BOLIVIAN ECONOMIC RESEARCH PAPERS, 2016, Vol 1(2)

THE ROLE OF AGGREGATE DEMAND AND RESOURCE DISTRIBUTION POLICIES IN THE ELUSIVE SEARCH FOR HIGH ECONOMIC GROWTH RATES

A Bayesian estimation of the Kaleckian model of growth in Bolivia, 1990-2015

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ABSTRACT

Can aggregate demand policies bring about economic growth in the long term? What is the impact of a better resource distribution on long-term economic growth in Bolivia? These questions are analyzed within the framework of a Kaleckian model of economic growth to make an empirical study of the relationships between the aggregate demand, distribution and growth. For estimating the structural behavior equations of the prevailing regimes in the Bolivian economy, Bayesian methods were used. The conclusions are that the Bolivian economy displays a wage-led demand regime and an overall contractive regime in the profit share (i.e. when the benefits in the profit share increase, economic growth goes down), and therefore a better resource distribution. When the aggregate demand increases, long-term economic growth will be greater. The results show that a decrease of 1% in the profit share, which increases the annual wage of the workers by approximately BOB 268.4, will lead to an annual aggregate output increase of 0,57%.

Classification JEL: E11, E22, C11
Keywords: Growth, Distribution, Demand-Driven Accumulation Regime, Productivity Regime, Endogenous Technological Change, Bayesian Analysis

* The content of this paper is the sole responsibility of the authors and does not compromise the opinion of the institution to which they belong. The authors wish to thank the external referees and the CIEB editorial committee for their valuable contributions. Luis Alberto Arce is the Bolivian Minister of Economy and Public Finance, David Quiroz is Director General of Public Credit at the same institution and José Alberto Villegas is a postgraduate student at ILADES. The authors can be contacted by email at luchoarce@hotmail.com, virrccad@gmail.com, bto1989@hotmail.com.

I. INTRODUCTION

Historically, in the elusive search for high economic growth rates to overcome underdevelopment and poverty, Bolivia's economic policy has followed different theoretical approaches with varying results for well-being of the Bolivian population.

From the second half of the 20th century, the economic growth policy in Bolivia followed the postulates of the ECLAC school and the dependency theory, applying development policies driven by the import substitution approach, Prebisch (1950). As from 1985, the growth policies focused on the determinants of the aggregate supply as means to achieve high growth patterns, following the theoretical framework provided by the neoclassical theory of economic growth, Solow (1956) and Swan (1956), and the endogenous growth theory, Romer (1986, 1987) and Lucas (1988). It should be noted that in this type of models the aggregate demand and resource distribution do not play any role in determination of the economic growth rate.

In Bolivia, faced with the unsatisfactory results of implementing these theoretical approaches, as from 2006 the policies for reactivating the aggregate demand and resource distribution became important axes of the economic policy within the framework of the Economic Social Communitarian Productive Model (MESCP, in Spanish). Seeking a better distribution of the resources in the economy and at the same time strengthening the domestic demand via an increase in household consumption became the foundations to expand the national production.

This change in the economic policy direction triggers the following research questions addressed in this paper: Can the Aggregate Demand policies generate economic growth in the long run? Should public policy focus only on aggregate supply factors to improve the growth results in Bolivia? What is the impact of a better resource distribution on long-term economic growth in Bolivia? In order to answer these questions, a Kaleckian growth model is used since it allows for simultaneously addressing the aggregate demand, distribution and growth in the long term in a coherent specification. The adopted strategy of empirical estimation follows a non-conventional approach in this literature: estimations of structural equations using Bayesian methodologies. The economic policy implications of the results are very important because if the aggregate demand and distribution factors are important in economic growth in Bolivia, public policy will have a larger and more flexible range of alternatives to draft its growth policy. In addition, it will be possible to use the obtained results as a more solid theoretical and empirical foundation underlying the growth policy presently applied in Bolivia. Finally, the recognition of the importance of the distribution in economic growth generates evidence that contradicts the hypothesis of the inverted U-curve of Kuznets, which is widely used in economic development debates to study the relationship between growth and inequality.

This paper is divided into five sections: section II outlines the theoretical foundations to develop the Kaleckian growth model; section III is a review of literature on the main empirical studies focused on the Kaleckian model; section IV describes the formulation and application of the empirical methodology that was applied to contrast the theoretical model; finally, section V presents the conclusions and policy recommendations derived from the results.

II. KALECKIAN THEORY OF ECONOMIC GROWTH

Starting in the 1950s, almost in parallel to the seminal works of Solow (1956) and Swan (1956), a series of growth models were developed based on the work of Polish economist Michael Kalecki[1]. The strict formulation of the Kaleckian model of economic growth began with the works of Kalecki (1971) and Steindl (1952), which were modified and enriched by Rowthorn (1982) and Dutt (1984). The current versions in the post-Kaleckian current are based on the contributions of Marglin and Bhaduri (1990).

In the Kaleckian model of economic growth, the aggregate demand is the determinant of the growth rate and capital accumulation. In this model, the distribution of the aggregate output determines the way in which an economy will grow and accumulate capital in the long term. Hence, theoretically speaking, it is possible to grow at higher rates by applying income redistribution policies.

Unlike the neoclassical current, the Kaleckian model considers that the way in which resources are distributed in an economy is not a product of economic growth, but rather on the contrary, the cause thereof. Hence, it recommends policies to intervene in the aggregate demand and the distribution of resources as a means to achieve greater economic growth rates.

II.1 Microeconomic foundations

Consider an economy that is open to trading goods and services with the rest of the world in which two types of economic agents coexist: capitalists (entrepreneurs) and workers, which are usually involved in a struggle to receive a greater part of the total output. Aggregate output Y of this economy will be divided into wages W and profit R:

$$Y = W + R \tag{1}$$

On the supply side, the economy is made up of various companies that produce a good that is relatively homogeneous but differentiated in a monopolistic competition market. Therefore, every company has a certain margin to set its prices, which will be above the marginal costs.

All companies in this economy seek to operate with backup installed capacity, which means that there will be curves of marginal costs (*MC*), average costs (*AC*) and constant average variable costs (*AVC*). A high fixed cost has to be paid to ensure differentiation of a product, and so one may think that the average fixed cost is relatively constant ($\overline{AFC}$).

Each company's decision to have backup installed capacity will have an impact on the level of the aggregate output. Utilization ratio u is defined as follows:

[1] Michael Kalecki (1899-1970) was one of the most important and most underestimated economists of the 20th century. In 1930 he wrote a series of fundamental contributions to macroeconomic theory, anticipating, complementing and somehow surpassing Keynes. Kalecki was a virtually complete autodidact in economics, influenced, as many others, by Marxism. Kalecki escaped the fatal content of the orthodox pre-Keynesianism, which did not point towards the true General Theory, see King (1996).

$$u = \frac{Y}{Y^*} \tag{2}$$

Where Y* represents the potential output. Therefore, if all companies in the economy operate with installed capacity, at all times we will have: $u < 1$[2].

Since each company is the price-setter of its product, it will have a price-setting rule based on MC, with a certain mark-up thereon. The price-setting rule can be expressed as follows:

$$p = (1+m)MC = (1+m)\{AVC + \overline{AFC}\} \tag{3}$$

Where m represents the mark-up on the MC. AVC refer to the payment of wages for labor and the cost of imported raw materials. Therefore, AVC can be expressed as follows:

$$AVC = \frac{wL + e(p^f M)}{Y} \tag{4}$$

Where w represents the real wage, L the number of workers, e the nominal exchange rate, p^f is the price of raw materials, and M the quantity of used imported raw materials. Replacing (4) in (3) and applying algebraic operations the following expression is obtained:

$$p = (1+m)\frac{w}{Y_L}\left[1 + \frac{e(p^f \mu) + \overline{AFC}}{\frac{w}{Y_L}}\right] \tag{5}$$

Where $Y_L = \frac{Y}{L}$ represents average productivity of the work and $\mu = \frac{M}{Y}$ is the quantity of raw material needed per unit of production. Be Z the quotient of input-labor unit costs, which is equal to the following expression:

$$Z = \frac{e(p^f \mu)}{\frac{w}{Y_L}} \tag{6}$$

Therefore, replacing (6) in (5), the final expression of the price equation is:

$$p = (1+m)\frac{w}{Y_L}\left[1 + Z + \frac{\overline{AFC}}{\frac{w}{Y_L}}\right] \tag{7}$$

Equation (7) clearly shows that prices mainly respond to variations of the production costs, either production costs or imported costs, and to changes to the mark-up.

The profit share is π = R/Y and the profit rate r = R/K. The profit share in the model will be the variable representing distribution of the aggregate output. An increase of the profit share is synonymous with a change in distribution of the aggregate output, favoring the profits of

[2] The microeconomic foundations to maintain installed capacities have been studied by Steindl (1952), Sylos-Labini (1971).

the capitalists to the detriment of wages and vice versa. The profit rate can be related to the profit share as follows:

$$r = \frac{\pi u}{v} \tag{8}$$

Where v = K/Y* is the potential capital-output quotient. Moreover, the profit share can be expressed as a function of the mark-up and of the input-labor unit cost quotient, for which the definition of profit share is used; thus, with replacement in equation (7) and applying certain algebraic operations, the result is:

$$\pi = \frac{1}{1 + \frac{1}{(1+z)m}} \tag{9}$$

Equation (9) shows that keeping the input-labor unit cost quotient constant, an increase (decrease) of the mark-up will increase (decrease) the profit share. Likewise, keeping the mark-up constant, an increase (decrease) of the input-labor unit cost quotient will increase (decrease) the profit share.

On the demand side, the assumption is that the households will save a constant proportion of their income. The capitalists, as the company owners, are interested in retaining part of their earnings to finance new investments and ensure the expansion of their companies, while the workers will save part of their wages to have access to a higher consumption in the future. Therefore, given that the savings of the capitalists are translated into investment, and the savings of the workers into future consumption, it is perfectly acceptable to assume that the workers' marginal propensity to save (S_w) is lower than that of the capitalists (S_π), i.e. $S_w < S_\pi$[3]

II.2. Kaleckian model of economic growth

II.2.1. Functions of behavior

The Kaleckian growth model[4] consists of four equations: a function of savings, a function of investment, a function of net exports (three functions that will determine the demand regime) and a function of labor productivity, which will determine the productivity regime.

a. Function of savings: The aggregate savings of this economy are determined by the sum of savings of the capitalists (S_w) and savings of the workers (S_π), i.e.:

$$S = S_w + S_\pi \tag{10}$$

[3] This assumption will be important when evaluating the impact of a better resource distribution —i.e. a decrease of the profit share— on capital accumulation and long-term economic growth.

