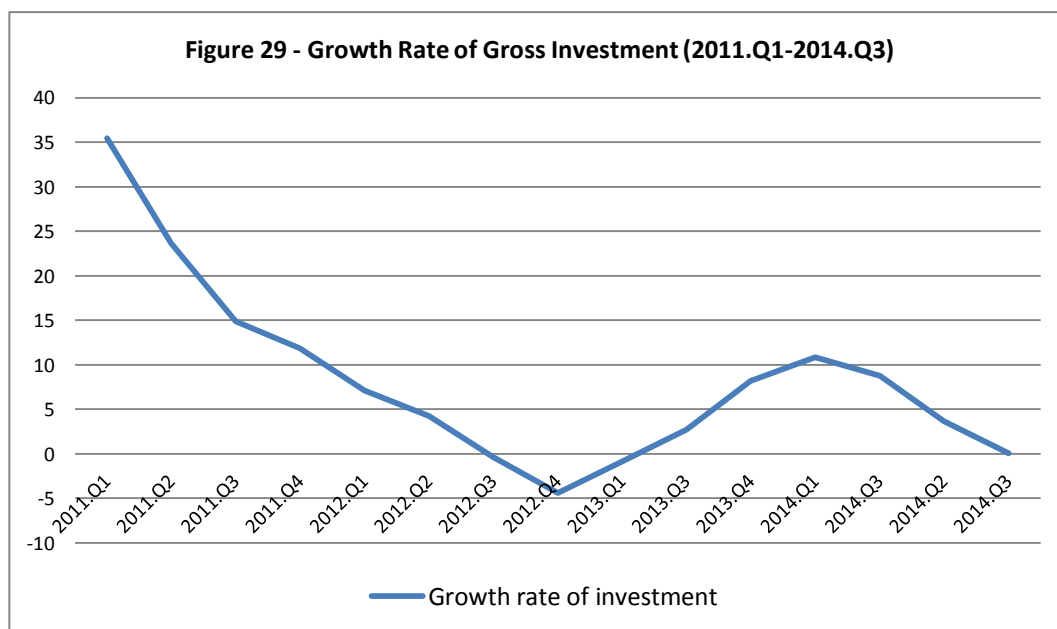
Table XXI – Evolution of ROE and Selic/Over in Brazil (2010-2014)

	ROE (1)	Selic/Over (2)
2010	16.5%	9.8%
2011	12.6%	11.7%
2012	7.2%	8.5%
2013	7.0%	8.2%
2014	4.3%	10.9%

Source: Rocca (2015). Authors' own elaboration. Note: (1) Average. (2) Average.

Thus Brazilian economy was experiencing a classical situation of *profit squeeze*, which had clear and strong negative effects over the rate of capital accumulation (Figure

29). From the first quarter of 2011 until last quarter of 2012, the moving average of the growth rate of investment decreased, reaching *minus* 4.4% p.y at the end of this period. During 2013 investment growth experienced a temporary recover may be due to the lagged effects of monetary and fiscal policy easing, but it started again to fall in the beginning of 2014.



Source: IPEADATA. Authors' own elaboration. Note: Moving average of last 12 months.

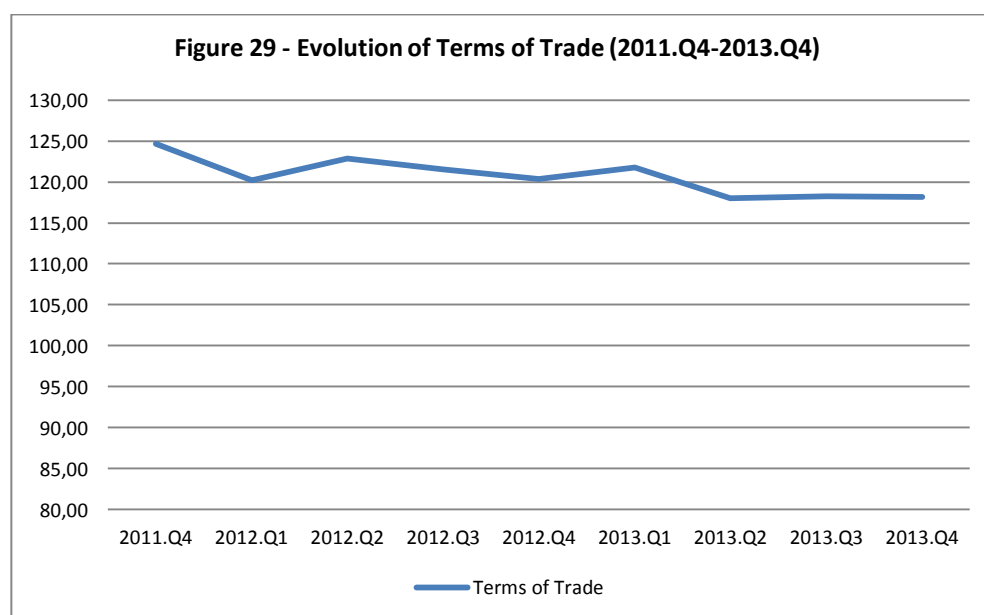
If reserve accumulation was not capable to restore real exchange rate at a competitive level, it was at least very successful in maintaining *External Fragility Indicators* at very comfortable levels (see Table XXII), despite the continuing increase in current account deficit as a ratio to GDP, thus avoiding a currency crisis due to the growing external disequilibrium of Brazilian economy.

Table XXII – Evolution of External Fragility Indicators (2011.Q4-2014.Q4)

Period	External Debt/GDP	External Debt/Exports	Reserves/External Debt	CA/GDP
2011.Q4	12,40%	120,00%	118%	-2,95%
2012.Q1	12,60%	120,00%	121,30%	-2,86%
2012.Q2	12,40%	120,00%	123,40%	-3,04%
2012.Q3	12%	130,00%	122,40%	-2,91%
2012.Q4	12,40%	130,00%	121%	-3,02%
2013.Q1	12,80%	140,00%	116,10%	-3,27%
2013.Q2	13,40%	130,00%	116,70%	-3,07%
2013.Q3	13,90%	130,00%	122,20%	-3,18%
2013.Q4	14,30%	130,00%	121,80%	-3,04%
2014.Q1	14,20%	130,00%	117,80%	-3,24%
2014.Q2	13,90%	140,00%	114,20%	-3,56%
2014.Q3	13,80%	140,00%	111%	-3,86%
2014.Q4	14,20%	150,00%	107,30%	-4,31%
Average	13,25%	131,54%	117,94%	-3,25%

Source: Central Bank of Brazil. Authors' own elaboration.

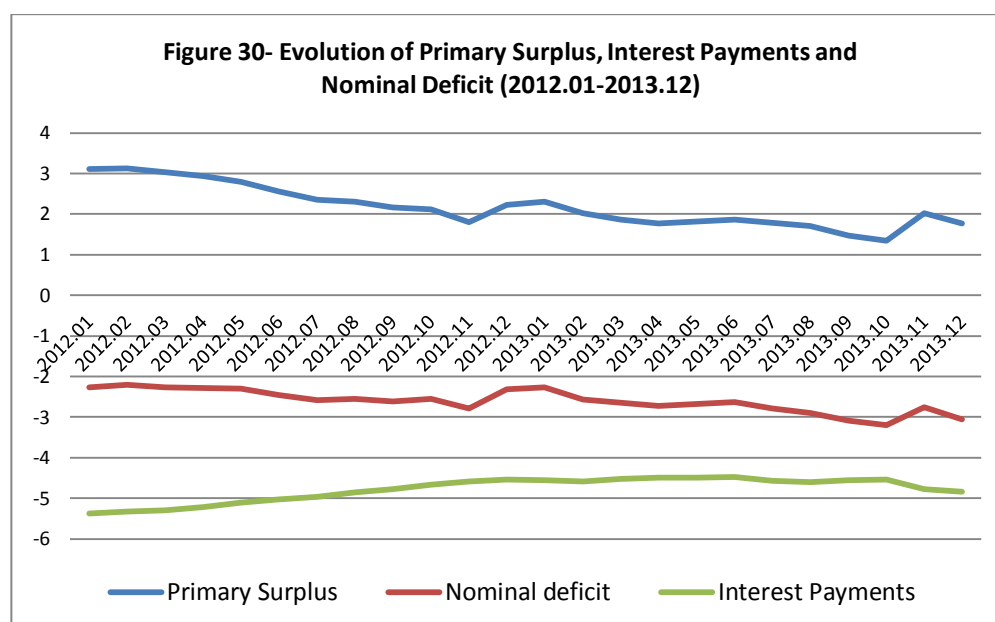
Another important element for explaining why exchange rate over-valuation did not cause a worsening in the External Fragility Indicators was the behavior of Terms of Trade. In the period 2011-2013, as we can see in figure 30, Terms of Trade remained stable at very high levels, sustaining the value of exports, despite the exchange rate over-valuation.



Source: Central Bank of Brazil. Authors' own elaboration.

At the end of 2013, however, Terms of Trade became to deteriorate, signaling clearly the end of commodity boom that begun in 2006. This would have a very strong and negative effect in Brazilian economy in 2014 and 2015, helping to transform a situation of economic stagnation in a depression of economic activity.

Regarding public finance indicators, the period under new macroeconomic matrix showed a very good performance. Due to a combination of low real interest rates and positive, although declining, growth rates and primary surplus; nominal deficit remained at very low levels, below 3.0% of GDP, as we can see in figure 30, more than sufficient to stabilize (net) public debt/GDP ratio¹⁶. Up to that moment Brazilian economy had no serious risk of Fiscal dominance.



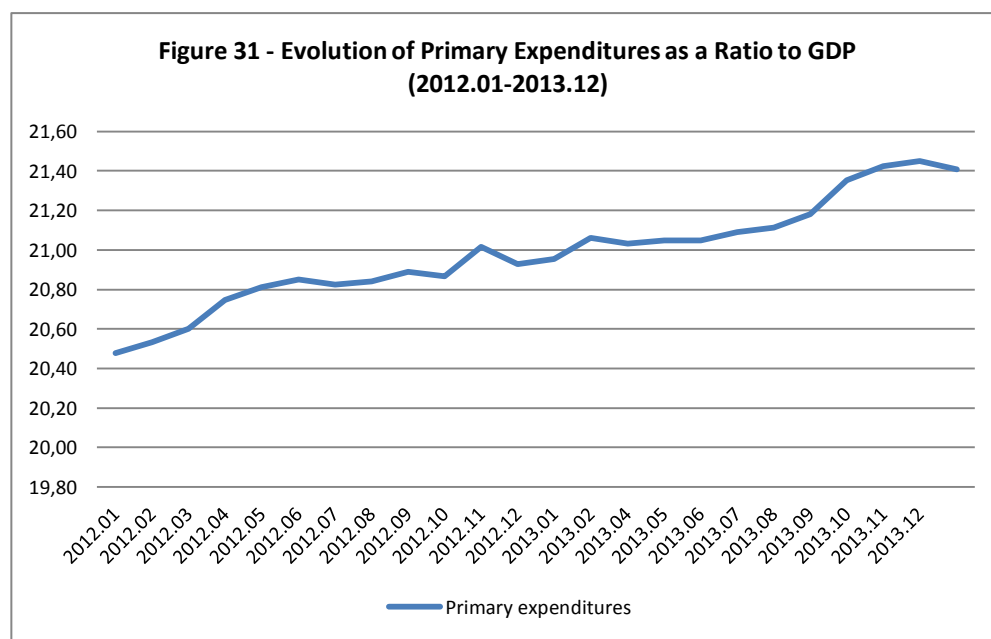
Source: Central Bank of Brazil. Authors' own elaboration.

The central problem of Brazilian public finance continued to be the trend growth of Central Government's primary expenditures as a ratio to GDP. In a period of only two years, from January of 2012 to December of 2013, primary expenditures of Central Government as a ratio to GDP had increased from 20.28% to 21.41%, as we can see in Figure 31. Primary expenditures in real terms continued to grow at a faster rate than real GDP. This was clearly an *unstainable* state of affairs. Sooner or later, total receipts will no longer grow at the required rate to produce the primary surplus necessary to stabilize

¹⁶ From the first quarter of 2012 to the last quarter of 2013, net public debt as a ratio to GDP had fallen from 35.0% to 30.6%.

net public debt/GDP. When this happened, a fiscal crisis would appear and the emergence of fiscal dominance would be unavoidable.

The stagnation of investment due to profit squeeze anticipated a new round of reduction in growth rates with negative effects over the growth rate of total receipts. Time was running out for a fiscal consolidation.

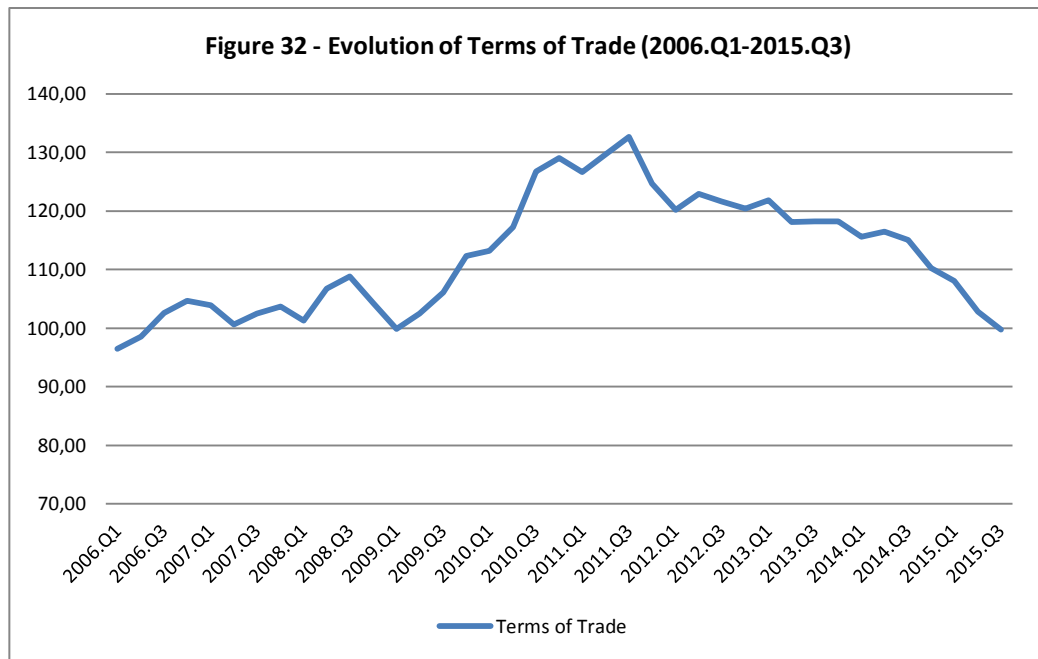


Source: Central Bank of Brazil. Authors' own elaboration.

4.3 The end of commodities boom, fiscal crisis and depression (2014-2015)

From 2009 to 2011, Brazilian economy experienced a strong improvement in the terms of trade. As we can see in figure 32 below, terms of trade increased from 99.87 in the first quarter of 2009 to 132.67 to the third quarter of 2011, almost 33% increase. This improvement was mainly due to the increase in the price of exports, which increased from 120.9 in 2009 to 179 in 2011. Compared to 2006, export prices were 79% higher at the end of 2011 (Table XXIII).

This huge increase in export prices was due to the commodity boom that world economy experienced after the 2008 financial crisis and the unprecedented easing of monetary policy in developed countries. Once again compared to 2006, export prices of primary products in Brazil were 128.41 higher in 2011. At the same period, export prices of manufactured products increased only 46.77%.



Source: Central Bank of Brazil. Authors' own elaboration.

Table XXIII – Evolution of Brazilian Export Prices (2006-2014)

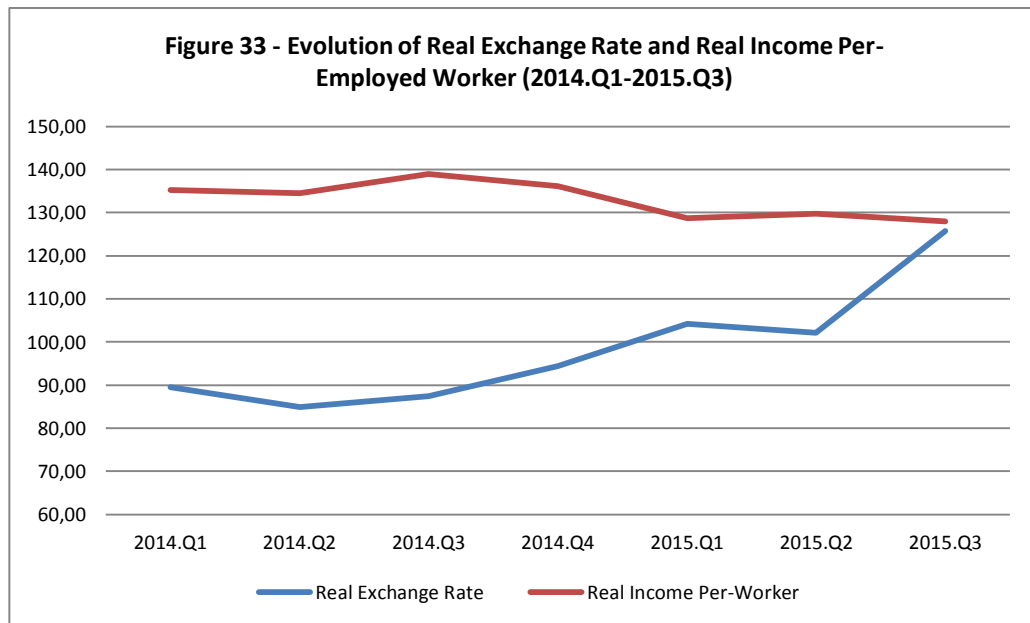
Year	Total	Primary	Manufactured	Semi-Manufactured
2006	100	100	100	100
2007	110,51	114,53	108,39	110,87
2008	139,61	161,77	125,97	138,91
2009	120,9	133,73	118,62	110,76
2010	145,72	173,96	128,69	142,92
2011	179,52	228,41	146,77	172,85
2012	170,65	209,71	146,35	161,03
2013	165,22	206,7	142,19	144,84
2014	156,48	188,3	140,81	138,78

Source: FUNCEX. Authors' own elaboration.

