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## **DOMESTIC DEMAND AS ENGINE OF THE ECONOMIC GROWTH IN BOLIVIA**

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### **ABSTRACT**

During recent years, the Bolivian economy has exhibited a great performance, which in the structure of the current economic model, it is underpinned by domestic demand and the active participation of the State in the economy. This research presents empirical evidence that corroborate these assertions. Moreover, it disaggregates the specific impacts of private domestic demand, public domestic demand and external demand on growth. The document also displays evidence on the relationship of complementarity between public domestic demand and private domestic demand (crowding-in). For these purposes, an Structural VAR is estimated which interrelates the product, the private domestic demand, public domestic demand and external demand, based on identification conditions in line with the reality of the Bolivian economy.

Classification JEL: C50, E12, O40

Key Words: Growth, Private Domestic Demand, Public Domestic Demand, External Demand

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## I. INTRODUCTION

Historical levels of growth have characterized the Bolivian economy between 2006 and 2014, which are attributed to the implementation of the Economic Social Communitarian Productive Model since 2006. Two of the key fundamentals of this model are: i) the reactivation of domestic demand as engine of economic growth and ii) the active participation of the State in the economy. It means that one of the main roles of the State is now the redistribution of the strategic sectors surplus toward the sectors which generate revenue and employment, and directly toward the population. These precepts are opposed to those followed by the economic model prior to 2006, in which external demand was the priority and the State had a negligible role in the economy.

In addition to the high rates of economic growth, this good performance has had a positive effect on social aspects such as poverty decline, both moderate and extreme, and in the decrease of inequality. Moreover, under this growth approach boosted by domestic demand, the Bolivian economy showed resilience in times of the international crisis, presenting outstanding expansions in comparison with other countries in the region and around the world in general.

In this framework, the following questions arise: Is domestic demand the true main determinant of growth or is it the external demand?. If domestic demand is disaggregated in private and public, which one of these has a greater impact on growth?. Is the active participation of the State effective to stimulate the Bolivian economic activity? Is there a complementary relationship between the public domestic demand and the private domestic demand?.

The objective of this research is to generate empirical evidence to answer appropriately these questions. For this purpose, an SVAR, *Structural Vector Auto Regressions Model* is estimated, which interrelates the product, private domestic demand, public domestic demand and government revenues. These last two variables aim to capture the participation of the State in the economy and the external demand. Furthermore, specific identification conditions are developed in order to obtain the impacts of structural shocks among the cited variables in line with the reality of Bolivia.

This document is structured in six sections. The first one is the introduction, which is addressed at this moment. The second one corresponds to the literature review where references related to the theory of economic growth, empirical evidence specific to the Bolivian economy, and studies on the consequences of fiscal policy are presented. In the third section some stylized facts regarding the variables of interest are developed. In the fourth section the methodology used is explained, detailing specification and identification issues. The fifth section analyzes the results obtained. Finally, in last section some conclusions are pointed out.

## II. LITERATURE REVIEW

In the literature there is still a debate regarding the determinants of economic growth. On one hand, neoclassic growth theory which begins with the works of Solow (1956) and Swan (1956), state that supply conditions explain long term economic growth and relegate demand's contribution to the short run. During the 80's decade, starting with the works of Romer (1986) and Lucas (1988) was born the theory of endogenous growth, which is characterized by models where the sources of growth are endogenous, however, demand is still in the background.

On the other hand, Kalecki (1971), based on microeconomic fundamentals, poses as the main factor of economic growth and capital accumulation to aggregate demand, and thus the redistribution of income becomes fundamental to grow at higher rates. In the same vein, works from Richard Kahn, Nicholas Kaldor, Joan Robinson, Piero Sraffa and Luigi Pasinetti, renowned Post-Keynesians economists, maintained a harsh criticism to neoclassic growth models approach, mainly due to their assumptions. More recent works from authors who belong to a heterodox view such as Blecker (2000) and Palley (2002) propose the importance of domestic demand as an alternative to external demand to promote growth.

In the region, Prebish (1950) stated that in order to generate growth it is necessary to promote an effective domestic demand, for which it is necessary that the State actively participates in the economy and redistributes revenues to better the social conditions and to strengthen the domestic demand.

In the literature on the determinants of growth in Bolivia, Ramirez (1992) identifies the investment on human capital, inflation, debt service and devaluation of the nominal exchange rate as the main determinants of growth. Likewise, Humerez and Dorado (2006), on one hand, using growth accounting find that the main source of growth is capital; on the other hand, based on time-series econometrics and panel data, show that investment, government consumption, exports, fiscal deficit, the economically active population (EAP), life expectancy, schooling and access to basic services, positively affect the economic growth.

Meanwhile, Calvo (2006), based on the Haussman et al. (2005) growth diagnosis, finds, among other results, that domestic demand explains Bolivian growth in greater extent than exports. Additionally, he argues that during the 90's decade, the national private investment was the major determinant of total investment.

Similarly, another analysis of the Bolivian economic growth determinants, is given by Mendieta and Martin (2008), who find that structural factors are the ones that slowdown the economic development of the country. Factors that persists since the beginning of Bolivia as republic, such as institutional problems, and low levels of saving, investment, human capital and technological innovation, among others. Moreover, they suggest that macroeconomic stability constitutes a requirement to avoid important collapses in per capita income.

Other documents such as Machicado et al. (2012), based on a supply approach, identify the total factor productivity (TFP) as the main determinant of growth. From a different perspective, Humerez (2014), based on an *ad hoc* econometric demand specification, through an Error Correction Model and Bayesian Vector Autoregression (BVAR), presents evidence to conclude that domestic demand is the main source of economic growth, both in the short and long term. Additionally, he indicates that growth is more sensitive to changes in consumption, mainly private.

Another fundamental component of present work is to know the growth impact and the private domestic demand impact of fiscal policy. Within the literature focused on this subject, Blanchard and Perotti (2002) characterized the dynamic effects of government expenditure and taxes shocks (fiscal policy) on the economic activity of United States for the post war period. For this purpose, they use a Structural VAR (SVAR), and achieved identification based on institutional information. The results show that positive shocks in government expenditure have positive effects on product, and positive shock in taxes have negative ones.

Perotti (2005) extends the SVAR methodology developed by Blanchard and Perotti (2002) to study the effects of fiscal policy on GDP and its components, for United States, Germany, United Kingdom, Canada and Australia. Among his major findings he suggest that the assessed effects of fiscal policy on growth tend to be small with exception of the American economy on the post 1980's era, where he estimated a greater than unit positive government expenditure multiplier.

Regarding the impact of government spending shocks on private consumption, there is still no consensus in the empirical literature about this subject. Fatas and Mihov (2001), Blanchard and Perotti (2002) and Perotti (2005, 2007) report that private consumption increases persistently as a response to a positive innovation of government spending. Caldara and Kamps (2008) show that both the consumption of durable and nondurable goods increases as consequence of a government spending structural shock. The effect has an inverted "u" pattern but it is more pronounced for durable goods. By contrast, Mountford and Uhlig (2005) and Edelberg et al. (1999) present evidence for a close to zero and statistically nonsignificant reaction of private consumption over time. In addition, Ramey (2011) shows that private consumption significantly falls in response to government spending shocks.

