Is the Fed Hindering Development?

Impacts of US interest rates on growth, income distribution and macroeconomic policy space in developing countries: a demand-led growth model

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List of Abbreviations

BIS – Bank of International Settlements

BPCG – Balance of Payments Constrained Growth

BoP – Balance of Payments

Fed – Federal Reserve Bank of the United States of America

IMF – International Monetary Fund

RoW – Rest of the World

SFC – Stock Flow Consistent

US – United States of America

List of Variables

K – capital

E – equities

C_W – worker's consumption

C_R – rentier's consumption

Y_p – productive income

Y_F – financial income

Π – total profits

W – total wages

i – domestic interest rates

B – public debt stocks

b – public debt to capital stock

Ψ – ratio of financial income to productive income

ω – wage share of total income

h - profit share of total income

φ – financial share of total income

π – share of profits on productive income

S – total domestic savings

σ – domestic savings to capital stocks ratio

I – investment

TB – trade balance

tb – trade balance to capital stocks ratio

Gov – government flows: government consumption and interest payments minus tax revenues

gov – Gov to capital stocks

X – exports, subscripts characterize different components of exports as described in text

M – imports, subscripts characterize different components of imports as described in text

G_C – government consumption

T – tax revenue

g – rate of capital accumulation and investment to capital stocks ratio

γ – firms' expected sales or 'animal spirits' investment

γ_u – reaction of investment to deviations of current capacity utilization from normal/desired level

u - rate of capacity utilization, subscript n presents the normal level

x – autonomous exports to capital stocks ratio

e_R - real exchange rate

e – nominal exchange rate

ϕ – propensities of net exports' variations to real exchange rates and utilization levels

θ – firms' mark-up on prices

w – nominal wages

p – domestic prices

p_f – foreign prices

y – labor productivity

ϕ – elasticity of X and M to e_R and to u

ϑ – government consumption to capital stock

τ – tax rate on income

s – rentiers' propensity to save out of income

s_r – tax-adjusted rentiers' propensity to save

Z – autonomous non-capacity-creating demand

z – autonomous non-capacity-creating demand to capital stock ratio

I_A – autonomous investment

α – ratio of total government expenditure effect on demand to Z

g_G – growth rate of total government expenditure effect on aggregate demand

g_x – growth rate of exports

g_Z – growth rate of autonomous non-capacity-creating demand

R – foreign reserve stocks

r – foreign reserves to exports ratio

D – external debt stocks

d – external debt stocks to exports ratio

F – net financial inflows

i_f – Fed funds basic rate

i_x – interest rate on external debt

μ – country risk-premium return on bonds

ϵ – financial risk perception

ε – financial risk perception to export ratio

δ – elasticity of financial inflows to interest rate differentials, production and financial risk

g_b – Thirlwall Law balance of payments constrained growth rate in BPCG literature

η – income elasticity of imports

$\dot{}$ represent variable's variation on time, $\widehat{}$ represents the growth rate of ratios, * represents short-run equilibrium values, and ** represents long-run equilibrium values

1. Introduction

The US Fed has responded to recent inflation pressures with the most rapid interest rate hike since the 1979-82 Volcker's disinflation. The hike in the beginning of the 1980s was followed by harsh external crises in the developing world, especially in Latin America. The current situation adds tot that the role the US monetary policy plays on quickly shifting massive capital flows in a world of open and volatile capital accounts (Rey, 2015). On the other hand, interest rate levels remain low on historical levels and developing countries come from decades of relative growth and record international reserve accumulation. Following the recent development in external policy space debates, this thesis aims to understand how a deterioration of external conditions, especially through higher foreign interest rates, may impact growth, income distribution, and macroeconomic policy space in developing countries.

Canonical models of external crises usually relate these events to countries' misuse of fiscal deficits (Krugman, 1979). On the other hand, recent contributions on gross capital flow determinants and Global Financial Cycles have pointed to movements on the US interest rate as primary drivers of capital outflows from developing countries (Rey, 2015; Borio and Disyatat, 2015). Under this context, Cline and Vernengo (2016) have proposed a Post-Keynesian model with Latin American Structuralism influences that points to the opposite causality: external crises lead to fiscal constraints possibly incurring in insolvency crises. Their argument is based on the identification of the balance of payments as the major external constraint to growth from the demand side (Kaldor, 1978; Thirlwall, 1979), which results from the extension of endogenous money theory to the open economy (Lavoie, 2001).

The centrality given to balance of payments opens space for the interaction of other autonomous demand components with this external constraint, most notably government expenditure. Recent contributions have presented this interaction under Supermultiplier models (Morlin, 2022; Dvoskin and Torchinsky Landau, 2023a,b). This thesis builds upon this research using a stock-flow-consistent modelling strategy under an open economy Neo-Kaleckian framework (Godley and Lavoie, 2007; Nah and Lavoie, 2017). It presents a supermultiplier growth model led by government expenditure and exports, with domestic and external debt dynamics that considers international capital flows with their own determinants.

By relating domestic macroeconomic policy and the external constraint the model may contribute to the recent debate on external space differences between developing and developed countries (Wray, 2012; Vernengo and Perez-Caldentey, 2020). By looking at the effect of a rise in US Fed interest rates on the external accounts path in the model, the thesis sheds light on the balance of payments as a constraint not only on long-run growth but also on short-to-medium-run policy space, income distribution, and growth. It considers 3 macroeconomic tools the government has to counter balance-of-payments imbalances – nominal exchange rate, interest rate, and government expenditure – and highlights different channels of causality from external restrictions to fiscal crises.

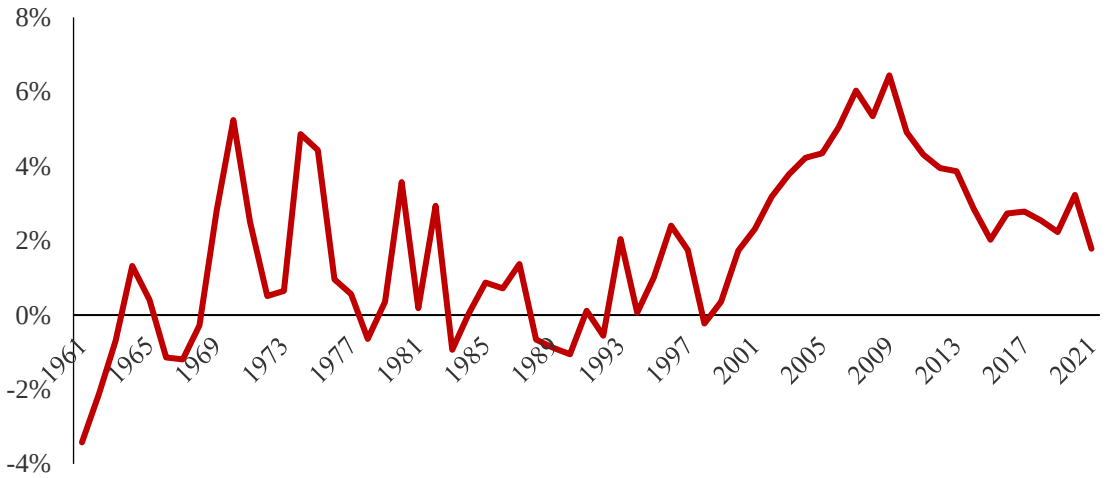
Section 2 presents and relates historical data on growth in developing countries, foreign interest rates, and international reserve accumulation. Section 3 presents the theoretical background of open economy demand-led growth. Section 4 develops our model. Section 5 presents the debates on fiscal policy space and external crises. Section 6 presents the comparative dynamics exercise of foreign interest rate hike on the model. Section 7 concludes.

2. From 1982 to 2022: Growth and External Conditions in Developing Countries Between Interest Rate Hikes

Mainstream development economists usually argue developing countries would eventually "catch up" to advanced economies if they followed pro-market policies (Rostow, 1959; Abramowitz, 1986). As we can see on Figure 1, however, not until the 2000s have developing countries sustained a stable positive growth differential in relation to rich countries. For most of the post-war period these two groups, developed and developing countries[1], grew at rather similar rates, with poorer nations performing only slightly better in averages, until the 2000s.

[1] For the matters of our research we do not differentiate between emerging and developing countries, referring to both as 'developing countries'. At some points in the text we use the Structuralist terms of center and peripheral countries with the same idea in mind from when we refer to developed and developing economies. For Figure 1 we proxied these groups by World Bank's definitions of 'high income' and 'middle and low income countries'. The former would correspond roughly to developed economies, and the latter to developing ones.

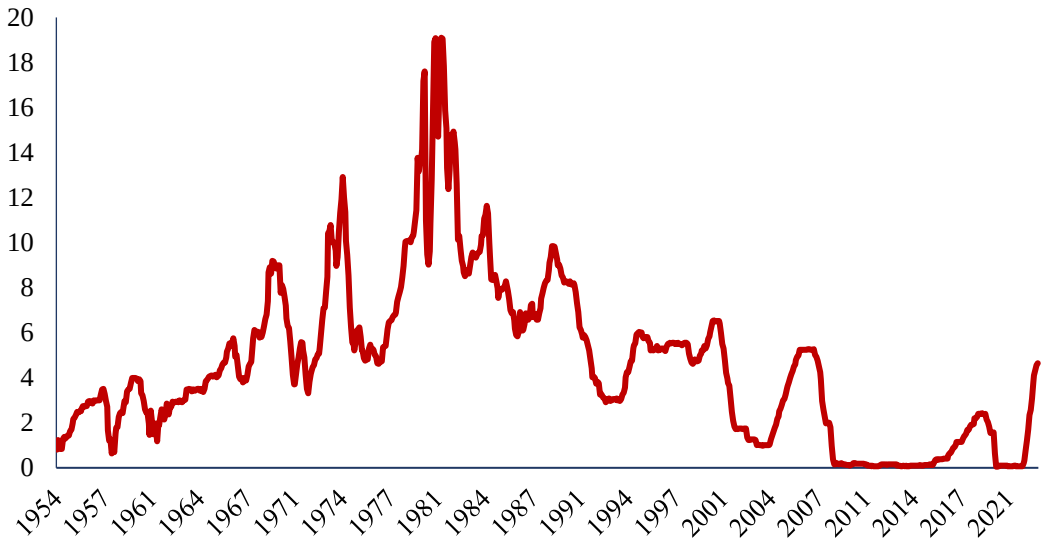
Figure 1. Growth Rate Differentials between Low- & Middle- Income and High-Income Countries (year over year % variation, 1961-2021)



Source: World Bank (2023) | Own elaboration
Note: Aggregations by the World Bank depending on country's size and their classification

As we can see in Figure 1, the decade of the 1980s to beginning of the 1990s presents the lowest growth differentials in favor of developing countries following interest rate historical highs (Figure 2). Developing countries had accumulated external debt in the 1970s for their process of industrialization and counteracting that decades' oil crises. With the hike in interest rates, these countries saw their balance of payments deteriorate leading to sharp economic downturns and the necessity of extraordinary rescue loans from the IMF and the World Bank. The rescue came with harsh 'structural adjustment' conditions and low growth and employment. Most theoretical models of the time blamed overspending governments for these external crises (Krugman, 1979).

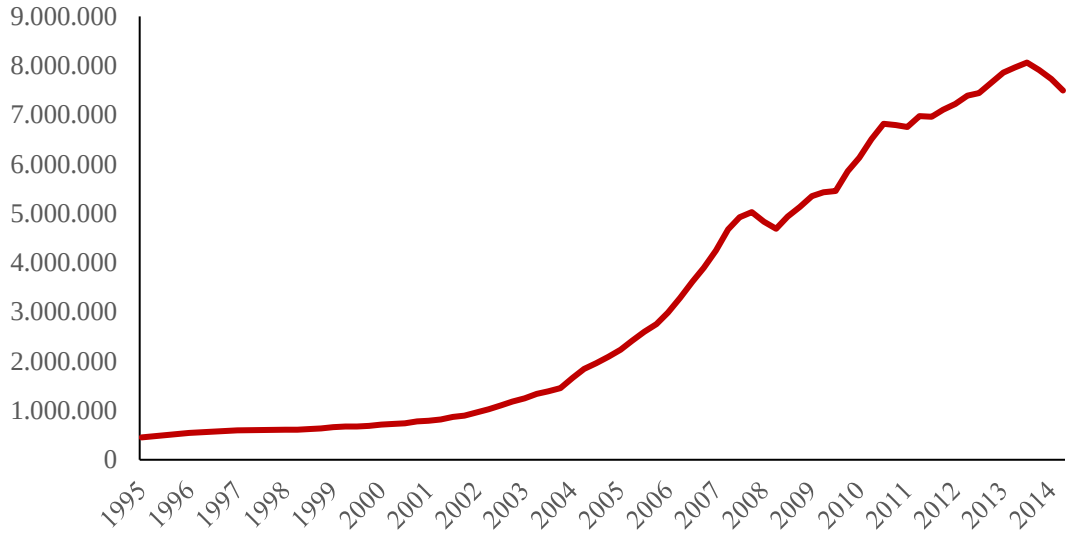
Figure 2. US Fed Funds Effective Interest Rate (monthly data, in %, 1954-2023)



Source: FRED (2023) | Own Elaboration

In the end of the 1990s, external crises came back with the Asian Financial crisis of 1997-8 as a prime example. This time, however, most Asian countries were applying Washington Consensus pro-market policies and running fiscal surpluses, challenging the view that "irresponsible fiscal policy" was to blame for the crisis (Cline and Vernengo, 2016). The record accumulation of international reserves that followed these crises (see figure 3) is usually associated with a hedging strategy to protect these economies from balance of payments crises resulting from external shocks and financial speculation.

Figure 3. Total Foreign Exchange Reserves of Emerging and Developing Economies (US Dollars, Millions, 1995-2015)



Source: IMF | Own Elaboration
Note: Starting 2015Q2, the breakdown for emerging and developing economies is no longer availab

Figure 1 shows that since the downturn of 1998 developing countries have sustained stable high growth differentials with their developed counterparts for the longest time in post-war history. Figures 2 and 3 complement this story by showing the period also presented historically low US interest rates and record accumulation of international reserves. Some economists have argued the increased demand for dollars as a reserve currency led to lower interest rates due to a 'global savings glut' (Bernanke, 2005).[2] Inspired by the recent empirical literature relating financial flows to US monetary policy (Rey, 2015; Bruno and Shin, 2015), this thesis considers the opposite causality. Low interest rates in the US would have opened up more external space in developing countries both for expansionary policy and for reserve accumulation. On the other hand, the most

[2] Benanke's argument has been criticized by mistaking saving and financing (Borio and Disyatat, 2011), as we come back to in section 3.4. Furthermore, when referring to short to medium run the new consensus in mainstream economics is that monetary policy sets the short-run interest rate, what sometimes is described as the Taylor rule (Taylor, 2000; Carlin and Soskice, 2006). Bernanke's point can then be seen as a medium to long run tendency, or a short-run pressure. There is indeed a lot of contreversy about the role and existance of a 'loanable funds market' and the possibility of central banks to influence medium and long run interest rates. Even within orthodox traditions some recent works have presented empirical evidence that monetary policy has strong effects on real interest rates for longer period horizons (see Borio et al., 2017, for example). This evidence would undermine the causality channel proposed by Bernanke (and even the whole Wicksillian concept of real interest rates). To not diverge much from our research focus, we do not go further into this debate in this paper.

rapid interest rate hike since Volcker in 2022 (Matthews, 2022; Ross, 2022) may create new turmoil in the developing world. This research aims at finding new insights on the role of external constraints on the historical tendencies exposed in Figures 1 to 3, as well as on the upcoming situation of developing countries.