From 2012 on, terms of trade became to deteriorate, but remained at a higher level until the beginning of 2014. At the end of this year, terms of trade started a new decline, returning to the level prevalent at 2006.

The deterioration of the terms of trade induced a sharp depreciation of real exchange rate, as we can see in Figure 33 below¹⁷. Due to the increase in the price of tradeable goods caused by exchange rate depreciation, real income per-worker started to decline from 2014.Q3.

¹⁷ The depreciation of real exchange rate occurred from 2005.Q2 on seemed to be more the result of the political crisis that erupted in Brazil after the beginning of President Dilma Rouseff second term and the downgrade of Brazil by Rating Agencies in the second semester of 2015.



Source: Central Bank of Brazil. Authors' own elaboration.

The failure of new macroeconomic matrix combined with the acceleration of inflation from 2013.Q3 on induced Brazilian Central Bank to end the period of unprecedented low levels for nominal and real interest rate. In the second semester of 2013, monetary authority begin the adjustment of short-term nominal interest rate, increasing Selic/over from 7.15% p.y in the first quarter of 2013 to 14.15% p.y in the third quarter of 2015. In the same period, inflation rate rose from 6.59% p.y to 9.49% p.y, becoming higher than the ceiling of ITR (6.5% p.y) and approaching the double digit for first time in almost ten years. Real interest rate rose at lower pace than nominal interest rate, from 0.53% p.y in the first quarter of 2013 to 4.26% p.y in the third quarter of 2015.

The combination of deterioration in terms of trade, exchange rate depreciation and inflation acceleration also forced Monetary Authorities to finish the policy of reserve accumulation started in 2006. From 2013 on, the problem facing Brazilian Central Bank was no longer to stop a trend appreciation of exchange rate, but precisely the opposite, to smooth the exchange rate depreciation in order to moderate the increase in nominal short term interest rate that was required to control inflation.

Table XXIV – Evolution of Inflation, Nominal and Real Interest Rate (2013.Q1-2015.Q3)

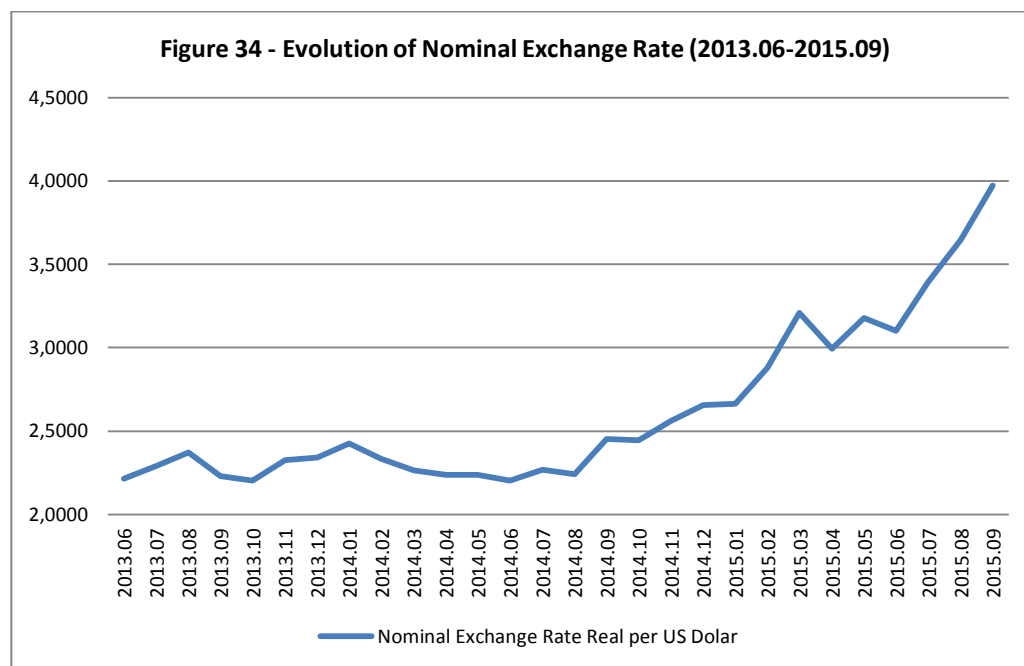
	Selic/Over	Inflation	Real Rate
2013.Q1	7,15	6,59	0,53
2013.Q2	7,90	6,70	1,12
2013.Q3	8,90	5,86	2,87
2013.Q4	9,90	5,91	3,77
2014.Q1	10,65	6,15	4,24
2014.Q2	10,90	6,52	4,11
2014.Q3	10,90	6,75	3,89
2014.Q4	11,58	6,41	4,86
2015.Q1	12,58	8,13	4,12
2015.Q2	13,58	8,89	4,31
2015.Q3	14,15	9,49	4,26

Source: Central Bank of Brazil. Authors' own elaboration.

In order to reduce the rate of exchange rate depreciation, Central Bank of Brazil had two policy options. The first one was to intervene in the exchange rate spot market, selling international reserves and then sterilizing its effects over the stock of high powered money buying Government bonds from the private sector. The second was to intervene in the exchange rate future market selling *exchange rate swaps*, a contract by which Central Bank trade the variation of nominal exchange rate for a certain period for the interest rate payments over the nominal value of the contract. The logic of the operation was to attend the precautionary and speculative demand for foreign currency by means of exchange rate swaps, resulting in a reduction of the pressure over spot price of foreign currency. The advantage for monetary authority is that these swaps were equivalent to an operation of selling reserves in the future markets, but had no effects over the stock of international reserves since the payment of exchange rate variation had to be made in domestic currency. Moreover, if nominal devaluation was lower than short term interest rate than Central Bank would make a positive profit on the operation¹⁸. Considering the risks involved in selling international reserves and reducing the external liquidity of Brazilian economy in a very uncertain international environment, it looked better for Brazilian Central Bank to use this second option as a

¹⁸ It is also clear that, on the contrary, if nominal devaluation was higher than short term interest rate, the operation would produce a loss for Monetary Authority that had to be paid, in the end, by National Treasury, thus increasing nominal deficit.

policy instrument. From June of 2013 on, Brazilian Central Bank started to sell large quantities of exchange rate swaps, reaching almost US\$ 100 billion in July of 2015¹⁹.

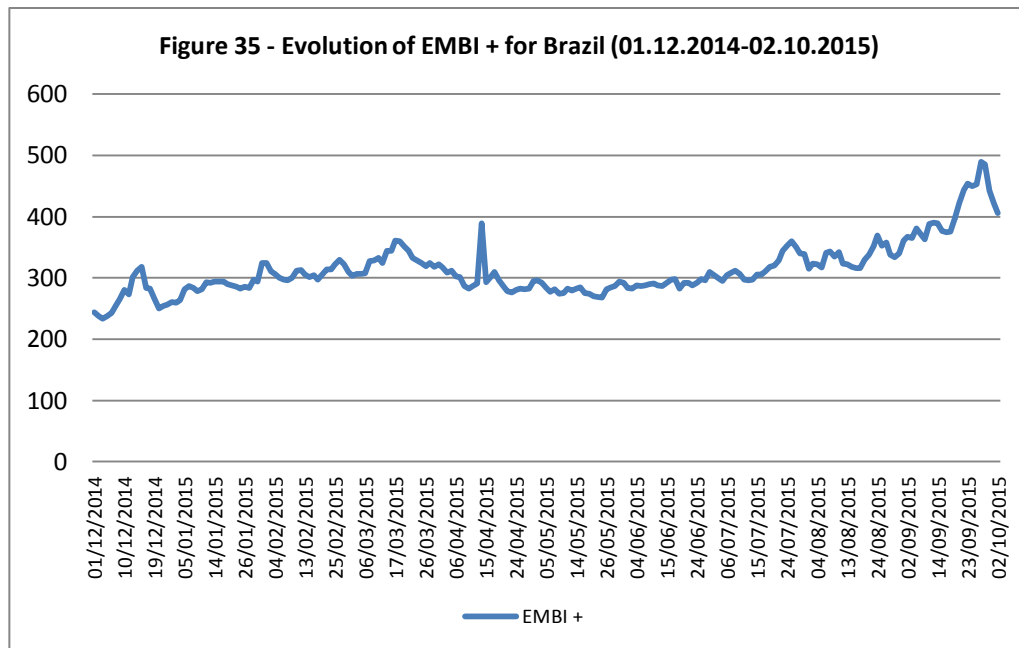


Source: Central Bank of Brazil. Authors' own elaboration. Note: Nominal exchange rate is the price of U.S dollar in Reais.

As we can see in figure 34 above, this policy was successful in maintaining nominal exchange rate relatively stable and below R\$ 2.50 until October of 2014. In November of 2014, President Dilma Rouseff was reelected for her second term as President of Brazil. Immediately after that, nominal exchange rate began to depreciate. Until the end of the first semester of 2015, this trend depreciation looked more to be the result of deterioration of *Terms of Trade* since *Sovereign Risk Premium*, measured by EMBI +, remained more or less at a stable level (see figure 35). In the beginning of September of 2015, however, Standard & Poor decided to downgrade the rating of Brazilian economy that lost *investment grade*²⁰. The downgrade combined with the increasing fiscal difficulties of Central Government induced a sharp increase in the *Sovereign Risk Premium*. As a matter of fact, from the beginning of July to the end of September EMBI + for Brazilian economy increased almost 59%, resulting in a sharp depreciation of exchange rate.

¹⁹ See <http://g1.globo.com/economia/noticia/2015/09/entenda-o-que-e-swap-cambial-leilao-de-linha-e-venda-direta-de-dolares.html>.

²⁰ See <http://g1.globo.com/bom-dia-brasil/noticia/2015/09/brasil-perde-selo-de-bom-pagador-de-agencia-classificacao-de-risco.html>.



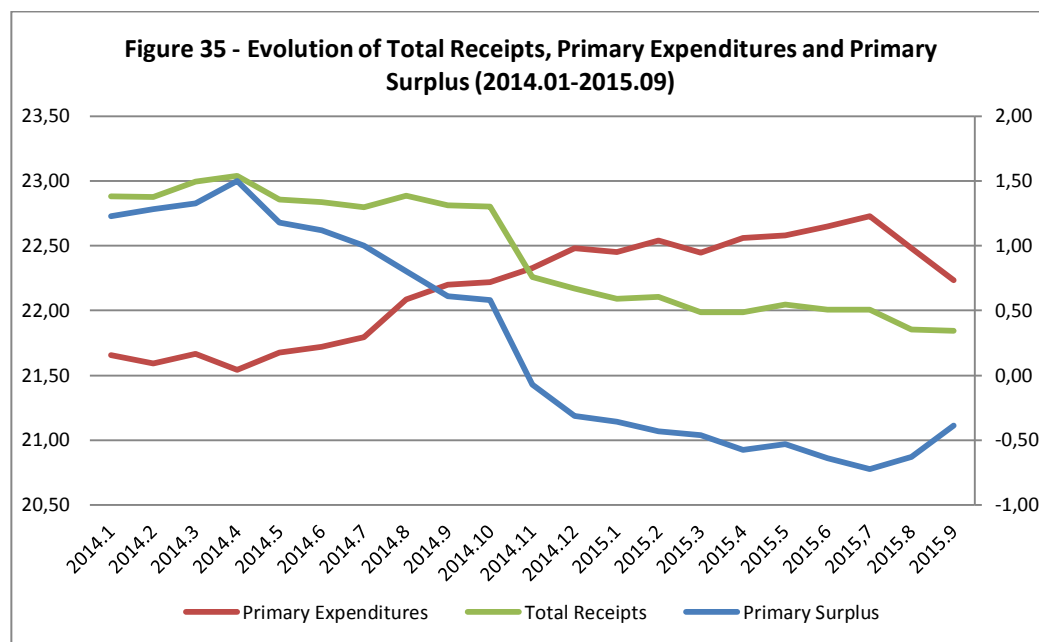
Source: Central Bank of Brazil. Authors' own elaboration.

Regarding fiscal policy, the trend growth of primary expenditures of Central Government continued after 2014, since primary expenditures as a ratio to GDP increased from 21.65% in January of 2014 to 22.73% in August of 2015. Total receipts as a ratio to GDP, however, started to decline after May of 2014 due to the stagnation and subsequent contraction of economic activity. As we can see in figure 35, total receipts as a ratio to GDP fell from 23.04% in April of 2014 to 21.85% of GDP in September of 2015. As a result, primary surplus as a ratio to GDP declined from 1.23% to minus 0.39% of GDP. It is noteworthy to stress that the efforts of the new Finance Minister²¹, Joaquim Levy, to make a fiscal adjustment in 2015 and increase primary surplus to 1.1% of GDP was completely unsuccessful. The first reason was due to the fact that primary expenditures only start to fall after July of that year, from 22.73% to 22.23% in September, a fall of only 0.5% of GDP²². The second reason is due to the effects of recession over total receipts. From January to September of 2015, total

²¹ At the end of her first term, President Dilma Rouseff announced a change in the Ministry of Finance, substituting Guido Mantega for Joaquim Levy. The new Finance Minister announced in December of 2014 that Central Government will seek a primary surplus of 1.1% of GDP as target of fiscal policy.

²² The inertia in primary expenditures is due to the rigidities in the Brazilian Federal Budget, since almost 90% of expenditures can't be reduced without explicit authorization of National Congress or changes in the Constitution. The 10% of Federal Budget that can be changed by a discretionary decision of the Minister of Finance is constituted mainly by public investment. This means that fiscal adjustment in Brazil tend to be done by means of cutting investment expenditures, what has negative effects over growth potential of Brazilian economy.

receipts as a ratio to GDP fall from 22.09% to 21.85%, a fall of 0.24% of GDP, almost a half of the reduction in primary expenditures.

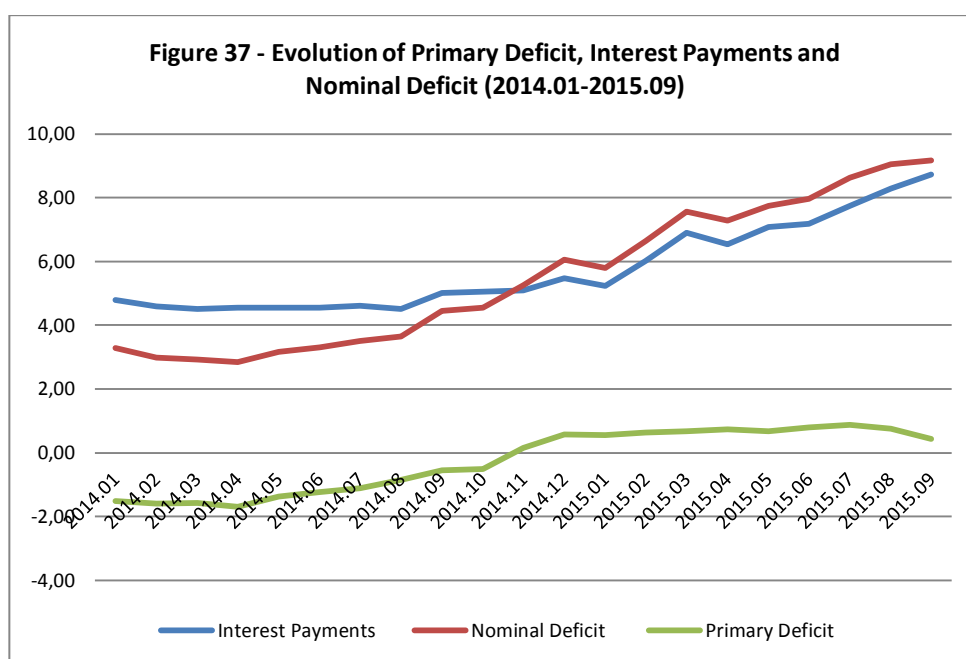


Source: Central Bank of Brazil. Authors' own elaboration. Note: Primary surplus is measured at the right axis.

The primary surplus was no longer at the required level for stabilizing gross public debt as a ratio to GDP. Moreover, the increase in real interest rate and the reduction in the growth rate of real GDP to negative levels at the end of 2014 had also increased the required level of primary surplus. As a result, gross debt of General Government increased from 49.9% of GDP in January of 2014 to 60.2% of GDP in September of 2015. Due to the exchange rate devaluation, however, net public debt increased only from 30.1% of GDP to 32.6% of GDP in the same period. This means that the difference between gross and net debt of public sector as a ratio to GDP increased from 19.8% in the beginning of 2014 to 27.6% in September of 2015. The growing divergence of gross and net public debt showed that stabilizing net public debt as a ratio to GDP is no longer enough to guarantee the solvency of the Public Sector.

