Informal Economy and Kaleckian Long-Run Equilibrium

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Abstract

The urban informal economy (which is markedly different from the Lewisian duality) is yet to be integrated into growth models meant to be applied for developing countries. Besides having conceptual relevance, informality can possibly play a major role in the macroeconomic adjustment towards long-run equilibrium, especially if it is extensive enough as a share of total employment or output.

In this vein, we present a Kaleckian framework in which we incorporate the informal sector. Then we provide a set of numerical simulations, indicating that informality changes the long-run equilibrium values, but also the adjustment path towards equilibrium, accelerating it (if informal output responds pro-cyclically to the formal sector), or slowing it down (if it responds counter-cyclically).

Keywords: Kaleckian Model, Informal Economy, Macrodynamics

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1. Introduction

The pervasive presence of the informal economy is a distinctive, nearly defining characteristic of developing countries. Even though there was wide belief in the early development literature that inevitable formalization would take place as countries progressed towards a "modern", capitalistic economy, in the past few decades informality levels remained stagnant or even increased amid economic growth (Kanbur, 2017).

The perception of this phenomenon has raised renewed interest in the informal sector (IS), especially after the 1990s. While a large share of the literature has been devoted to explaining the causes of informality, considering it to be an anomaly

amidst an otherwise modern economy, considerably less attention has been devoted to the effects of informality on the long run trajectory, or on how its presence and size could alter standard, well-established adjustment mechanisms.

This issue could be even more relevant in a post-Keynesian setting, where aggregate demand plays an important role in output determination. It is not clear whether a larger IS would be expected to increase employment and consumption, specially of the poorest, thus adding to aggregate demand or on the contrary, to diminish overall demand for formal goods thus hurt overall investment and hence long run output growth. Still, both effects could take place, so that the overall impact would depend on which of them prevails.

In this context, the present paper seeks to shed light on the effects of the IS on the macroeconomic trajectory of a developing economy set in a Kaleckian framework. Our main goal is to highlight the non-neutrality of the IS, and to point out a few mechanisms by which its presence and extension could impact the long-run growth path. In order to do that, we first redefine two major variables for the (neo-)Kaleckian investment function (Dutt,1984; Rowthorn, 1999) – the profit share and the rate of capacity utilization – so the fact that a part of the economy runs outside the formal sector (FS) can be considered. Later, we incorporate this modified investment function into the Kaleckian reproduction scheme – which is also modified to accommodate the IS. Then we run a number of numerical simulations in this framework, in order to visualize how major variables behave during the economy's trajectory towards its steady-state values.

We believe the IS is an important feature to be taken into account in growth models, which could significantly alter results of standard models. More importantly, it could affect the mechanisms by which macroeconomic variables adjust towards their steady-state values.

The remaining of this paper is organized as follows: Section 2 gives a brief account of the theoretical context that frames the question of the impacts of informality on long-run trends. Section 3 presents the theoretical advancements we are putting forward in order to accommodate the informality in the Kaleckian mid/long-run equilibrium determination. Next, numerical simulations are presented and discussed in Section 4. Finally, Section 5 concludes with our final remarks.

2. Informal Economy and the Adjustment Towards Equilibrium Positions in Kaleckian Models

The perception that a large share of economy in developing countries was not fully integrated into the capitalist system, even as late as the 20th century, was first brought about by Lewis (1954) in his groundbreaking essay. Since then, the concept of a dual-economy has been crystalized in the economic literature, referring to the coexistence of a modern and a traditional economy in the same country.

Nevertheless, the setting in which Lewis develops his analysis is one of vast rural populations immersed in a subsistence economy, which means that individual households produce for their own consumption. In this case, output is not limited by demand. However, the opposite is true when it comes to production for exchange, which is the case for the contemporary urban informal economy.

It is widely accepted that the term "informal economy" first appeared in 1970s, defined as the set of economic activities that take place beyond the reach of the State's regulatory reach (Hart, 1973). Now this definition has been established in a context of urban informality, where informal workers do not produce for subsistence, rather for exchange. Thus, the informal output in this context can be thought as being limited by demand, at least as a theoretical possibility.

If this is the case, then the growth of the FS could spur the growth of the IS, for it will increase income, which might then increase demand for informal goods (as well as for formal goods). In order for this to happen, the only condition is that income-elasticities of demand for informal-sector products must not be negative (that is, these must not be inferior goods). Part of the empirical literature provides support that this might be the case (Elgin & Birinci, 2016; Kanbur, 2017; Ramos, 2007; Ulyssea, 2020).