3. Open Economy Demand-Led Growth

3.1. Endogenous Money in Open Economies: The Compensation Thesis

Most mainstream macroeconomists now agree that in capitalist economies money is created in most part by commercial bank's loans (McLeay et al., 2014, p. 444). Monetary policy is now usually represented in conventional models by Central Banks' nominal interest rate setting, while the old idea that the government intervenes in the interest rate through adjustments of an "exogenous money supply" has become obsolete in most influential mainstream monetary models (see for example Taylor, 2000; Romer, 2000; Carlin and Soskice, 2006). However, as pointed out by Serrano and Summa (2015), these advancements seem to have been widely left aside in an open economy context.[3] Most orthodox textbooks still use the ideas of the Mundell-Fleming model when addressing the open economy (Carlin and Soskice, 2006; Mankiw, 2010, Ch. 15). Heterodox economists, on the other hand, increasingly criticize the conclusions of the still widely used Mundell-Fleming model (Lavoie, 2001; Serrano and Summa, 2015; Lavoie, 2022, Ch.7.2).

The canonical Mundell-Fleming model states an impossible policy trilemma (Obstfeld et al., 2005). In a world with free capital flows, a government that chooses a fixed or managed exchange rate regime would lose its independence to set interest rates. The idea is that changes in money flows to the country would cause exchange rate movements, by intervening to not let these exchange rates absorb the whole external change governments change the country's supply of money, which would change interest rates. Lavoie (2001; 2022, Ch. 7.2) has criticized this view by presenting the 'Compensation Thesis', an extension of the endogenous money theory to an open economy context.[4] The thesis states that "fluctuations in the foreign reserves of a central bank will

[3] Serrano and Summa (2015) point out to Romer (2006) as an exception in the orthodox field.

[4] As pointed out by Lavoie (2001 ; 2022, Ch.4), the endogeneity of money is an old idea, dating back to the 'reflux principle' from the Banking School, and the debate of this school with the Currency School in the first half of the 19th century. While the latter stood by the quantitaty theory of money in which money supply created demand, the former pointed to the reverse causality: aggregate demand determined the stock of money. Which led them to defend that price controls should focus on credit instead of money aggregates.

be *compensated* by opposite movements in other elements of its balance sheet" (p. 504, own highlight). Since money is created by the demand for loans if this demand does not change the increase in money supply from the rest of the world will only represent a change in the Central Bank's balance sheet. As he points out, this was indeed recognized to be the case even by Mundell (1961) which "lamented the fact that modern central banks were following the 'banking principle', […] hence adjusting the 'domestic supply of notes to accord with the needs of trade' (Mundell, 1961, p. 153)" (in Lavoie, 2022, p. 507). Orthodox authors have counterargued that the change in the central bank's balance sheet (usually referred to as 'sterilization') can do little to change the exchange and interest rate link, as rentability differences would keep attracting/losing capital flows (Obstfeld and Rogoff, 1995). This hypothesis, however, assumes that assets across countries are not only perfectly mobile but also perfectly substitutable, having similar rentabilities (Serrano and Summa, 2015; Lavoie, 2022, Ch. 7.2). It also undermined by the evidence of sustained managed exchange rate regimes with record sterilizing of international reserves since the 2000s, as presented in section 2.

The compensation thesis, however, does not hold that the external financial conditions of a country would not impose policy constraints. But it points out that these constraints are asymmetrical. Although the central bank can choose its exchange rate and interest rate policy by sterilization in moments of money influxes, the opposite case is more complicated. When external accounts lead to devaluation pressures, the country will either have to continuously sell its international reserves or rebalance its balance of payments somehow to keep its exchange rate value. In this case the interest rate policy for attraction of capital becomes relevant. As does the fiscal policy, which we explore in depth later. These still represent policy choices, however, not mechanical adjustments. The compensation thesis highlights that the external constraints on policymaking in an open economy comes ultimately from the balance of payments constraint. This work follows this tradition taking the findings of the compensation thesis and focusing on the balance of payments constraints to growth and policymaking.

3.2. Growth in Open Economies: The Balance of Payments Constraint

Most canonical growth models focus on closed economy analysis, and no external constraints are considered (Solow, 1956; Romer, 1986; Lucas, 1988). As pointed out by McCombie and Thirlwall (2002), Harrod (1933), with his trade multiplier, gave the first relevant contribution since the

mercantilists about how growth would be affected by export performance and import propensity, but his work would have been "eclipsed" by Keynes' multiplier. Prebisch (1950), looking at developing countries' challenges, was "the first economist in the post-war era to seriously challenge the doctrine of mutual profitability of free trade between developed and developing countries" (Thirlwall, 2011, p. 12). Prebisch's work was seminal to the Latin American Structuralist school of thought. [5]As pointed out by Thirlwall (2011), Prebisch's analysis focused on the monetary, or balance of payments aspects of trade, and his equations can be considered "the dynamic analogue of the static Harrod foreign trade multiplier" (p. 13). Years later, looking at growth differentials between countries, Kaldor (1975) would try to revive the trade multiplier tradition affirming it was a "far more important principle for explaining the growth and rhythm of industrial development" over long periods of time than Keynes' (1936) short period analysis of unemployment (in McCombie and Thirlwall, 2002, p. 47).

These contributions are the basis for an extensive literature that emphasizies the balance of payments as the main constraint to growth in open economies (McCombie and Thirlwall, 2002; Thirlwall, 2011; Setterfield, 2012). The Balance of Payments Constrained Growth (BPCG) model was first developed by Thirlwall (1979). In its simplified version, it is assumed that countries cannot sustain long term trade deficits or surpluses. Following Kaldor (1978), which showed that trade surpluses and deficits were largely left unaffected by (nominal and real) exchange rate movements, long-run adjustments in balance of payments would come from quantities not through prices. Because imports depend on domestic income and exports do not, the adjustment of balance of payments is brought by income movements. This would give Thirlwall's (1979) Law: long-run growth is constrained by the growth rate of exports in proportion to the income elasticity for imports. Thirlwall Law tradition would then follow both the Structuralist (Prebisch, 1950) and the Keynesian (especially Kaldor, 1970,1978) traditions (Perez-Caldentey and Vernengo, 2019). Thirlwall (2011) presents a review of 43 country and regional empirical applications of BPCG

[5] Prebisch (1950) posed that countries in the capitalist system could be divided between center and periphery according to their structure of production and place in the international division of labor. Center countries would produce high-value added manufactured goods, while peripherical countries would produce low-value added primary and intermediary goods. Different from what is usually posed by the Ricardian comparative advantage hypothesis, specialization would not benefit developing countries because they would focus on primary goods which have diminishing returns and low income elasticity of exports, opposite to central or developed countries which would specialize in high income elastic manufactured goods.

models. Although the empirical literature on BPCG has found large empirical evidence of its theoretical findings, this has not come without controversies about its empirical methodology.[6]

3.3. Multiple Autonomous Demand Components Leading Growth in Open Economies: The Supermultiplier Growth Model

The BPCG model based on Kaldor (1978) and Thirlwall (1979) is a model in which long-term growth is brought forth by an autonomous demand component, exports, and with all capacity-creating investment being considered induced by this autonomous demand. Serrano (1995) points to Kaldor's contribution as a first "supermultiplier-type analysis". Although the supermultiplier model as such was just formalized by Serrano (1995), in a Sraffian manner. He sought to achieve what Garegnani (1992) called the 'Second Keynesian Position'. The combination of the 'Keynesian Hypothesis' - that the economy may be persistently bellow full-employment in the long-run with saving rates accommodating investment decisions - with the Classical or Sraffian theory of distribution, in which income distribution is determined separately from accumulation. In the model, investment and growth are induced by autonomous from current income non-capacity creating components of demand – autonomous consumption, exports, government expenditure, residential investment, and innovation expenditure in the literature. The name supermultiplier comes from the fact that the economy would present a multiplier effect not only through induced consumption, but also induced investment. The idea of autonomous (non-investment) demand can be linked to Hick's (1950) supermultiplier, Harrod's trade multiplier, Kaldor's and Thirlwall's export-led growth model, the role of public expenditure in Keynes (1936) and 'external markets' in Kalecki (1967) (Cesaratto, 2015). Granger-causality tests have recently been applied (among complementary methodologies) to test this chain of causality for different countries, finding robust evidence that these components (granger) cause growth (Girardi and Pariboni, 2016, 2020; Braga, 2020; Pérez-Montiel & Erbina, 2020; Fazzari et al. 2020; Haluska et al., 2021).

Some authors have recently applied the Sraffian Supermultiplier mechanism in Neo-Kaleckian growth models by adding autonomous components to their demand function (Allain, 205; Lavoie, 2016; Nah and Lavoie, 2017; Hein, 2018, among others). Lavoie (2016) shows that this change

[6] For this debate, see Blecker (2021) and McCombie (2021).

permits the Neo-Kaleckian model to achieve two goals their model lacked in the view of critics. Namely, the convergence to a normal rate of utilization in the long-run and the consistency with Harrod's (1939) dynamic instability of growth argument (Shaikh, 2009; Skott, 2012; Duménil and Lévy, 2014). This latter being the idea that the dual role of investment as the short-term adjustment mechanism of demand and the long-run responsible for capital accumulation makes the economy dynamically diverge out of equilibrium. The model also preserves the main Kaleckian findings of the paradox of savings and paradox of costs as level effects and as average effects on growth rates during the adjustment period (although not on growth rates).[7]

According to Lavoie (2016), what Serrano shows is that under the supermultiplier the Keynesian Hypothesis would be even more general than previously thought. It would not need to rely on an endogenous rate of utilization (as in the Neo-Kaleckian tradition), nor on an endogenous profit share (as in the early Kaldor-Robinson tradition). [8] And the adjustment to a long-run normal rate of utilization would also not need a fully endogenous marginal propensity to save (as in Shaikh, (2016) and the classical tradition).

One critique the supermultiplier has received is whether any expenditure is really autonomous in the long run given stock-flow adjustment constraints (Skott, 2012; Nikiforos, 2018). This has led to recent developments of debt-dynamics in Supermultiplier models (Hein, 2018; Hein and Woodgate,2020; Freitas and Christianes, 2020; Morlin, 2022; Dvoskin and Landau, 2023a,b). The first to look at public and foreign debt dynamics in this context was Morlin (2022). It also builds upon the work of Bhering et al (2019), looking at a maximum level of external debt to exports as a balance of payments constraint of growth in his supermultiplier model, linking it back to the BPCG literature. This external indebtedness would function as a channel in which government expenditure would have to adjust down to the growth rate of exports. A finding in line with the current literature that has given attention to the interaction between autonomous components making them "semi-autonomous" (Fiebieger and Lavoie, 2019; Allain, 2022). However, although allowing for external indebtedness, Morlin's model does not include gross capital flows, for

[7] As we will see later, for Open-Economies the paradox of profits as a traverse may hold or not depending on the parameters. Which is in line with the Open Economy Neo-Kaleckian theory (Blecker, 1989, 2002).
[8] See Lavoie (2022, Ch.6) for more on demand-led long-run growth controversies.

matters of simplification. Something considered by Dvoskin and Torchinsky Landau (2023b) and by this research. Which we should explore in depth.

3.4. Capital Flows in Open Economies: Net and Gross Flows and the Capital and Financial Accounts Reconsidered

While the first BPCG models focused on trade deficits and surpluses, later contributions allowed for the possibility of external indebtedness that would persistently finance trade deficits (Thirlwall and Hussain, 1982; Barbosa-Filho, 2001; Moreno-Brid, 2003; Perez-Caldentey and Moreno-Brid, 2021). These contributions focus on capital flows from interest payments and consequently on *net* capital flows, as it considers the total flows to the country as reflecting the current account result. Since the Global Financial Crisis of 2008, however, many authors have started giving more attention to *gross* capital flows (Rey, 2015; Obstfeld and Zhou, 2023). In special, a group of contributions of researchers linked to the Bank of International Settlements (BIS) have highlighted that canonical international economic models usually give little attention to this difference between gross and net flows (Borio and Disyatat, 2011, 2015; Avdjiev et al., 2016). Which would also apply for heterodox models. While looking only at *net* capital flows these models would underlying assume that *gross* capital flows do not follow their own determinants.

The point made by these authors can be interpreted as an extension of the endogeneity of money and its effects on balance of payments accounting. As argued by Borio and Disyatat (2015) mainstream economics often mistake the difference between *saving* and *financing*. While the former is a national account concept of income not consumed, the latter is a cash-flow concept of accessing money for purchase power by any means, including borrowing. As they put it: “most prevailing models overlook the role of banks in endogenously creating purchase power and hence financing, which would make the distinction between saving and financing even clear” (Borio and Disyatat, 2015, p. 2). When looking at the balance of payments, they hold that the current account expresses whether a country is on net releasing or drawing money from the rest of the world (its external *saving*), however, “the corresponding expenditures could be financed *entirely* at home or abroad, *regardless* of current account positions” (p.2, emphases in the original). The current account does not say anything about a country’s *financing*. For example, a purchase of foreign machinery through foreign borrowing or by newly created money domestically have the same impact on the current account, while it represents different international financial relations, thus

also showing differently on the capital and financial accounts. This gives new significance to the capital flows represented on the capital and financial accounts. Although in terms of accounting they will reflect the current account (along with foreign reserves variations), economically these flows may have their own determinants. With the US interest rate being an important one of them, as we will see in section 5.

This reconsideration of the capital and financial accounts also opens new space for the role of international reserves. If in a financialized and globalized economy capital flows have their own determinants (Rey, 2015), then the term in balance of payments accounting that accommodates changes of these flows and of current accounts is the variation of international reserves, especially for countries without fully flexible exchange rates. Which can help model an economy in which the great reserve accumulation we have seen in the past two decades can be considered. Dvoskin and Torchinsky Landau (2023b) is the first work, of our knowledge, that allows for these type of capital flows in a supermultiplier model, with an external debt accumulation and balance of payments constraint à la Bhering et al. (2019). This article builds upon their work, adding a slightly different capital flows specification and considering a model with public domestic debt.

4. A Stock-Flow Consistent Supermultiplier Growth Model led by Public Expenditure and Exports

As we have seen so far, there is an interesting recent development on the role of autonomous non-capacity-creating expenditures on long-run growth. This tradition respects the consequences of endogenous money creation on open economy macroeconomics and highlights the balance of payments as a core restriction to growth. It also opens space for other drivers of growth such as government expenditure and changes in the structure of production (as it highlights the role of export growth and import elasticity). To study the effects of external constraints on fiscal policy and domestic aggregate demand growth the thesis builds upon this literature to present a Supermultiplier model in which growth is led by public expenditure and exports. It starts with the Open Economy supermultiplier model by Nah and Lavoie (2017) while including the public sector inspired by the work of Hein (2018), the role of domestic and external debt as in Morlin (2022), and financial flows inspired by the work of Dvoskin and Torchinsky Landau (2023b). Interest

payments and stock-flow dynamics are considered in line with the tradition after Godley and Lavoie (2007).[9]

4.1. Economic Environment

Following the tradition that comes from Taylor (1983) and Dutt (1984), and more recently the works of Hein and Vogel (2008), Nah and Lavoie (2017), and Hein (2018), we assume an open economy that imports intermediate and capital goods and sells in both domestic and international markets. We assume firms' price-setting powers are dependent on the international and national competition environment and worker's bargaining power, such that national prices and income distribution between capital and labor are jointly determined exogenously, through this political process of dispute over the shares of production. With these conditions given, prices are inelastic with respect to demand. Changes in demand will then lead to movements in total output and capacity utilization. To maintain so for our open economy, we also assume the international market is competitive in such way that the domestic country actors cannot affect import and export prices. We also assume our economy is too small to affect its own export demand through income flows to the rest of the world. Tables 1 and 2 present the balance sheet and transaction matrices that synthesize the environment of this modelled economy.

