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INCOME DISTRIBUTION AND ECONOMIC CYCLES IN AN OPEN ECONOMY SUPERMULTIPLIER MODEL[1]

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Abstract

Supermultiplier growth models show that higher autonomous spending leads to stronger economic growth, implying that greater government spending can boost economic activity (Freitas and Serrano, 2015). However, several authors highlighted the limits of this strategy, arguing that increased spending might lead to unsustainable debt accumulation patterns. This is particularly important for small open economies, where growth requires imports that must be paid with foreign currency, which can lead to growing external indebtedness (Thirlwall, 1979; Nikiforos, 2018; Oreiro and Costa Santos, 2019).

We build a structuralist supermultiplier model for a small open economy with two sources of autonomous demand, government expenditures and exports. We account for the dynamics of external indebtedness (determined by economic activity), wage growth (related to wage resistance) and the exchange rate (determined by the Central Bank but limited by international reserves constraints). We find that, in the long run, there is a limit for government spending: its growth rate cannot exceed that of exports without generating an external crisis. However, there is a strong role for public policy: there is nothing that automatically leads the economy to its maximum growth rate compatible with the external constraint to growth, and if government expenditures grow less than exports, the economy will not completely exploit its external space.

But the main contribution of the paper is in the short-run analysis, where we find an additional restriction, related to income distribution. Since higher wages increase consumption and economic activity, they also require more imports, potentially leading to unsustainable debt growth. Therefore, there is a maximum real wage compatible with external equilibrium (Canitrot, 1983). If unions' demand wages are lower than the external equilibrium wage, the economy will be stable, but will also achieve unnecessarily low output and real wages. On the contrary, if target wages exceed those compatible with external equilibrium, the economy displays economic cycles between capacity utilisation, income distribution and indebtedness, marked by permanent inflation. We show that, in the short run, the government can optimize fiscal and monetary policies to maximise output given the external space, but that in the long run, economic growth requires not only domestic spending but also increasing exports to be sustainable.

Keywords: Sraffian supermultiplier, Thirlwall's law, fiscal policy, income distribution, structuralism

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DISTRIBUCIÓN DEL INGRESO Y CICLOS ECONÓMICOS EN UN MODELO DE SUPERMULTIPLICADOR PARA UNA ECONOMÍA ABIERTA

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Resumen

El modelo del supermultiplicador Sraffiano concluye que un aumento del gasto autónomo da lugar a una mayor tasa de crecimiento económico, lo que implica que incrementos del gasto público pueden potenciar la actividad económica (Freitas y Serrano, 2015). Sin embargo, varios autores han señalado los límites de esta estrategia, argumentando que mayores gastos pueden generar dinámicas de endeudamiento insostenibles. Esto es particularmente relevante para las economías pequeñas y abiertas, donde el crecimiento económico requiere importaciones que deben ser pagadas con divisas, lo que puede dar lugar a un creciente endeudamiento externo (Thirlwall, 1979; Nikiforos, 2018; Oreiro y Costa Santos, 2019).

En este trabajo construimos un modelo de supermultiplicador para una economía pequeña y abierta con dos fuentes de demanda autónoma: gasto público y exportaciones. Consideramos la dinámica de la deuda externa (determinada por la actividad económica), los salarios (explicados por la resistencia salarial) y el tipo de cambio (definido por el Banco Central, aunque sujeto a la disponibilidad de reservas). Encontramos que, en el largo plazo, hay límites para el gasto público: su tasa de crecimiento no puede exceder la de las exportaciones sin dar lugar a una crisis de balance de pagos. Aun así, la política pública retiene un importante rol, ya que la economía no tiende de forma automática a su tasa máxima de crecimiento compatible con el equilibrio externo, pudiendo ser el gasto público una herramienta para aprovechar este espacio externo.

En el corto plazo, hallamos una restricción adicional, vinculada a la distribución del ingreso. Dado que mayores salarios elevan el consumo y la actividad económica, también dan lugar a un aumento de las importaciones, potencialmente llevando a una dinámica de crecimiento insostenible de la deuda externa. Por lo tanto, existe un nivel máximo del salario real compatible con el equilibrio externo (Canitrot, 1983). Si los salarios reales demandados por los sindicatos son mayores que aquellos compatibles con la restricción externa, las principales variables de la economía (uso de la capacidad instalada, distribución del ingreso, deuda externa) pueden experimentar una dinámica cíclica, marcada por una inflación persistente. Demostramos que, en el corto plazo, el gobierno puede optimizar la política fiscal para maximizar el producto dado el espacio externo, pero que en el largo plazo un mayor crecimiento económico requiere no solo de un mayor gasto autónomo doméstico sino también de un aumento en la tasa de crecimiento de las exportaciones.

Palabras clave: Supermultiplicador Sraffiano, ley de Thirlwall, política fiscal, distribución del ingreso, estructuralismo

1. INTRODUCTION: THE SRAFFIAN SUPERMULTIPLIER IN SMALL OPEN ECONOMIES

Extending the principle of effective demand to the long run has been one of the main quests of post-Keynesian economists. As a result, there have been several approaches to economic growth modelling, opening a significant debate in the heterodox community. In the recent years, the Sraffian supermultiplier (SSM), a relatively new approach to growth modelling based on the Classic-Keynesian tradition, has boomed, with an increasing number of scholars and publications resorting to this approach (Serrano, 1995; Bortis, 1997).

The success of the SSM is explained by some advantages it displays over its predecessors. The SSM model considers that investment is mainly induced by demand, since firms increase their productive capacity if there is sufficient demand for their products. This feature, while diminishing the role of *animal spirits* on investment, allows the model to reach some interesting results that represent more truthfully actual economies: after a shock, firms' capacity utilisation tends to return to its previous "normal" levels, the investment share of output increases with economic growth, and components of demand not systematically derived from production decisions (non-capacity creating "autonomous" components), such as residential investment or government spending, often drive economic activity. Since these three characteristics are missing in the competing heterodox approaches, the SSM has seen an increased recognition by scholars in the last years (Fagundes and Freitas, 2017).

The takeaway of the model is that economic growth depends, ultimately, on the rates of expansion of autonomous components of demand. Income distribution, key in previous models, can affect output levels, although not its trajectory (Nah and Lavoie, 2019). Therefore, expansionary and redistributive policies increase output, and the only limit for those is the full use of productive capacity.

Such a bold policy conclusion has led to several critiques to the model. Skott (2016) and Nikiforos (2018) argue that the SSM approach disregards the potential accumulation of debt, public or private, and its effects on economic activity. If autonomous spending grows, it must be, by definition, financed by credit, leading to increases in debt that might, at some point, raise debt ratios and force a reduction in spending. Therefore, there would be no fully autonomous expenditure. According to them, the SSM model, by not considering this, leaves out the possibility of Minskyan indebtedness cycles, which are crucial for economic growth dynamics, as events like the Great Financial Crisis show.

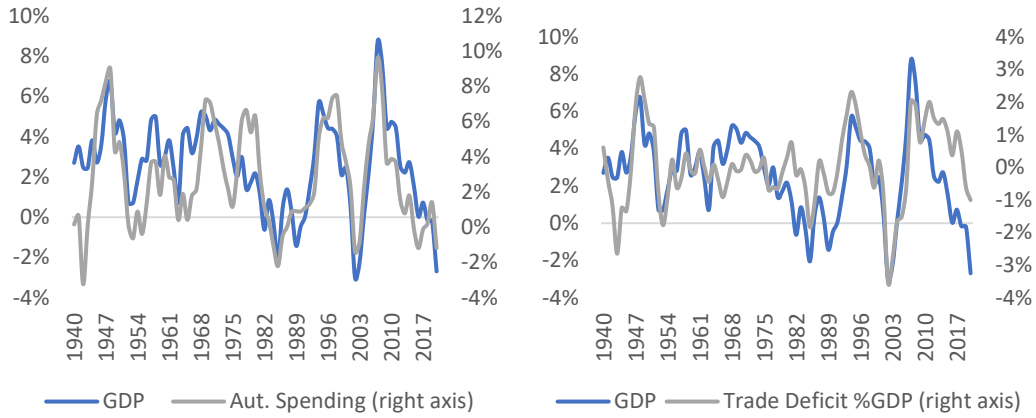
However, if public spending is considered as the main source of autonomous demand, it can be argued that public debt can always be repaid in monetary sovereign countries, so there is no objective limit to the rise in the debt ratio when debt is issued in domestic currency[2]. But foreign debt is a different story, particularly for developing countries[3]. Structuralist and Kaldorian authors have shown how countries that do not issue a reserve currency cannot maintain a trade deficit in the long run (Thirlwall, 1979). Since imports are related to output, while exports can

[2] This does not mean that any level of government debt is always sustainable. For instance, investors may refuse to roll over the debt if they perceive that its growth rate is excessive. For a detailed treatment of the issue, see Freitas and Christianes (2020).

[3] Excessive private debt ratios could also lead to reductions in autonomous demand. Pariboni (2016) argues that, if more than one component of autonomous demand is considered, autonomous consumption can lead to growing debt ratios. See also Mandarino, Dos Santos and Macedo E Silva (2020).

be considered an autonomous component, an increase in autonomous spending along the lines of the SSM policy conclusions might lead to growing BOP deficits and therefore unsustainable external indebtedness, a result that also applies to all demand-led growth models. The economy might face a limit for output growth before reaching full employment given by the lack of foreign currency[4]. As an example, Figure 1 shows this dynamic for Argentina, a particularly illuminating country due to its frequent BOP crises. GDP growth follows that of autonomous spending (exports, government consumption and dwellings investment), while increases in GDP are almost immediately accompanied by a worsening of the trade balance, which must be financed with international reserves or foreign debt.

Figure 1. GDP and autonomous spending growth and trade deficit variation (MA5)
Argentina (1940-2019)



Source: the authors based on Kidyba and Suárez (2020)

Structuralist authors showed how such an external constraint to growth can lead to economic cycles: increases in output, due to higher autonomous spending or improved income distribution, lead to higher imports and trade deficits, which erode Central Bank reserves and eventually force exchange rate depreciations. These devaluations are *recessive* rather than expansionary (Díaz Alejandro, 1963; Krugman and Taylor, 1978), since they increase domestic prices and therefore reduce the purchasing power of workers, shrinking demand and output but restoring trade balance. Eventually, the cycle restarts when unions start demanding nominal wage increases to restore their purchasing power (Braun and Joy, 1968).