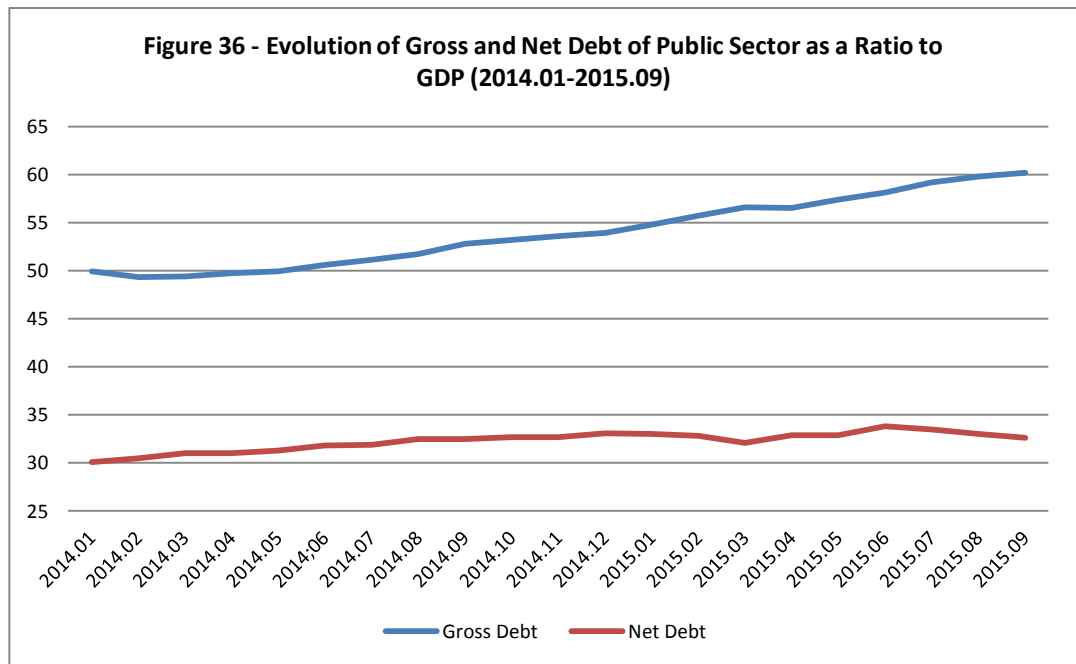
The combined effects of increasing real interest rate and the carrying costs of exchange rate swaps due to losses originated from the nominal exchange rate devaluation produced a remarkable increase in the interest payments of public sector debt as a ratio to GDP. As a matter of fact, interest payments increased from 4.5% of GDP in August of 2014 to 8.72% of GDP in September of 2015, increasing nominal deficit to 9.16% of GDP. The value reached by interest payments as a ratio of GDP

together with the continuous increase of primary deficit at the beginning of 2015 means that the capacity of Central Bank to use monetary policy to control inflation was severely limited (See De Bolle, 2015). Moreover, at the end of 2015 Central Bank of Brazil monetized the capital gains obtained by international reserves due to the exchange rate devaluation and transferred it to National Treasury, allowing the payment of some debts (the so-called “pedaladas fiscais”) with public banks (BNDES, Banco do Brasil and Caixa Econômica Federal) and FGTS (Fundo de Garantia por Tempo de Serviço)²³. Since the use of capital gains from international reserves for the payment of debts is the central feature of Fiscal Dominance in emerging markets (Montiel, 2011, chapter 9), then Brazilian economy was once again at this regime.



Source: IPEADATA. Authors' own elaboration.

²³ See <http://www1.folha.uol.com.br/mercado/2016/01/1732851-pagamento-de-pedaladas-e-questionado-por-especialistas.shtml>.



Source: Central Bank of Brazil. Authors' own elaboration. Note: Gross debt considered only the General Government, excluding Central Bank and State-Owned Enterprises.

The macroeconomic performance of this period was terrible. As we can see in Table XXV, average growth rate was *minus* 0.99% p.y, the worst result since the implementation of macroeconomic tripod. In the third quarter of 2015, GDP decreased at an annual rate of 4.21%, signaling that recession was turning into a depression. Although growth potential was reduced due to de-industrialization and re-primarization of exports, Brazilian economy was now growing below potential due to insufficiency of aggregate demand. Average inflation rose to 7.48% p.y, but reached near 10% p.y in the third quarter of 2015. Brazilian economy was thus experiencing a deep recession with inflation acceleration, the typical case of stagflation. Recession made unemployment rate rose to almost 12% of labor force in the third quarter of 2015. Stagnation with full employment of the new macroeconomic matrix gave place to the typical Keynesian case of recession with unemployment.

Table XXV – Evolution of Indicators of Macroeconomic Performance (2014.Q1-2015.Q3)

	Growth Rate	Output gap	Inflation	Unemployment
2014.Q1	2,05	4,28	6,15	9,40
2014.Q2	0,87	-0,48	6,52	9,40
2014.Q3	0,10	-0,21	6,75	8,70
2014.Q4	-0,32	0,23	6,41	8,00
2015.Q1	-2,34	1,45	8,13	9,40
2015.Q2	-3,12	-3,82	8,89	11,10
2015.Q3	-4,21	-4,30	9,49	11,80
Average	-0,99	-0,40	7,48	9,69

Source: Central Bank of Brazil. Authors' own elaboration.

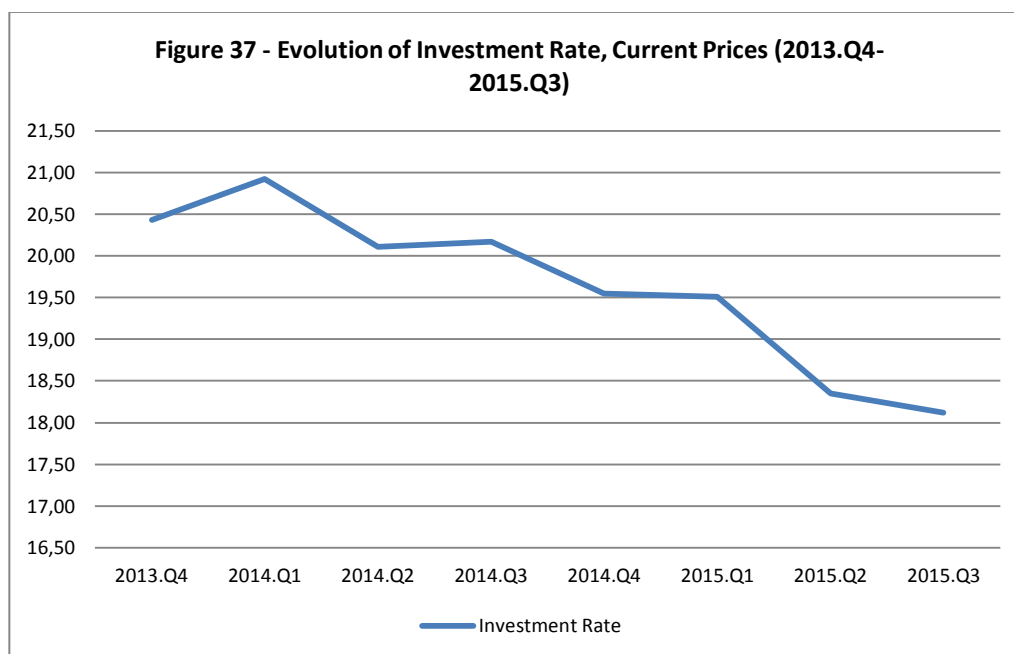
What factors explain this collapse of macroeconomic performance after 2014? We had seen in last section that due to exchange rate over-valuation, Brazilian economy had experienced some structural negative changes like de-industrialization and re-primarization of exports that reduced its long-run growth potential. These structural changes were sufficient to explain a situation of near stagnation that Brazil experienced in the period 2011-2013; but are incapable for its own to produce a deep recession as the one seen in 2015. A recession is always and elsewhere caused by insufficient effective demand, so in order to explain why Brazil entered in a deep recession we have to understand what factors caused a fall of aggregate demand at the end of 2014 and beginning of 2015.

Some economists in Brazil argue that recession was the result of the fiscal adjustment implemented in the beginning of the second term President Dilma Rouseff by the Finance Minister, Joaquim Levy²⁴. The economic reasoning of this statement is based in the so-called hydraulic Keynesianism, according to which a reduction of government expenditures will produce a more than proportional reduction in real output and employment, causing a fall in tax receipts and thus increasing the fiscal deficit, instead of reducing it. Apart from the naïve conception of the workings of economic system and also about the interrelation between fiscal policy, asset prices and economic activity, this hydraulic version of Keynesianism does not have any correspondence with facts occurred in Brazil. Indeed, according to data of Brazilian Central Bank primary

²⁴ See <http://economia.ig.com.br/2016-03-18/belluzzo-sobre-levy-disse-que-ia-fazer-ajuste-fiscal-mas-produziu-desajuste.html>.

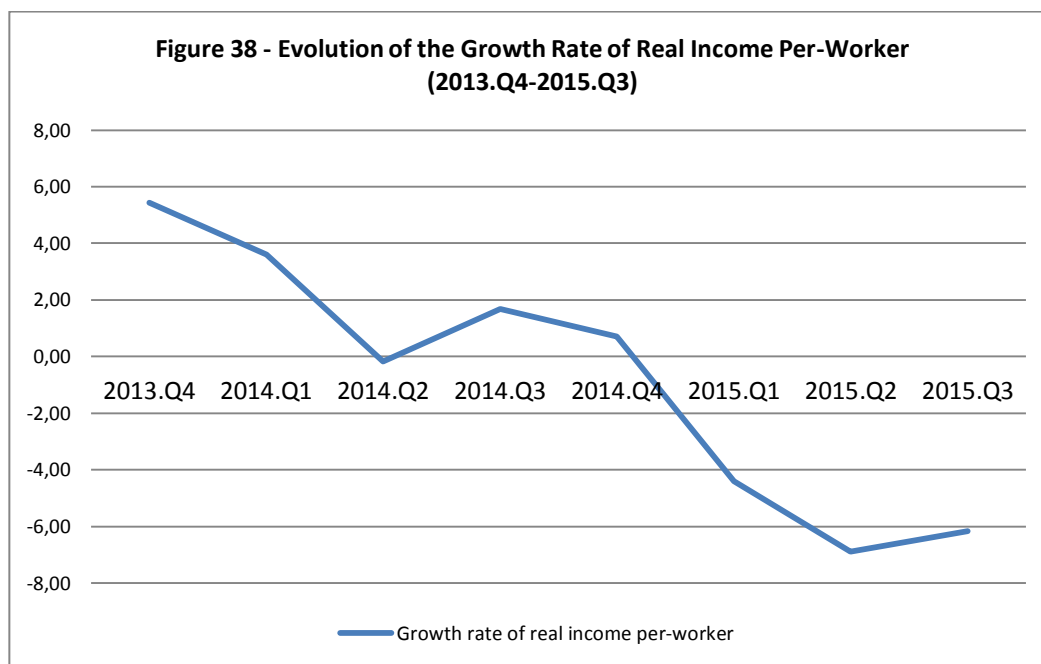
expenditures accumulated in 12 months had increased 0.384% in real terms from December of 2014 to September of 2015, precisely the period of Levy's fiscal adjustment. Hence there is no evidence of a major contraction of primary expenditures of Central Government in real terms.

The first cause of the contraction of aggregate demand was the reduction of investment rate. As we can see in figure 37 below, investment had fallen from 20.92% of GDP in the first quarter of 2014 to 18.12% of GDP in the third quarter of 2015, a fall of 2.80% of GDP in less than two years. This contraction of investment demand is for sure the result of ROE falling below the safe rate of interest after 2012 as we had seen in last section, i.e. a result of a profit squeeze. Besides that, the public scandal originated by police investigations of corruption (the so-called "operação lava-jato") at PETROBRAS had provoked a major political crisis with a serious threat of impeachment of President Dilma Rouseff. This crisis had also a clear and negative (but until now not quantified) effect over investment expenditures of private sector since it increased the perceived uncertainty in economic environment. Finally, the deterioration in terms of trade had also a negative effect over profitability of investment projects of the mining industry (oil and iron ore), which become increasing important in Brazil during the commodity boom.



Source: Central Bank of Brazil. Authors' own elaboration.

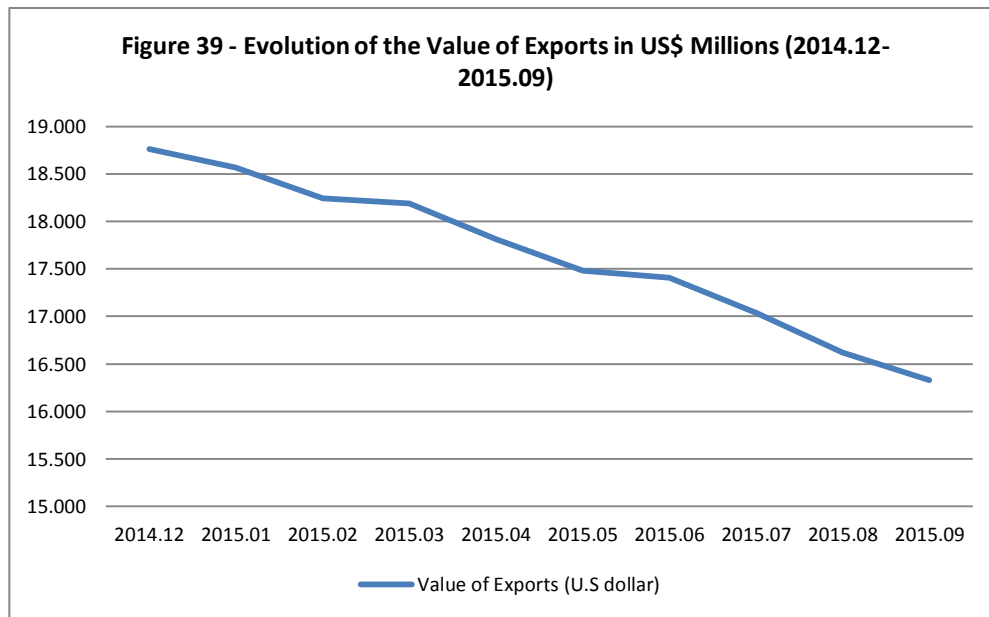
The second cause was the huge contraction of real income per-worker since the beginning of 2015. As we can see in figure 38 below, in the first semester of 2015 real income per-worker started to fall at a very fast rate, with the expected effects over consumption expenditures. The fall in real income per-worker was the result of inflation acceleration occurred in 2015 combined with the increasing in the rate of unemployment.



Source: Central Bank of Brazil. Author's own elaboration.

Finally, the deterioration in terms of trade produced a sharp decrease in the value of exports measured in U.S dollar, as we can see in figure 39. As a matter of fact, the twelve month average value of exports per month was reduced from US\$ 18.75 billion in December of 2014 to US\$ 16.33 billion in September of 2015, an average fall of 12.94% of exports value per-month.

To sum-up, a combination of change in international economic environment, delayed effects of errors in the conduction of economic policy, profit squeeze and a major political crisis had created the scenario of a *perfect storm*, generating a huge contraction of aggregate demand that reduced growth below potential. Since potential growth was reduced due to negative structural changes that Brazilian economy faced as a consequence of exchange rate over-valuation, the result was a deep recession, probably the deepest that occurred in Brazil since the end of Second World War.



Source: IPEADATA. Authors' own elaboration. Note: The series is the twelve month moving average of the value of exports per month in U.S dollar.

The deterioration in terms of trade had also a negative effect over the indicators of external fragility of Brazilian economy. As we can see in Table XXVI below, external debt as a ratio to GDP, external debt as a ratio to exports, Reserves as a ratio to external debt and current account deficit as a ratio to GDP had all increased in the period 2014.Q1 to 2015.Q3, mainly as the result of the reduction of the value of Brazilian exports. All indicators except current account as a ratio to GDP, however, remained at very good levels, indicating that Brazilian economy was still respecting the external solvency condition. Regarding current account as a ratio to GDP the huge depreciation of real exchange rate occurred in 2015 combined with the effects of the recession over imports will cause a future reduction for more sustainable levels²⁵.

²⁵ At the time that we were writing this paper, projections for current account made by economists and Central Bank showed a reduction for more or less 2.0% of GDP at the end of 2016.

Table XXVI – Evolution of External Fragility Indicators (2014.Q1-2015.Q3)

Period	External Debt/GDP	External Debt/Exports	Reserves/External Debt	CA/GDP
2014.Q1	14,20%	130,00%	117,80%	-3,24%
2014.Q2	13,90%	140,00%	114,20%	-3,56%
2014.Q3	13,80%	140,00%	111%	-3,86%
2014.Q4	14,20%	150,00%	107,30%	-4,31%
2015.Q1	15,40%	160,00%	107,40%	-4,50%
2015.Q2	16,90%	170%	107,30%	-4,40%
2015.Q3	17,80%	180%	107%	-4,09%
Average	15,17%	152,86%	110,29%	-3,99%

Source: Central Bank of Brazil. Author's own elaboration.

5 – Lessons from the Brazilian Case: What we have learned? What can be done?

Now we will turn our attention to the discussion of the lessons learned from the Brazilian experience with the management of the macroeconomic tripod and what reforms in the architecture of Brazilian macroeconomic regime can be done in order to restoring economic growth in Brazil.

Lesson #1: A good management of the macroeconomic tripod is not sufficient for macroeconomic stability. Real exchange rate targeting is necessary.

The macroeconomic tripod was believed by orthodox economists to be a necessary and sufficient condition for macroeconomic stability, defined as the achievement of a low and stable inflation rate. The Brazilian experience with the management of the tripod, however, showed that this was not true.

First of all, the achievement of a low and stable inflation rate is not enough to assure a stable growth path for real output, i.e. there is no such a thing as the “divine coincidence” in Inflation Targeting Regimes²⁶. From 2004 to 2010 Brazil had a stable and low inflation rate, but this was accomplished by means of a huge and persistent real exchange rate appreciation. The exchange rate appreciation paved the way for the near

²⁶ The term “divine coincidence” was introduced to represent a standard property of new Keynesian macroeconomic models according to which stabilization of inflation is consistent with the stabilization of the output gap (See. Blanchard and Gali, 2005). This property, however, is not a genetic feature of inflation targeting regimes, but derives from the hypothesis of absence of non-trivial real imperfections. Once real wage rigidity is introduced, divine coincidence disappears.

stagnation of GDP observed after 2011 due to its effects over imports penetration, industrial output and manufacturing share.

Moreover, a target for primary surplus is also not enough to guarantee the solvency of public sector in the long run and thus avoid a situation of fiscal dominance. Brazil had a structural fiscal problem related to the trend increase in primary expenditures as a ratio to GDP²⁷. Indeed, primary expenditures as a ratio to GDP had increased from 17.32% of GDP in December of 1999 to 22.48% in December of 2014, a real increase of 29.79% in 15 years. This means that primary expenditures as a ratio to GDP increased at an average rate of 1.98% p.y in the period 1999-2014. Since GDP increased at an average rate of 3.18% p.y during this period, real primary expenditures increased at an average rate of 5.16% p.y. For some time, this trend growth of primary expenditures was compatible with a stable primary surplus as a ratio to GDP due to the simultaneous increase in total receipts to GDP ratio. However, the near stagnation of Brazilian economy after 2011 reduced the growth rate of total receipts, producing a noticeable reduction of primary surplus even before the great recession of 2015.

