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DISTRIBUTION AND PRODUCTIVITY GROWTH: AN EMPIRICAL EXERCISE APPLIED TO SELECTED LATIN AMERICAN

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DISTRIBUTION AND PRODUCTIVITY GROWTH: AN EMPIRICAL EXERCISE APPLIED TO SELECTED LATIN AMERICAN COUNTRIES

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SUMÁRIO

RESUMO

Neste artigo, analisamos, a partir de uma perspectiva estruturalista latino-americana, se o crescimento da produtividade é afetado pelo crescimento da renda e do emprego. Para testar nossa hipótese, escolhemos uma amostra de países da América Latina que representam 86% do produto interno bruto da região. Realizamos um teste econométrico do chamado parâmetro Kaldor-Verdoon e o parâmetro de crescimento do emprego para os países selecionados.

Palavras-chave: crescimento liderado pela demanda, mudança tecnológica endógena, regimes de demanda liderados por salários e lucros, regime de produtividade, estruturalismo latino-americano.

ABSTRACT

In this article we analyze, from a Latin American structuralist perspective, whether productivity growth is affected by growth in income and employment. In order to test our hypothesis, we have chosen a sample of Latin American countries that represent 86% of the region's gross domestic product. We perform an econometric test of the so-called Kaldor-Verdoon parameter and the employment growth parameter for the selected countries.

Key words: Demand-led growth, Endogenous technological change, Wage-led and profit-led demand regimes, Productivity regime, Latin American structuralism

JEL classifications: O4, O3, E3

1. INTRODUCTION

The effect of income distribution on productivity growth is undoubtedly a question of utmost importance for Latin American countries. Partial answers can be found in research stirred by early models such as the seminal work by Bhaduri and Marglin (1990) and applications such as that presented by Bowles and Boyer (1995), who show that aggregate demand and capital accumulation can be either wage- or profit-led, suggesting that there may be different patterns of interaction between real wage growth, productivity growth, and output. In this sense, further developments of the same models came to consider productivity growth as an endogenous variable. Rowthorn (1981), Cassetti (2003), Dutt (2003), Naastepad (2006), and Hein and Tarassow (2010) have introduced models in which income distribution explicitly affects productivity growth. These models set the real wage growth and income growth as explicative variables in relation to the growth in productivity.

On the empirical front, there is a large body of evidence on the relationship between output and productivity growth—the so-called Kaldor-Verdoorn coefficient—for Latin American countries, as in Acevedo et al. (2009), Borgoglio and Odisio (2015), Britto and McCombie (2015), Carton (2009), Destefanis (2002), Libanio (2006), and others.

However, there is still little evidence on the relationship between real wage growth and productivity growth in the region. Following Cassetti (2003), Naastepad (2006), and Hein and Tarasoww (2010), real wage growth gives firms an additional incentive to increase resources dedicated to innovation. In the words of Hein and Tarassow (2010, 735):

> Low unemployment and increasing bargaining power of employees and their labour unions will speed up the increase in nominal and real wages, which will finally generate a rising wage share and hence a falling profit share. This will accelerate firms' efforts to improve productivity growth in order to prevent the profit share from falling.

This argument has strong empirical evidence for developed economies such as Austria, France, Germany, the Netherlands, the United Kingdom, and the United States. We investigate here whether the same can be said of Latin American economies.

While an increase in real wage growth (or employment growth as a proxy for real wage growth) has a positive impact on productivity growth in advanced countries, in Latin American economies this relationship can be negative. As argued by the Latin American structuralist authors, the way productivity is spread in developing countries is quite different from its diffusion in advanced economies. In the Latin American countries, sectors with high and low productivity coexist. This structural heterogeneity among sectors slows down the productivity transmission throughout the economy. As a result, real wage growth (employment growth) might not be significant in econometrics terms, or this relationship can even be negative—profit-led in terms of Lavoie and Stockhammer (2012).

This article is organized as follows. In the second section, we present the main arguments of the Latin American structuralist approach and the difficulties for estimating the wage push coefficient, which means the impact of real wage growth on productivity growth. The discussion contributes to the design of the econometric exercise and to the interpretation of its results. The third section discusses the

Bhaduri and Marglin (1990) post-Kaleckian model with productivity growth in a very simple fashion; the fourth section further discusses regimes of productivity growth; the fifth section presents our econometric experiment, where the objective is to analyze the Kaldor-Verdoorn parameter and the employment growth parameter; and a conclusion summarizes our findings.

2. THE LATIN AMERICAN STRUCTURALIST SCHOOL

The Latin American Structuralist Approach (LASA) is associated with the Economic Commission for Latin America and the Caribbean (ECLAC), especially with Raúl Prebisch's work. Structuralism regards traditional institutions, sociological factors, and particularities of the productive structure as key elements in order to better understand economic systems in terms of their concrete reality.

In his *Manifesto* (1949), Prebisch argues that the international economy is an integrated system whose dynamics are the result of the power relations embedded in a core-periphery hierarchy, and that the fate of Latin American primary goods-exporting economies is explained by the historical development of this international division of labor (Bielchowsky 1998; Missio and Oreiro 2015).

In addition, structuralism identifies the following characteristics in Latin American economies: i) the notion that the economic growth of the region is limited by the import capacity; ii) Latin America has experienced premature urbanization and service-sector expansion; iii) the region has an inefficient agricultural sector and tributary system; and iv) its economies are marked by reduced domestic market size. Hence, for the LASA, economic analysis should rely on the economic structure and target the transformation of such economies.

For Prebisch, one of the consequences of the international division of labor for developing countries is that the productivity gains derived from technological progress do not result in declining prices for industrial goods. Consequently, the periphery faces a deterioration of the terms of trade, exporting primary commodities and importing manufactured goods, and the results are balance of payment deficits and reduced capacity to import capital goods, which are needed to develop the industrial sector (Bianchi and Salviano 1999; Bianchi 2002; Ocampo 2011; Cimoli and Porcile 2013).

The LASA argues that, in countries of the industrialized north, technical progress would spread through the economy faster than in developing economies. In developed countries, labor scarcity and trade unions would push real wages up. Due to real wage increases, firms would have incentives to accelerate innovation and technological progress in order to substitute labor for capital. Thus, in advanced economies, there is a push towards increases in capital intensity, and, along with it, increases in the real wages and in labor productivity (Rodriquez 2009; Bresser-Pereira 2011; Missio and Oreiro 2015). Authors like Naastepad (2006), Storm and Naastepad (2007), Hein and Tarassow (2010), and Storm and Naastepad (2012) found robust econometric evidence in favor of this argument in European and advanced economies.

In the periphery, new technologies are implemented mostly in the primary export sector and a few related activities. Exporting sectors coexist with backward, low-productivity sectors. Thus, such economies have two main characteristics: the growth of productivity is directed towards the primary goods export sector, and the economic structure is heterogeneous in the sense that there is a productivity increase in the primary goods exporting sector while in backward sectors productivity growth is slow. Hence, in the periphery, technical progress does not spread to the whole economy. As a result, the growth of labor productivity is low, leaving little room for increases in real wages (Pinto 1976; Sunkel 1978; Rodriquez 2009; Cimoli and Porcile 2013; Missio and Oreiro 2015).