Based on these arguments, Oreiro and Costa Santos (2019) argue that supermultiplier models —and, by extension, all demand-led growth models— face an "impossible quartet": they cannot successfully combine growth led by autonomous components of demand, exogenous income distribution, a tendency towards the normal use of capacity utilisation and balanced trade, rendering the SSM approach useless for small open economies.

In the last decades, and as an alternative approach not only to the supermultiplier model but mainly to all domestic expansionary policies, new-developmentalist authors rethought the structuralist argument fundamentally as an exchange rate problem (Frenkel and Ros, 2006; Bresser, 2019). Due to social demands, the real exchange rate (RER) tends to appreciate to a

[4] To this "technical dependency" (Tavares, 2000) we could add the "financial dependency" that results from the growing importance of financial flows (Dvoskin and Feldman, 2018). In this paper we focus on the former, remaining pending a thorough analysis of financial flows for future research.

level where real income (that is, wages) is excessive for exports. The solution to the external constraint would be, then, a Central Bank that actively intervenes to prevent exchange rate appreciation. This would allow exports to increase, due to the relative cheapness of domestic products, and substitute imports for local production, allowing a growth process compatible with BOP equilibrium.

However, these approaches only work under very restrictive conditions. For the economy not to contract after a devaluation and its impact on real income, an infinitely elastic demand for exports is needed[5]. Also, wage resistance must be assumed away (Kaldor, 1964). And the conclusions of the model do not necessarily hold when the tradable sector works under conditions of differential rent, which is usual in developing economies, or when sectors' relative competitiveness change with the level of the exchange rate (Dvoskin, et al. 2019). Still, the problem persists: exchange rate appreciations often lead to unsustainable external imbalances.

In this paper we address the aforementioned critiques to the supermultiplier approach by including these features of developing open economies to a canonical SSM model. This allows for an interpretation of economic growth in small open economies that overcomes the limitations of new-developmentalist models, by not needing to resort to the assumptions of the new-developmentalist approach. To do so, we build a model where growth is demand-led and driven by autonomous components of demand, like in traditional SSM models, but we also add an external sector in a structuralist fashion. By explicitly modelling external debt and exchange rate dynamics, we make effective income distribution result from wage claims and external-sector dynamics.

Our model has two main takeaways, one for the long run, and another for the short period. In the long run, it shows that government spending and output cannot grow faster than exports without leading to a process of unsustainable indebtedness. At the same time, however, government spending should not grow more slowly than exports if the policy goal is to maximize output and employment. Therefore, to increase growth rates it is required both to increase exports but also to expand government spending at the same pace, to avoid an unnecessary accumulation of reserves that could be used to finance higher output levels.

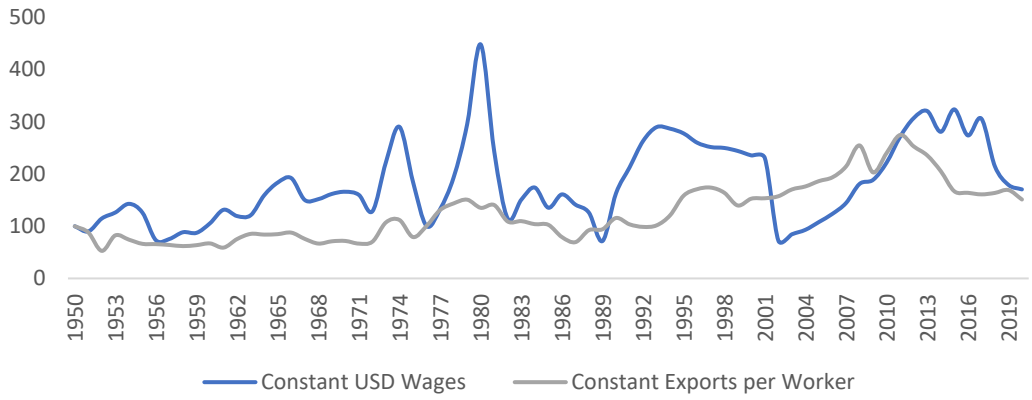
In the short run, the stability of the economy depends on income distribution. Since higher wages increase consumption and output, therefore leading to higher imports, there is a maximum real wage compatible with external balance, with a corresponding minimum real exchange rate as in Canitrot's (1983) analysis[6]. If workers' wage aspirations are lower than this

[5] Crespo, Dvoskin and Ianni (2019) show how, under certain conditions, it is even possible that an economy is completely unable to develop an export sector, independently of the exchange rate. Additionally, empirical work shows that the elasticity of exports to the exchange rate tends to be low or negligible (Reinhart, 1995; Bahmani, Harvey and Hegerty, 2013; Bernat, 2015). Dominant Currency Paradigm (DCP) authors, such as Gopinath (2015), argue that this low export elasticity is due to the fact that international trade is mostly invoiced in dollars, and therefore small open economies cannot change their export price by devaluating their currency.

[6] Gerchunoff and Rapetti (2016) argue, when analysing the Argentinian economy, that there are two different real exchange rate equilibrium values: a macroeconomic equilibrium RER, given by the external constraint to growth, and a social equilibrium RER, consistent with income aspirations of the society. Distributive conflict, and therefore macroeconomic imbalances, emerge when the social RER is more appreciated than the macroeconomic one. Our model also displays these two wage values, but, since we do not assume that the RER has a strong and persistent effect on exports, distributive conflict cannot be solved by devaluation. This imposes a binding external constraint to growth.

level, the economy is stable and gravitates around a "normal" position after a number of periods, but if they exceed it, then the economy displays a cyclical behaviour between income distribution, indebtedness and the exchange rate, marked by permanent inflation. As Figure 2 shows for Argentina, each time real wages grew faster than exports, they eventually returned to their previous values through exchange rate depreciations that reduced their purchasing power. Also, after these episodes real wages often tended to increase again, which implies a significant degree of wage resistance capable of generating instability.

Figure 2. Wages and exports per worker in constant US dollars
Argentina, 1950=100 (1950-2019)



Source: the authors based on Kidyba and Vega (2015), Kidyba and Suárez (2020) and FRED

Therefore, our model retains the core results of SSM models —long-run growth determined by demand autonomous components, normal capacity utilisation, procyclical investment share— while allowing for short run economic cycles in BOP constrained economies with distributive conflict[7].

To simplify the exposition and analysis of this approach, we build our model by layers, progressively adding new features to a baseline supermultiplier model. In the following section, we present the SSM model and provide a simple extension for open economies, based on Freitas and Serrano (2015). In the third section we will include the dynamics of debt, following Morlin (2021). Finally, in the fourth section we build on the previous results, including wage and exchange rate dynamics and analyse the resulting cycles, which is the main contribution of the paper. Finally, section five concludes.

2. THE SRAFFIAN SUPERMULTIPLIER

This baseline supermultiplier model assumes a small, open economy that produces a homogeneous tradable good with capital, labour, and an imported input which are combined in fixed proportions. The international prices of the tradable commodity, p_y^*, and of the imported input, p_m^*, are given; for simplicity they have been both normalized to one, i.e., $p_y^* = p_m^* = 1$.

[7] Our model displays an endogenous supermultiplier through changes in income distribution by incorporating a mechanism similar to a profit-squeeze (Goodwin, 1967) but where the cause of the decrease in real wages and demand is the inflation caused by the external constraint to growth. Several mechanisms have been explored to use consumption smoothing as a stabilizing device but generally not resorting to changes in income distribution (Brochier and Macedo E Silva, 2019; Nomaler, Spinola and Verspagen, 2020; Allain, 2021).

We also assume that the nominal exchange rate, e, is exogenously determined by the monetary authority, $e = \bar{e}$. This means that, given international prices, the domestic price of the consumption good and of the imported capital good are immediately determined, too. The discussion of the effects of changes in the exchange rate in the price of the consumption good, and hence in the real wage, is postponed to section 4. We carry out our analysis in real terms.

Labour and natural resources are assumed to be abundant, imported goods have no supply constraints, there is no technological progress and there are constant returns to scale. Labour is assumed to be always available[8], so, given the technology, the maximum output attainable by the economy, Y_t^K, is only limited by the available capital stock K_t, and the units of capital required to produce one unit of output, v.

$$Y_t^K = \frac{1}{v} K_t \tag{2.1}$$

In each period, the capital stock grows with new investment. If, for simplicity's sake, we assume away depreciation, the growth rate of the capital stock, g_t^K, can be calculated as the ratio between investment and the capital stock[9]:

$$g_t^K = \frac{\dot{K}_t}{K_t} = \frac{I_t}{K_t} \tag{2.2}$$

By dividing both the numerator and the denominator by Y, and combining the result with equation (2.1), we get a new expression for the growth rate of the capital stock g_t^K:

$$g_t^K = \left(\frac{h_t}{v}\right) u_t \tag{2.3}$$

In equation (2.3), h_t is the investment share of output I_t/Y_t, and u_t is the degree of capacity utilisation Y_t/Y_t^K. Lower spare capacity and a higher investment ratio increase capital stock growth, while a higher capital-output ratio reduces it. The utilisation of the current productive capacity (u_t) will vary according to the difference between the rates of growth of output and capital stock: if output increases more rapidly than the capital stock, this implies that the existing productive capacity is being used more intensively, and vice versa.

$$\dot{u}_t = u_t(g_t - g_t^K) \tag{2.4}$$

We know that g_t^K depends on investment, but how is output growth g_t determined? To answer that question, we need to turn to the demand side of our model. Total real expenditures, which must meet total supply (whether domestic or imported) can be chiefly classified in four types: consumption, investment, government consumption and exports.

$$Y_t + M_t = C_t + I_t + G_t + X_t \tag{2.5}$$

Y_t represents total net output, M_t imports, C_t household consumption I_t investment, G_t government consumption and X_t exports[10]. While we can assume that government

[8] We assume a developing economy with an "unlimited" supply of labour, whether because there is unemployment or because of "disguised" unemployment in low-productivity activities *à la* Lewis (1954).

[9] The dot above a variable, as in $\dot{K}$, represents its time derivative.