### III. STYLIZED FACTS

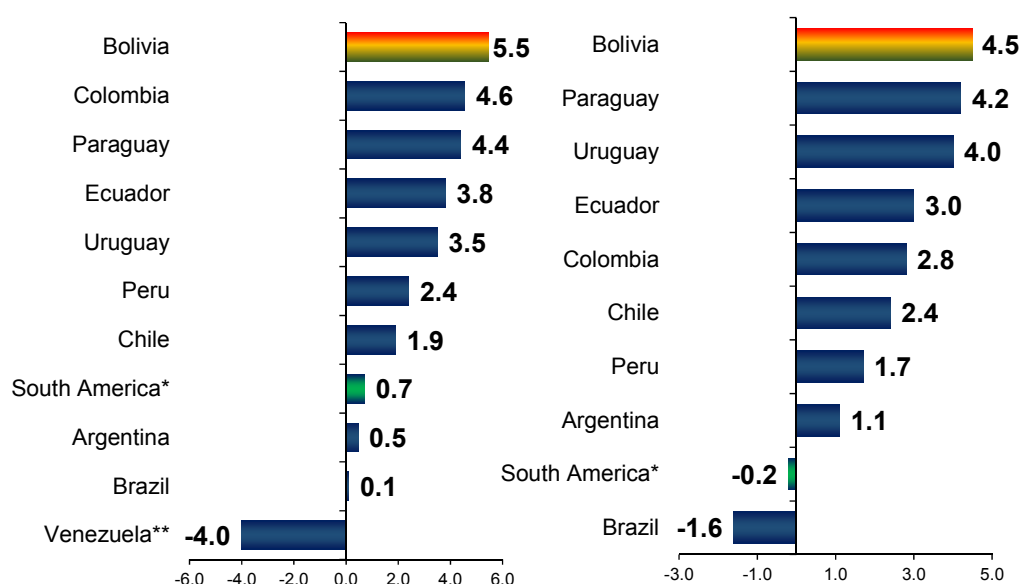
#### a. Performance of the Bolivian economy in the framework of the Economic Social Communitarian Productive Model

In a generalized environment of economic slowdown, deeper in advanced economies, the Bolivian economy maintains a stable rhythm of growth. In 2014, for example, the rate of GDP growth reached 5.5%, level that positioned Bolivia for the second time in its history as the

economy with the highest growth in the region<sup>1</sup> (see Graph 1 (a)). Similarly, by the first semester of 2015 the economic activity in Bolivia expanded in 4.5%, figure which once again consolidated Bolivia as the economy with greater level of growth in the region (see Graph 1 (b)).

The good performance of the Bolivian economy since 2006, is sustained in the fundamentals of the Economic Social Communitarian Productive Model. This model, unlike the preceding ones, defines the State as the leading actor in the economy which comprehensively plays the role of market failures corrector and main promoter of growth. Therefore, “the State must be all, planner, entrepreneur, investor, banker, regulator, development producer”.<sup>2</sup>

**Graph 1: GDP growth in South American Countries 2014 and first trimester of 2015 (Percentages)**



\*, \*\* Estimated from the International Monetary Fund (WEO – April 2015)

Prepared by the authors on the basis of data from the National Institute of Statistics and Central Banks from each country.

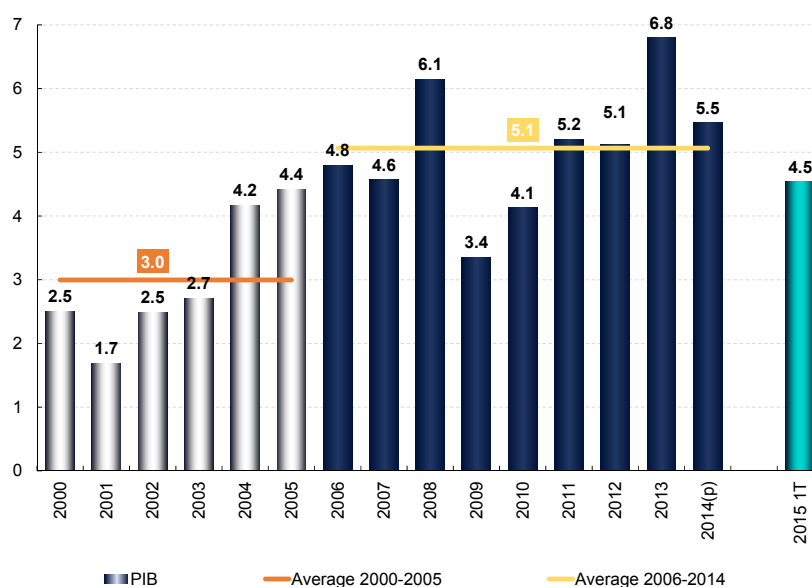
Another fundamental aspect underlying the Economic Social Communitarian Productive Model is the understanding of domestic demand as the main determinant of economic growth. On this postulate rests the strength of the model to face external shocks, given that it reduces the dependency from variations of external demand. Therefore there are necessary some mechanisms such as the redistribution of income and an active fiscal policy to promote and consolidate domestic demand as essential to the Bolivian economic growth.

<sup>1</sup> In 2009, the GDP expansion in Bolivia (3, 4%) constituted for the first time in the history of the country as the highest level of growth in the region. The three countries which preceded in terms of economic growth were Uruguay (2, 9%), Peru (0, 9%) and Argentina (0, 9%).

<sup>2</sup> Plural Economy (2011) - The New Economic Social Communitarian Productive Model. Ministry of Economics and Public Finances Publication

In this framework, Graph 2 suggest that greater levels of growth are evident since the implementation of the Economic Social Communitarian Productive Model. In average, the GDP between 2006 and 2014 increased in 5.1% each year; instead, during the period 2000-2005 the economic activity increased by a 3.0% yearly.<sup>3</sup>

**Graph 2: Growth of real GDP, 2000-2014 and first trimester of 2015  
(Percentage)**



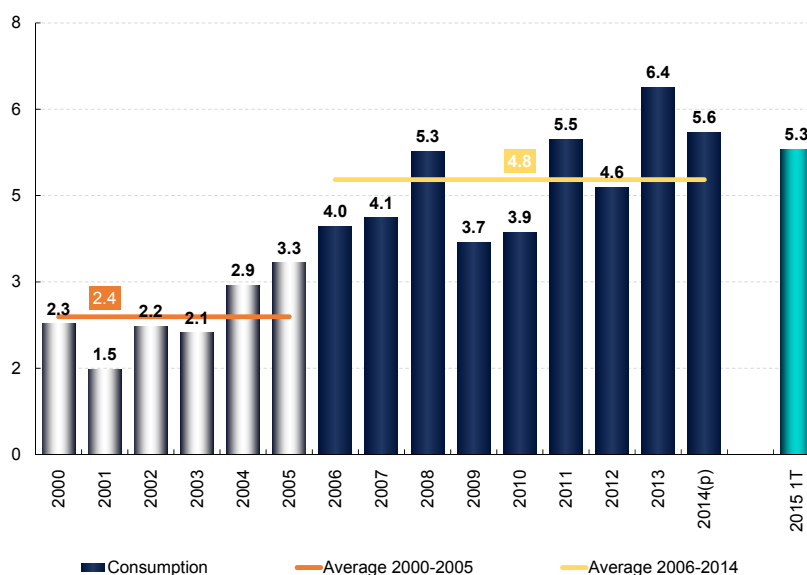
(p) Preliminary

Prepared by the authors on the basis of data from the National Institute of Statistics.

