

The Foreign Saving Moderating Effect on Public Spending in Mexico

El efecto moderador del ahorro externo sobre el gasto público en México

Banegas Rivero Roger Alejandro¹
Blancas Neria Andrés²

Abstract

This paper evaluates the effects of public spending on economic growth and social welfare in Mexico through a CGE model. The behavior of foreign saving moderates the relationship between public spending, economic growth and social welfare with asymmetric effects for different public expenditure instruments. Under unrestricted foreign saving conditions, an increase in public spending leads to greater economic growth and social welfare, although this causes fiscal deterioration, increased public debt and a larger deficit in the balance of payments. Without any increase in foreign savings, public spending does not influence economic growth or social welfare, only the fiscal position.

Keywords: Public spending, economic growth, social welfare, foreign saving, CGE model.

Resumen

En este documento se evalúan los efectos del gasto público sobre el crecimiento económico y el bienestar social en México mediante un modelo de equilibrio general computable (MEGC). La condición del ahorro externo modera la relación entre gasto público, crecimiento económico y bienestar social con efectos asimétricos para los distintos instrumentos de gasto. Bajo el contexto de ahorro externo irrestricto, un incremento en el gasto público conlleva a mayor crecimiento económico y bienestar social, aunque puede causar deterioro fiscal y mayor déficit en la balanza de pagos; de forma opuesta, sin variación del ahorro externo, el gasto público no influye sobre el crecimiento económico, ni sobre la bienestar social, solamente sobre la posición fiscal.

Palabras claves: Gasto público, ahorro externo, crecimiento económico, bienestar social, MEGC.

JEL Classification: H50, H54, L38, O11, O23.

1 Department of Economics. Universidad Autónoma Gabriel René Moreno (UAGRM). Bolivia. Email: rogerbanegas@uagrm.edu.bo

2 Institute of Economic Research (IIEc), National Autonomous University of Mexico (UNAM). Email: neria@unam.mx

Introduction

One of the most important issues in both economic theory and the practical field of economic policy has been undoubtedly the effect of public expenditure on economic growth. In the endogenous growth theory, public investment or infrastructure investment is considered as a proxy variable of productive public spending with positive implications for economic growth (Barro, 1990; Romer, 1990). However, in Latin America there is evidence that public investment crowds out private investment as a negative externality (Ramírez and Nazmi, 2003). In addition, it has been argued that government consumption, and public spending itself, does not influence on economic growth (Butkiewicz and Yanikkaya, 2011; Dakurah, Davies and Sampath, 2001; Carter, Craigwell and Lowe, 2013; Engen and Skinner, 1992).

From the Keynesian perspective, the positive effect of public spending is based on the stimulus on aggregate demand, whereas the neoclassical approach suggests that public spending has no effect on economic growth (Kaminsky, 2009). Consequently, the main questions of interest focus on answering: what is the role of foreign savings in the relationship: public spending, economic growth and social welfare? What mechanisms would the effects of public expenditure have a connotation according to the Keynesian or neoclassical approach?

The main hypothesis of this paper is that under the assumption of endogenous foreign saving there is a positive effect of public expenditure on economic growth and social welfare; additionally, there are opportunity costs associated with the deterioration of the fiscal position (fiscal deficit and public debt) as well as an increase in the deficit of the current account of the balance of payments (Keynesian approach)³. On the other hand, if foreign saving is assumed to be exogenous, the hypothesis of the neoclassical stance is fulfilled: public spending does not influence economic growth or social welfare. To test this hypothesis, we use an adapted version of the 1-2-3 CGE model for one country (1: Mexico), two sectors (2: domestically produced goods and exported goods) and three goods (3: imported, consumed domestically and exported). Such models are characterized by their capability to assess public expenditure policies and tax impacts, effects of exchange rate policy and the expected response to internal and external shocks, such as remittances and oil prices (Devarajan, Go, Lewis, Robinson, and Sinko, 1997). The contribution of this paper to the understanding of the literature on the relationship between public expenditure, economic growth and social welfare is therefore to explain under what circumstances the results of Keynesian theory and neoclassical

3 The Keynes' analysis of a closed economy has evolved toward the open economy stage by using concepts like raw material prices, terms of trade and international capital flows, among others (Davidson, 2011). Moreover, the Keynesian approach also considers Thirlwall's Law, which states that the growth rate of a country is conditioned by the income elasticity of exports and imports; therefore, economic growth may affect the deficit in the balance of payments (Thirlwall, 2003; Perrotini, 2003; Lavoie, 2014; Clavijo and Ros, 2015).

theory are presented if the moderating effect of foreign saving is added in the 1-2-3 model applied for a developing countries like Mexico.

Thus, the document is made up of five sections: the theoretical framework linked to government and external constraints of economic growth are considered in the first section. The second section deals with the construction of a macro-aggregated Social Accounting Matrix (SAM) that reflects the circular flow of the Mexican economy. The third section comprises the specification of the CGE model and alternative closure rules for foreign savings. The fourth section addresses the results of fiscal policy effects under alternative closure rules. In section fifth, we point out some discussion of results, the implications for public policies and the research agenda. Finally, section sixth indicates some conclusions.

1. Theoretical Framework

1.1 The government budget constraint

To determine the effect of public spending on economic growth, the government faces a budget constraint between components of spending and funding sources:

$$G \text{ prim}_t + i_t D_{t-1} = I_t + i_t \Delta D_t + \text{AyExt}_t \quad (1)$$

Equation (1) states that primary spending, (government consumption, transfers and capital expenditure), as well as the financial cost of public debt in the previous period (can be financed by total revenue (I_t), increasing public debt (ΔD_t) multiplied by the nominal interest rate (i_t) or even by foreign financial aid (AyExt_t)⁴. From equation (1) we get public debt equations (2) and (3):

$$D_t = D_{t-1} + i_t D_{t-1} + (G \text{ prim}_t - I_t) - \text{AyExt}_t \quad (2)$$

$$D_t = D_{t-1} + i_t D_{t-1} - (I_t - G \text{ prim}_t) - \text{AyExt}_t \quad (3)$$

Where, the difference between fiscal incomes and primary spending corresponds to the primary budget balance:

$$D_t = D_{t-1} + i_t D_{t-1} - \text{BP}_t - \text{AyExt}_t \quad (3')$$

If equation (3') is divided by the GDP (Y_t), we get:

$$\frac{D_t}{Y_t} = \frac{D_{t-1}}{Y_{t-1}} + \frac{r_t D_{t-1}}{(1+g_t)Y_{t-1}} - \frac{\text{BP}_t}{Y_t} - \frac{\text{AyExt}_t}{Y_t} \quad (4)$$

⁴ Foreign aid also refers to the debt forgiveness, very applicable to highly indebted and low-income countries.

Which can be rewritten as:

$$d_t = d_{t-1} + \frac{r_t}{(1+g_t)}d_{t-1} - bp_t - ayext_t \quad (5)$$

The dynamics of the public debt behavior in equation (5) is based on a direct relationship between the primary budget balance and public debt. The higher primary budget surplus, the lower public debt as a share of GDP; in the presence of a fiscal deficit, the public debt/GDP ratio does increase.

Other factors affecting public debt are: the real cost of public debt (r_t), the real growth rate of GDP (g_t), foreign aid ($ayext_t$) and the level of past debt (d_{t-1}). The expression $(r_t)/(1+g_t)$ corresponds to the real cost of debt adjusted by real GDP growth [real interest rate adjusted *ex-post*].