Table 1. Balance Sheet Matrix

	Workers	Rentiers	Firms	Government	RoW	Σ
Domestic Loans		$+B$		$-B$		0
Foreign Loans				$-D+R$	$+D-R$	0
Equities		$+E$	$-E$			0
Capital			K			K
Σ	0	$+B+E$	0	$-B-D+R$	$+D-R$	$K=E$

[9] Any model can in theory be stock-flow-consistent (SFC). What is highlighted by the tradition is that one sector's asset is another's liability. As a consequence, it is crucial to consider when modelling that all flows and their resulting stock accumulations are taken into account and that the financial interaction between sectors is clear. Tables 1 and 2 clarify these interactions, while subsection 3.5 further elaborates on some important takeaways from such stock-flow considerations.

Table 2. Transaction Flow Matrix

	Workers	Rentiers	Firms		Government		RoW	Σ
			Current	Capital	Domestic	Foreign		
Private Domestic Consumption	$-C_w$	$-C_r$	$+(C_w + C_r)$					0
Private Investment expenditure			$+I$	$-I$				0
Imports			$-M$				$+M$	0
Exports			$+X$				$-X$	0
Government Expenditures			$+G_C$		$-G_C$			0
Taxation	$-\tau W$	$-\tau(\Pi + iB)$			$+T$			0
Wages	$+W$		$-W$					0
Profits		$+\Pi$	$-\Pi$					0
Domestic Interest Payments		$+iB$			$-iB$			0
Foreign Interet Payments						$-i_\beta D + i_f R$	$+i_\beta D - i_f R$	0
Change in Equity		$-dE$		$+dE$				0
Change in Domestic Loans		$-dB$			$+dB$			0
Change in Foreign Loans						$+dD - dR$	$-dD + dR$	0
Σ	0	0	0	0	0	0	0	0

We focus on the role of government's economic policies, so we keep our private sector simple. Workers consume all their after-tax income domestically, such that wages (W) are divided between (C_w) and taxation (τW). All profits (Π) are distributed to rentiers as dividends. For simplification, we do not consider private debt or portfolio choices, and we assume investment decisions do not depend on previous savings. Apart from profits, domestic rentiers also receive interests on their domestic bonds (iB). Rentiers consume a share of their disposable income domestically and save the other share, which can be held as equity issued by firms (dE) or bonds issued by the government (dB).[10]

We then include our public sector. Government consumption[11] (G_C) and interest payments may be financed by taxation or by issuing debt.[12] Taxation shares of income are the same for all different

[10] Although rentiers consume out of interest income they do not consume out of wealth in our model. This simplification was chosen due to our focus on the role of the government. Adding another exogenous expendiutre would complicate the algebra without changing our main results for the object of analysis. The same can be said about the abstraction from credit consumption.

[11] In this simplified model we do not differentiate between different types of government expenditure, looking only at aggregate levels, such that we abstract from public investment. Deleidi and Mazzucato (2019, 2022) have worked theoretically and empirically on new versions of the supermultiplier that find different multipliers for different types of government expenditures, focusing on advanced economies. Advancements in this direction would for sure contribute to the understanding of fiscal policy in developing countries. We leave that aside in this research for matters of simplicity.

[12] As argued by Lerner (1943) and the chartalists (Wray, 2012), government expenditure could also be financed by issuing money. However, as most countries have constitutional mechanisms that prevent such a policy, we abstract from this possibility. As posed by Hein (2018) such inclusion would imply a « non-interest bearing asset which could be used as a distributional instrument affecting the average rate of interest on the two financial assets [money and debt] in the system » (p. 321).

forms of income, such that tax does not hold any directly redistributive role on income. Government can issue both domestic debt (B) and foreign currency-denominated (net) external debt (D). Although the interest rates on both forms of assets are determined by the government, they are different. The domestic interest rate (i) is the basic rate on government bonds and is assumed to be in full control of the government, although it will reflect domestic conditions and the country's position in currency hierarchy. The interest rate on the net external debt (i_x) is a rate of return on past loans and bonds that compete in the international financial market, so it is based on a risk-premium given above the return on the safest asset, which is considered in the model to be the US Fed Funds bonds, which hold the interest rate i_f.This means that i_x is indexed to the basic interest rate of the US, i_f, these relations will be further explored when we introduce capital flows in section 4.4.4.[13] Furthermore, we assume all export proceedings in dollars are sold to the Central Bank, which is the case in most countries and often mandatory (Dvoskin and Torchinsky Landau, 2023b). Imports are also done by buying dollars from the Central Bank, such that only the public sector holds external assets and liabilities, and thus receives and pays interests on them. Although this is obviously a simplification, it gives focus on the government action which is the main purpose of our investigation. Also in this direction, we assume the Central Bank is part of the government.[14]

Our external sector then corresponds to the balance of payments result as the variation in international reserves. Exports are separated into a portion that is exogenously determined (X_0) and one that depends positively on short-run variations in the real exchange rate ($X_1(e_R)$). Imports are also distinguished between a part that varies proportionally to income (M_0) and a part that diminishes with short-run increases in the real exchange rate ($M_1(e_R)$). The current account includes the interest payments on net external debt and interests received on international reserve stocks previously accumulated. Following Borio and Disyatat (2015) and Dvoskin and Torchinky Landau (2023b), we assume financial flows have their own determinants. Subsection 4.4.4.

[13] It will be the case for all developing countries that $i > i_f$ and $i_x > i_f$ due to currency hierarchy and risk on the corresponding assets. On the other hand, the relationship between i and i_x may vary to each country. It is interesting to notice that in in countries where because of the financial conditions and monetary policy $i > i_x$, governments might choose to issue debt externally as it would be cheaper to service its interests than domestically.

[14] It is interesting to notice that the independence of the Central Bank to the government may create political economy conflicts between both when it concerns external assets. As the Central Bank would accumulate foreign assets (as international reserves) that could be used to pay foreign liabilities from the Treasury (external debt bonds).

introduces these determinants along with balance of payments dynamics. As presented in section 3.1., it is assumed countries may respond to money inflows by changes in Central Banks' balance sheets as stated by the Compensation Thesis. Under this assumption, the model considers that the country is under a fixed or managed exchange rate regime such that nominal exchange rates are exogenous and a policy variable. In section 6 we will look at the case of a flexible rate absorption of external shocks for developing countries.

As in Hein (2018), the total domestic income (Y) in our model will be composed of productive income (Y_P) and financial income (Y_F), such that we can describe total income distribution as:[15]

$$Y = Y_P + Y_F = W + \Pi + iB \tag{1}$$

$$\Psi = \frac{Y_F}{Y_P} = \frac{iB}{Y_P} = \frac{ib}{u} \tag{2}$$

$$\omega = \frac{W}{Y} = \frac{(1-\pi)Y_P}{(1+\Psi)Y_P} = \frac{1-\pi}{1+\Psi} \tag{3}$$

$$h = \frac{\Pi}{Y} = \frac{\pi Y_P}{(1+\Psi)Y_P} = \frac{\pi}{1+\Psi} \tag{4}$$

$$\varphi = \frac{Y_F}{Y} = \frac{(1-\pi)Y_P}{(1+\Psi)Y_P} = \frac{\Psi}{1+\Psi} \tag{5}$$

Equation 2 presents the ratio of financial income to productive income in the economy (Ψ), while equations 3 to 5 represent the wage, profits, and financial shares of total income, respectively. Productive profits and wages depend on the exogenous profit share of productive income (π). The shares of all groups depend on the domestic debt to capital ratio (b) and the capacity utilization of installed capacity ($u = \frac{Y_P}{K}$). Total rentiers share of income can be described by $h + \varphi$. We can now look at the dynamics of our model.

4.2. Dynamics of the model

[15] Because foreign assets and liabilities are only held by the government, international interest payments and receipts affect the financial position of the country with the rest of the world but does not directly affect the national income.

Macroeconomic equilibrium can be characterized by the fundamental identity dictating that saving (S) should equal the sum of investment expenditures (I), the the trade balance (TB), and the total government deficit or surplus (Gov):[16]

$$S = I + TB + Gov \tag{6}$$

or

$$s_r(\Pi + iB) = I + (X - M) + (G_C - T + iB) \tag{6A}$$

Having defined the behaviour of the different sectors of our economy we can describe the dynamics of the expenditures in the model:

$$g = \frac{I}{K} = \gamma + \gamma_u(u - u_n) \tag{7}$$

$$tb = \frac{TB}{K} = x + \phi_e e_R - \phi_u u \tag{8}$$

Capital accumulation (equation 7) depends positively on the difference between u and u_n, the current and normal rates of capacity utilization, and on the parameter γ, which indicates the expected growth of sales by the capitalists, or their "animal spirits" (Nah and Lavoie, 2017). Equation 8 represents the trade balance in proportion to the capital stock. It depends positively on $x = \frac{X_0}{K}$ and on a Marshall-Lerner-like positive effect of exchange rate depreciation on net exports ($\phi_e e_R$). The real exchange rate is defined as $e_R = \frac{e p_f}{p}$, where p and p_f are the domestic and foreign price levels, respectively. It is important to notice that ϕ_e represents both the variation of exports and of imports to a depreciation of the domestic currency (that is both X_1 and M_1 in proportion to capital). Following the canonical Neo-Kaleckian open economy models we assume its value is positive in our basis model for the short-run, but we loosen this assumption when we apply the

[16] It is important to notice that equation 6 represents the goods market equilibrium. Financial relations such as the receipt of external capital flows and interest payments that do not affect current aggregate income cancel each other out on both sides of the equation and thus are not included. Their effects on debt and the dynamics of expenditures, however, are explored in the subsequent sections.

model to developing countries in section 6. ϕ_u represents the propensity to import in aggregate demand, which we assume is a constant parameter.[17]

We can now describe the government and savings to capital equations:

$$gov = \frac{Gov}{K} = \vartheta - \tau u + ib \tag{9}$$

$$\sigma = \frac{S}{K} = s_r(\pi u + ib) \tag{10}$$

ϑ denotes the government consumption to capital ratio, which is assumed to be autonomous from current income and a policy variable. τ is the tax rate on income. We assume that all sources of income are taxed proportionally, so taxation does not have a directly redistributive role. Furthermore, equation 10 represents the savings-to-capital ratio, which depends on the share of profits on productive income (π) and on the interest on domestic public bonds received by rentiers. s_r is the tax-adjusted savings rate of the rentiers, such that $s_r = s(1-\tau)$, where s is the general propensity to save of the rentiers which is the same for all their sources of income. It is assumed, as usual in this literature, that workers as a group do not save.

By applying equations 7 – 10 to equation 6 we can rewrite it as:

$$s_r\pi u = \gamma + \gamma_u(u - u_n) + x + \phi_e e_R - \phi_u u + \vartheta - \tau u + (1 - s_r)ib \tag{6B}$$

4.3. Short-run equilibrium:

4.3.1. Deriving the equilibrium values

From equation 11 we can find the short-term equilibrium rate of capacity utilization (11), and by applying that to equation 7 we have the short-run equilibrium rate of accumulation (12). Equations 13 to 15 give the equilibrium shares of income:

$$u^* = \frac{\gamma + x + \phi_e e_R + \vartheta + (1 - s_r)ib - \gamma_u u_n}{s_r\pi + \phi_u + \tau - \gamma_u} \tag{11}$$

[17] Some contributions on the Thirwall Law tradition model a variable propensity to import (Thirlwall, 2011). By means of simplicity we assume this parameter is exogenous and could only be changed by structural change or trade policies which are beyond the macroeconomic variables treated in this research.

$$g^* = \gamma + \gamma_u \left(\frac{\gamma + x + \phi_e e_R + \vartheta + (1 - s_r) ib - (s_r \pi + \phi_u)\, u_n}{s_r \pi + \phi_u + \tau - \gamma_u} \right) \tag{12}$$

$$\omega^* = \frac{1 - \pi}{1 + \frac{ib}{u^*}} \tag{13}$$

$$h^* = \frac{\pi}{1 + \frac{ib}{u^*}} \tag{14}$$

$$\varphi^* = \frac{\frac{ib}{u^*}}{1 + \frac{ib}{u^*}} = \frac{1}{1 + \frac{u^*}{ib}} \tag{15}$$

From equations 13 to 15 we can see the effect of an increase in capacity utilization and domestic interest rates on income distribution:

$$\frac{\partial \omega^*}{\partial u} = \frac{ib(1 - \pi)}{1 + \frac{ib}{u^*}} > 0 \tag{16}$$

$$\frac{\partial \omega^*}{\partial i} = \frac{(bu^* - \frac{\partial u^*}{\partial i} ib)(1 - \pi)}{(u^* + ib)^2} \tag{17}$$

In which:

$$\frac{\partial u^*}{\partial i} = \frac{(1 - s_r) b}{s_p \pi + \phi_u + \tau - \gamma_u} > 0 \tag{18}$$

Then the effect of an increase in domestic interest rates on wage shares in the short-run depends on whether the effect of higher interest rates on capacity utilization is stronger than the direct effect of domestic interest rates increasing financial domestic income. Fundamentally it depends on whether $\gamma + x + \phi_e e_R + \vartheta > \gamma_u u_n$, a condition that should be easily met.[18] If the inequality holds

[18] In an economy without domestic public debt this is necessarily the case, otherwise capacity utilization would become negative. In an economy with a positive domestic public debt it would only not be the case if $(1 - s_r) ib >$

then $\frac{\partial \omega^*}{\partial i} < 0$, and if the opposite inequality holds then an increase in domestic interest rates would increase the wage share, in line with the Neo-Kaleckian literature (Hein (2018)).

4.3.2. Properties of short-run equilibrium:

As traditional in the literature, it is assumed that the Keynesian stability condition holds. That is, that savings respond more strongly to changes in the rate of utilization than the sum of investment, net exports and tax revenues. Which guarantees short-term stability by making the denominator of equations 11 and 12 positive. The condition is formalized in equation 19:

$$s_r \pi > \gamma_u - \phi_u - \tau \tag{19}$$

We can see that with the inclusion of the foreign and public sectors dynamics our stability condition is even less biding than the basic Keynesian claim that savings are more responsive to income than investment.

Furthermore, because the rate of capacity utilization should be non-negative and smaller than unit, we also must have:

$$0 \leq \gamma + x + \vartheta + \phi_e e_R - \gamma_u u_n + (1 - s_r) ib \leq s_r \pi - \gamma_u + \phi_u + \tau \tag{20}$$

We can also look whether the main Kaleckian results of the paradox of savings (higher saving rates decrease output) and of the paradox of profits[19] (higher profit shares decrease output) are valid in the short run. We have:

$$\frac{\partial u^*}{\partial s_r} = -\frac{(\pi u^* + ib)}{s_r \pi + \phi_u + \tau - \gamma_u} < 0 \tag{21}$$

$$\frac{\partial u^*}{\partial \pi} = \frac{\phi_e \frac{\partial e_R}{\partial \pi} - s_r u^*}{s_r \pi + \phi_u + \tau - \gamma_u} \tag{22}$$

We can see from equations 21 and 22 that when the Keynesian stability condition holds the paradox of savings is maintained, while the paradox of profits depends on the parameters. On one hand a

$\gamma_u u_n - (\gamma + x + \vartheta + \phi_e e_R) > 0$, a very specific and unlikely scenario as it would presuppose a negative aggregate demand when excluding consumption out of interest payments..