3. A POST-KALECKIAN MODEL

In post-Keynesian models, economic growth is an endogenous phenomenon. The foundation of these models is based on the theoretical contributions of Nicholas Kaldor, specifically the Cambridge Equation and endogenous economic growth [1]. Kaldor (1956) discusses the technical progress function, in which labor productivity depends on per capita capital growth and on the existence of the relationship between economic growth and the functional income distribution.

Stockhammer (1999), Bertella (2007), and Oreiro (2011) identified three generations of economic growth models in the post-Keynesian tradition. The first generation was developed by Kaldor (1956), Robinson (1956), Kalecki (1954), Harrod (1933), Domar (1946), and Pasinetti (1962). In this generation of models, the income distribution function is endogenous. In this approach, long-run economic growth is induced by investment. Thus, investment will increase if the profit share and/or the profit rate rises.

The second generation was proposed by Kalecki (1969) and Steindl (1952). Therein, the level of capacity utilization adjusts according to changes in savings and investment. Then, real wages' growth has a positive impact on capacity utilization, which triggers investment and then capital growth. The income distribution function is determined by the exogenously given markup level on direct costs.

Finally, the third generation has been presented by Bhaduri and Marglin (1990), Marglin and Bhaduri (1990), Dutt (1984), Naastepad (2006), Stockhammer (1999), and Hein (2014). In this line of models, the major innovation was to consider the degree of capacity utilization and the profit margin as distinct arguments in the investment function, rather than combining the arguments into the investment function. In this way, rising real wages may have a positive impact on the rate of profit (Stockhammer 1999; Bertella 2007; Foley and Michl 1999).

According to Bhaduri and Marglin (1990), an increase in aggregate demand and, therefore, of economic growth, may be achieved by increasing the profit rate and the wage share. The reasoning is that the increasing wage share would lead to a positive effect on consumption, which in turn would again improve capacity utilization and profit rates. The requirement for this mechanism is that the impact on capacity utilization must be higher than the reduction of the profit share. The opposite effect can also occur. Furthermore, the redistribution of income from profits to wages may have an ambiguous effect on aggregate demand and, thus, on economic growth.

The second generation of economic growth models has four major distinctions from the first one. First, prices are influenced by direct costs of production and the degree of monopoly. Second, the marginal costs of production are considered constant until the economy reaches full production capacity. Third, production capacity is not fully utilized. Fourth, the investment function depends on the profit rate and the degree of capacity utilization (Bertella 2007)[2].

The important innovation of the approach proposed by Bhaduri and Marglin (1990) was to consider the degree of capacity utilization and the profit margin as distinct parts in the investment function. Thus, an increase in real wages can have a positive impact in the profit rate (Stockhammer 1999; Bertella 2007).

Bhaduri and Marglin (1990) argue that, in a closed economy without government, an expansion of aggregate demand can be caused by an increase in wage share and/or profit share. Increasing the wage share would cause a positive impact on consumption and increase the use of a firm's capacity utilization, which would in turn increase the profit rate. Indeed, to achieve this outcome, the impact on the capacity utilization must be greater than the impact of the reduction of the profit share in income. On the other hand, the rising wage share in income via higher real wages may increase the production costs, reducing profits, which could reduce investment and thus aggregate demand. The redistribution of income from profits to wages, or otherwise, may have an ambiguous effect on aggregate demand and economic growth.

Bhaduri and Marglin (1990) also analyze the relationship between wages and unemployment. In an open economy, the real wage can be increased due to foreign exchange adjustment, such as appreciation of the exchange rate. Therefore, they use the assumption that real wage rate ($w = W/p$), is an exogenous variable. The authors also adopt other hypotheses, such as: i) a short-term aspect; ii) the *IS* model; iii) consumption and/or investment can expand the aggregate demand; vi) a constant income fraction is saved. It is also assumed that the output (Y) is homogeneous. The capital-potential output ratio is ($b = K/Y^p$), where $Y^p$is assumed as the capital potential output, which is determined by the capital stock on full or normal capacity utilization. Also, u is the capacity utilization rate given by the capital stock. The labor-output ratio is ($a = L/Y$), with both a and b assumed to be constant.

The innovation introduced by Bhaduri and Marglin (1990), i.e., capacity utilization and profit share as separated arguments in the investment function, which creates the possibility of increases in real wages, leads to a rise in profit (r), as can be seen in the following equation:

$$g = \frac{I}{K} = \alpha + \beta u + \tau\pi;\ \alpha, \beta, \tau > 0 \qquad (1)$$

In equation (1), capital accumulation depends on the "animal spirits," the capacity utilization rate, and profit share.

The savings equation can be written in the following form:

$$\sigma = \frac{\sigma_\pi + \sigma_\omega}{pK} = \frac{\sigma_\pi \prod + \sigma_\omega (Y - \prod)}{pK} = [\sigma_\omega(1-\pi) + \ \sigma_\pi \pi]\left(\frac{u}{b}\right) = [\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{u}{b}\right) \quad (2)$$

in which σ_ω is the propensity to save out of wages. This employs the following assumption: $0 \leq \sigma_\omega < \sigma_\pi \leq 1$.

The equilibrium condition is given by:

$$g = \sigma \tag{3}$$

Again, it is possible to achieve the equilibrium rates of capital accumulation, profit, and capacity utilization merging equations (2) and (1) into equation (3), and solving for the equilibrium rates of u^*, g^*, and r^*, which results as follows:

$$u^* = \frac{\alpha + \tau\pi}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta} \tag{4}$$

$$g^* = \frac{(\alpha + \tau\pi)[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{u}{b}\right)}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta} \tag{5}$$

$$r^* = \frac{(\alpha + \tau\pi)\frac{\pi}{b}}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta} \tag{6}$$

The comparative statics is obtained taking the partial derivative of the equations above, first in relation to the propensity to save out of profits and wages as follows: $\frac{\partial u^*}{\partial \sigma_\pi} < 0, \frac{\partial u^*}{\partial \sigma_\omega} < 0, \frac{\partial g^*}{\partial \sigma_\pi} < 0, \frac{\partial g^*}{\partial \sigma_\omega} < 0, \frac{\partial r^*}{\partial \sigma_\pi} < 0, \frac{\partial r^*}{\partial \sigma_\omega} < 0.$

In Bhaduri and Marglin (1990), the paradox of saving holds that increases in the propensity to save out of profit (σ_π) or wages (σ_ω) cause a negative impact on capacity utilization, capital accumulation, and profit rate. The coefficients of the saving and investment functions define the impact of the variation in the profit share on u^*, g^*, and r^*. Depending on this impact, the growth regime may be wage-led or profit-led.