[10] In nominal terms, equation (2.5) is:

consumption and exports are autonomous from current income, consumption, imports, and investment are not. Regarding consumption, we will assume an economy with two classes: workers, whose labour is needed to produce output v_l times per unit, and are paid money wages w (which, for the moment, we assume exogenously fixed[11], as a result of social norms and the distributive conflict), and capitalists, whose consumption is negligible[12]. Workers are assumed to spend all their income, so consumption will be equal to:

$$C_t = wv_lY_t \tag{2.6}$$

Investment, as it was discussed before, is fully induced, and represents a share h_t of output.

$$I_t = h_tY_t \tag{2.7}$$

And we finally have the two autonomous components of demand, which do not depend on income: government expenditures G_t and exports X_t, which add up to Z_t:

$$Z_t = G_t + X_t \tag{2.8}$$

All these components include both domestic and imported goods and services. To attain equilibrium in the goods market, we must also consider imports, which, since they are used in the production process, can be assumed as linked to output levels, given a coefficient m representing the requirements of imports per unit of output[13]:

$$M_t = mY_t \tag{2.9}$$

The autonomous components of demand Z_t can be divided between government expenditures and exports, being α the proportion of the total autonomous expenditures represented by the former and $(1-\alpha)$ that by the latter:

$$Z_t = G_t + X_t = \alpha Z_t + (1-\alpha)Z_t \tag{2.10}$$

If we replace these expressions in equation (2.5), we obtain a simple expression for output:

$$Y_t = wv_lY_t + hY_t + Z_t - mY_t \tag{2.11}$$

Solving for Y_t:

$$Y_tp_y + M_te = C_tp_y + I_tp_y + G_tp_y + X_te$$

So, in principle, changes in the exchange rate e could alter relations among real variables. However, since we discuss a small open economy where $p_y = e$ —recall that we have normalized international prices so that, $p_Y^* = p_m^* = 1$—, this possibility is precluded.

[11] Note, that, given the international price of the consumption good and the exchange rate, the moment the money wage, w, is determined, the real wage $\frac{w}{e}$ is also determined. Since domestic prices equal international ones multiplied by the exchange rate, all changes in wages have an analogous inverse impact in the profit rate. Therefore, a depreciation reduces real wages and increases the rate of profits. For a detailed treatment of this issue, see Dvoskin and Feldman (2018).

[12] We could include capitalists' consumption as an autonomous component of demand, independent of their current income, as Freitas and Christianes (2020) do, but, since we already have a second source of autonomous demand, it would make our equations unnecessarily more complex without providing new insights.

[13] Imports depend on aggregate demand rather than output, that is, $M_t = m(Y_t + M_t) = m(C_t + I_t + G_t + X_t)$. But for the sake of simplicity, and since it does not affect our results, we calculate them as a share of output. We also assume the same propensity to import for all demand components, although this is also a simplifying assumption (see Akyüz, 2011; Amar, Torchinsky Landau and Wirkierman, 2016).

$$Y_t = \frac{1}{1 - wv_l - h + m} Z_t \tag{2.12}$$

The expression $\frac{1}{1-wv_l-h+m}$ is nothing but the "supermultiplier", which combines the Keynesian principles of the multiplier and the accelerator: economic activity is triggered by autonomous components of demand (government expenditures and exports) and is then expanded by the induced consumption by workers and the necessary investment to produce the capital stock required in the production process (Samuelson, 1939). A higher import propensity, conversely, reduces output, since it implies that a greater part of the total demand will be met by foreign instead of national income. For output to converge to a stable and positive level we need that $1 - w_t v_l - h + m > 0$, which is the open-economy version of the Keynesian stability condition for open economies with capital goods[14].

Up to now, investment was only depicted as a fixed share h of total output. However, as it was discussed in the introduction, a crucial feature of the Sraffian supermultiplier model is that induced investment allows capacity utilisation to return to its normal level. For that to happen, h cannot be constant, but must vary following the gap between actual capacity utilisation and its normal level, u_n.

$$\dot{h}_t = h_t \gamma (u_t - u_n) \tag{2.13}$$

If capacity utilisation exceeds its normal level, firms increase their productive investment to maintain their desired spare capacity, raising the investment share of output (h). On the contrary, if demand is low and there is excessive idle capacity, there are no incentives for increasing the capital stock, leading to a reduction in the investment share. The parameter γ represents how fast is the adjustment of the investment share to the capacity utilisation gap[15]. It must be higher than zero but also lower than one, so we have a *flexible accelerator* mechanism which allows avoiding Harrodian instability (Freitas and Serrano, 2015)[16]. From equation (2.12), and substituting with equation (2.13), we derive the growth rate of output g_t[17]:

$$g_t = \frac{h_t \gamma (u_t - u_n)}{1 - wv_l - h + m} + g_z \tag{2.14}$$

[14] Note that the inclusion of *m* increases the likelihood of this condition to be met.

[15] This way to depict investment is consistent with what Garegnani (1984) calls the "second Keynesian position": in order to attain normal capacity utilisation income distribution does not need to change, like in Neo-Keynesian models; instead, investment will adjust and increase/decrease productive capacity to demand. In the short run, effective and normal capacity utilisation will differ, but in the long run the former will adjust to the latter without affecting income distribution but output.

[16] By assuming $0 < \gamma < 1$ we imply that the adjustment of productive capacity to demand growth is gradual, so it takes several periods for the capital stock to adjust to demand (Gahn, 2021).

[17] Equation (2.14) is derived from equation (2.12), by first applying natural logarithms:

$$\ln(Y_t) = \ln(1) - \ln(1 - wv_l - h_t + m) + \ln(Z_t)$$

And then deriving with respect to time:

$$g_t = \frac{\dot{h}_t}{1 - wv_l - h + m} + g_z$$

And finally replacing $\dot{h}$ with equation (1.13).

Where g_z is the rate of growth of the autonomous components of demand[18]. As equation (2.13) shows, in equilibrium, where $u_t = u_n$, the first component of the equation is zero, and output growth equals the growth rate of demand autonomous components. This does not only mean that output will be equal to autonomous expenditures, but also that the latter will "trigger" the economic process, which is then amplified by consumption and investment. In equilibrium, then, we have:

$$g^* = g_z \tag{2.15}$$

On the contrary, if capacity utilisation differs from its normal level, output growth will be higher in order to allow for stronger investment process that restores normal capacity utilisation. Also, from equation (2.4), we know that capacity utilisation will follow the gap between capital and output growth. Thus, in equilibrium, where $u_t = u_n$ so $\dot{u} = 0$, we obtain:

$$g_t^K = g_t = g^* = g_z \tag{2.16}$$

Therefore, both the capital stock and output grow at the same rate, that of the autonomous components of demand. To complete our equation system, we only need to know the equation for the investment ratio h in equilibrium. If we replace g_t^K with g_z in equation (5.3), and u_t with u_n, we reach:

$$h^* = g_z \frac{v}{u_n} \tag{2.17}$$

A higher growth rate of autonomous components of demand, and therefore a higher growth rate of output, requires that a greater portion of output is dedicated to investment[19]. The reason is that, if an economy grows faster, it will need to invest a higher share of the economic surplus to increase productive capacity and therefore have the capital stock required to produce more in the following periods. This does not mean that consumption will have to be reduced to compensate for the growth in the investment share, but that, during the transition to the new growth rate, capacity utilisation will be higher— except in the unusual case where full capacity is reached, in which case (temporary) inflation and a subsequent fall in consumption is to be expected.

Substituting (5.19) and (5.16) in equation (2.11), we obtain then an expression for the output level in full equilibrium.

$$Y^* = \frac{1}{1 - wv_l - \frac{g_z v}{u_n} + m} Z_t \tag{2.18}$$

Wrapping up, the supermultiplier model allows detaching growth rates from income distribution, which is not possible in other Post-Keynesian models —however, income distribution can affect output levels, as argued by Nah and Lavoie (2019) and shown in equation

[18] We assume that exports and the government expenditures grow at the same rate, for the sake of simplicity and, as it will be discussed later, to avoid one of both components of autonomous demand to prevail in the long run. If they differed, the growth rate of autonomous demand could be represented as the weighted sum of its components: $g_z = \alpha g_G + (1 - \alpha) g_X$.

[19] The relation between growth and the investment ratio is a stylised macroeconomic fact (Braga, 2020; Girardi and Pariboni, 2020).

(2.18). Instead, growth responds to the autonomous demand components, exports and government consumption, and, when a "fully adjusted" position is reached, output, the capital stock and the autonomous components of demand all grow at the same rate. Second, growth and output do not depend on changes on capacity utilisation, which, due to the *flexible* accelerator mechanism, tends to return to its normal levels (Freitas and Serrano, 2015).

Up to now, the external sector of the economy appeared in the model represented by exports, which are considered autonomous, and imports, related to the level of income. But nothing has been said about how these affect the balance of payments, a crucial issue for economies that do not issue reserve currencies, which forces them to obtain hard currency via exports to pay for their imports. In the following section we delve into this and consider how the external sector can impose a constraint on the economy's growth.

3. THE EXTERNAL CONSTRAINT TO GROWTH: EXTERNAL INDEBTEDNESS

Based on the results from the previous section regarding growth and demand, we can analyse thoroughly how growth affects the balance of payments and the sustainability of different growth patterns[20]. To do so, we need to add an additional equation to our system, representing net foreign indebtedness, which equals to gross debt in foreign currency minus international reserves. Since a current account deficit must be financed with reserve spending or foreign inflows, while a current balance surplus leads to debt repayment or reserve accumulation, we can define $\dot{D}_t$ as the change in net foreign debt in period t. $\dot{D}_t$ will be equal to the trade deficit plus the interest payments/accruals on existing net debt, which depend on debt levels and the interest rate paid on foreign debt, i^*:

$$\dot{D}_t = M_t - X_t + i^* D_t \tag{3.1}$$

In order to study the sustainability of debt, what matters is not its absolute value but its relation to other aggregates of the economy. Usually, the literature on balance-of-payments constrained growth considers its ratio to GDP (McCombie and Thirlwall, 1997; Moreno-Brid, 2003). However, as Bhering et al (2019) argue, it is not GDP what is used to repay foreign debt but exports, since GDP implies production in domestic currency, but foreign debt, by definition, has to be repaid with foreign currency which only can be obtained through exports[21]. Therefore, we define d as the ratio between debt and exports.

$$d_t = D_t / X_t \tag{3.2}$$

[20] For the sake of simplicity, we are assuming away public deficits and government debt. However, public deficits could affect foreign currency demand if private surpluses are used for saving in foreign currency, as it happens in *bimonetary* economies. In that case, public deficits, by creating private savings, could end up reducing reserves or pushing the exchange rate upwards, which could be modelled as an additional addend in the debt equation, depending positively on the differential between domestic and foreign exchange rates. A way to prevent this, at least partially, would be setting a domestic interest rate higher than the international one. See Corso (2021) for a discussion on foreign currency as a financial asset, and Serrano, Summa and Aidar (2021) for an analysis of the dynamics of capital flows.