1.2 The external constraint on economic growth

The basic hypothesis in the Keynesian framework points out that economic growth is facing an external imbalance restriction. For further economic growth, it is necessary to increase the flow of investment; however, given an initial condition of restricted domestic saving, it is required to get access to foreign financing, leading to current account deficit in the balance of payments. Furthermore, if the income elasticity of exports and imports are sensitive to the increase in foreign production and domestic product levels, respectively, the balance of payments tends to be worse as the level of economic activity increases. Dynamically, the presence of prolonged balance of payment deficits results in subsequent depreciations of the local currency, increasing foreign debt and external debt service, which is considered an unsustainable growth mechanism (Loría, 2007).

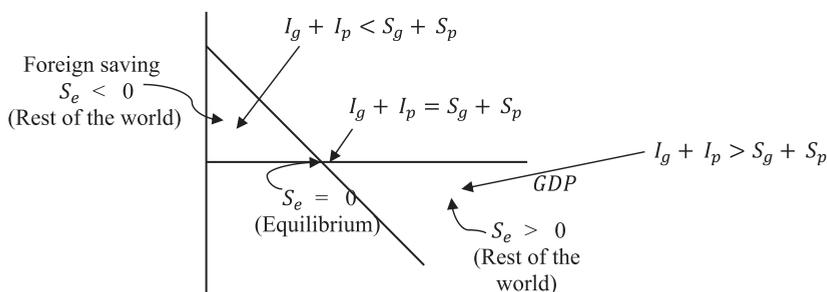
Additionally, from the Keynesian perspective, aggregate demand sets up restrictions on the rate of economic growth; therefore, increases in aggregate demand lead to foreign sector disequilibrium (Rodríguez and Venegas, 2012). So, if we add the foreign saving (S_e) to the accounting relationship between public and private domestic saving and investment we get:

$$(I_g - S_g) + (I_p - S_p) = S_e \quad (6)$$

Equation (6) shows the implications of seeking higher levels of public (I_g) or private (I_p) investment compared with the respective level of saving (S_p or S_g). So, if aggregate investment (I) is greater than the level of domestic saving (S), there will be a current account deficit or positive foreign saving ($S_e > 0$), the country is a net debtor of the rest of the world. On the contrary, if $I < S$, there will be a current account surplus or negative foreign saving ($S_e < 0$), the country becomes a net creditor to the rest of the world (Fig. 1). On the other hand, if government consumption increases or the marginal propensity

to private consumption changes, the domestic saving rate will be reduced; therefore, foreign saving (current account deficit) is required. Note that negative foreign saving, current account surplus or net debtor from the rest of the world are considered as synonymous. Similarly, positive foreign saving, current account deficit or net creditor of the rest of the world, are analogous concepts.

Figure 1
 External restriction to the level of economic activity, GDP



1.3 Public spending and economic growth relationship

The impact of public spending on economic growth is one of the most studied topics in economics. However, the results remain inconclusive (Gaber, Gruevski and Gaber, 2013; Li, 2009) with differentiated effects according to the classification of countries (developed and developing). For example, there is evidence of a negative relationship between aggregate public spending and economic growth in a group of developed countries; moreover, the public spending on consumption has restrictive effects on economic growth in the case of developing countries (Butkiewicz and Yanikkaya, 2011); interpreted as unproductive public expenditure (ineffective governments). Similarly, it is pointed out that a greater government consumption as a share of GDP leads to a negative effect on economic growth, and that public spending on infrastructure is the best proxy of public expenditure with positive effects on economic growth (Barro, 1990, 1991; Romer, 1990; Zagler and Dürnecker, 2003).

On the contrary, it has been questioned the impact of public investment and government capital spending without significant effect on economic growth (Hansson and Magnus, 1994; Schaltegger and Benno, 2006). In Latin America has been shown that public investment has a crowding-out effect on private investment (Ramirez and Nazmi, 2003)⁵, which is interpreted as a poor role of fiscal policy. The results of other previous studies differ, mentioning that government current spending has a positive effect on economic

⁵ This crowding out effect has been identified for nine Latin American economies during the period 1983-1993: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru and Uruguay.

growth; while government spending on infrastructure has a negative effect, especially for developing economies (Devarajan, Swaroop and Zou, 1996; Ghosh and Gregoriou, 2008)⁶.

1.4 Economic growth and social welfare

It is assumed that sustained economic growth improves the prosperity of society directly and positively. In spite of this, there are several trends indicating that there is not any relationship between economic growth and social welfare (Easterlin, 1974); as well as the idea that economic growth, as a proxy variable, is an imperfect representation for social welfare (Nordhaus and Tobin, 1972).

There are some inconsistencies in the relationship between economic growth and the level of social welfare; furthermore, its measurement presents some complications because it is not a direct observed variable. So, the alternative measures for social welfare are classified in three approaches: i) Economic approach, ii) Utility functions, and iii) Social welfare indicators (Pena, 2009). In the economic approach, there are basic criteria like real GDP growth (Koutsoyanis, 2002), the employment level (Shapiro, et al., 1987), income distribution (Dalton, 1920), the Human Development Index (HDI), and the real wages, among others. In the utility functions approach, social welfare criteria are based on the consumer utility from a cardinalist-marginalist perspective and from the sum of net individual utilities (Bergson, 1938; Allen, 1960; Kaldor, 1939). Finally, in the third approach, social welfare indicators are based on the population life quality (Veenhoven, 1998).

In this paper, we use the second approach to measure the social welfare. Under this approach, the objective of economic policy and the decisions of individuals is to maximize the level of welfare for consumers, who try to maximize the consumption of domestic and imported goods, subject to relative prices and a budget constraint.

Similarly, the change in the level of economic activity (economic approach) is interpreted as a proxy for change in social welfare: it is assumed as a necessary but not sufficient factor, associated with the population life quality (third approach) considering that this statement has been subject to several critics, specially by the side of income distribution analysis. An argument in favor of taking a positive relationship between economic growth and social welfare would be the antithesis condition (negation): social welfare has a negative or no relationship with economic growth (perhaps could it be the case of consumerist societies that are satiated *ad hoc*).

⁶ Devarajan, Swaroop, and Zou (1996) consider 43 developing countries for 20 years (1970-1990). Ghosh and Gregoriou (2008) take into account 15 developing countries, using panel data for 28 years (1972-1999).

2. Data: Macro-Aggregated Social Accounting Matrix (SAM)

In order to observe the relationship between public spending, level of economic activity and social welfare; first, we elaborate a macro-aggregated social accounting matrix (SAM) for the Mexican economy, and then, we used it as the main data source in a computable general equilibrium (CGE) model. The design of a macro-aggregated SAM (Table 1) aims to measure the circular flow of the economy between factors of production, goods and services as well as an alternative macroeconomic approach for interconnection between economic agents (private sector, government and the rest of the world) (Taylor, 2004) and institutions (Blancas, 2010).