On the other hand, if these income-elasticities are less than the unity (i.e. lie in the $(0,1)$ interval), then long-run growth and increase in per capita income would eventually decrease the demand for informal products. Along the income growth path, a decreasing share of total income would be spent in the IS, thus its share of total

output would continuously decline, in the Pasinettian sense (Pasinetti, 1983; Araújo & Teixeira, 2002).

Moreover, in this case the interaction between the FS and the IS should influence the trajectory of the major macroeconomic variables in its path towards adjustment or possibly even alter the steady-state level. This would happen if the IS should have any impact on aggregate demand in the FS – for in this situation any shifts in demand would affect the FS directly, which would then impact the IS, that would provoke another effect in aggregate demand (hence establishing feedback effects).

It is precisely the possibility of this interaction a main point of interest we wish to examine more closely in the present article. In particular, we seek to stress that the influence of informality on the macroeconomic trajectory is such, that it cannot be overlook in models meant to be applied for developing countries.

It is well-known that stability issues arise in the extension of the Kaleckian framework to the mid- and long-run. This matter has received substantial attention in the literature in the recent years. In particular, the investment function, which is crucial for the outcomes of the model, has been subject to intense dispute in the theoretical literature. It has been heavily criticized the fact that Kaleckian models put forward for the long-run an investment function that is better suited for the short-run movements (Lavoie, 1995; Skott, 2012).

A major point of debate resides in the fact that is not entirely clear by which means the utilization rate would be brought back to its normal level after it deviates due to external shocks or variations caused by endogenous adjustments. In this context, some attempts have been made to put forward different adjustment mechanisms by which convergence towards a long-run trajectory that is not path-dependent, such as Shaikh (2007) and Duménil & Lévy (1999), among others. Other attempts to reconcile short and long-run equilibria pursue the preservation of key Kaleckian features, such as Cassetti (2006).

In fact, the equilibrium profit rate and the capacity utilization rate in the earlier Kaleckian models for the long-run can be understood as short- to mid-term steady states, whereas the long run is seen as a succession of shorter periods. In this case, long-term trajectory could be indeed path-dependent. As Hein, van Treeck and Lavoie (2008) point out, it can be argued that it can be more fruitful to focus on these short-

to-mid-run provisional equilibria than to search for fixed long-run trajectories (Chick & Caserta, 1997), since the very existence of equilibrium values obtained from parameters that are fixed for the long run can be put into question.

In this vein, our approach is to pursue the analysis of provisional equilibria, in order to examine more closely how these are affected by the presence and extension of the informal economy. However, we hope that the discussion presented here may provide new elements for the discussion of adjustments from mid- to long-run trajectories, once the IS has been included as a relevant piece of the mechanisms that bring about this adjustment.

According to Hein (2017), the post-Kaleckian model can be understood as a particular closure for a framework common to post-Keynesian and Marxian-classical models, meaning that there are fundamental elements maintained throughout these somewhat distinct perspectives. In this vein, we understand that our proposed modifications can be seen as an additional layer on the standard models, since we believe they do not dramatically alter the mechanisms identified with the Kaleckian tradition. On the contrary, we seek to point out how these mechanisms remain in operation after the IS has been considered.

3. Introduction of the Informal Economy in the Kaleckian Growth and Distribution Model

Before we consider the informal economy, we briefly describe the Kaleckian framework which has been used for the numerical simulations presented later on. We have combined two structures within the same tradition into a single model. On one hand, we take the Kaleckian interpretation of the Marxian reproduction scheme (Kalecki, 1968, which describes the profits and output as determined by capitalists' spending, but leaves no indication on what determines the investment rate. On the other hand, we use the investment function *à la* Rowthorn (1999), Steindl (1979) and Dutt (1984).

The aforementioned reproduction scheme considers a closed private economy consisting of three sectors or departments: investment goods (I), capitalists'

consumption goods (C_c) and workers' consumption goods (C_w), thus $Y = I + C_w + C_c$, where Y is the total output. Because profits (P) and wages (W) constitute the national income, and because workers do not save, then we have $C_w = W$, thus $I + C_c = P$.

It is a major point made in Kalecki's essay that in the latter identity the causation runs from the left to the right, that is form investment and capitalists' consumption to profits. Indeed, after defining the wage shares in each department as w_I, w_c and w_w, respectively, it is shown that the output is given by:

$$Y = I + C_c + \frac{w_I I + w_c C_c}{1 - w_w} \quad (1)$$

This particular formulation does not require any specific form of investment determination, and can be shown to be fully compatible with an investment function of the class $I/K = \alpha_0 + \alpha_1 u + \alpha_2 r$, where u is the utilization rate of the given capital stock, r is the profit rate and α_j, $j = \{0,1,2\}$ are parameters (Hein, 2014).