[21] For sake of simplicity, we assume that all export proceedings are received by the exporters in local currency, selling the foreign currency to the Central Bank. This is the case in most countries, and it is often mandatory. If that were not the case, because for instance the private sector accumulates foreign currency due to financial reasons then, if the external debt were public, the public sector would be forced to acquire it in the market, making the exchange rate an important determinant of its capacity to absorb these funds. We hope to deal with those kinds of financial restrictions in a future contribution.

If we derive this ratio with respect to time, we get an equation representing debt dynamics:

$$\dot{d} = \frac{\dot{D}X - D\dot{X}}{X^2} \tag{3.3}$$

And, if we replace with equation (3.1), $\dot{d}$ is:

$$\dot{d} = \frac{M}{X} - 1 + (i^* - g_X)d \tag{3.4}$$

A trade deficit is only sustainable in the long run ($\dot{d} \leq 0$) if the interest rate on foreign debt is lower than the growth rate of exports, that is, $i^* < g_X$ (Bhering, Freitas and Serrano, 2019). If that condition is not fulfilled, debt accumulates at a higher pace than the resources to repay it. In equilibrium, where $\dot{d} = 0$, we find:

$$d^* = \frac{\frac{M}{X} - 1}{(g_X - i^*)} \tag{3.5}$$

Note however that even if $i^* < g_X$, a wider trade deficit (represented in a higher M/X coefficient) will increase the equilibrium indebtedness ratio d^*, and nothing guarantees that this equilibrium level is a sustainable one. If d^* exceeds a maximum level, which we call $\bar{d}$, the trade balance will forcefully need to be improved, leading to an unstable boom-and-bust dynamic we deal with in the following section.

To advance in this direction, we must relate our debt condition to the determination of output and growth in our SSM model. From our equations representing the autonomous components of demand (2.10) and output (2.12) we know that:

$$X_t = (1 - \alpha)Z_t \ \wedge \ M_t = mY = \frac{mZ_t}{1 - w_t v_l - h + m} \tag{3.6}$$

If we replace these values in equation (3.4), we get a new equation for indebtedness dynamics:

$$\dot{d} = \frac{m}{(1 - \alpha)(1 - w v_l - h + m)} - 1 + (i^* - g_X)d \tag{3.7}$$

Equation (3.7) shows how the different parameters and variables will affect the dynamics of external indebtedness. A higher nominal wage w, or greater requirements of labour per unit of output v_l will increase the share of output appropriated by workers and therefore the supermultiplier and output. This necessarily implies higher imports, leading to indebtedness. Second, a higher propensity to import also implies an increasing debt ratio, since for the same level of output more imports will be needed[22]. Third, a higher growth rate of exports g_X will

[22] There is a similarity here with Kaldorian models. For Thirlwall (1979), the growth rate of output compatible with the balance of payments equilibrium is $g = \frac{g_z}{\mu}$, being μ the elasticity of imports to growth. In the supermultiplier model, by defining a constant m, it is implicitly assumed that $\mu = 1$, which brings Thirlwall's model to the same result than the supermultiplier in an open economy, as we will see later: $g = g_z$. That is why a change in m affects output levels, rather than its growth rates, like a change in μ in Thirlwall's model does. This does not mean that coefficient m is irrelevant, since a reduction in it of, for example, 50%, would allow to double the level of output.

reduce debt growth since exports provide the foreign currency required for repayment[23]. And fourth, a higher foreign interest rate i^* will accelerate indebtedness since the interest payments on previous debt will be higher. The exchange rate does not appear as a determinant of indebtedness in equation (3.7), but in the next section, when we allow it to vary, it will also play a role by affecting income distribution.

What about α, the share of government consumption in autonomous demand? When this parameter increases, indebtedness growth will be higher since the output-to-exports ratio will be higher. α will be constant only if, as we assumed before, both components of autonomous demand, government spending and exports, grow at the same pace, that is, $g_G = g_X$. Otherwise, in the long run, the component that grows at the lower pace would tend to represent a nil part of total autonomous demand[24]. If $g_G > g_X$, eventually public expenditure would dominate autonomous spending and α would be 1. In that case, indebtedness growth would tend to infinity, as it can be seen in expression (3.7), a clearly unsustainable situation.

On the contrary, if $g_G < g_X$, then growth would be fully determined by exports, with no role for government spending, which is far from what is observed in actual economies. In the long run, growth would be determined by exports but at an output level significantly lower than what it could be, since there would be permanent reserve accumulation. Moreover, in the *transition* towards this long run position, not only output levels but also growth would be lower than the maximum attainable, since total growth would be a weighted average of the rate of growth of government consumption and exports.

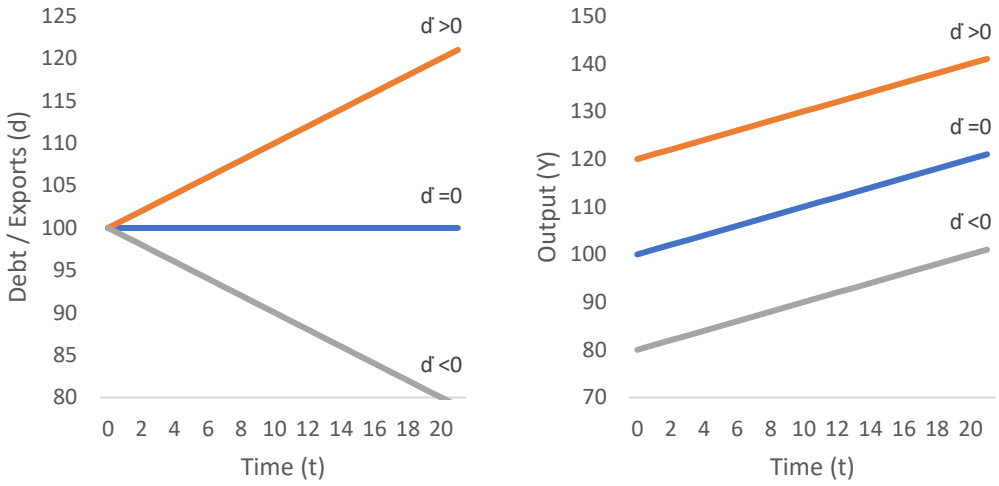
We reached here a crucial conclusion of our analysis: domestic autonomous demand — government spending— cannot grow persistently faster than foreign one, for foreign debt to be sustainable[25]. Therefore, for our model to display a relevant role in aggregate demand for government spending and exports, both components must grow, in a fully adjusted position, at the same rate[26]; that is, $g_G = g_X$.

Oreiro and Costa Santos (2019) argue, based on this result, that it is impossible to combine long-term growth driven by government spending with the BOP-constraint in a supermultiplier model, limiting the role for public spending in this approach. Our model shows that while it is true that fiscal policy is constrained, particularly in the long run, the government still has an important role to play, since there is nothing that automatically leads the economy to its maximum output level compatible with the external restriction, where $\dot{d} = 0$. To do so, the government can determine the value of the parameter α, by a one-time increase/decrease in its spending levels (to return to its previous rate of growth after that, the same than exports' growth

[23] g_X has also a positive effect on d since it affects h positively. However, the latter effect must be smaller than the former unless $m > 1$, in which case economic activity is impossible since it does not produce surplus.
[24] This is why we assume $g_z = g_G = g_X$ in equation (2.14).
[25] This constraint, in a Sraffian tradition, can be thought of in general terms: an economy cannot grow faster than the growth rate of its basic good with the lowest growth rate. In a balance-of-payments constrained economy, that "good" would be exports, since they provide a basic input for economic activity, that is, hard currency required for imports. This does not preclude other inputs from constraining economic growth, such as energy or labour.
[26] We are overlooking here the fact that a specific part of government spending, public investment, can provide the required infrastructure to increase productivity, and therefore improve competitiveness and boost exports (Aschauer, 1989).

rate), which does not affect the long-run growth rate of the economy but impacts on its output level[27].

Figure 3. Output and debt/exports ratio



As Figure 3 shows, if the government sets an α too low (that is, a conservative fiscal policy, represented with the grey line) the growth rate of foreign debt will tend to fall and the country will become a net creditor, but at expense of an output that could be at a higher level without leading to BOP disequilibrium. On the contrary, if α is too high (in orange), the debt ratio will increase persistently, leading to an unsustainable trajectory. Therefore, the fiscal policy (in blue) that maximizes the *level* of output that is simultaneously compatible with the external constraint, consists of adjusting government spending so α reaches a value equal to:

$$\alpha^* = 1 - \frac{m}{[1 + d(g_X - i^*)][1 - wv_l - h + m]} \tag{3.8}$$

And therefore, the economy will reach its maximum output level without leading to an ever-growing debt ratio[28]. Our analysis also shows important results for industrial policy: while an import substitution strategy, aimed to decreasing m, can affect the output level compatible with balance of payments equilibrium, it does not affect its growth rate, since the condition $g_X \geq g_G$ is still binding —although the impact on output levels can be significant; for example, halving the import coefficient allows to duplicate output. Instead, if the industrial policy is export oriented, and succeeds in increasing the growth rate of exports g_X, then higher growth rates can be attained (which will require also increasing government expenditures at the same pace than exports)[29].

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[27] The balance of payments imposes a limit to economic activity, but is not an attractor for the latter: for output to be equal to its maximum level compatible with balance of payments equilibrium domestic expenditures must be high enough (Palley, 2002; Setterfield, 2006).

[28] Serrano and Wilcox de Souza (2000) also calculate the maximum value for output compatible with BOP equilibrium in a supermultiplier model.

[29] This argument does not consider the potential effect of output growth on productivity, known as the Kaldor-Verdoorn law (Kaldor, 1957). An increase on productivity also leads to higher competitiveness and thus boosts exports. In that case, affecting level variables such as m or α could also increase exports indirectly and therefore allow for higher growth rates. For a thorough analysis on the interaction between growth, productivity and exports see Lavopa (2015).

We have highlighted the role for domestic demand autonomous components and, perhaps more importantly, its constraints. But we have not discussed how these constraints become active for the economy, that is, what are the mechanisms by which these constraints become binding. In the following section we propose an alternative, based on the structuralist tradition: we build a dynamic model where, when indebtedness becomes excessive, the exchange rate adjusts to recover balance-of-payments equilibrium through an increase in domestic prices and a subsequent decrease in real wages.