[4] The model presented is a version based on Loaiza (2012), Marglin and Bhaduri (1990), and Hein and Vogel (2007).

The households save a constant proportion of their income, depending on the class they belong to, therefore:

$$S = S_w + S_{\text{п}} = s_w W + s_{\text{п}} R \tag{11}$$

Normalizing the aggregate savings by capital stock, the result is:

$$\frac{S}{K} = \sigma = \frac{s_w W + s_{\text{п}} R}{K} \tag{12}$$

Applying an algebraic operation on expression (12), we obtain:

$$\sigma = [S_w + (S_{\text{п}} - S_w)\text{п}]\frac{u}{v} \tag{13}$$

Based on this equation, it can be asserted that a decrease of the profit share will generate a decrease in savings if - $S_w < S_{\text{п}}$; relationship assumed previously. The decrease of aggregate savings implies an increase of the aggregate demand, since the aggregate consumption of this economy will increase.

b. Function of investment: The function of investment will mainly depend on the expected profit rate, as shown in equation (8) above. The profit rate is related directly to the profit share and the utilization ratio. Since variations in labor productivity are not necessarily translated into a modification of the real wages, the assumption is that increases of the labor productivity incentivize investment through their effect on the profit rate. Therefore, the function of investment, normalized by capital stock, will have the following form:

$$\frac{I}{K} = g^i = g[r^e] = g[r^e(\text{п}, \mu, \dot{y}_L)] = g[\text{п}, \mu, \dot{y}_L] \tag{14}$$

Assuming a linear form of function $g[\cdot]$, the result is:

$$g^i = \alpha + \beta\mu + \tau\text{п} + \omega\hat{y}_L \tag{15}$$

Parameter β will determine the "aggregate demand effect", parameter τ will show the "profit effect", while w determines the effect of the increase in labor productivity. Where: $\alpha, \beta, \tau, w > 0$.

c. Function of net exports: Net exports depend on the national aggregate output (Y) and an aggregate of the production of the rest of the world (Y^e). On the other hand, the real exchange rate *(q)* is also a determinant of net exports, which is explained by:

$$q = \frac{ep^f}{p} = \frac{ep^f}{(1+m)\frac{w}{Y_L}\left[1 + z + \frac{\overline{AFC}}{\frac{w}{Y_L}}\right]} = \frac{1}{(1+m)\left[\frac{\mu}{z} + \mu + \frac{\overline{AFC}}{ep^f}\right]} \tag{16}$$

The real exchange rate will be influenced by the mark-up and by the input-labor unit cost quotient. As shown in equation (9), an increase of the mark-up gives rise to an increase of the

profit share, which will lead to real appreciation, and vice versa. An increase of the input-labor unit cost quotient gives a rise of the profit share, generating in this case a depreciation of the real exchange rate and vice versa:

$$\frac{\partial q}{\partial \pi}\frac{\partial \pi}{\partial m} < 0, \frac{\partial q}{\partial \pi}\frac{\partial \pi}{\partial z}\frac{\partial z}{\partial e} > 0, \frac{\partial q}{\partial \pi}\frac{\partial \pi}{\partial z}\frac{\partial z}{\partial w} < 0 \tag{17}$$

In this case, the function of net exports normalized by the capital stock will be represented as follows[5]:

$$\frac{NX}{K} = nx = b[Y, q] = b\{Y, q[\pi(m, z)]\} \tag{18}$$

It is known that an increase of the national domestic output enhances the demand for domestic goods and for imported goods, and therefore reduces net exports. On the other hand, any appreciation of the real exchange rate will foment imports and discourage exports, whereby the opposite is seen in case of depreciation of the real exchange rate.

In this model, the exchange rate is related to the profit share, a variable which in turn depends on the mark-up and the input-labor unit cost quotient. As noted above, any increase of the profit share will give rise to a real appreciation and therefore reduce net exports. While an increase of the cost of imported inputs, which increases the input-labor unit cost quotient, will give rise to a real depreciation and increase net exports.

Assuming once again that the function b{·} has a linear form:

$$nx = \psi q[\pi(m, z)] - \Phi u \tag{19}$$

Note that the effect of the real exchange rate will not be defined unless the source of variation of the profit share is specified: the mark-up or the costs of imported raw materials, or the labor costs.

d. Function of productivity: Growth of the productivity is endogenous in the system. The function of productivity is specified as follows:

$$\hat{y}_L = \Theta(g, u, \pi)$$

Two possible linear forms are considered for function $\Theta(\cdot)$[6]:

$$\hat{y}_L = \eta + \rho u - \theta\pi \tag{20}$$

$$\hat{y}_L = \eta + \varepsilon g^i - \theta\pi \tag{21}$$

[5] Excluding the aggregate output of the rest of the world Y* which is considered a variable that is exogenous to the model.
[6] Later, two separate functions are considered in order to facilitate the graphic display of the proposed model.

In the work, ρ is called the "Kaldor Effect" and ε the "Verdoorn Effect" ("Verdoorn's Law"), while θ shows that the better distribution of resources towards wages incentivizes measures that increase productivity in the companies to mitigate the initial negative effect on profit.

II.2.2. Demand regime, productivity regime and overall regime[7]

The demand, productivity and overall regimes show the response of growth and capital accumulation to changes in the distribution of the output in this economy.

a. Demand regime: The start is the condition of equilibrium of the goods market:

$$\sigma = g^i + nx$$

Replacing functions (13), (15) and (19) in this condition of equilibrium and isolating the capacity utilization ratio of equilibrium u*, the result is:

$$u^* = \frac{\alpha + \tau\pi + \omega\dot{y}_L + \psi q(\pi)}{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} - \beta + \Phi} \tag{22}$$

Replacing the previous expression in the function of investment (15) to determine the equilibrium accumulation ratio g*, we get:

$$g^* = \frac{\left\{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} - \beta + \Phi\right\}(\alpha + \tau\pi + \omega\dot{y}_L) + \beta\psi q(\pi)}{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} - \beta + \Phi} \tag{23}$$

Thus, the impact of the profit share on utilization ratio u* and accumulation quotient g* will determine the demand regime in this economy. Those impacts are defined by the following derivatives:

$$\frac{\partial u^*}{\partial \pi} = \frac{\tau + \Psi\frac{\partial q(\pi)}{\partial \pi} - (S_\pi - S_w)\frac{u^*}{v}}{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} - \beta + \Phi} \tag{24}$$

$$\frac{\partial g^*}{\partial \pi} = \frac{\tau\left\{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} + \psi\right\} - \beta(S_\pi - S_w)\frac{u^*}{v} + \beta\psi\frac{\partial q(\pi)}{\partial \pi}}{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} - \beta + \Phi} \tag{25}$$

Depending on the signs of the foregoing derivatives, the existing demand regime is determined:

- **Profit-led demand regime**: In this case, derivatives (24) and (25) are positive. Hence, improvements in distribution of the resources towards the workers (decrease of the

[7] In the following sections with theoretical content about the regimes in the Kaleckian growth model, the assumption is that the endogenous variables in the model will be equilibrium utilization ratio u*, equilibrium accumulation ratio g* and productivity growth $\dot{y}_L$, while profit share π will be a variable that will be changed exogenously.

profit share) will decrease the economic growth and capital accumulation. Thus, for example, in the numerator of derivatives (24) and (25), the effect of redistribution in favor of profit is seen when there is a positive increase through a component of the function of investment, profit effect τ, as well as the effect in net exports $\psi \frac{\partial q(\pi)}{\partial \pi}$. When there is an increase of the input-labor unit cost, the result will be a real depreciation of the exchange rate with an increase of net exports and finally a reduction of the aggregate demand $(S_\pi - S_w)\frac{u^*}{v}$.

- **Wage-led demand regime**: In this case, derivatives (24) and (25) are negative. Therefore, an improvement in distribution of the resources towards the workers (decrease of the profit share) will give rise to a greater growth and capital accumulation. In this case, the magnitude of the increase of the demand $(S_\pi - S_w)\frac{u^*}{v}$ is greater and there is a reduction of profit effect τ and a real appreciation in net exports $\psi \frac{\partial q(\pi)}{\partial \pi}$.

Within this framework, occurrence of any of the two regimes will be determined by the impact of the profit share on the elements of the aggregate demand. The profit-led demand regime prevails when the sum of the responses of the investment and net exports is higher than the absolute value of the response of consumption to the increase of the profit share. In other words:

$$\tau + \psi \frac{\partial q(\pi)}{\partial \pi} > \left|(S_\pi - S_w)\frac{u^*}{v}\right| \tag{26}$$

$$\tau\left\{[S_w + (S_\pi - S_w)\pi]\frac{1}{v} + \psi\right\} + \beta\psi \frac{\partial q(\pi)}{\partial \pi} > \left|\beta(S_\pi - S_w)\frac{u^*}{v}\right| \tag{27}$$

for equations (24) and (25), respectively. In the case of the wage-led demand regime, inequations (26) and (27) are met in the opposite direction.

b. Productivity regime: The determination of productivity is simpler, since only one equation defines the impact of the profit share on growth of the productivity. In this case, taking equation (20) or (21), the derivative of growth of the productivity relative to the profit share will be negative and equal to:

$$\frac{\partial \hat{y}_L^*}{\partial \pi} = -\theta \tag{28}$$

c. Global regime: The result of the overall regime of the economy modeled so far depends on the impact of the profit share on equilibrium utilization ratio u*, equilibrium accumulation ratio g* and the growth of productivity $\hat{y}_L$. In order to graphically show how the overall regime is generated in an economy, diagrams are used for equations (22) and (20), i.e. the work is in plane $u^* - \hat{y}_L$, without forgetting that the results are the same when using equations (23) and (21) working in plane $g^* - \hat{y}_L$. Graphs 1a and 1b in Annex 1 show the overall equilibrium in

both planes $g^* - \hat{y}_L$ and $u^* - \hat{y}_L$, for which the values of equilibrium utilization ratio u*, equilibrium accumulation ratio g*, and the growth of productivity $\hat{y}_L$, are defined jointly through the equations of behavior of the aggregate demand and productivity.

To define the overall regime, it is necessary to once again evaluate the impact of the profit share on the values of u^*, g^* and $\hat{y}_L$[8].

Graph 2a in Annex 2 shows the case in which the increase in the profit share of: $\overline{\pi}_1 > \overline{\pi}_2$ gives rise to a decrease of u^*, g^* and $\hat{y}_L$. This is because the effect of the wage-led demand regime will be complemented by the negative effect of the productivity regime, generating a contractive regime. In the case of graph 2b in Annex 2, an increase of the profit share will give rise to a positive effect on u^* and g^*, but this will be reversed by the strong negative effect of the productivity regime, generating an overall contractive regime in the profit share.