Over-valuation of real exchange rate and the fiscal structural problem are interconnected. The trend increase in primary expenditures to GDP ratio combined with a more or less constant primary surplus to GDP (until 2010) resulted in a clearly expansionary fiscal policy²⁸. In order to maintain a stable inflation rate, Brazilian Central Bank had to engage in a very tight monetary policy, setting short-term nominal interest rate at level higher enough to induce capital inflows and appreciation of nominal exchange rate. The result of this policy mix – ease fiscal policy and tight monetary policy – was a huge appreciation of real exchange rate accompanied by a fast disinflation from 2003 to 2006.

The improvement in terms of trade after 2006 acted to reinforce the movement towards exchange rate appreciation, forcing Brazilian Central Bank to make sterilized

²⁷ One of the main reasons for this trend growth in primary expenditures is increasing expenditures of social security due to the indexation of social security payments to minimum wage combined with ageing of Brazilian population. Since minimum wage is indexed to inflation and real GDP growth, social security payments growth rate is at least equal to growth rate of nominal GDP. The ageing of Brazilian population in the last 20 years due to the decline in fertility rates made retired population to increase at a faster rate than labor force, making social security payments to increase at a faster rate than nominal GDP. The increase in government expenditures with health care and education is also another important source of increase in primary expenditures.

²⁸ According to Haavelmo's theorem of balanced budget multiplier (see Haavelmo, 1945), an increase of government expenditures that is financed by increase in tax receipts cause an increase in real output equivalent to the increase in government expenditures, i.e. the government expenditures multiplier is equal to one.

interventions in exchange rate market by means of massive reserve accumulation in order to avoid an excessive over-valuation. The high level of short-term interest rate in Brazil combined with the appreciation of nominal exchange rate made this sterilized interventions too costly for Monetary Authorities, increasing nominal deficit and thus making increasingly difficult the stabilization/reduction of public debt/GDP.

Monetary Authorities in Brazil faced a clear dilemma. Due to the behavior of fiscal policy, the maintenance of inflation within the bounds of Inflation Targeting Regime required a tight monetary policy. This policy mix caused an exchange rate appreciation that was reinforced by the improvement in terms of trade. In order to avoid an excessive over-valuation of exchange rate, Central Bank had to intervene in the exchange rate market by means of massive reserve accumulation. But this intervention was too costly due to high domestic interest rate. Moreover, exchange rate appreciation was required to maintain a stable and low inflation in face of an expansionary fiscal policy. At the end, Central Bank of Brazil tried a compromise between the objectives of inflation stabilization and exchange rate management: reserve accumulation will be at a pace that could avoid an *excessive* over-valuation but not at a rate that could put in danger the achievement of target inflation.

The compromise failed in accomplishing its objectives. Neither Central Bank could avoid an excessive over-valuation; neither the target inflation of 4.5 % p.y was obtained after 2009. The result was inflation with stagnation from 2011 on. The macroeconomic tripod was not sufficient to assure macroeconomic stability.

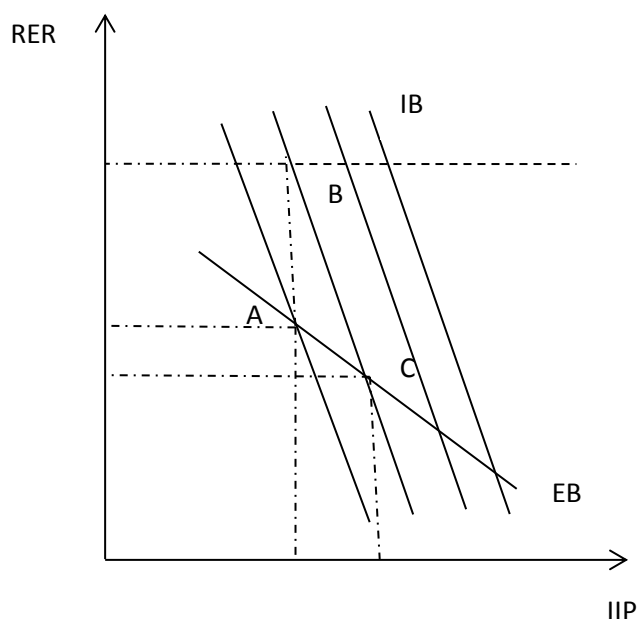
The Brazilian experience shows that some kind of target for real exchange rate is required for a good macroeconomic performance in the medium term. This observation demands two additional clarifications. The first one regards the feasibility of targeting real exchange rate; the second one regards the level of real exchange rate that must be targeted by policy makers. In order to produce a permanent change in the level of real exchange rate, economic policy must be capable to produce a change in the equilibrium value of real exchange rate. But what does equilibrium real exchange rate means? There are two different concepts of equilibrium real exchange rate in the literature. The first one is the *Classical concept*, according to which equilibrium real exchange rate is the level of real exchange rate that assure internal balance, i.e. market clearing in all markets including labor market (Montiel, 2011, p.381). The second one is the *Nurksian concept* according to which equilibrium real exchange rate is the level of real exchange rate that guarantees the internal and also the external balance of the economy, which is

defined as a situation where international investment position (IPP)²⁹ of the domestic economy is constant over time (Ibid, p. 205).

A reduction of government expenditures – a fiscal contraction – produces a depreciation of real exchange rate according to the classical concept, but an appreciation according to the Nurksian concept. This divergence about the behavior of real exchange rate is due to the impacts of a change in fiscal policy over international investment position. Let us consider an economy that is on an initial position of internal and external balance, as the one represented by point A in Figure 40, but policy makers want to depreciate real exchange rate to a more competitive level. A reduction of government expenditures will produce a fall in aggregate demand, making internal balance curve to shift to the right. For equilibrium in goods and labor markets to be maintained real exchange rate had to depreciate in order to increase net exports and restore the equality between output and aggregate demand. Internal balance is restored at point B with real exchange rate depreciation, as desired by policy makers, but the economy is no longer in a position of external balance. Due to real exchange rate depreciation, current account is now on a surplus and international investment position begins to increase. Over time the increase in net financial wealth of domestic economy will induce an increase in demand for domestic bonds due to wealth effects, causing nominal and real interest rate to fall, thus increasing aggregate demand. The expansion of aggregate demand will result in an increase in domestic prices, making real exchange rate to appreciate. This process will continue until current account is on balance and international investment position is again constant (point C). Once external balance is obtained, real exchange rate will be lower and international investment position will be higher than in the initial equilibrium.

²⁹ International investment position is the net financial wealth of domestic economy, i.e. the difference between foreign assets held by residents and domestic assets held by non-residents. As a first approximation it can be taken as equal to (-) net external debt.

Figure 40: Determination of Internal and External Balance in a Medium-Run Macroeconomic Model³⁰



In order to avoid the appreciation of real exchange rate in the long-run due to the increase in international investment position, Monetary Authorities must depreciate nominal exchange rate in order to offset the effects of domestic inflation over real exchange rate. This would keep the economy moving to the right of point B with a constant real exchange rate, due to the displacement of IB curve to the right. Since real exchange rate will be kept at a higher level, current account will remain on surplus, forcing monetary authorities to accumulate reserves for avoiding an appreciation of nominal exchange rate. Reserve accumulation will not cause a monetary expansion – and thus an acceleration of inflation - if it is sterilized by means of Repo operations.

These considerations allowed us to conclude that a *real exchange rate targeting* (at a more competitive level) requires a *fiscal contraction* combined with the adoption of a *crawling-peg exchange rate regime*, where Central Bank sets the rate of devaluation of nominal exchange rate at a level equal to the difference between target (domestic) and international inflation. In this setting, monetary autonomy can be maintained by means of the sterilization of the effects of reserve accumulation over monetary base.

³⁰ The model is due to Montiel (2011, chapter 8).

What level of real exchange rate must be targeted? According to Frenkel (2002, 2014) in order to give a positive contribution for economic growth, exchange rate policy must be designed to target real exchange rate at a stable, sustainable and competitive level. A competitive level for real exchange rate seems to be the one for which domestic firms that operate with state-of-art technology can compete with foreign firms in both domestic and international markets. Such a level of real exchange rate is defined as *industrial equilibrium*³¹ by Bresser-Pereira, Oreiro and Marconi (2014), since it is also compatible with a constant share of manufacturing industry in GDP³². For countries that had abundant natural resources as Brazil, industrial equilibrium exchange rate is greater than the level of real exchange rate required for external equilibrium. This means that industrial equilibrium is also sustainable if a proper exchange rate policy is implemented³³. Last but not least, industrial equilibrium exchange rate will be relatively stable over time if the ratio between domestic unitary labor costs in domestic currency and foreign unitary labor costs in foreign currency is kept more or less constant over time³⁴.

Lesson #2: The composition of public debt matters, moreover for macroeconomic stability central government must be net creditor in foreign currency. Reducing the level of Brazilian international reserves for finance public investment is not a good idea.

A good management of public debt is of fundamental importance for macroeconomic stability. As the Brazilian experience in 2002 had shown, the combination of floating exchange rate and a robust primary surplus as a ratio to GDP are not enough to avoid the emergence of fiscal dominance and/or the occurrence of a fiscal crisis. If a large share of public debt is indexed to nominal exchange rate, a capital flight originated by rumors about some kind of default on public debt (as the ones

³¹ We will define industrial equilibrium exchange rate as the rate of exchange for which unit labor costs in domestic currency of local firms are equalized with the unit labor costs of foreign firms measured in foreign currency. The same definition is adopted by Marconi (2012).

³² For the methodology of calculating the industrial equilibrium exchange rate see Marconi (2012).

³³ Sustainability of real exchange rate at the industrial equilibrium level requires the neutralization of Dutch disease. This can be done by means of the imposition of taxes over exports of goods intensive in natural resources.

³⁴ This will require domestic labor unions to accept a policy of *wage moderation* according to which domestic wage inflation must be equal to wage inflation in the rest of the world *plus* the difference between domestic growth rate of labor productivity and foreign productivity growth rate.

occurred in the second semester of 2002 due to the fears regarding the economic policy to be implemented by President Lula) will generate a very fast increase in the public debt/GDP ratio, increasing the likelihood of default. This was a clear example of a fiscal crisis generated by self-fulfilling prophecies.

From 2003 on, National Treasury sets a policy of reducing the share of net public debt that was indexed to nominal exchange rate, which reached a negative value after 2006 due to the accumulation of international reserves. The change in the situation of public sector from a net debtor to a net creditor in foreign currency was fundamental for the consolidation of a monetary dominance regime and also for external robustness of Brazilian economy. Due to this change in the composition of net public debt, Brazilian economy did not suffer a huge capital flight³⁵ or a fiscal crisis after the eruption of world financial crisis in 2008. Moreover, to be a net creditor in foreign currency allowed Central Government to profit from the huge depreciation of nominal exchange rate occurred in 2015, using the seignorage receipts due capital gains from international reserves to reduce the pace of debt accumulation.

Recently some left-wing economists started to defend the use of international reserves in order to finance public investment in infra-structure as an emergency anti-cyclical policy³⁶. Apart from the obvious fact that a noticeable reduction of international reserves would produce a sharp deterioration in the external fragility indicators – mainly reserves to external debt ratio – in a very uncertain international environment where Brazilian economy had lost investment grade (what could induce a sudden capital flight from Brazil and thus a huge exchange rate depreciation), this proposal would reduce the net creditor position in foreign currency of Central Government, thereby reducing the generation capacity of seignorage in a moment where National Treasury needs these receipts in order to reduce the growth rate of public debt. This is a clear example of a bad idea, proposed in the wrong time.

³⁵ According to data presented in Oreiro and Basilio (2011) between august and September of 2008 there is no capital flight from Brazil. The capital flight occurred from October of 2008 to January of 2009, being partially reverted in February of that year.

³⁶ See <http://oglobo.globo.com/economia/proposta-de-uso-das-reservas-internacionais-abre-polemica-18885326>.

Lesson # 3: Reserve accumulation was not enough to prevent real exchange rate appreciation. Fiscal policy must also be designed in order to stabilize real exchange rate.

We had seen that from 2006 to 2013, Brazilian Central Bank made huge sterilized (and also no-sterilized) interventions in exchange rate market by means of massive reserve accumulation in order to stop or reduce the trend appreciation of real exchange rate. These interventions failed. A persistent over-valuation of real exchange rate was the norm in Brazilian economy up to 2015.

Why reserve accumulation failed in the task of reversing over-valuation of real exchange rate? The fundamental reason is, for sure, the absence of a *real exchange rate target* for macroeconomic policy. As well known, macroeconomic tripod was based on the *new macroeconomic consensus* that established price stability as the only or more important objective of macroeconomic policy. The architecture of the macroeconomic tripod does not give to policy makers the required policy instruments to stabilize real exchange rate at some target level. In particular it would be necessary not only to make sterilized interventions in exchange rate market by means of reserve accumulation (and also capital controls in order to disconnect nominal exchange rate from movements in sovereign risk premium); but also fiscal policy must be designed in order to avoid that domestic absorption to increase in a faster rate than GDP. This means that the objective of fiscal policy can't be only the stabilization of public debt as a ratio to GDP, but also to stabilize real exchange rate at a competitive level. One possibility should be making the target of primary surplus adjustable according to the difference between the growth rate of domestic absorption and growth rate of GDP. In times where domestic absorption increases at a faster rate than GDP, central government should increase the target for primary surplus in order to reduce the rate of growth of domestic absorption and then avoid an appreciation of real exchange rate. When the rate of growth of domestic absorption is below the GDP growth then central government can reduce the target for primary surplus.

To implement such a fiscal policy it would be necessary to eliminate the structural fiscal problem of Brazilian economy, i.e. the trend growth of primary expenditures as a ratio to GDP. In order to do that, some reforms in social security as, for example, an increase in the minimum age for retirement and also a change in the indexation rule of minimum wage must be introduced.

Lesson # 4: Inflation Targeting is not sufficient to assure price stability. Fiscal and income policies must help Central Bank in the task of controlling inflation.

Inflation targeting in Brazil had a poor performance. From 1999 to 2003, Target inflation was reached only in one year (2000). In 1999 inflation was within the band for inflation, but in all other years inflation was above the ceiling for inflation. From 2004 up to 2010, the performance was superior since inflation was near or below target in 2006, 2007 and 2009 and within the band but substantially higher than target in 2004, 2005, 2008 and 2010. From 2011 inflation was always higher than target, but within the band until 2014. Finally in 2015 inflation was much higher than the ceiling of 6.5% p.y.

From 1999 to 2003 the difficulties in reaching the target inflation was a result of the combination of declining targets for inflation with the exchange instability due to the composition of Brazilian public debt that allowed the occurrence of a fiscal crisis generated by self-fulfilling prophecies. The adoption of a constant target for inflation from 2006 on combined with the improvement in the composition of net public debt and a huge exchange rate appreciation allowed inflation to remain within the band and more or less near to the target of 4.5% p.y until 2010.

From 2011 on, however, inflation remained close to 6.0% p.y, very near to the ceiling of 6.5% p.y and far from the target of 4.5% p.y. What factors explain this behavior of inflation rate?

The first one is the end of the real exchange rate appreciation cycle. From 2003 to 2010, real exchange rate had a huge appreciation due to a combination of improvement in terms of trade and reduction in the sovereign risk premium. This appreciation of real exchange rate allowed inflation to stay at low and stable levels at the same time that real interest rate was being gradually reduced. From 2011 on, however, the trend appreciation was partially reversed as Central Bank of Brazil finally recognized that this movement was destroying the external competitiveness of Brazilian manufacturing industry. The policy answer was to reduce short nominal interest rate and allow an increase in domestic inflation in order to open a policy space for exchange rate depreciation. In other words, Central Bank decided to make inflation targeting more flexible.

The problem with this policy option is that the space created for nominal exchange rate depreciation was not enough to allow a noticeable correction of real exchange rate without making inflation to be higher than the ceiling of 6.5% p.y. For that it would be necessary to meet other conditions. The first one, the structural fiscal problem had to be solved in order to make a change in the mix of fiscal and monetary policy. Real exchange rate appreciation was the result of a tight monetary policy combined with an easy fiscal policy. For a non-inflationary depreciation of real exchange rate to occur then an easy monetary policy should be combined with a tight fiscal policy, what would require the stabilization/reduction of primary expenditures as a ratio to GDP.

The second condition is related to wage policy. We had seen that from 2007, minimum wage growth in Brazil was determined by law at a rate equal to last year inflation measured by Consumer Price Index (IPC) plus the real growth rate of GDP two years before. This rule resulted in minimum wage growth much ahead of productivity gains. Since in Brazil wage structure is organized in such way that workers of both formal and informal sectors earn a multiple of the minimum wage (the so-called numeraire effect) than wage growth ahead of productivity gains spread all over the economy³⁷, resulting in increase of unit labor costs and decreasing profit shares³⁸ in manufacturing industry and inflation pressure in non-tradeable sectors. This rule for wage growth clearly created an autonomous source of inflationary pressure that limited the policy space of Central Bank to induce a depreciation of nominal exchange rate without jeopardizing Inflation Targeting Regime.

To sum up, the performance of inflation targeting in Brazil was negatively affected by fiscal policy and wage policy. The combination of an easy fiscal policy with a rule for minimum wage that induced wage growth ahead of productivity gains to spread all over the economy limited the space of Central Bank to manage the required depreciation of exchange rate. The result was the worst of all: real exchange rate remained over-valued and inflation rose to an uncomfortable level between 6.0% to 6.5% p.y%.

³⁷ About the numeraire effect of minimum wage in Brazil see Neri, Gonzaga and Camargo (2001).

³⁸ The ability of the firms of the tradeable sector to increase prices due to increase in unit labor costs is limited by external competition. That is why the trend increase in unit labor costs in manufacturing industry was followed by a reduction in profit share and return on equity as can be seen in the work of Rocca (2015).