Analyzing the GDP components by spending categories, it can be observed that, both consumption, and gross fixed capital formation, which form part of domestic demand, have grown at higher rates since the change of the economic view in 2006. Real consumption, between 2000 and 2005 grew at an average rate of 2.4% while in the period 2006-2014 this rate increased at an average of 4.8%. Similarly, the gross fixed capital formation, between 2000 and 2005 registered on average a negative variation of 2.9%, whereas, during the period included between 2006 and 2014 it presented a positive variation of 11% (see Graphs 3 and 4).

<sup>3</sup> The descriptive analysis was performed for the 2000-2014 period, in some cases up to the first trimester of 2015, given that this is the period used for obtaining the results for section V.

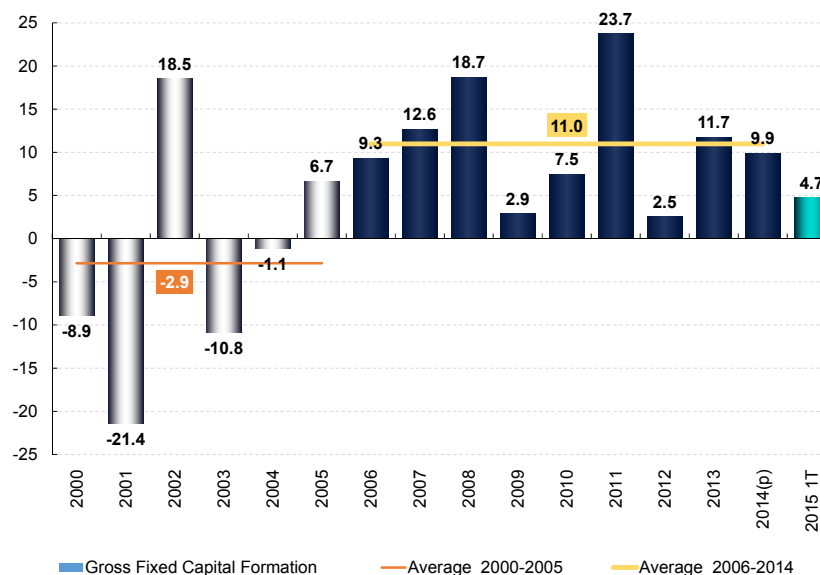
**Graph 3: Growth of real GDP, 2000-2014 and the first trimester of 2015 (Percentage)**



(p) Preliminary

Prepared by the authors on the basis of data from the National Institute of Statistics.

**Graph 4: Growth of real GDP, 2000-2014 and the first trimester of 2015 (Percentage)**



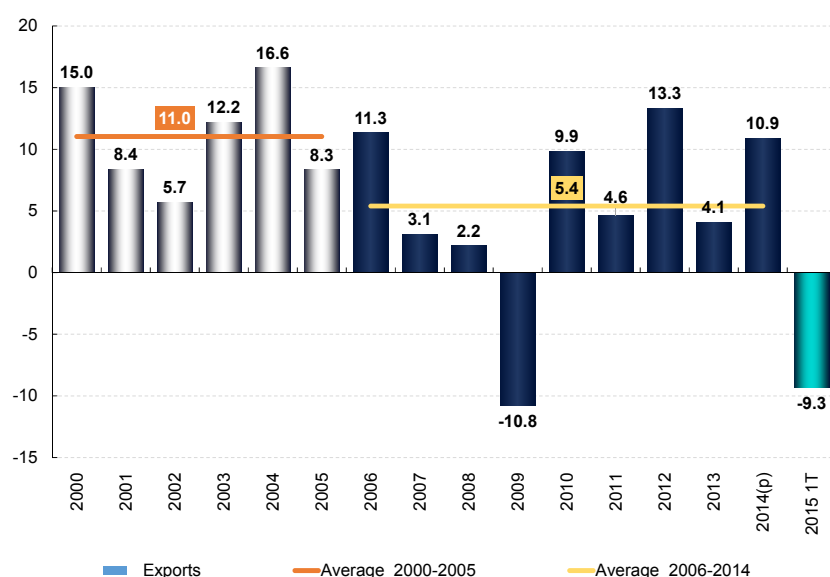
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Prepared by the authors on the basis of data from the National Institute of Statistics.

On the other hand, Graph 5 shows the evolution of real exports growth, there it can be observed that in the period 2000-2005 the average expansion of exports (11.0%) was greater than in the

period 2006-2014 (5.4%). Which is coherent with the economic view leading in both periods, that is, in the period 2000-2005 external demand was prioritized, unlike the current economic view. On the other hand, in 2009 and in the first trimester of 2015, exports registered negative variations, which are explained by the effects of the international crisis and the consequent reduction of external demand. Nevertheless, it must be pointed out that in these periods, the Bolivian output growth was the highest in the region, which indicates, on one hand, the resilience of the economy to external demand shocks and, on the other hand, that domestic demand is the principal factor of growth.

**Graph 5: Growth of Real Exports, 2000-2014 and the first trimester of 2015  
(Percentage)**



(p) Preliminary

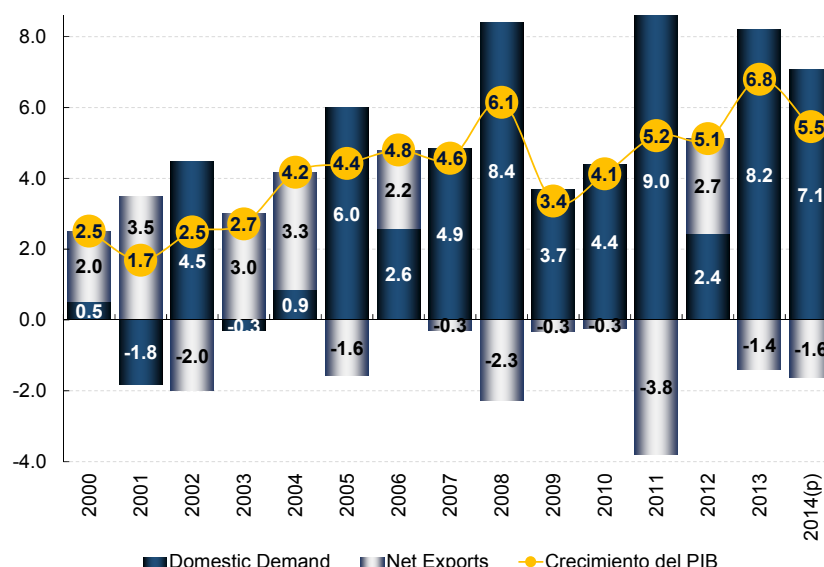
Prepared by the authors on the basis of data from the National Institute of Statistics.

### **b. Incidence of domestic demand on growth**

In general, as observed in Graph 6 the product grew at a higher rates when the incidence of domestic demand were larger. Nevertheless, it must be noted that it is since 2006, date when it starts the implementation of the ESCPM, that domestic demand is consolidated as the component of major incidence on economic growth.



**Graph 6: Growth of GDP and incidence on domestic demand and net exports, 2000-2014 (Percentage)**



(p) Preliminary

Prepared by the authors on the basis of data from the National Institute of Statistics.