Graph 3a in Annex 3 once again shows a profit-led demand regime, but in this case the effect of the productivity regime is not strong enough to be reversed. Therefore, the overall regime will be expansionary in u*, g*, but $\hat{y}_L$ will decrease. Finally, graph 3b in Annex 3 shows an entirely expansionary regime both in u*, g* and $\hat{y}_L$, due to the large positive effect of the demand regime that fully reverses the productivity regime.

Note that the Kaleckian model of growth does not yield unidirectional conclusions on the relationship between the aggregate demand, growth and distribution in a market economy. This model allows for joining the three variables, but the final conclusion will basically depend on the results obtained with the aggregated data. In the section on specific empirical literature, it can be seen that the evidence of the demand and overall regimes of an economy changes significantly from country to country and from region to region.

To finalize this section, it is necessary to underscore that an economy with a wage-led demand regime will always give rise to an overall contractive regime in the profit share since the productivity regime will always have the same sense as a wage-led demand regime. In this type of contexts, the policy of strengthening the aggregate demand by enhancing household consumption and resource redistribution policies will generate higher rates of growth of the output and a greater capital accumulation in the long term and hence, any growth policy based on this type of measures is totally justifiable.

III. LITERATURE REVIEW

Within the framework of the Kaleckian model of growth, the empirical studies yield a variety of results which are sometimes contradictory. The econometric methodologies used in these estimations range from the simple use of Ordinary Least Squares (OLS) or Two-Stage Ordinary Least Squares (TSOLS), to Structural Vector Autoregression (SVAR) and Vector Error Correction (VEC) models. In all cases, time series are used with annual or six-monthly frequencies, provided the said information is available. Furthermore, these documents have

[8] In all diagrams, an increase of the profit share is assumed, i.e. $\pi_2 > \pi_1$

been limited to studying developed economies and some developing economies, but outside the Latin American continent.

Bowles and Boyer (1995) estimate equations of behavior for savings, investment and net exports in OECD countries, applying Ordinary Least Squares (OLS) and adjustment through an AR process (1). The resulting evidence points to existence of a wage-led demand regime in the OECD economies.

The work of Gordon (1995), covering 1955-1988 as the period of analysis, asserts that the US economy displayed a profit-led demand regime. The estimations were based on TSOLS.

Stockhammer and Onaran (2002) estimate a SVAR model and make an analysis of impulse response among capital accumulation, capacity utilization, profit share, unemployment rate and the growth of labor productivity in the United States, the United Kingdom and France. Based on this empirical research, they conclude that the impact of income distribution on the aggregate demand and on employment is very weak. Moreover, Stockhammer and Onaran (2005) make estimations for the cases of Turkey and South Korea, applying a SVAR model, and they find that there was no demand regime influencing growth in these economies.

Naastepad (2006) presents a study for the Netherlands with evidence in the sense that during 1960-2000 the Dutch demand regime was wage-led, though marginally. The estimations were based on OLS adjusted with an AR(1). On the other hand, Naastepad and Storm (2007) estimate models of equations of behavior using OLS with adjustment of an ARIMA model for eight OECD economies. The evidence resulting from these estimations suggests that economic growth is boosted by profits or by wages, depending on the characteristics of the different economies.

Ederer and Stockhammer (2007) estimate equations for consumption, investment and net exports, using OLS and they conclude that the French economy displays a wage-led demand regime and that the openness to trade turns the regime into a profit-led one.

Finally, Hein and Vogel (2007) and Hein and Tarassow (2008) estimate functions of behavior for savings, investment and exports to determine the prevailing demand regime for six OECD economies in 1960-2005 and 1960-2007, respectively. The estimation was based on OLS and VEC in case of cointegration relationships. The obtained results are diverse because in the studied economies the wage-led demand regime prevails in some cases while the profit-led demand regime prevails in others. Inclusion of the productivity regime does not change the results to any significant extent.

The literature review clearly shows the double contribution of this paper to the empirical literature on the Kaleckian model of economic growth. First, the few empirical works for heterodox growth models were applied to developed economies. Therefore, the evidence provided by this paper for a developing economy is very important in terms of a different perspective to understand the reasons underlying the low performance in economic growth of

the Latin American continent[9]. Second, the estimation methodology used to contrast the theoretical conclusions of the Kaleckian model follows, in a dominant manner, the frequentist paradigm, which requires databases of time series of a large magnitude, which is a disadvantage for the case of the Bolivian economy. Hence, using a Bayesian methodology, this paper does not only take advantage of a non-conventional methodology in literature, but it also takes into account the limitations of the reduced information of the Bolivian economy.

IV. ECONOMETRIC ESTIMATION

The Bayesian methodology simultaneously combines information from previous studies (a priori evidence) and observed data to estimate the parameters of the model, which in this case has a Kaleckian approach. Using a priori information is particularly appropriate if the model is complex or if the sample of the data period is small. Bolivia, a developing country, does not have long series of the set of variables to make estimations of the parameters; it should be clarified that the period covered by the study (1990 to 2015) was selected according to the available annual information of the set of variables analyzed in the theoretical model.

Since the determination of the demand regime and the overall regime is an empirical rather than a theoretical matter, to determine the demand, productivity and overall regimes, this section will establish a Bayesian estimation strategy for the Kaleckian growth model proposed previously. Within this framework, each of the equations of behavior seen in the theoretical model will be estimated through Bayesian lineal regressions, using Zellner's[10] g-priors[11]. Utilizing the estimated parameters, it will be possible to define the regimes in the Bolivian economy.

IV.1. Used data

For the estimation, time series have been considered for the period between 1990 and 2015, with annual frequencies. The following table shows the main series used and their respective sources.

Table 1: Used Data and Source

Series	Variable	Source
Gross Domestic Product in BOB of 1990 (GDP)	Y	INE
Profit share	$\pi = B/Y$	INE
Unemployment rate	u	INE

[9] Onaran and Galanis (2012) present estimations for developing economies.
[10] For a better understanding of the Bayesian linear regressions, consult Greenberg (2012), Jacobi (2009), among others.
[11] Following the literature on economic growth (Poirier, 1988) it is important to show how different priors affect the conclusions of an empirical result. For analyzing sensitivity of the results when scaling g, we have considered that g = 1 / k_2= 1 / 2^2 = 0.25 where k is the number of explanatory variables (it should be noted that k varies from model to model); $g = \sqrt{1/n} = \sqrt{1/26} = 0.1961$ where n is the number of observations; and finally g = 1 which is equivalent to putting the same information in the prior as in the sample, meaning that the probability mass will be less disperse.

Economically Active Population	L	INE
Final household consumption in BOB of 1990	C	INE
Investment in BOB of 1990	I	INE
Net Exports in BOB of 1990	XN	INE
GDP of the manufacturing sector in BOB of 1990	Y^M	INE
Real GDP of the United States	Y^{USA}	NBER
Gross operating surplus	B	INE

IV.2. Specification and estimation of structural equations

Within the framework of the specifications proposed by Hein and Vogel (2007) and Hein and Tarassow (2008), this section will seek to find functions of behavior for aggregate consumption, aggregate investment, net exports and labor productivity for determining the demand, productivity and overall regimes.

The shown theoretical model initially determined the demand regime and the overall regime based on the sign of the partial derivative of the profit share on output, the capital accumulation and labor productivity. For the empirical estimation strategy, the general form of the theoretical model will be used, i.e. seeking to estimate the four equations making up the model and verifying that the signs of the partial effects of certain variables in the model are met. However, to quantify the effect of an increase of the profit share, we will follow a strategy that is widely used in the empirical literature of Kaleckian models of growth, seeking to determine the demand regime and the overall regime in terms of elasticities. In other words, we will seek to estimate the percentage variation of the aggregate demand when the profit share varies by 1%. Note that this does not change either the theoretical model or the determination of the demand regime and the overall regime; the empirical strategy seeks the most convenient form to estimate, ceteris paribus, the effects formulated in the theoretical model.

Therefore, the purpose of the econometric estimation is to obtain the percentage effect on each demand component and labor productivity in case of a change of 1% of the profit share, i.e. the objective is to estimate the elasticities of the profit share with respect to the aggregate consumption, the aggregate investment, net exports and labor productivity[12]. Following Hein and Vogel (2007), the demand regime (DR) is estimated by adding up the elasticities of profit share-consumption, profit share-investment and profit share-net exports, while the overall regime (OR) of an economy could be estimated by adding up the demand regime (elasticity

[12] Likewise, the theoretical model sought to determine the effect of the profit share on the values of equilibrium of the utilization ratio and labor productivity. Since the empirical data always show equilibrium values for each component of the aggregate demand, the theoretical and empirical approaches are equivalent.

profit-share aggregate demand) and the elasticity of profit share-labor productivity, i.e. the overall regime will be determined by:

$$OR = \frac{\partial Y}{\partial \pi} \cdot \frac{Y}{\pi} = \frac{\partial I}{\partial \pi} \cdot \frac{C}{\pi} + \frac{\partial I}{\partial \pi} \cdot \frac{I}{\pi} + \frac{\partial NX}{\partial \pi} \cdot \frac{NX}{\pi} + \frac{\partial \hat{y}_L}{\partial \pi} \cdot \frac{\hat{y}_L}{\pi} = DR + PR \quad (29)$$

Where:

$$DR = \frac{\partial I}{\partial \pi} \cdot \frac{C}{\pi} + \frac{\partial I}{\partial \pi} \cdot \frac{I}{\pi} + \frac{\partial NX}{\partial \pi} \cdot \frac{NX}{\pi}$$

represents the estimation for the demand regime and

$$PR = \frac{\partial \hat{y}_L}{\partial \pi} \cdot \frac{\hat{y}_L}{\pi}$$

is the estimation for the productivity regime.

Therefore, the overall regime and the demand regime will show the percentage response of the aggregate output and the aggregate demand, respectively, in case of a 1% improvement of the distribution of resources for the entrepreneurs (capitalists).

Even though the empirical strategy is a bit different from the way in which the demand and productivity regimes were determined in the theoretical model, because of the simplicity at the time of estimating them –in addition to the convenient and useful interpretation of the estimations in the empirical strategy-, it is quite attractive to follow this strategy at the time of making an empirical estimation of the Kaleckian model of growth for Bolivia. Next, the specification and estimations of each structural function of the Kaleckian model of growth will be shown.

a. Function of consumption

The specification for the estimation of the function of consumption was made by following the strategy suggested by Hein and Vogel (2007), in which consumption is a function of the profits and wage C = f (R, W) just like formulation of the function of savings in equation (10), i.e.:

$$C = (1 - s_w)W + (1 - s_\pi)R \quad (30)$$

where C is the aggregate consumption, R is the aggregate profits of the capitalist, which are multiplied by the capitalists' marginal propensity to consume $(1 - s_\pi)$. Likewise, W is the aggregate wage which is in turn multiplied by the workers' marginal propensity to consume $(1 - s_w)$.