Taking the partial derivative from u^*, g^*, and r^* in relation to profit share (π) renders the following equations:

$$\frac{\partial u^*}{\partial \pi} = \frac{\tau - (\sigma_\pi - \sigma_\omega)\frac{u}{b}}{\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta\}^2} \tag{7}$$

$$\frac{\partial g^*}{\partial \pi} = \frac{[\tau\sigma_\omega + (\sigma_\pi - \sigma_\omega)(\tau\pi - \beta u)]\frac{1}{b}}{\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta\}^2} \tag{8}$$

$$\frac{\partial r^*}{\partial \pi} = \frac{[\alpha + 2\tau\pi - [\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{u}{b}\right)]\frac{1}{b}}{\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta\}^2} \tag{9}$$

A wage-led demand regime is achieved through a low direct effect of profit share on investment (τ) and a substantial difference between the propensity to save out of profits and the propensity to save out of wages. In this case, an increasing wage share would lead to higher consumption, which in turn has a positive impact on the capacity utilization rate, therefore increasing investment. In a profit-led demand regime, the direct effect of profit share on investment, through the parameter (τ), is combined with a low propensity to save out of profits and a higher propensity to save out of wages. In this case, higher profit share would lead to higher investment.

From equation (7), assuming that the stability condition holds, which means that the denominator is bigger than zero, the following equation is obtained: $\frac{\partial u^*}{\partial \pi} > 0$ if: $\tau - (\sigma_\pi - \sigma_\omega)\frac{u}{b} > 0$. In this case, a profit-led demand regime is achieved. Otherwise, $\frac{\partial u^*}{\partial \pi} < 0$ if: $\tau - (\sigma_\pi - \sigma_\omega)\frac{u}{b} < 0$, which means that a wage-led demand regime is reached.

From equation (8), again assuming that the stability condition holds, the following equation is obtained: $\frac{\partial g^*}{\partial \pi} > 0$ if: $[\tau\sigma_\omega + (\sigma_\pi - \sigma_\omega)(\tau\pi - \beta u)]\frac{1}{b} > 0$. Hence, a profit-led capital accumulation growth regime is generated. On the other hand, when $\frac{\partial g^*}{\partial \pi} < 0$ if: $[\tau\sigma_\omega + (\sigma_\pi - \sigma_\omega)(\tau\pi - \beta u)]\frac{1}{b} < 0$.

Therefore, a wage-led capital accumulation growth regime is created. An intermediate regime can be reached when from equation (7) $\frac{\partial u^*}{\partial \pi} < 0$ and from equation (8) $\frac{\partial g^*}{\partial \pi} > 0$. In conclusion, a profit-led regime is achieved if $\frac{\partial u^*}{\partial \pi} > 0$ and $\frac{\partial g^*}{\partial \pi} > 0$, whereas a wage-led regime is obtained if both $\frac{\partial u^*}{\partial \pi} < 0$ and $\frac{\partial g^*}{\partial \pi} < 0$ inequalities hold.

So far, the models described closed economies without government.

Now we turn to an open economy. In order to analyze the effects of variations of the endogenous variables on distribution, imported input prices are assumed as exogenous, as well as the real exchange rate and foreign economic activity. Foreign imports increase competition in the domestic economy, which may lead in turn to reductions in the markup power of domestic firms.

In this post-Kaleckian open-economy model, the new variables are μ, which corresponds to unit raw material and semi-finished product inputs, p_f, the prices of imported foreign goods in foreign currency, and E as the nominal exchange rate. Taking these variables into consideration, the following price equation is reached:

$$p = (1 + m)\big(Wa + p_f E\mu\big), m > 0 \tag{10}$$

The variable γ is defined as the relationship between unit labor costs and unit material costs, as follows:

$$\gamma = \frac{p_f E\mu}{Wa} \tag{11}$$

Thus, it is possible to rewrite the price equation as follows:

$$p = (1 + m)Wa\left(1 + \frac{p_f E\mu}{Wa}\right) = (1 + m)Wa(1 + \gamma) \tag{12}$$

The profit share in this model is given by:

$$\pi = \frac{\Pi}{\Pi + W} = \frac{(1+\gamma)m}{\frac{1}{(1+\gamma)}+1} \qquad (13)$$

In an open economy, the profit share is determined by the markup and the parameter γ.

Assuming that the real exchange rate is an indicator for international competitiveness, the real exchange rate is given by:

$$\theta = \frac{Ep_f}{p} \qquad (14)$$

Increases in θ lead to a positive impact on international competitiveness. Taking the equation (14) in growth rates:

$$\hat{\theta} = \hat{E} + \hat{p}_f - \hat{p} \qquad (15)$$

From equation (15), an increase in the nominal exchange rate and/or in the level of international prices have a positive impact on international competitiveness. On the other hand, increases in domestic prices decrease international competitiveness.

Merging equations (10) and (14), and taking the partial derivative of the real exchange rate, first in relation to markup, second in relation to the nominal wage, and third in relation to the nominal exchange rate, and rearranging the terms, renders $\frac{\partial\theta}{\partial m} < 0$.

A rise in the markup implies an increase in the profit share and a reduction in international competitiveness. From $\frac{\partial\theta}{\partial W} < 0$, nominal wage expansion changes the relationship between labor costs and raw material costs. Thus, a rise in nominal wage implies a decrease in the profit share, which in this case reduces international competitiveness. Finally, from $\frac{\partial\theta}{\partial E} > 0$, an increase in the nominal exchange rate (depreciation) denotes a rise in the profit share and also in international competitiveness.

In order to analyze the distribution and growth in an open economy, the goods market equilibrium is defined as follows:

$$S = pI + pX - Ep_fM = I + NX \qquad (16)$$

where S is total savings, pI the total nominal investment, pX the total nominal export, Ep_fM the total nominal imports, and NX the net exports. The division of equation (6) by the nominal capital stock (pK) renders i) $S/pK = s$; ii) $I/K = g$; iii) $NX/pK = nx$. Assuming that

$$\sigma = g + nx \qquad (17)$$

and also assuming that the Marshall-Lerner condition holds, i.e., that the sum of the absolute values of the price elasticities of exports and imports elasticities exceed 1, the real exchange rate and world income have a positive influence on net export. On the other hand, domestic demand has a negative relationship with net exports.

Summarizing, the net export depends on the real exchange rate (θ); domestic capacity utilization (u) indicating domestic demand; and foreign capacity utilization (u_f) as an indicator for foreign demand. The net exports equation can be expressed as follows:

$$nx = \varsigma_1\theta(\pi) - \varsigma_2 u + \varsigma_3 u_f, \;\; \varsigma_1, \varsigma_2, \varsigma_3 > 0 \tag{18}$$

The stability condition is $\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} - \frac{\partial nx}{\partial u} > 0 \Rightarrow [\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2$.

