Wage- and profit-led growth regimes: A panel data approach[1]

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Abstract: The extensive empirical effort made in the neo-Kaleckian literature to estimate whether economic growth is wage or profit led has raised important criticisms about the identification strategy used in the empirical models. This paper estimates a panel data model in which country-specific structural characteristics and possible endogenous relationships in the net exports rate and investment function are explicitly take into account. The paper attempts to respect key tenets of the neo-Kaleckian investment function. Hence, the identification strategy is based on several estimates of the stock of capital and the rate of capacity utilization for some developed and developing countries. The main results suggest that the growth regime was wage led in developed countries, while most developing countries exhibited a profit-led growth regime. Interestingly, however, while the profit-led regime occurs through the international trade channel in Latin American developing countries, in other developing countries, the causality channel is mainly related to the domestic investment function.

Keywords: Economic growth; income distribution; panel data.

Resumo: O amplo esforço feito na literatura neo-Kaleckiana para estimar se o crescimento econômico é wage- ou profit-led tem levantado criticas importantes sobre a estratégia de identificação usada nos modelos empíricos. Este artigo estima um modelo de dados de painel em que características estruturais específicas dos países e possíveis relacionamentos endógenos na taxa de exportações liquidas e na função investimento são explicitamente consideradas. O artigo busca respeitar os princípios fundamentais da função investimento neo-Kaleckiana. Assim, a estratégia de identificação é baseada em estimativas do estoque de capital e da taxa de utilização da capacidade para alguns países desenvolvidos e em desenvolvimento. O principal resultado sugere que o regime de crescimento foi wage-led nos países desenvolvidos, enquanto muitos países em desenvolvimento exibiram um regime de crescimento profit-led. Entretanto, enquanto o regime de crescimento ocorre por meio do canal de comércio internacional nos países Latino-Americanos, em outros, em o canal de causalidade esta principalmente relacionado a função de investimento doméstico.

Palavras-chave: Crescimento econômico; distribuição de renda; dados em painel.

Área 6: Crescimento, desenvolvimento econômico e instituições.
JEL Classification: O47; E12; O57.

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1 Introduction

One of the main interesting contributions of the neo-Kaleckian model of growth and distribution is the *theoretical* possibility that economic growth may be guided by the distribution of income in favor of wages (workers) or profits (capitalists), the so-called wage- and profit-led growth regimes.[2] There is a significant branch of the empirical literature seeking to empirically test such a possibility.

Considering the type of identification strategy used in the literature, Blecker (2016) separated most of the empirical effort into two groups: the aggregative and structural approaches. The structural approach estimates each individual component of aggregate demand function separately and then adds the effects together to determine the liquid effect. The aggregative approach relies on the estimation of a reduced form of the aggregate demand function, calculating the regime by computing the partial effects of wage share on output.

Based on a structural approach, Hein and Vogel (2007) estimated this relationship between functional income distribution and economic growth in six developed countries from 1960 until 2005: Austria, France, Germany, Netherlands, the United Kingdom, and the USA. They found mixed results over the period: France, Germany, the UK, and the USA were wage led, whereas Austria and the Netherlands were profit led. In an expanded version of the model, which explicitly considered the role of productivity growth, Hein and Torassow (2009) showed that in countries in which the growth is wage led, an income redistribution to profits not only weakens aggregate demand and GDP growth but, through the Verdoorn effect, also negatively affects productivity growth.

Using a similar structural approach, Stockhammer and Wildauer (2015) reported panel data evidence showing that the domestic demand in 18 OECD countries was wage led. The authors used an empirical model controlling for debt effects. Meanwhile, Kiefer and Rada (2014), using a panel data econometric model covering the period of 1970 to 2012, found that eight in 13 European countries exhibited profit-led demand. They used an aggregative approach, and their results suggest that the empirical evidence remains controversial.

Despite the identification strategy that was used in both studies, the utilization of large panel data models is scarce in the neo-Kaleckian empirical literature, given the difficulty of exploring large homogeneous and reliable cross-country datasets. Hence, most studies have focused on a single-country time series econometric approach.[3]

[2] The term neo-Kaleckian growth model is used to refer to models inspired by Rowthorn (1982), Dutt (1984), and Bhaduri and Marglin (1990).

[3] The empirical literature on wage- and profit-led growth is extensive and fruitful, so a complete description of all initiatives is beyond our scope. See, e.g., Lavoie and Stockhammer (2013) and Blecker (2016) for complete review of the literature.

This extensive empirical effort also raised criticisms about the identification strategies of the models as well the political interpretations of their econometric results. For example, Blecker (2016) argued that the empirical literature is not paying sufficient attention to the time dimension, and that the distinction between short- and long-run effects requires a more detailed treatment. Palley (2013) emphasized the identification problems raised by possible nonlinearities in the specification of the neo-Kaleckian investment function.

Skott (2015) raised a critical issue, arguing that the profit share is not a strictly exogenous variable. Hence, reduced form estimations between income distribution and economic growth are, in general, biased. In the same line, Razmi (2016) argued that this debate is misguided when applied to low-income countries, as it ignores the existence of non-tradable goods and the shortage of capital goods. According to the author, when such aspects are properly accounted for in the model, the likelihood of the occurrence of wage-led regimes vanishes.

The present paper focuses on an empirical treatment for similar endogenous and omitted variables bias problems. We explicitly consider a possible endogenous relation between income distribution, economic growth, and international trade. Using the new Extended Penn World Table (EPWT, v. 6) (Marquetti, 2017), the paper proposes a new identification strategy, mainly based on the Arellano and Bond (1991) approach to panel data. Taking a different route from the previous literature, key tenets of the neo-Kaleckian investment function are respected. Hence, the identification strategy is based on several estimates of the stock of capital and the rate of capacity utilization for 61 countries. This sample is heterogeneous, containing data of developed and developing economies from 1995 to 2014. This heterogeneity raises the possibility of exploring the effect of structural cross-country differences over the growth regimes.