Lesson # 5: Growth may be demand-led; but firms also need to have access to demand in order to produce and invest.

The so-called new macroeconomic matrix was an attempt made under the first term of President Dilma government to accelerate growth of Brazilian economy and to revert the situation of stagnation in manufacturing industry after 2011. The diagnosis of policy makers at the Ministry of Finance was that growth deceleration was due to a reduction of aggregate demand growth due to the continued effects of world financial crisis of 2008 over Brazilian economy. The policy action was to make a fiscal and monetary expansion in order to boost aggregate demand and stimulate growth and capital formation.

There is some evidence that economic growth in Brazil is demand-led. As a matter of fact, Oreiro et al (2012) found some empirical evidence about the endogeneity of natural rate of growth, which is sensitive to actual growth rate, showing that an increase in aggregate demand can induce an increase in potential output. However, a growth of aggregate demand can be a necessary, but not a sufficient condition for growth of real GDP. For real GDP to respond to growth of aggregate demand is also necessary for domestic firms to have access to this demand, what requires real exchange rate to be at a competitive level (Bresser-Pereira, 2014).

The deeper cause of failure of new macroeconomic matrix was its incapacity to solve the over-valuation of exchange rate, what would require profound changes in the macroeconomic policy regime in Brazil. Because of exchange rate over-valuation, expansion of aggregate demand induced under new macroeconomic matrix had small and temporary effect over economic growth, since it resulted in a strong increase in imports and a major reduction in primary surplus/GDP, making a fiscal adjustment and a reversal of some tax exemptions absolutely necessary from 2014 on.

Since economic growth was not restored by the simple creation of aggregate demand, investment rate did not increase as it would be expected by accelerator theory of investment behavior, worsening the productivity stagnation and deepening the profit squeeze problem originated by wage growth ahead of productivity gains.

The permanent effects of the new macroeconomic matrix were to increase the fiscal and external disequilibrium of Brazilian economy.

6 – Macroeconomic challenges to restoring economic growth in Brazil: The Foundations of a New Macroeconomic Policy Regime.

In the last sections we saw that growth deceleration in Brazil after 2011 has a structural cause which is de-industrialization and re-primarization of exports caused by the chronic over-valuation of real exchange-rate. This over-valuation was the consequence of both the improvement in terms of trade (Dutch disease caused by commodity boom) mainly after 2006 and trend growth of primary expenditures as a ratio to GDP. In the last semester of 2015, however, terms of trade seemed to return to the level observed at the end of 2005, inducing a depreciation of real exchange rate to a level compatible with industrial equilibrium. Indeed, from September of 2014 to September of 2015, nominal exchange rate had devaluated in 62.10%, reaching a value near R\$ 3.97 in the beginning of October. If we consider the industrial equilibrium exchange rate then we obtain a value of R\$ 3.60 per dollar as the adequate level for nominal exchange rate³⁹. This means that exchange rate adjustment is done. From now on the challenge is to avoid a new round of exchange rate appreciation.

In order to maintain real exchange rate at a stable, sustainable and competitive level in the medium term is necessary to stop the trend growth in primary expenditures to GDP ratio. Doing that would allow a change in the economic policy mix toward a combination of easy monetary policy and tight fiscal policy, producing a reduction of real interest rate. With interest rate near the international level (adjusted for sovereign risk premium), the pressure for exchange rate appreciation will be greatly reduced, making easier for Central Bank to manage exchange rate at a competitive level in the medium term by means of sterilized interventions in the exchange market.

Once trend growth of primary expenditures/GDP was stopped⁴⁰, a new target rule for primary surplus/GDP must be introduced in order to guarantee the targeting of real exchange rate at a competitive level. This means that fiscal policy objective will not be limited to stabilization of public debt, as what happened under the macroeconomic tripod, but also to manage real exchange rate around a competitive level in the medium run

³⁹ See Marconi (2012) for the methodology of estimating the level of industrial equilibrium exchange rate. Our estimates for industrial equilibrium exchange rate are based on Marconi's estimates for 2011, updating it according to the inflation differential between Brazil and United States from 2012 to 2015.

⁴⁰ This will require a structural fiscal reform with changes in social security and in the minimum wage rule.

The new target rule for primary surplus can be seen in equation (1) below:

$$s_t = \bar{s} + \delta(g_{a,t-1} - g_{y,t-1}) \quad ; \quad \delta > 0 \quad (1)$$

Where: s_t is the target for primary surplus at year t ; $\bar{s}$ is the primary surplus/GDP required to stabilize public debt/GDP in the long term; $g_{a,t-1}$ is the growth rate of domestic absorption at year $t-1$; $g_{y,t-1}$ is the growth rate of GDP at year $t-1$.

According to equation (1) when domestic absorption was growing at a higher rate than GDP, then Fiscal Authority must increase the target for primary surplus as a ratio to GDP above of the required level to stabilize public debt/GDP, in order to decrease the growth rate of domestic absorption and avoid a real exchange rate appreciation. If domestic absorption is growing at a lower rate than GDP, than fiscal policy could be eased by a reduction of primary surplus/GDP to a level below the one required for the stabilization of public debt in order to increase the growth rate of domestic absorption and avoid a depreciation of real exchange rate above the industrial equilibrium level.

This rule is compatible both with stabilization of public debt/GDP ratio in the long run as with the exchange rate targeting at a competitive level. Indeed, in the long run growth rate of domestic absorption had to be equal to growth rate of GDP since current account surplus or deficit as a ratio to GDP can't grow forever. Being so, a primary surplus targeting rule as the one given by (1) will generate the required primary surplus for the stabilization of public debt. In the medium term, however, the rule gives flexibility for Fiscal Authority to pursue the stabilization of real exchange rate at the industrial equilibrium level.

What value $\bar{s}$ must have in order to stabilize public debt to GDP ratio in the long run? According to Montiel (2011, chapter 9), the level for primary surplus/GDP that is required to stabilize gross public debt/GDP is given by:

$$s = (r - g)d(0) - (\pi + g)m \quad (2)$$

Where: r is the real interest rate, g is the growth rate of real GDP, $d(0)$ is the initial value of gross public debt/GDP, π is the rate of inflation and m is the ratio of monetary base/GDP.

In December of 2015 the net public debt/GDP was 43.1%, increasing 9.1% of GDP in twelve months. For 2016 public sector is expected to have a primary deficit of 1.5% of GDP due to the continued effects of the recession over tax receipts. A primary surplus is not expected before of 2018 when net public debt/GDP may have reached 60%. We will take this number as the initial value for net public debt/GDP.

Regarding other parameters, the average value of the ratio of monetary base/GDP in 2015 was 4.08% and we have no reason to expect a change of this ratio. For long-run projections it is reasonable to assume that inflation will be on target, than we will set 4.5% p.y as the long-run value of inflation. For real interest rate and growth rate of real GDP it is impossible to have point estimation. Let us assume that real interest rate can oscillate in the interval between 2.0% p.y and 4.0% p.y once a structural fiscal adjustment is made. For real growth rate we will assume that it will oscillate between 1.5% p.y and 3.5% p.y, depending on how successful targeting real exchange rate at a competitive level will be for inducing a reindustrialization of Brazil.

The values of the primary surplus/GDP that is required to stabilize net public debt/GDP are shown in Table XXVII.

Table XXVII – Required Primary Surplus/GDP for Different Combinations of Real Interest Rate and Growth of Real GDP

	1,50%	2,00%	2,50%	3,00%	3,50%
2,00%	0,05%	-0,27%	-0,59%	-0,91%	-1,23%
2,50%	0,35%	0,03%	-0,29%	-0,61%	-0,93%
3,00%	0,65%	0,33%	0,01%	-0,31%	-0,63%
3,50%	0,95%	0,63%	0,31%	-0,01%	-0,33%
4,00%	1,25%	0,93%	0,61%	0,29%	-0,03%
seignorage	0,25%	0,27%	0,29%	0,31%	0,33%

Source: IPEADATA. Author's own elaboration. Real interest rates are at the left column and Real GDP growth rates are at the upper line.

What value for $\bar{s}$ should be considered? In a situation of k-uncertainty (uncertainty in Keynes-Knight sense) as the one we are facing, the criteria for rational choice is the MMEU (MaxMim expected utility), i.e. to select the course of action that produce the best outcome in the worst scenario (Vercelli, 1991, p.87). Clearly the worst scenario is the one in which required primary surplus is 1.25% of GDP.

This value for primary surplus will be high enough to stabilize net public debt as a ratio to GDP at 60% if the worst combination of for real interest rate and real growth rate of GDP occurred. However to stabilize net public debt at a so high value is not a good policy choice. Although there is no clear threshold level for net public debt/GDP above which public sector became insolvent, there may be an upper limit for the size of required primary surplus/GDP due to economical and/or political considerations. Since the required primary surplus is itself a positive function of the level of public debt/GDP, a gradual reduction in public debt/GDP ratio seems to be a good idea in order to maintain a safety margin that can be used in the future. In other words, the reduction of public debt to GDP to a lower level – say, 30% of GDP – is required in order to build a fiscal space as a precaution against future recessions. Due to these considerations, a primary surplus/GDP of 2.0% seems to be appropriate for Brazilian economy.

A primary surplus of 2.0% of GDP will require a substantial fiscal adjustment once we noticed that market projections for 2016 pointed a primary deficit of 1.5% of GDP. This means that it is necessary to make an increase of 3.5% of GDP in the primary surplus. More or less 30% of the required increase in primary surplus will come from the cyclical recovery of the economy. For instance, in April of 2014 Brazilian economy was not on recession and tax receipts of central government reached 23.04% of GDP. One year after, economy was in recession and tax receipts fallen to 21.98% of GDP, a reduction of 1.06% of GDP in the total receipts of Central Government due to the effects of recession over tax revenues.

According to Salto and Marconi (2015) there are potential gains to be obtained by means of the improvement in the efficiency in the system of purchases of goods and services by Public Administration⁴¹. From 2005 to 2014 the accumulated change in the GDP deflator of Public Administration was 128.6%, but only 88.5% in the private sector. This means that inflation for Public Administration was 40.0 p.p. higher than for private sector. This divergence of inflation for Public Administration and Private Sector occurs due to the frequent delays in the payments that the former has to do for its purchases of goods and services from the latter, which occurs only to make cosmetic improvements in the accounting statistics of the Public Administration. These delays induce private sector to incorporate an over-price in its sales for Public Administration. Due to this over-price, expenditures of public sector are 2.6% of GDP higher than it

⁴¹ See <http://www1.folha.uol.com.br/ilustrissima/2015/08/1674874-ajuste-pode-ser-feito-sem-cortar-conquistas-sociais-importantes.shtml>.

were necessary if the over-price was eliminated. A simple change in the rule of payments combined with a renegotiation of all contracts of Private Sector with Public Administration can produce an increase of primary surplus in 2.5% of GDP.

Besides a change in fiscal policy regime, it is also required a change in the minimum-wage policy. It is consensus among Brazilian economists that minimum-wage policy was extremely important in the last 15 years for reducing income inequality in Brazil⁴². However, the minimum wage policy designed after 2007, according to which minimum wage growth in year t is given by last year inflation and real GDP growth two years before, produced an autonomous source of inflationary pressure due to the so-called *numeraire effect* that spread real wage increase ahead of productivity gains for all over economy. Moreover, since social security transfers are highly indexed to minimum wage, this rule is also one of the fundamental causes of trend increase in primary expenditures/GDP in Brazil. A new rule for minimum wage must be designed.

A new rule for minimum wage must eliminate the indexation by past inflation, at the same time that assures the maintenance of the purchase power of minimum wage in the medium term. An option would be to substitute past inflation for target inflation. Since in the medium term inflation will reach target value in a successful Inflation Targeting Regime, than this substitution will be compatible with the stability of purchasing power of workers.

It is also necessary to incorporate productivity gains due to economic development in the minimum wage in order to produce a smooth increase in the standard of living of the working classes. One way to do that is to substitute real GDP growth of year $t-2$ for the five years moving average at year $t-2$ of real growth of per-capita income. Since in a balanced growth path per-capita income growth must be equal to productivity growth, this rule is compatible with a non-inflationary increase of minimum wage in the medium run.

The change in the fiscal policy regime combined with the change in the minimum wage policy will produce a much more stable inflation environment, making easier for Brazilian Central Bank to target inflation. This would allow a reduction in nominal and real short-term interest rate, producing a devaluation of exchange rate and also a reduction in nominal deficit of public sector due to lower interest payments over

⁴² See Saboia (2015) and Lavinias (2013).

public debt. This does not mean that some changes in the Inflation Targeting Regime in Brazil are not necessary.

Regarding these matters it is necessary to change the Institutional Arrangement of Inflation Targeting Regime in order to consolidate the required change in the mix of macroeconomic policy towards a more easy monetary policy⁴³. In particular it is necessary to change the convergence period for target inflation. Since the implementation of inflation targeting in 1999, converge period was set in one year. In many inflation targeting countries, convergence period was higher than one year. For example, in Korea the convergence period was set in three years, and in Canada it was set in five years (Oreiro and Rocha, 2011). A small convergence period makes difficult for Monetary Authority to accommodate supply shocks, inducing a tight in monetary policy by means of increasing short-term interest rates. This is not an adequate response neither for inflation or exchange rate stabilization. Given this considerations, a three-year convergence period for inflation seems to be a reasonable compromise horizon for Brazilian Central Bank.

Another issue is the numerical value for target inflation. Since 2006 target inflation was set at 4.5% p.y. in Brazil. There is a growing consensus in Brazil that this number is too high for a long-run target since it is much higher than the inflation levels observed in developed and even in some developing countries. A long-run target of 3.5% p.y seems to be more appropriate for monetary policy in Brazil.

The market expectation for inflation in 2016 is 7.5%. No one expects inflation to reach 4.5% p.y. before the end of 2017. This means that the 3.5% p.y target inflation must be left to 2019 or 2020 in order to avoid an unnecessary and harmful thigh of monetary policy in the years to come.

A concrete proposal for changing the institutional arrangement of Inflation Targeting in Brazil could be seen in Table XXVIII.

Table XXVIII – A Proposal for Target Inflation 2016-2024.

	2016-2018	2019-2021	2022-2024
Target inflation	4.5%	4%	3.5%
Band	1.5%	1.0%	1.0%

Source: Authors' own elaboration.

⁴³ See Squeff, Oreiro and De Paula (2009) for a discussion about the convenience of a more flexible Inflation Targeting Regime in emerging economies.

According to the proposal presented in Table XXVIII, besides the compromise horizon for short-run targeting inflation being extended to three years, convergence to the long-run target of 3.5% p.y was thought to occur by the end of period 2022-2024. This gives a 9 year horizon for a gradual convergence of inflation to the long-run target. Since the compromise horizon was extended to three years, a band of 2.0 p.p of tolerance for inflation as the one observed today in Brazil seems to be excessive. In order to reduce the volatility of inflation expectations, the band must be gradually reduced first to 1.5 p.p in 2016-2018 and then to 1.0 p.p from 2019 on.

The change in the economic policy mix from an easy fiscal policy-tight monetary policy to a tight fiscal policy-easy monetary policy is necessary but may not be sufficient for targeting real exchange rate at a stable, sustainable and competitive level in the medium run. Foreign exchange markets in emerging economies like Brazil are too much volatile due to its low density compared to the size of capital flows. This structural feature makes exchange rates too sensitive to changes in sovereign risk premium as we had seen to occur in the Brazilian case. Moreover the abundance of natural resources made Brazilian economy particularly vulnerable to Dutch disease due to improvements in terms of trade.

In face of these considerations, it seems reasonable to impose a floor to nominal exchange rate in order to avoid nominal exchange rate to appreciate at a level below the industrial equilibrium. This floor must be publicly announced by Central Bank and changed annually at a rate equal to the difference between domestic and international inflation. The implementation of such a floor would demand the realization of sterilized interventions in foreign exchange markets as it was done by Brazilian Central Bank from 2006 to 2013, but now with an explicit target for nominal exchange rate (more precisely, a floor for nominal exchange rate). In order to make these interventions more effective, controls over capital inflows must also be implemented⁴⁴. The tax over financial transactions - *Imposto sobre Operações Financeiras* (IOF) - must be set at rate enough high to eliminate any possible arbitrage gains from holding domestic assets vis-a-vis foreign assets. In order to guarantee the effectiveness of capital controls, the tax over financial transactions must be extended to all types of capital inflows, including foreign direct investment.

⁴⁴ Capital controls will reduce capital inflows thereby reducing the pressure for exchange rate appreciation and the need of sterilized interventions in foreign exchange markets. For the economic theory of capital controls see Oreiro (2004B).

Regarding the Dutch disease, although for now there is no obvious sign of its presence in Brazil due to the deterioration in terms of trade occurred in 2015, it is prudent to have a contingent plan to face its effects if and when it is necessary. One possibility is to introduce an export tax over commodities, but set a zero rate if the commodity price index was below some threshold level, as recently defended by Bresser-Pereira (2016). Above this level, the tax over exports of commodities should be done at an increasing rate. This tax will reduce the profitability of commodities exports only in periods of high commodity prices, thereby reducing the strength of Dutch disease.

To sum up, the proposal for a new macroeconomic policy regime encompass deeper changes in the objectives, targets and instruments of fiscal, monetary, wage and exchange rate policies. These changes can be seen in table XIX below.

As we can see in Table XXIX, one important feature of the proposed macroeconomic regime is the presence of positive spillover effects of one policy over the others. For example, the wage policy clearly makes easier for Central Bank to achieve target inflation. Fiscal policy also facilitates the maintenance the competitiveness of domestic firms in international markets due to the mechanisms designed to target real exchange rate at a stable, sustainable and competitive level. Due to the presence of these positive spillover effects, the new policy regime seemed to be consistent in the sense of Tinbergen (1988), meaning that the simultaneous achievement of all objectives and targets of the macroeconomic policy regime is possible by means of an adequate manipulation of policy instruments.