Table 1
 Schematic Macro-Aggregated Social Accounting Matrix (SAM)

	Cost of production	Factors of Production	Households	Government	Private saving/Investments	Public saving/Investments	Rest of the world	Total
Production uses	Intermediate consumption		Private Consumption	Government consumption	Private Capital Gross Formation (GCF) + II	Public Capital Gross Formation + II	Exports	Total demand
Factors of Production	Factor payments, GDP at factor prices						Factor services	Total factor incomes
Households		Retribution to domestic factors		Government transferences to households			Remittance + transferences to households	Total household incomes
Government	Net taxes on production	Indirect taxes + oil rent + other taxes	Direct taxes					Total government incomes
Public savings				Government savings		- public GCF - changes in inventories		Public savings for investment
Private saving			Private savings		- private GCF - changes in inventories (II)		Foreign savings	Aggregate savings
Rest of the world	Imports	Retribution to foreign factors	Foreign transferences					Total capital outflows
Total	Total supply	Total factor spending	Total household spending	Total government spending	Aggregate demand of private investment	Aggregate demand of public investment	Total capital inflows	

From the 80s until the first decade of the XXI century, a few studies have used a SAM in the analysis of the Mexican economy; from the initial application of Pleskovic and Treviño (1985), who used a SAM framework in the analysis of the public sector in Mexico; only three works using a SAM were published between 1985 and 2004 (Barboza, Vazquez and Matus, 2009). Additionally, a SAM methodology has been used for regional analysis (Becerril, Dyer, Taylor and Yúnez, 1996). From 2004 to 2015, some CGE models were constructed on a SAM framework; for instance, in the analysis of tax changes, subsidies and their implications on welfare changes (Minzer, Perez, and Solis 2014); in regional income-generating activities for households (Chapa and Gonzalez, 2010); generation and distribution of income in Mexico (Tellez, Cantu, Grimaldo and Gonzalez, 2009); one macro-aggregated construction and a micro version (Barboza, Vazquez and Matus, 2009); and for structural analysis of the rural economy (Nuñez and Mendoza, 2008). Also, the productive linkage analysis based on an input-output Leontief matrix has been extended toward the so called: *inter-institutional linkage analysis*, based on a SAM framework (Blancas, 2006),

In this document, the macro-aggregated SAM is based on the national accounting system for the Mexican economy in 2011 as the base year, which

does not consider the sectorial details of intermediate inputs. The SAM is a square matrix (7x7 dimension), where entries or revenue accounts by row represent payments or expenditure accounts by column, and according to the principle of double entry that rules over the registration of transactions between economic agents in a SAM, the sum of the corresponding rows and columns must be balanced, representing different macro-balances in national income and product accounts. To achieve the objective of this article we consider a SAM for an open economy and public sector. In 23 accounts, the SAM shows the circular flow of the productive activities to factor's payments and institutions income: households, government, savings-investment and return to aggregate demand. In the first row and first column total demand and total supply are registered, respectively. The total supply costs are broken down into intermediate inputs, value added, indirect taxes less subsidies and value of total imports. Total demand is broken down into intermediate demand and final demand, including exports. Account (1, 1) corresponds to the intermediate production use, that is, the intermediate production demand, on the side of the rows and production costs of intermediate inputs, on the side of the columns. The account (2,1) represents the income of the factors of production comprising the gross value added or income of the factors of production minus indirect taxes less subsidies, which are registered in the (4,1) account as income Government: indirect taxes less subsidies. Finally, the account (7.1) registers the total imports of the economy. On the side of the rows, account (1, 3) shows the household incomes allocated to final consumption expenditure, while the government income, which is intended for final consumption, is recorded in the account (1, 4). Accounts (1, 5) and (1, 6) correspond to revenues which are intended for private and public spending in investment respectively; while export incomes are registered in (1, 7) account. Remittance incomes of households are registered in (2, 7) account as part of the income from the rest of the world of the factors of production. The remuneration to domestic and external factors are considered in accounts (3, 2) and (7, 2); oil income and other taxes are registered in the account (4, 2), while direct taxes are registered in account (4, 3).

The current domestic transfers and transfers from the rest of the world received by households are recorded in the accounts (3, 4) and (3, 7), respectively; while transfers from households to the rest of the world are recorded in account (7, 3). Moreover, the saving of household, government and the rest of the world is registered in the accounts (6, 3), (5, 4) and (6, 7), respectively. The sign convention is that the sources of funds (savings plus increased liabilities) are positive, while uses (investment plus the increase in assets) are negative, because all the new resources saved are for capital formation. Accounts (6, 5) and (5, 6) show this idea. Net loans or financial surplus is zero.

For constructing a macro-aggregated SAM in 2011, it was needed four blocks of data: national accounts that were obtained from the National In-

stitute of Statistics and Geography of Mexico (INEGI, 2012); Fiscal results, obtained from the Ministry of Finance, were complemented with INEGI fiscal data; the balance of payments data comes from the Mexican Central Bank: Bank of Mexico (Banxico). So, Table 2 presents the macro-aggregated SAM for Mexico (2011).

Table 2
 Macro-Aggregated SAM for Mexico, 2011 (billions of pesos)

	PU	PF	H	GOV	PRISAV	GOVSAV	ROW	
PU	10392.88	0.00	9278.20	1689.17	3163.44	402.22	4544.37	29470.27
PF	13843.76	0.00	0.00	0.00	0.00	0.00	137.47	13981.23
H	0.00	11964.27	0.00	1227.80	0.00	0.00	511.24	13703.31
GOV	507.74	1839.60	923.75	0.00	0.00	0.00	0.00	3271.08
GOVSAV	0.00	0.00	0.00	354.11	0.00	-354.11	0.00	0.00
PRISAV	0.00	0.00	3105.07	0.00	-3163.44	0.00	106.47	48.11
ROW	4725.90	177.4	396.29		0.00	0.00	0.00	5299.55
TOT	29470.27	13981.23	13703.31	3271.08	0.00	48.11	5299.55	

Where: PU = production use ; PF = production factors ; H = households ; GOVSAV = Current savings of government (in row and investment in column); PRISAV = savings of private sector (in row and investment in column); ROW = Rest of the world; Tot= Total Source: Elaborated on the base of INEGI, Banxico and SHCP data.

3. A Computable General Equilibrium (CGE) Model for the Mexican Economy

The SAM data are used to construct and estimate a modified 1, 2, 3 CGE model, originally proposed by Devajaran, Go, Lewis, Robinson and Sinko (1997) who define the model for one country (1) in the presence of two sectors (2): exported goods and goods consumed internally. There are also three types of goods (3): a) Imported (Q_m), b) Internally consumed (X_d) and c) Exported goods (X_e). Actually, the CGE model proposed in this paper constitutes a modified version of the original 1 2 3 model, since it stands for an alternative specification in the model structure; we include the behavior of the nonfinancial public sector, as well as in the closure rules, total investment value is equal to the level of saving. In the original model it is assumed that the current account balance is endogenous, while in the proposed model this is an exogenous variable as an option of a closure condition.

The CGE model for the Mexican economy contains 29 equations (25 endogenous variables and 4 equilibrium equations) for a total of 17 exogenous variables in six blocks of equations: a) Production; b) Earnings and savings; c) Consumption and aggregate demand; d) Nonfinancial public sector; e) Closure conditions; f) Social welfare and consumer utility function with CES (constant elasticity of substitution).

3.1 Model Structure

3.1.1 Production

This section measures the possibilities of production with six equations: aggregate supply resulting from a production function with constant elasticity of substitution (CET), supply for exported goods, domestic supply as a residual function between total produced and exported goods, demand for intermediate consumption of the factors of production (considered as a supply component) as well as a function of value added that contemplates the estimation of technical coefficients of production. At the end, the equation for the total supply of the economy includes the intermediate and final supply.