By controlling for possible endogenous relations, the omitted variables bias, and the structural cross-country heterogeneity, the present paper shows that average economic growth was wage led in developed countries over the period. With some exceptions, most developing countries in Latin America and Asia exhibited profit-led growth regimes. Interestingly, however, while in Latin American developing countries the profit-led regimes occur through the international trade channel, in other developing countries, the causality channel is mainly related to the domestic investment function.

The reminder of this paper is organized as follows: The theoretical model, which is based on Badhuri and Marglin (1990), is presented in Section 2. The identification strategy is discussed in Section 3. In Section 4, the main results are discussed as well the economic and political implications of the analysis. Finally, some concluding remarks are presented in Section 5.

2 The theoretical benchmark model

The present section describes a neo-Kaleckian benchmark model based mainly on the seminal work of Dutt (1984), Rowthorn (1984), and Badhuri and Marglin (1990). The model starts by considering an economy in which a capitalist save a fraction $0 < s < 1$ of its gross profits Π, but workers as a class do not save their wage incomes (Foley and Michl, 1999). Hence, the savings function can be written as $S = s\Pi$.

In turn, the investment behavior relates the target rate of growth of capital to the expected rate of profit of entrepreneurs. The central idea is that if entrepreneurs expect a higher rate of profit, their *animal spirits* will be excited, and they will invest more. Mathematically, this post-Keynesian theory of investment can be represented by an equation that relates the level of investment to the actual gross profit. Hence, the investment function, I, is proportional to Π: $I = \eta\Pi$. η is the propensity to invest out of profits.

Both investment and saving functions can be normalized by the capital stock, a steady-state analysis. Hence,

$$\frac{S}{K} \equiv g^S = sr, \tag{1}$$

$$\frac{I}{K} \equiv g^I = \eta r. \tag{2}$$

Marglin and Badhuri (1990) noted that we can decompose the profit rate, r, into three components: the profit-share, π, the rate of capacity utilization, u, and the output–capital ratio at full capacity, ρ, so that $r = \pi u \rho$. In order to solve the investment and savings demand equations for the equilibrium level of capacity utilization, we can suppose a linear form of (2):

$$g^I = \eta + \eta_\pi \pi + \eta_u u + \eta_\rho \rho, \tag{3}$$

where η can be interpreted as the autonomous investment, η_π is the sensitivity of investment to variations in profit share, η_u is the impact of capacity utilization on investment, and η_ρ is the sensitivity of investment to variations in the output–capital ratio at full capacity. (1) and (3) form the Keynesian equilibrium condition in a closed economy.

In an open economy, however, savings must be equal to planned investment plus net exports, NX. Thus, $S = I + NX \equiv I + EX - M$, where EX is the exports and M the imports. Normalizing the net exports by the capital stock, $b = {NX}/{K}$, the Keynesian equilibrium condition for an open economy is equal to

$$g^S = g^I + b. \qquad (4)$$

Following Hein and Vogel (2007), Blecker (1989), and Badhuri and Marglin (1990), we suppose that the net export rate is positively affected by international competitiveness. The Marshall–Lerner condition is supposed to hold, and the sum of the price elasticities of exports and imports exceeds unity. Hence, the real exchange rate, e_R, positively affects the net exports rate. In addition, it is supposed that domestic demand, moving in line with the rate of capacity utilization, negatively affects the net exports rate. Hence, a linear form of the net exports rate can be written as follows:

$$b = \theta_e e_R(\pi) - \theta_u u, \qquad (5)$$

where $\theta_e, \theta_u > 0$. In addition, note that the real exchange rate is related to the profit share of income. The reasoning for this relationship lies in the relation between prices, distribution, and international competitiveness (see, e.g., Hein and Vogel, 2007; Blecker 1989).

Using (5), (3), and (1) under the definition of the profit rate, *r*, in the Keynesian equilibrium condition (4), we can solve for the short equilibrium value of *u:*

$$u^* = \frac{\eta + \eta_\pi \pi + \eta_\rho \rho + \theta_e e_R(\pi)}{s\pi\rho - \eta_u + \theta_u}, \qquad (6)$$

where the Keynesian short-run stability condition is supposed to hold. This means that the equilibrium value for *u* will be stable provided that the denominator of (6) is positive. Differentiating the equilibrium condition with respect to π to measure the effect of changes in functional income distribution on *u*, we have

$$\frac{\partial u^*}{\partial \pi} = \frac{\eta_\pi + \theta_e e_R'(\pi) - s\rho u}{s\pi\rho - \eta_u + \theta_u}. \qquad (7)$$

While in a closed economy an increase in the profit share decreases the utilization rate, in an open economy, the sign of (7) remains ambiguous. Using the equilibrium value of *u* in (7), it can be seen that the signal will depend on the effect of profit share on the net exports rate, $\theta_e e_R'(\pi)$. The direction of the latter depends on the source of redistribution and can be either negative or positive (as discussed in detail by Hein and Vogel (2007)).