In this setting, we introduce the IS by defining the national output (Y) as comprised by a formal share (Y_f) and an informal one (Y_i), thus:

$$Y = Y_i + Y_f \quad (2)$$

It is assumed that investment goods and capitalists' consumption goods can be produced only by the FS. Workers, on the other hand, spend a fraction of their consumption expenditures in informal goods. This share is designated by γ_f for FS workers and γ_i for IS ones. Hence we have:

$$Y_f = I + C_c + C_{wf} \quad (3)$$

where C_{wf} is consumption of workers that occurs in the FS, regardless of from which sector the income for consumption comes. That is to say tha consumption in the FS is given by $C_{wf} = (1 - \gamma_f)W_f + (1 - \gamma_i)W_i$, where W_f is the formal wages mass and W_i is the aggregate remuneration of informal laborers. Informal

consumption, on the other hand, is given by $C_i = \gamma_f W_f + \gamma_i W_i$. Since the informal economy produces only workers' consumption goods, then $Y_i = C_i$.

We assume informal goods to be produced without any capital requirements, thus no profits are obtained in the IS, so that $W_i = Y_i$. Putting together the expressions involving Y_i, C_i and W_i and rearranging, we obtain:

$$Y_i = \frac{\gamma_f}{1-\gamma_i} W_f \tag{4}$$

This equation simply establishes the informal output as determined by the formal wages mass and workers' consumption parameters.

Now in order to accommodate the informal sector (IS) in the investment function, we must properly define the relevant variables considering the new framework just described above. First of all, as in the presence of informality the economy is divided into a formal share (Y_f) and an informal one (Y_i), we can thus define the share of formalization of national output, denominated by θ, as:

$$\theta \equiv Y_f / Y \tag{5}$$

In the absence of government activities and in a closed economy setting, output as national income is of course divided into wages and profits. However, since the IS output has only labor as a factor of production, then all profits must come from the FS. In this context, the mass of profits (P) can be compared either to total national income, or alternatively to the FS income only. In the first case, the profit share can be defined as usual, as $h \equiv P/Y = P/(Y_f + Y_i)$. As for the second case, the "formal profit share" can be defined $h_f = P/Y_f$. It is immediate to notice that:

$$h = \theta h_f \tag{6}$$

Because the degree of capacity utilization is influenced by the profit share, since $u = vr/h$, it can also be seen as firstly referring to the whole economy, as $u \equiv Y/Y^P$,

where Y^P is the potential output, given by the current capital stock and the technological capital-to-output ratio ($v \equiv K/Y^P$). Assuming the potential output is achieved when the formal economy is at its full capacity utilization (thus $Y^P = Y_f^P$), we have:

$$u \equiv \frac{Y}{Y^P} = \frac{K}{Y_f^P}\frac{P}{K}\frac{Y}{P} = \frac{vr}{h} \tag{7}$$

$$u_f \equiv \frac{Y_f}{Y^P} = \frac{K}{Y^P}\frac{P}{K}\frac{Y_f}{P} = \frac{vr}{h_f} = \theta\frac{vr}{h} \tag{8}$$

Therefore the relationship between the utilization rate of the capital stock and the utilization rate of the capacity of the whole economic system can be expressed as:

$$u_f = \theta u \tag{9}$$

When we mention a capacity of the whole economic system, we mean we are considering the fact that since the IS is capable of producing goods and services as well. Even though it is assumed that no capital is utilized in informal production, it has the capacity of organizing labor and increase output when demand for its product expands.

As for the investment function, the measure of capacity utilization that matters is the one referring to the FS output, since this is the one that informs about the level of capital stock utilization and signals whether there is any necessity to expand it or not. With that in mind, the investment function can be written as:

$$g_I = \frac{I}{K} = \alpha_0 + \alpha_1 u_f + \alpha_2 r \tag{10}$$

Or, in terms of the formalization share:

$$g_I = \frac{I}{K} = \alpha_0 + \alpha_1 \theta u + \alpha_2 r \tag{11}$$

This latter form makes explicit a point we intend to make: as long as the informal output grows faster than the formal one after any (possibly exogenous) increase in the capacity utilization, that is if $\Delta Y_i/Y_i > \Delta Y_f/Y_f$ (which can be a very reasonable assumption, as we shall argue later on), then θ will decrease, therefore decreasing g_I and then bringing u to its previous level. How strong should the change in θ be in order to guarantee the reversion of capacity utilization to its steady-state level is a question we address in our numerical simulations, presented in Section 4.

The possibility of a higher proportional response in the IS could be argued on the grounds of a lower rigidity in this side of the economy. Since it does not need to mobilize capital, when demand increases the expansion of output should be faster, so informal goods would be more readily available (and presumably cheaper), thus incrementing its market share. In this pro-cyclical case the IS acts as a stabilizing force, increasing investment when u decreases.