In this sense, the elasticity of saving is larger than the elasticity of investment and net exports. Merging equations (2), (1), and (18) into equation (17), and solving for capacity utilization, capital accumulation, profit rate, and net of export, the following equations are obtained:

$$u^* = \frac{\alpha + \tau\pi + \varsigma_1\theta(\pi) + \varsigma_3 u_f}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \tag{19}$$

$$g^* = \frac{(\alpha + \tau\pi)[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi + \varsigma_2] + \beta[\varsigma_1\theta(\pi) + \varsigma_3 u_f]}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \tag{20}$$

$$r^* = \frac{(\alpha + \tau\pi + \varsigma_1\theta(\pi) + \varsigma_3 u_f)\frac{\pi}{b}}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \tag{21}$$

$$nx^* = \frac{-\varsigma_2(\alpha + \tau\pi) + [\varsigma_1\theta(\pi) + \varsigma_3 u_f][\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi + \varsigma_2]}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \tag{22}$$

Taking the partial derivative of the equations above in relation to savings out of profit and wages, and in relation to profit share, the following expressions are obtained: $\frac{\partial u^*}{\partial\sigma_\pi} < 0$ and $\frac{\partial u^*}{\partial\sigma_\omega} < 0$; thus the paradox of thrift is revealed, i.e., increases in the propensity to save out of wages or profits lead to reductions in the level of capacity utilization.

From the set of equations above—(19), (20), (21), and (22)—it can be seen that:

$$\frac{\partial u^*}{\partial\pi} = \frac{\tau - (\sigma_\pi - \sigma_\omega)\frac{u}{b} + \varsigma_1\frac{\partial\theta}{\partial\pi}}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \gtrless 0 \tag{23}$$

From equation (23), the relationship between capacity utilization and profit share can be positive or negative. A positive result of equation (23) means that the positive effect related with investment demand (τ) and with net exports ($\varsigma_1\frac{\partial\theta}{\partial\pi}$) is bigger than the reduction in consumption ($(\sigma_\pi - \sigma_\omega)\frac{u}{b}$). In this case, a profit-led regime is obtained. Otherwise, a wage-led demand is reached.

Taking the partial derivative of capital accumulation in relation to saving out profits and wages, it is obtained that $\frac{\partial g^*}{\partial \sigma_\pi} < 0$ and $\frac{\partial g^*}{\partial \sigma_\omega} < 0$. Increasing propensity to save out wages and profits reduces capital accumulation.

In relation to profit share, the following equation can be obtained:

$$\frac{\partial g^*}{\partial \pi} = \frac{\tau\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2\} - \beta(\sigma_\pi - \sigma_\omega)\frac{u}{b} + \beta\varsigma_1\frac{\partial \theta}{\partial \pi}}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \gtrless 0 \qquad (24)$$

The partial derivative of capital accumulation in relation to profit share is ambiguous, and its sign depends on the overall outcome of equation (24). In an open economy, it is less likely that the economy's accumulation and growth are wage-led. The overall outcome for equation (24) depends on the direct effect of the improvement in the profit ($\tau\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2\}$), on the indirect effect of distribution ($\beta(\sigma_\pi - \sigma_\omega)\frac{u}{b}$), and finally, on the indirect effect of international competitiveness through net exports and domestic capacity utilization ($\beta\varsigma_1\frac{\partial \theta}{\partial \pi}$).

A devaluation in the real exchange rate would increase competitiveness, increasing the set of parameters ($\beta\varsigma_1\frac{\partial \theta}{\partial \pi}$), which would make the profit-led accumulation more likely. At the same time, if the income redistribution is in favor of wages, and this in turn is associated with a decrease in the markup pricing, the competitiveness will improve, thus increases in net exports can reinforce a wage-led regime. In the case of profit-led capital accumulation growth and a wage-led demand regime, an intermediary regime takes place.

Taking the partial derivative of the profit rate equation in relation to the endogenous variables renders $\frac{\partial r^*}{\partial \sigma_\pi} < 0$, $\frac{\partial r^*}{\partial \sigma_\omega} < 0$ and $\frac{\partial r^*}{\partial \pi} \gtrless 0$.

The overall outcome for profit rate is the same as in a closed economy, and the analysis applied for the profit share can be easily reproduced.

Taking the partial derivative of the net exports equation in relation to the propensity to save out of profit and wages, where $\frac{\partial nx^*}{\partial \sigma_\pi} > 0$, $\frac{\partial nx^*}{\partial \sigma_\omega} > 0$, the partial derivative of net exports in relation to propensity to save is, not surprisingly, positive. Increases in the propensity to save have a positive impact on net exports through a reduction in the domestic demand.

As for the profit rate and profit share:

$$\frac{\partial nx^*}{\partial \pi} = \frac{\varsigma_1\frac{\partial \theta}{\partial \pi}\left\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta\right\} + \varsigma_2[(\sigma_\pi - \sigma_\omega)\frac{u}{b} - \tau]}{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta + \varsigma_2} \gtrless 0 \qquad (25)$$

The relation between net exports and profit share is ambiguous. Assuming a wage-led regime, the second term in the numerator of equation (25) will be positive: ($\varsigma_2[(\sigma_\pi - \sigma_\omega)\frac{u}{b} - \tau > 0$).

At the same time, it is possible to assume that devaluation in the nominal exchange rate can boost competitiveness. Furthermore, if the effect of capacity utilization on investment is low, the first term of equation (25) can also be positive: ($\varsigma_1 \frac{\partial\theta}{\partial\pi}\left\{[\sigma_\omega + (\sigma_\pi - \sigma_\omega)\pi]\left(\frac{1}{b}\right) - \beta\right\} > 0$).

In this case, a wage-led regime can be verified, and nominal exchange rate devaluation increases competitiveness. Assuming a wage-led regime and that markup pricing is constant, increases in the wage share have a negative impact on net exports, which can reverse the overall result to a profit-led case. Nevertheless, in an open economy, domestic firms might have to reduce markup pricing due to international competition. If this situation increases labor bargaining power, it can reduce prices and thus increase competitiveness.

Summarizing, assuming a wage-led demand regime, the overall result of the model can be ambiguous. It will depend on the power of domestic enterprises to keep the markup constant. If the domestic firms can maintain the level of markup, the overall result might be profit-led, otherwise, wage-led. In a profit-led demand regime, with increasing profit share and devaluation of the nominal exchange rate, assuming that the Marshall-Lerner condition holds, the overall result should be profit-led.

4. PRODUCTIVITY GROWTH APPROACH

Having presented the Bhaduri and Marglin (1990) or the basic post-Kaleckian model, let us now turn to the effects of productivity growth.

The model relates profit-led and wage-led regimes with productivity. Thus, productivity can be considered wage-led in the case where an increase in wages raises productivity, enhancing capital investment; as a result, there is an increase in labor productivity growth. Nevertheless, in the case where real wages increase productivity, enhancing capital investment, the regime is wage-led (Lavoie and Stockhammer 2012, 15).