Using (6) in (3), the neo-Kaleckian equilibrium rate of accumulation, *g*, assuming no depreciation, is given by

$$g^* = s\pi\rho\left[\frac{\eta+\eta_\pi\pi+\eta_\rho\rho+\theta_e e_R(\pi)}{s\pi\rho-\eta_u+\theta_u}\right]. \tag{8}$$

In turn, the effect of a change in profit share on the rate of accumulation is equal to

$$\frac{\partial g^*}{\partial \pi} = s\frac{\partial r}{\partial \pi} \equiv s\left[\left(\eta_\pi + \theta_e e_R'(\pi)\right)\pi - (\eta_u - \theta_u)u\right]\frac{\rho}{s\pi\rho-\eta_u+\theta_u}. \tag{9}$$

Note that the effect of changes in profit share on the rate of accumulation depends solely on the effects of profit share on the profit rate. In turn, the latter depends on the signal of the numerator of (9), $\varphi \equiv \left(\eta_\pi + \theta_e e_R'(\pi)\right)\pi - (\eta_u - \theta_u)u$. If $\varphi > 0$ is positive, the growth regime is called profit led. Otherwise, if $\varphi < 0$, the growth regime is called wage led. Interestingly, the causality channel for this result may be heterogeneous. For example, even when the investment rate is wage led, economic growth may be profit led if the effects of changes in profit share on the net trade rate are positive and relatively high. By examining the limit cases, we also note the following:

If $\eta_\pi = 0$, we see that

$$\lim_{\eta_\pi \to 0}\frac{\partial g^*}{\partial \pi} < 0 \leftrightarrow \theta_e e_R'(\pi)\pi - (\eta_u - \theta_u)u < 0.$$

If $\eta_u = 0$, on the other hand,

$$\lim_{\eta_u \to 0}\frac{\partial g^*}{\partial \pi} > 0 \leftrightarrow \left(\eta_\pi + \theta_e e_R'(\pi)\right)\pi + \theta_u u > 0.$$

Hence, the impact of a change in profit share on economic growth depends on the coefficients of the investment function and the net trade rate, leading to the distinction between wage-led and profit-led growth regimes.

3 The identification strategy

The empirical strategy is utilized to correctly identify the investment function and net exports rate parameters in (9). Using a balanced panel data, the paper estimates two separate linear functional forms: one investment function (3) and one net exports rate (5). In this sense, the strategy is similar to a structural approach (Blecker, 2016). The empirical form of (3) and (5) can be written, respectively, according to the following equations:

$$g^I{}_{it} = \mu_i + \gamma_t + \eta_\pi\pi_{it} + \eta_u u_{it} + \eta_\rho\rho_{it} + \epsilon_{it}, \tag{10}$$

$$b_{it} = \beta_i + \delta_t + \alpha_\pi \pi_{it} - \theta_u u_{it} + \varepsilon_{it}. \quad (11)$$

In (10), γ_t can account for the effect of technological progress (modeled as a set of temporal dummies); μ_i is the country-specific effect, which controls the parameters for all the structural characteristics that are fixed over 1995 and 2014; and ϵ_{it} is the idiosyncratic perturbation term that varies among countries and time. All the other parameters and variables retain their previous interpretations. In turn, ε_{it} is the stochastic term in (11), while β_i stands for the country fixed effect. δ_t is a set of temporal dummies that are capturing all the global effects in time, as the changes of global income. In this regard, since the global income, which obviously may affect international trade, is not changing among the countries, its marginal effects are algebraically the same as those captured by the set of temporal dummies. Following Hein and Vogel (2007), we model the effects of changes in profit share on the net exports rate in (11). Thus, α_π is used to estimate $\theta_e e_R'(\pi)$ in (9).

Regarding the consumption function, which is estimated in some empirical models (Hein and Vogel, 2007), a comment is in order. The assumption that workers as a class consumed their whole wage does not, of course, rule out the possibility that individual workers might save. According to Foley and Michl (1999), this classical view amounts to the assumption that the saving of some workers is matched by the dissaving of others. For empirical purposes, this rules out the possibility to estimate the direct effect of changes in profit share on consumption in aggregate demand. Therefore, the paper omits an explicit consumption function. Despite this theoretical basis, the reason is also empirical and is related to the difficultly of obtaining compatible and reliable data on consumption for the 61 countries of the sample. However, note in (8) that the paradox of thrift continues to hold in the model.

The main issue in (10) and (11) is how to model the specific effects of each country. Two techniques were used to address this. The first considers these effects as fixed, and a fixed effect (FE) estimator is used. In the second, given the possible endogeneity of the investment function, a Generalized Method of Moments (GMM) estimator is used. The first approach estimates the FE model via dummies, similar to Islam (1995), who uses a country-specific effect to allow for its correlation with other explanatory variables. FE models are also helpful for minimizing problems due to the omitted variable bias, such as the structural characteristics of low-income countries, as recognized by Razmi (2016).

The identification hypothesis from the FE model in (10) is as follows: the absence of a serial correlation between the idiosyncratic error and the explanatory variables plus the fixed effect, strict exogeneity, is $FE1{:}\, E\left[\epsilon_{it} \middle| x_{ij}, \mu_i\right] = 0$. Full rank, the variable vector x, must have an inverse $FE2{:}\, rankE[x_{ij}{}' x_{ij}] = k$. Finally, homoscedasticity between individuals in cross-sections is assumed. However, this hypothesis is related to the correlation among the error terms in time, or

$FE1: E\left[\epsilon_{it}\epsilon_{it}'\middle|x_{ij},\mu_i\right] = \sigma^2\epsilon I_t$. The same identification hypothesis must hold for the FE model estimated using (11). In general, details from FE models are very well known (see, e.g., Greene (2000) and Wooldridge (2002)).

The second estimator uses instrumental variables to control for a possible endogenous effect in (10). As discussed above, a similar point was raised by Skott (2015), who argued that the profit share is not a strictly exogenous variable. In fact, the existence of a possible *endogenous* relation between variations in economic growth and income distribution is an empirical characteristic frequently ignored in the literature. The point is that it does not logically follow from a particular theoretical specification, which supposes a certain degree of *exogeneity* of income distribution, that its functional form will obey the *strict exogeneity* assumption required for the consistent estimation of econometric models. It is clear that an empirical estimation of an investment function in the presence of endogenous variables is no longer valid for the parameters of interest.