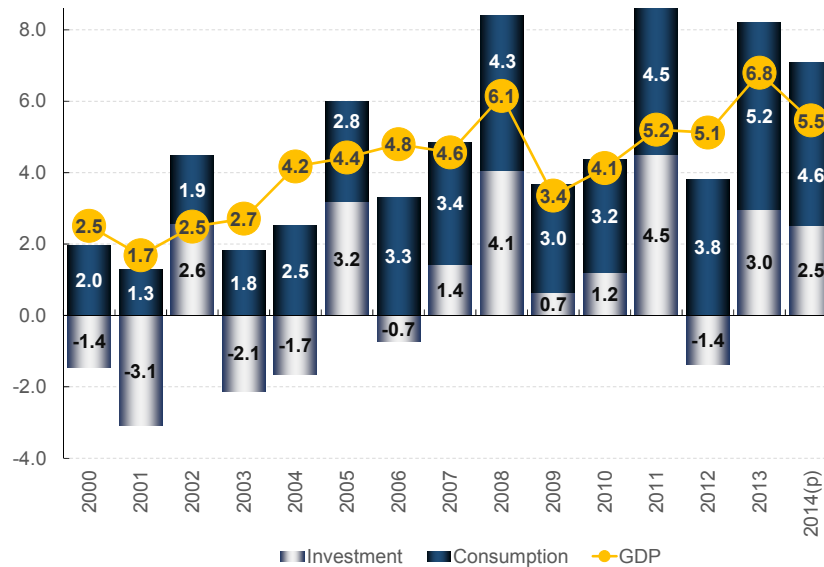
In this context, two events exemplify the importance of domestic demand for the economic activity, on one hand, the resilience against the impacts of the international economic crisis, and on the other hand, the levels of economic growth registered in 2008 and 2013, which were 6.1% and 6.8%,<sup>4</sup> respectively. These rates were determined by domestic demand, considering that its incidence was 8.4pp in 2008 and 8.2pp in 2013. Note that the incidence of net exports on output growth were negative (-2.3pp in 2008 and -1.4pp in 2013).

Furthermore, in Graph 7, domestic demand is disaggregated in consumption and investment, there it can be noted that consumption is the component with larger incidence on growth. However, since 2006, investment increase its incidence on the Bolivian economic growth. On the other side, net exports had a negative incidence on product in recent years.

Considering the years 2008 and 2013, where the economic growth rates were 6.1% and 6.8%, respectively. It is observed that the consumption incidence in these years were 4.3pp and 5.2pp, respectively. Whereas the investment incidence was in 4.1pp and 3.0pp, respectively. These facts show that while consumption is the principal determinant of growth, it must be complemented with high levels of investment to reach growth rates above the average. It should be mentioned that the larger rates of total investment is due to the public investment that in recent years registered unprecedented levels.

<sup>4</sup> GDP did not report a growth rate of 6.8% since 1976. Similarly, the economic growth in Bolivia in 2013 was well above the average growth in Latin America and the Caribbean which was 2.7%.

**Graph 7: Growth of GDP and incidence of consumption and investment, 2000-2014  
(Percentage)**

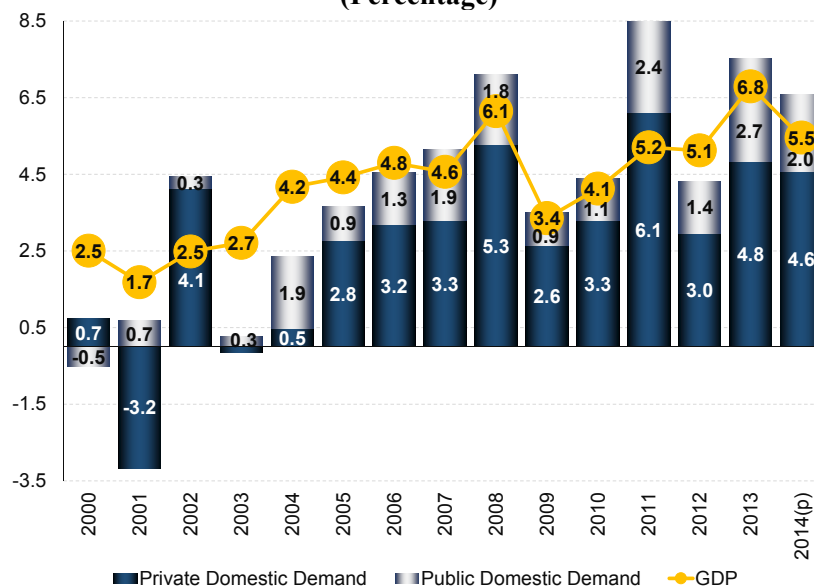


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Prepared by the authors on the basis of data from the National Institute of Statistics.

On previous graphs it was observed that domestic demand, led by consumption, is the main determinant of growth; nevertheless, private and public sector contribution to the domestic demand was not considered. On Graph 8, it is observed that private domestic demand - the aggregation of consumption and the private sector investment - is an important component of growth. In fact, the periods with highest rates of growth (which were registered between the period 2006-2014) are characterized by a good performance of private domestic demand but complemented by considerable levels of expenditure and public investments (public domestic demand).

**Graph 8: Growth of GDP and incidences of the private domestic demand and the public domestic demand, 2000-2014 (Percentage)**



(p) Preliminary

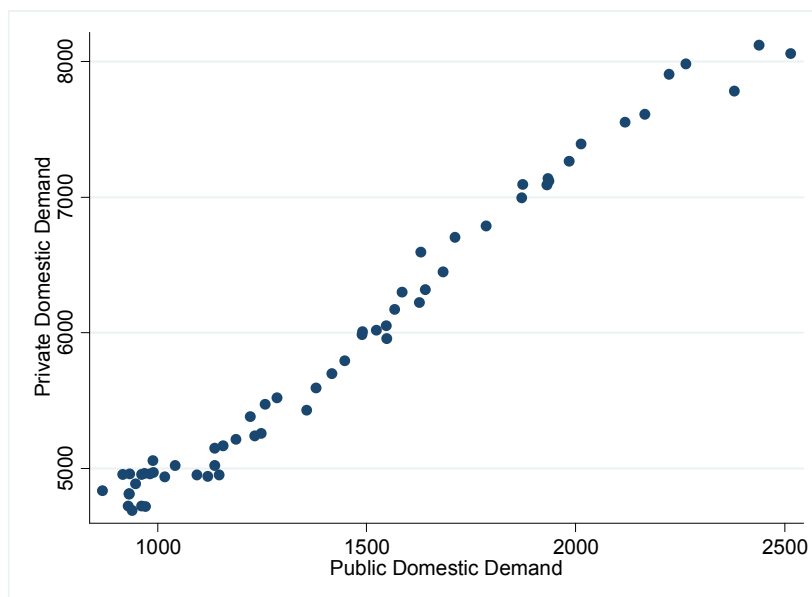
Note: Variations in inventory are not included, as this cannot be disaggregated in public and private.

Prepared by the authors on the basis of data from the National Institute of Statistics.

### c. Relation between private domestic demand and public domestic demand (crowding-in)

As previously indicated, the outstanding performance of the Bolivian economy in recent years was related to the role of private domestic and public domestic demand. Similarly, as it was established in the introduction of this document, one research question of interest is whether there is some complementarity between public domestic demand and private domestic demand, or in more appropriate economist terms: is there a traction effect (crowding-in) between public domestic demand and private domestic demand? Next graph displays the dispersion between both variables, there it can be seen the existence of a positive relationship which suggests a possible crowding-in between these variables.

**Graph 9: Scatter plot between the public domestic demand and private domestic demand, 2000-2014**



Note: The variables are logarithms and seasonally adjusted by the Census X-13 Method.  
Prepared by the authors on the basis of data from the National Institute of Statistics.

Assuming the possible crowding-in between the public domestic demand and the private domestic demand, it is interesting to know the causal relationship between both variables. For this purpose, the results of the Granger causality test between these variables are shown in Table 1. The results indicate that the public domestic demand Granger causes the private domestic demand and not vice versa.