4. DISTRIBUTIVE CYCLES

4.1 Distributive cycles in a supermultiplier model

Our model has shown that the growth of autonomous demand components, and, consequently, that of the whole economy, cannot be higher than that of exports in the long run. But what happens when this condition is not fulfilled, due to excessive autonomous demand or high wages? How does this constraint become binding in practice? Structuralist authors have argued that balance-of-payments deficits are generally solved through currency devaluations, but that these do not boost exports and reduce imports, as in a Mundell-Fleming fashion. Instead, it is output what bears the brunt of adjustment, in what has been called a process of *recessive devaluation* (Díaz Alejandro, 1963; Krugman and Taylor, 1978; Prebisch, 1986).

Braun and Joy (1968) provide a succinct version of this process and describe how the external constraint generates economic cycles. If economic activity leads to a level of imports excessive for the current level of exports, there is a depreciation of the currency which, given that domestic production requires imports to be produced, increases domestic prices. If nominal wages remain constant, then there is a decrease in the real wage (in our model, a reduction in the *supermultiplier*) that implies a lower income, and therefore less imports, restoring external equilibrium. It is income distribution and output what adjusts to the balance-of-payments constraint, and not exports. Eventually, unions start demanding increases in their nominal wages to recover workers' previous purchasing power, which increases their share of output and also the *supermultiplier*, augmenting total output and imports and restarting the cycle.

We add this feature to the model built in the previous sections by adding two dynamic equations, one considering the determination of the exchange rate and domestic prices, and another for nominal wages. Regarding the former, we assume that the Central Bank (CB) intervenes in the spot market, following the evidence that shows that, albeit often they do not declare it explicitly, Central Banks usually participate in the exchange rate market, particularly in times of distress (Reinhart and Rogoff, 2004; Levy-Yeyati and Sturzenegger, 2005)[30]. This is more common in emerging economies, even when committed to inflation targeting regimes (BIS, 2019)[31]. Hence, we assume that, in period t, the CB buys and sells international reserves as needed to maintain the nominal exchange rate at its current level e_t, unless indebtedness levels exceed a certain level $\bar{d}$, which might be established by the bank itself or by international credit markets. In that case, the CB allows —or cannot avoid— a currency depreciation.

[30] Serrano, Summa and Aidar (2021) show that flexible exchange rate regimes tend to be intrinsically unstable due to exchange rate expectations, providing justification for CB intervention.

[31] According to the IMF AREAER database, only 20% of low income and developing economies applied a floating exchange rate regime in 2019 (IMF, 2020).

$$\frac{\dot{e}}{e} = \max\left(0, \gamma_e\left(d_t - \bar{d}\right)\right) \tag{4.1}$$

Nothing precludes the use of a flexible exchange rate regime in the model. A schematic adaptation of the model shows that our results change for certain scenarios if a flexible exchange rate regime is considered, but a thorough analysis of the dynamics of the model under such a regime remains pending[32].

Wages are a result of the distributive conflict between workers and capitalists, so they are "exogenous" in the sense that they are not determined by any mechanical law as in marginalist theory. Workers form social conventions about what a "normal" real wage is, represented by the parameter w_n. Real wages are equal to nominal wages divided by domestic prices, which, due to our assumption of a small open economy, are equivalent to international prices $p_y^*(=1)$ multiplied by the exchange rate e_t in period t. Therefore, a depreciation reduces real wages, by increasing domestic prices. If real wages are lower than w_n, the "normal" wage, then unions will demand nominal wages increases. On the contrary, if the real wage exceeds the normal one, they cease demanding increases but do not allow reductions, that is, there is downward nominal wage rigidity, a feature often defined by law or in collective agreements[33].We can represent this dynamic with the following equation:

$$\frac{\dot{w}}{w} = \max\left(\gamma_w\left(w_n - \frac{w_t}{e_t}\right), 0\right) \tag{4.2}$$

We complete our model with the three equations already defined for capacity utilisation, the investment ratio and external indebtedness. Since wages and prices are not assumed to remain constant anymore, we also must adapt the wage-share expression in our previous equations for it to be represented in real terms. Modifying equations (2.3), (2.4) and (2.14) to consider this, and combining them, we can derive a dynamic expression for capacity utilisation, considering now that the short-term growth rate is affected by changes in the wage share, which is not fixed anymore[34]:

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[32] We can instead define a flexible exchange rate rule, where the exchange rate tends towards the value that stabilizes the balance of payments based on equation (4.8). That is, we can assume that all agents are "conventionalists" in the sense of Lavoie and Daigle (2011), and that the value they expect for the exchange rate is that compatible with BOP equilibrium. We then find different results according to the scenario depending on the normal wage discussed below. If the normal wage is equal to the equilibrium wage, results coincide with the original model. If it is lower, then there is real appreciation process that leads the real wage and indebtedness towards the external limit. Finally, if it is higher, then the real wage and indebtedness tend towards a position between the internal and external equilibrium, marked by constant inflation. If wage resistance and the exchange rate responsiveness are high enough, distributive cycles can emerge.

[33] Note that we assume that the "normal" real wage w_n is exogenous. However, the normal real wage could vary with changes in unemployment rates, since this affects the bargaining power of workers, or in effective wage values, causing hysteresis and adding an additional layer of complexity to the model (Stirati, 1992).

[34] We take natural logarithms from (2.12), adapted to consider the real wage rather than the nominal one:

$$\ln(Y_t) = \ln(1) - \ln\left(1 - \frac{w_t v_l}{e_t} - h_t + m\right) + \ln(Z_t)$$

Solving and deriving with respect to time we obtain:

$$g_t = \frac{\frac{v_l p^*[\dot{w}e_t - \dot{e}w_t]}{{e_t}^2} + \dot{h}}{1 - \frac{w_t v_l}{e_t} - h_t + m} + g_z$$

We then replace $\dot{w}$, $\dot{e}$ and $\dot{h}$ with the values from equations (3.1), (3.2) and (1.13), obtaining the value of g_t:

$$\frac{\dot{u}}{u} = \frac{h\gamma(u_t - u_n) + \frac{w_t v_l}{e_t}\left\{\max\left(\gamma_w\left(w_n - \frac{w_t}{e_t}\right), 0\right) - \max\left(0, \gamma_e\left(d_t - \bar{d}\right)\right)\right\}}{1 - \frac{w_t v_l}{e_t} - h_t + m} + g_z - \left(\frac{h_t}{v}\right)u_t \tag{4.3}$$

This cumbersome expression can be narrowed down to some simple concepts. Capacity utilisation grows when the investment share of output increases (the first addend in the numerator), or when the wage share grows (the second addend), due to increases in the nominal wage share or reductions in the exchange rate and therefore on domestic prices. A stronger supermultiplier (the denominator) intensifies this effect. Also, higher autonomous spending g_z boosts capacity utilisation, and a stronger growth of the capital stock $\left(\frac{h_t}{v}\right)u_t$ reduces it. In the long run, however, these influences are temporary, and capacity utilisation returns to u_n. The investment share of output remains the same than in equation (2.13):

$$\frac{\dot{h}}{h} = \gamma(u_t - u_n) \tag{4.4}$$

And indebtedness is, according to equation (2.6), which is also adapted to depict the real wage:

$$\frac{\dot{d}_t}{d} = \frac{m}{(1-\alpha)\left(1 - \frac{w_t v_l}{e_t} - h_t + m\right)d_t} - \frac{1}{d_t} + (i^* - g_X) \tag{4.5}$$

Note that, even though the exchange rate and prices are variable now, exports remain unaffected by them. This happens because a) as discussed earlier, we assume the export-exchange rate elasticity to be zero, and b) because variables are expressed in real terms, and domestic prices are equal to international ones multiplied by the exchange rate, so it is indifferent to express variables in real terms or in foreign currency. Therefore, the only influence of the exchange rate in the debt to exports ratio is through changes in the real wage w_t/e_t.

Let us solve this system. From equation (4.4), we know that, in equilibrium:

$$u^* = u_n \tag{4.6}$$

Combining this result with equation (4.3), and assuming a stable wage share in the long run, we know that the investment share of output will be equal to:

$$h^* = \frac{g_z v}{u_n} \tag{4.7}$$

$$g_t = \frac{h\gamma(u_t - u_n) + \frac{w_t v_l}{e_t}\left\{\max\left(\gamma_w\left(w_n - \frac{w_t}{e_t}\right), 0\right) - \max\left(\gamma_w\left(w_n - \frac{w_t}{e_t}\right), 0\right)\right\}}{1 - \frac{w_t v_l}{e_t} - h_t + m} + g_z$$

We finally combine this result with equations (1.4) and (1.3) to calculate the dynamics of capacity utilisation.

Let us turn to real wages, which are, as said, the mechanism of adjustment of the model. For the external sector, represented in equation (4.5), to be in equilibrium, the real wage should be equal to:

$$\frac{w}{e} = \left[1 - \frac{m}{[1-\alpha]\left[(g_Z - i^*)\bar{d} + 1\right]} - g_z \frac{v}{u_n} + m\right]\left[\frac{1}{v_l}\right] \tag{4.8}$$