The final production of the economy (X_s) is compounded of final domestic production (X_d) and final production for export (X_e). The production function of the economy is inherently a non-linear Cobb-Douglas production function as a special case that is determined by a constant elasticity of transformation, CET [$\omega = 1 / (1-\varphi)$], which is represented by:

$$X_s = A_x [\alpha X_e^\varphi + (1 - \alpha) X_d^\varphi]^{1/\varphi} \quad (1)$$

Under the profit maximization principle, equation (1) has an optimal ratio of exported goods in terms of domestic sales:

$$\frac{X_e}{X_d} = \left[\frac{(1-\alpha) P_e}{\alpha P_d} \right]^{1/(\varphi-1)} \quad (2)$$

Furthermore, domestic sales are a residual of foreign sales:

$$X_d = X_s - X_e \quad (3)$$

Similarly, there is a demand for intermediate consumption (IC), which is derived from a technical coefficient relative to the final production (Equation 4). Analogously, there is a technical coefficient that relates the total value added (TVA) and the final production (Equation 5):

$$IC = \kappa_1 * X_s \quad (4)$$

$$TVA = \kappa_2 * X_s \quad (5)$$

The total supply of the economy is equal to the sum of intermediate consumption (IC), total value added (TVA), total taxes on final output imports (Q_m):

$$TS = IC + TVA + T_x * X_s + Q_m \quad (6)$$

3.1.2 Income and savings

The circular flow of the economy relative to income and savings is addressed in this section with a set of six equations: income of production factors, revenues, consumption and savings of the private sector, government revenues according to the tax rates, government savings, and the total savings of the economy. The income of the factors of production consists of the total value added and factor services sent to the rest of the world ($FPROW$). The Private income (Y_H) is composed of a technical relationship with the total income of the factors of production (κ_3) plus government transfers (Th_{gov}) and the rest of the world (Th_{row})

$$Y_{FP} = TVA + FPROW \quad (7)$$

$$Y_H = (\kappa_3) * TVA + Th_{gov} + Th_{row} \quad (8)$$

Private consumption (CP) is determined by the private income, the income tax rate (T_h) and the marginal propensity to consume ($PMgC$). Private saving ($PSAV$) is the difference between disposable income after taxes and private consumption and transfers to the rest of the world ($TROWH$).

$$CP = Y_H * (1 - T_h) * PMgC \quad (9)$$

$$PSAV = Y_H * (1 - T_h) - CP - TROWH \quad (10)$$

The government revenue (Y_G) depends on three types of taxes: income tax (T_h), indirect tax (T_d) and production tax (T_x); similarly it depends on other incomes from oil production factors ($ORFP$). The current government saving ($GOVSAV$) includes the difference between government revenue and current expenditure of government for consumption and transfers (GS).

$$Y_G = Y_H * T_h + X_s * (T_d + T_x) + * ORFP \quad (11)$$

$$GOVSAV = Y_G - GS - Th_{gov} \quad (12)$$

The aggregate saving of the economy is the sum of private saving, government saving and foreign saving that is equivalent to the deficit or surplus in the current account:

$$ASAV = PSAV + GOVSAV + FSAV \quad (13)$$

3.1.3 Consumption and aggregate demand

Potential consumption and aggregate demand are examined in six equations: total domestic demand, the demand for imported goods derived from a function of constant elasticity of substitution (CES), the accounting equation for aggregate demand and GDP. Finally, we estimate the nominal and real GDP growth rates.

Total domestic demand in the economy (TID) consists of intermediate consumption plus the sum of consumption and public and private investment, in addition to external demand:

$$TID = IC + CP + GS + GINV + PINV + X_e \quad (14)$$

Similarly, it has an optimal ratio of imported goods in terms of domestic goods for consumption, given a ratio of domestic relative prices and export prices:

$$\frac{Q_m}{X_d} = \left[\frac{\beta}{(1-\beta)} \frac{P_d}{P_m} \right]^{1/(1+\rho)} \quad (15)$$

The analysis of possibilities of consumption is analogous to the analysis of possibilities of production: consumers seek to minimize the cost in the composition of consumption, it is defined by a CES, $[\sigma = 1 / (1 + \rho)]$, which is added to imported goods (Q_m) and domestic goods (D_x). The aggregate consumption function (Q_s) is inherently non-linear as it is presented in equation (16):

$$Q_s = B_q [\beta Q_m^{-\rho} + (1 - \beta) X_d^{-\rho}]^{-1/\rho} \quad (16)$$

In equation (16), the final aggregate demand is the sum of private and public consumption, public and private investment, and the external demand:

$$AD = CP + GS + GINV + PINV + X_e \quad (17)$$

The accounting equation of GDP and the nominal and real exchange rates for the respective form GDP (expressions 18, 19 and 20) is as follows:

$$GDP = CP + GS + GINV + PINV + X_e - Q_m \quad (18)$$

$$g_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \quad (19)$$

$$greal_t = \frac{1+g_t}{1+\pi_t} - 1 \quad (20)$$

3.1.4 Non-financial public sector (NFPS)

The fourth section contains four behavioral equations for the non-financial public sector, excluding the Central Bank accounts: primary fiscal balance (PB), overall fiscal balance (OFB)—including interest payments on public debt—, non-oil primary fiscal balance ($NOPB$)—as an indicator necessary in the analysis about the economic dependency on oil (Medas and Zakharova, 2009)—, and total public debt (PD) in terms of GDP . Consequently, the impact of public spending in oil and non-oil fiscal indicators for the fiscal position is analyzed in terms of such non-financial public sector variables:

$$PB = (Y_G - (GS - Th_{gov} - OPS))/GDP \quad (21)$$

$$OFB = (BP - IPD)/GDP \quad (22)$$

$$NOPB = (BP - TOR)/GDP \quad (23)$$

$$PD = \frac{PD_{t-1}}{GDP_{t-1}} - \frac{r_t}{1+g_t} \frac{PD_{t-1}}{GDP_{t-1}} - PB \quad (24)$$

Where, OPS stands for other public current expenditures; IPD is the interest paid on the public debt; TOR is the total oil revenue; PD_{t-1} is the past balance public debt; r_t is the weighted average interest rate on public debt.

3.1.5 Closure conditions (equilibrium)

The fifth block of equations states the conditions for closing the model with four characteristics: equilibrium of the domestic economy between total production, domestic and external demand; balance of supply and total demand; investment equals savings; private investment is endogenous to public investment.

The first condition states that the final output of the economy (X_f) is equal to final demand for domestic goods (X_d) and demand for exported goods (X_e), at their respective market prices (equation 25):

$$P_x * X_s = P_d * X_d + P_e * X_e \quad (25)$$

In (26), the total supply in the economy is equal to the total domestic demand, including intermediate consumption:

$$TS = TID \quad (26)$$

In (27), the value of total investment (TINV) equals the level of savings:

$$TINV = PSAV + GOVSAV + FSAV \quad (27)$$

Finally, it is assumed that private investment is a residual between the total investment in the economy and public investment (equation 28):

$$PINV = TINV - GINV \quad (28)$$

3.1.6 Social welfare and consumer utility function

The last set of equations shows the maximization of the consumer's utility function with nonlinear CES, subject to the restrictions mentioned in the previous blocks and closing conditions (equations 1-28):

$$Max U_c = [\alpha^{1/\sigma} * Q_m^{\frac{\sigma-1}{\sigma}} + (1 - \alpha)^{1/\sigma} * X_d^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \quad (29)$$

Given the utility function (Equation 29), we use two types of changes in the social welfare analysis: The Hicksian equivalent variation (VEH) in consumer's utility (29.1), and the Hicksian compensation variation (VCH) (29.2). Likewise, percentage changes are estimated in consumer's utility and private income respectively (equations 29.3- 29.4):

$$VEH = \frac{(U_c^f - U_c^o)}{U_c^o} * Y_H^o \quad (29.1)$$

$$VCH = \frac{(U_c^f - U_c^o)}{U_c^f} * Y_H^f \quad (29.2)$$

$$\Delta\%U_c = \frac{(U_c^f - U_c^o)}{U_c^o} * 100 \quad (29.3)$$

$$\Delta\%Y_H = \frac{(Y_H^f - Y_H^o)}{Y_H^o} * 100 \quad (29.4)$$

Where, U_c^f , U_c^o , Y_H^f and Y_H^o represent the final levels of utility and private income respectively.

3.2 Parameter Specification and Model Calibration

The regular CGE model procedure starts from a basic specification of elasticities, CES and CET, as well as by considering the social accounting matrix (SAM) as the numerical basis to calibrate the parameters of the CGE model (Table 3). Thus, the artificial representation of the economic system is con-

structured through the equations of institutional behaviors that represent the equilibrium in the markets of production factors and final goods that are combined with calibrated parameters, prices and initial accounting balances described in the SAM. The final objective is to assess the impacts of various public expenditure instruments on economic activity and social welfare: a discrete-comparative approach.