**Table 1: Granger causality test between the public domestic demand and private domestic demand**

Ho: "X" does not Granger cause "Y"				
X	Y	Chi2	df	Prob
Public Domestic Demand	Private Domestic Demand	7.653	1	0.006
Private Domestic Demand	Public Domestic Demand	0.296	1	0.587

Note: The Granger causality test was made on the underlying VAR used to obtain the results in section V. The analysis period is 2000q1-2015q1.

Note that this result is just a priori evidence on the relationship between the public and private domestic demand, therefore, more robust evidence is needed, which will be presented in section V.

#### IV. METHODOLOGY

For purposes of the current investigation, a Structural Vector Auto Regression (SVAR)<sup>5</sup> model is estimated. In first instance, it is based on the methodology developed by Blanchard and Perotti (2002) and Perotti (2005) aimed at capturing the effects of the State participation in the economy. In second instance, this methodology is expanded to identify the effects of the domestic demand (private and public) and the external demand on growth and simultaneously, the interaction between the public domestic demand and private domestic demand.

The underlying VAR is estimated with a constant, tendency, seasonal dichotomous variables and a dichotomous variable to capture the break originated since 2006.

##### a. Specifications

Starting from the reduced form VAR:

$$x_t = \Gamma(L)x_t + u_t \quad (1)$$

Where  $x_t$  is a vector ( $n \times 1$ ) of endogenous variables,  $\Gamma(L)$  is a matrix ( $n \times n$ ) corresponding to a first order lag polynomial,  $u_t$  is a vector ( $n \times 1$ ) of reduced form innovations which are i.i.d. The relationship between the innovations of the reduced form  $u_t$  and the structural shocks  $v_t$ , which are the variables of interest, are represented by:

$$Au_t = Bv_t \quad (2)$$

Where the ( $n \times n$ ) matrix A and B describes the instantaneous relationship between the variables, and the lineal relationship between the reduced form residuals and the structural shocks, respectively.

It is assumed that the structural shocks are not correlated among them (i.e. the variance-covariance matrix of the structural shocks  $\Sigma v$  is diagonal). Without restrictions on the parameters A and B the structural model is not identified. Therefore, in the following section, the conditions of identification used are developed.

In the specification used for this study,  $x_t = [y_t, dpri_t, dpub_t, ipn_t, dex_t]$ , where: GDP is represented by  $y_t$ , private domestic demand by  $dpri_t$ , public domestic demand by  $dpub_t$ , net public revenue by  $ipn_t$  and external demand by  $dex_t$ .

##### b. Identification of the structural shocks

**Step 1.** The specified VAR in (1) is estimated and the residuals of the reduced form are obtained  $u_t = [u_t^y, u_t^{dpri}, u_t^{dpub}, u_t^{ipn}, u_t^{dex}]$ . Considering that  $dpub_t$  and  $ipn_t$  are the variables which capture the participation of the State in the economy, following Perotti (2005), the innovations  $u_t^{dpub}$  and  $u_t^{ipn}$  are assumed to be the lineal combinations of three types of shocks: i) the automatic or cyclical

<sup>5</sup> The underlying pre and post estimation tests are shown in Annex.

response of public domestic demand and of net public revenues to innovations in the product; ii) the systematic response of fiscal policy to macro shocks during the same period and; iii) structural shocks that reflect discretionary fiscal policy. These can be represented as follows:

$$u_t^{dpub} = \alpha_y^{dpub} u_t^y + \beta_{ipn}^{dpub} \varepsilon_t^{ipn} + \varepsilon_t^{dpub} \quad (3)$$

$$u_t^{ipn} = \alpha_y^{ipn} u_t^y + \beta_{dpub}^{ipn} \varepsilon_t^{dpub} + \varepsilon_t^{ipn} \quad (4)$$

Where  $\varepsilon_t^{dpub}$  y  $\varepsilon_t^{ipn}$  are the mutually uncorrelated structural shocks of the fiscal variables, which we want to identify. Considering that it is assumed that discretionary fiscal decisions are implemented with a lag larger than a trimester, the contemporaneous fiscal policy answers to macro shocks can be dismissed. Which is key for the identification purposes, since it allows to assume that the coefficient  $\alpha_y^{dpub}$  and  $\alpha_y^{ipn}$  in (3) and (4), only capture the automatic answers of fiscal variables to changes in the product.

Since the reduced form residuals are correlated with the structural shocks, it is necessary to apply restrictions which will allow to identify the coefficients  $\alpha_y^{dpub}$  y  $\alpha_y^{ipn}$ . Consequently, to identify the system, external estimates of  $\alpha_y^{dpub}$  y  $\alpha_y^{ipn}$  are used.

**Step 2.** Considering that the data frequency is trimestral, the parameter  $\alpha_y^{dpub}$  is equal to zero (equation (5)), given that expenditures and government investment are programed. This means that the public domestic demand does not respond contemporaneously to innovations in the product. Regarding the net government revenues,  $\alpha_y^{ipn}$ , it is externally estimated, and thus the cyclically adjusted shock,  $u_t^{ipn-adj}$ , is calculated as shown in equation (6):

$$u_t^{dpub} = \beta_{ipn}^{dpub} \varepsilon_t^{ipn} + \varepsilon_t^{dpub} \quad (5)$$

$$u_t^{ipn-adj} = u_t^{ipn} - (\alpha_y^{ipn} u_t^y) = \beta_{dpub}^{ipn} \varepsilon_t^{dpub} + \varepsilon_t^{ipn} \quad (6)$$

**Step 3.** To identify the structural fiscal shocks it is assumed that the public revenues structural shocks do not have an impact on the structural shocks in the public domestic demand  $\beta_{ipn}^{dpub} = 0$ . Therefore, equation (5) is reduced to:

$$u_t^{dpub} = \varepsilon_t^{dpub} \quad (7)$$

So it is assumed that the public domestic demand structural shocks are equal to the reduced form shocks of this variable. Considering that these were already estimated, they are used in equation (6) to estimate the response of the public revenues cyclically adjusted shocks  $\beta_{dpub}^{ipn}$  to structural innovations in the public domestic demand.

**Step 4.** The parameter associated to the private domestic demand reduced form residuals are identified  $\alpha_y^{dpri}$ ,  $\alpha_{ipn}^{dpri}$  y  $\alpha_{dpub}^{dpri}$ , whose equation is as follows:

$$u_t^{dpri} = \alpha_y^{dpri} u_t^y + \alpha_{dpub}^{dpri} u_t^{dpub} + \alpha_{ipn}^{dpri} u_t^{ipn} + \varepsilon_t^{dpri} \quad (8)$$

Similar to Step 2, it is assumed that  $\alpha_y^{dpri}$  captures the automatic or cyclical domestic private demand response to changes in the product. It means that this parameter is valued externally.

To obtain the coefficients  $\alpha_{dpub}^{dpri}$  and  $\alpha_{ipn}^{dpri}$ , in first place, the shocks of private domestic demand adjusted for the economic cycle are calculated as follows:

$$u_t^{dpri-adj} = u_t^{dpri} - (\alpha_y^{dpri} u_t^y) = \alpha_{dpub}^{dpri} u_t^{dpub} + \alpha_{ipn}^{dpri} u_t^{ipn} + \varepsilon_t^{dpri} \quad (9)$$

In second place, equation (9) is estimated using  $\varepsilon_t^{ipn}$  as instrument of  $u_t^{ipn}$ , and replacing  $u_t^{dpub}$  by  $\varepsilon_t^{dpub}$ . Since as shown in equation (7) the public domestic demand reduced form shocks are equal to their structural shocks.