The endogeneity issue is more complex than usually supposed, as its economic sense of *causality* assumes different meanings with regard to the econometric technique adopted. In mostly time series non-stationary approaches, for instance, the meaning of causality is limited to *temporal precedence*. This is not the interpretation that an eventual manipulation of the *cause* changes the *effects*, as in robust panel data and microeconometrics models. Hence, even without going further in an eventual Lucas's critique, the endogeneity *per se* challenges most results, and even the policy recommendations in this strand of literature.

From a technical perspective, if the time is long enough in the regression, the FE model would not report a biased estimation. However, in the present instance, the period is from 1995 to 2014, and thus it may be influenced by endogeneity. A GMM estimator from Arellano and Bond (1991) is used to account for this possible effect.

3.1. Sample and data

The main data source is the new Extended Penn World Tables (EPWT v. 6.0) (Marquetti, 2017). It is organized using the Penn World Table (PWT v. 9) (Feenstra et al., 2015) and other resources. The EPWT presents homogeneous data for a large number of countries for the years between 1967 and 2014. However, the methodological procedure for computing some of the EPWT variables is subject to criticisms, which are discussed in the respective documentation.[4]

From the EPWT, we use the gross domestic product (GDP), *X*, the standardized fixed capital stock, *K*, and the investment, *I*, with all variables expressed in purchasing power parity (PPP) in 2011

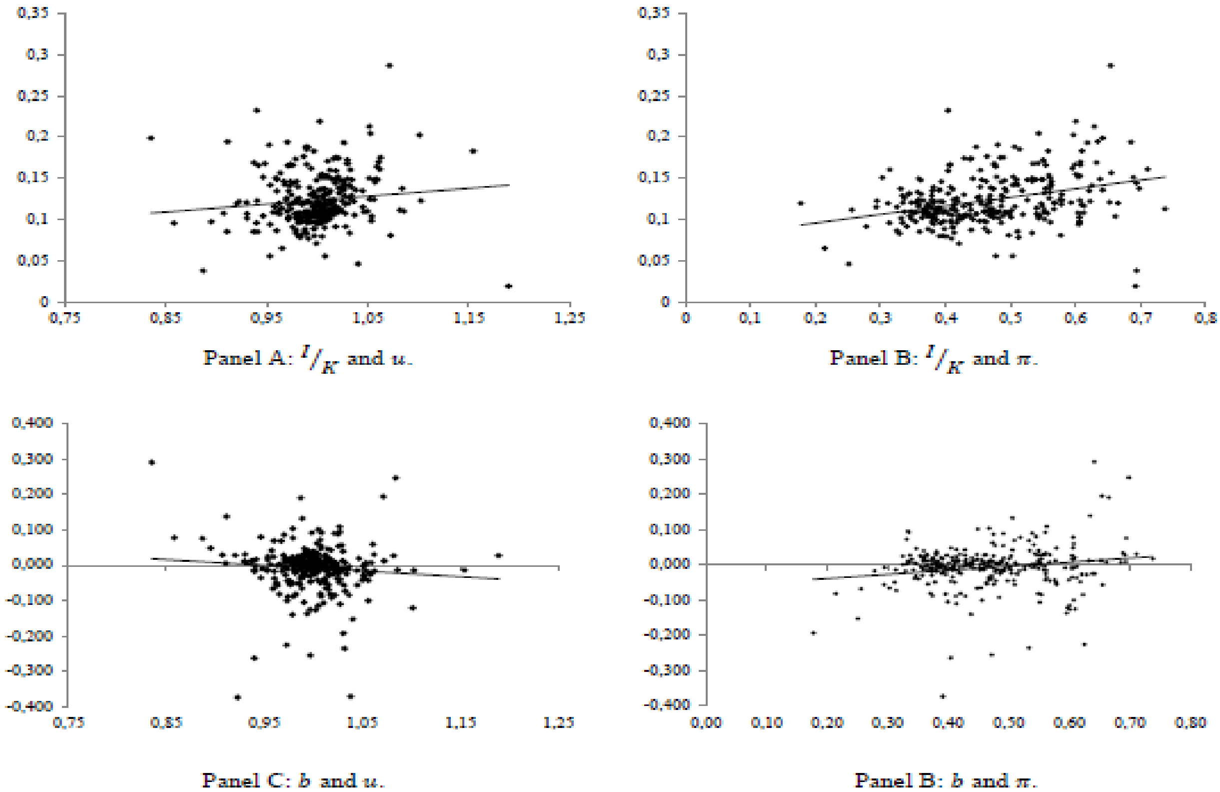
[4] The EPWT consist of two parts, a document in Word with the definition and methodological procedure for the computation of each variable and an Excel file with the data.

international dollars. The standardized fixed capital stock is computed using the perpetual inventory method.

Reliable data for capacity utilization over longer periods of time is difficult to obtain for cross-country analysis. The paper uses the Hodrick–Prescott filter to estimate the potential output, X_p, for each country between 1964 and 2014. Hence, from the HP filter we compute the rate of capacity utilization, $u = {}^{X}/_{X_p}$, and the output-capital ratio, $\rho = {}^{X_p}/_{K}$, at full capacity. This procedure for estimating the capacity utilization is not free of criticisms. Appendix A shows the estimation of the rate of capacity utilization using distinct time series filters.