Consequently, a double log-regression of exports as a function of the domestic production was used to determine the parameter for exported goods and domestic production ($\phi=0.65$ in the CET elasticity). Similarly, a double log-regression for imports as a function of domestic demand was used to determine the parameter for imports explained by domestic demand (in the ($\rho=1.67$ CES elasticity); whose relationship was positive at 1% level of statistical significance.

Table 3
 Elasticities and Calibrated Parameters

Parameters	Symbol	Value
<u>Production, technology and factor income</u>		
Exponent of Argminton production coefficient	ϕ	0.65
Constant elasticity of transformation, CET	ω	2.86
Armington share production coefficient	α	0.40
Constant of Argminton production function	A_c	1.89
Rate of indirect taxes	T_d	0.06
Rate of production taxes	T_x	0.03
Technical coefficient of intermediate consumption to Aggregate Supply	κ_1	0.55
Technical coefficient of Agreggate Value (VA) to Aggregate Supply	κ_2	0.73
Technical coefficient of household's payment to Aggregate Supply	κ_3	0.86
<u>Possibilities of consumption and private savings</u>		
Exponent of Argminton consumption coefficient	ρ	1.67
Constant elasticity of sustitution, CES	σ	0.38
Distribution coefficient of consumption	β	0.05
Constant of Argminton consumption coefficient	β_c	1.15
Rate of direct taxes (incomes and wealth)	T_h	0.07
Marginal propensity to consume	PM_gC	0.73
Marginal propensity to save	PM_gS	0.24

3.3 Variables of Fiscal Policy

The CGE model calibration allows replicating the national economic system in terms of macroeconomic aggregates, identically as the SAM; at the same time, the mentioned elasticities and calibrated parameters allow to reproduce exactly the behavior of the Mexican economy established as the *baseline scenario*. Complementarily, other public spending instruments are used to assess their impacts on economic activity and social welfare.

We conducted three experiments with fiscal policy variables as individual and independent variation for every type of public spending. One arbitrary single variation of 10% is assumed separately for each type of public spending (*Once and for all*) (Loria, 2007). So, we identify three type of public expenditures that correspond to government consumption (*scenario A*), transfers of government to households (*scenario B*) and public investment (*scenario C*).

3.4 Two Alternative Closures for the CGE Model: The Moderating Behavior of Foreign Savings

In order to close the CGE model and the social accounting matrix (SAM), we use two alternative closure rules: 1. Foreign saving is exogenous and restricted, so that saving determines investment; 2. Foreign saving is endogenous and unrestricted: the need for investment increases debt with the rest of the world; therefore, the investment determines the savings. To address these two types of closure take advantage of the differentiated effects of public spending on economic growth through aggregate demand and the savings-investment relationship.

The justification for alternative closure rules, under general equilibrium conditions, is that an expansionary policy of government spending on the side of government consumption and public investment can have positive effects on aggregate demand; however, public spending competes with private investment given the restriction on the total savings of the economy; therefore, it could be present a crowding-out effect that neutralizes the growth of aggregate demand and there would be no effect on economic growth or social welfare. In sum, under these conditions, it is likely that there is not any effect on economic growth and social welfare.

In conditions of an increasing indebtedness with the rest of the world (increased foreign savings), public investment does not compete with private investment since the national economy does not present restrictions on the level of aggregate savings, therefore, there could be a positive effect on aggregate demand and consequently on aggregate supply. The final result of a fiscal expansion will bring expansion of economic activity and improvement of social welfare.

In previous section, we argued that although an increase in public spending can have a positive impact on economic growth and social welfare under conditions of unrestricted external financing, opportunity costs for the economy can be presented: i) fiscal deterioration, ii) increasing public debt, iii) increasing deficit in the current account. Consequently, if these opportunity costs persist over time, fiscal policy will become unsustainable.

4. Simulation Results

Tables 4 and 5 present the three scenarios (A, B and C) of fiscal expansion represented by an increase of 10% in public spending: government consumption, transfers to the private sector (households) and public investment, respectively. The *baseline scenario* was the exact replication of the performance of the Mexican economy in terms of aggregate demand, aggregate supply, income and saving components, as well as the performance of the nonfinancial public sector.

4.1. Scenario A: Effects of a Positive Shock in Government Consumption

It was assumed that a 10% increase in government consumption increased domestic demand by 1.2% for both closures, while private investment reacted differently to the constraint on external financing. With restriction on external saving (without variation), government consumption displaced private investment (-5.3%) as a result of a decrease in total economy savings (-4.7%). The increase in government consumption decreased public current savings elastically (elasticity > 1), and thus overall savings (inelastic sensitivity). In the end, the increase in aggregate demand was neutralized by the negative variation in total saving and the decrease in private investment; there were not changes on economic activity (GDP), nor were there any changes in levels of social welfare.

Without restrictions on foreign savings, government consumption did not shift private investment; aggregate demand increased (0.89%) and the composite goods (both domestic and imported) increased in the same magnitude. There were positive effects of the fiscal expansion on social welfare from the perspective of consumer utility but against an increase in the indebtedness with the rest of the world.

In summary, in contrast to the two alternative closures for external saving: i) In the first case, an increase in government consumption deteriorated the oil and non-oil fiscal deficit elastically and increased the public debt/GDP ratio to a lesser extent (elasticity < 1); ii) In the second case, foreign savings to finance government consumption showed an elastic sensitivity (elasticity > 1).

4.2. Scenario B: Expansion of Government Transferences to Private Sector

For the different closure alternatives in external savings, with and without restriction, the fiscal expansion in government transfers to the private sector (10% simulation) did not generate any impact of variation on economic activity (GDP), neither on social welfare based on changes in profits; however, the positive impact was seen in the increase in private income and private consumption (+1%); moreover, fiscal expansion in government transfers negatively deteriorated the oil and non-oil fiscal deficit (elasticity > 1).

Also, for both CGE model closure specifications, an increase in private income had a positive effect on private saving. However, the fiscal expansion in government transfers elastically reduced government savings, and net aggregate savings remained at the initial level: the decline in private investment neutralized the positive variations in private consumption. Government transfers do not produce variations in the level of economic activity, only *tradeoffs* between income, savings and expenditure.

4.3. Scenario C: Fiscal Expansion with Public Investment

Analogous to government consumption and government transfers to the private sector, a 10% positive change in public investment was considered, which increased domestic demand by 0.3% for both closures, despite the fact that private investment reacted according to the restriction on foreign savings. Without a change in foreign saving, public investment crowded-out private investment (-1.3%) as domestic savings in the economy did not increase. As a result, a positive change in government fixed investment generated greater domestic saving (which is restricted). The increase in public investment had no effect on public current savings; therefore, the total saving of the economy was not affected. However, as the levels of aggregate public and private investment were offset, there were no changes in economic activity (GDP), nor were there any changes in levels of social welfare. With positive variation in foreign savings, public investment did not displace private investment, aggregate demand increased (0.2%), as did aggregate supply. There were positive effects of fiscal expansion on social welfare from the perspective of consumer utility.

Like government consumption, under alternative closure specifications for the behavior of external savings, an increase in public investment deteriorated elastically the oil and non-oil fiscal deficit, and caused an inelastic sensitivity in the level of the public debt/GDP ratio to a smaller extent (elasticity < 1).

Finally, external savings to finance public investment showed an elastic sensitivity (elasticity > 1).