**Step 5.** External demand is considered exogenous, so that the estimated reduced form residuals will be equivalent to the structural innovations of this variable.

$$u_t^{dex} = \varepsilon_t^{dex} \quad (10)$$

**Step 6.** Finally, the parameters associated to the residuals of the product are identified,  $\alpha_{dpri}^y$ ,  $\alpha_{dpub}^y$ ,  $\alpha_{ipn}^y$  and  $\alpha_{dex}^y$ , whose equation is as follows:

$$u_t^y = \alpha_{dpri}^y u_t^{dpri} + \alpha_{dpub}^y u_t^{dpub} + \alpha_{ipn}^y u_t^{ipn} + \alpha_{dex}^y u_t^{dex} + \varepsilon_t^y \quad (11)$$

Equation (10) is estimated using  $\varepsilon_t^{dpri}$  and  $\varepsilon_t^{ipn}$  as instrument of  $u_t^{dpri}$  and  $u_t^{ipn}$ , respectively. The reduced form shocks  $u_t^{dpub}$  and  $u_t^{dex}$  are equivalent to their structural innovations  $\varepsilon_t^{dpub}$  and  $\varepsilon_t^{dex}$ .

### c. Matrix of contemporaneous effects and relationships matrix between the reduced form residuals and the structural shocks.

Based on the identification conditions developed in previous section, matrix A and B, which describe the instantaneous relationship between the variables and the lineal relationship between the reduced form residuals and the structural shocks, are structured as follows:

$$A = \begin{bmatrix} 1 & -\alpha_{dpri}^y & -\alpha_{dpub}^y & -\alpha_{ipn}^y & -\alpha_{dex}^y \\ -\alpha_y^{dpri} & 1 & -\alpha_{dpri}^{dpri} & -\alpha_{ipn}^{dpri} & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -\alpha_y^{ipn} & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & \beta_{dpub}^{ipn} & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

#### d. Data

The variables used are: i) the Gross Domestic Product (GDP), ii) private domestic demand, iii) public domestic demand, iv) government net revenues and, v) external demand. The private domestic demand is defined as the sum of private domestic consumption and investment. Similarly, public domestic demand is composed of government consumption and public investment.<sup>6</sup> The variable government net revenues is calculated as General Government revenues minus the interest payments for debts (domestic and external), transferes and pensions.

Finally, the External Demand variable is represented by the exports.

GDP and the variables described in the previous paragraph, except for government net revenues come from the National Institute of Statistics (INE). The information of government net revenues comes from the General Government Operations, whose source is the Ministry of Economy and Public Finances (MEPF).

All variables are in real terms, in logarithms and were seasonally adjusted by the method Census X13-ARIMA. Trimestral data is used, and the analysis period involves the first trimester of 2000 up to the first trimester of 2015.

## V. RESULTS

Following the identification procedures developed in last section, the estimated parameters for matrix  $A$ <sup>7</sup> and  $B$  are as follows:<sup>8</sup>

$$A = \begin{bmatrix} 1 & -0.63 & -0.11 & 0.03 & -0.08 \\ -0.50 & 1 & -0.11 & 0.02 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ -1.57 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

<sup>6</sup> Fiscal data comes from the General Government fiscal operations since they do not involve Public Enterprises.

<sup>7</sup> Note that in Matrix  $A$  the parameters are declared with opposite signs.

<sup>8</sup> Annex 2 details the estimation technics used to obtain these parameters.

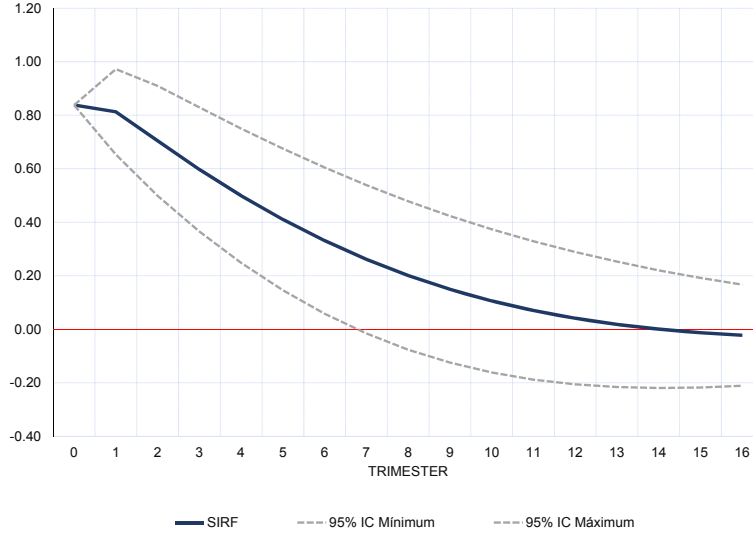


$$B = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0.69 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Using these parameters to estimate the SVAR and generating the Structural Impulse Response Functions (SIRF), the impacts of the structural innovations  $\varepsilon_t^{dpr}$ ,  $\varepsilon_t^{dpub}$  and  $\varepsilon_t^{dex}$  on economic growth are obtained.<sup>9</sup>

Graph 10 shows the output response to a structural shock on private domestic demand. In first instance, it must be noted that the effect of this shock is highly persistent and it becomes statistically not significant after six trimesters. The instantaneous impact of a structural perturbation equivalent to a 1% change in the private domestic demand on growth is 0.8% and the accumulate effect in one year is 2.6%.

**Graph 10: Structural Impulse Response Function of the Private Domestic Demand over the GDP**

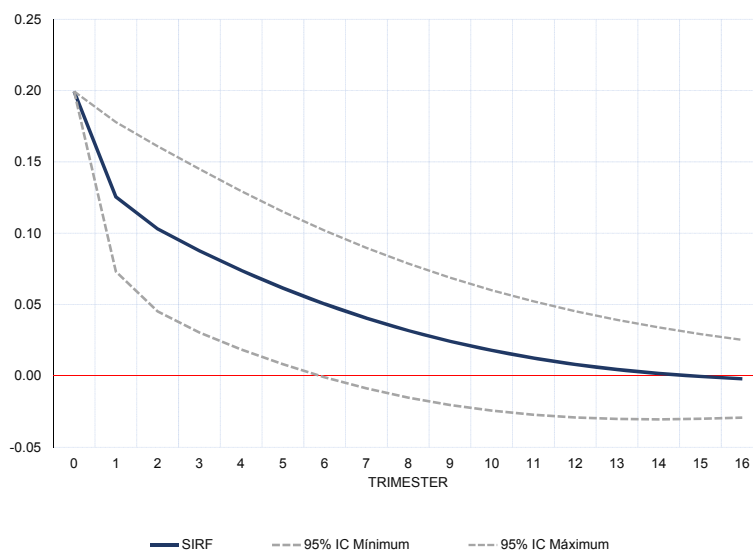


The SIRF demonstrates that the product varies instantly by 0.2% when the public domestic demand increases by 1% as result of a structural shock (see Graph 11), the accumulative impact on growth in one year is 0.5%. Furthermore, the impact of a public domestic demand structural perturbation on growth is similar to the private domestic demand effect, that is, the persistence of the effect is very prolonged, since the interval confidence does not involve zero through the

<sup>9</sup> As robustness analysis the structural VAR was valued by varying lags and parameters. The results do not vary significantly in regards to the ones exposed on this research document.