Of course it could also be argued that the informal consumption might be countercyclical, so that γ_f and γ_i will decrease when u increases, hence leading to a decrease in the ratio Y_i/Y and increase in θ. This would happen if workers reacted to higher unemployment (lower u) by purchasing more informal goods relative to formal. If that is the case, then the IS should reinforce any variations in capacity utilization. This means that, as long as stability is guaranteed, any adjustments should take place at a more rapid pace.

Stability can be checked by the equilibrium values of u and r, which are obtained by equalizing (11) and the traditional savings equation, $g_s = sr$, where $0 < s < 1$ is the (capitalists') propensity to save. Then, solving for the equilibrium utilization rate u^* and substituting this back in (11) to find the equilibrium profit rate r^*. In this setting we have:

$$u^* = \frac{\alpha_0 v}{hs - \alpha_1 v\theta - \alpha_2 h} \tag{12}$$

$$r^* = \frac{\alpha_0}{s - \alpha_1 \frac{v}{h}\theta - \alpha_2} \tag{13}$$

The only difference to standard, handbook equilibrium values of the Kaleckian framework is that in those we have $\theta = 1$, which means no informality at all. In that sense, the standard model can be seen as a particular case of the form where informality is incorporated.

Stability requires that $s > \alpha_1 \frac{v}{h}\theta + \alpha_2$. Since $0 < \theta < 1$, the increase in the relative size of the IS (that is, decrease in θ) will make stability more likely, for it diminishes the right-hand side of the inequality. Moreover, it can be shown that $\partial u^*/\partial\theta > 0$ and $\partial r^*/\partial\theta > 0$, which means the decrease in informality raises the equilibrium values u^* and r^*, thus increasing long-run growth.

4. A Numerical Simulation

4.1 The theoretical underpinnings for a Computation

In order to construct a numerical simulation of the model, it has been necessary to discretize the equations, since it is computationally more straight forward to calculate variables period by period, instead of in continuous time. To allow comparison with the case without IS, where $\theta = 1$, a standard Kaleckian model was also simulated. In this standard version, the movement of the stock of capital can be described by the following equations:

$$I_{t+1} = \alpha_0 + \alpha_1 u_t + \alpha_2 r_t \tag{14}$$

$$K_{t+1} = I_t + K_t(1 - \sigma) \tag{15}$$

Where subscripts indicate the time period, $t = (0,1,2,\dots)$, and $0 < \sigma < 1$ is the depreciation rate. As in Kalecki (1968), investment determines the output, for

$Y_t = I_t + C_t^c + C_t^w$, where $C_t^c = P_{t-1} - I_t$ represents the consumption of the capitalists and C_t^w the consumption of workers, which is a function of investment[1].

The wage shares of the three departments are taken to be exogenous and shall remain constant throughout the long-run trajectory[2]. In this setting, the departments' output determines the formal wage mass as $w_I I_t = W_t^I$, $w_c C_t^c = W_t^c$ and $w_I C_t^w = W_t^w$. After these definitions are set, the output of workers' consumption department can be determined by:

$$C_t^w = \frac{w_I I_t + w_c C_t^c}{1 - w_w} \tag{16}$$

The equation above states that the contemporary expenditures of the capitalists (I_t and C_t) determines the mass of wages and thus the output of the workers' consumption department, since workers do not save, and all wages are spent in this department. In this setting, the current output is fully determined by current investment, given by equation (11) above, and by capitalists' consumption, assumed given by the savings rate and the previous period's profits[3], that is $C_t^c = (1 - s)P_{t-1}$. It is noteworthy that the current profits are given by contemporary investment and capitalists' consumption, thus $P_t = I_t + C_t^c$, in which it is important to emphasize once again that the order of causation runs clearly from the right-hand to the left-hand side.

Once the output and the stock of capital are determined, given an exogenous capital to potential output ratio v we can find the current values of the capacity utilization (u_t) and the profit rate (r_t):

$$u_t = v\frac{Y_t}{K_t} \tag{17}$$

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[1] In the following, we have let to the superscripts the identification of variables that were before as subscripts. Instead we will identify time periods in the subscripts, as is as more conventional notation.

[2] On critique to the pursue of stable long-run growth paths is that it must rely on fixed values of key parameters for a very long time, when too many institutional changes must occur (Hein, van Treeck and Lavoie,2008; Chick & Caserta, 1997)

[3] In his essay, Kalecki states that both I and C_c should respond to profits with a certain delay, for "Investment and capitalists' consumption in the short period considered are the outcome of decisions taken in the past" (p.75)

$$r_t = \frac{u_t h_t}{v} \tag{18}$$

Where it can be shown that $h_t = \frac{w_I I_t + w_c C_t^c + w_w C_t^w}{Y_t}$, which tends to converge to a fixed value, as we shall see later on. From an initial set of values, the model converges to a steady-state. In order to allow for comparison, we plot the path of the most important variables against the path of the version where informality is present.