[19] Here the paradox of profits is taken as the proportion of profits in productive income and not on total income, this is in line with the previous literature of Neo-Kaleckian Supermultiplier models with government (see for example Hein, 2018; Hein and Woodgate, 2020).

higher profit share decreases domestic consumption. On the other hand, it may also cause a real exchange rate depreciation with a positive effect on aggregate demand. The result would then depend on the related parameters. We can express it as:

$$\frac{\partial e_R}{\partial \pi} < \frac{s_r u^*}{\phi_e} \tag{23}$$

That is, if this inequality is maintained the economy is wage-led, if the opposite inequality holds than the economy would be profit-led.[20] In the border case in which both terms are the same there is no effect of higher profit share on short-run equilibrium capacity utilization. According to Hein and Vogel (2008), the direction of the effect of income inequality on real exchange rates depends on the source of such change. We can see this from Hein and Vogel's (2008) profit equation and Nah and Lavoie's (2017) implicit price equation:

$$\pi(e, w, \theta) = \frac{\theta(1 + j(e, w))}{1 + \theta(1 + j(e, w))} \tag{24}$$

$$e_R = \frac{e p_f y}{w(1 + \theta)(1 + j(e, w))} \tag{25}$$

As mentioned before, the profit share of productive income (π) is exogenously determined and political determined in the price-setting process of dispute over the aggregate production income, with its value realized together with the nominal wage (w) and the mark-up (θ) for a given nominal exchange rate (e). y denotes labor productivity and $j = j(e, w)$ is the ratio of unit material costs to unit direct labor costs, which increases in e and decreases in w. Under this context, an increase in mark-ups would be associated with both a higher profit share and decreased (appreciated) real exchange rates. On the other hand, both a decrease in nominal wages or an increase in the nominal exchange rate should increase both the profit share and the real exchange rate. While under the first source the paradox of profits would necessarily hold (higher profits would decrease aggregate demand), under the second and third it would depend on the magnitude of such effect in relation to the domestic demand effects. In other words, in relation to the parameters in $\frac{s_p u^*}{\phi_e}$. These

[20] Wage and profit led does not mean there is a growth path being set by one or other shares of income. It only characterizes the effect of an increase in the profit share on aggregate demand and production. When the overall effect of such an increase is expansionary to total income the economy is profit-led, if the opposite holds the economy is profit led. (see Bhaduri and Marglin, 1990 and Blecker (1989) for a seminal works on the topic, and Stockhammer and Onaran, 2013, for an overview of the concept).

conclusions are in line with the findings of the canonical open-economy Kaleckian theory (Blecker, 1989; Bhaduri and Marglin, 1990).

Table 3 below summarizes the effects of our exogenous variables and parameters on the short-run values of the endogenous variables.

Table 3. Effects of Exogenous Variables on Short-Run Equilibrium Values

	u^*	g^*	ω^*	h^*	φ^*
γ	+	+	+	+	-
γ_u	+/-	+/-	+/-	+/-	+/-
π	+/-	+/-	+/-	+	+/-
s_r	-	-	-	-	+
e_R	+	+	+	+	-
ϕ_u	-	-	-	-	+
x	+	+	+	+	-
τ	+/-	+/-	+/-	+/-	+/-
ϑ	+	+	+	+	-
i	+	+	+/-	+/-	+/-
b	+	+	+/-	+/-	+/-
u_n	-	-	-	-	+

4.4. Long run equilibrium:

4.4.1. Aggregate demand growth and capital accumulation

The short-run equilibrium represents the adjustment of capacity utilization to the given aggregate demand, so it assumes x, ϑ, b and foreign asset positions do not change.[21] After this quick adjustment, however, it is expected that these ratios start to change. To look at the long run equilibrium, or fully adjusted position, we assume γ changes and adjusts to the growth rate of the autonomous components as expressed by Dutt (2019). That is, we assume that firms understand that "the expected long-run growth is equal to the known rate of growth of the exogenous component" in the long-run, such that animal spirits equal to the actual rate of growth of autonomous demand in the long-run, and $\dot{\gamma} = 0$. We also assume Marshall-Lerner effects does not

[21] This implies the short run is like a snapshot of the economy (Nah and Lavoie, 2017) in which not even the flows (like exports or government expenditure) change. It is only the adjustment of output to the given aggregate demand.

hold in the long-run. This is in line with the BPCG literature and its empirical findings that relative price changes explain little to none of the long-run movements of trade (Kaldor, 1978; Thirlwall, 2011). Which means exchange rate variations would have more short-term effects, something that has also been remarked by the open-economy Neo-Kaleckian literature (Blecker, 2016). We thus assume $\phi_e = 0$ in the long-run.[22] We are left with three autonomous to current income and non-capacity creating components of demand (Z):

$$Z = G_C + (1 - s_r)iB + X_0 \qquad (26)$$

With equation 26, we can rewrite equation 11 in terms of the supermultiplier, the autonomous non-capacity creating (excluding $\phi_e e_R$ in this version) and the autonomous capacity-creating autonomous component of demand (I_A). We would have:

$$u^* = \left(\frac{Y_P}{K}\right)^* = \frac{I_A + Z}{Z(s_r\pi + \phi_u + \tau - \gamma_u)} = \frac{\gamma - \gamma_u\, u_n + z}{s_r\pi + \phi_u + \tau - \gamma_u} \qquad (27)$$

In which $z = \frac{Z}{K}$ and equation 27 corresponds to an alternative short-run equilibrium in which $\phi_e = 0$. We can see the supermultiplier $\left(\frac{1}{s_r\pi + \phi_u + \tau - \gamma_u}\right)$ increases the effect of variations on autonomous components, both capacity-creating and non-capacity-creating. The term I_A, which indicates the part of the investment of the firms that is independent of current income, is common in the Neo-Kaleckian Supermultiplier literature (Allain, 2015; Lavoie, 2016, among others). The inclusion of consumption out of interest payments as an autonomous expenditure also highlights the point stressed in the supermultiplier tradition more generally that autonomous to current income expenditures do not imply they are exogenously given variables, with autonomous components often variating with other forms of government policy (Serrano, 1995; Freitas and Serrano, 2015; Allain, 2022).

Consumption out of interests on domestic debt, $(1 - s_r)iB$, depends on the government current interest payments, thus representing part of the effect government's expenditure on current

[22] This means that ϕ_e corresponds to a one-time effect of the variation of the real exchange rate on aggregate demand. This implies ϕ_e is constant over time, but it does not imply that real exchange rate variation may have effects on average growth through its effect on the traverse.

aggregate demand. With this in mind, we define $\alpha Z = G_C + (1 - s_r)iB$ as the government expenditure contribution to autonomous demand. We also assume that the growth rate of this flow, represented by $\overline{g_G}$, is exogenous and a policy variable set by the government such that the government consumption growth g_{G_C} accommodates the growth rate of domestic public debt and possible changes in domestic interest rates and rentiers' savings rate.[23] We also assume that exports (now only composed of X_0) grow at an exogenously given rate $\overline{g_X}$. Note that a dot $\dot{}$ above a variable represents the rate of change of that variable in time, g variables with subscripts represent the growth rate of normal variables (with g itself representing the growth rate of the capital stock, or the rate of accumulation), while $\widehat{}$ variables represent the rate of growth of ratio variables, to avoid confusion. All of them are considered in constant time. We have:

$$g_z = \alpha\overline{g_G} + (1 - \alpha)\bar{g}_x \tag{28}$$

$$\dot{\alpha} = \alpha(1 - \alpha)(g_G - g_X) \tag{29}$$

We can now look at the dynamics of the ratio of autonomous non-capacity-creating demand to capital stocks:

$$\left(\frac{\widehat{Z}}{K}\right) = \hat{z} = g_z - g^* = g_z - \gamma - \gamma_u\left(\frac{\gamma + z - (s_r\pi + \phi_u)\,u_n}{s_r\pi + \phi_u + \tau - \gamma_u}\right) \tag{30}$$

$$\frac{\partial \hat{z}}{\partial z} = -\frac{\gamma_u}{s_r\pi + \phi_u + \tau - \gamma_u} < 0 \tag{31}$$

Inequality 31 holds given the Keynesian Stability condition and it points out that the autonomous non-capacity-creating demand converges to the capital stock in growth rates, such that the ratio converges to a point in which $\dot{z} = 0$. The long-run equilibrium position also requires that $\dot{\alpha} = 0$ (Freitas and Serrano, 2015; Morlin, 2022). Which is attained either by a very specific growth dynamic of α in equation 29 or when $g_z = g_G = g_x$. The first option is discarded as it would

[23] This sheds light on the fact that total government expenditure may have lower fiscal multiplier effects if the payment of interests starts to represent a larger share in total government expenditure, as part of this expenditures become stocks of rentiers' savings, as one can see in Table 2. This is in line with the empirical literature that show that fiscal multipliers depend on the accommodation of monetary policy - lower rates increase the multiplier (see for example Canova and Pappa, 2011). Analogously, a decrease in rentier's savings rate increases the fiscal multiplier.

require an arbitrary specific growth path of the economy. We assume the long-run equilibrium to be the one in which the different "semi-autonomous" components equalize in growth rates. This sets an equilibrium α^{**} that can assume any level between 0 and 1 as long as the different autonomous non-capacity-creating components grow at the same rate (as done in Morlin (2022)). In subsections 4.4.6 and 4.5 we further explore the interactions between these semi-autonomous components in the long run.

We can now find the long-run equilibrium levels of growth and capacity utilization by making equations 29 and 30 equal zero:

$$g^{**} = g_z = g_G = g_x = \gamma^{**} \tag{32}$$

$$u^{**} = u_n \tag{33}$$

$$z^{**} = (s_r\pi + \phi_u)u_n - g_z \tag{34}$$

Variables with two stars ** representing the long-run equilibrium, just as one star * represented short run equilibrium.

We can see the long-run growth of the economy is completely determined by the growth rate of the autonomous non-capacity-creating components of demand and the economy converges to a normal level of capacity utilization desired by the firms. Equation 34, representing the equilibrium level of autonomous non-capacity creating components to capital, can be derived from equation 30.

4.4.2. Domestic Public Debt Dynamics

We can now look at our domestic public debt dynamics:

$$\dot{B} = G_C - T + iB \tag{35}$$

The debt increases with higher government expenditure and interest payments and decreases with higher tax revenue. It is important to take into consideration that the relevant domestic debt for most economies is not the gross domestic public debt, but its ratio to domestic production, or, as we have been considering so far, to the installed capital. We then consider the dynamics of $b = \frac{B}{K}$. Remembering that $T = \tau Y = \tau(Y_P + iB)$, we have:

$$\dot{b} = \frac{\dot{B}K - B\dot{K}}{K} = \vartheta - \tau(u + ib) + (i - g)b \tag{36}$$

Now, we can rewrite 36 considering that $\vartheta = \alpha z - (1 - s_r)ib$:

$$\dot{b} = \alpha z - \tau u + [i(1 - \tau - (1 - s_r)) - g]b \tag{37}$$

We can describe the stability of b as:

$$\frac{\partial \dot{b}}{\partial b} = i(1 - \tau - (1 - s_r)) - g \tag{38}$$

Thus, the domestic debt to capital ratio stability and convergence to an equilibrium depends on:

$$g > i(1 - \tau - (1 - s_r)) \tag{39}$$

Equation 39 is a less restrictive condition than Domar's (1944) public debt stability hypothesis of $g > i$. This is in line with the findings of the literature that takes into consideration private consumption out of interest payments on government debt (Godley and Lavoie, 2007, Ch. 11; Lavoie, 2022, Ch. 5.6.3). That is, because rentiers both consume and pay taxes on interest payments part of the gross public debt accumulation is offset by an increase in both GDP (or capital stock) and government revenues, resulting from these expenditures.

We can now find the equilibrium long-run domestic debt level of our economy by equalizing equation 38 to zero:

$$b^{**} = \frac{\alpha z^{**} - \tau u_n}{g - i(1 - \tau - (1 - s_r))} \tag{40}$$

4.4.3. Income Distribution in the Long Run

From the long run equilibrium of aggregate demand and public debt dynamics we can come back to equations 3 to 5 to describe the long-run equilibrium values of our distributional variables:

$$\omega^{**} = \frac{1 - \pi}{1 + \frac{ib^{**}}{u_n}} \tag{41}$$

$$h^{**} = \frac{\pi}{1 + \frac{ib^{**}}{u_n}} \tag{42}$$

(43)

$$\varphi^{**} = \frac{1}{1 + \frac{u_n}{ib^{**}}}$$

In the long-run higher domestic interest rates and higher public debt stocks decrease wage and profit shares of total income and increase the financial share of income.

4.4.4. Foreign Reserves and External Public Debt Dynamics:

Based on the works of Morlin (2022) and Dvoskin and Torchinsky Landau (2023b), we build the behavior of the balance of payments in our model. Our model considers the most realistic case in which current account imbalances do not mechanically determine financial flows in an economy with relatively open capital accounts as described in subsection 3.4. This implies that the variation in international reserves (R) is the element that accommodates changes in the current, capital, and financial accounts. Which follows from the assumption that we are dealing with an economy with fixed of managed nominal exchange rates.[24] Balance of payments accounting usually defines the gross external debt as the opposite to the current account, which means it incorporates changes in international reserves. It has then to be differentiated from the net external debt (D), which excludes international reserves. By these definitions, the change of the net external debt will be correspondent to the results of the capital and financial accounts. This can be seen in the dynamics of both stocks:

$$\dot{R} = X - M - i_x D + i_f R + F \tag{44}$$

$$\dot{D} = F\left(i, i_f, \epsilon\right) = \delta[\left(i - i_f\right)Y_P - \ \epsilon] \tag{45}$$

$i_x$and i_f are the interest rates on external public debt and on international reserves, respectively, such that $i_x = i_f + \mu$, where $\mu \geq 0$ represents a risk premium on lending to this country. This definition highlights that the rate on external debt is indexed to or directly affected by the US Fed rate i_f while being higher than it. While this is a realistic case for loans from the IMF and World Bank and it may very well also be the case for bonds issued by the government to foreign creditors, as they compete in the international asset market in which the Fed interest rate serves as the base rate of return on the safest asset. R is the international reserve stock which is assumed to be held

[24] Section 6.1.1 considers the case in which nominal exchange rates are responsible to fully accomodate balance of payments movements such that international reserves remain the same

in US Fed treasury bonds to not incur into opportunity costs of holding currency, as there is no receipt of interests when holding cash as an asset. We also assume there is a high liquidity for these bonds, such that the reserve stocks vary with the balance of payments result, so the country can always buy or sell the reserves in each period. D represents the net external debt stocks, the foreign liabilities the domestic economy holds with the rest of the world, which in our model we assume are all held by the public sector in foreign currency (see Table 1).[25] As discussed before, $\dot{D} = F$, in which F is the net financial inflows and represents the total result of the capital and financial accounts.[26] We build our net financial inflow function based on the literature that describes the behavior of capital flows and their own determinants (Borio and Disyiatat, 2011, 2015; Rey, 2015; Dvoskin and Torchinsky Landau, 2023b), while trying to keep it simple. Financial inflows depend on the interest rate differential (between domestic and international rates),[27] on the country's domestic production (assuming larger economies receive more flows), and negatively on the risk assessment by the market (ϵ), assumed exogenous for matters of simplification.[28] The parameter

[25] Dvoskin and Torchinsky Landau (2023b) considers the cases in which the external debt is denominated either in foreign or in domestic currencies and find little difference in both in terms of effects on economic growth, although a devaluation of domestic currency becomes less costly in the latter case. Although domestic currency denominated external debt has become more common for developing countries in the last two decades, foreign currency denominated debt is still more predominant, many times because foreign lenders avoid taking devaluation risks. For matters of simplicity, we just consider the case of foreign currency denominated external debt.

[26] We do not explicitly distinguish different forms of capital flows between the accounts. However, it should be the case that the composition matters, and part of its effects can be seen in our model. A country with more portfolio flows and less FDI, for example, will probably be more volatile to global financial cycles, which in our model would mean they have a higher δ. Furthermore, a recent empirical literature has explored the effects of portfolio flows on deindustrialization (see for example Botta et al., 2022), while FDI is often related to industrialization (Prebisch, 1962; Botta et al., 2022). This would mean the composition of these capital flows could influence the income elasticity of exports and imports of the country, thus affecting the external constraint also through these channels. Which we do not consider in this thesis. Further investigation in this direction can be interesting to interpret the process of capital attraction onto structural change and external constraints in developing economies.