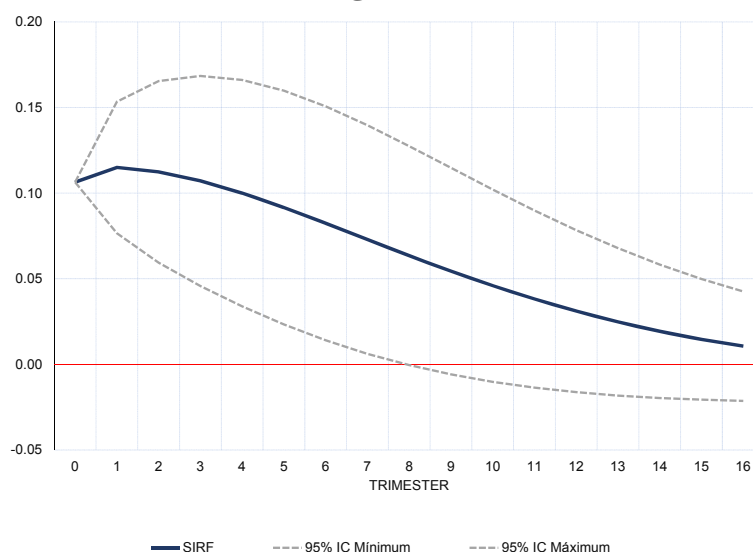
seventh trimester. This high persistence is a common finding in studies using VAR models, as the cases of Fatas and Mihov (2001), Blanchard and Perotti (2002) and Perotti (2005).

**Graph 11: Structural Impulse Response Function of the Public Domestic Demand over the GDP**



The instantaneous reaction of product to a structural perturbation which expands external demand by 1% is 0.1%, whereas the accumulated effect in a year is 0.4%. The persistence of the impact from external demand's shocks is two years (see Graph 12).

**Graph 12: Structural Impulse Response Function of the Public External Demand over the GDP**



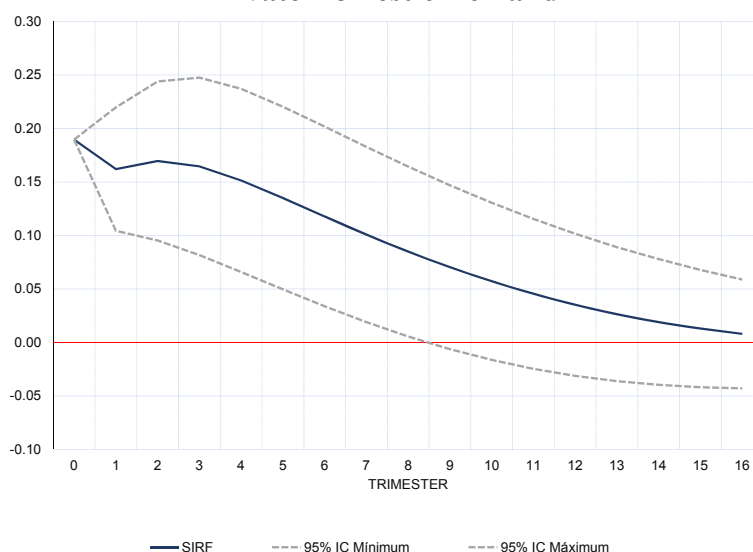
In this way, the SIRFs shown in last graphs demonstrates positive impacts and considerable persistence in the effect of domestic demand, both private and public, and external demand on the growth. However, it should be noted, as shown by this evidence, that the main determinant of

growth is clearly domestic demand. This fact is coherent with the statistics presented in the third section, and with the fundamentals of the Economic Social Communitarian Productive Model.

When disaggregating domestic demand into private and public, it was observed that the instantaneous effect on growth, coming from private domestic demand structural shocks are larger than the associated effect of a public domestic demand structural shock.

Until now, it is clear what the evidence suggest, that both private and public domestic demand are essential to the Bolivian economy. However, a question that arises is whether the State, through its leading participation in the economy (public domestic demand), impacts positively or not to private domestic demand's performance (i.e., crowding-in). In order to provide evidence on this regard, next graph shows the response of private domestic demand to a structural perturbation in the public domestic demand.

**Graph 13: Structural Impulse Response Function of the Public Domestic Demand over the Private Domestic Demand**



Graph 13, shows that a public domestic demand structural shock has a positive impact on private domestic demand. Furthermore, the impact of this shock has a persistence of eight trimesters. Specifically, the instantaneous impact of a structural perturbation equivalent to a change of 1% in public domestic demand on private domestic demand is 0.2% and the accumulated effect in one year is 0.7%. Therefore, the answer to the previous question is yes, meaning that there is a crowding-in from public domestic demand to private domestic demand in Bolivia.

## VI. CONCLUSIONS

This document presented evidence regarding the determinants of economic growth in Bolivia from a demand approach. In addition, evidence was also offered regarding the interaction between public domestic demand and private domestic demand. The purpose was to provide

statistical evidence on the role played by domestic demand as engine to economic growth in Bolivia. In this regard, a structural VAR model was estimated, for which specific identification conditions were established trying to fit the reality of the Bolivian economy.

In this framework, the results suggest that domestic demand is clearly the principal determinant of the Bolivian economy growth and not so external demand. Likewise, when breaking down domestic demand by sector, meaning in private domestic demand and public domestic demand, the evidence shows that the first one has a greater impact on growth, in terms of elasticity. In addition, it was evident that the active participation of the State (public domestic demand) is effective to boost the economic activity, being a better instrument than external demand.

Regarding the existence of a complementarity relationship between fiscal policy and private sector domestic demand, the results obtained in this research indicate that evidently a traction effect (crowding-in) arises between public domestic demand and private domestic demand. In conclusion, these results suggest that a proper mechanism to maintain a sustained growth of the Bolivian economy and to face the international economic crisis (decrease of the external demand) is the active participation of the State, through higher government spending levels and public investment. With these policies, on one hand economic growth is promoted directly, on the other hand, the private domestic demand is boost, and as it was indicated previously it is the main determinant of economic growth in the country.

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## APPENDIX 1.

### PRE AND POST- ESTIMATION TESTS OF THE UNDERLYING VAR

#### Unitary Root Test

The variables of interest are: GDP, private domestic demand, public domestic demand, government net revenues and external demand. All these variables are in logarithms. To make these variables stationary, the strategy was to control for all those factors which could make non-stationary the series of interest. For this reason we introduced as control variables: the lags of the dependent variable, the tendency, dichotomous seasonal variables, and another dummy for the period of 2000-2014. In this way all temporary effects which could make non-stationary the series were cleaned. It means that the variables are stationary in the framework of the model.

To verify that the variables of interest are stationary, the property of “Partialling-out” from the multiple regression analysis is initially used. Later the conventional unitary root tests are applied. The procedure is as follows:

**Step 1:** A regression of the dependent variable<sup>10</sup> as function of all regressors used (variable lags, tendencies, stationary dummies and dummy 2006-2014) without the explanatory variable of interest from which the coefficient is sought. The residuals of this regression is obtained, which represent the part of the dependent variable not explained by all regressors used.

**Step 2:** A regression of the explanatory variable of interest (the one excluded on Step 1) is estimated in function of all regressors used (same as Step 1). The remainders are obtained, which represent the part of the excluded explanatory variable (now as dependent variable) not explained by the regressors.

**Step 3:** Carry out Step 1 and Step 2 for each one of the coefficients obtained in the estimation of the underlying VAR.

**Step 4:** Partialling-out: Regress the residuals of Step 1 in function of the residuals of Step 2, for all cases. The same exact coefficients that when estimating the underlying VAR are obtained. This is the property of Partialling-out.