Now the investment depends on the formalization rate θ, which affects the impact that the utilization rate has on investment. This means that for a given level of output, the less formalized the output (lower θ), the less investment will take place.

$$I_{t+1} = \alpha_0 + \alpha_1 \theta u_t + \alpha_2 r_t \tag{19}$$

Further, workers' consumption will be divided into an informal share γ and a formal share $(1-\gamma)$. In this case we also must take into consideration the informal workers, since it is possible that they have a higher propensity to consume informal goods, relative to formal ones. Thus we assume two different shares of informal consumption, γ_f for formal workers and γ_i for the informal. In this setting, workers' formal consumption (i.e. that which occurs in the FS, comprised of formal goods) will be given by:

$$C_t^f = (1-\gamma_f) W_t^f + (1-\gamma_i) W_t^i \tag{20}$$

Where W_t^f and W_t^i are the contemporary formal wage mass and informal remuneration mass, respectively. Thus we have:

$$Y_t^i = \frac{\gamma_t^f}{1-\gamma_t^i} W_t^f \tag{21}$$

The above equation is the one that determines the informal output as stemming from the formal economy, without any lags. The remaining equations are kept unchanged after the inclusion of the IS. It must be pointed out that in this version it is

still true that $P_t = I_t + C_t^c$, for $C_t^f = W_t^f$ still holds, which can be seen by the substitution of (21) into (22).

The model with the IS can be further split into two variants: one where there are fixed values for the propensities for consuming informally, so $\gamma_t^f = \overline{\gamma_f}$ and $\gamma_t^i = \overline{\gamma_i}$; and another one where they vary in response to the FS. Now this second case opens a wide range of possibilities for the form how the γ-propensities react to changes in the FS.

In order to simplify our analysis, we shall assume that a percentage change in the utilization rate of the FS is passed to the propensity to consume informally proportionally to a coefficient χ, thus for the FS and IS respectively:

$$\gamma_t^f = \gamma_{t-1}^f \left(1 + \chi_f \left(\frac{\Delta u_t^f}{u_{t-1}^f}\right)\right) \tag{22}$$

$$\gamma_t^i = \gamma_{t-1}^i \left(1 + \chi_i \left(\frac{\Delta u_t^f}{u_{t-1}^f}\right)\right) \tag{23}$$

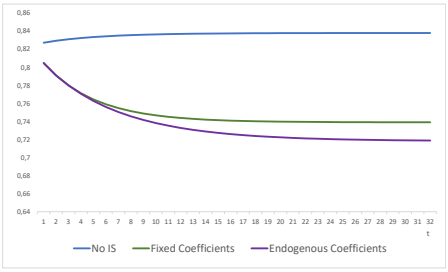
The magnitude of plausible values for the χ parameters is a matter for empirical investigation. Here we simply assume they are $|\chi| > 1$, for this would lead to increased response of the IS to the FS changes. However, we do consider the possibilities that there could be either $\chi > 0$ or $\chi < 0$.

4.2 Results for the Numerical Simulations

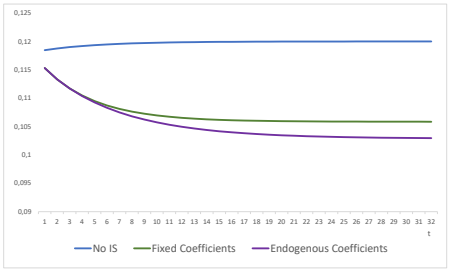
Parameter values as well as the values for $t = 0$ are presented in the appendix. The initial values were chosen with attention to the internal consistency of the Kaleckian framework, guaranteeing that dependent variables maintain its appropriate relation to the independent ones. Also, values were set in order to produce reasonable values for the variables of interest (e.g. u_f, r and θ, but also I/Y_f and $\Delta Y_f/Y_f$, which might also be interesting to evaluate).

To highlight the different paths, we set the case without informality as the baseline. In the first batch, we compare the case of fixed propensities to consume informally with the case where they are endogenous. We have taken the counter-cyclical function for the endogenous γ-coefficients setting, since this is the one that tend to result in trajectories that stand further apart from the other cases[4].