Considering a developing economy, in which the labor productivity is not spread towards the economy, such economy can be considered productivity growth profit-led, since increasing real wage growth would not have a positive impact on productivity growth.

In the model presented by Hein and Tarassow (2010), the capital accumulation equation considered the growth rate of productivity. Capital accumulation is positively related to profit share, capacity utilization, and productivity growth. The accumulation rate is positive whenever the expected profit rate exceeds the minimum profit rate. In contrast with the previous model (Bhaduri and Marglin 1990), Hein and Tarassow (2010) include the productivity term in the investment equation.

Both Naastepad (2006) and Hein and Tarassow (2010) suggest a simple equation with endogenous productivity growth as follows:

$$\hat{\lambda} = \beta_0 + \beta_1\hat{y} + \beta_2\widehat{w};\ 0 < \beta_1 < 1;\ \beta_{2,} > 0 \qquad (26)$$

in which $\hat{\lambda}$ is the labor productivity growth rate, $\hat{y}$ the real output growth rate, and $\hat{w}$ the real wage growth rate.

The coefficient β_1 is the Kaldor-Verdoorn coefficient, which means that productivity growth is caused by increasing output growth, which, going back to Kaldor's seminal works, can explained by improvements in the division of labour; learning-by-doing; and increasing investment, as new equipment and new methods can both enhance productivity (Storm and Naastepad 2012).

The coefficient β_2 in equation (26) reflects a positive relationship between real wages growth and productivity growth. As argued by the LASA, increases in the real wage raise firms' effort to accelerate innovation and technological progress. Furthermore, Hein and Tarassow (2010) argue that a high employment rate increases workers' bargaining power, leading to a rise in nominal and real wages. Therefore, the wage share rises, causing a reduction in the profit share and hence real wage increases will have a positive impact on productivity growth[3]. In the Hein and Tarassow model, β_2 is positive by definition. Due to their characteristic structural heterogeneity, which determines a backward pattern of productivity growth, this may not be the case for developing economies.

Three important works test equation (26). The first is Naastepad (2006). In this paper, the author tested not only equation (26) but a set of equations to determine whether the Netherlands operates under a wage- or profit-led regime. The second work is Naastepad and Storm (2007), in which the authors perform a similar empirical exercise for a larger sample of developed countries, including France, Germany, Italy, Japan, the Netherlands, Spain, the United Kingdom, and the United States. The third noteworthy empirical exercise was carried out by Hein and Tarassow (2010), who tested the equation for Austria, France, Germany, the Netherlands, the United Kingdom, and the United States.

The results from Naastepad (2006) and Naastepad and Storm (2007) are quite similar. The Kaldor-Verdoorn coefficient estimated in Naastepad (2006), or the parameter β_1, is 0.63, which is close to the estimation for OECD countries performed by León-Ledesma (2002). The wage-push coefficient, β_2, is 0.52. Both coefficients have the expected signs and are highly significant [4].

Considering the terminology used by Lavoie and Stockhammer (2012), the Netherlands can be considered wage-led, since increases in real wage are aligned with enhanced technological progress. Hein and Tarassow (2010) obtained a coefficient for the Netherlands (0.45), which is smaller than that of Naastepad (2006) [5]. The Kaldor-Verdoorn coefficient is smaller when compared with other studies for advanced countries. The authors attribute this difference to the introduction of lagged variables. It is interesting to note, though not surprising, that the wage-push coefficient is positive for all advanced economies, reinforcing the structuralist argument that technological progress spreads evenly throughout these economies and real wage growth has a positive impact on productivity growth.

As emphasized in the introduction, there is robust evidence for the Kaldor-Verdoorn law in relation to Latin American countries; such evidence has been shown by Acevedo et al. (2009), Borgoglio and Odisio (2015), Britto and McCombie (2015), Carton (2009), Destefanis (2002), Oliveira and Lemos (2006), and others.

5. ECONOMETRIC EXERCISE

The aim of this subsection is to compare outcomes for different Latin American countries. In order to do so, the major difficulty is data availability, given that the majority of international databases have a shortage of data in one form or another. Even CEPALSTAT, a database created by the Comisión Económica para América Latina y el Caribe*,* has data only for recent years, which makes comparable statistical analysis impossible. Consequently, proxies were used for some variables. A description of the data can be found in Table 1.

TABLE 1
Description of variables

Variable	Abbreviation	Period	Source
Productivity = GDP per capita, constant local currency	$ln\,\lambda$	Brazil: 1980–2014: Bolivia: 1980–2012; Chile: 1980–2012; Mexico:1989–2014; Venezuela:1981–2014	World Bank national accounts data, and OECD National Accounts data files
GDP = constant local currency	$ln\,y$		World Bank national accounts data, and OECD National Accounts data files
employment rate [7]	$ln\,e$		International Labour Organization, Key Indicators of the Labour Market database. Except Mexico: IMF-WEO

The estimated equation is:

$$\lambda = \beta_0 + \beta_1 y + \beta_2 e;\ 0 < \beta_1 < 1;\ \beta_2 \gtrless 0 \qquad (27)$$

in which λ is labor productivity, y the real output, and e the employment rate [6]. The estimates can be found in Table 2.

TABLE 2
Estimates of productivity equation (27), selected countries

Equation Productivity	Argentina	Brazil	Bolivia	Chile	Colombia	Mexico	Uruguay	Venezuela
Constant	-0.0009 (-0.33)	-0.005 (-0.48)	-0.02 (-2.91)	-0.0009 (-0.11)	-0.005 (-0.86)	-0.006 (-2.56)	0.006 (1.55)	-0.02 (-1.05)
$Dln\ y\ (-1)$	0.59 (4.22)	0.51 (3.07)	0.63 (4.54)	0.74 (6.16)	0.55 (3.49)	0.62 (6.66)	0.62 (3.54)	0.54 (1.86)
$Dln\ e\ (-1)$	0.12 (0.28)	-0.41 (-0.82)	-0.04 (-0.36)	0.40 (3.63)	0.56 (2.92)	-0.43 (-1.35)	0.94 (2.71)	-0.59 (-0.71)
$AR(1)$	Yes	No	No	Yes	Yes	No	No	-
$AR(2)$	No	Yes	No	Yes	No	No	No	-
$MA(1)$	Yes	Yes	No	Yes	Yes	Yes	Yes	-
$MA(2)$	Yes	Yes	No	Yes	No	No	Yes	-
Dummy	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.50	0.26	0.56	0.26	0.19	0.31	0.53	0.19
SE	0.04	0.02	0.01	0.02	0.02	0.01	0.02	-
D.W	1.82	2.14	1.94	2.00	2.10	2.03	2.30	-
F-stat.	6.252	2.76	14.12639	2.45	2.52	408.6	7.80	-
prob>F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
obs.	34	34	32	32	34	33	31	33
Period	1980-2014	1980-2014	1980- 2012	1980- 2012	1980-2014	1981- 2014	1983-2014	1980- 2014

Note: The estimation method was least squares corrected by HAC standard errors and covariance (Bartlett kernel, Newey-West fixed) for Brazil, Chile, Colombia, Uruguay, and Venezuela. The estimation method was least squares corrected by White heteroskedasticity-consistent standard errors and covariance for Mexico. The t-statistics are the numbers in parentheses below each coefficient. SE is the standard error.