The data on labor share in GDP and the exchange rate, e_R, is from the PWT. The real exchange rate is calculated as the ratio between the nominal exchange rate and the purchasing power parity conversion factor, the same as the EPWT. Some annual observations of the labor share are repeated or inconsistent in the PWT, so we excluded these countries from the analysis. We calculate the profit share, π, as one minus the labor share. Regarding the net trade balance, the data source is World Bank (2018).

Figure 1: Investment rate, net exports rate, profit-share, and capacity utilization.



Source: EPWT, PWT, and World Bank.

The main panel is comprised of 61 countries from 1995 to 2014, being strongly balanced. The sample starts in 1995 due to several problems with past estimation of the labor share in the PWT. To avoid complications with non-stationary time series, the paper uses five cohorts: 1995, 2000, 2005, 2010, and 2014. All the level variables are included in the model as five-year averages of the previous years of the cohort. Therefore, the focus of the analysis is the long run.

Figure 1 plots the rate of capacity utilization and the profit share in relation to the investment–capital ratio and the net exports rate for the whole sample. While there is a clear positive association of functional distribution and capacity utilization with the investment rate, the relationship with net exports rate is difficult to infer.

Table 1: Subsamples of countries.

Subsample	Countries
A	Argentina, Australia, Austria, Belgium, Bolivia, Brazil, BurkinaFaso, Burundi, Canada, Chad Chile, China, ChinaHongKongSAR. Colombia, CostaRica, Cyprus, Denmark, Ecuador, Egypt, Finland, France, Germany, Greece, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Luxembourg, Mauritius, Mexico, Morocco, Namibia, Netherlands, NewZealand, Niger, Nigeria, Norway, Panama, Peru Philippines, Portugal, RepublicofKorea, Senegal, Singapore, SouthAfrica, Spain, SriLanka, Sweden, Switzerland, Thailand, TrinidadandTobago, Tunisia, Turkey, UnitedKingdom, United States, Uruguay, Venezuela.
B	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.
C	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Jamaica, Mexico, Panama, Peru, Uruguay, Venezuela, Trinidad and Tobago.
D	China, ChinaHongKongSAR, India, Indonesia, Iran, Philippines, Republic of Korea, Singapore, South Africa, Thailand, Tunisia, Turkey.

The advantage of using panel data is the possibility to design different subsamples in search of more structural homogeneity among countries. The paper uses four groups of countries: Subsample A is composed of all the sample countries; Subsample B is composed of the 23 available developed countries. Subsample C is composed of the 14 developing Latin American countries. Finally, subsample D is composed of the other 12 developing countries, mostly in Asia. Table 1 describes the corresponding countries in each subsample.

4 Results and discussion

This section presents the results in stages. First, we discuss the results related to the investment function estimated from (10). Next, we present the results for the net exports rate estimated from (11). Then, we compute a country-specific estimate to verify whether average economic growth was wage or profit led in the period.

Table 2 presents the results for the investment function in all the countries of the sample using the FE model and Arellano–Bond estimator. The output–capital ratio at full capacity is statistically significant in all four models. The same is true for the rate of capacity utilization. In both cases, it is clear that the estimated parameter is relatively stable in each model. The Arellano–Bond model seems to improve the identification of the parameters.

It is interesting to note that the profit share is not statistically significant in the FE model. Its signal is unstable. When eventual endogenous effects are take into account in the Arellano–Bond estimator, the parameter turns statistically significant only in the model without time dummies. However, when aggregate time series trends are included in the model, the positive effect of profit share on the investment function vanishes. In other words, the omitted variables bias from failing to control for year is positive due to the aggregate rising trends in profit share and investment rate in most countries of the sample in the studied period.

Table 2: The empirical investment function for the whole country sample, 1995–2014.

Dependent variable: I/K	**Fixed effects**	**Fixed effects**	**Arellano-Bond**	**Arellano-Bond**
u	0,1493 (3,39)	0,1607 (4,67)	0,2579 (7,86)	0,2191 (4,45)
π	0,077 (0,91)	-0,1792 (-0,17)	0,2016 (3,43)	0,0859 (1,24)
ρ	0,054 (2,24)	0,057 (2,71)	0,051 (4,72)	0,071 (7,07)
Time dummies	No	Yes	No	Yes
Adjustment*	0,2821	0,2590	127,83	240,02

Source: Author's calculation.
t-statistic and z-statistic between parenthesis. * R^2 in the case of FE model and Wald test in the case of Arellano-Bond.

From Table 2, we can thus conclude that the average domestic investment rate in the countries in the full sample of countries was wage led in the studied period. This result does not, of course, rule out the possibility that individual countries might have been profit led. However, even controlling for country-specific effects and endogeneity, this result is still overly aggregate.

Table 3 presents results for subsample B, which consists only of developed countries. The output–capital ratio at full capacity is statistically significant in all four model, and its elasticity is higher than that of the full sample in Table 2. The rate of capacity utilization is also statistically significant in all four models, and its elasticity is stable and relatively greater than in subsample A. Again, the Arellano–Bond estimator with time dummies improved the results.

In turn, the profit share was not statistically significant. Its elasticity was negative, even when eventual endogenous effects are accounted for in the model. When aggregate time series trends are included in the specification, the elasticity of the profit share is close to zero, but it remains statistically not significant. Based on these results, the evidence in Table 3 suggests that the average domestic investment function was wage led in developed countries between 1995 and 2014.

Table 3: The empirical investment function for subsample B (developed countries), 1995–2014.

Dependent variable: I/K	**Fixed effect**	**Fixed effect**	**Arellano-Bond**	**Arellano-Bond**
u	0,3220 (5,70)	0,3528 (6,49)	0,4111 (14,88)	0,3215 (3,12)
π	-0,1506 (-1,31)	-0,077 (-0,69)	-0,1428 (0,69)	-0,005 (-0,05)
ρ	0,1876 (4,36)	0,2041 (4,93)	0,1312 (2,18)	0,1445 (2,76)
Time dummies	No	Yes	No	Yes
Adjustment	0,2395	0,3310	251,11	252,02

Source: Author's calculation.
t-statistic and z-statistic between parenthesis. * R^2 in the case of FE model and Wald test in the case of Arellano-Bond.