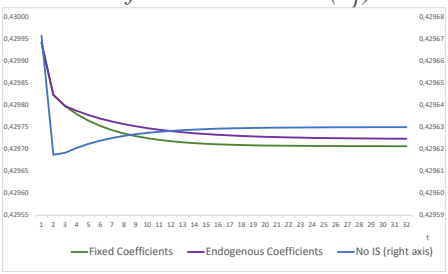
Utilization Rate of the FS (u_f)



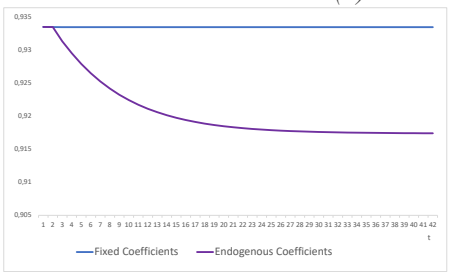
Profit Rate (r)



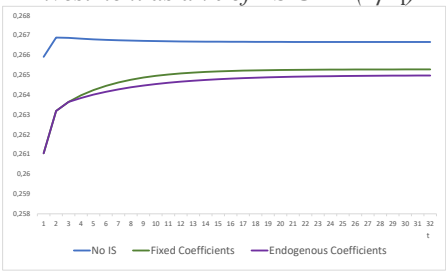
Profit Share in the FS (h_f)



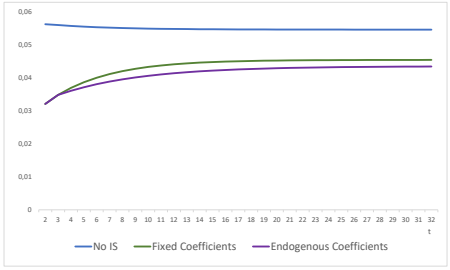
Formalization Share (θ)



Investment as a % of FS GDP (I/Y_f)



FS Growth Rate



[4] The pro-cyclical case tends to result in long-run paths that lie between the fixed-coefficients and the fully-formal economy cases. In the end of this section we highlight a few differences between the counter and pro-cyclical variants.

Because initial values are to some extent arbitrary, the transition from $t = 0$ to $t = 1$ could be at times quite abrupt and distort the graphic scale. For this reason we have omitted them in the plots. At times, a large number of periods is displayed (in some case more than 40) in order to guarantee that it is visually clear that convergence does occur (in all cases convergence is verified).

The figures show that the presence of informality lowers the long-run growth rate, since it impacts the investment share (I/Y_f) through the reduction of both the utilization rate and the profit rate. It also introduces some changes in the profit share, which are quite small (although the graphic scale could be misleading), with fully-adjusted values varying from 0.42963 in the fully-formal economy to 0.42971 and 0.42972 in the fixed and endogenous-coefficients, respectively.

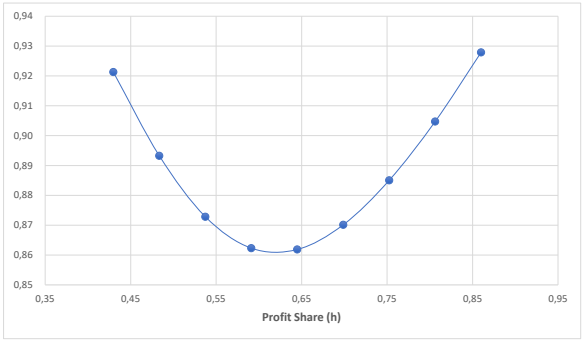
Nevertheless, the adjustment path is interestingly quite different in the presence of the informal economy. This suggests that the IS could play a bigger role in the adjustment process once the investment function includes the profit share as an additional term, possibly helping to shape demand and growth regimes (Bhaduri & Marglin, 1990; Kurz, 1991).

The long-run growth rate, on the other hand, measured as percentage change in formal GDP decreases from 5.45% in the no-informality case to 4.53% and 4.33% in the fixed and endogenous-coefficients cases, respectively. Now this magnitude of difference has significant impacts in the GDP level in the long-run. This is an important result of our framework, for it indicates the extent to which the presence and size of the informal economy can impact long-term capital accumulation and formal GDP growth.

The steady-state paths are by all means dependent on parameter values. A particular important set of parameters for the equilibrium configuration is to be found in the sectors' wage shares w_I, w_c and w_w, for they determine (jointly with the sectoral composition of output) the profit share in the formal economy, h_f. This, in turn, affects the equilibrium utilization rate. We have applied different sector wage shares in order to generate variations in the h_f. All variables of interest changed as expected, with higher h_f associated with lower growth (and lower u_f, r, etc.).

Nevertheless, the fully-adjusted formalization share (θ^*) interestingly increased again for higher values of the profit share, as seen in the graph below.