Equation (30) can be expressed as follows

$$\frac{C}{Y} = (1 - s_w) + (s_w - s_\pi)\pi \quad (31)$$

Equation (30) will be the specification of the function of consumption. Note that in this specification, the partial effect of interest is $\frac{\partial C/Y}{\pi} = (s_w - s_\pi)\pi$, the sign of which is expected to be negative because of the assumption concerning the marginal propensities to save of the capitalists and workers. This partial effect shows the percentage points by which the share of the aggregate consumption varies in case of a variation of one percentage point of the profit share.

The specification of the function of consumption can be changed slightly so that the partial effect would better resemble an elasticity:

$$\frac{C}{Y} = (1 - s_w) + (s_w - s_\pi)\log(\pi) \tag{32}$$

In this case, the marginal effect of interest shows the percentage points by which the share of consumption in the output varies in case of a variation of 1% in the profit share. Therefore, the specification for the estimation of the function of consumption is:

$$\frac{C_t}{Y_t} = \underbrace{\beta_1}_{(1-s_w)} + \underbrace{\beta_2}_{(s_w - s_\pi)} \log(\pi) + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_\varepsilon) \tag{33}$$

The parameter of interest will be β_2, but as is evident, this partial effect is not yet expressed in terms of elasticity. However, it is possible to transform the expression so that interpretation would be in terms of elasticity[13] [14]:

$$\frac{\partial \log(C_t)}{\partial \log(\pi_t)} = \beta_2 \cdot \left(1 \Big/ \frac{C_t}{Y_t} \right) \tag{34}$$

Where $\frac{C_t}{Y_t}$ is the share of consumption in the aggregate output. For the present case, we use the average share of consumption in the output for years 1990-2015. Hence, the estimation of the profit share-aggregate consumption elasticity will be:

[13] It was possible to specify the consumption model in a log-log form for the parameter of interest to directly have an interpretation of elasticity. Unfortunately, the priors from other studies with developing economies calculated a marginal effect, not in terms of elasticities but as the variation of the consumption-output ratio in case of a variation of 1% in the profit share. That is why only the functional specification of these studies was taken. As will be evident later, this case was presented for each element of the aggregate demand regime.

[14] $\frac{\partial \left(\frac{C_t}{Y_t}\right)}{\partial \log(\pi_t)} = \beta_2$

$$\frac{\partial \left(\frac{C_t}{Y_t}\right)}{\partial log(\pi_t)} \cdot \frac{\partial C_t}{\partial C_t} \cdot \frac{C_t}{C_t} = \frac{1}{\partial log(\pi_t)} \cdot \frac{1}{Y_t} \cdot \partial C_t \cdot \frac{C_t}{C_t} = \frac{\frac{\partial C_t}{C_t}}{\partial log(\pi_t)} \cdot \frac{C_t}{Y_t} = \beta_2$$

$$\frac{\partial \log(C_t)}{\partial \log(\pi_t)} = \beta_2 \cdot \left(1 \Big/ \frac{C}{Y} \right) \tag{35}$$

For the Bayesian linear model, the vector of unknown parameters is $(\beta_1, \beta_2, \sigma_\varepsilon)$, where σ_ε is the precision parameter. We follow Zellner (1986), who –under the normal linear model- proposes a priori distributions based on the Normal-Gamma conjugated family, since there is little or no information on the distributions of the unknown parameters[15].

A priori distribution of consumption[16]

Parameter	Function of density	Average	Standard deviation	Source
β_1	Normal	0	1	Not informative
β_2	Normal	-0.44	0.17	Onaran and Galanis (2012)
σ_ε	Inverse gamma	1	1	Not informative

The results of the estimation of the a posteriori distribution of the Bayesian general linear model for the function of consumption are[17]:

A posteriori distribution of consumption

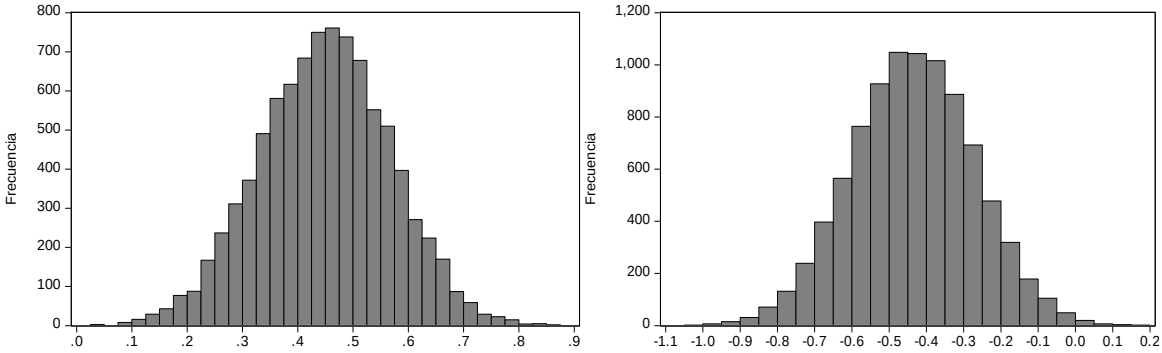
Parameter	g-prior	Average	Standard deviation	Credibility interval at 95%	
β_1	$1/k^2$	0.4396	0.0762	0.2859	0.5867
	$\sqrt{1/n}$	0.4385	0.0713	0.2971	0.5787
	1	0.4487	0.1185	0.2140	0.6748
β_2	$1/k^2$	-0.4446	0.0837	-0.6113	-0.2814
	$\sqrt{1/n}$	-0.4440	0.0734	-0.5874	-0.2999
	1	-0.4362	0.1648	-0.7591	-0.1175
σ_ε	$1/k^2$	0.0810	0.0242	0.0468	0.1403
	$\sqrt{1/n}$	0.0807	0.0238	0.0464	0.1374
	1	0.0810	0.0242	0.0467	0.1398

[15] It should be clarified that for all subsequent estimations of the Bayesian general linear models the suggestion of Zellner (1986) regarding a priori distributions is followed. One important aspect to be mentioned is that the priors used in the following sections are the only ones available in literature.

[16] The choice of the a priori parameter for the distribution of consumption was based on information from Onaran and Galanis (2012), who made estimations of the partial effect of the profit share on the consumption for developed and developing economies, of which only developing economies were considered, such as Turkey (-0.491), Mexico (-0.438) and Argentina (-0.153). Of these values, the median is the parameter considered a priori. It should be noted that instead of using the average, the median was used to calculate the variance.

[17] All Bayesian estimations were made by means of Markov Chain Monte Carlo (MCMC) simulations, namely: Metropolis-Hasting and Gibbs simulations, with 10,000 simulations, discarding the first 1,000.

A posteriori distribution: β1 **A posteriori distribution: β2**



The domain of the estimated distribution of parameter of interest β_2, for a g-prior equal to 1 is always negative; at a credibility of 95% it moves within interval -0.7591; -0.1175.

The point estimate of the marginal effect of interest within the function of consumption is the average of the estimated distribution for β_2, namely[18]:

$$\frac{\partial\left(\frac{C_t}{Y_t}\right)}{\partial \log(\pi_t)} = \frac{-0.4362}{100} = -0.0043$$

This result shows that an increase in the profit share of 1% will lead to a reduction of the share of consumption in the output by 0.004362 percentage points. Note that the Kaleckian hypothesis regarding the differences in the marginal propensities to consume between the capitalist class and the working class is correct, because otherwise the sign would be contrary to what the theoretical model assumed. This is not only correct for the average of the a posteriori distribution of the parameter of interest but, as mentioned before, this is true for the entire a posteriori distribution.

To evaluate the robustness of the estimations, other g-priors were taken, which consider only a portion of the information. It should be noted that the estimation of parameter of interest β_2 does not change greatly when modifying the g-priors. The only thing that happens is that when taking less information with different g-priors, the variance of the distribution of estimator β_2 changes slightly.

As mentioned before, in the specification of the function of consumption, parameter β_2 is not interpreted as an elasticity; changing this requires multiplying the point estimate of β_2 by the share of consumption in the output. In this sense, we took the average of this share in years 1990-2015[19]. Hence, the estimation of the profit share-consumption elasticity will be:

[18] Remember that for interpreting a log-level estimation, the parameter of interest should always be divided by 100.
[19] The average of the shares of each component of the aggregate demand in the output in obtaining the estimations of the elasticities for the demand regime is shown in Annex 4.

$$\frac{\partial \log(C_t)}{\partial \log(\pi_t)} = -0.3184$$

In other words, an increase of 1% of the profit share will lead to the aggregate consumption contracting by 0.3184%. The magnitude of the effect is similar for the case of the Bolivian economy compared to the studies conducted by Hein and Vogel (2007) and Hein and Tarassow (2008), for the economies of France (-0.350), and Germany (-0.317), while it is more than double the estimation obtained for the United States (-0.141).

The above is empirical evidence of the great importance of the aggregate consumption and the sensitivity thereof to changes in the distribution in the Bolivian economy. A better distribution of the resources to the population segment with the greatest propensity to consume may boost growth of the aggregate consumption; hence, the orientation of public policies to resolve the problems of inequality is fundamental to strengthen the aggregate demand on the side of consumption.

b. Function of investment

In a similar manner, for specifying the function of consumption, a linear lin-log form of the function of investment was chosen, in which the dependent variable is the share of investment in the aggregate output (It / Yt), and the regressor of interest is the logarithm of the profit share. In other words, the specification of the Bayesian general linear model for the function of investment is:

$$\frac{I_t}{Y_t} = \alpha_1 + \alpha_2 \log(\pi_t) + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_\varepsilon) \quad (36)$$

The choice of the a priori distributions and the results of the a posteriori distributions for the parameters of the function of investment are:

A priori distribution of investment[20]

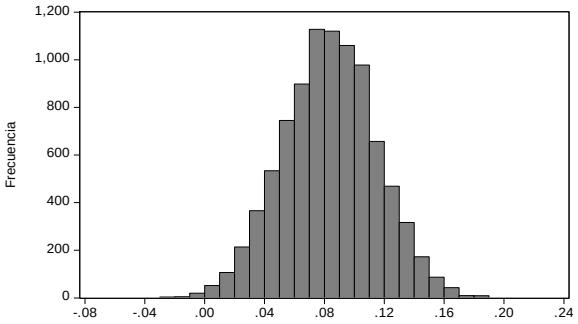
Parameter	Function of density	Average	Standard deviation	Source
α_1	Normal	0	1	Not informative
α_2	Normal	0.084	0.07	Onaran and Galanis (2012)
σ_ε	Inverse Gamma	1	1	Not informative

[20] The choice of the a priori parameter of the distribution of the investment was based on the information of Onaran and Galanis (2012), who conducted estimations of the partial effect of the profit share on investment for developing economies, among which Mexico (0.153) and Argentina (0.015). Note that Turkey does not have a partial effect.