**Table XXIX – Objectives, Targets and Instruments of the New
Macroeconomic Policy Regime**

Policy	Objectives	Targets	Instruments
Monetary policy	Low and stable inflation rate	Medium-run inflation target	Short-term interest rate
	Nominal Exchange rate at a stable, sustainable and competitive level	Floor for nominal exchange rate	Capital controls. Sterilized interventions in foreign exchange market
Fiscal policy	Net public debt as a ratio to GDP at a low and stable level.	Target for primary surplus/GDP at a level compatible with stabilization of public debt in the long run as but adjustable for allowing exchange rate targeting in the medium run	Reform in social security and change in minimum wage law.
	Targeting real exchange rate at a stable, sustainable and competitive level.	Stability in primary expenditures/GDP ratio.	Change in discretionary expenditures when it is necessary to adjust primary surplus. Tax over commodity exports
Wage policy	Low and stable inflation rate Improvement in the standard of living of working classes	Growth of real wages in line with productivity growth .	Minimum wage growth according to inflation target and trend growth of per-capita income.
Exchange rate policy	To guarantee the external competitiveness of domestic firms.	Target real exchange rate at a stable, sustainable and competitive level (industrial equilibrium)	Capital control. Interventions in foreign Exchange Market Tax over commodity exports.

Source: Authors' own elaboration.

7 – Final Remarks

This article presents an evaluation of the macroeconomic policy regime in Brazil since the implementation on the macroeconomic tripod in 1999. As we had seen macroeconomic tripod was not sufficient to assure macroeconomic stability in the medium/long-run since it was not capable to avoid a persistent real exchange rate over-valuation neither the trend increase in primary expenditures as a ratio to GDP. These developments cause the deindustrialization of Brazilian economy and the return to a fiscal dominance regime. Due to deindustrialization, potential growth was reduced, making impossible for the public sector to achieve the primary surplus/GDP that is required to stabilize public debt in face of the trend increase in primary expenditures/GDP. The policy response to these developments, the so-called new macroeconomic matrix, was a complete failure since it was incapable to address the structural problems of Brazilian economy. The political crisis started at the end of 2014 combined with the end of commodity boom and a sudden and great depreciation of nominal exchange rate in 2015 transformed the stagnation into a major recession. Growth can be restored in 2017 if political crisis is solved in the first semester of 2016, may be with the impeachment of President Dilma Rouseff.

Once a new government is set in place, a new macroeconomic policy regime must be implemented in order to start the reindustrialization of the country and to guarantee the solvency of the public sector in the medium/long run. The foundations of this new macroeconomic policy regime were settled. The objectives, targets and instruments of a macroeconomic policy regime that is consistent in the sense of Tinbergen were defined in this article. From now on it is a question of obtaining political support for the required changes in the macroeconomic policy regime. This will not be an easy task.

References

- Agenor, P.R; Montiel, P.J. (1999). *Development Macroeconomics*. Princeton University Press: Princeton.
- Amaral, R. (2009). “Armadilha do Regime Monetário Brasileiro: a existência de equilíbrios múltiplos” In: Oreiro, J.L; De Paula, L.F; Sobreira, R (orgs). *Política Monetária, Bancos Centrais e Metas de Inflação: Teoria e Experiência Brasileira*. FGV Editora. Rio de Janeiro.
- Amaral, R; Oreiro, J.L. (2008). “Relação entre o mercado de dívida pública e a política monetária no Brasil”. *Revista de Economia Contemporânea*, v. 12, p. 491-517.
- Blanchard, O; Gali, J. (2005). “Real Wage Rigidities and the New Keynesian Model”. NBER working paper 11806, November.
- Bresser-Pereira, L.C. (2016). “Retenção Cambial Aliquota Zero”. *Valor Econômico*, 03/03/2016.
- (2014). “The Access to Demand”. *Working Paper n° 366*, EESP-FGV, May.
- Bresser-Pereira, L.C; Oreiro, J.L; Marconi, N. (2014). *Developmental Macroeconomics: new developmentalism as a growth strategy*. Routledge: London.
- Brown, R. L., Durbin, J., Evans, J. M. (1975). “Techniques for testing the constancy of regression relationships over time”, *Journal of the Royal Statistical Society B* 37: 149-192.
- Brüggemann, R. and Lütkepohl, H. (2001). “Lag selection in subset VAR models with an application to a U.S. monetary system”. In: R. Friedmann, L. Knüppel and H. Lütkepohl (eds), *Econometric Studies: A Festschrift in Honour of Joachim Frohn*, LIT Verlag, Münster, pp. 107-128.
- Candelon, B. and Lütkepohl, H. (2001). “On the reliability of Chow-type tests for parameter constancy in multivariate dynamic models”. *Economics Letters*, Elsevier, vol. 73(2), pp. 155-160.
- Canova, F. (2005), *Methods for Applied Macroeconomic Research*. Princeton.
- D’Agostini, L. L. M. (2013). *Econometria Temporal Multivariada*. Ed. Blucher. 2013. São Paulo.
- De Bolle, M. (2015). “Brazil Yield to Abandon Inflation Targeting and Yield to Fiscal Dominance”. Peterson Institute for International Economics. Downloaded at <http://blogs.piie.com/realtime/?p=5172>.
- Doornik, J. A. and Hansen, H. (1994). “A practical test of multivariate normality”. unpublished paper, Nuffield College.
- Doornik, J. A. and Hendry, D. F. (1997). *Modelling Dynamic Systems Using PcFiml 9.0 for Windows*, International Thomson Business Press, London.
- Edgerton, D.; Shukur, G. (1999). “Testing autocorrelation in a system perspective”. *Econometric Reviews* 18: 343-386.
- Frenkel, R. (2014). “How to manage a sustainable and stable competitive real exchange” In: Bresser-Pereira, L.C; Kregel, J; Burlamaqui, L. (Eds). *Financial*

Stability and Growth: Perspectives of Financial Regulation and New-Developmentalism. Routledge: London

- (2002). "Capital Market Liberatization and Economic Performance in Latin America" In: Eatwell, J; Taylor, L. (Eds). *International Capital Markets: Systems in Transition*. Oxford University Press: Oxford.
- Garcia, M.P. (2011). "Can Sterilized FX Purchases under Inflation Targeting be Expansionary". Working Paper 441, Center for International Development, Stanford University.
- Godfrey, L. G. (1988). *Misspecification Tests in Econometrics*. Cambridge University Press, Cambridge.
- (1978). "Testing for higher order serial correlation in regression equations when the regressors include lagged dependent variables". *Econometrica* 46: 1303–1313.
- Haavelmo, T. (1945). "Multiplier effects of balanced budget". *Econometrica*, vol. 13, pp. 311-318.
- Hall, P. (1992). *The Bootstrap and Edgeworth Expansion*, Springer, New York.
- Herr, H; Kazandziska, M. (2011). *Macroeconomic Policy Regimes in Western Industrial Countries*. Routledge: London.
- Hodrick, Robert; Prescott, Edward C. (1997). "Postwar U.S. Business Cycles: An Empirical Investigation". *Journal of Money, Credit, and Banking* 29 (1): 1–16.
- Jarque, C. M.; Bera, A. K. (1987). "A test for normality of observations and regression residuals". *International Statistical Review* 55: 163-172.
- Lavinas, Lena. (2013). "21st Century Welfare". *New Left Review*, n. 84, November-December, p. 5-40.
- Lütkepohl, H. (2005). *New Introduction to Multiple Time Series Analysis*, Springer. Berlin.
- (1991). *Introduction to Multiple Time Series Analysis*, Springer Verlag, Berlin.
- Marconi, N. (2012). "The Industrial Equilibrium Exchange Rate in Brazil: an estimation". *Brazilian Journal of Political Economy*, 32(4).
- Marconi, N.; Araujo, E.; Oreiro, J.L. (2015). "The Exchange Rate, Income Elasticities and Structural Change: Theoretical Foundations and Empirical Evidence" downloaded at <http://joseluisoreiro.com.br/site/link/cc9fb322bbf3298e3e6dd8933c926998dcc8b44f.pdf>.
- Montiel, P. (2011). *Macroeconomics in Emerging Markets*. Cambridge University Press: Cambridge.
- Nassif, A. (2015). "As Armadilhas do Tripé da Política Macroeconômica Brasileira". *Brazilian Journal of Political Economy*, 35(3).
- Neri, M; Gonzaga, G; Camargo, J.M. (2001). "Salário Mínimo, 'Efeito Farol' e Pobreza". *Brazilian Journal of Political Economy*, 21(82).

- Oreiro, J.L. (2015). “Muito Além do Tripé: Proposta de um novo regime de política macroeconômica para dobrar a renda per-capita em 20 anos” In: Barbosa, N et al. (Eds). *Indústria e Desenvolvimento Produtivo no Brasil*. Elsevier: Rio de Janeiro.
- (2004 A). “Prêmio de Risco Endógeno, Equilíbrios Múltiplos e Dinâmica da Dívida Pública”. *Revista de Economia Contemporânea*, Rio de Janeiro, v. 8, n.1, p. 67-91.
- (2004 B). “Autonomia de Política Econômica, Fragilidade Externa e Crise do Balanço de Pagamentos: A Teoria Econômica dos Controles de Capitais”. *Economia e Sociedade*, Campinas, v. 23, p. 1-21.
- Oreiro, J.L; Nakabashi, L; Silva, G.J; Souza, G.J.G. (2012). “The Economics of Demand-Led Growth: theory and evidence for Brazil”. *CEPAL Review*, N.106, Abril.
- Oreiro, J.L; Punzo, L.; Araujo, E. (2012). “Macroeconomic Constraints to Growth of Brazilian Economy: diagnosis and some policy proposals”. *Cambridge Journal of Economics*, v. 36, p. 919-939.
- Oreiro, J.L; Basilio, F. (2011). “Exchange rate derivatives, Financial Fragility and Monetary Policy in Brazil during the World Financial Crisis”. In: Philip Arestis; Rogério Sobreira; José Luis Oreiro. (Org.). *An Assessment of the Global Impact of the Financial Crisis*. London: Palgrave Macmillan, pp. 236-260.
- Oreiro, J.L; Rocha, M. (2011). Inflation Targeting Regimes, Institutional Flexibility and Growth Performance: A Keynesian/Kaldorian Perspective in a Dynamic Panel Analysis. *Análise Econômica*, Vol. 29, p. 61-93.
- Oreiro, J.L; Feijó, C. (2010). “Desindustrialização: conceituação, causas, efeitos e o caso brasileiro”. *Brazilian Journal of Political Economy*, Vol. 30, N.2.
- Ornellas, R; Portugal, M. (2011). “Fiscal and Monetary Interaction in Brazil”. XXVI Jornadas Annuales de Economia. Banco Central del Uruguay: Montevideo.
- Rocca, C. A. (2015). “Ajuste Fiscal e a Recuperação do Investimento”. Apresentação 14º Seminário CEMEC de Mercado de Capitais. São Paulo.
- Romer, D. (2006). *Advanced Macroeconomics*. McGraw-Hill: New York.
- Saboia, J. M. (2015). Salário Mínimo e Distribuição de Renda no Brasil – potencial e limites. *Política de Salário Mínimo para 2015-2018. Avaliações de Impacto Econômico e Social*. Nelson Barbosa, Samuel Pessoa & Rodrigo Leandro de Moura (orgs). São Paulo: Elsevier-FVG, pp.65-82.
- Salto, F; Marconi, N. (2015) “Ajuste pode ser feito sem cortar conquistas sociais importantes”. Folha de São Paulo, 30/08/2015.
- Sawyer, M. (2009). “Fiscal and interest rate policies in the ‘new consensus’ framework: a different perspective”. *Journal of Post Keynesian Economics*, Vol. 31, N.4.
- Serrano, F; Summa, R. (2011). “Macroeconomic Policy, Growth and Income Distribution in Brazilian Economy in the 2000’s”. *Center For Economic Policy Research*, Washington.
- Sims, C.; Ctock, J.; Watson, M. (1990). “Inference in linear time series models with some unit roots”. *Econometrica*, v.58, p.113-44.

- Squeff, G; Oreiro, J.L; De Paula, L.F. (2009). “Política de Metas de Inflação: análise retrospectiva e desafios para o futuro” In: Oreiro, J.L; De Paula, L.F; Sobreira, R (orgs). *Política Monetária, Bancos Centrais e Metas de Inflação: Teoria e Experiência Brasileira*. FGV Editora. Rio de Janeiro.
- Tinbergen, J. (1988). *Política Econômica: princípios e planejamento*. Nova Cultural: São Paulo.
- Thirwall, A.P. (2002). *The Nature of Economic Growth*. Edward Elgar: Aldershot.
- Valor Econômico (2014). “Compromissadas fecham o ano em R\$ 890 bilhões”. 26/12/2014.
- (2012). “Nova Matriz Econômica garantirá crescimento acelerado”. 17/12/2012.
- Vercelli, A. (1991). *Methodological Foundations of Macroeconomics: Keynes & Lucas*. Cambridge University Press: Cambridge.

Appendix A - Empirical Evidence on Brazilian Case (2003-2015).

This section is dedicated to analyze the reaction functions in several macroeconomic variables of Brazilian economy, following a positive exogenous shock in terms of trade and a positive exogenous shock in domestic absorption. Before the presentation of the results of the reactions functions, we adopted some statistical and econometric procedures, usually used when working with time series⁴⁵, in order:

- a) **Correlation analysis between variables (A.1):** Based on *Mundell-Fleming Macroeconomic Model* for emerging economies several macroeconomic variables of the Brazilian economy were selected as candidates to compose the set of variables of the dynamic statistical model. From the analysis of correlation between variables in level, their first differences and their accumulated growth rates, we choose the ones that have, over the period considered, a considerable correlation (moderate or strong, positive signal or negative).
- b) **Use of Temporal Multivariate Series (A.2):** Vector Auto Regressive models (VAR), with finite lag orders, were specified, estimated, analyzed and used to generate graphs of reaction function.

A.1 - Multiple-Variable Analysis – Correlation Matrix

Since we are interested in the relationship between two variables, more precisely, since we want to know how variation of one affects the other, by a shock with a commanded mechanism transmission in a model where there are variable multipath by impulse function response of a multivariate model, we start from the bivariate correlation analysis to choose the variables to be inserted in the autoregressive vector. The correlation study allowed us to determine the type of dependence or relationship between the variables (linear or not) and the intensity of this relationship (correlation measure) at same time. The familiar measure of dependence between two quantities is the Pearson product-moment correlation coefficient.

To multiple times series, the matrix of Pearson product-moment correlation coefficients between each of the random variables in the random vector $X' =$

⁴⁵ We use the R and J-MULTI softwares.

$[X_1 \ X_2 \ \dots \ X_n]$, $Corr(X)$, is the matrix decomposition of the covariance matrix, Σ , which can be written:

$$Corr(X) = (diag(\Sigma))^{-\frac{1}{2}} \cdot \Sigma \cdot (diag(\Sigma))^{-\frac{1}{2}} = \begin{bmatrix} r_{x_1x_1} & \cdots & r_{x_1x_n} \\ \vdots & \ddots & \vdots \\ r_{x_nx_1} & \cdots & r_{x_nx_n} \end{bmatrix}$$

When Σ is the covariance matrix of random variables, $X_1, X_2, \dots, X_n$:

$$\Sigma = \begin{bmatrix} COV(X_1, X_1) & \cdots & COV(X_1, X_n) \\ \vdots & \ddots & \vdots \\ COV(X_n, X_1) & \cdots & COV(X_n, X_n) \end{bmatrix}$$

And $(diag(\Sigma))^{-\frac{1}{2}}$ is the matrix triangular of the diagonal elements of Σ . The result of the $Corr(X)$ show the correlation coefficients, $r_{x_nx_n}$, between each variable and the others at same time. Each element on the principal diagonal is the correlation of a random variable with itself, which always equals 1. By Cauchy–Schwarz corollary, each off-diagonal element is between 1 and -1 , inclusive. The Pearson correlation is $+1$ in the case of a perfect direct (increasing) linear relationship (correlation), -1 in the case of a perfect decreasing (inverse) linear relationship (anticorrelation), and some value between -1 and 1 in all other cases, indicating the degree of linear dependence between the variables. As it approaches zero there is less of a relationship (closer to uncorrelated). We have adopted numerical criteria to differentiate the degree of correlation between variables (strong, moderate or weak), according to Table A1.

Table A1 - Degree of correlation between variables

Correlation Coefficient Value	Degree of correlation	Variables enter in VAR?
$0.7 \leq r_{xy} \leq 1$	strong positive correlation	Yes, except if $r_{xy} = 1$
$0.3 \leq r_{xy} < 0.7$	moderate positive correlation	Yes
$-0.3 < r_{xy} < 0.3$	weak correlation or correlation absence	No
$-0.7 < r_{xy} \leq -0.3$	moderate negative correlation	Yes
$-0.7 \leq r_{xy} \leq -1$	strong negative correlation	Yes, except if $r_{xy} = -1$

Source: Authors' own elaboration.

Correlations were calculated on 13 samples of President Fernando Henrique Cardoso (FHC) government (1999-2002), 32 samples of the government of President Luis Inacio Lula da Silva (Lula) government (2003-2010), 19 samples government Dilma Rousseff (Dilma) government (2011-2015) and 64 samples in the period where the macroeconomic tripod has been implemented (1999-2015). All collected samples are quarterly order. Only the risk variable Brazil, measured by the EMBI+, disclosed on

a daily basis, was converted to quarterly data. Each new quarterly report was obtained by the simple average of daily samples within each quarter in question.

Also in this context, some variables had to be calculated or even handled in such a way to adjust the database, namely the output gap, the domestic absorption, real interest rate and the real growth rate of deflated product IPCA.

The variable output gap was calculated using the Hodrick-Prescott filter⁴⁶. The usual definition of the output gap is the difference between the product (GDP) logarithm, y_t , and the product potential (potential GDP) logarithm, y_t^* . In practical, the gap output is obtained by trend extraction methods (we use the Hodrick-Prescott filter here), and is calculated as the difference between the product and its trend:

$$x_t = y_t - y_t^* \therefore x_t = C_t + \theta_t$$

The series x_t is made up of a trend component, denoted by θ and a cyclical component, denoted by C such that in econometrics with disturb, $x_t = C_t + \theta_t + \epsilon_t$.