[27] We consider the realistic case in which domestic interest rates play an important role in attracting foreign capital. Under the structure of our model it can be understood, for example, that the domestic interest rate is associated with the rentability of a series of assets, both private and public within the country. And that although this inflow of foreign currency may have different destinations the government holds the dollars while passing the money to private actors under the current exchange rates, as it was supposed for exports and imports. Thus, only the government pays interest to the rest of the world as it is the one holding the liabilities. For matters of simplification, we abstract from changes that this operation could bring to the financial obligations of rentiers with governments.

[28] Dvoskin and Torchinsky Landau (2023b) consider the dynamics of the net external debt to international reserves as a proxy for the risk assessment. To maintain our model simple, we do not consider that. In general, however, having an exogenous component of risk assessment when modelling financial flows can be quite useful. Part of these flows represent portfolio flows that are exposed to all kinds of perceptions from the financial market on the country, and many times herd effects of financial market speculation (Lavoie, 2022, Ch. 7.4). The prospect of a certain election result or an international flight to safety due to a shock like a pandemic, for example, can be relevant for capital flows and are very hard (if not impossible) to model endogenously.

δ is positive and indicates how elastic financial inflows are to the other variables, which would incorporate effects of capital controls imposed by the country, for example.

As we have done with domestic public debt, it is important to consider the relevant debt dynamic is not the one of the stocks of net external debt. While part of the literature on balance of payments constrained growth has considered external debt to GDP as the relevant variable (Moreno-Brid, 2003; Setterfield, 2012), Bhering et al. (2019) has highlighted that this view can be misleading. GDP is usually denominated in national currency, while external debt is usually denominated in foreign currency, what matters in term of liquidity to service the debt would be the access to this foreign currency, not the GDP in national currency.[29] This has led some contributions to consider the ratio of external debt (and international reserves) to exports as the relevant variable to look at external debt dynamics (Morlin, 2022; Dvoskin and Torchinsky Landau, 2023a,b). Dividing 44 and 45 by exports we have the dynamic equations:

$$\dot{r} = \left(\frac{\dot{R}}{X}\right) = \frac{\dot{R}X - RX}{X^2} = 1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right) - \phi_u\right) - i_x d + \left(i_f - g_x\right)r - \delta\varepsilon \quad (46)$$

$$\dot{d} = \left(\frac{\dot{D}}{X}\right) = \frac{\dot{D}X - DX}{X^2} = \frac{Y_P}{X}\delta\left(i - i_f\right) - \delta\varepsilon - g_x d \quad (47)$$

In which $\varepsilon = \frac{\epsilon}{X}$, and r and d are the international reserves and net external debt to export ratios. The individual stabilities of the international reserves and net external debt to exports ratios will then depend on the inequalities:

$$\frac{\partial \dot{r}}{\partial r} = i_f - g_x < 0 \quad (48)$$

$$\frac{\partial \dot{d}}{\partial d} = -g_x < 0 \quad (49)$$

[29] This still holds for external debts denominated in domestic currency when the lenders would like to receive these returns in foreign currency, i.e. the lenders are assuming the risk of an exchange rate variations. For more on this see the model of Dvoskin and Torchinsky Landau (2023b) which introduces a similar external debt dynamic with domestic currency denominated debt.

Since we are considering the realistic scenario in which $i_f \geq 0$, we can see the stability of both ratios are met when $g_x > i_f$. Although the net external debt has a less restrictive stability condition of $g_x > 0$ when taken individually.

We can then derive the long run equilibrium positions in which $\dot{r} = \dot{d} = 0$:

$$r^{**} = \frac{1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right) - \phi_u\right) - i_x d^{**} - \delta\varepsilon}{g_x - i_f} \tag{50}$$

$$d^{**} = \frac{\frac{Y_P}{X}\delta\left(i - i_f\right) - \delta\varepsilon}{g_x} \tag{51}$$

By plugging 51 into 50 we can also rewrite 50 as:

$$r^{**} = \frac{1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right)\left(1 - \frac{i_x}{g_x}\right) - \phi_u\right) - \delta\varepsilon\left(1 - \frac{i_x}{g_x}\right)}{g_x - i_f} \tag{50A}$$

Finally for a full appreciation of the effect of our parameters on the equilibrium of balance of payments we can use equation 27 to rewrite $\frac{Y_P}{X}$ on equation 50A and have:

$$r^{**} = \left[1 + \frac{(\gamma^{**} - \gamma_u\, u_n + z^{**})[\delta\left(i - i_f\right)\left(1 - \frac{i_x}{g_x}\right) - \phi_u]}{(1 - \alpha)z^{**}(s_r\pi + \phi_u + \tau - \gamma_u)} - \delta\varepsilon\left(1 - \frac{i_x}{g_x}\right)\right]\frac{1}{(g_x - i_f)} \tag{50B}$$

We can see the equilibrium international reserves and net external debt stocks thus depend on a series of parameters. For example, an increase in aggregate demand affects international reserves positively through higher financial flows, but negatively through higher imports and higher net external debt, with its net effect depending on parameters. The interest rate differential between domestic and foreign interest rates and the risk perception also both affect reserves and debt, having a general effect on long-run equilibrium depending on $\frac{i_x}{g_x}$. We do a throughout analysis of the effects of different variables on the balance of payments dynamics in section 6.

We must also consider that both equations form a dynamic system, which imposes that local stability of the long-run equilibrium depends on a negative trace and a positive determinant of its Jacobian matrix. We have:

$$J = \begin{pmatrix} \frac{\partial \dot{r}}{\partial r} & \frac{\partial \dot{r}}{\partial d} \\ \frac{\partial \dot{d}}{\partial r} & \frac{\partial \dot{d}}{\partial d} \end{pmatrix}$$

Which impose the inequalities:

$$Det_J = \frac{\partial \dot{r}}{\partial r} * \frac{\partial \dot{d}}{\partial d} - \frac{\partial \dot{r}}{\partial d} * \frac{\partial \dot{d}}{\partial r} = -g_x(i_f - g_x) > 0 \quad (52)$$

$$Tr_J = \frac{\partial \dot{r}}{\partial r} + \frac{\partial \dot{d}}{\partial d} = i_f - 2g_x < 0 \quad (53)$$

It is easy to see that both inequalities for the determinant (Det) and the Trace (Tr) of the Jacobian matrix for the dynamic system will only hold when $g_x > i_f \geq 0$. This is in line with the findings of the theoretical literature that explore models of external debt dynamics (Cline and Vernengo, 2016; Morlin, 2022). The result points out that interest rate hikes in the center country have important implications for the balance of payments of countries everywhere, something we further explore in section 6.

4.4.5. A limit to external indebtedness and Thirlwall's law

Until now we assumed the trade imbalance can be always financed by financial flows, with no limit to r or d. As done by Bhering et al. (2019) and Morlin (2022), we now consider the more plausible situation in which international creditors will not undefinedly finance the country's indebtedness, imposing a maximum level of external debt to exports ratio $\bar{d}$. This level would then be associated with a minimum level of international reserve stocks $\bar{r}$ through equation 52. Apart from interest on a maximum net external debt, a minimum positive level of international reserve stocks has also to be considered for the maintenance of a fixed or managed exchange rate regime.[30]

[30] The minimum rate of international reserves to exports associated with both goals – maintaining net external debt below certain value and being able to interviene to change exchange rate values – do not necessarily have to be the same. For a country that wants to achieve both goals the higher of the two rates will then become the minimum rate of international reserve to exports, the rate associated with a balance of payments constraint.

Above this maximum level of external indebtedness, or below this minimum level of international reserves, the country would enter a balance of payments crisis. We can define the maximum level of net external debt to exports ratio and the related minimum international reserves to exports level from equations 52 and 53 as:

$$\bar{r} = \frac{1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right) - \phi_u\right) - i_x\bar{d} - \delta\varepsilon}{g_x - i_f} \tag{54}$$

$$\bar{d} = \frac{\frac{Y_P}{X}\delta\left(i - i_f\right) - \delta\varepsilon}{g_x} \tag{55}$$

Because $\frac{Y_P}{X}$ depends on the share of government expenditure in autonomous non-capacity generating demand (α), we can use equation 52B along with equations 54 and 55 to derive a maximum level of government expenditure in autonomous demand associated with balance of payments equilibrium:

$$\bar{\alpha} = 1 - \left[\frac{(\gamma - \gamma_u\, u_n + \, z)\left[\phi_u - \delta\left(i - i_f\right)(1 - \frac{i_x}{g_x})\right]}{z(s_r\pi + \phi_u + \tau - \gamma_u)[\left(i_f - g_x\right)\bar{r} - \delta\varepsilon(1 - \frac{i_x}{g_x}) + 1]}\right] \tag{56}$$

We can see from equation 56 that the country might be faced with a balance of payments limit to its government expenditure share of demand. This is the direct long-run external constraint on fiscal policy in our model, as the government may have to decrease $\overline{g_G}$ temporarily to bring the economy to a level of public expenditure aligned with the balance of payments constraint, also affecting growth in the traverse between short and long-run. It is important to notice that this constraint is also affected by monetary and exchange rate policies which may change the external space of fiscal policy. We explore these policy relations in section 6.

4.4.6. Long-run convergence to equilibrium, some considerations

Our final long-run equilibrium presents the stability conditions $\dot{\gamma} = \dot{z} = \dot{\sigma} = \dot{b} = \dot{d} = \dot{r} = 0$. The conditions $\dot{\gamma} = \dot{z} = 0$ are typical of all Neo-Kaleckian supermultiplier models (while Sraffian versions have $\dot{h} = \dot{u} = 0$ (Freitas and Serrano (2015)). In our model $\dot{\gamma} = 0$ is obtained by the mechanism proposed by Dutt (2019) as we chose not to deal with Harrodian instability in this

model.[31] The stability of the debt dynamic $\dot{b} = 0$ and of the dynamic system in which $\dot{d} = \dot{r} = 0$ were examined separately from income, and individually in each subsection, as there is no feedback effect of the dynamic system of r and d nor of b in $\dot{u}$ and $\dot{z}$ or in each other.[32] The condition $\dot{\alpha} = 0$ was already pointed out by Allain (2022) and Morlin (2022) as a necessary condition for analytical examining long-run equilibriums with more than one autonomous component. While $\dot{\alpha} = 0$ is an assumption, it does not impose a specific equilibrium value, with any α between 0 and 1 possible for our equilibrium, but it imposes that $g_G = g_x$ in our equilibrium. This is compatible with the investigations of semi-autonomous variables behaviors done by Allain (2022) and with the simulations done by Morlin (2022) for a model without capital flows with their own determinants. From equation 56, we can see that a situation in which $g_G > g_x$ with increasing α would force the country into a balance of payment crises which would force the government to decrease the growth rate of government expenditure and the share of government expenditure on aggregate demand. Which means there would be a clear adjustment mechanism in this case. For the opposite case, in which $g_G < g_x$, Allain (2022) points out government could decide to expand expenditure as there is more fiscal space (by balance of payments and higher tax revenues) or there could be Kaldor-Verdoon effects on productivity that could slow down export growth with time if government maintains expenditure low. In any of these mechanisms, however, the adjustment is less obvious than in the opposite case and not mechanical. Which means the

[31] Nah and Lavoie (2017) present a Harrodian mechanism in which there are two different periods of adjustment with $\dot{\gamma}$ adjusting in the second period. This method could theoretically be applied to this model, we chose not to do so for matters of simplicity. Hein and Woodgate (2020) also consider the Harrodian mechanism in a supermultiplier model that includes interest payments, finding that the joint determination of public debt and aggregate demand dynamics creates some stability constraints. Indeed, in our model the introduction of three debt dynamics along with the dynamics of autonomous demand to capital ratio might complicate the model's stability if it is assumed all ratios adjust at the same time under a Harrodian context. However, since interest payments do not affect the dynamics of $\dot{z}$, a different specification of the investment function, like the one used by Sraffians (for example in Morlin (2022)) might be consistent with a stable conversion to long-run equilibrium with Harrodian Instability, under the conditions presented by Freitas and Serrano (2015). Further investigation would be needed to assess whether these two alternatives would be feasible.

[32] Note that the independence between the dynamics $\dot{z}$ and $\dot{b}$ differs from the contributions of Hein (2018) and Hein and Woodgate (2020) which focus on stability constraints set by these expenditures. This difference emerges from our choice of specification of the growth of government expenditure effect on demand. Following their specification would complicate our algebra without bringing much insight for our object of analysis in this paper. The independence of $\dot{z}$ to the dynamic of external financial positions is due to the fact that interest paid and received from the rest of the world does not affect aggregate demand expenditures in our model, as we focus on government behaviour. Other works have specifications in which private owned external debt stocks might affect private investment dynamics (see Kohler (2017) for example). We do not consider these cases in this thesis.

disequilibrium could possibly last much longer. This result leads us to the finding of an open-economy asymmetry of demand-led growth. Which we discuss in depth in the next subsection.

Table 4 below summarizes the effects of the exogenous variables and parameters on the long-run equilibrium values:

Table 4. Effects of Exogenous Variables on Long-Run Equilibrium Values

	u^{**}	g^{**}	z^{**}	b^{**}	r^{**}	d^{**}	ω^{**}	h^{**}	φ^{**}
γ	0	0	0	0	+	+	0	0	0
γ_u	0	0	0	0	+/-	+/-	0	0	0
π	0	0	+	+	+/-	-	-	+/-	+
s_r	0	0	+	+	-	-	-	-	+
Φ_u	0	0	+	+	-	-	-	-	+
τ	0	0	-	-	-	-	+	+	-
i	0	0	0	+	+/-	+	-	-	+
i_f	0	0	0	0	-	-	0	0	0
μ	0	0	0	0	-	0	0	0	0
ε	0	0	0	0	-	-	0	0	0
δ	0	0	0	0	+/-	+/-	0	0	0
u_n	+	0	+	+/-	+/-	-	+	+	-
g_x	0	+	-	-	+/-	-	0	0	0
g_G	0	+	-	-	+/-	-	0	0	0
α	0	0	0	+	+/-	-	+	+	-

4.5. Main results of SFC Supermultiplier Model and Implications for Open Economy Demand Led Growth

As we have seen, the model leads to the long-run convergence of capacity utilization to 'normal' levels (u_n)[33] and growth is determined by demand, most specifically the non-capacity creating autonomous components of demand - government expenditure and exports in our case.[34] As we have discussed, this ultimately means that in equilibrium the economy grows at the same rate as exports. A result compatible with the BPCG tradition. As in Morlin (2022), we can easily see that

[33] Which has been highlighted in different strands as a 'desired characteristic of growth models' (Nikiforos, 2018)
[34] With consumption out of interest payments counting as part of total government expenditure effect on aggregate demand.

the maximum growth rate in the model´s equilibrium is compatible with the Thirlwall Law. The growth rate compatible with the balance of payments constraint g_b as presented by Thirlwall Law:

$$g_b = \frac{g_x}{\eta}$$

Maximum growth compatible with the balance of payments depends on the growth rate of exports (g_x) divided by the income elasticity of imports (η). In this model, the income elasticity of imports is constant and equal to 1 as it is assumed that propensity to import (ϕ_u) is constant through time. Under this assumption, we can see that the long-run growth rate is compatible with the one of Thirlwall's Law:

$$g^{**} = g_z = g_G = g_x = g_b \qquad (32A)$$

This result highlights the role of structural change for economic growth, as the structure of production determines the export growth and the propensity to import which are main determinants of long-term growth. That is, the economy would be determined by its structure of production through demand channels. A finding for long highlighted by Kaldorians under the Thirlwall Law tradition and by Latin American Structuralists (Perez-Caldentey and Vernengo, 2019). In this scenario, industrial and commercial policy gain high importance, as they can shift long-run growth maximum rates, while macroeconomic policies cannot. Our model, thus sustains some of the main findings from the Kaldorian and Structuralist traditions.[35]

On the other hand, the effect of another autonomous component on growth, government expenditure, lets us observe relevant effects on the traverse, thus on average growth. As we have seen in subsection 4.4.6, growth could remain for a long time below the growth rate compatible with balance of payments constraint due to lower government expenditure growth.[36] Our model

[35] For matters of simplification, we did not include the investigation of income elasticities of exports and imports in our model, as is common in the Thirlwall Law tradition (Thirlwall, 2011). It is important to notice, however, that the Kaldor Laws (Thirlwall, 1983; Tregenna, 2008) that study productivity effects on output focus on gains from manufacturing, which has Verdoorn effects on growth. This paper focuses on macroeconomic policies, abstracting from sectorial composition. Higher growth rates of exports or general output related to higher commodity prices or increase in services, for example, may not present the same productivity effects highlighted by Kaldor and Verdoorn for manufacturing. Nevertheless, an important avenue of research is opened with models that add government expenditure on growth models, as one can study the effects of different government expenditures on structural change and productivity channels, linking macro and industrial policy. We leave that for future research.