Table 4
 Alternative Closure I, Foreign Savings Exogenous and Restricted: Saving
 Determines Investment

	Calibrated baseline scenario	Scenario A: $\Delta+10\%$ in government consumption			Scenario B: $\Delta+10\%$ in government transference to private sector			Scenario C: $\Delta+10\%$ in public investment		
		Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity
Demand factors										
Private consumption	9,278	1.0000	0.00%	0.00	1.0096	+0.96%	0.10	1.0000	0.00%	0.00
Internal demand	14,533	1.0000	+1.16%	0.12	1.0000	0.0%	0.00	1.0028	+0.28%	0.03
Aggregate demand	19,077	1.0000	0.00%	0.00	1.0000	0.0%	0.00	1.0000	0.00%	0.00
Government consumption	1,689	1.1000	+10.0%	1.00	1.0000	0.0%	0.00	1.0000	0.00%	0.00
Public investment	402	1.0000	0.00%	0.00	1.0000	0.0%	0.00	1.1000	+10%	1.00
Private investment	3,164	0.947	-5.34%	-0.53	0.9718	-2.82%	-0.28	0.9873	-1.27%	-0.13
Supply factors										
Compound good	19,077	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Exported good	4,544	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Internal consumption good	14,533	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Intermediate consumption	10,393	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Retribution to productive factors	13,844	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Total supply	29,470	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Imported good	4,726	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
GDP	14,352	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Incomes factors										
Incomes of productive factors	13,981	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.00	0.0000	0.00
Incomes of private sector	13,793	1.0000	0.00%	0.00	1.0090	+0.90%	0.09	1.00	0.0000	0.00
Government revenues	3,271	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.00	0.0000	0.00
	Calibrated baseline scenario	Scenario A: $\Delta+10\%$ in government consumption			Scenario B: $\Delta+10\%$ in government transference to private sector			Scenario C: $\Delta+10\%$ in public investment		
		Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity
Saving factors										
Private saving	3,105	1.0000	0.00%	0.00	1.0108	+1.08%	0.11	1.0000	0.00%	0.00
Government saving	354	0.523	-47.70%	-4.77	0.6533	-34.67%	-3.47	1.0000	0.00%	0.00
Foreign saving	106	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Aggregate savings	3,566	0.953	-4.74%	-0.47	0.9750	-2.50%	-0.25	1.0000	0.00%	0.00
Non-financial public sector (NFPS)										
Overall fiscal balance/ GDP	-2.5%	(1.480)	-48.00%	-4.80	-1.3600	-36.00%	-3.60	-1.1200	-12.00%	-1.20
Primary balance/GDP	-0.7%	(2.714)	-171.43%	-17.14	-2.2857	-128.57%	-12.86	-1.4286	-42.86%	-4.29
Non-oil primary balance/GDP	-8.4%	(1.143)	-14.29%	-1.43	-1.0952	-9.52%	-0.95	-1.0357	-3.57%	-0.36
Public Debt/ GDP	32.5%	1.037	+3.69%	0.37	1.0277	+2.77%	0.28	1.0092	+0.92%	0.09
Social Welfare computations										
Var. Hicksian equivalence (Millions of SMC)			0.0			0.0			0.0	
Var. Hicksian compensatory (Millions of SMC)			0.0			0.0			0.0	
Var. % Consumer utility			0.00%			0.00%			0.00%	
Var. % Private income			0.00%			+0.90%			0.00%	

The multiplier value corresponds to the ratio of the simulation value/calibrated baseline scenario: a ratio equal to unity indicates that there are no changes or multiplier effects (no effect); a larger unit rate implies a negative effect; a ratio greater than the unit and signals a positive effect. The marginal change refers to the percentage change or exchange value of the simulated policy. The elasticity corresponds to the percentage change in the endogenous variable given a percentage of change in simulated exogenous variable: there are three types of sensitivity: elastic ($e>1$), unitary ($e=1$) and inelastic ($e<1$).

Table 5
Alternative Closure II, Endogenous and Unrestricted Foreign Savings:
Investment Determines Savings

	Scenario A: Δ -10% in government consumption				Scenario B: Δ -10% in government transference to private sector			Scenario C: Δ -10% in public investment		
	Calibrated baseline scenario	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity
Demand factors										
Private consumption	9,278	1.0000	0.00%	0.00	1.0096	+0.96%	0.10	1.0000	0.00%	0.00
Internal demand	14,533	1.0116	+1.16%	0.12	1.0000	0.00%	0.00	1.0028	+0.28%	0.03
Aggregate demand	19,077	1.0089	+0.89%	0.09	1.0000	0.00%	0.00	1.0021	+0.21%	0.02
Government consumption	1,689	1.1000	10.00%	1.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Public investment	402	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.1000	10.00%	1.00
Private investment	3,164	1.0000	0.00%	0.00	0.9718	-2.82%	-0.28	1.0000	0.00%	0.00
Supply factors										
Compound good	19,077	1.0089	+0.89%	0.09	1.0000	0.00%	0.00	1.0021	+0.21%	0.02
Exported good	4,544	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Internal consumption good	14,533	1.0116	+1.16%	0.12	1.0000	0.00%	0.00	1.0028	+0.28%	0.03
Intermediate consumption	10,393	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Retribution to productive factors	13,844	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Total supply	29,470	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Imported good	4,726	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
GDP	14,352	1.0118	+1.18%	0.12	1.0000	0.00%	0.00	1.0028	+0.28%	0.03
Incomes factors										
Incomes of productive factors	13,981	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Incomes of private sector	13,703	1.0000	0.00%	0.00	1.0090	+0.90%	0.09	1.0000	0.00%	0.00
Government revenues	3,271	1.0000	0.00%	0.00	1.0000	0.00%	0.00	1.0000	0.00%	0.00
Saving factors										
	Calibrated baseline scenario	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity	Multiplier	Marginal change	Elasticity
Private saving	3,105	1.0000	0.00%	0.00	1.0108	1.08%	0.11	1.0000	0.00%	0.00
Government saving	354	0.5230	-47.70%	-4.77	0.6533	-34.67%	-3.47	1.0000	0.00%	0.00
Foreign saving	106	2.5866	+158.65%	15.86	1.0000	0.00%	0.00	1.3778	+37.78%	3.78
Aggregate savings	3,566	1.0000	0.00%	0.00	0.9750	-2.50%	-0.25	1.0113	+1.13%	0.11
Non-financial public sector (NFPS)										
Overall fiscal balance/ GDP	-2.5%	-1.4400	-44.00%	-4.40	-1.3600	-36.00%	-3.60	1.1200	-12.00%	-1.20
Primary balance/GDP	-0.7%	-2.7143	-171.43%	-17.14	-2.2857	-128.57%	-12.86	1.4286	-42.86%	-4.29
Non-oil primary balance/GDP	-8.4%	-1.1310	-13.10%	-1.31	-1.0952	-9.52%	-0.95	1.0238	-2.38%	-0.24
Public Debt/ GDP	32.5%	1.0369	+3.69%	0.37	1.0277	+2.77%	0.28	1.0092	+0.92%	0.09
Social Welfare computations										
Var. Hicksian equivalence (Millions of SMD)			+128.43			0.0000			+30.53	
Var. Hicksian compensatory (Millions of SMD)			+127.24			0.0000			+30.46	
Var. % Consumer utility			+0.94%			0.00%			+0.20%	
Var. % Private income			0.00%			+0.90%			0.00%	

The multiplier value corresponds to the ratio of the simulation value/calibrated baseline scenario: a ratio equal to unity indicates that there are no changes or multiplier effects (no effect); a lower unit rate implies a negative effect; a ratio greater than the unit and signals a positive effect. The marginal change refers to the percentage change or exchange value of the simulated policy. The elasticity corresponds to the percentage change in the endogenous variable given a percentage of change in simulated exogenous variable: there are three types of sensitivity: elastic ($e > 1$), unitary ($e = 1$) and inelastic ($e < 1$)

5. Discussion of Results

When expansive effects on different public expenditure instruments are evaluated, government consumption and public investment stimulate aggregate demand, economic activity and social welfare, but only under unrestricted external savings condition as a financing mechanism. However, the main opportunity costs are centered on the deterioration of the fiscal deficit, the increase in public debt, and the elastic increase in the current account deficit, whose results are in line with the Keynesian stance (Rodríguez and Venegas, 2012).