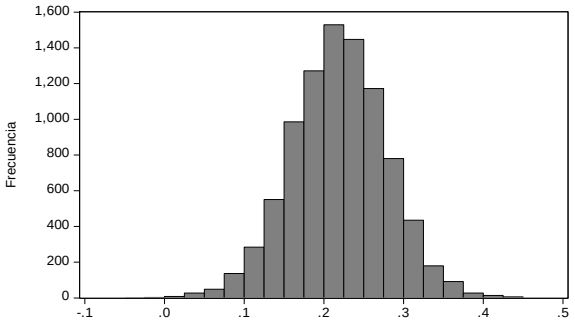
A posteriori distribution of investment

Parameter	g-prior	Average	Standard deviation	Credibility interval at 95%	
α_1	$1/k^2$	0.2188	0.0592	0.1030	0.3348
	$\sqrt{1/n}$	0.2128	0.0588	0.1030	0.3352
	1	0.2192	0.0597	0.1001	0.3355
α_2	$1/k^2$	0.0837	0.0347	0.0164	0.1518
	$\sqrt{1/n}$	0.0834	0.0300	0.0242	0.1422
	1	0.0836	0.0314	0.0219	0.1455
σ_ε	$1/k^2$	0.0808	0.0237	0.0466	0.1383
	$\sqrt{1/n}$	0.0811	0.0240	0.0470	0.1402
	1	0.0807	0.0243	0.0466	0.1408

A posteriori distribution: α1



A posteriori distribution: α2



The results of the estimation of the distribution of α_2 show that the sign of this parameter for the entire distribution is positive, which is once again the expected sign based on the theoretical model. An increase of the portion of the output taken by the capitalists (increase of the profit share) should incentivize them to invest more in their firms and vice versa. With a credibility of 95%, parameter α2 moves within the positive interval: 0.0219; 0.1455. Taking the average of the distribution of parameter α_2 as the representation of this marginal effect, we see that:

$$\frac{\partial\left(\frac{I_t}{Y_t}\right)}{\partial \log(\pi_t)} = \frac{0.0836}{100} = 0.000836$$

In other words, with an increase of 1% of the profit share the share of investment in the output increases by 0.000836 percentage points. In the same way as for the function of consumption, a sensitivity analysis was made to evaluate robustness of the distribution obtained for parameter α_2 with different g-priors. The obtained results do not change significantly, confirming robustness of the a posteriori distribution estimated for parameter α_2.

To convert α_2 into an elasticity, as was done with the previous function, it is necessary to multiply this parameter by the inverse of the share of investment in the aggregate output. Hence, using the average of the a posteriori distribution of parameter α_2, the following estimation is obtained for the profit share-investment elasticity:

$$\frac{\partial \log(I_t)}{\partial \log(\pi_t)} = 0.0491$$

In this case, the obtained elasticity shows that an increase of 1% of the profit share increases the aggregate investment by 0.0491%. The partial effect obtained is much lower compared to New Zealand (0.340) and France (0.221) in the study of Hein and Vogel (2007). The estimation of the function of investment once again confirms the hypothesis of the Kaleckian model of growth related to the sigs of the partial effects of the profit share on investment. The reduced magnitude of the estimation shows the low sensitivity of the investment to the changes in the distribution of the output in the Bolivian economy.

What are the implications of these results? First, we can see that the estimation obtained of α_2 accounts for 20% of the estimation obtained of β_2. This clearly shows that in the case of the Bolivian economy, there is evidence backing the hypothesis that the aggregate consumption is much more sensitive than the investment to changes in the distribution of resources in an economy.

Therefore, in this case, any factor causing a more equitable distribution of the output for the workers will reduce investment due to the lower incentives to invest, but this effect will be reversed by the increase in the aggregate consumption thanks to the workers' greater consumption, meaning that the share of the domestic demand in the output will increase following an improved distribution of resources for the benefit of the workers. With these estimations, it can be asserted that with a decrease of the profit share of 1% (improved distribution favoring the workers), on average the share of the domestic demand in output will increase by 0.003526 percentage points (0.004362 – 0.000836).

Moreover, because of the lower sensitivity of the investment in relation to consumption in case of changes in the distribution of resources in the Bolivian economy, any improvement in the latter for the benefit of the workers will increase the domestic demand. The estimations show that for the Bolivian economy, a decrease of 1% of the profit share (improved distribution benefiting the workers), the domestic demand will increase by an average 0.269% (0.3184- 0.0491).

c. Function of net exports

The estimations obtained for elasticity of the consumption and investment in case of variations of the profit share initially show that a more equitable distribution of the resources may generate an increased domestic demand. The function of net exports in the Kaleckian model of growth will be vitally important when defining the magnitude and sign of the overall demand regime.

As explained in section II.2.1, an increase of the profit share can be determined by an increase of the mark-up of the companies or by a decrease of the salaries. This form of generating an increase of the profit share will have a different impact on the final prices of the outputs generated by the firms and hence on the real exchange rate. If the increase of the profit share is through increases of the mark-up, there will be an increase of the prices of final goods and hence a real appreciation; if, however, the increase of the profit share is through a decrease of wages, in this case due to the decrease of the average production costs, the price of the final goods will decline, generating a real depreciation.

Given that the effect of the profit share on the real exchange rate will be ambiguous, the sign of the effect of a change in the profit share in net exports will be ambiguous as well. Finally, this ambiguity can be avoided only when making an empirical estimation of this marginal effect.

For estimating the effect of an increase of the profit share on net exports, the specification followed will be similar to the one used for the functions of consumption and investment. Following the strategy proposed by Onaran and Galanis (2012), the specification of the function of net exports will not only include the logarithm of the profit share but also the GDP of the United States, as a proxy of performance of the international context. Therefore, the specification of the Bayesian general linear model for the function of net exports will be as follows:

$$\frac{XN_t}{Y_t} = \gamma_1 + \gamma_2 \log(\pi_t) + \gamma_3 Y_t^{USA} + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_\varepsilon) \quad (37)$$

Below is an overview of the parameters and the a priori distributions chosen, as well as the results of the estimations of the a posteriori distributions of each parameter of the function of net exports:

A priori distribution of net exports[21]

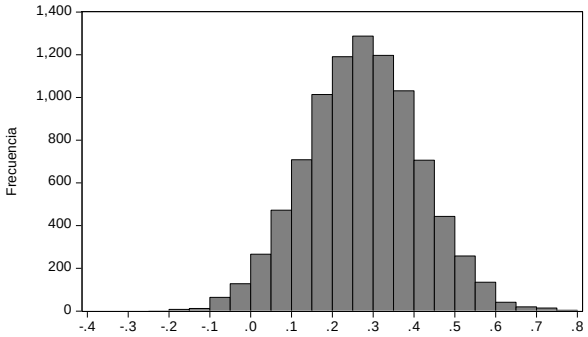
Parameter	Function of density	Average	Standard deviation	Source
γ_1	Normal	0	1	Not informative
γ_2	Normal	0.28	0.18	Onaran and Galanis (2012)
γ_3	Normal	0	1	Not informative
σ_ε	Inverse Gamma	1	1	Not informative

[21] The choice of the a priori parameter for the distribution of net exports was based on the information of Onaran and Galanis (2012), who conducted estimations of the partial effect of the profit share on net exports for developed and developing economies, of which only the developing economies were considered, among which Turkey (0.283), Mexico (0.381) and Argentina (0.192). The median is the parameter considered to be a priori; the calculation of the variance was conducted in the same manner.

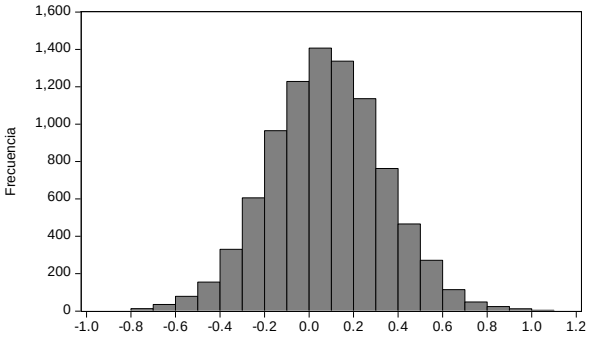
A posteriori distribution of net exports

Parameter	g-prior	Average	Standard deviation	Credibility interval at 95%	
γ_1	$1/k^2$	0.0751	0.2326	-0.3745	0.5456
	$\sqrt{1/n}$	0.0700	0.2216	-0.3694	0.5039
	1	0.0786	0.2591	-0.4287	0.5889
γ_2	$1/k^2$	0.2790	0.0898	0.1042	0.4562
	$\sqrt{1/n}$	0.2810	0.0779	0.1296	0.4352
	1	0.2746	0.1386	0.0032	0.5467
γ_3	$1/k^2$	0.0083	0.0203	-0.0322	0.0484
	$\sqrt{1/n}$	0.0089	0.0195	-0.0292	0.0475
	1	0.0077	0.0218	-0.0387	0.0510
σ_ε	$1/k^2$	0.0840	0.0251	0.0480	0.1444
	$\sqrt{1/n}$	0.0831	0.0246	0.0475	0.1441
	1	0.0843	0.0253	0.0481	0.1462

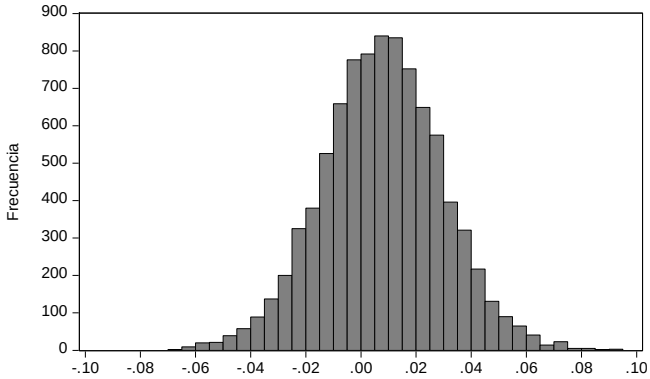
A posteriori distribution: γ_1



A posteriori distribution: γ_2



A posteriori distribution: γ_3



Initially, it should be noted that the estimations of distribution of the parameter of interest γ_2 display, throughout their domain, the same positive sign. With a credibility of 95%, γ_2 moves within interval 0.032;0.5467. The sensitivity analysis made in the estimation of the a posteriori distribution of parameter γ_2 with different g-priors shows that it is quite robust, with slight changes but in no case is there a reversion of the sign in the domain in which the parameter of interest moves.