[36] In a similar model, Morlin (2022) shows that government expenditure could also remain for a relevant period of time above export growth without bad external debt consequences when interest rates on external debt are

then leads to the conclusion that the economy will follow either a "balance of payments constrained demand-led growth process" or a "policy-constrained (or pure) demand-led growth process". While this naming is used by Sraffian authors in the supermultiplier tradition (Freitas and Dweck, 2013; Morlin, 2022), the concept was introduced under the BPCG tradition (see McCombie and Thirlwall, 2002).[37]

We shall have a closer look at this dichotomy between policy-constrained and balance-of-payments-constrained. As we have discussed, the possibility of an external crisis when government expenditure is held above export growth sets the balance of payments constraint as an upper limit to growth. But the same is not true in the opposite scenario. A country could run long periods with lower government expenditures as there is no limit to international reserve accumulation, a point often highlighted in the literature (Lavoie, 2022, Ch.7).[38] Although this would impose lower growth than "potential", it would be feasible and stable for long periods of time. For this reason, although a "traverse case" and not a "long-run case", the policy-constrained growth regime is still quite relevant to understand the growth patterns of many economies around the world.[39]

Indeed, these conclusions can be related to older ideas of the New Cambridge School, and their analysis of fiscal and trade policies (Godley and Cripps, 1976, 1983; Godley, 1999; Lavoie, 2022, Ch. 7.6.2). The school originated under the Cambridge Economic Policy Group gave strong importance to financial balances analysis, the fundament to Godley's trade performance argument

substantially low. This holds for our mode, although it would also require the use of some international reserve stocks, for debtor countries. Creditor countries, on the other hand, could sustain longer trade imbalances led by high government expenditure when foreign interest rates were higher.

[37] McCombie and Thirlwall (2002) also point out to a "resource constrained" regime, which is not presented by Freitas and Dweck (2013). From our understanding, this would correspond to a supply constraint, such that the country is employing full capacity of its resources and is not limited by the balance of payments, but by its economic structure.

[38] Note that in our model when the growth of government expenditure effect on aggregate demand is below export growth the domestic economy will grow less than exports, so everything else equal exports will grow faster than imports and capital inflows influenced by the economies' size. Because we allow for capital flows with their own determinants, it could also be that other changes in the balance of payments could keep international reserves from quickly accumulating (the country could hold low interest rates for example). Furthermore, a persistent government surplus could also be associated with a persistent private deficit instead of a current account surplus, which would lead to the accumulation of private debt. This may have been the case of advanced economies that sustained public surpluses with current account deficits in the build up of the 2008 crisis. This case would also be unsustainable. Since we focus on domestic and external public debt dynamics we do not explore private balances here. However, one must consider that a variety of positions between the three sectors' balances could be found under low government deficits, with some of them presenting long-lasting dynamics.

[39] It is important to notice, as highlighted by Kalecki (1943), that "policy constrained" may very often mean "politically constrained" as different groups within the country may have opposing interests that lead them to back and implement policies that are not compatible with higher growth rates of aggregate income.

(Lavoie, 2022, Ch.4). Godley's idea is that in the case the net accumulation of the domestic private sector tended towards zero, when $I = S$, output would depend on government expenditure, exports and the elasticities of tax revenues and imports to income. In fact, when the propensity to save and to invest is the same our short-run equilibrium equation 27 becomes equivalent to the correspondent output equation from Godley when including interest payments, as in Godley and Lavoie (2007, p.178). In such a situation, the economy would have twin deficits or surpluses (the public and external accounts), unless there would be a specific situation in which both would be under equilibrium at the same time. This meant that the ratio of government expenditure to the tax rate (the fiscal stance) would have to equal the ratio of exports to import propensity (the external stance). Godley and Cripps (1983, p.296) reach the conclusion that if the fiscal stance is higher than the external stance there would be a twin-deficit position, which would indicate an 'unsustainable process' (Godley, 1999) as stock accumulation related to these flows would force the change. The opposite situation of a higher fiscal stance than the external stance would mean a twin-surplus, "such a situation can last a long time, since there is nothing to force a change" (Lavoie, 2022, p. 563). As in other traditions, Godley would conclude that the trade performance was the upper limit to growth in the economy. Thirlwall's Law can be interpreted as the dynamic version of this upper limit (Perez-Caldentey, 2007, p. 210). However, the opposite "long-lasting" case of twin-surpluses in Godley was left aside in most of the BPCG literature. Our model can be interpreted as a dynamic version of Godley's condition with constant tax rate and propensity to import, and with the public domestic debt to capital and the external debt to exports as the relevant stocks related to changes in these flows.

This finding highlight that the influence of stock dynamics on expenditure decisions may contribute to the study of interactions between semi-autonomous components (as started by Fiebieger and Lavoie (2019) and Allain (2022), for example). In the case described by Godley, in which we abstract from the private sector balance, the decision to increase government expenditure and move from a policy-constrained to a balance-of-payments-constrained regime could come from the government's preference for a certain international reserve stock level. If public expenditure would not increase in this case, there would be a constant accumulation of reserves.[40] A finding that is in line with Godley and Lavoie (2007) notion of *stock-flow norms*, desired stock

[40] As we are dealing with a fixed or managed exchange rate regime in our model. In the case of a fully flexible exchange rate it could also have to do with an aversion of exchange rate appreciation.

or level positions that affect expenditure decisions. This leads us to hold that the New Cambridge approach towards economic realism and the study of financial balances (Smith, 2016), summarized in the stock-flow-consistent modelling (Godley and Lavoie, 2007), poses important contributions to the supermultiplier literature by connecting stock-flow relations to the interactions between different 'semi-autonomous' demand components.

A last point should be made about the dichotomy between policy-constrained and balance-of-payments-constrained regimes. The fact that the balance of payments functions as a ceiling but not a floor to growth is what characterizes the open-economy asymmetry of demand-led growth. While the adjustment down from a growth path above that compatible with balance of payments may come quickly through external troubles, the adjustment up from a position of more available external space may not be fulfilled by the country. The use of this external space will depend on policy decisions.

The relationship of our model with the Sraffian and Neo-Kaleckian traditions within Post-Keynesianism shall also be highlighted. Long-term growth in our model depends on the growth of autonomous non-capacity-creating components of demand with its long-run equilibrium being independent from income distribution, findings highlighted by the Sraffian Supermultiplier tradition. The Keynesian/Kaleckian finding of the paradox of savings is also sustained as "a traverse effect" as the savings rate affects the supermultiplier with a decrease in s_r being associated with higher average growth rates. The same could be said about the Kaleckian paradox of profits, although this result depends on the value of the parameters as explored in section 4.3.2. For this reason, the economy in our model can be either wage- or profit-led in the short run (and consequently on the traverse). This finding, as well as our autonomous investment comes from our basis on the canonical Open Economy Neo-Kaleckian Supermultiplier model (Nah and Lavoie, 2017; Blecker, 1989). However, different from these models, we abstained from the long-run Marshall-Lerner effect, for the reasons already justified before. This modelling choice is what makes it possible for us to create a Neo-Kaleckian Open Economy model with a Balance of Payments Constraint, connecting the former with the tradition after Thirlwall (1979). We hold this choice is not unreasonable even within the open-economy Neo-Kaleckian tradition. As highlighted

by Blecker (2016) himself, it is expected that exchange rate variations would have much stronger effects in the short-term than in longer terms.[41]

We then contribute to the literature on demand-led growth by presenting a first stock-flow-consistent supermultiplier model with domestic and external debt that takes into consideration endogenous money and capital flows with their own determinants. We show the model is compatible with main findings from the Sraffian, Neo-Kaleckian, New Cambridge school, Kaldorian, and Structuralist traditions.[42] We highlight the model points out to the open economy asymmetry of demand-led growth that arises from the ceiling effect represented by the balance of payments. Demand-led growth under this asymmetry can be characterized either as balance-of-payments-constrained or policy-constrained. Long-run growth depends on changes in economic structure and productivity, while the growth path (as well as the external indebtedness ceiling) greatly depends on macroeconomic policymaking. These policies' space of action is also restricted by the external constraint of the balance of payments, what we turn to next.

[41] On the other hand, it is true that level effects of international price competition highlighted by the Open-Economy Neo-Kaleckian tradition are excluded in our long-run analysis (see Blecker (2002), for example). We base this choice on the structuralist focus (present in the BPCG tradition) of non-price competitiveness dominance on net exports' performance over price competitiveness (Cimoli and Porcile, 2014; Gräbner et al, 2020). Although both could be indirectly affecting exogenous export growth and import propensity in our model. We also abstracted from level effects of sustaining certain exchange rate levels for the purpose of international competitiveness (as is often highlighted by New Developmentalists (Bresser-Pereira, 2020)).

[42] The compatibility with different strands of Post-Keynesian Economics is not a coincidence. They arise from some core concepts underlying all strands. First, the understanding of the endogeneity of money creation in capitalist economies, which allows for the relative independence of investment from previous accumulated savings, gives centrality to demand created autonomously from current income in determining output. Keynes' (1936) role of government expenditure and the Luxemburg-Kaleckian concept of 'external markets' (Kalecki, 1967) are such examples. Secondly, the role of induced investment in the supermultiplier has been highlighted by Serrano (1995) to have been present in Kaldor (1978) and the BPCG literature that followed. This concept has been conciliated with Keynes' 'animal spirits' investment in the Neo-Kaleckian tradition by long-run convergences of these animal spirits to autonomous demand growth (Allain, 2015; Lavoie, 2016; Dutt, 2019). Lastly, although distribution and price theory may diverge between these traditions, they seem to be somehow contemplated by the findings of the model. The open economy Neo-Kaleckian model has often focused on income distribution effects on capital accumulation. The effects of distribution on the supermultiplier allow for the observation of these effects as 'traverse effects' (Lavoie, 2016) without taking out the fact that long-run growth is not affected by income shares, in line with the Classical or Sraffian theory of distribution. Of course, these observations do not point out that our model is compatible with all findings of these traditions nor that all authors from these traditions would agree with the compatibility pointed out here.

5. External Constraints to Macroeconomic Policy in Developing Countries

5.1. Fiscal Policy, Functional Finance, and Currency Hierarchies: structuralism faces MMT in the developing world

The popularization of Modern Monetary Theory (MMT) in the United States and among heterodox economists in general has sparked renewed debate on external constraints of economic policy (and fiscal policy in special) in developing countries (Neto and Vernengo, 2004; Vernengo and Perez-Caldentey, 2020; Aboobaker and Ugurlu, 2020; Porcile and Yajima, 2021; Botta et al., 2023). MMT is often referred to as a strand of Post-Keynesian Economics (Lavoie, 2022, Ch.1) with 'functional finance', the central element of its theory, being shared with other strands in the field. Introduced by Lerner (1943), the concept of 'functional finance' points out that the government should use fiscal deficits/surpluses to compensate for private sector financial surpluses/deficits to stabilize aggregate demand at non-inflationary full employment levels.

Indeed, recent empirical studies looking at demand sources under finance-dominated capitalism applied to developing countries have found deficit-financed public expenditure are an especially relevant source of demand for emerging countries (Akcay et al, 2022; Passos and Morlin, 2022; Campana et al., 2023). However, in developing economies fiscal policy must go beyond aggregate demand effects to also direct structural change that leads to industrialization and productive development, a precondition for sustained growth not yet met by these economies (Mazzucato, 2011; Cimoli et al., 2020; Aboobaker and Ugurlu, 2020; Botta et al., 2023).

Although fiscal policy is central for development it may be much more restricted in these countries than MMT seems to perceive (Bonizzi et al., 2019; Vernengo and Perez-Caldentey 2020; Aboobaker and Ugurlu, 2020). The view of MMT can be seen by the statement by Wray (2012, p.42): "most developing countries adopt their own domestic currency. [Since] they do issue their own currency, the analysis here of sovereign currency does apply to them". Adding the amendment that "it is critical that sovereign nations avoid the temptation to directly (or indirectly) take on foreign currency-denominated debt" (Wray, 2006, p.225). That is, avoiding what Eichengreen et al. (2005) call the "original sin": borrowing in foreign currency.

As Cline and Vernengo (2016) point out, the "original sin", usually done by developing countries, follows their balance of payments constraint. As presented in section 2, the Structuralist school has for a long time highlighted why peripheral (or developing) nations are bound to such constraint, what has been recently reclaimed by authors from this tradition (Vernengo and Perez-Caldentey 2020; Porcile and Yajima, 2021). The idea is that peripheral countries need access to foreign currency (dollars) to access intermediary and capital goods not available in the country. But their access to the currency is limited by their export revenues and by the demand for their domestic currency elsewhere, usually very low. Which puts them on a low position in the global 'currency hierarchy' (Fritz et al., 2018).[43] Even if the country issues external debt in domestic currency, a practice that became more common since the beginning of the 2000s, it will still have its fiscal and monetary policies restricted to deal with external imbalances because of increasing import needs. The basic feature of BPCG, as presented in the model in section 4.[44] This becomes even worse with financialization and rapid capital movements, as countries are more vulnerable to capital volatilities and short-term flows (Botta et al., 2022; Botta et al., 2023).

5.2. The controversial causality between external crises and fiscal policy and the role of US monetary policy on Global Financial Cycles

Since the 1980s, the International Monetary Fund (IMF) has imposed 'consolidation programs' to bail out countries undergoing external debt crises. At the heart of the neoliberal policies proposed in these programs there is the twin-deficit hypothesis (Polak, 1857; Miller and Russek, 1989). Different from the mere identity also observed by Godley and described in section 4.5, the hypothesis here states that the causality of the identity of public and foreign deficits would run from the former to the latter. Countries should apply austerity policies creating government surpluses and solving both deficits at the same time. What goes in the opposite direction of functional finance, which leads Post-Keynesians to argue this policy would dampen effective demand and output with it (Lavoie, 2022, Ch. 4, p. 288).

[43] As an example, Perez-Caldentey and Vernengo (2020) point out that in Latin America and Africa foreign currency denominated debt represented 30% and 26% of total government debt and 48% of the financial sector debt. While Asia and developing Europe had more than 50% of their financial sector's debt in foreign currencies in 2019.
[44] Although we assumed external debt in foreign currency only, Dvoskin and Torchinsky Landau (2023b) also consider an external debt in domestic currency in a supermultiplier model with balance of payments constraint and reach the conclusion that although devaluation consequences are different, the overall balance of payments constraint still imposes restrictions on both monetary and fiscal policy.

A similar idea is seen on the conventional models of balance of payments crises which "suggest that in the heart of [these crises] there is invariably a fiscal crisis" (Cline and Vernengo, 2016, p.41). Balance of payment crises, very common in the developing world in the 1980s and 1990s, would follow certain steps. Governments with some form of pegging on their currency under a balance of payments deficit would spend their international reserves to maintain the value of their currency. At a certain point, usually before the country had lost all its reserves, private investors would do a speculative attack quickly withdrawing financial flows from these countries leading the country to quickly run out of its reserves and be forced to give up the currency peg and look for exceptional international borrowing. These crises usually come with big losses in terms of employment and GDP growth, also usually associated with banking crises (Kaminsky and Reinhart, 1999).