D.W. is the Durbin–Watson statistic. F is the F-statistic and prob > F is the probability associated with observing an F-statistic.

The overall estimation presents a high-adjusted R^2. The Durbin-Watson statistic does not suggest any problem with serial correlation. For most of the countries studied, it was not possible to reject the hypothesis of serial correlation and heteroskedasticity, except for Argentina.

For those countries that presented serial correlation and heteroskedasticity, the OLS corrected by the HAC standard errors and covariance (Bartlett kernel, Newey-West fixed) was applied. For Venezuela, we used the robust least squares method. The model *ARMA* was also applied when it was needed. We also applied the KPSS unit roots test on the series to verify whether the series were stationary. For most of the countries, the estimation did not reject the hypothesis that the series are stationary. The table with the tests is reported in the appendix.

The Kaldor-Verdoorn coefficient estimated was (0.59) for Argentina, (0.51) for Brazil, (0,63) for Bolivia, (0.74) for Chile, (0.55) for Colombia, (0.62) for Mexico, (0.62) for Uruguay, and (0.54) for Venezuela. These coefficients are similar to estimations from other studies.

Acevedo et al. (2009) studied the Kaldor-Verdoorn law for different sectors for a panel of 18 Latin American countries for the period 1950–2006. Using disaggregated data, the authors were able to calculate the elasticities of sectoral growth to overall output. Their results suggest not only that the manufacturing sector is one of the drivers of economic growth, but also that some sectors lead growth within the manufacturing industry. Their results also confirm that there is a negligible relationship between primary resource sectors and economic growth, which gives support for the structuralist thesis.

Borgoglio and Odisio (2015), using panel data, estimated the Kaldor-Verdoorn coefficient for Argentina, Brazil, and Mexico. Between 1951 and 1982, the estimated coefficient β_1 was 0.62, and 0.56 between 1983 and 2010. In their words, "Existe fuerte evidencia a favor de la vigencia de la [Law Kaldor Verdoorn] para el conjunto de Argentina, Brasil y México durante las seis décadas que transcurren entre 1950 y 2010 (Borgoglio and Odisio 2015, 205)." Carton (2008) estimated the Kaldor-Verdoorn coefficient for Argentina, Brazil, Chile, and Venezuela and found that β_1 was 0.78 between 1961 and 2005. Libânio (2006), using data for Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Peru, Uruguay, and Venezuela from 1980 and 2006, found the coefficient β_1 to be between 0.64 and 0.69 depending on the estimation method that was implemented. Carton (2009) estimated β_1 to be 0.68 for Brazil, Bolivia, Ecuador, Paraguay, Colombia, Chile, Argentina, Uruguay, and Venezuela.

The employment push coefficient was not significant for the majority of the countries. The exceptions were Chile, Colombia, and Uruguay, which presented a positive and significant coefficient, which indicates a wage-led regime. Nonetheless, for the other countries these parameters were not significant, confirming the Latin American structuralist hypothesis that for Latin American countries productivity does not spread through the economy in the way it does in advanced economies. In this case, employment growth, which is used as a proxy for real wage growth, does not have a positive impact on productivity growth, as is the case in advanced economies.

6. CONCLUSION

This research concludes that the Kaldor-Verdoorn coefficients estimated here are similar to those obtained by other studies, such as those of Borgoglio and Odisio (2015), Britto and McCombie (2015), Carton (2009), Destefanis (2002), and others.

This study shows that the employment push coefficient was not significant for the majority of the countries in the sample. The exceptions are Chile, Colombia, and Uruguay, which showed a positive and significant coefficient, suggesting a wage-led regime. Nevertheless, for the other countries, these parameters were not significant, which is consistent with the LASA hypothesis. In fact, for Latin American economies, a pervasive feature is the fact that the heterogeneity of the productive structure does not tolerate a pattern of technological diffusion similar to what is observed in the economies of industrialized Northern countries. Therefore, a rise in real wage growth (or employment growth) does not have a positive impact on productivity growth.

In Latin American countries, structural heterogeneity indicates that high and low productivity sectors coexist, restricting the spread of productivity gains through the whole economy. One possible path to modify this structure is to increase the proportion of sectors with high productivity in the economy, as pointed out by recent research from the structuralist school.

NOTES

[1] Endogenous growth in the post-Keynesian framework is different from the endogenous growth built in Romer (1986/1990). In Romer, the growth is endogenized by human capital in a typical Cobb-Douglas function in a dialogue with the Solow growth model, in which the technical progress is exogenous. In a post-Keynesian framework, the endogenous growth is related to a demand-led approach in which path dependence is central for growth.

2. Regarding the degree of capacity utilized, the discussion by Bhaduri and Marglin (1990) had previously been made, in some way, by other authors. For instance, Amadeo (1986) argues that, if the level of capacity utilization is endogenous, changes in real wages make the effect regarding functional distribution of income (wages and profits) ambiguous. The author argues that reductions in real wages are not sufficient for the economy to have higher rates of growth. On the other hand, increases in real wages may increase the level of capacity utilization, thus increasing the rate of profit.

[3] In the next chapter, equation (1) will be discussed in more detail.

[4] There are several differences in regard to the estimated equation and applied methods used by these authors. Although the outcomes are reported here, the reader should know that the estimated equation is quite different.

[5] For France 0.54, Germany 0.43, Austria 0.33, UK 0.23, and US 0.11. The wage-push coefficients are: Germany 0.32, France 0.31, Netherlands 0.33, Austria 0.67, UK 0.25, and US 0.36.

[6] This variable is used as a proxy for the variable gross output of the manufacturing industry.

[7] Estimated from series of unemployment as a total percentage of the labor force (national estimate) as 100-unemployment.