The results for the estimation of the investment function for Latin American developing countries are presented in Table 4. The output–capital ratio at full capacity is not statistically significant in the Arellano–Bond model. Meanwhile, the rate of capacity utilization remains statistically significant in all four models. Its elasticity is relatively stable and improved when possible endogenous effects are controlled for in the regression.

The empirical signal of the profit share is positive and statistically significant in the two models that do not control for the aggregate time series trends. When time dummies are included in the models, the parameters turn negative, even in the model that controls for possible endogenous relations. However, both models fail to obtain statistically significance. Based on this evidence, we cannot reject the possibility that the average domestic investment function in Latin American developing countries was wage led in the studied period.

Table 4: The empirical investment function for subsample C (Latin American developing countries), 1995–2014.

Dependent variable: I/K	**Fixed effect**	**Fixed effect**	**Arellano-Bond**	**Arellano-Bond**
u	0,1715 (2,92)	0,1871 (3,01)	0,2395 (4,10)	0,2356 (3,09)
π	0,1728 (2,14)	-0,0024 (-0,04)	0,3003 (1,72)	-0,0253 (-0,15)
ρ	0,1523 (3,41)	0,1751 (5,14)	0,0873 (0,87)	0,1558 (1,87)
Time dummies	No	Yes	No	Yes
Adjustment	0,3291	0,3535	51,27	145,77

Source: Author's calculation.
t-statistic and z-statistic between parenthesis. * R^2 in the case of FE model and Wald test in the case of Arellano-Bond.

The results are relatively different in subsample D, which includes other developing countries, mostly in Asia. Table 5 presents the empirical investment function for these countries. The output ratio at full capacity fails to achieve statistical significance in either of the Arellano–Bond models. The rate of capacity utilization is not statistically significant in the Arellano–Bond model with time dummies. In both cases, for ρ and u, the elasticity associated with each variable is relatively stable. This non-significance is probably related to the size of the sample—60 observations in this case.

Interestingly, however, the profit share is statistically significant in all four models at the conventional critical values. Its parameter is relatively stable in both regressions, which suggests that possible endogenous effects are relatively weak in this subsample. The parameter remains relatively stable even when the aggregate time series trend is included in the specification. Unlike all the previous subsamples, the average domestic investment function is profit led in subsample D.

Table 5: The empirical investment function for subsample D (other developing countries), 1995–2014.

Dependent variable: I/K	**Fixed effect**	**Fixed effect**	**Arellano-Bond**	**Arellano-Bond**
u	0,1722 (2,13)	0,1239 (1,77)	0,1998 (2,16)	0,1371 (1,52)
π	0,3159 (3,33)	0,3590 (1,98)	0,3657 (2,88)	0,3410 (1,85)
ρ	0,1437 (3,18)	0,1408 (2,70)	0,1213 (1,59)	0,1786 (1,57)
Time dummies	No	Yes	No	Yes
Adjustment	0,06	0,06	187,86	107,08

Source: Author's calculation.
t-statistic and z-statistic between parenthesis. * R^2 in the case of FE model and Wald test in the case of Arellano-Bond.

Turning the focus to international trade, Table 6 presents the results of the regressions using the Arellano and Bond (1991) model for the net exports rate. All regressions include the time dummies as a measure of the effect of changes in the global economy on the net exports rate. In the theoretical model, net exports are positively affected by the real exchange rate and negatively affected by the domestic rate of capacity utilization. The real exchange rate, in turn, is dependent on the profit share, whose signal is theoretically ambiguous. Now, we can empirically compute all these relations.

The model fails to obtain statistical significance for the net exports rate in subsample A, which is, in fact, too aggregate. The reasons can be inferred from Figure 1 above, in which no apparent relationship can be observed. Hence, based on the results in Table 2 and 6, the average economic growth in these countries was characterized by a wage-led regime. Again, this result is still overly aggregated to serve as a reliable general conclusion.

Table 6: Arellano–Bond regressions on the net exports rate, 1995–2015.

Dependent variable: *b*	**Subsample A**	**Subsample B**	**Subsample C**	**Subsample D**
u	-0,0169 (-0,12)	-0,0674 (-0,73)	-0,1682 (-0,14)	-0,0403 (-2,66)
π	0,1904 (0,77)	0,3623 (2,03)	(0,5816) (2,13)	-0,1353 (-2,00)
Time dummies	Yes	Yes	Yes	Yes
Wald test	6,56	69,23	44,82	251,47

Source: Author's calculation.
t-statistic and z-statistic between parenthesis.

The model predicts that the rate of capacity utilization does not affect the net exports rate in developed and Latin American developing countries. Interestingly, the net exports are positively affected by the profit share in both subsamples, B and C. The elasticity associated with the profit share is higher in Latin American developing countries than in developed ones.

In the case of subsample D, the model predicts that both the rate of capacity utilization and the profit rate negatively affect the net exports rate in the studied period. However, the net exports respond relatively more to variations in the profit share. The negative signal associated with the profit share can be explained by the relationship between prices, distribution, and international competition in the neo-Kaleckian open economy model. In general, if a change in income distribution is caused by a change in the mark-up rate in these countries, we may observe an inverse relationship between the profit share and international competitiveness.