Krugman (1979) presents the first canonical model that tries to formalize common features present in balance of payment crises. As pointed out by Cline and Vernengo (2016), Krugman's model and the ones that followed it are based on certain "fundamentals": the tendency of the economy to reach its "natural" level, Purchase Power Parity (PPP), and the quantitative theory of money. Under these fundamentals, fiscal expenditures financed by issuing new money always lead to inflation, deterioration of current account and expectations of depreciation. As was already mentioned in section 2, mainstream models have long applied the quantitative theory of money to the open economy even when evidence (and their usual closed economy counterparts) show that in capitalist economies money is endogenous to the demand for loans. Nevertheless, by basing himself in these fundamentals, Krugman (1979) derives the conclusion that fiscal deficits lead to current account imbalances, governments may try to preserve their currency peg by selling out reserves, but this would lead to a speculative attack and a balance of payment crisis as it is more rational for private investors to withdraw money in this situation.

The empirical evidence, on the other hand, does not seem to support the straight causality from fiscal deficits to balance of payment crises. Eatwell and Taylor (2000) point out that many of the countries that went into crises in the 1980s ran very modest fiscal deficits, or even surpluses. The East Asian countries that suffered such attacks in the late 1990s had budget surpluses and were following Washington Consensus types of policy (Stiglitz, 2000). The Asian Financial Crises would have much more to do with financial deregulation and its consequence was weakening of

state action and intervention, rather than the opposite (Chang, 1998; Alexander et al., 2006). Nikiforos et al. (2013) also finds empirically that for the case of Greece in 2011-12 it was the current account deficit which (Granger) caused the public deficit. A result that is in fact also found by the authors of the canonical models when doing empirical estimations. Kaminsky and Reinhart (1999) find that fiscal spending fared the worst of all their variables on defining the currency crisis, with fiscal deficit to GDP "accurately calling only slightly over a quarter of the currency crisis" (p. 490). A result that would imply the opposite causality, at least in Granger terms, something not discussed by the authors.

Under this context, Cline and Vernengo (2016) have recently developed a Post-Keynesian Structuralist model in which balance of payment crises are triggered mainly by external factors - the central country's (the US) interest rate increases and the fall of terms of trade faced by the country. With the model and doing a historical recollection of currency crises, they find the causality would run from external crises to fiscal crises (something also more throughout explored by Vernengo (2006)). In their model, a hike in US interest rates or a fall in terms of trade would lead to the break of the external debt stability condition, similar to the condition $g_x > i_f$ presented in section 4.4. This research builds upon the contribution by Cline and Vernengo (2016) by including financial flows with their own determinants and by exploring other channels of causality from the balance of payments constraint to fiscal policy space. Arguing that not only the external crisis itself but already the prospect of it presents a constraint to macroeconomic policy. We will come back to it in the next section.

The causality from US interest rate movements to external constraints on developing country has found substantial empirical evidence lately, following the work of Rey (2015). Miranda-Agrippino and Rey (2015) find evidence of a global financial cycle, with global factors alone accounting for around 25% of the variation of asset transactions across the globe. These global financial cycles could be substantially tracked by the VIX, an index capturing both market volatility and risk appetite of investors. The VIX itself presenting high correlation with the US Fed's monetary policy in the empirical estimations (Bekaert et al., 2013; Bruno and Shin, 2015). Under the era of open capital accounts, capital flows to emerging and developing countries would follow Global Financial Cycle movements in great part directed by the US monetary policy (Rey, 2015). Under this context, higher foreign interest rates not only increase the interest on external debt (increasing

the deficit of the current account and possibly leading to instability) they also drain short-term capital flows that could be sustaining a current account deficit. This is in line with the result found by Dedola et al. (2016) that higher US interest rates slow down aggregate demand in emerging countries.[45] Passari and Rey (2015) show empirically this result does not seem to depend on exchange rate regimes. This characterizes Rey's open economy dilemma: countries with open capital (and financial) accounts cannot revert capital outflows (and then the balance of payments constraint) without raising domestic interest rates. In section 6.2, based on the compensation thesis and on the results of the model it is argued that this represents an asymmetrical dilemma, that might very well be the case faced by many developing countries depending on their financial integration to the rest of the world. We may now apply our model to this situation of a US interest rate hike.

6. Effects of Deteriorating External Conditions for Developing Countries

6.1. Comparative Dynamics Exercise: policy reactions to a hike in the US Fed interest rate

As we have seen so far, there are important controversies in the literature about the causality between external crisis and fiscal policy crises and general macroeconomic policy space differences between central and peripheral countries. Inspired by the empirical literature that finds that capital outflows from developing countries are usually led by increases in the interest rates in the US (Rey, 2015; Miranda-Agrippino and Rey, 2015; Passari and Rey, 2016; Dedola et.al., 2016), we now look at the effect of a rise in the US interest rate on the model. Then exploring different dynamics related to possible policy responses from the government.

This approach may be seen as somehow innovative, as it applies a long-run growth model to a medium run policy response environment. This is inspired by the insight of Lavoie (2016) about the importance of the traverse (the adjustment period between short-term and long-term

[45] Dedola et al. (2016) also find for their BVAR model that while higher interest rates in the US diminishes inflation in advanced economies, it increases inflation in emerging economies, because of different pass-through effects. Although we do not deal in depth with inflation in this research, it is clear that it creates further pressure on currency pegs and on the wage share. One possibility of this pass-thorugh effect in developing countries is considered in section 6.1. when we discuss the effects of exchange rate devaluation on the economy.

equilibriums) in economic dynamics.[46] The long-run equilibrium equations give us a relevant understanding of the path towards which the economy is headed after a shock, while the dynamic equations let us analyze the economic effects already in the first periods coming out of an equilibrium position. We hold this is particularly useful for the case of balance of payments crises. As was mentioned before, an important component of such crises is the expectations of the path the economy is heading, more specifically the expectation that a certain external disequilibrium will remain. As we will see, a worsening of external conditions alters long-run equilibrium with relevant effects on the movement of endogenous variables towards such equilibrium, especially the loss of international reserves. The lack of response from the government under this scenario represents a choice of selling international reserves which runs the risk of accelerating the external deterioration by affecting these expectations and possible speculative attacks.

To focus our analysis on developing countries some considerations must be made. We have assumed so far in the model that movements in exchange rates have no "Marshall-Lerner" effect on exports and imports in the long-run, only in the short run. However, an important literature following Díaz-Alejandro (1963) and Krugman and Taylor (1978) have found that exchange rate devaluations have contractionary effects on the economy also in the short-run, bringing the balance of payments to equilibrium through lower income not through higher exports. Indeed, there are good reasons to believe that even in the short-run the positive effects of devaluations on net exports is quite limited in developing countries. First because these countries are usually primary good exporters, so their exports have low exchange rate elasticity (Reinhart, 1995; Bernat, 2015).[47] Secondly, because an import substitution process is unlikely for these countries due to their lack of access to capital goods domestically, which force them to import, imposing a pass-through to prices (Perez-Caldentey and Vernengo, 2020; Dvoskin and Torchinsky Landau, 2013b). For these

[46] Trezzini (2011) and Park (1995) have also highlighted the role of the traverse. The idea is that the focus solely on steady states, or fully adjusted positions (Lavoie, 2016), dismisses the fact that moving averages of the path towards such steady-state positions may be very different from the steady-state value itself. Our policy-constraint growth process exposed in section 4.5 highlights this feature. Nevertheless, here we take it one step further. Not only the averages of the traverse matter, but the movement towards the steady state already represents a balance of payments disequilibrium – a loss of international reserves – that carries important economic consequences.

[47] For econometric evidence of low-price elasticity of exports and imports for country specific cases (Santos, et al., 2015; Padrón et al., 2015). Although we do not deal with that in this research, some Open Economy Post-Kaleckian models also consider that devaluations increase investment through higher exchange rates when they come from higher profit shares (Blecker, 2002). Summa and Serrano (2018) and Braga and Serrano (2023) argue it is often the opposite in developig countries, as private non-residential investment is mostly induced by demand and aggregate demand is reduced by the exchange rate devaluation.

reasons, the effect of a shift in nominal exchange rates considered here is the effect of decreasing the equilibrium productive wage share through an increase in prices that decreases real wages, such that $\frac{\partial \pi}{\partial e} > 0$, as expressed in section 4.3.2. and highlighted by the literature following Krugman and Taylor (1978).[48]

Furthermore, since we are considering developing countries that could face a balance of payments crisis, it is assumed they are net debtors with the rest of the world, such that $d > r$. Since the currency crisis is determined by definition as a moment in which the country cannot intervene to sustain its desired exchange rate levels, it is assumed that the country starts with a positive level of international reserves r, and that the relevant limit to balance of payments is the one in which the economy does not run out of international reserves to sustain its currency.

We shall then look at the effects on the dynamic of international reserves between short- and long-run equilibriums, as they express the result of the balance of payments. This movement in the traverse is interpreted as the medium-run dynamics of the model. Equation 46 is presented again for this reserve dynamics:[49]

$$\dot{r} = 1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right) - \phi_u\right) + i_x d + \left(i_f - g_x\right)r - \delta\varepsilon \qquad (46)$$

It is important to notice that while d starts at a given level of equilibrium it will also change with time towards its long-run value. The medium-run dynamics takes into consideration the change out of the previous equilibrium position, while on the long-run a full adjustment of all stocks to their long-run positions can be already assumed.[50] Equation 52 is presented again for the long-run reserves equilibrium:

$$r^{**} = \left[1 + \frac{Y_P}{X}\left(\delta\left(i - i_f\right) - \phi_u\right) - i_x d^{**} - \delta\varepsilon\right]\frac{1}{\left(g_x - i_f\right)} \qquad (52)$$

we can then look at the impact of a variation in i_f on both equations:

[48] Summa and Serrano (2018) and Braga and Serrano (2023) also argue that a devaluation of nominal exchange rates lead to higher mark-ups, which would further decrease the wage-share.

[49] Since our short-run is determined as a snapshot of the economy in which flows have not yet changed, the dynamic equations out of equilibrium, or the begining of the traverse, represent a sort of 'short-run' effect as they represent how things start moving from the previous equilibrium position.

[50] For a future version of this work, we want to simulate mathematically the whole trajectory, but it is not done here yet.

$$\frac{\partial \dot{r}}{\partial i_f} = -\frac{Y_P}{X}\delta + (r - d) < 0 \tag{57}$$

$$\frac{\partial r^{**}}{\partial i_f} = \left[-\frac{Y_P}{X}\delta\left(1 + \frac{i_x}{g_x}\right) + (r^{**} - d^{**})\right]\frac{1}{g_x - i_f} < 0 \tag{58}$$

Since we defined that we have a net debtor country and it is assumed the external debt stability condition $g_x > i_f$ holds, we can see that the US Fed Funds rate has a negative impact on the ratio of international reserves to exports both in the traverse and in the long run. In the case in which $g_x < i_f$ the dynamics of our external debt stocks would already be unstable and indicative of a possible currency crisis, as pointed out by Cline and Vernengo (2016).

If the new r^{**} is still higher than $\bar{r}$ compatible with balance of payments equilibrium under the current fixed exchange rate the economy can find a new equilibrium with lower international reserves without any expectation of external crisis. However, if the new r^{**} is lower than $\bar{r}$ (which would be the case if the economy started with maximal use of its external space), then the economy is under a balance of payments constraint in the long-run and in a balance of payments imbalance currently (already on first periods after the shock). It must bring the BoP to equilibrium or keep losing reserve stocks. The dynamics of the latter choice baring the risk of acceleration of capital outflows under a speculative attack. To equilibrate the balance of payments, the modelled government has 3 tools: the nominal exchange rate (e), the domestic interest rate (i) and the growth rate of government expenditure contribution to aggregate demand (g_G).

It is important to notice, this exercise is constructed under the conditions in which the model presents stable dynamics, that is: when the Keynesian Stability Condition, $s_r\pi > \gamma_u - \phi_u - \tau$, the domestic debt stability condition, $g > i(1 - \alpha(1 - s_r) - \tau)$, and the external debt system stability condition, $g_x > i_f \geq 0$, all hold. Economic scenarios in which any of these conditions do not hold will already lead to disequilibrium and to crises if persistent. We focus on the partial effects when stability still holds to examine the external restrictions to domestic policy even under a stable trajectory of domestic and external debt.

Until now we are assuming a fixed exchange rate regime. The shock of capital outflows led by the monetary policy in the center would create pressure on the currency to devaluate. To keep the

currency at its desired level the government would have to spend its international reserves until external situation improve or until it is able to bring balance of payments to equilibrium by other means. When choosing to spend its reserves, however, the country can be more prone to a speculation attack that accelerates the process of reserve loss. Moreover, the selling of international reserves could also only be maintained temporarily. In our analysis we consider the shock is somewhat persistent such that the government is forced to take some action to bring the BoP to equilibrium. We analyze how the government could use their three macroeconomic policy mechanisms – exchange rate, interest rate, and government expenditure – to bring BoP back to equilibrium. We later briefly discuss the case in which the external restriction is temporary.

We look at impacts of each policy on short-run capacity utilization and wage share, on the dynamics of the balance of payments, and on our long-run equilibrium variables.

6.1.1. Case 1: let nominal exchange rates depreciate

We shall start by considering the case in which the government lets the currency take the whole shock of capital outflows, which would be correspondent to a case in which the country had a fully flexible exchange rate. Since we assumed out Marshall-Lerner effects in the case of developing countries, the effect that dominates is the shock of nominal exchange rates on domestic prices. We can then consider the effects of an increase in exchange rates through its implicit effect on increasing the profit share of productive income.

Short-run:

$$\frac{\partial u^*}{\partial e} = \frac{\partial \pi}{\partial e} * \frac{-s_r u^*}{s_r \pi + \phi_u + \tau - \gamma_u} < 0 \tag{60}$$

$$\frac{\partial \omega^*}{\partial e} = \frac{-\frac{\partial \pi}{\partial e}\left(1 + \frac{ib}{u^*}\right) + \frac{\partial u^*}{\partial e}(1-\pi)}{\left[1 + \frac{ib}{u^*}\right]^2} < 0 \tag{61}$$

Medium-run dynamics:

$$\frac{d\dot{r}}{de} = \frac{\partial \pi}{\partial e} * \frac{-s_r(\gamma^{**} - \gamma_u u_n + z^{**})\left(\delta\left(i - i_f\right) - \phi_u\right)}{(1-\alpha) z^{**}(s_r \pi + \phi_u + \tau - \gamma_u)^2} \tag{62}$$

Long-run:

$$\frac{\partial z^{**}}{\partial e} = \frac{\partial \pi}{\partial e} * s_r u_n > 0 \tag{63}$$

$$\frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial e} = \frac{\partial \pi}{\partial e} * \frac{s_r u_n \left(1 - \frac{1}{z^{**}}\right) - \frac{s_r}{(s_r \pi + \phi_u + \tau - \gamma_u)}}{\left(g_x - i_f\right)(1-\alpha) z^{**}(s_r \pi + \phi_u + \tau - \gamma_u)} < 0 \tag{64}$$

$$\frac{\partial d^{**}}{\partial e} = \frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial e} \frac{\delta\left(i - i_f\right)}{g_x} < 0 \tag{65}$$

$$\frac{\partial r^{**}}{\partial e} = \left[\frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial e} \frac{\left[\delta\left(i - i_f\right)\left(1 - \frac{i_x}{g_x}\right) - \phi_u\right]}{\left(g_x - i_f\right)}\right] \tag{66}$$

$$\frac{\partial b^{**}}{\partial e} = \frac{\partial \pi}{\partial e} * \frac{s_r u_n \alpha}{g - i\left(1 - \tau - (1 - s_r)\right)} > 0 \tag{67}$$

$$\frac{\partial \omega^{**}}{\partial e} = \frac{-\frac{\partial \pi}{\partial e}\left(1 + \frac{i b^{**}}{u_n}\right) - \frac{\partial b^{**}}{\partial e}\frac{i(1-\pi)}{u_n}}{\left[1 + \frac{i b^{**}}{u_n}\right]^2} < 0 \tag{68}$$

Since $\frac{Y_P}{X}$ at equilibrium is a function of z^{**}, the partial derivative of equilibrium value $\left(\frac{Y_P}{X}\right)^{**}$ is added for matters of presentation. The same is done when looking at fiscal policy.