There is, therefore, a maximum wage compatible with balance-of-payments equilibrium, since the wage share affects output and therefore imports (Canitrot, 1983). However, for the demands of unions to be met, that is, to reach equilibrium in equation (4.2), it is needed that:

$$\frac{w}{e} = w_n \tag{4.9}$$

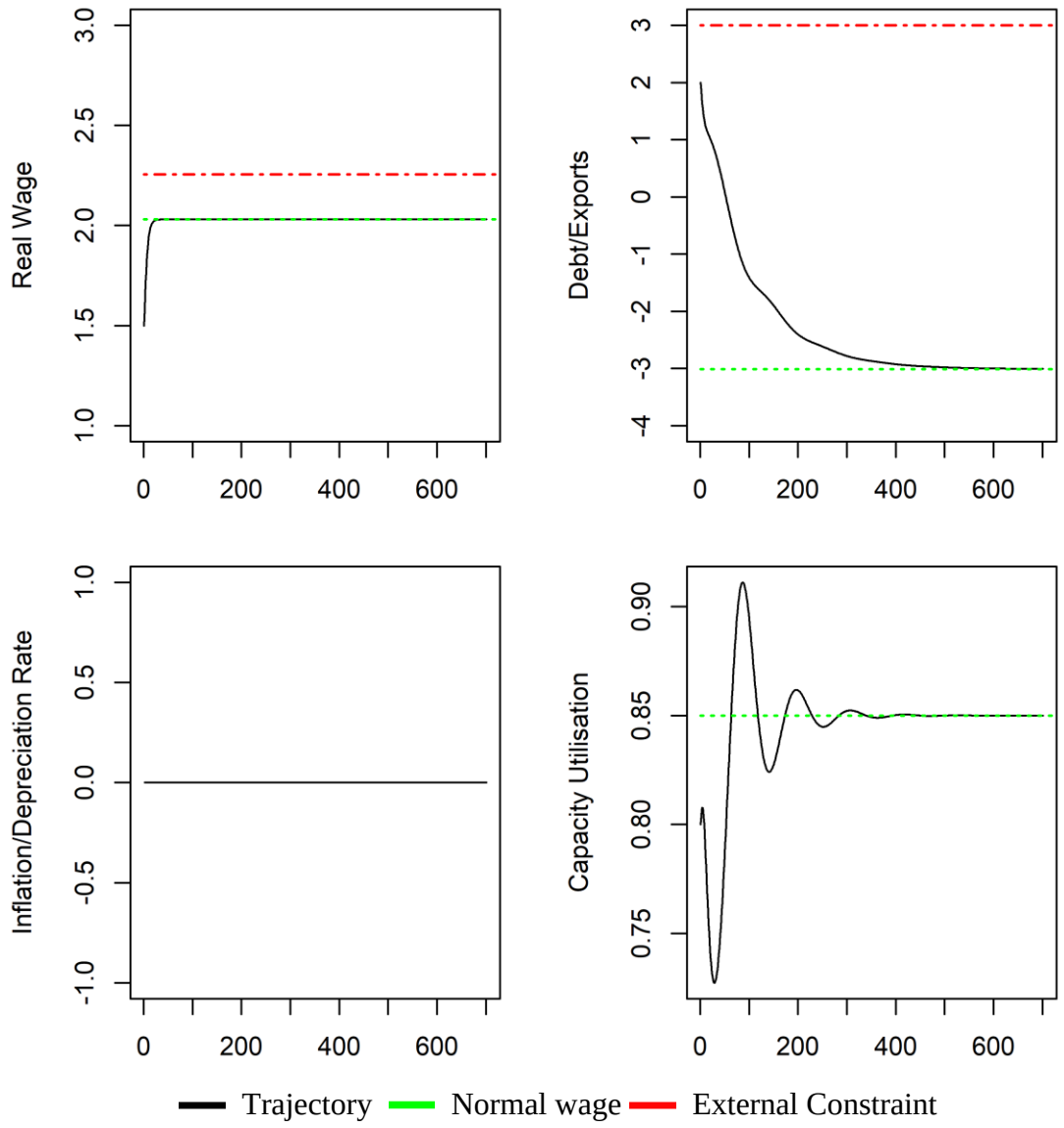
Notice that there are two values for real wages in this model, the one that meets unions' demands, and the one that allows for a balanced external sector, and they do not necessarily coincide. This feature can be thought as a representation of the potential wage struggle in the economy: if the normal real wage is higher than the level allowed by the external constraint to growth, the economy will not be able to reach an equilibrium, permanently pressured by wage demands and recessive depreciations (Olivera, 1991). Otherwise, unions' demands will be compatible with the external constraint to growth, and the economy will tend towards a long run equilibrium. The conditions of the economy depend mostly on the value of the normal wage, as we can see by combining equations (4.8) and (4.9):

$$w_n \lesseqgtr \left[1 - \frac{m}{[1-\alpha]\left[(g_Z - i^*)\bar{d} + 1\right]} - g_z \frac{v}{u_n} + m\right]\left[\frac{1}{v_l}\right] \tag{4.10}$$

We face three possible scenarios, depending on whether the normal wage is lower, equal, or higher than its equilibrium value, given by the right side of equation (4.10)[35]. The first case, where the normal real wage is lower than that the one allowed by the external constraint, is represented in Figure 4.

[35] A discrete version of the model was built to carry out the simulations. The full model and the values of the parameters are described in the annex.

Figure 4. Normal wage lower than its external equilibrium value



In this case, the real wage (upper left panel) starts at a lower level than the normal one w_n (represented as a green line). Therefore, unions start demanding higher wages, until they reach w_n. Real wages could continue rising, up to the external equilibrium level (red line), and still allow for a higher value of output and a stable level of indebtedness. However, there is nothing pushing them upwards, since unions' demands are already met. Given that output is lower than its maximum level compatible with external equilibrium, external debt, measured as a percentage of exports (upper right panel), will tend up to an equilibrium level, called d_n, and lower than $\bar{d}$:

$$d_n = \left[1 - \frac{m}{(1-\alpha)\left(1 - w_n v_l - g_z \frac{v}{u_n} + m\right)}\right]\left[\frac{1}{(i^* - g_X)}\right] < \bar{d} \qquad (4.11)$$

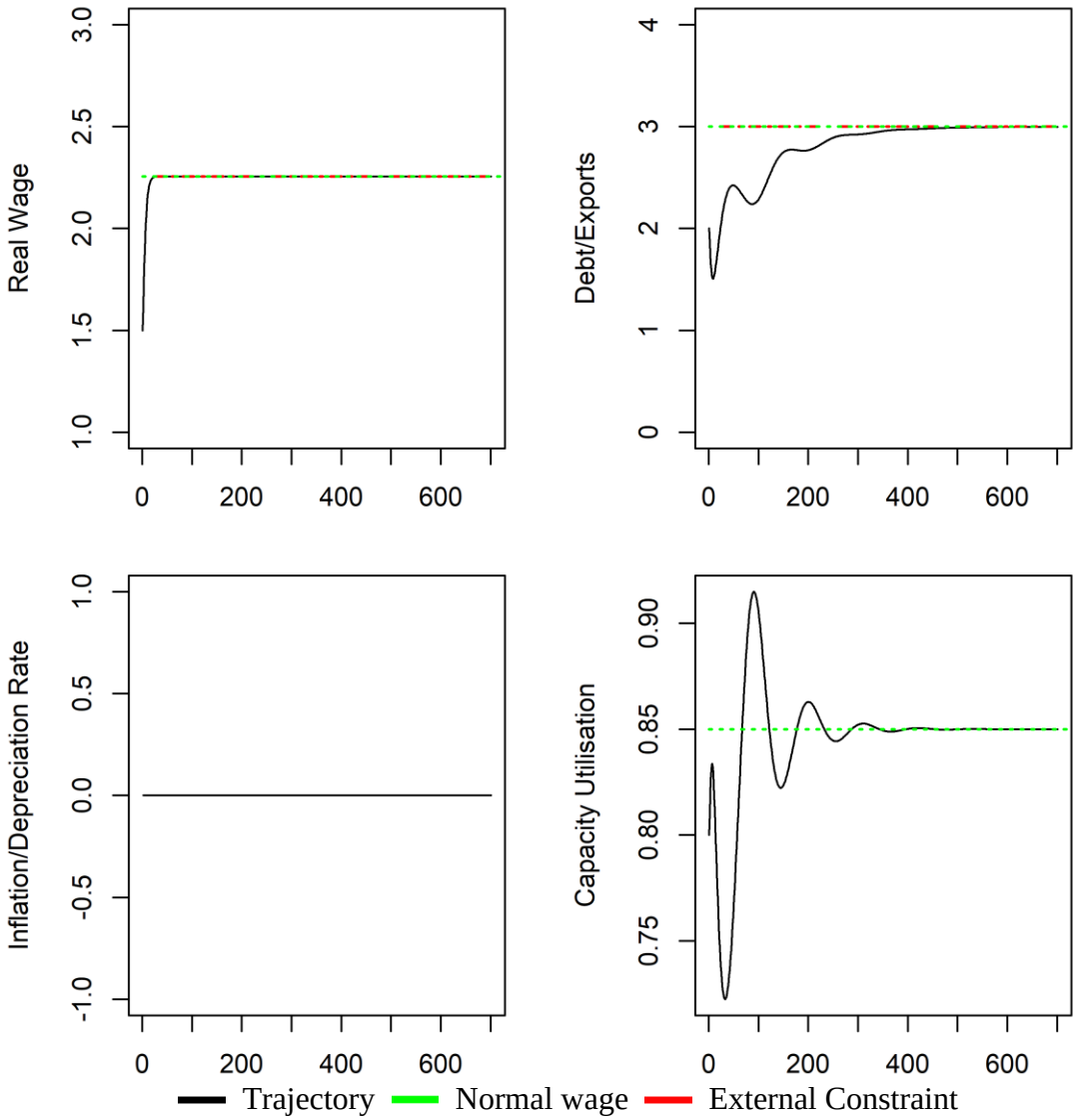
Since debt is below its threshold, the exchange rate (lower left panel) will be stable: there is no need for currency depreciations. Capacity utilisation will progressively converge to its normal

level u_n, as in the original model (lower right panel). This scenario, while stable, features an output than is permanently lower than what it could be without leading to external imbalances. The government could exploit this external space by increasing its spending and pushing α upwards, up to a level α^* where (4.10) is an equality, raising output without affecting real wages nor generating an indebtedness crisis.

$$\alpha^* = 1 - \frac{m}{\left[1 + (g_Z - i^*)\bar{d}\right]\left[1 - w_n v_l - g_z \frac{v}{u_n} + m\right]} \tag{4.12}$$

In the second scenario, the normal wage is equal to its limit value given by the external constraint to growth, leading equation (4.10) to be an equality. In that case, represented in Figure 5, there will also be no conflict in the long run, since real wages demanded by unions will be exactly the maximum ones allowed by the external sector. If wages are initially lower than their normal level, unions' demands will increase them up to their normal level w_n, also increasing economic activity and the debt ratio up to its maximum level (note that in this case, the green and the red lines coincide).