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APPENDIX

TABLE A1
KPSS test for the Latin American selected countries

Variables	Argentina t-test	Brazil t-test	Bolivia t-test	Chile t-test	Colombia t-test	Mexico t-test	Uruguay t-test	Venezuela t-test	Critical value			Argentina Result	Brazil Result	Bolivia Result	Chile Result	Colombia Result	Mexico Result	Uruguay Result	Venezuela Result
									1% level	5% level	10% level								
Lnpr	0.615	0.630	0.593	0.653	0.673	0.600	0.704	0.189	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary
Lny	0.646	0.688	0.633	0.661	0.693	0.666	0.717	0.650	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary
Lne	0.282	0.410	0.448	0.235	0.153	0.150	0.153	0.117	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary
dLnpr	0.181	0.453	0.473	0.128	0.302	0.260	0.138	0.177	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary
dLny	0.232	0.178	0.446	0.128	0.142	0.185	0.116	0.124	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary
dLne	0.264	0.358	0.141	0.068	0.126	0.101	0.114	0.165	0.739	0.463	0.347	Stationary	Stationary	Stationary	stationary	Stationary	Stationary	stationary	stationary

TABLE A2
Breusch-Godfrey Serial Correlation LM Test for Latin American selected countries

Equation Productivity	Argentina	Brazil	Bolivia	Chile	Colombia	Mexico	Uruguay	Venezuela
$RESID(-1)$	-0.17 (-0.87)	0.81 (4.55)	0.64 (3.84)	0.78 (4.24)	0.83 (4.90)	1.11 (7.00)	0.78 (5.28)	0.87 (5.02)
$RESID(-2)$	0.14 (0.73)	0.18 (1.00)	0.35 (2.01)	0.25 (1.28)	0.18 (1.03)	-0.12 (-0.76)	0.23 (1.50)	0.11 (0.63)
F-statistic	0.838733	57.96642	27.31700	264.2558	119.3640	153.5934	70.65133	116.2427
Obs*R-squared	1.859144	27.19685	21.41617	31.33966	30.31716	30.24333	26.18238	30.22924
Prob. F(2,29)	0.4425							
Prob. F(2,29)		0.0000						
Prob. F(2,27)			0.0000					
Prob. F(2,28)				0.0000				
Prob. F(2,26)					0.0000			
Prob. F(2,21)						0.0000		
Prob. F(2,26)							0.0000	
Prob. F(2,29)								0.0000
Prob. Chi-Square(2)	0.3947	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adj. R	-0.07	0.77	0.62	0.94	0.87	0.90	0.82	0.87
Durbin-Watson stat	1.98	1.30	1.55	1.05	1.17	1.28	1.13	1.01
Period	1980-2014	1980-2014	1980- 2012	1980- 2012	1980-2014	1988-2014	1983-2014	1980-2014

TABLE A3
Heteroskedasticity Test ARCH for Latin American selected countries

Equation Productivity	Argentina	Brazil	Bolivia	Chile	Colombia	Mexico	Uruguay	Venezuela
RESID^2(-1)	0.05 (0.29)	0.78 (5.68)	0.58 (3.87)	0.71 (5.53)	0.87 (10.51)	0.78 (7.06)	0.45 (2.88)	0.86 (10.29)
F-statistic	0.084635	32.36361	14.99882	30.60653	110.5955	49.94683	8.303480	106.0377
Obs*R-squared	0.089850	16.85509	10.56764	16.16012	25.77519	19.99202	6.861722	25.53490
Prob. F(1,31)	0.7730							
Prob. F(1,32)		0.0000						
Prob. F(1,29)			0.0006					
Prob. F(1,31)				0.0000				
Prob. F(1,31)					0.0000			
Prob. F(1,23)						0.0000		
Prob. F(1,29)							0.0000	
Prob. F(2,31)								0.0000
Prob. Chi-Square(2)	0.7644	0.0000	0.0012	0.0001	0.0000	0.0000	0.0000	0.0000
Adj. *R*	-0.029448	0.49	0.031	0.48	0.77	0.61	0.20	0.76
Durbin-Watson stat	1.99	2.11	1.40	1.59	2.00	1.10	1.99	1.57
Period	1980-2014	1980-2014	1980- 2012	1980- 2012	1980-2014	1988-2014	1983-2014	1980-2014

TABLE A4
Autocorrelation tests for Latin American selected countries

Argentina
Sample: 1980 2014
Included observations: 34

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.17...	-0.17...	1.1755	0.278
		2	0.161	0.134	2.1667	0.338
		3	0.242	0.305	4.4752	0.215
		4	-0.08...	-0.01...	4.7778	0.311
		5	0.267	0.180	7.7965	0.168
		6	-0.02...	-0.00...	7.8273	0.251
		7	-0.07...	-0.14...	8.0515	0.328
		8	-0.03...	-0.21...	8.0956	0.424
		9	-0.03...	-0.03...	8.1424	0.520
		1...	-0.07...	-0.06...	8.4453	0.585
		1...	-0.04...	-0.01...	8.5653	0.662
		1...	-0.04...	0.041	8.6669	0.731
		1...	-0.04...	0.084	8.7626	0.791
		1...	-0.08...	-0.07...	9.2248	0.816
		1...	-0.04...	-0.07...	9.3539	0.858
		1...	-0.07...	-0.09...	9.7028	0.882

Brazil
Sample: 1980 2014
Included observations: 34

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.819	0.819	24.849	0.000
		2	0.705	0.106	43.860	0.000
		3	0.615	0.037	58.789	0.000
		4	0.516	-0.05...	69.638	0.000
		5	0.399	-0.11...	76.368	0.000
		6	0.253	-0.19...	79.168	0.000
		7	0.194	0.121	80.881	0.000
		8	0.115	-0.05...	81.506	0.000
		9	0.061	0.042	81.690	0.000
		1...	0.008	-0.03...	81.693	0.000
		1...	0.025	0.168	81.727	0.000
		1...	-0.00...	-0.13...	81.727	0.000
		1...	-0.02...	0.004	81.766	0.000
		1...	-0.01...	0.004	81.786	0.000
		1...	0.004	0.082	81.787	0.000
		1...	-0.01...	-0.16...	81.807	0.000

Bolivia
Sample: 1 33
Included observations: 32

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.703	0.703	17.366	0.000
		2	0.604	0.216	30.592	0.000
		3	0.548	0.130	41.847	0.000
		4	0.378	-0.18...	47.400	0.000
		5	0.272	-0.07...	50.380	0.000
		6	0.265	0.127	53.321	0.000
		7	0.168	-0.04...	54.554	0.000
		8	0.153	0.061	55.613	0.000
		9	0.067	-0.17...	55.828	0.000
		1...	-0.07...	-0.22...	56.084	0.000
		1...	-0.17...	-0.15...	57.613	0.000
		1...	-0.25...	-0.06...	61.043	0.000
		1...	-0.26...	0.161	65.012	0.000
		1...	-0.33...	-0.15...	71.843	0.000
		1...	-0.31...	0.022	78.100	0.000
		1...	-0.27...	0.003	83.153	0.000

Chile
Sample: 1980 2013
Included observations: 33

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.928	0.928	31.071	0.000
		2	0.841	-0.14...	57.396	0.000
		3	0.778	0.144	80.695	0.000
		4	0.708	-0.13...	100.64	0.000
		5	0.632	-0.02...	117.14	0.000
		6	0.533	-0.25...	129.30	0.000
		7	0.432	-0.02...	137.60	0.000
		8	0.332	-0.15...	142.69	0.000
		9	0.212	-0.19...	144.85	0.000
		1...	0.099	-0.04...	145.34	0.000
		1...	0.010	0.061	145.35	0.000
		1...	-0.08...	-0.10...	145.70	0.000
		1...	-0.17...	-0.05...	147.41	0.000
		1...	-0.25...	0.024	151.25	0.000
		1...	-0.29...	0.150	156.93	0.000
		1...	-0.34...	-0.13...	164.83	0.000