GDP is the main information on the level of activity economic and the output gap product is a central concept in macroeconomic discussion, since it allowed us to make inferences about the state of the economy. For example, a positive value for the gap product can indicate the need raise the interest rate for contain demand pressures in the economy.

The Hodrick–Prescott filter is used to remove the cyclical component of a time series from raw data. It is used to obtain a smoothed-curve representation of a time series, one that is more sensitive to long-term than to short-term fluctuations. The adjustment of the sensitivity of the trend to short-term fluctuations is achieved by modifying a multiplier λ . The reasoning for the methodology uses ideas related to the decomposition of time series. Let x_t for $t = 1, 2, \dots, T$, denote the logarithms of a time series variable. The series x_t is made up of a trend component, denoted by θ and a cyclical component, denoted by C such that $x_t = C_t + \theta_t + \epsilon_t$. The adjusted values of the x_t are the estimated potential products and ϵ_t are the gaps of product. Given an adequately positive chosen of the smoothing⁴⁷ parameter multiplier, λ , positive there is a trend component that will solve minimizing the loss functions:

⁴⁶ Hodrick-Prescott (1997).

⁴⁷ The parameter λ is a number positive that penalizes the variability of potential output growth.

$$L = \min_{\theta} \left(\sum_{t=1}^T \left(\frac{x_t - \theta_t}{d_t} \right)^2 + \lambda \cdot \sum_{t=2}^{T-1} [(\theta_{t+1} - \theta_t) - (\theta_t - \theta_{t-1})]^2 \right)$$

The first term of the equation is the sum of the squared deviations, $d_t = x_t - \theta_t$, which penalizes the cyclical component, The second term is a multiple λ of the sum of the squares of the trend component's second differences. This second term penalizes variations in the growth rate of the trend component. The larger the value of λ the higher is the penalty. Hodrick-Prescott (1997) suggest $\lambda = 1600$ as a value for quarterly data. And still T is the sample size. Once $y_t^* = \theta_t$ was calculated using the HP filter, we obtain the output gap from equation $x_t = y_t - y_t^* \therefore x_t = C_t + \theta_t$.

The variable domestic absorption, AD, was calculated as the difference between the gross domestic product at market price, GDP at market prices, and the net balance of exports of goods and services, NX:

$$AD = PIBpm - NX$$

We also calculate the real interest rate, r , of the Brazilian economy for the entire period using the following function:

$$r_t = 100 * \{((i_t - \pi_t) \cdot (1 + \pi_t)^{-1}) - 1\}$$

Where: i_t is the nominal interest rate and π_t is the inflation rate. For the nominal interest rate we use the basic rate of accumulated SELIC interest in annualized month, based on 252 working days, and the rate of inflation we use the inflation rate as measured by the Broad Consumer Price Index (IPCA) accumulated in 12 months since this indicator is used by governments, since the implementation of the inflation targeting regime, as target measured variable of the monetary policy rule.

The variable real growth rate of gross domestic product accumulated in the last twelve months, $\%PIBr12m_t$, was calculated by deflating in terms of the accumulated IPCA in twelve months, π_t , as follows:

$$\%PIBr12m_t = 100 * \{(\%PIB12m_t - \pi_t) \cdot (1 + \pi_t)^{-1}) - 1\}$$

We divided the correlation analysis into four parts: government of President Fernando Henrique Cardoso (1999-2002), Lula I and II (2003- 2010) and Dilma and I early part of Dilma II (2011-2015) and full term macroeconomic tripod 1999-2015. The results are shown in Table A2.

Table A2 - Correlations between Terms of Trade and Domestic Absorption with the other possible variables to be included in the VAR

Correlation Terms of Trade with others variables					Correlation Domestic Absorption with others variables				
President	FHC	Lula	Dilma	All	President	FHC	Lula	Dilma	All
Period	1999-2002	2003-2010	2011-2015	1999-2015	Period	1999-2002	2003-2010	2011-2015	1999-2015
Quarter Samples	13	32	19	64	Quarter Samples	13	32	19	64
Correlation	TT	TT	TT	TT	Correlation	DA	DA	DA	DA
TT	1,00	1,00	1,00	1,00	TT	0,27	0,91	-0,64	0,78
Real Exchange Rate	-0,27	-0,83	-0,85	-0,75	Real Exchange Rate	0,39	-0,85	0,80	-0,52
Interest Rate	-0,19	-0,77	-0,33	-0,68	Interest Rate	-0,60	-0,85	0,25	-0,69
IPCA 12m	0,10	-0,56	-0,54	-0,29	IPCA 12m	0,63	-0,60	0,60	-0,15
Real Interest Rate	-0,18	-0,52	0,03	-0,57	Real Interest Rate	-0,64	-0,59	-0,19	-0,65
NFSP (%PIB)	n.a	0,46	-0,91	0,29	NFSP (%PIB)	n.a	0,56	0,77	0,80
NFSP	n.a	-0,40	-0,89	-0,43	NFSP	n.a	-0,39	0,64	0,17
Acumullated PIB	0,50	0,46	-0,90	0,29	Acumullated PIB	-0,29	0,56	0,76	0,79
%PIB 12m	0,60	-0,56	0,78	-0,04	%PIB 12m	-0,18	-0,60	-0,80	-0,40
%PIBr12m	0,31	0,32	0,80	0,25	%PIBr12m	0,82	0,33	-0,85	-0,12
PIBind	0,26	0,90	-0,33	0,81	PIBind	1,00	0,95	0,78	0,95
PIBpm	0,17	0,91	-0,64	0,78	PIBpm	0,09	1,00	1,00	1,00
PIBind/PIBpm (%)	0,58	-0,30	0,64	-0,50	PIBind/PIBpm (%)	0,81	-0,42	-0,87	-0,69
FBKF	0,65	0,90	-0,45	0,83	FBKF	-0,01	0,99	0,95	0,99
FBKF/PIB	-0,02	0,74	0,73	0,84	FBKF/PIB	0,32	0,80	-0,42	0,70
NX	0,27	-0,42	0,33	-0,53	NX	0,27	-0,53	-0,57	-0,63
DA	0,90	0,91	-0,64	0,78	DA	1,00	1,00	1,00	1,00
Unemployment	-0,15	-0,81	-0,38	-0,87	Unemployment	-0,36	-0,93	-0,29	-0,92
Real Wage	0,20	0,89	-0,34	0,81	Real Wage	-0,37	0,98	0,86	0,95
T.DA-RM	-0,50	-0,76	-0,65	-0,81	T.DA-RM	0,31	-0,81	0,20	-0,72
HIATO%	0,81	-0,26	0,42	0,16	HIATO%	-0,49	-0,29	-0,17	0,06
ΔTT	-0,51	-0,09	0,49	0,01	ΔTT	0,02	0,08	-0,37	-0,26
%TT12m	-0,52	0,47	0,59	0,20	%TT12m	-0,03	0,22	-0,79	-0,24
ΔAD	-0,42	0,44	0,27	0,29	ΔAD	0,02	0,33	0,00	0,21
%DA.t	0,20	0,27	0,32	0,01	%DA.t	-0,21	0,17	-0,08	-0,08
%AD.12m	0,22	0,26	0,54	0,03	%AD.12m	-0,19	0,08	-0,55	-0,19
Δwreal	n.a	0,38	0,30	0,23	Δwreal	n.a	0,39	-0,26	0,06
%Wreal.t	n.a	0,34	0,30	0,21	%Wreal.t	n.a	0,36	-0,27	0,06
%Wreal.12m	n.a	0,41	0,63	0,35	%Wreal.12m	n.a	0,50	-0,56	0,12
ΔPIBind	n.a	0,17	0,10	0,03	ΔPIBind	n.a	0,07	0,06	-0,01
%PIBind.t	n.a	0,08	0,10	-0,03	%PIBind.t	n.a	-0,02	0,06	-0,08
%PIBind.12m	-0,12	0,11	0,22	-0,16	%PIBind.12m	-0,15	-0,09	-0,06	-0,23
%PIBindreal.12m	-0,29	0,14	0,03	0,00	%PIBindreal.12m	0,45	0,14	-0,20	-0,01
EMBI	-0,55	-0,59	-0,81	-0,61	EMBI	-0,36	-0,69	0,67	-0,55

Legend: Positive Strong Correlation Moderate Positive Correlation Low Correlation or not existent Moderate Negative Correlation Negative Strong Correlation

Source: Author's own elaboration.

Based on the correlations showed in Table A1, Table A2 shows the endogenous variables inserted in the Model A, where the shock will be given in terms of trade, and Model B, where the shock will be given in domestic absorption.

Table A2 – Endogenous variables included in the model A and model B

Order in "A" Model	Order in "B" Model
Terms of trade (TT), Country risk premium (EMBIBR), Real Exchange Rate (TRC), Real Interest Rate (TRJ), gross fixed capital formation/GDP (FBKFPIB), manufacturing share on GDP (PIBindPIB), Domestic absorption (AD), Output gap (gap), Primary surplus (NFSPPIB), Real Labor Income (W), Unemployment (U), Inflation (IPCA)	Domestic absorption (AD), Terms of trade (TT), Country risk premium (EMBIBR), Real Exchange Rate (TRC), Real Interest Rate (TRJ), gross fixed capital formation/GDP (FBKFPIB), share of the manufacturing industry on GDP (PIBindPIB), Domestic absorption (AD), Output gap (gap), primary surplus (NFSPPIB), Real Labor Income (W), Unemployment (U), Inflation (IPCA)

Source: Authors' own elaboration.

A.2. Use of Temporal Multivariate Series

Once the variables are chosen, we will use the methodology VAR to generate momentum (impulse or shocks) in terms of trade, model A, and domestic absorption, model B, to observe the responses in the variables Brazil's country risk premium (EMBIBR), Real Exchange Rate (TRC), Real Interest Rate (TRJ), Gross fixed capital formation/GDP (FBKFPIB), manufacturing share of GDP (PIBindPIB), Output gap (gap), Primary Surplus/GDP (NFSPPIB), Real Labor Income (W), Unemployment (U) and Inflation (IPCA).

For the empirical analysis we adopted the following in order⁴⁸: (i) specify the VAR models following Sims-Stock-Watson (1990), ie with several variables in level, first differences or combinations of both, (ii) choose to lag optimal VAR(p) the criteria of Akaike (AIC), Final Prediction Error (FPE), Hannan-Quinn (HQ) and Schwarz (SC); (iii) estimate VAR models by Estimated Generalized Least Squares (EGLS) intercept, trend, restriction in coefficients via Top/Down method chosen by Akaike criteria; (iv) analyze the stability of VAR by eigenvalues polynomial reverse feature; (v) make the structural break point from Chow Forecast Test; (vi) make Cusum on each residual equation of the VAR, as Brown et al (1975); (vii) analyzing the autocorrelation of residuals through the auto-correlation function and partial auto-correlation, Portmanteau tests and Breusch (1978) and Godfrey (1978); (viii) analyze the normality of the residual from function Kernel type Gaussian with multivariate Jarque-Bera, Lütkepohl (1993) and Doornik-Hansen (1994) tests (ix) Generate impulse (shock) in the variable terms of trade in model A and domestic absorption in model B, and analyze the responses of the variables entered in the systems.

The basic vector autoregressive model (VAR) has the form:

$$y_t = A_1 \cdot y_{t-1} + \dots + A_p \cdot y_{t-p} + B_0 \cdot x_t + \dots + B_q \cdot x_{t-q} + C \cdot D_t + \mu_t$$

Where $y_t = (y_{1t}, y_{2t}, \dots, y_{Kt})'$ is a vector of K observable endogenous variables; $x_t = (x_{1t}, x_{2t}, \dots, x_{Mt})'$ is a vector of M observable exogenous or unmodelled variables, D_t contains all deterministic variables which may consist of a constant, a linear trend, seasonal dummy variables as well as user specified other dummy variables, and μ_t is a K dimensional unobservable zero mean white noise process with positive definite covariance matrix $E(u_t, u_t') = \Sigma_u$. The A_i , B_j and C are

⁴⁸ All these methods are described in Lukthepol (2005), Canova (2005) and D'Agostini (2013).

parameter matrices of suitable dimension. In the $VAR(p)$ process, theoretically, it is assumed that: (i) $E(\mu_t)=0$; (ii) $E(\mu_t\mu_t')=\Sigma_u$; (iii) $E(\mu_t\mu_s')=0$ for $s \neq t$; (iv) the covariance matrix, Σ_u is singular. Said properties are desirable in a $VAR(p)$ stable and consistent.

The VAR order p may be chosen with the help of model selection criteria. The optimal lag order is chosen by minimizing one of the following information criteria for a range of lag orders n : Akaike (AIC), Final Prediction Error (FPE), Hannan-Quinn (HQ) e Schwarz (SC).

With samples of the first quarter of 2003 to the third quarter 2015, comprising therefore Lula and Dilma governments, the results of the SC, AIC, FPE and HQ tests, including exogenous variables as intercept, trend and seasonal dummies were calculated, always searched for one to ten lag. We will consider in this analysis the strategy of: (i) compare the order suggested by different criteria; (ii) use the order of selection indicated by most criteria; (iii) if the criteria indicate different orders, we will use, for thrift, the smallest gap; (iv) if half of the selection criteria point to a lag and the other half points to another delay, once again, we will use sparingly. Also, we execute analyzes with different orders of VAR. In Table A3 we can see the optimal criterion for lag selection for model A is using the order of 3, 1 and 2 lags. And for the model B, the optimal criterion for lag selection points is using the order of 1, 3 and 2 lags.

Table A3 - Optimal endogenous lags from information criteria

SPECIFICATION	LAG USED INTO VAR	OPTIMAL LAG ORDER				EXOGENOUS VARIABLES
		AIC	FPE	HQ	SC	
“A” MODEL	1	2	2	1	1	intercept, trend and seasonal dummies
“B” MODEL	1	3	3	2	1	intercept, trend and seasonal dummies

Source: Authors’ own elaboration.

The next step is to estimate the coefficients of the specifications proposed in Model A and Model B, according to Table A2 and the optimal lags obtained A3. To decrease the number of estimated parameters, we adopt the VAR with restrictions on the coefficients, said VAR* by Estimator Generalized Least Squares (EGLS) method and Top-Down procedure (TD), that chosen by Akaike criteria.

After, we evaluate the stability of residues of each equation in the VAR. In theory the residuals must meet the white noise condition. In practice, according Lutkepohl (2005, p. 157) if the model order is chosen by economic theory (our case) to generate momentum in a variable (shock) and observed responses in the other system variables is necessary investigate the properties of the residuals. For strategy, began by

analyzing the Kernel probability density function on residuals. Subsequently, apply the Portmanteau Test and Lagrange Multipliers Tests, including the LM test Breusch-Godfrey.

Let $(\mu_1, \mu_2, \dots, \mu_n)$ in each equation into VAR be an independent and identically distributed sample drawn from some distribution with an unknown density f . We are interested in estimating the shape of this function f . The calculus of Kernel density estimator on residuals, $K(\mu)$, is:

$$\hat{f}_h(\mu) \div K(\mu) = nh^{-1} \cdot \sum_{i=1}^n \{K(*) \cdot [(\mu - \mu_i) \cdot h^{-1}]\}$$

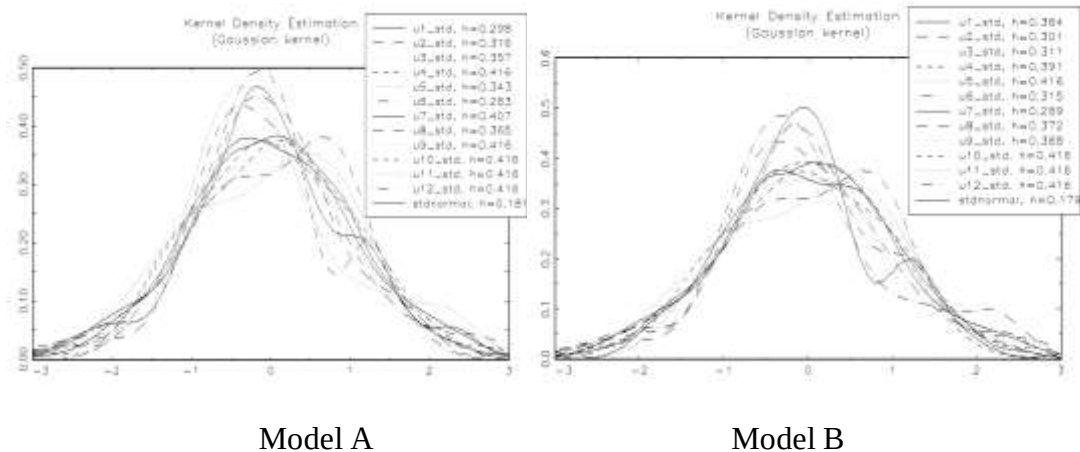
Where the h is called the scaled Kernel, $K(*)$ is a function that defines a kernel distribution. Data that residuals VAR should theoretically be independent and identically distributed use here the partial $K(*)$ that generates the Gaussian aspect of the distribution function estimated Kernel probability. The $K(*)$ is:

$$K = (\sqrt{2 \cdot \pi})^{-1} \cdot \exp^{-(2^{-1} \cdot \mu^2)}$$

Where K is a non-negative function that integrates to one and has mean zero, and $h > 0$ is a smoothing parameter called the bandwidth.

To illustrate the analysis of the residual in Model A and Model B, we take a simulated random sample from the standard normal distribution in the Kernel density, using a bandwidth $h=0.05$ at $h=2$. The kernel density with a bandwidth of $h=0.182$ is considered to be optimally smoothed. The Figure A1 insert too the bandwidth h to each residuals of estimated VAR.

Figure A1 – Residual Kernel Density Estimation - A Model and B Model



Source: Authors' own elaboration.