Equilibrium Formalization Rate (θ)



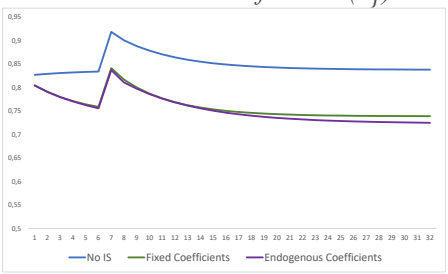
It is worthy mentioning that this happens only for the endogenous, counter-cyclical γ case. The reason is because the informal economy is (positively) influenced by the wage share though also by the utilization rate (negatively, in the endogenous counter-cyclical case). Thus for low values of h_f the first effect dominates, and for higher values the latter overtakes.

Another important feature to observe is the adjustment towards equilibrium after an external shock. Since the model can be very stable, given the stability conditions discussed earlier are not particularly difficult to be met, it is expected that convergence will occur after disturbances. This analysis is presented in the next subsection.

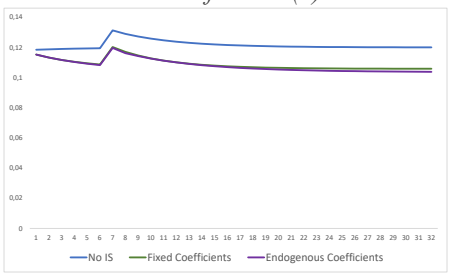
4.3 Evaluating External Shocks to the Model

Since capitalists' expenditures (i.e. C_c and I) determine output, profits and wages, these are the truly independent variables in the Kaleckian scheme. In the simulations presented below, investment was chosen to produce external shocks, which were generated by an addition of 5 units (about 1/6 of current investment level) in the seventh period.

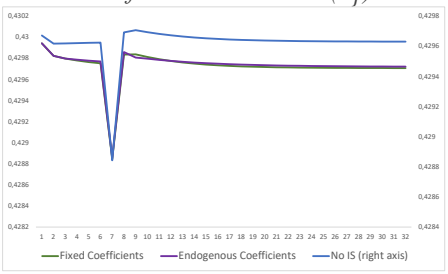
Utilization Rate of the FS (u_f)



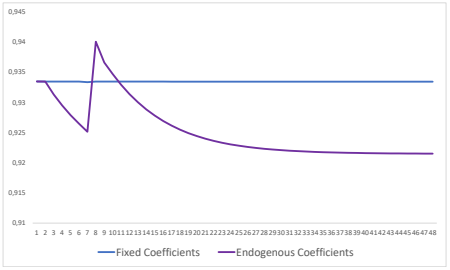
Profit Rate (r)



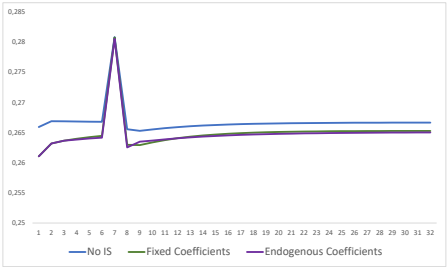
Profit Share in the FS (h_f)



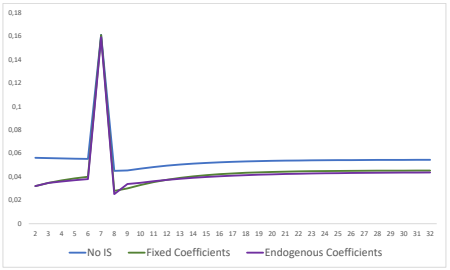
Formalization Share (θ)



Investment as a % of FS GDP (I/Y_f)



FS Growth Rate

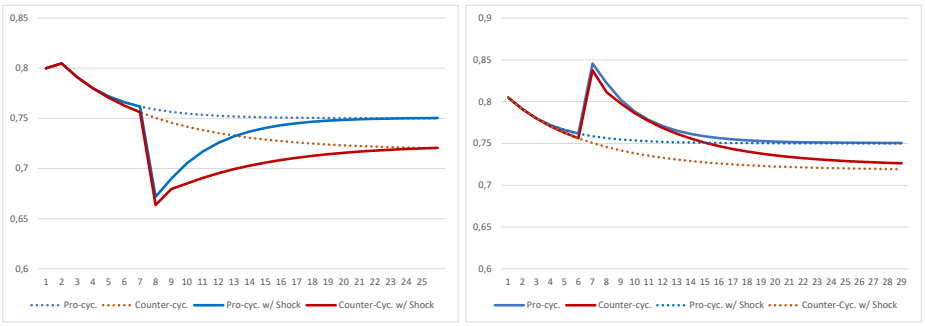


One important result in these figures is that external shocks, even if quite large (1/6 of current investment level) do not significantly impact the slowdown in economic growth imposed by the presence of the informal economy. It can be shown that for most variables there is a small though permanent impact in the level of the long-run equilibrium value after the shock.