The average effect of changes in profit share on the economic growth can now be calculated using the parametric results obtained from Tables 3, 4, 5, and (6) in the numerator of Equation (9). In order to do that, we compute the numerator of (9) as follows:

$$\bar{\varphi}_i \equiv (\hat{\eta}_\pi + \hat{\alpha}_\pi)\bar{\pi}_i - (\hat{\eta}_u - \hat{\theta}_u)\bar{u}_i, \tag{12}$$

where the emphasis, $\hat{\eta}_\pi$, indicates that the parameter is estimated, while the bar, $\bar{u}_i$, indicates that we are using the average values of the respective variable over time. We use the parameters estimated by the Arellano–Bond model with time dummies, which controls for endogeneity and the aggregate time series trends. Each parameter is used only if it is statistically significant; otherwise we are unable to reject the null hypothesis. In other words, we cannot reject the possibility that the parameter is equal to zero.

Table 7 shows the results for subsample B of developed countries. The estimated signal in (12) was negative. The result indicates that the average economic growth was wage led in the studied period. In terms of the empirical literature, this result is in line with Onaran and Galanis (2012, 2013). The authors used data on 16 of the G20 countries and found that all countries in their sample, including the US and Japan, had wage-led growth regimes. The present result is in line with the general structural approach studies showing that the larger European countries and the Euro area as a whole are mainly characterized by wage-led growth. Some studies, however, often reach opposite conclusions about the US and Japan. For example, Storm and Naastepad (2012) found that the growth regimes in Japan and the US were profit led. The present result, however, focuses on the long run and finds that both countries were characterized by wage-led growth regimes between 1995 and 2014.

Table 7 – Estimated growth regimes in Subsample B (Developed countries).

Country	$(\hat{\eta}_\pi + \hat{\alpha}_\pi)\bar{\pi}_i$	$(\hat{\eta}_u - \hat{\theta}_u)$	$\bar{\varphi}_i$	**Growth Regime**
Australia	0,1528	0,3206	-0,1677	Wage-led
Austria	0,1459	0,3223	-0,1763	Wage-led
Belgium	0,1358	0,3221	-0,1863	Wage-led
Canada	0,1355	0,3202	-0,1847	Wage-led
Denmark	0,1303	0,3211	-0,1908	Wage-led
Finland	0,1455	0,3183	-0,1728	Wage-led
France	0,1372	0,3212	-0,1840	Wage-led
Germany	0,1323	0,3227	-0,1903	Wage-led
Greece	0,1728	0,3205	-0,1477	Wage-led
Ireland	0,1859	0,3180	-0,1320	Wage-led
Israel	0,1552	0,3223	-0,1671	Wage-led
Italy	0,1673	0,3217	-0,1544	Wage-led
Japan	0,1347	0,3233	-0,1886	Wage-led
Luxembourg	0,1389	0,3226	-0,1837	Wage-led
Netherlands	0,1388	0,3212	-0,1824	Wage-led
NewZealand	0,1626	0,3207	-0,1581	Wage-led
Norway	0,1653	0,3198	-0,1545	Wage-led
Portugal	0,1327	0,3217	-0,1890	Wage-led
Spain	0,1350	0,3211	-0,1861	Wage-led
Sweden	0,1651	0,3203	-0,1552	Wage-led
Switzerland	0,1237	0,3214	-0,1977	Wage-led
UnitedKingdom	0,1379	0,3201	-0,1822	Wage-led
UnitedStates	0,1390	0,3206	-0,1816	Wage-led

Source: Author's calculation.

The results for subsample C, which includes Latin American developing countries, are presented in Table 8. The results indicate that the average growth of these countries in the studied period were profit led. However, this result is explained by the positive effect that the profit share had on the net exports rate, as its effects on the domestic investment function were negative (both economies are domestically wage led). The result is irrespective to the size of the economy or the degree of openness.

Table 8 – Estimated growth regimes in Subsample C (Latin-American developing countries).

Country	$(\hat{\eta}_\pi + \hat{\alpha}_\pi)\bar{\pi}_i$	$(\hat{\eta}_u - \hat{\theta}_u)$	$\bar{\varphi}_i$	Growth Regime
Argentina	0,3234	0,2367	0,0866	Profit-led
Bolivia	0,2839	0,2362	0,0477	Profit-led
Brazil	0,2679	0,2356	0,0322	Profit-led
Chile	0,3213	0,2371	0,0843	Profit-led
Colombia	0,1875	0,2361	-0,0486	Wage-led
CostaRica	0,2254	0,2360	-0,0106	Wage-led
Ecuador	0,3217	0,2358	0,0859	Profit-led
Jamaica	0,2478	0,2369	0,0109	Profit-led
Mexico	0,3256	0,2358	0,0898	Profit-led
Panama	0,3359	0,2363	0,0996	Profit-led
Peru	0,3832	0,2348	0,1484	Profit-led
Uruguay	0,2915	0,2367	0,0548	Profit-led
Venezuela	0,3443	0,2356	0,1087	Profit-led
Trinidad and Tobago	0,3511	0,2319	0,1192	Profit-led

Source: Author's calculation.

Two Latin American developing countries reported in Table 8, however, had an average growth regime characterized by a wage-led regime: Colombia and Costa Rica. In these countries, the average profit share in income was relatively low, about 32% and 38%, respectively. These levels of profit share are similar to the average in developed countries.

Table 8 – Estimated growth regimes in Subsample D (Other developing countries).