Considering the average a posteriori distribution of parameter γ_2 as the point estimator of the marginal effect, we see that:

$$\frac{\partial\left(\frac{XN_t}{Y_t}\right)}{\partial \log(\pi_t)} = \frac{0.2746}{100} = 0.002746$$

Therefore, the point estimate of the obtained marginal effect shows that in case of an increase of 1% in the profit share, the share of net exports in the aggregate output increases by an average 0.002746 percentage points. Hence, as pointed out in the theoretical model, this result shows that the firms adjust their profit share by reducing the workers' wages and not by increasing their mark-ups, which depreciates the real exchange rate since the prices of the final goods decline within the economy, which in the end gives rise to a decrease of imports and an increase of exports. In order to express this marginal effect in terms of elasticities, it is multiplied by the inverse of the total trade ratio in the economy relative to GDP[22]. Hence, the profit share-net export elasticity will be:

$$\frac{\partial \log(XN_t)}{\partial \log(\pi_t)} = 0.1614$$

The profit share-net exports elasticity shows that a 1% increase in the profit share will increase net exports by 0.1614%. In view of the estimations of the profit share – domestic demand elasticity, the profit share – net exports elasticity will reverse the positive effect of a better distribution on the aggregate demand. It may be that this reversion in the end generates a profit-led demand regime if the net exports are much more sensitive to changes in the distribution of resources in relation to sensitivity of the domestic demand.

(i) Determination of the demand regime

As mentioned at the beginning of the specification of the empirical strategy, the estimation of the demand regime is determined on the basis of the sum of the elasticities of the components of the aggregate demand relative to the profit share. They were estimated by taking the averages of the a posteriori distributions of parameters α_2, β_2 and γ_2 coming from the functions

[22] Given that in various years the trade balance displayed a deficit, averaging the share of net exports in international trade in years 1990-2015, the value is very much reduced and negative; hence the average total trade quotient was taken (exports plus imports) on the aggregate output. The incorporation of separate estimations of a function of exports and imports would allow for correcting this problem. This is pending for future studies.

of consumption, investment and net exports, to then multiply them by the inverse of their share in the aggregate output, i.e.:

$$DR = \frac{\partial I}{\partial \pi} \cdot \frac{C}{\pi} + \frac{\partial I}{\partial \pi} \cdot \frac{I}{\partial \pi} + \frac{\partial NX}{\partial \pi} \cdot \frac{NX}{\partial \pi} = \beta_2 \left({}^{1}\!\Big/\!_{\frac{C_t}{Y_t}} \right) + \alpha_2 \left({}^{1}\!\Big/\!_{\frac{I_t}{Y_t}} \right) + \gamma_2 \left({}^{1}\!\Big/\!_{\frac{NX_t}{Y_t}} \right)$$

Replacing all previous estimations in the equation above, we obtain the estimation of the demand regime (DR) for the Bolivian economy:

$$DR = -0.3184 + 0.0491 + 0.1614 = -0.1079$$

The interpretation of this result shows that with a decrease of 1% in the profit share (better distribution of the output for the benefit of the workers), on average the aggregate demand increases by 0.1079%.

It is important to highlight that this empirical evidence supports any attempt to improve the distribution of resources for the benefit of the average household, because on average this may generate a greater growth of the aggregate demand and therefore of the aggregate output in the long term. The greater sensitivity of aggregate consumption to a change in distribution of the resources in relation to investment and net exports justifies the position that any improvement of the household wage may improve aggregate performance of the Bolivian economy.

d. Function of productivity: productivity regime

Finally, the productivity regime remains to be determined, which –according to the Kaleckian model of growth–is defined only by the function of productivity. In the case of the Bolivian economy, given that the demand regime is wage-led, when the sign of the estimated productivity regime is as expected, it will exacerbate the demand regime, generating a contractive regime in the Bolivian economy.

In this case the estimation strategy will take into account the work of Hein and Tarassow (2008), which aside from considering the logarithm of the profit share in the specification of the productivity function, also considers GDP growth[23] and the share of the manufacturing sector in GDP as explanatory variables. The priors of profit share–labor productivity elasticities were obtained from other studies. The function of productivity is specified as a log-log model so that the obtained estimations would have an interpretation of elasticities. The specification of the Bayesian general linear model for the function of productivity will be:

$$\log(\hat{y}_t) = \delta_1 + \delta_2 \log(\pi_t) + \delta_3 Y_t^{Manu} + \delta_4 \Delta Y_t + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_\varepsilon) \qquad (38)$$

The distributions and parameters chosen as priors and the estimations of the a posteriori distributions of the parameters of the function of productivity are shown below:

[23] The marginal effect of which is known in literature as the Verdoorn effect.

A priori distribution of productivity[24]

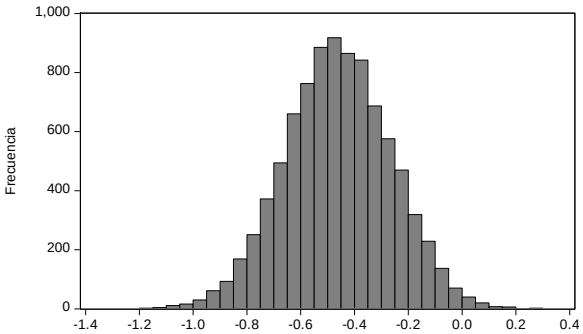
Parameter	Function of density	Average	Standard deviation	Source
δ_1	Normal	0	1	Not informative
δ_2	Normal	-0.46	0.22	Hein and Tarassow (2008)
δ_3	Normal	0	1	Not informative
δ_4	Normal	0.38	0.15	Hein and Tarassow (2008)
σ_ε	Inverse Gamma	1	1	Not informative

A posteriori distribution of productivity

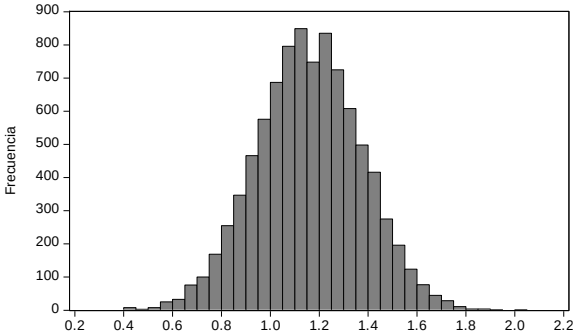
Parameter	g-prior	Average	Standard deviation	Credibility interval at 95%	
δ_1	$1/k^2$	1.1338	0.1188	0.9026	1.3677
	$\sqrt{1/n}$	1.1252	0.1092	0.9107	1.3394
	1	1.1583	0.2149	0.7387	1.5765
δ_2	$1/k^2$	-0.4798	0.1017	-0.6791	-0.2738
	$\sqrt{1/n}$	-0.4839	0.0901	-0.6625	-0.3108
	1	-0.4616	0.1967	-0.8487	-0.0832
δ_3	$1/k^2$	0.1730	0.4900	-0.7882	1.1271
	$\sqrt{1/n}$	0.1780	0.4463	-0.6905	1.0621
	1	0.1671	0.9836	-1.7268	2.1459
δ_4	$1/k^2$	0.3789	0.0736	0.2339	0.5208
	$\sqrt{1/n}$	0.3791	0.0658	0.2506	0.5072
	1	0.3784	0.1488	0.0857	0.6732
σ_ε	$1/k^2$	0.0948	0.0279	0.0554	0.1633
	$\sqrt{1/n}$	0.0954	0.0280	0.0552	0.1619
	1	0.0946	0.0279	0.0548	0.1627

[24] The choice of the a priori parameter for the distribution of productivity was based on the information of Hein and Tarassow (2008), who conducted estimations of the partial effect of the profit share on productivity for developed economies: United Kingdom (-0.46), United States (-0.33), Germany (-0.87), the Netherlands (-0.33) and Austria (-0.68). Of these data, the median is the parameter considered as a priori. Likewise, the variance was calculated. On the other hand, the partial effect of the increase of the production on productivity was based on United Kingdom (0.43), United States (0.54), Germany (0.45), France (0.33), the Netherlands (0.23) and Austria (0.11).

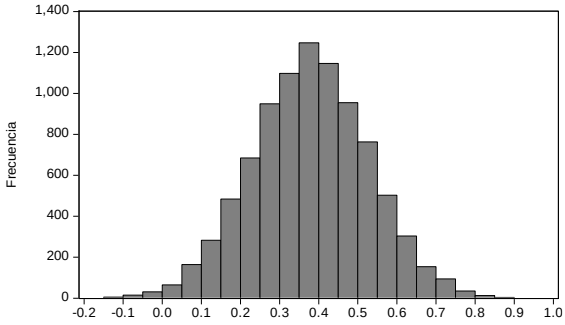
A posteriori distribution: δ_1



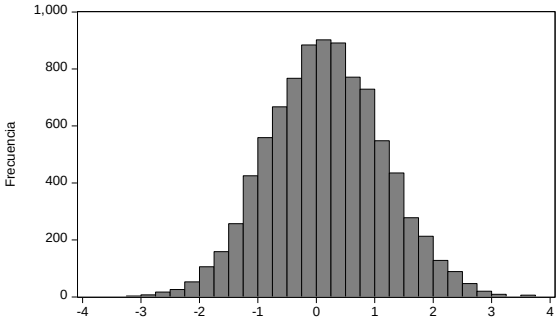
A posteriori distribution: δ_2



A posteriori distribution: δ_3



A posteriori distribution: δ_4



It is clear that the sign of the productivity regime determined by the function of productivity is as predicted by the Kaleckian model. The a posteriori distribution of parameter δ_2 is negative in its entire domain: at a credibility of 95%, this parameter is located within interval: -0.847;-0.0832. The estimation of the subsequent distribution of parameter δ_2 is solid to modifications of the g-prior, but not as much as in the cases of the estimations for the components of the demand regime. In any case, the modifications are not excessively large and their sign does not change, which is a rather good sign of the quality of the obtained estimations. Taking the average of the distribution of parameter δ_2 as the point estimate of the profit share – productivity elasticity, the productivity regime for the Bolivian economy is as follows:

$$\frac{\partial \log(\hat{y}_t)}{\partial \log(\pi_t)} = PR = -0.4616$$

In this case, an increase of the profit share by 1% gives an average decrease of labor productivity of 0.4616%, which, as mentioned in the theoretical model, is explained by the lower incentive of the firms to innovate and increase labor productivity given that they receive a higher profit margin. Likewise, as mentioned above, in the case of a wage-led demand regime, the productivity regime will be complementary, in aggregate generating an overall contractive regime in the profit share, as detailed below.