**Step 5:** Since the coefficients estimated through the property of Partialling-out are similar to those obtained in the underlying VAR, the unitary root test can be performed over each one of the residuals obtained in Steps 1 and 2. In other words, these residuals represent the variables of interest isolated from any temporary impact which might bias the results. In this sense, the testing procedure consists in analyze whether this residuals from which at the end the coefficients are estimated are stationary or not, using the traditional unitary root test (Dickey-Fuller and Phillips-Perron).

The results, shown below, suggest that these series are stationary, aspect which constitutes a proof that the results obtained in the estimation of the underlying VAR are free of the non-stationary problem.

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<sup>10</sup> In this case we have five dependent variables

## Unitary root tests from the Partialling-out approach

		GDP		Private Domestic Demand		Public Domestic Demand		External Demand		Government Net Revenues	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GDP	Residual Step 1	-6.737*	-6.738*	-7.383*	-7.395*	-8.105*	-8.150*	-6.967*	-6.930*	-9.298*	-9.508*
	Residual Step 2	-5.382*	-5.377*	-5.382*	-5.377*	-5.382*	-5.377*	-5.382*	-5.377*	-5.382*	-5.377*
Private Domestic Demand	Residual Step 1	-9.835*	-10.566*	-4.847*	-4.849*	-7.808*	-7.872*	-6.918*	-6.879*	-8.901*	-8.868*
	Residual Step 2	-4.828*	-4.830*	-4.828*	-4.830*	-4.828*	-4.830*	-4.828*	-4.830*	-4.828*	-4.830*
Public Domestic Demand	Residual Step 1	-9.498*	-9.971*	-6.884*	-6.865*	-7.691*	-7.736*	-6.991*	-6.960*	-8.791*	-8.836*
	Residual Step 2	-6.609*	-6.562*	-6.609*	-6.562*	-6.609*	-6.562*	-6.609*	-6.562*	-6.609*	-6.562*
External Demand	Residual Step 1	-9.126*	-9.372*	-7.040*	-7.049*	-7.729*	-7.771*	-3.639*	-3.559*	-8.386*	-8.360*
	Residual Step 2	-3.863*	-3.852*	-3.863*	-3.852*	-3.863*	-3.852*	-3.863*	-3.852*	-3.863*	-3.852*
Government Net Revenues	Residual Step 1	-9.500*	-9.987*	-6.886*	-6.881*	-7.660*	-7.682*	-6.879*	-6.840*	-3.924*	-4.015*
	Residual Step 2	-3.481*	-3.660*	-3.481*	-3.660*	-3.481*	-3.660*	-3.481*	-3.660*	-3.481*	-3.660*

Ho: There is a Unit Root.

\* Indicates that the Ho is rejected with a significant level of 1%.

Note: Tests on the residuals of the temporary control variables are not included because it is not the objective to show that these controls are stationary.



### Optimal Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	607.08	NA	4.19e-15	-18.92	-17.88	-18.51
1	747.58	230.33*	9.65e-17*	-22.71*	-20.80*	-21.96*
2	769.69	32.62	1.11e-16	-22.61	-19.84	-21.53
3	795.27	33.55	1.18e-16	-22.63	-18.99	-21.21
4	809.90	16.78	1.92e-16	-22.29	-17.79	-20.53
5	831.90	21.64	2.66e-16	-22.19	-16.83	-20.09

\* Indicates the selected lag order by the criteria.

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike Information Criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn Information Criterion

### Stability test

Root	Modulus
0.858250 - 0.107830i	0.864998
0.858250 + 0.107830i	0.864998
0.382427	0.382427
0.185269 - 0.015566i	0.185922
0.185269 + 0.015566i	0.185922

No root lies outside the unit circle.

VAR satisfies the stability condition.

### Johansen Cointegration Test

Selected (0.05 level\*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	3	2	2	0
Max-Eig	1	1	0	0	0

\*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	673.539	673.539	690.0267	690.0267	699.8452
1	699.6594	699.861	706.8234	707.7715	716.9705
2	709.1856	716.1871	722.1182	723.2767	727.8059
3	717.5242	724.7971	730.3528	732.5904	735.933
4	720.9482	732.8815	734.7815	738.8427	741.7881
5	721.3094	736.0745	736.0745	742.2397	742.2397
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-20.78463	-20.78463	-21.16756	-21.16756	-21.32817
1	-21.32198	-21.29537	-21.39411	-21.39238	-21.56568
2	-21.30619	-21.4729	-21.57061	-21.54256	-21.59353*
3	-21.25081	-21.39324	-21.51176	-21.48635	-21.5311
4	-21.03161	-21.29605	-21.32605	-21.32809	-21.39294
5	-20.71031	-21.03582	-21.03582	-21.07466	-21.07466
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-19.03934	-19.03934	-19.24774*	-19.24774*	-19.23383
1	-19.22764	-19.16612	-19.12524	-19.08861	-19.12228
2	-18.86279	-18.95969	-18.95268	-18.85481	-18.80107
3	-18.45835	-18.49606	-18.54477	-18.41464	-18.38958
4	-17.89009	-18.01491	-18.01001	-17.87242	-17.90236
5	-17.21974	-17.37071	-17.37071	-17.23502	-17.23502

Note: The period of the sample is 2000q1-2014q4. Variables are in logarithms.

### Autocorrelation

Lags	LM-Stat	Prob
1	30.89284	0.1926
2	19.60023	0.7675
3	13.65062	0.9675
4	23.16866	0.5677
5	28.87112	0.2693
6	29.00436	0.2637
7	17.98285	0.8431
8	20.42994	0.7239

Probs from chi-square with 25 df.

**Normality**

<b>Component</b>	<b>Skewness</b>	<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
Joint		3.769500	5	0.5831

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<b>Component</b>	<b>Kurtosis</b>	<b>Chi-sq</b>	<b>df</b>	<b>Prob.</b>
Joint		2.824909	5	0.7270

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<b>Component</b>	<b>Jarque-Bera</b>	<b>Df</b>	<b>Prob.</b>
Joint	6.594409	10	0.7631

Null hypothesis: residuals are multivariate normal

## APPENDIX 2.

## ESTIMATION OF THE PARAMETERS A and B FOR THE SVAR

Parameter	Coefficient	p-value	Méthod	Weak Instruments F-test	Hansen J-test
$\alpha_{dpri}^y$	0.63	0.000	GMM-IV	27.44	0.15
$\alpha_{dpnb}^y$	0.11	0.000	GMM-IV	27.44	0.15
$\alpha_{ipn}^y$	-0.03	0.059	GMM-IV	27.44	0.15
$\alpha_{dex}^y$	0.08	0.000	GMM-IV	27.44	0.15
$\alpha_y^{dpri}$	0.50	0.003	GMM-IV	10.31	0.58
$\alpha_{dpnb}^{dpri}$	0.11	0.034	GMM-IV	75.54	0.33
$\alpha_{ipn}^{dpri} 1/$	-0.02	0.216	GMM-IV	75.54	0.33
$\alpha_y^{ipn}$	1.57	0.028	GMM-IV	59.65	0.12
$\beta_{dpnb}^{ipn}$	0.69	0.045	MCO		

1/ The estimated parameter corresponding to  $\alpha_{ipn}^{dpri}$  is not statistically significant. Therefore, to verify the robustness of the results, we estimated the SVAR assigning a zero value to this parameter and the results do not vary significantly, which supports the conclusions generated on Section V.