Country	$(\hat{\eta}_\pi + \hat{\alpha}_\pi)\bar{\pi}_i$	$(\hat{\eta}_u - \hat{\theta}_u)$	$\bar{\varphi}_i$	Growth Regime
China	0,0829	0,0403	0,0426	Profit-led
ChinaHongKongSAR	0,1033	0,0404	0,0629	Profit-led
India	0,0933	0,0403	0,0530	Profit-led
Indonesia	0,1134	0,0406	0,0727	Profit-led
Iran	0,1410	0,0403	0,1007	Profit-led
Philippines	0,1233	0,0405	0,0828	Profit-led
RepublicofKorea	0,0972	0,0405	0,0567	Profit-led
Singapore	0,1142	0,0399	0,0744	Profit-led
SouthAfrica	0,0895	0,0401	0,0494	Profit-led
Thailand	0,1257	0,0406	0,0851	Profit-led
Tunisia	0,1008	0,0404	0,0604	Profit-led
Turkey	0,1008	0,0403	0,0605	Profit-led

Source: Author's calculation.

Table 9 presents the estimated results for subsample D, which includes other developing countries. The average economic growth in these countries was characterized by a profit-led regime, as the signal of the parameter is positive. Despite the evidence that changes in profit share negatively affect the net exports rate, its positive effect on the domestic investment function is leading the average effect. The relatively weak effect of the rate of capacity utilization on the net exports rate also helps to explain the profit-led growth regime in these countries. These results are also in line with some of the findings in the literature, especially those of Onaran and Galanis (2012, 2013). The authors found that several of the smaller or more open economies (Mexico, Argentina, India, South Africa, and China) had profit-led growth regimes.

5 Conclusions

The extensive empirical effort made by the neo-Kaleckian literature to estimate whether economic growth is wage or profit led in different economies raised important criticisms about the identification strategy utilized in the empirical models as well the political interpretations of their econometric results. This paper contributes to the empirical neo-Kaleckian literature on wage- and profit-led growth regimes by estimating a panel data model in which country-specific structural characteristics and possible endogenous relationships among the variables in the net exports rate and investment function are explicitly taken into account.

To do this, the identification strategy uses the new EPWT (2017) and the PWT (2015) to estimate an investment and net exports function between 1995 and 2014, under reasonable theoretical assumptions. Taking a different route from the previous literature, the paper attempts to respect key tenets of the neo-Kaleckian investment function. Hence, the identification strategy is based on several estimates of the stock of capital and the rate of capacity utilization for the 61 countries in the sample.

Controlling for endogeneity and country-specific effects, a key result of the neo-Kaleckian empirical literature remains true: the average economic growth in developed countries (large European economies, but also the US and Japan) was wage led in the period. The present result, however, focuses on long-run elasticities. The causality channel is mainly related to the domestic investment function, despite the positive effects that the profit rate had on the average net exports rate.

Meanwhile, economic growth in most developing countries tends to be profit led. Remarkably, however, there are important heterogeneities in the results. In most Latin American developing countries, the domestic investment function is wage led, while the net exports rate is profit led. The exceptions to this are Colombia and Costa Rica, where the average profit share was at the level of the developed countries in the period.

In other developing countries, primarily in Asia, the growth regime is also profit-led. The causality channel, however, is different from that in Latin American countries. The average domestic investment function is profit led, while the net exports rate is negatively affected by the profit share.

In these countries, it is likely that the mark-up rate is affecting the profit share and thus international competitiveness. The effect of the rate of capacity utilization on the net exports is also negative.

It is important to recognize, however, that while the empirical relationship between income distribution and economic growth seems to suggest the existence of wage- and profit-led growth regimes, it remains unclear whether the government can explore this relationship. All that the present results suggest is that the economic growth in those countries, with a relatively low profit share in income, was wage led in the studied period. However, this does not mean that redistribution towards wages in these economies would guarantee a future boost in economic growth.

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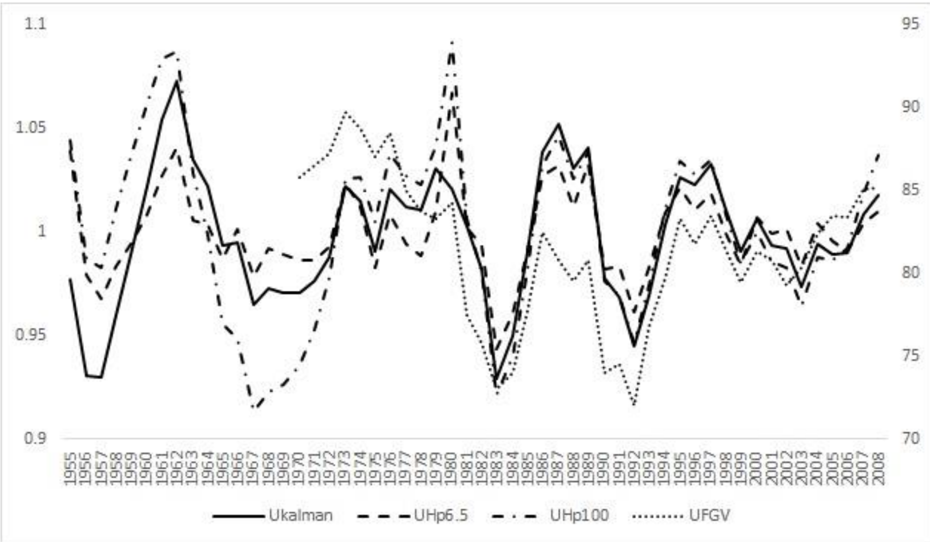
Appendix A

Figure 2 presents the evolution of different filter-based techniques to estimate the rate of capacity utilization for Brazil. The estimations are compared to the index of capacity utilization calculated by IBRE-FGV. The level is relatively different, but the average fluctuations are relatively similar. The pattern is also similar in other countries.

Figure 2: Estimated rate of capacity utilization using Hodrick-Prescott and Kalman filter compared to the index of capacity utilization rate (IBRE-FGV), Brazil 1955-2008.



Source: Author’s calculation and IBRE-FGV (2018).