(ii) Determination of the overall regime, joining the demand regime with the productivity regime

Remember that the overall regime of an economy was estimated based on equation (29), which is repeated below:

$$OR = \frac{\partial Y}{\partial \pi} \cdot \frac{Y}{\pi} = \frac{\partial I}{\partial \pi} \cdot \frac{C}{\pi} + \frac{\partial I}{\partial \pi} \cdot \frac{I}{\pi} + \frac{\partial NX}{\partial \pi} \cdot \frac{NX}{\pi} + \frac{\partial \hat{y}_L}{\partial \pi} \cdot \frac{\hat{y}_L}{\pi} = DR + PR$$

Replacing the estimations of the demand regime and the productivity regime for the Bolivian economy, the overall regime will be equal to:

$$OR = -0.1079 - 0.4616 = -0.5695$$

The interpretation of this result indicates that an increase of 1% in the profit share will give rise to the total output decreasing by 0.5695%. Hence, an increase of the wage share in output of 1% will give rise to an increase of the aggregate output by 0.5695%.

Clearly, given that the demand regime is wage-led, the productivity regime will be complementary, giving a more negative character to the response of output growth and capital accumulation to the increase of the profit share. The obtained results clearly show that the Bolivian economy is characterized by an overall contractive regime in the profit share; hence, a better output distribution will strengthen the aggregate demand, which will benefit economic growth and the growth of productivity.

Using the obtained results, it is possible to do a simple exercise to calculate the resource redistribution policy needed to generate an increase of 0.5695% in the aggregate output.

For 2014, the preliminary information on the share of wages and the benefits in output was 26.6% and 51.04%, respectively. It is assumed that it is possible to draft a policy for redistributing resources from the entrepreneurs to the workers, i.e. that it is possible to increase the wage share in output by 1% with a decrease of the share of profits in the output by 1%.

This would imply that the wage share in output would increase to 26.93% and that the share of profits in the output would fall to 50.53%. In aggregate figures, this means that the wage share in output would increase by approximately BOB 1,142 million. Assuming that the central government distributes these resources equitably among the workers[25], i.e. each household of each worker would receive an additional BOB 268.4, this redistribution is the one needed to increase the aggregate output by an average 0.5695% in that year. Hence, in order to achieve an increase of more than half a percentage point of growth for the Bolivian economy, a minimum redistribution of BOB 268 per year would be necessary[26].

[25] The entire economically active population was considered for this purpose as a proxy of the number of people belonging to the working class.

[26] It should be underscored that these figures are estimations and should therefore not represent an exact guide when preparing resource redistribution policies, because they were obtained by assuming ceteris paribus in the rest of the factors affecting economic growth, which may be affected either negatively or positively as well by a resource redistribution policy.

Note that the exercise above is only an estimation of the potential gains of a better resource distribution for an economy like Bolivian. The above provides clear empirical evidence justifying the use of redistribution policies with the aim of improving the most important macroeconomic performance indicator for Bolivia: economic growth.

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

This study tried to answer three very pertinent policy questions in the present economic context: (i) Can aggregate demand policies bring about economic growth in the long term? (ii) Should public policy focus only on aggregate supply factors to improve growth outcomes in Bolivia? (iii) What is the impact of a better resource distribution on long-term economic growth in Bolivia?

This paper has estimated the structural equations of the Kaleckian model of growth using Bayesian methods. Based on the obtained empirical evidence, it is possible to assert that the Bolivian economy shows a wage-led demand regime and an overall contractive regime in the profit share, i.e. a decrease of 1% in the profit share causes the aggregate demand to increase by 0.106% and the aggregate output by 0.506%. The above conclusion represents evidence that justifies the use of redistribution policies to increase output growth. In addition, a simple exercise was conducted to evaluate the effect of a redistribution policy on output growth. Based on the obtained estimations, it was evident that a resource redistribution policy for the benefit of the working class, increasing their annual wage by BOB 268 will give rise to an annual increase of the aggregate output by an average of 0.5695%.

Using the obtained results, it is possible to answer the above-mentioned policy questions: (i) It is possible to generate long-term economic growth with policies that focus on the aggregate demand given that the Bolivian economy displays a wage-led demand regime. (ii) The growth policy should not forget that although aggregate supply factors also have a determining influence on output growth, if the focus is merely on these factors and the aggregate demand factors are left out, the spectrum of policy instruments to attain a greater long-term economic growth becomes smaller. (iii) A decrease of 1% in the profit share, which entails an increase of the workers' annual wage by approximately BOB 268 will generate an annual increase of the aggregate output by 0.5695%.

In addition to answering the previous policy questions that are vital for the economic policy authorities, this paper makes two fundamental contributions to the empirical literature on this type of models. First, in view of the reduced statistical information for Bolivia the choice of Bayesian methods is appropriate for this particular case, compared to empirical literature that exclusively uses frequentist econometric models. This is deemed to be a first contribution of this paper by implementing a methodology that has not been used previously for the empirical estimation of the Kaleckian model of economic growth. Second, this paper also contributes to empirical literature by obtaining estimations of a Kaleckian model for the case of a Latin America and developing economy, which is not habitual in this literature that primarily focuses on analyses of developed economies.

The best economic growth policy which an economy can adopt is a question determined solely by empirical evidence, based on a theoretical model to guide the estimations and ensure a coherent interpretation thereof. In the particular case of the Bolivian economy, despite not being empirically incorrect drafting the economic growth policy based on aggregate supply determinants, displays failures of omission since it forgets the importance of the distribution of output and the aggregate demand when determining the long-term economic growth rates. It is essential to consider both determinants of economic growth, supply and demand, when formulating a growth policy in order to achieve better growth outcomes.

Strengthening and expanding the aggregate demand as well as improving redistribution are important for economic growth. Hence, when drafting policies aimed at fomenting economic growth, the aggregate demand and redistribution should be seen as policy objectives to achieve better results. For many years, the domestic demand and inequality had played second fiddle in the growth policies put forward by the successive governments; in this paper empirical evidence has been provided in the sense that the impact of the demand on growth is important and that a better resource distribution is a good policy to foment sustained growth in a developing economy like Bolivia.

REFERENCES

Bowles, S. & Boyer, R. (1995). Wages, aggregate demand, and employment in an open economy: An empirical investigation. In: Epstein, G.A., Gintis,

H.M. (eds.), Macroeconomic Policy after the Conservative Era, Cambridge: Cambridge University Press.

Dutt, A. (1984). Stagnation, income distribution and monopoly power. Cambridge Journal of Economics, 8: 25-40.

Ederer, S. & Stockhammer, E. (2007). Wages and aggregate demand in France: an empirical investigation. E, Hein and A. Truger (compilers): Money, distribution, and economic policy–alternatives to orthodox macroeconomics. Cheltenham (United Kingdom), Edward Elgar.

Greenber, E. (2012). Introduction to Bayesian Econometrics. Cambridge University Press.

Gordon, D. (1995). Growth, Distribution, and the Rules of the Game: Social Structuralist Macro Foundations for a Democratic Economic Policy. In: Epstein, G.A., Gintis, H.M. (eds.), Macroeconomic Policy after the Conservative Era. Cambridge: Cambridge University Press.

Hein, E. & Vogel, L. (2007). Distribution and growth reconsidered- empirical results for Austria, France Germany, the Netherlands, the UK and the USA. Macroeconomic Policy Institute (IMK) in the Hans Boeckler Foundation, Working Paper, 3/2007.

Hein, E. & Tarassow, A. (2008). Distribution, aggregate demand and productivity growth: Theory and empirical results for six OECD countries based on a Post-Kaleckian model. Macroeconomic Policy Institute (IMK), Working Paper, 18/2007.

Jacobi L. (2009). Introduction to Bayesian Econometrics. Economic Record, 85(270), 364-366.

Kalecki, M. (1971). Class struggle and the distribution of national income. Collected works of Michal Kalecki, Vol. II, edited by J. Osiatynsky, Oxford University Press.

King, J.E. (1996). An Alternative Macroeconomic Theory: The Kaleckian Model and Post-Keynesian Economics. La Trobe University. Australia.

Loaiza, Q.O.L. (2012). La Demanda Agregada y la Distribución del Ingreso: Un Estudio a partir de los Modelos de Crecimiento Kaleckianos. Cuadernos de Economía, 31(58), 23-47.

Lucas, R.E.Jr. (1988). On the Mechanics of Economic Development. Journal of Monetary Economics, 22, 3-42.

Marglin, S. & Bhaduri, A. (1990). Profit Squeeze and Keynesian Theory. In: S. Marglin and J. Schor (eds): The Golden Age of Capitalism. Reinterpreting the Postwar Experience. Oxford: Clarendon.

Naastepad, C.W.M. (2006). Technology, Demand and Distribution: A Cumulative Growth Model with an Application to the Dutch Productivity Growth Slowdown. Cambridge Journal of Economics, 30: 403-434.

Naastepad, C.W.M. & Storm, S. (2007). OECD demand regimes (1960- 2000). Journal of Post Keynesian Economics, 29: 211-246.

Onaran, Ö. & Galanis, G. (2012). Is aggregate demand wage-led or profit-led, national and global effects. ILO Conditions of Work and Employment Series, 31.

Poirier, D.J. (1988). Frequentist and subjectivist perspectives on the problems of model building in economics. Journal of Economic Perspectives 2,121-144.

Prebisch, R. (1950). The Economic Development of Latin America and its Principal Problems. reprinted in Economic Bulletin for Latin America, 1962, 7(1), 1-22.

Romer, P. M. (1986). Increasing returns and long-run growth. Journal of Political Economy, 1002-1037.

Romer, P. M. (1987). Growth based on increasing returns due to specialization. American Economic Review, 77(2), 56-62.

Rowthorn, R. (1981). Demand, real wages and economic growth. Thames Papers in Political Economy, 1-39.

Solow, R.M. (1956). A Contribution to the Theory of Economic Growth. The Quarterly Journal of Economics, 70(1), 65-94.

Steindl, J. (1952). Maturity and Stagnation in American Capitalism. New York: Monthly Review Press.