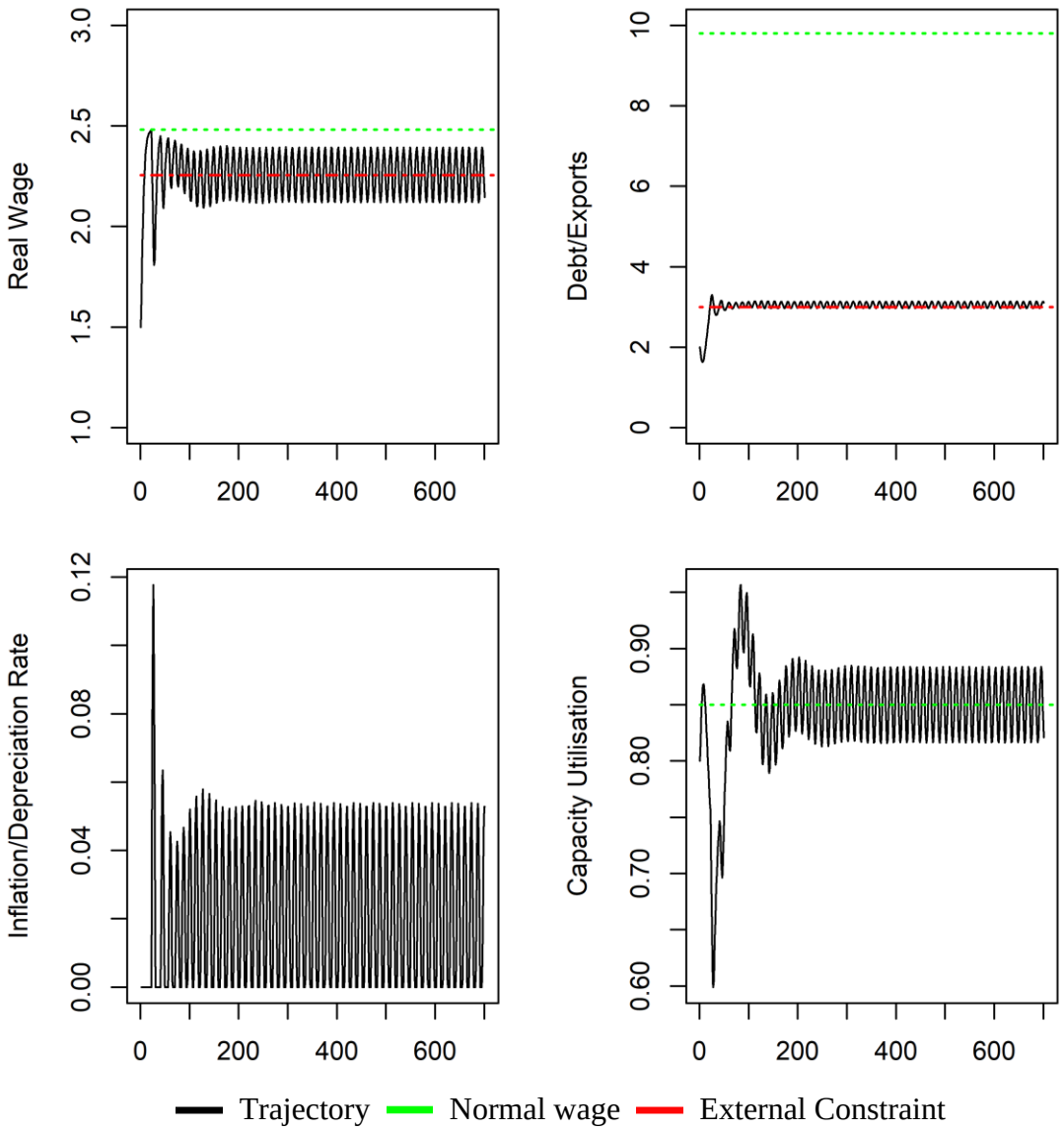
Figure 5. Normal wage equal to its external equilibrium value



In the previous case, output was not at its maximum level allowed by the external constraint to growth, since normal wages were lower than what it allowed. Here, instead, output reaches its limit value, so the economy is exploiting completely its external space. While this is not considered explicitly in the model, several forces could lead the economy towards this equilibrium: for example, fiscal spending might surge when there is external margin, increasing α, or normal wages might also be endogenous and tend to increase when previous wage demands were met without leading to a distributive conflict. The import share could also be endogenous in some cases, if the production function is less rigid than the one considered here and imported inputs can be replaced with domestic production.

The third scenario, and the most interesting one for our purposes, is when the normal real wage exceeds the value allowed by the external constraint, leading to excessive economic activity and indebtedness. In this case, the domestic distributive pattern is incompatible with external equilibrium, which leads to economic cycles. If the economy departs from a situation where the real wage is lower than its normal level, unions will demand wage raises, which will be progressively met. The real wage will tend towards its normal level, as seen in the upper left panel, and capacity utilisation will increase. However, this implies a value of the supermultiplier for which output and imports exceed exports, leading to growing indebtedness, (upper right panel). When d exceeds $\bar{d}$, the Central Bank is forced to devaluate the currency (lower left panel), increasing domestic prices and reducing the wage share, which will tend towards its external equilibrium level (red dotted line in the upper left panel). Capacity utilisation, due to lower demand, will decrease. The reduction in activity reduces indebtedness but restarts the cycle: since real wages are now lower than the normal ones, unions push for wage increases.

Figure 6. Normal wage higher than its external equilibrium value



The outcome of this distributive struggle will be a cyclical economy, where real wages and indebtedness oscillate between two equilibria: an internal one, given by unions' demands, and an external one, imposed by the external constraint to growth[36]. This continuous tension will result in permanent increases in the exchange rate and continuous inflation due to the balance of payments constraints, as well as volatility in capacity utilisation, income distribution and growth, as argued by structuralist authors[37].

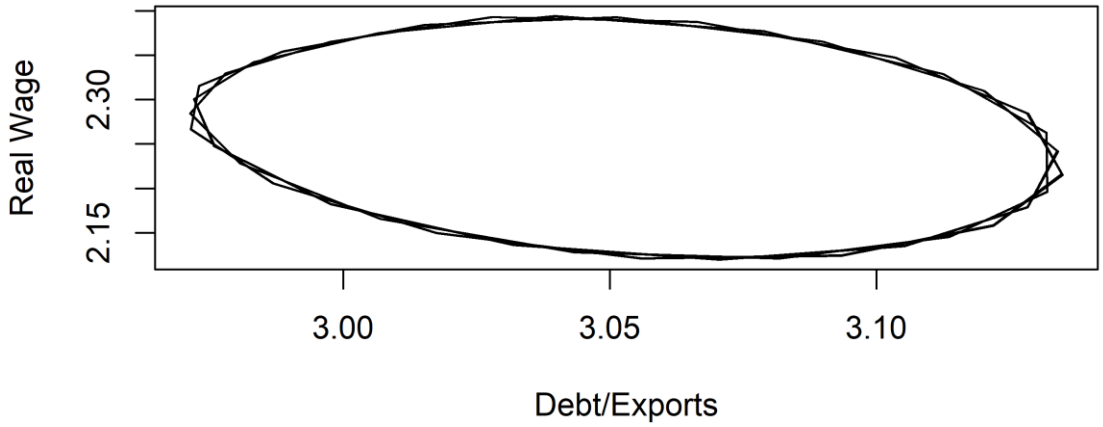
This can be appreciated more readily in Figure 7, which shows the behaviour of the debt ratio and the real wage. Since higher wages lead to excessive indebtedness, and debt eventually

[36] In this situation, we have, conceptually, a model similar to that of Hicks (1950), recovered by Fazzari *et al.* (2013): there is an unstable equilibrium but the system does not explode due to a demand floor, given by autonomous demand and the minimum values of the supermultiplier, and a ceiling, provided in this case by the external constraint to growth instead of full employment.

[37] This dynamic depends on the crucial assumption that the normal wage is exogenous. However, if the normal wage were to vary inversely to unemployment levels (Rowthorn, 1977), or with previous levels of effective wages (Stirati, 1992), the "internal" equilibrium could adjust towards the external one, eliminating the cyclical dynamic.

reduces salaries through exchange rate devaluations, the economy will permanently display oscillations[38].

Figure 7. Distribution and debt cycles



In this scenario, output will oscillate around its maximum attainable level, like in the previous situation, although with strong volatility and permanent inflation. There is therefore a rationale for the government, when increasing exports or substituting imports is not possible (or takes too long), to implement a conservative fiscal policy to stabilize the exchange rate and domestic prices, reducing α (and therefore economic activity) to the value α^* given by equation (4.12), which allows the economy to operate at its maximum levels compatible with the external constraint to growth without "hitting" the latter, which leads to economic cycles and inflation.

Since output is necessarily constrained by the availability of foreign currency, a stabilization policy would not reduce growth rates in the long run (although it will, in the short run) but it would put inflation and depreciation under control. Therefore, in a demand-led economy with distributive struggle and without unlimited access to foreign currency, fiscal policy can be used to tame inflation by adjusting government spending so α equals α^*, in order to allow the economy to reach its maximum level of output without triggering an inflationary process. Of course, in reality this value will not be constant but change with modifications in other parameters such as international interest rates, international prices, export prices or the target wage, which implies that in practice the fiscal policy would have to act in a countercyclical manner[39]. Although it is not modelled explicitly here, stabilising the exchange rate and taming inflation could have positive effects on output, particularly in economies where instability led to partial dollarisation, furthering the demand for foreign currency.