In the A model and B model, as the skewness and kurtosis, we observed that the estimated residuals of the VAR equations have similarities with the normal distribution (zero skewness and tree kurtosis). For example, in Model B, some waste as μ_2, μ_6, μ_7 e μ_8 exhibit leptokurtic curves while $\mu_1, \mu_3, \mu_4, \mu_5, \mu_9, \mu_{10}, \mu_{11}$ and μ_{12} exhibit mesokurtics curves. Yet all residues exhibit some form of symmetry about zero. The same interpretation to the residuals can be given to the Model A. Apparently the residuals are very similar to the normal distribution in scale, as manner.

The next step is to perform multivariate normality test Jarque-Bera (1987), Lütkepohl (1993) and Doornik-Hansen (1994).

The Jarque -Bera test (1987) is based on the third and fourth central moments of the standard normal distribution, respectively skewness and kurtosis. The nonnormality residuals test proposed by Lutkepohl (1991) is an extension of Jarque-Bera test. The test focuses on the method of calculating the factorization matrix, which is the inverse of the lower triangular Cholesky matrix with positive elements on the diagonal orthogonal obtained by factorization of the residual covariance matrix. As the input order of the variables is defined by the Cholesky decomposition, so the results of the non-normality test residuals also depend on variable VAR in the input order. The Doornik-Hansen test does not vary by sorting and the range of the variable VAR, such as in Lutkepohl test. The test of the inverse of the square root of the residual correlation matrix.

The Lütkepohl tests and Doornik-Hansen show small systematic deviations of skewness and kurtosis observed by viewing the Gaussian kernel in some residual, but do not reject the null hypothesis of multivariate normality of the residuals of the models A and B. As for the Jarque-Bera test, the results do not reject the null hypothesis of normality waste in models A and B.

One of the most important tests in the VAR model, when it incorporates stationary variables and non-stationary, mixed way comments the article Sims Stock-Watson (1990), is to see if the set of equations of VAR has stability and consistent.

The joint distribution of equations into VAR process is uniquely determined by the distributions μ_t process. The first and second time of VAR process, ie, the mean and covariance⁴⁹, are independent of time, therefore stationary and stable.

The VAR process is stable if the reverse characteristic polynomial has no roots inside the unit circle and the circle unit complex. Formally, this condition is given by:

$$\det(I_K - A.z) \neq 0 \therefore \det(I_K - A_1.z - A_2.z^2 - \dots - A_p.z^p) \neq 0$$

Where I_K is the identity matrix, A is the set of matrix coefficients and z is modulus of the eigenvalues of the reverse characteristic polynomial. So strategically in practice, we can filter VAR models eliminating those that have at least one value in module of eigenvalues of polynomial lower reverse feature that unit.

The Table A4 shows the results of modulus of the eigenvalues of the reverse characteristic polynomial, z, to A model and B model.

Table A4 - Results of modulus of the eigenvalues of the reverse characteristic polynomial, z, to A model and B model.

SPECIFICATION	MODULUS OF THE EIGENVALUES OF THE REVERSE CHARACTERISTIC POLYNOMIAL
“A” MODEL	z = (1.7334, 1.7334, 4.1724, 4.1724, 1.5069, 1.5069, 1.0144, 1.0144, 1.4876, 1.4876, 1.2124, 2.0138)
“B” MODEL	z = (1.8559, 1.8559, 3.9905, 3.9905, 1.4772, 1.4772, 1.0181, 1.0181, 1.1588, 1.4299, 1.4299, 2.0951)

Source: Authors’ own elaboration.

Both model A and model B are stable because no eigenvalues of the reverse characteristic polynomial are less than unity. The covariance matrix, Σ_u , is not singular.

Finally, in order to check if VAR processes is stable we need to check the residual autocorrelation, as in theory $E(\mu_t \mu'_s) = 0$ for $s \neq t$. In practice it is almost inevitable when there are several variables in the VAR system. However the use of optimum lag assists order to improve the problem of residual autocorrelation.

Tests such as Portmanteau and Lagrange Multiplier Breusch-Godfrey Test⁵⁰, help to determine whether, in general, there is residual autocorrelation in the VAR models. A Portmanteau Test for residual autocorrelation may be applied if a pure VAR process possibly with subset restrictions but without exogenous variables has been fitted. The test checks the null hypothesis. The Portmanteau test and Lagrange Multipliers Test Breusch-Godfrey has the null hypothesis not residual autocorrelation, $H_0 = E\mu_t \mu'_{t-i} = 0$, with $s = t - i$ and $i = 1, 2, \dots, h$. The alternative hypothesis test is that

⁴⁹ The proof is in Lutkepohl (2005, p.689).

⁵⁰ See Breusch (1978), Godfrey (1978), with modification Godfrey (1988).

at least one auto-covariance, and thus a self-correlation is not zero, showing auto-correlation.

The Table A5 shows the results of the Portmanteau and Lagrange Multipliers Breusch-Godfrey Test.

Table A5 - Results of Portmanteau Test and Breusch-Godfrey Test

SPECIFICATION	Portmanteau	Breusch-Godfrey
“A” MODEL	Not a rejection of H_0	Not a rejection of H_0
“B” MODEL	Rejection of H_0	Not a rejection of H_0

Source: Authors’s own elaboration.

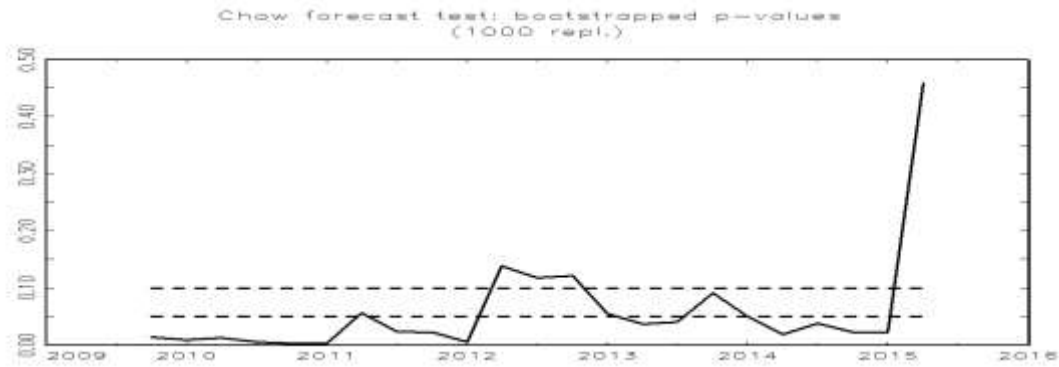
Using the Chi-Square distribution in both tests, a 5 % significance, both the Portmanteau test and Breusch- Godfrey test does not reject the null hypothesis of no residual autocorrelation in Model A. Ambiguities in test results were observed in the model B, where the Portmanteau test rejects the null hypothesis of no residual autocorrelation, while Breusch-Godfrey does not reject the null hypothesis of no residual autocorrelation, this with 10 % significance level. But it is assumed possibility of autocorrelation, trivial in practical conditions.

Another concern is the parameter constancy throughout the sample period is a key assumption in VAR econometric models. In this sense residual CUSUM tests and parameters constancy Chow tests were used to verify the parameter constancy.

To test this, the Figure A2 presents the Chow test results⁵¹ for structural break in the last years of multivariate temporal series into VAR model. The dotted line show the p-values with 5% and 10% of significance. Chow Forecast Test has the null hypothesis against an alternative that all coefficients, including the residual covariance matrix, Σ_u , may be exchanged. The null hypothesis of constant parameters is rejected between 2012 and 2013 and strongly in 2015, during the second year of government mandate of Dilma.

⁵¹ See the test in the Candelon-Lütkepohl (2000).

Figure A2- Structural Break: Chow Forecast Test Results 2009-2015.



Source: Authors' own elaboration.

Replicating CUSUM stability test on residuals proposed by Brown et al (1975)⁵² in model A and model B, over the past years (2009-2015), the results observed indicate stability on VAR process, with 5% significance.

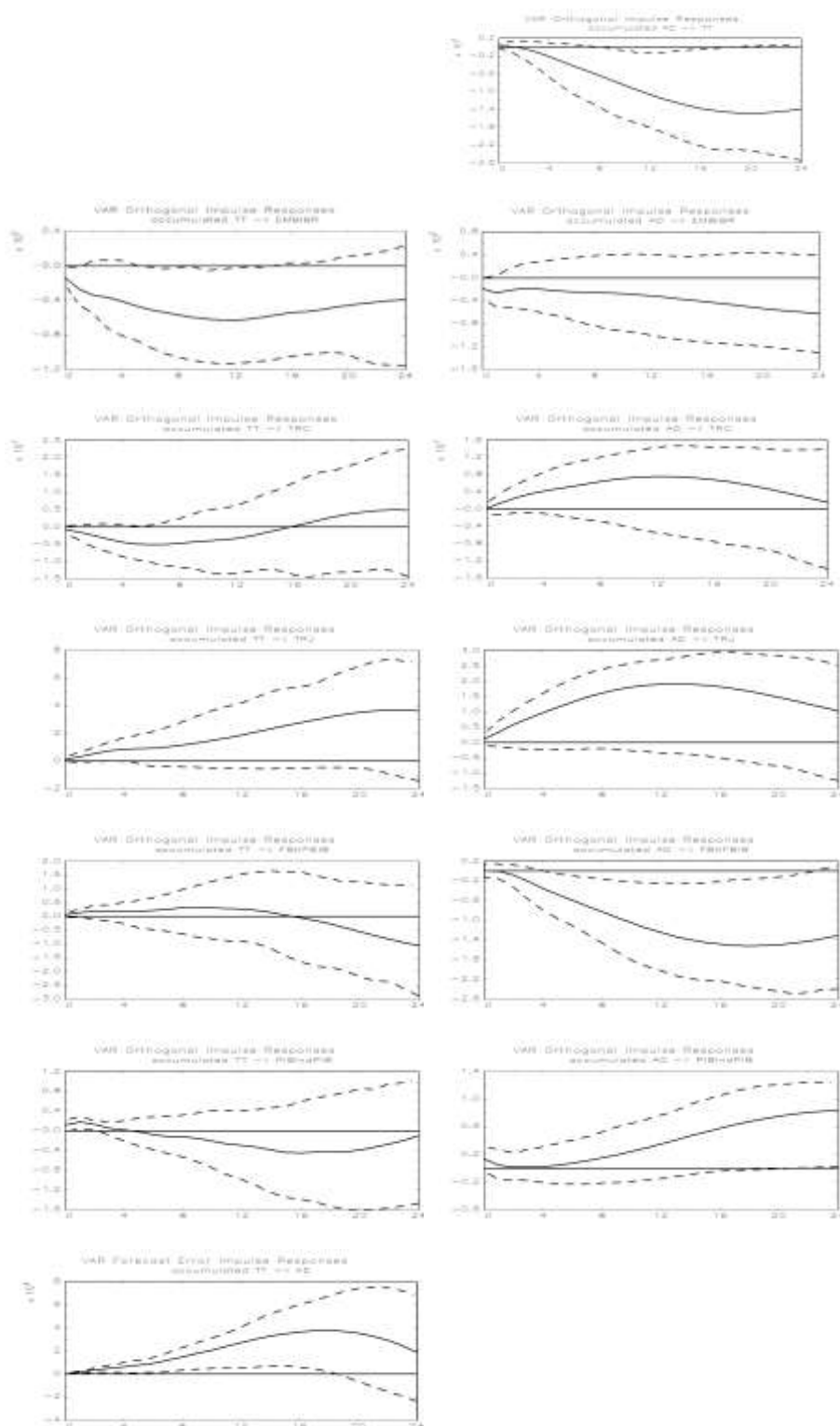
To analyze the dynamic interactions between the endogenous variables the last part of this section analyzes the responses of the variables inserted in $VAR(p)$, when it generates a shock in terms of trade, in the A model, and a shock in domestic absorption in B Model. The total cumulative effects of impulses in the residuals, u_t 's, were obtained by addition of appropriate coefficients of Impulse Response Function (IRF).

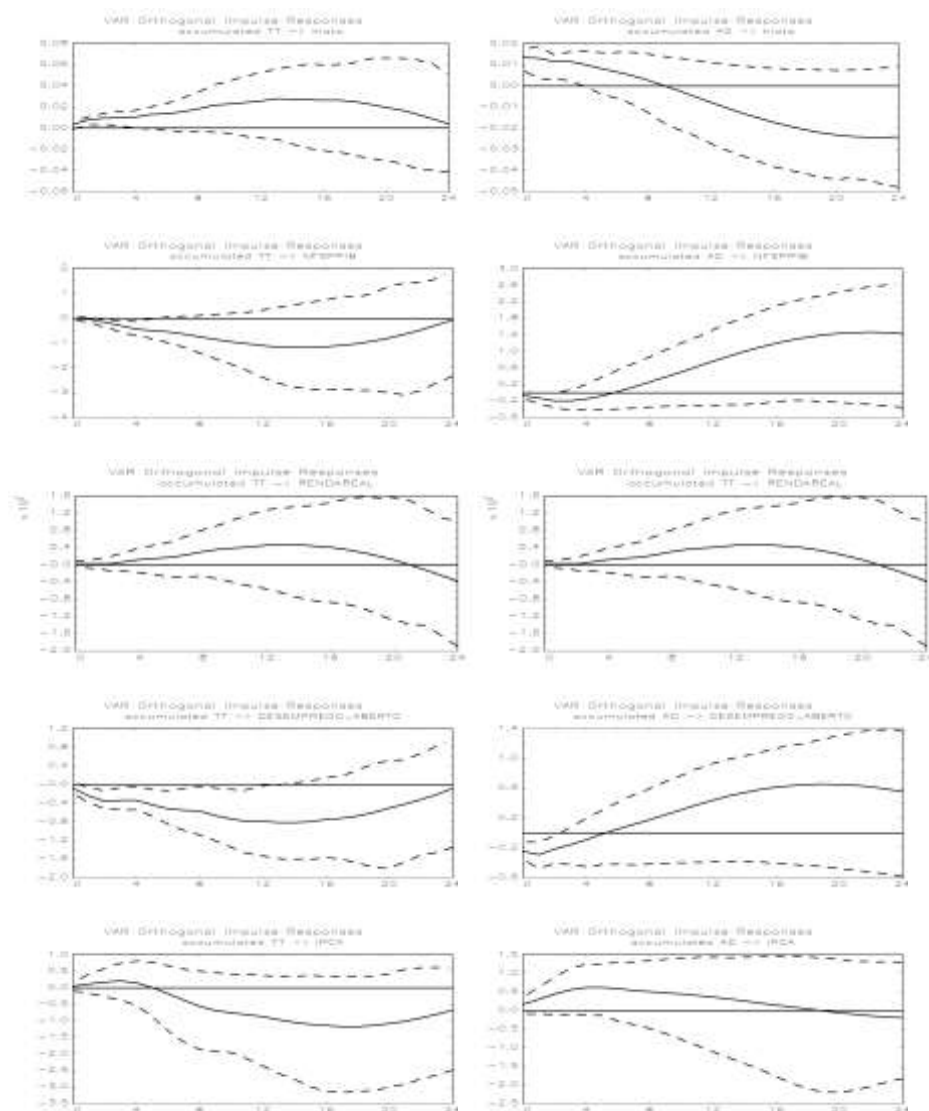
Too the impulse responses are computed from the estimated VAR coefficients and Hall bootstrap percentile method with 95% confidence interval⁵³. We created orthogonalized impulse responses based on an innovation of size one standard deviation in the transformed model as well as forecast error variance impulse responses based on a unit innovation in the original model. The responses of "A" Model, which generate a shock in terms of trade, and Model B, which generate a shock domestic absorption can be seen in Figure A3, left and right side, respectively.

⁵² See the test in Brown et al (1975).

⁵³ See Hall (1992).

Figure A3 – Impulse Response Functions of Models “A” and “B”.





Source: Authors' own elaboration.

As we can see in Figure A3 a positive shock in Terms of Trade is associated with a permanent decrease in the sovereign risk premium measures by EMBI +, in the investment rate, manufacturing share in GDP, unemployment rate and inflation. Real exchange rate appreciates in first instance, and then depreciates after 16 quarters. A positive shock in terms of trade is also associated with a permanent increase in the real income per-worker and in output gap.

Regarding domestic absorption we can see that a positive shock in domestic absorption is associated with a permanent decrease in sovereign risk premium, investment rate and output gap, but with a permanent increase in real interest rate, unemployment and inflation.

As we saw in sections 2 to 4, Brazilian economy from 2003 to 2013 has experienced a continued improvement in terms of trade. According to the econometric model A the expected output of a positive shock in terms of trade will be real exchange rate appreciation, a decline in investment rate and manufacturing share (de-industrialization), an increase in real interest rate, output gap and in real income per-worker and, finally, a decrease in inflation and unemployment. All these expected results really happened in Brazilian economy during this period, showing that the relatively good macroeconomic performance during this period was a side effect of the improvement in terms of trade.

The trend increase in primary expenditures/GDP is one of the factors that can boost domestic absorption. As we saw in sections 2 to 4, Brazilian economy had also experienced a trend increase in primary expenditures/GDP since 2003, boosting domestic absorption. According to model B the expected output will be a decline in investment rate and output gap combined with an increase in real income per-worker, inflation, unemployment, real interest rate and a depreciation of real exchange rate. This means that a positive shock in domestic absorption – due to the increase in primary expenditures/GDP – is associated with a poor macroeconomic performance.

The change from a good to a poor macroeconomic performance in Brazil after 2013 can be partially explained by the combined effects of a negative shock in terms of trade and a positive shock in domestic absorption due to the trend increase in primary expenditures to GDP. But these factors do not seem to be enough to explain the magnitude of the fall in GDP occurred in 2015. As we saw in figure A2 there is econometric evidence of structural break in the econometric model in 2012, 2013 and, more strongly, in 2015. This structural break may be caused by the increased in the perception of uncertainty due to the Brazilian political crisis. This means the way to Brazil get out of the great recession is to solve the political mess. Up to now there is no sign of a definite solution for this problem, even with the Impeachment of President Dilma Rousseff.