The speed of adjustment is also different when we compare the two possibilities for the response of workers' consumption to the utilization rate in the FS. In the pro-cyclical case (when $\chi_f, \chi_i > 0$) the relative size of the IS moves in the same direction as u_f, thus adjustment should be faster (as long as stability is guaranteed). This is

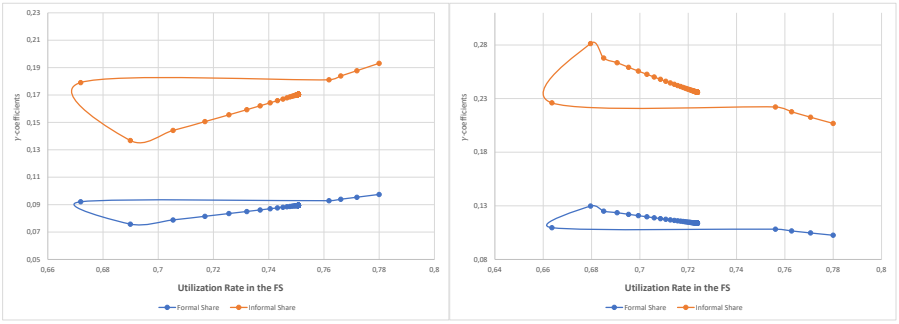
what is shown in the two graphs below, where the u_f is plotted after a negative (left chart) and positive (right chart) shock to investment.

u_f after a Negative Schock to I *u_f after a Positive Schock to I*



It can be clearly seen that counter-cyclical case (red lines) takes much longer to fully adjust. In fact, it does not completely adjust from the positive shock in the number of periods shown in the graph, however it eventually does come to its long-run equilibrium value. The difference in the trajectories is highlighted when we plot the γ-coefficients against the utilization rate in the FS (u_f), which is done in the two graphs below for both cases, for a negative shock in investment.

Pro-cyclical γ adjustment to u_f *Counter-cyclical γ adjustment to u_f*



The trajectories start in the right-most point of each sequence, where initial u_f is higher. The shock can be seen in the long segment between dots, when u_f is thrown to the left. At that moment, the economy was still heading towards the steady-state, with

the γ pair adjusting downwards in the pro-cyclical case, and upwards in the counter-cyclical setting. When u_f is suddenly reduced, they are forced past the equilibrium level, then move in a trajectory close to the one they were following, though in the opposite direction. Dots closer together indicate smaller adjustments, thus the proximity of the steady-state level.

5. Conclusions

The informal sector (IS) employs a significant part of the work force in developing countries, and also a non-negligible share in the developed world, thus it should not be overlooked in growth models. While a vast literature referring to dual economies has been developed since Lewis (1954), it has not been fully integrated into the development framework. In particular, most of the models does not apply to a specifically urban context, and for this reason does not consider the demand-side as a limiting factor for the informal economy.

We have put forward a possibility of integration of the IS into a Kaleckian framework, yet maintaining nearly all of its relevant features. In order to analyze the impacts of the IS for the steady-state equilibrium, we have performed a number of numerical simulations using our model with informal economy fully integrated.

Our results show that informality reduces long-run growth, for it diminishes both the utilization and the profit rates. Also, adjustment after an exogenous shock can be influenced by the presence and relative size of the IS. This influence is different for each of the two possibilities that we consider for the reaction of the propensity of consumers to buy informal goods.

In the first case, consumers react pro-cyclically to changes in the formal sector (FS), for when the economy reaches an upturn, informal goods could be made more easily available. In this situation, provided stability is guaranteed, the adjustment to the steady-state is faster, for the IS reinforces the changes in the FS towards equilibrium. In the second case, consumers react counter-cyclically, buying more informal goods when unemployment is higher, since they should be cheaper. In this

context, adjustment will be slower, since the IS behaves in a manner to countervail the movements towards equilibrium in the FS.

We have not considered the target pricing (or any price differentiation) as a potential mechanism for adjustment. The possibilities here presented, however, can be seen as an initial effort to include the informal economy as an important part of the short-run movements towards (or away from) mid- to long-run equilibrium.

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Appendix

Parameter values and initial variable values ($t = 0$)

$v = 3$

$w_I = 0.55$ $\quad w_c = 0.5$ $\quad w_w = 0.6$

$\alpha_0 = 0.02$ $\quad \alpha_1 = 0.055$ $\quad \alpha_2 = 0.07$

$s_c = 0.6$

$\sigma = 0.02$

$\gamma^f_{t=0} = 0.1$ $\quad \gamma^1_{t=0} = 0.2$

$\chi_f = 1.5$ $\quad \chi_i = 2.0$

$K_{t=0} = 300$ $\quad I_{t=0} = 15$ $\quad C^c_{t=0} = 20$