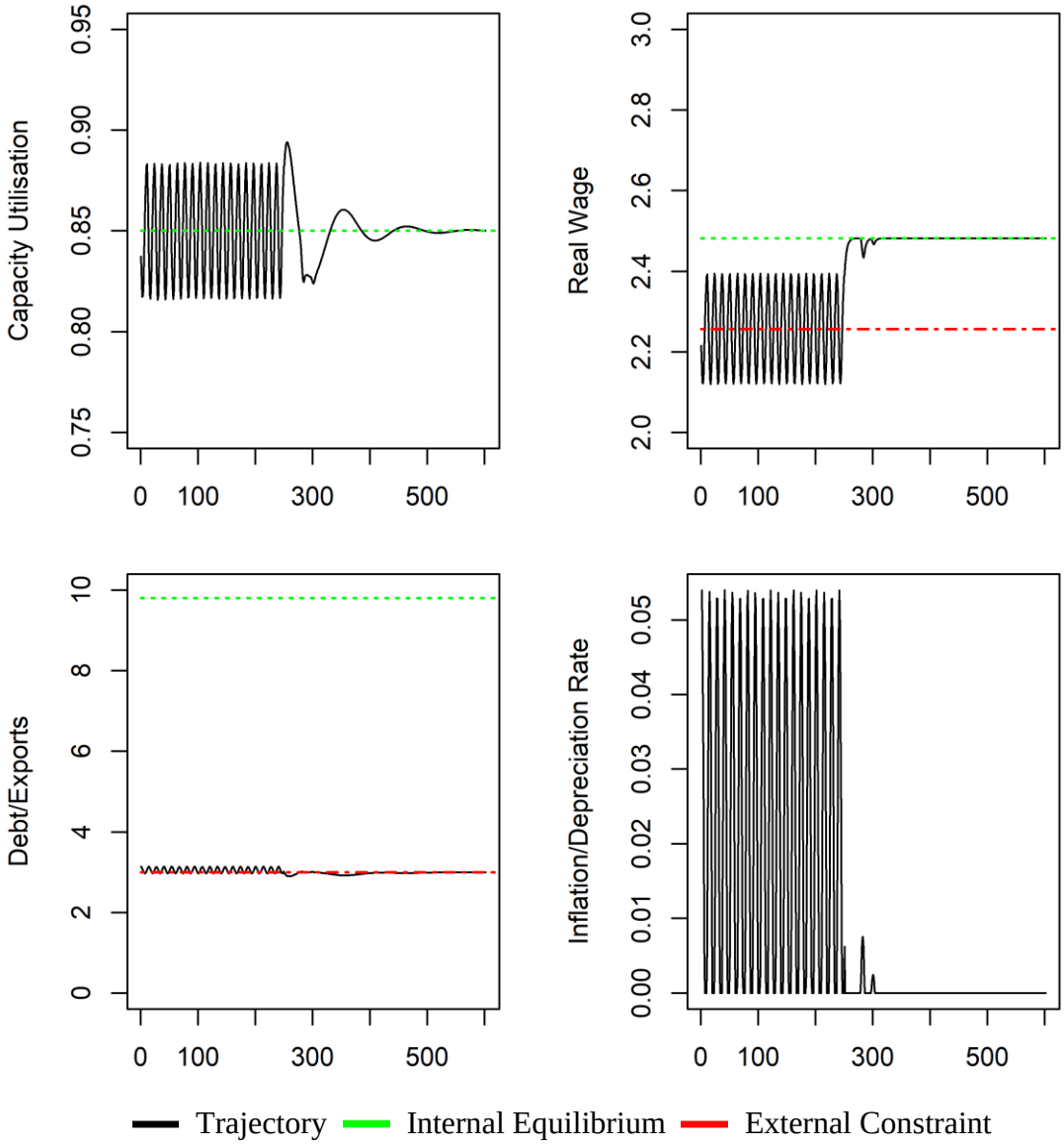
Figure 6 shows how such a stabilization policy can succeed in controlling inflation. By a one-time reduction in government spending that reduces parameter α to α^* (which only implies changing governments' spending level, not its long-run growth rate), the government makes output compatible with the external constraint to growth and eventually achieves nominal stability, while real wages reach their normal value. Note that this policy implies, however, to

[38] If exchange rate responsiveness to debt is too low, the economy also generates cycles, but they converge towards an equilibrium. This equilibrium, however, still displays permanent inflation.

[39] This fiscal rule bears resemblance to the functional finance paradigm (Lerner, 1943), but considering as a limit not full employment but the availability of foreign currency. There is no reason for the external constraint to be stricter or looser than the full employment one, so, in the former case, the economy would necessarily be in a permanent underemployment condition.

"manage" the external constraint to growth by avoiding the potential instability in nominal variables rather than "solving" it. To do so, the only way is to promote exports, so they grow at a faster pace, and only then expanding domestic spending. The results of our model, therefore, consider both the importance of demand in output determination and the external constraint to growth[40].

Figure 8. Stabilization fiscal policy[41]



5. FINAL REMARKS

In this paper we built a dynamic supermultiplier model with two sources of autonomous demand, one domestic (government spending) and another foreign (exports), that considers, unlike the original SSM model, that small open economies can be restrained by the balance-

[40] An alternative way to control inflation would be reducing wage resistance, represented by a reduction in the coefficient γ_w, which also implies a lower wage share. Abeles and Cherkasky (2019) argue that this is what happened in most countries, which explains the global reduction in inflation rates since the 80s.

[41] The shock consists of the decrease of α from its initial value (0,67) to α^* (0.64).

of-payments. We found, in the first place, a long run growth constraint: since output requires imports to be produced, growth cannot exceed that of exports without leading to external debt crises. However, to exploit that external space for growth, domestic autonomous spending must also increase at the same pace. Therefore, boosting exports is fundamental for growth, but also, once this objective is achieved, government spending must also be increased to exploit the gained external space. Fiscal policy remains crucial in the open-economy supermultiplier model, although constrained by the balance-of-payments.

In the short run, however, that constraint might be violated, and output can exceed its level compatible with the external constraint to growth, due to government spending or to high wages, which increase consumption. In that case, indebtedness grows and eventually triggers a balance-of-payments crisis that depreciates the domestic currency and restores equilibrium. Unlike in traditional models, equilibrium is restored through a *contractionary devaluation*: a higher (i.e., more depreciated) exchange rate raises domestic prices and reduces real wages, dampening aggregate demand and therefore reducing imports. Therefore, in the model considered it is income distribution what takes the brunt of adjustment, in a structuralist fashion. If there is no wage resistance, the economy reaches an equilibrium, compatible with the external constraint.

However, if workers, after seeing their purchasing power reduced, demand nominal wage increases to restore it, demand grows again, and the economy restarts an indebtedness cycle that eventually will end up in a balance-of-payments crisis. If the real wage that meets workers' demands exceeds the level compatible with external balance, the economy oscillates permanently between two equilibria: an internal one, given by workers' demands, and an external one, imposed by the external constraint to growth. Similar to Hicks (1950), the economy is unstable but explosive dynamics are prevented because of a minimum output, given by autonomous demand and the lowest value of the supermultiplier, and a maximum one due to the availability of foreign currency.

Then, the dynamics of the economy crucially depend on the "normal" real wage demanded by workers: if it drives the economy to an output level compatible with the external constraint to growth, there is nominal equilibrium, but at an output level that could be higher. On the contrary, if it leads to an output higher than that compatible with exports, it creates a cyclical dynamic in the economy, marked by permanent inflation. In this context, fiscal policy can also be a powerful tool to tame instability, by adjusting spending to a level where the economy does not exceed the external constraint but also where spending is not too low, and reserves accumulate further than necessary.

However, fiscal policy has a limit: it can "manage" the external constraint, pushing growth to its limit while avoiding inflation, but, in the long-run, higher growth rates can only be achieved with increasing exports, which provide foreign currency, and a corresponding boost on government spending. A fine tuning of fiscal and industrial policies is required for increasing long-run growth, implying that specific types of government spending, such as the provision of infrastructure or the development of import substitution projects, could help ease off the external constraint to growth. The management of the interest rate, not explored here, could also be a powerful tool to attract capital flows and increase the external space, although it has to be tuned carefully in order to avoid an increasing debt burden. Still, there remain some

crucial exogenous variables for export growth: trade partners' growth rates and access to their markets, as well as international prices of exported goods.

Wrapping up, in this paper we built a model where we combine a supermultiplier model, where demand determines long-run growth, with a balance-of-payments constraint to growth. We have shown how, depending on government spending and income distribution patterns, the economy can reach different output levels and display stable growth or a cyclical dynamic and inflation.

Further research along this path is required. First, empirical testing of the model for different countries would be useful to analyse its fit to actual economic dynamics. Second, we assumed away fiscal deficits and their financing to focus on the external constraint, but fiscal deficits create private savings that, in *bimonetary* economies, can traduce to foreign assets demand, increasing the pressure on the BOP. Finally, a crucial link between domestic demand and exports is overlooked in our model: following the Kaldor-Verdoorn law, output growth leads to higher productivity, which can increase competitivity of exports and therefore boost the latter. The inclusion of that effect could tame instability at least partially when it emerges and provide a strong argument for the synergy between domestic and foreign demand.

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7. Annex: discrete model and parameters

To simulate the model of section 4, we develop a discrete version of it. Our discrete model displays 5 modified equations. The exchange rate dynamics are given by:

$$\frac{\Delta e_t}{e_{t-1}} = \max\left(0, \gamma_e\left(d_{t-1} - \bar{d}\right)\right) \tag{7.1}$$

Nominal wages follow equation (7.2):

$$\frac{\Delta w_t}{w_{t-1}} = \max\left(\gamma_w\left(w_n - \frac{w_{t-1}}{e_{t-1}}\right), 0\right) \tag{7.2}$$

While capacity utilisation is defined by:

$$\frac{\Delta u_t}{u_{t-1}} = \frac{h_{t-1}\gamma(u_{t-1} - u_n) + \frac{w_{t-1}v_l}{e_{t-1}}\left\{\max\left(\gamma_w\left(w_n - \frac{w_{t-1}}{e_{t-1}}\right), 0\right) - \max\left(0, \gamma_e\left(d_{t-1} - \bar{d}\right)\right)\right\}}{1 - \frac{w_{t-1}v_l}{e_{t-1}} - h_{t-1} + m} + g_z - \left(\frac{h_{t-1}}{v}\right)u_{t-1} \tag{7.3}$$

The investment share of output is:

$$\frac{\Delta h_t}{h_{t-1}} = \gamma(u_{t-1} - u_n) \tag{7.4}$$

Finally, the ratio between debt and exports follows equation (7.5):

$$\frac{\Delta d_t}{d_{t-1}} = \frac{m}{(1-\alpha)\left(1 - \frac{w_{t-1}v_l}{e_{t-1}} - h_{t-1} + m\right)d_{t-1}} - \frac{1}{d_{t-1}} + (i^* - g_X) \tag{7.5}$$

There are not many references for the values of the parameters, so they were chosen based on Morlin (2021) and Haluska, Braga and Summa (2020). For the normal wage values, the external equilibrium wage was reduced/augmented by 10% to reach the normal wage for each scenario. The values for parameters are:

Variable	Value	Description
X	100	Exports
G	200	Government spending
g_Z	0.04	Growth rate of autonomous demand
α	0.67	Share of government spending on autonomous demand
m	0.25	Import propensity
u_n	0.85	Normal capacity utilisation
v	1.5	Capital-output ratio
i^*	0.03	International interest rate
p_y^*	1	International price of domestic good
p_m^*	1	International price of imported good
$\bar{d}$	3	Debt to exports ratio limit
v_l	0.2	Labour-output ratio

γ	0.1	Investment to capacity utilisation elasticity
γ_e	0.4	Exchange rate to debt elasticity
γ_w	0.1	Nominal wages to real wage elasticity
w_n	2.03	Target wage in first scenario
	2.25	Target wage in second scenario
	2.48	Target wage in third scenario

And the initial values for variables:

$u_{t=0}$	0.8	Capacity utilisation
$h_{t=0}$	0.1	Investment share of output
$d_{t=0}$	2	Debt to exports ratio
$e_{t=0}$	1	Nominal exchange rate
$w_{t=0}$	1.5	Nominal wage in first scenario