The previous interpretation confirms the fulfillment of the hypothesis of external restriction to economic growth for Mexico. Thus, an increase in economic activity through the stimulus of public spending in consumption and investment, deteriorate the external sector accounts (Téllez and Vene-

gas, 2014; Loría, 2001; Moreno-Brid, 1998)⁷. Unlike previous studies, the main findings of this paper reveal evidence of external constraint to economic growth in the short term given that previous research has been approached from long-term relationships.

In addition, previous studies have not been able to demonstrate that when there are restrictions on external saving, an increase in public spending does not have any effect on aggregate demand. In this way, there is no influence on economic activity, nor on the level of social welfare. In the absence of external savings, an expansive fiscal policy of public spending produces crowding-out effects on private investment, since the requirements of nonfinancial public sector financing compete with the level of domestic savings to finance private investment; which is consistent with previous studies (Butkiewicz and Yanikkaya, 2011; Dakurah, Davies and Sampath, 2001; Carter, Craigwell and Lowe, 2013; Engen and Skinner, 1992)

Previous studies consider negative effects of public spending on economic growth given their non-productive orientation (*ibid.*). In this paper, it is argued that under restrictions on foreign savings and without the possibility of increasing domestic savings, an expansion of government consumption reduces the marginal propensity of government savings, as well as a reduction in the level of aggregate savings. Likewise, an increase in public spending will lead to an increase in domestic demand, which is reversed by the contraction of private investment (crowding-out effect); consequently, there is no variation in the components of demand, nor does the variation in aggregate supply occur. The final effect is resumed in the deterioration of the fiscal position (increase of the fiscal deficit and of the public debt).

In sum, because there is no effect of public expenditure on economic activity, with restricted foreign savings, there is no evidence of changes in the level of social welfare. A critical point for reflection is related to the role of government transfers, whose scope is oriented to positive impacts on private incomes in an inelastic way. The impact of government transfer spending should be reflected in positive changes on the level of social welfare. This is interpreted as a deficient role of public social spending in Mexico.

Consequently, the main findings of this paper are based on demonstrating that there are differentiated effects on the different instruments of public expenditure on economic activity (Keynesian or neoclassical). The differences are based on the role of foreign savings as a financing mechanism, with alternative closures, which determine the final impacts of public spending on the level of economic activity and the change of social welfare. This is the meaning of the *foreign saving moderating effect*.

7 For example, Tellez and Venegas (2014) argue that the hypothesis of external constraint to economic growth (REC) is presented since national output is sensitive to foreign output (Thirlwall's law). Similarly, Moreno-Brid (1998) argues that compliance with the REC hypothesis is true in Mexico because an increase in economic activity increases elastically the sensitivity of imports. So, the current account and balance of payments become worse.

5.1 Implications for Public Policies, Limitations and Research Agenda

As previously argued, the alternative public spending instruments have different effects on the level of economic activity and social welfare. For example, while government consumption and public investment stimulate aggregate demand, government transfers to the private sector only impact marginal income changes, with no change in consumer utility levels (measuring the social welfare). Similarly, the positive effects of public spending are only presented with foreign saving financing.

For purposes of public policies, two extreme cases are mentioned below under negative external shocks: 1) Increase the level of economic activity driven by public expenditure; 2) In the presence of negative external shocks, the government decides to do nothing. For the first case, an expansive fiscal policy of public spending seeks to stimulate aggregate demand; however, this mechanism is unsustainable given the elastic deterioration of the current account deficit (Keynesian approach of the external constraint to economic growth). For the second case, fiscal policy is insensitive and remains constant (neoclassical approach) in order to avoid deterioration in the fiscal position (increase of the fiscal deficit and public debt). This is equivalent to pointing out that the world is falling and the government does not help to mitigate any external events.

From the Keynesian and neoclassical positions, these theoretical approaches are possibly solutions of corners or extreme cases; however, the opposite scenarios allow us to appreciate the need for an intermediate and sustainable point (for both economic growth and the current account deficit, as for public expenditure and the fiscal deficit). Also, the main methodological limitation in this paper is its static modeling nature.

Consequently, for subsequent work, dynamic specifications could be made through fiscal reaction functions that allow incorporating the sustainability of economic growth and public finance in order to avoid corner solutions. The fiscal reaction functions can be interpreted as an inter-temporal dynamic, similar to Agénor and Yilmaz (2011) scheme, where public expenditure responds to changes in the level of previous public expenditure, as well as to changes in indebtedness. Finally, the sustainable response of public spending should consider the previous level of the fiscal deficit and the gaps of the real product (phases of overheating, balance or underproduction). That is to say, the fiscal policy is directed toward a sustainable and countercyclical behavior of public expenditure in relation to the level of economic activity.

In times of economic overheating or positive internal and external shocks, the government would be expected to react with lower levels of public spending, which would generate greater government savings to be employed in times of recession or economic downturn.

Thus, during negative economic gaps or negative shocks affecting the product, the government can react with expansive stimuli of public spending, public debt and fiscal deficit and then converge to an improvement in the fiscal position when the economy reaches a level of sustainable growth.

6. Conclusions

In this paper we have explained why public spending generates differential effects on economic growth and social welfare (Keynesian approach) and under what circumstances public spending has no influence on economic activity (neoclassical approach). With the use of a CGE model for the Mexican Economy, we show that the final impact of the public expenditure instruments (government consumption, public investment and transfers) on economic activity and social welfare depends on the behavior of foreign savings (restricted or unrestricted), which is identified as the *foreign saving moderating effect*.

According to the Keynesian approach, an increase in government consumption or public investment stimulates aggregate demand, as well as economic activity and social welfare, only if foreign saving is unrestricted; that is, the aggregate investment determines the savings (*alternative closure 1*). However, public policies face a trade-off between greater economic growth and lower current account deficits (the hypothesis of the external constraint on economic growth). On the other hand, a neoclassical argument for the relationship between public expenditure and economic activity is the relevance of saving, since aggregate saving determines investment; Therefore, if external saving is restricted (*alternative closure 2*), the aggregate effect of public expenditure is zero, and it displaces private investment, without effects on economic activity and without presenting changes in the level of social welfare, only increases the fiscal deficit and public indebtedness. A critical point in the role of government transfers to the private sector is limited to a positive inelastic variation of private income, without generating changes in economic activity or the level of social welfare. It can be summarized that in Mexico, fiscal stimuli have a limited room for maneuver to promote growth and general welfare simultaneously.

References

- Agénor, R., and D. Yilmaz. "The tyranny of fiscal rules: fiscal discipline, productive spending, and growth in a perfect foresight model." *Journal of Economic Policy Reform* 14, no. 1 (2011): 69-99.
- Allen, R. *Mathematical Economics*. R.U.: Mac Millan, (1960).
- Barboza, I., J. Vázquez, and J. Matus. "Matriz de contabilidad social 2004 para México." *Agrociencia* 43, no. 5 (2009): 551-558.