Colombia
Sample: 1980 2014
Included observations: 34

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.894	0.894	29.628	0.000
		2	0.814	0.076	54.982	0.000
		3	0.733	-0.03...	76.214	0.000
		4	0.642	-0.10...	93.015	0.000
		5	0.555	-0.04...	106.03	0.000
		6	0.454	-0.12...	115.05	0.000
		7	0.357	-0.06...	120.84	0.000
		8	0.289	0.078	124.78	0.000
		9	0.221	-0.01...	127.17	0.000
		1...	0.157	-0.03...	128.43	0.000
		1...	0.097	-0.04...	128.94	0.000
		1...	0.022	-0.13...	128.96	0.000
		1...	-0.03...	-0.01...	129.03	0.000
		1...	-0.10...	-0.11...	129.69	0.000
		1...	-0.15...	0.016	131.26	0.000
		1...	-0.22...	-0.13...	134.68	0.000

Mexico
Sample: 1981 2014
Included observations: 33

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.911	0.911	29.962	0.000
		2	0.810	-0.11...	54.412	0.000
		3	0.693	-0.14...	72.897	0.000
		4	0.577	-0.05...	86.146	0.000
		5	0.488	0.101	95.981	0.000
		6	0.406	-0.04...	103.02	0.000
		7	0.349	0.062	108.42	0.000
		8	0.292	-0.06...	112.36	0.000
		9	0.228	-0.09...	114.85	0.000
		1...	0.143	-0.17...	115.88	0.000
		1...	0.043	-0.11...	115.98	0.000
		1...	-0.06...	-0.09...	116.18	0.000
		1...	-0.17...	-0.11...	117.84	0.000
		1...	-0.24...	0.084	121.44	0.000
		1...	-0.31...	-0.16...	127.98	0.000
		1...	-0.38...	-0.10...	137.97	0.000

Uruguay
Sample: 1983 2014
Included observations: 31

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.844	0.844	24.291	0.000
		2	0.753	0.141	44.290	0.000
		3	0.632	-0.11...	58.882	0.000
		4	0.535	-0.01...	69.710	0.000
		5	0.417	-0.10...	76.547	0.000
		6	0.304	-0.09...	80.321	0.000
		7	0.221	0.036	82.409	0.000
		8	0.144	-0.01...	83.336	0.000
		9	0.113	0.096	83.927	0.000
		1...	-0.01...	-0.34...	83.941	0.000
		1...	-0.08...	-0.01...	84.298	0.000
		1...	-0.21...	-0.25...	86.780	0.000
		1...	-0.24...	0.200	90.056	0.000
		1...	-0.29...	-0.04...	95.412	0.000
		1...	-0.38...	-0.25...	104.87	0.000
		1...	-0.40...	0.096	116.29	0.000

Venezuela
Sample: 1980 2014
Included observations: 34

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.907	0.907	30.511	0.000
		2	0.815	-0.04...	55.947	0.000
		3	0.743	0.059	77.764	0.000
		4	0.665	-0.07...	95.831	0.000
		5	0.580	-0.07...	110.05	0.000
		6	0.473	-0.18...	119.85	0.000
		7	0.368	-0.07...	125.98	0.000
		8	0.274	-0.03...	129.50	0.000
		9	0.195	0.027	131.36	0.000
		1...	0.144	0.118	132.41	0.000
		1...	0.077	-0.10...	132.72	0.000
		1...	0.010	-0.03...	132.73	0.000
		1...	-0.07...	-0.21...	133.03	0.000
		1...	-0.12...	0.073	133.95	0.000
		1...	-0.15...	-0.02...	135.52	0.000
		1...	-0.20...	-0.08...	138.43	0.000

TABLE A5
Multiple breakpoint tests for Latin American selected countries

Brazil

Sequential F-statistic determined breaks: 2

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	2.547.826	7.643.477	13.98
1 vs. 2 *	2.577.619	7.732.857	15.72
2 vs. 3	4.232.293	1.269.688	16.83

Break dates:

	Sequential	Repartition
1	2004	1998
2	1988	2005

Chile

Sequential F-statistic determined breaks: 3

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	5.920.593	1.776.178	13.98
1 vs. 2 *	1.108.839	3.326.516	15.72
2 vs. 3	3.336.609	1.000.983	16.83

Break dates:

	Sequential	Repartition
1	1996	1995
2	2004	2004

Colombia

Sequential F-statistic determined breaks: 4

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	4.130.584	1.239.175	13.98
1 vs. 2 *	7.291.999	2.187.600	15.72
2 vs. 3 *	1.157.926	3.473.779	16.83
3 vs. 4 *	2.178.877	6.536.631	17.61

Break dates:

	Sequential	Repartition
1	1994	1989
2	1989	1994
3	2002	2002
4	2009	2009

Uruguay

Sequential F-statistic determined breaks: 2

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	1.050.914	3.152.743	13.98
1 vs. 2 *	6.141.848	1.842.555	15.72
2 vs. 3 *	3.911.080	1.173.324	16.83

Break dates:

	Sequential	Repartition
1	2000	2000
2	2006	2006

Venezuela

Sequential F-statistic determined breaks: 3

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	3.838.828	1.151.648	13.98
1 vs. 2 *	1.773.704	5.321.111	15.72
2 vs. 3	1.259.407	3.778.222	16.83
3 vs. 4	4.755.610	1.426.683	17.61

Break dates:

	Sequential	Repartition
1	1997	1988
2	1988	1997

Argentina

Sequential F-statistic determined breaks: 3

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	5.001.868	1.500.560	13.98
1 vs. 2 *	1.778.415	5.335.245	15.72

Break dates:

	Sequential	Repartition
1	2008	2008

Bolivia

Sequential F-statistic determined breaks: 3

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	4.959.375	1.487.812	13.98
1 vs. 2 *	8.640.235	2.592.070	15.72
2 vs. 3 *	1.265.799	3.797.397	16.83
3 vs. 4	3.688.484	1.106.545	17.61

Break dates:

	Sequential	Repartition
1	2000	1985
2	2010	2000
3	1985	2010

Mexico

Sequential F-statistic determined breaks: 1

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	5.143.959	1.543.188	13.98
1 vs. 2 *	5.207.331	1.562.199	15.72

Break dates:

	Sequential	Repartition
1	1999	1999

Bai-Perron tests of L+1 vs. L sequentially determined breaks; sample: 1960–2011; break test options: Trimming 0.15, Max. breaks 5, Sig. level 0.05; Test statistics employ HAC covariances (Bartlett kernel, Newey-West fixed bandwidth) assuming common data distribution; * significant at the 0.05 level;

** Bai-Perron critical values.