Stockhammer, E. & Onaran, O. (2002). Accumulation, Distribution and Employment: A Structural VAR Approach to a Post Keynesian Macro Model. Vienna University of Economics and Business Administration, Working Paper No. 20.

Stockhammer, E. & Onaran, O. (2005). Two Different Export-Oriented Growth Strategies Accumulation and Distribution in Turkey and South Korea. Emerging Markets Finance and Trade, 41(1), 65-89.

Swan, T. W. (1956). Economic growth and capital accumulation. Economic record, 32(2), 334-361.

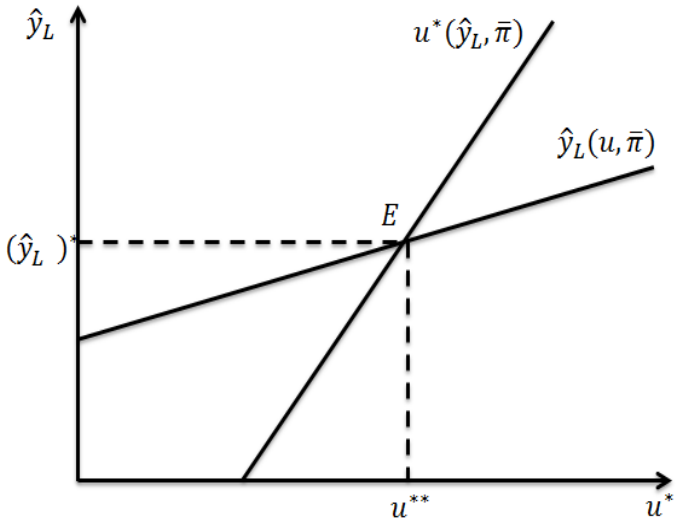
Sylos-Labini, P. (1971). La théorie des prix en régime d'oligopole et la théorie du développement. Revue d'économie politique, 81(2), 244-72.

Zellner, A. (1986). On assessing prior distributions and Bayesian regression analysis with g-prior distributions. Bayesian inference and decision techniques: Essays in Honor of Bruno De Finetti, 6, 233-243.

ANNEX 1

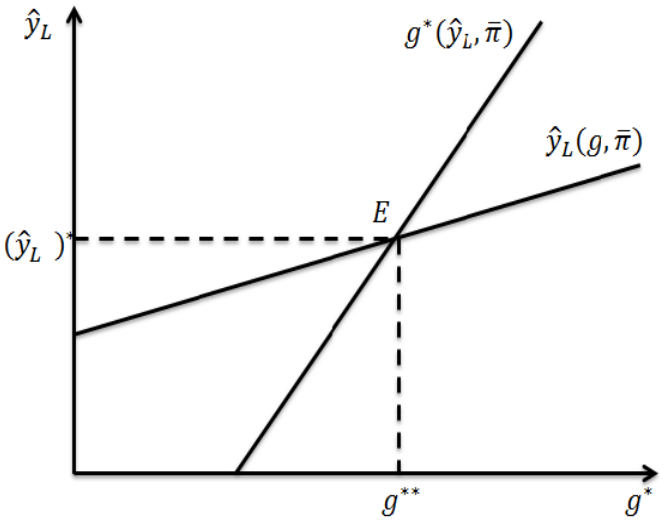
KALECKIAN MODEL EQUILIBRIUM

Graph 1a. Overall Equilibrium: Plane $u^* - \dot{y}_L$



Source: Prepared by the authors based on Hein and Vogel (2007).

Graph 1b. Overall Equilibrium: Plane $g^* - \dot{y}_L$

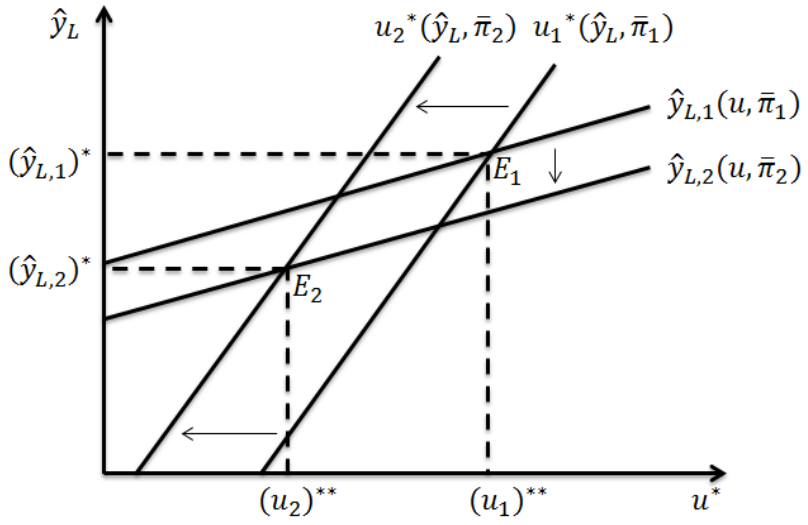


Source: Prepared by the authors based on Hein and Vogel (2007).

ANNEX 2

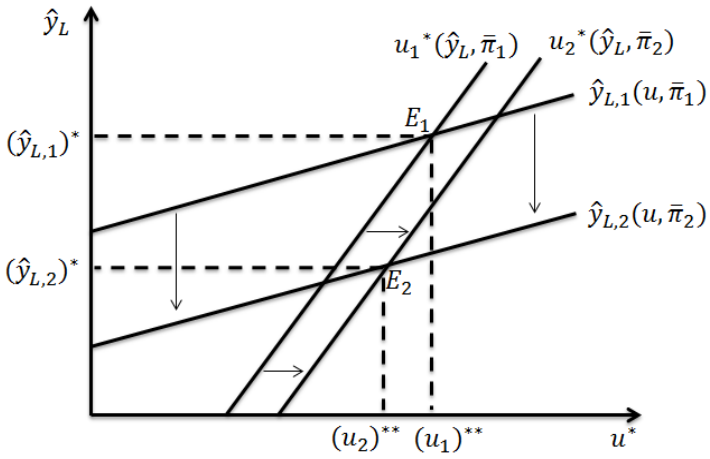
OVERALL CONTRACTIVE REGIME

Graph 2a. Overall Contractive Regime: Wage-led demand regime



Source: Prepared by the authors based on Hein and Vogel (2007).

Graph 2b. Overall Contractive Regime: Profit-led demand regime

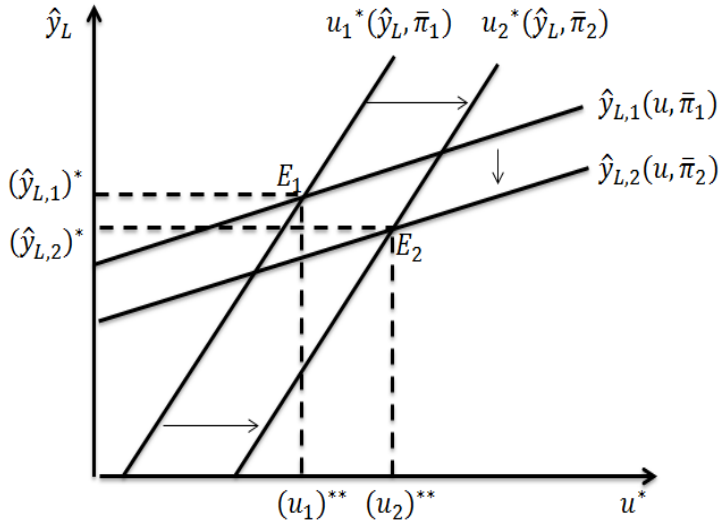


Source: Prepared by the authors based on Hein and Vogel (2007).

ANNEX 3

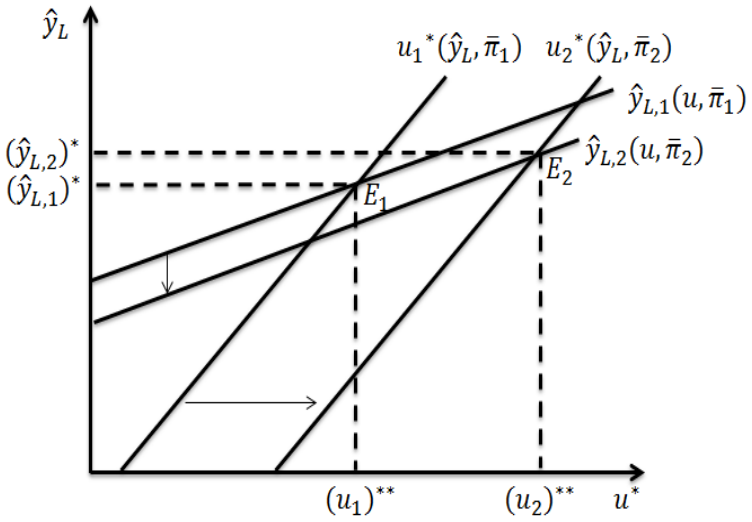
OVERALL EXPANSIONARY REGIME

Graph 3a. Overall Expansionary Regime: Profit-led demand regime



Source: Prepared by the authors based on Hein and Vogel (2007).

Graph 3b. Overall Expansionary Regime: Profit-led demand regime



Source: Prepared by the authors based on Hein and Vogel (2007).

ANNEX 4

SHARES OF AGGREGATE DEMAND COMPONENTS IN OUTPUT:

	C/Y	I/Y	(X+M)/Y
1990	0.7686	0.4670	0.4670
1991	0.7544	0.4881	0.4881
1992	0.7686	0.5077	0.5077
1993	0.7616	0.4967	0.4967
1994	0.7490	0.5066	0.5066
1995	0.7366	0.5276	0.5276
1996	0.7289	0.5358	0.5358
1997	0.7322	0.5398	0.5398
1998	0.7338	0.5912	0.5912
1999	0.7508	0.4987	0.4987
2000	0.7493	0.5313	0.5313
2001	0.7463	0.5286	0.5286
2002	0.7431	0.5644	0.5644
2003	0.7371	0.5841	0.5841
2004	0.7281	0.6229	0.6229
2005	0.7205	0.6644	0.6644
2006	0.7155	0.6869	0.6869
2007	0.7128	0.6811	0.6811
2008	0.7084	0.6777	0.6777
2009	0.7105	0.5869	0.5869
2010	0.7095	0.6225	0.6225
2011	0.7095	0.6552	0.6552
2012	0.7060	0.6768	0.6768
2013	0.7003	0.6727	0.6727
2014	0.7000	0.7209	0.7209
2015	0.7017	0.6497	0.6497
Average	0.7301	0.5879	0.5879

Source: Prepared by the authors based on INE data.