- Barro, R. "Economic growth in a cross section of countries." *Quarterly Journal of Economics* 106 (1991): 407-444.
- Barro, R. "Government Spending in a Simple Model of Endogeneous Growth." *Journal of Political Economy* 98 (1990): S103-S125.
- Becerril, J., G. Dyer, J. E. Taylor, and A. Yúnez. "Elaboración de matrices de contabilidad social para poblaciones agropecuarias: El caso de El Chante, Jalisco." Centro de Estudios Económicos, El Colegio de México, (1996).
- Bergson, A. "A reformulation of Certain of Aspects of Welfare Economics." *Quarterly Journal of Economics* 52 (1938): 316-334.
- Blancas, A. "Interinstitutional Linkage Analysis: a Social Accounting Matrix Multiplier Approach for the Mexican Economy." *Economic Systems Research* 18, no. 1 (2006): 29-59.
- Blancas, A. *Fragilidad Financiera en México*. IIEc.-UNAM, México, (2010):78-102.
- Butkiewicz, J., and H Yanikkaya. "Institutions, and the impact of government spending on growth." *Journal of Applied Economics* XIV, no. 2 (2011): 391-341.
- Carter, J, R. Craigwell, and Sh. Lowe. "Government expenditure and economic growth in a small open economy: a disaggregated approach." CBB Working Paper No. WP/13/15, Central Bank of Barbados, (2013).
- Chapa J. C., and González, E. "Análisis de la estructura productiva y de ingreso-gasto del estado de Nuevo León para el año 2004." *EconoQuantum* 6, no. 2 (2010): 55-79.
- Clavijo and Ros, "La Ley de Thirlwall: una Lectura Crítica", *Investigación Económica*, Vol. 74, no. 292, (2015): 11-40.
- Dakurah, H., S. Davies, and R. Sampath. "Defense spending and economic growth in developing countries: A causality analysis." *Journal of Policy Modeling* 23 (2001): 651-658.
- Dalton, H. "The Measurement of Inequality and Incomes." *Economic Journal*, (1920): 348-361.
- Davidson, P. *Post Keynesian Macroeconomic Theory*. Second Edition. U.K.: Edward Elgar Publishing, Inc., (2011): 224.
- Devarajan, S., D. S. Go, J. D. Lewis, S. Robinson, and P. Sinko. "Simple general equilibrium modeling." *Applied methods for trade policy analysis: A handbook*, (1997).
- Devarajan, S., V. Swaroop, and H. Zou. "The composition of public expenditure and economic growth." *Journal of Monetary Economics* 37 (1996): 313-344.
- Easterlin, R. A. *Does Economic Growth Improve the Human Lot? Some Empirical Evidence*. Edited by David Paul A. and Reder Melvin W. New York: Academic Press, (1974).
- Engen, E., and J. Skinner. "Fiscal Policy and Economic Growth." NBER, Working Paper, no. 4223, Massachusetts, (1992).

- Gaber, S., I. Gruevski, and V. Gaber. "The effects of discretionary tax policy on macroeconomic aggregates." *BEH - Business and Economic Horizons* 9, no. 1 (2013): 32-39.
- Ghosh, S., and A. Gregoriou. "The composition of government spending and growth: is current or capital spending better?." *Oxford Economic Papers* 60, no. 3 (2008): 484-516.
- Hansson, P., and H. Magnus. "A new framework for testing the effect of government spending on growth and productivity." *Public Choice* 81 (1994): 381-401.
- Kaldor, W. "Welfare Propositions in Economics and Interpersonal Comparisons of Utility." *Quarterly Journal of Economics* 49 (1939).
- Kaminsky, G. "Terms of Trade Shocks and Fiscal Cycles." Edited by Canberra, Australia) Reserve Bank of Australia and the Centre for Applied Macroeconomic Analysis (CAMA) (Australian National University. *Inflation in an Era of Relative Price Shocks*. Sydney, 17-18 August., (2009).
- Koutsoyanis, A. *Microeconomía moderna*. Primera reimpression. Londres, Buenos Aires, (2002).
- Lavoie, M. *Poskeynesian Economics, New Foundations*. Edward Elgar, Northampton, MA. USA, (2014): 518-528.
- Li, M. "Reexamining asymmetric effects of monetary and government policy on economic growth spending using Quantile Regression." *The Journal of Developing Areas* 30, no. 11 (2009): 137-154.
- Loría, E. "La restricción externa y dinámica al crecimiento de México a través de las propensiones al comercio, 1970-1999." *Estudios económicos* 16, no. 02 (2001): 227-251.
- . *Econometría con aplicaciones*. Primera. México: Pearson Education, (2007): 179.
- Medas, P., and D. Zakharova. "A Primer on Fiscal Analysis in Oil-Producing Countries." *IMF WP/09/56* (2009): 1-41.
- Minzer, R., A. Pérez, and V. Solís. "Análisis de algunas medidas fiscales en México y sus implicaciones bajo un enfoque de equilibrio general computable." Serie Estudios y Perspectivas. CEPAL. Naciones Unidas, (2014).
- Moreno-Brid, J. C. "México: crecimiento económico y restricción de la balanza de pagos." *Comercio Exterior* 48, no. 6 (1998): 478-486.
- Nordhaus, W. D., and J. Tobin. "Is growth obsolete?" *In Economic Research: Retrospect and Prospect. Economic Growth*. NBER. 5 (1972): 1-80.
- Núñez, G., and V. Mendoza. "Matriz de contabilidad social y análisis estructural de una economía rural: el ejido Los Lirios, municipio de Arteaga, Coahuila, México." *Economía: teoría y práctica • Nueva Época*, no. 28 (2008).
- Pena, B. "La medición del bienestar social: una revisión crítica." *Estudios de economía aplicada* 27, no. 2 (2009): 299-324.

- Perrotini, H. I. in Thirlwall P. A. *La Naturaleza del Crecimiento Económico: Un Marco Alternativo para Comprender el Desempeño de las Naciones*. Fondo de Cultura Económico, México, (2003): 12-14.
- Pleskovic, B., and G. Treviño. *The Use of a Social Accounting of Matrix Framework for Public Sector Analysis: The Case Study of Mexico*. International Center for Public Enterprises in Developing Countries. ICPE Monograph Series, no. 17 (1985): 125.
- Ramirez, M., and N. Nazmi. "Public investment and economic growth in Latin America: An empirical test." *Review of Development Economics* 7, no. 1 (2003): 115-126.
- Rodríguez, D., and F. Venegas. "La restricción externa al crecimiento en México: 1988-2009." *Contaduría y Administración* 57, no. 1 (2012): 215-239.
- Romer, P. "Increasing return and Long-run Growth." *Journal of Political Economy* 4 (1990): 1002-1017.
- Schaltegger, Ch., and T. Benno. "Growth effects of public expenditure on the state and local level: Evidence from a sample of rich governments." *Applied Economics* 38 (2006): 1181-1192.
- Shapiro, R., Patterson, K., Russell, J., and Young, J. Employment and social welfare. *Public Opinion Quarterly*, 51(2), (1987): 268-281.
- Taylor, L. *Reconstructing Macroeconomics*. London: Harvard University Press. Cambridge, Massachusetts, (2004): 1-43.
- Téllez, E. A., Cantú, J. C., Grimaldo, N. C., and González, E. R. Análisis de la generación y redistribución del ingreso en México a través de na matriz de contabilidad social. *Estudios económicos*, 1, (2009): 225-311.
- Téllez, I., and Venegas, F. ¿Ha sido la dinámica de la balanza de pagos realmente una restricción para el crecimiento económico en México? Parte II. *Revista Mexicana de Economía y Finanzas (REMEF): nueva época*, 61(8), (2014): 61-88.
- Thirlwall, P. A. *La Naturaleza del Crecimiento Económico: Un Marco Alternativo para Comprender el Desempeño de las Naciones*. Fondo de Cultura Económico, México, (2003): 85-91.
- Veenhoven, R. (1998). Qualita della vita e felicita. En D. G. col. (Ed.). Roma: Salud y cualidad de vida.
- Zagler, M., and Dürnecker, G. Fiscal Policy and Economic Growth. *Journal of Economic Survey*, (2003), 17(3): 397-418.