We can see that a depreciation of nominal exchange rates decreases short-term capacity utilization and the short and long-run wage shares. Its effect on the adjustment of the reserves to export ratio on the other hand is ambiguous, as it depends on whether its effect on decreasing imports is stronger than its effect on diminishing capital inflows through lower income. Something similar can be seen for the long-run equilibrium international reserves level, with the only difference that on the long-run equilibrium there is an extra positive effect of devaluation on international reserves through a decrease in the net external debt (in dollars!). This result is very interesting and seems to be in line with empirical findings. As we have discussed, the empirical literature after Rey (2015) has found that global financial cycles greatly commanded by US Fed interest rate hikes often cannot be offset by exchange rate devaluations from peripheral countries. Which they call a policy dilemma between capital opening and monetary policy, as the latter would be the only policy tool capable of bringing the balance of payments to equilibrium. Indeed, in our model the

greater the openness to capital flows (expressed by δ) the weaker the possibility of positive effects of nominal exchange rates on the reserves to exports ratio.

The depreciation of nominal exchange rates decreases the level of net external debt in dollars. But this result should be taken with attention. One common problem of balance of payments and currency crises is that it brings the country to a position of impossibility to service its external debts. This is due to a currency mismatch. As long as the country still has international reserves and export revenues to repay external debt services in dollars this mismatch should not be a problem. However, the moment the country loses its reserves and faces an exchange rate depreciation although the volume of external debt in dollars may decrease, most likely its total value will increase in domestic currency, making it harder for the country to service this debt with their own production and funds (which are in domestic currency). On top of that, as we can see a depreciation also increases the volume of public debt through an increase in z. This means apart from owing more to the rest of the world the government would also owe more domestically. This is one chain of transmission of currency crises to fiscal crises in this model. We shall see the other ones.

6.1.2. Case 2: increase of domestic interest rates

Alternatively to devaluating the currency, the government could choose to attract more capital by increasing domestic interest rates, thus decreasing the interest rate gap with the US. An option very often followed by governments, to different degrees. We would have:

Short-run:

$$\frac{\partial u^*}{\partial i} = \frac{(1 - s_r)b}{s_r\pi + \phi_u + \tau - \gamma_u} > 0 \tag{69}$$

$$\frac{\partial \omega^*}{\partial i} = -\frac{b\left(u^* - i\frac{du^*}{di}\right)(1 - \pi)}{u^{*2}\left(1 + \frac{ib}{u^*}\right)^2} < 0 \tag{70}$$

Medium-run dynamics:

$$\frac{\partial \dot{r}}{\partial i} = \frac{Y_P}{X}\delta > 0 \tag{71}$$

Long-run:

$$\frac{\partial z^{**}}{\partial i} = \frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial i} = 0 \tag{72}$$

$$\frac{\partial d^{**}}{\partial i} = \frac{Y_P}{X}\frac{\delta}{g_x} > 0 \tag{73}$$

$$\frac{\partial r^{**}}{\partial i} = \frac{Y_P}{X}\left[\frac{\delta(1-\frac{i_x}{g_x})}{(g_x - i_f)}\right] \tag{74}$$

$$\frac{\partial b^{**}}{\partial i} = \frac{(1-\tau-\alpha(1-s_r))(\alpha z^{**} - \tau u_n)}{[g - i(1-\alpha(1-s_r)-\tau)]^2} > 0 \tag{75}$$

$$\frac{\partial \omega^{**}}{\partial i} = -\frac{b^{**}\left(1 + i\frac{db^{**}}{di}\right)(1-\pi)}{u_n\left(1+\frac{ib^{**}}{u_n}\right)^2} < 0 \tag{76}$$

A hike in domestic rates in our model increases short-term capacity utilization but decreases wage share under realistic assumptions discussed in 4.3.3. In the long-run the negative effect on wage share is clear and is amplified by the increase in the domestic debt ratio. As we can see an increase in interest rates can also lead to a fiscal crisis. They limit the fiscal policy space through two channels. On one hand, it increases the government's domestic debt while on the other hand it can lead to a debt instability if it breaks with the stability condition $g > i(1-(1-s_r)-\tau)$, which would create a debt spiral unless the government takes other measures to prevent it.

When it comes to the balance of payments, the results are a bit more complicated. When we look at the medium-run dynamics out of the previous equilibrium, we see that an increase in domestic rates will tend to increase international reserves. However, the result of the rate hike on the long-run equilibrium of the reserves to export ratio is more ambiguous. This is because the attraction of capital flows due to interest rate hike has a double effect on international reserves. It increases reserves due to financial flows to the country, but it also increases the net external debt and the payment of interests on it, as these are flows that render returns to foreigners. This highlights the dual role of financial flows: they grant short-term foreign currency funds, but they also increase long-run debt payments. The effect of borrowing from an international creditor. Thus, when $g_x <$

i_x the increase brought by capital flows on international reserves is offset by a greater increase in debt services payment, while the opposite would hold if $g_x > i_x$.[51] This is because capital inflows increase international reserves and net external stocks by the same amount in each period, but the interest paid on the debt is higher than the one paid on international reserves, offsetting this difference over time. On each period the economy would receive an inflow of capital according to the new interest rate differential and in each period, they enjoy the full amount of these flows while losing just a small share of that as interest payment. However, everything else equal, this capital inflow is now constant over time while the interest payment increases (as net external debt is accumulating). If $g_x < i_x$, the longer the time smaller will be the international reserve increase until it will turn into a decrease until it reaches a new lower equilibrium of international reserves as the previous one. As the numerator D grows faster than the denominator X, that is, because $g_x < i_x$.[52] Which means that in this scenario any positive capital inflow is negative to the balance of payments in the very long-run, while capital outflows are positive. This is in line with the findings of the BPCG literature that includes capital flows following Moreno-Brid (2003). It is important to stress, however, that this will only be a problem in the long run, so domestic interest rate increases have a safe and strong effect on the balance of payments in the first periods after the shock, which can be the reason why they are so attractive by central bankers in periphery countries. Something else should be considered before taking these results in consideration.

Our modelling of the basic domestic interest rate captures three roles it has in the economy: on the payment of interest on domestic public debt, attracting financial flows, and increasing total income inequality (depending on certain conditions already discussed). On the other hand, the analysis of monetary policy responses also sheds light on two roles that are absent of our model when it comes to domestic interest rate effects on output: [53] its level has no effects on credit-based or return-

[51] Note that while we assumed $g_x > i_f$ as a stability condition of the external debt dynamic to begin with, $g_x > i_x$ is much more binding and can be much harder to achieve to poorer countries that have high risk premiums (μ) or that are indebted to the IMF, for example. As the IMF usually offers interest rates much higher than the US Fed rate.
[52] Note that more capital inflows increase the capital and financial account result but decreases the current account for a net debtor. Since international reserves change as a result of both, although more capital inflows may increase international reserves it will always increase it to a lower degree than the increase in net external debt. Which means an increase in the proportion of liabilities to assets in the country. The opposite result would hold for a net creditor country.
[53] Another limitation of the model, not related to output directly, is the complete independence between i and i_x. The interest rate on external debt in the literature is often the foreign interest rate (Cline and Vernengo, 2016 ;Morlin, 2022). Our variable i_x captures this relationship as it depends on the Fed's rate, which is reasonable for bonds sold

seeking expenditures, nor on the productive profit-share (π) the one that affects the supermultiplier.[54] The first one is an important limitation, a higher domestic interest rate in most economies is usually related to lower consumer credit or investment. With the latter being affected by both credit prices and rentability perspectives, as more rentiers might buy government bonds instead of investing in fixed capital accumulation when these bonds have higher returns. The lack of effect of interest rates on π derives from our modelling of income distribution, although this could be interpreted as a limitation it also has some ground on reality. On one hand it points out that consumption related to the profit share of production is affected by the level of production, while consumption out of financial income does not depend directly on production. On the other hand, it shows that interest rate levels do not affect wage-bargaining for higher wages, which fits our model specification.[55] This highlights that given a profit share of production, set by wage bargaining and price setting, the total wage and profit shares depend on policy decisions.[56]

Given this structure of our model, a contractionary monetary policy (increase in interest rates) has only expansionary effects on output (short run increase in capacity utilization). This should not be expected to be seen in reality because of the other effects domestic interest rates carry that we just exposed. If domestic interest rates had a negative effect on autonomous private investment or on consumer credit for example, aggregate demand and imports would diminish. This would amplify

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at international markets or loans given by international creditors. However, the attraction of capital through *i* means at least part of the external debt is related to assets to which domestic interest rates affect the rentability. This would mean higher domestic rates would not only increase external debt stocks, but also increase interst rates on such debt. We acknowledge this is a limitation of the present model and further researches taking capital accounts into full consideration should take these relationships between rates of return into consideration.

[54] Our model is similar in this stance to other supermultiplier models that focus on government expenditure and exports (Nah and Lavoie, 2017 ; Hein, 2018 ; Morlin, 2022). In general the Supermultiplier literature disconsiders that interest rates have effects on private corporate investment, focusing on its inducement by demand sometimes adding an 'animal spirits' variable, as in this model. However, the Sraffian supermultiplier tradition has long highlighted the importance of consumer credit and residential investment for growth, both dependent on the interest rate levels, while neo-Kaleckians have highlighted consumption out of interest. We abstracted from the former for matters of simplicity. Some Kaleckian traditions also sometimes consider the 'principle of increasing-risk' as affecting investment decisions negatively by higher interest rates (Hein, 2023, Ch. 3). Indeed the negative effect of interest rates on investment is also a building block of Keynes' (1936) theory of invesment behavior.

[55] If there was consumption out of credit done by workers, however, this could mean workers might bargain for higher wages as their real income might decrease through interest payment on previously borrowed loans. But on the other hand that could also affect the investment decision of firms if they held private debt. We do not enter into this topic here as it is not the focus of our study.

[56] This has interesting and important implications for distribution theory. It extends the political economy of conflict over income distribution on the firm/union level (usually emphisized in Kaleckian traditions (Hein,2023, Ch.3)) to the dispute over economic policy decisions by the government. Highlighting the role of the state on the workers/rentiers overall conflict over income distribution.

the effect of higher domestic interest rates on the balance of payments by dampening growth. As a consequence, however, a greater i would be associated with a lower g which would impose greater constraint to the domestic debt stability, emphasizing its effect as a fiscal constraint. This means that, depending on the parameters, a domestic interest rate hike could solve the balance of payments issue while also creating a fiscal crisis.

6.1.3. Case 3: fiscal contraction

Now we come to the last case in which the government directly responds to the worsening of the external conditions with austerity policies to limit government expenditure. Although our relevant variable in that regard, the share of government expenditure on autonomous non-capacity generating demand (α), is fixed in the long-run, the fact that it can assume any value in the traverse means the government may diminish temporarily its demand growth (g_G) to decrease the long-run share of public expenditure on autonomous demand (α), which alters the long-run international reserves equilibrium and its path.

Short-run:

$$\frac{\partial u^*}{\partial \vartheta} = \frac{1}{s_r\pi + \phi_u + \tau - \gamma_u} > 0 \tag{77}$$

Medium-run dynamics:

$$\frac{\partial \dot{r}}{\partial \alpha} = \frac{(\gamma^{**} - \gamma_u\, u_n + \, z^{**})\big(\delta(i - i_f) - \phi_u\big)}{(1-\alpha)^2 z^{**}(s_r\pi + \phi_u + \tau - \gamma_u)} \tag{78}$$

Long-run:

$$\frac{\partial z^{**}}{\partial \alpha} = 0 \tag{79}$$

$$\frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial \alpha} = \frac{(\gamma^{**} - \gamma_u\, u_n + \, z^{**})}{(1-\alpha)^2 z^{**}(s_r\pi + \phi_u + \tau - \gamma_u)} > 0 \tag{80}$$

$$\frac{\partial d^{**}}{\partial \alpha} = \frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial \alpha} * \frac{\delta(i - i_f)}{g_x} > 0 \tag{81}$$

$$\frac{\partial r^{**}}{\partial \alpha} = \frac{\partial \left(\frac{Y_P}{X}\right)^{**}}{\partial \alpha}\left[\frac{\left(\delta(i - i_f)(1 - \frac{i_x}{g_x}) - \phi_u\right)}{g_x - i_f}\right] \tag{82}$$

$$\frac{\partial b^{**}}{\partial \alpha} = \frac{z^{**}}{g - i(1 - \alpha(1 - s_r) - \tau)} > 0 \tag{83}$$

$$\frac{\partial \omega^{**}}{\partial \alpha} = -\frac{i\frac{\partial b^{**}}{\partial \alpha}(1 - \pi)}{u_n\left(1 + \frac{ib^{**}}{u_n}\right)^2} < 0 \tag{84}$$

A decrease in the share of government expenditure on aggregate demand may only increase international reserves if its impact diminishing imports is higher than its impact of diminishing financial flows. The same result we found for the devaluation of exchange rates, given their similar effect on the balance of payments through changes in the supermultiplier. It is also important to notice that this is the only policy scenario in which distribution of income improves. This is a result of decreasing public domestic debt which is held by rentiers. However, it comes with the cost of lower growth rates in the traverse between the short and the long run equilibrium as government expenditure decreases. Which is also a pro-cyclical policy that may present other negative consequences on output. This growth effect could also have a destabilizing effect on the domestic debt ratio, if the decrease in growth rates led it to be lower than the final interest paid on the debt.

6.2. Policy Takeaways and the Current Situation of the 2022-23 hike

Our exercise leads us to the conclusion that an increase in foreign interest rates creates important constraints to macroeconomic policies even before they realize a balance of payments crisis. If the increase in foreign interest rates corresponds to a long-run balance of payments constraint, already in the first periods after the shock (on the movement from short- to long-run equilibriums) the country has to choose on whether selling its stocks of international reserves (and risking a speculative attack) or implementing contractionary measures. Expansionary fiscal, monetary and exchange rate policies are severely restricted in this context. The government must pursue a contractionary policy with at least one of these tools to consolidate the balance of payments.

Domestic interest rate hikes ease the external constraint by attracting capital flows, coming with the cost of higher income inequality and possible domestic debt instability. Exchange rate

devaluations may ease balance of payments disequilibrium through contractionary effects on aggregate demand and imports. Which would come with the cost of lower average growth, higher income inequality, and possibly higher external debt when measured in domestic currency. Fiscal contraction presents a similar effect to exchange rate devaluation, although it is the only policy option that decreases public debt and income inequality. However, exchange rate and fiscal contractionary policies might not even be effective in bringing balance of payments to equilibrium.

In the case in which $\delta(i - i_f) > \phi_u$, that is, when the response of financial flows to changes in output is higher than the one from imports, neither devaluating nominal exchange rates nor austerity policies have any positive effect on balance of payments and might even just aggravate the loss of reserves. This is the dilemma observed by the literature following Rey (2015). It means that a country with great capital account opening (high value of δ) would have such an outflow of capitals with an increase in foreign interest rates that it is forced to follow this increase with domestic interest rates to not lose all its reserves and enter a balance of payments crisis. In sum, only monetary policy would be able to restore balance of payments equilibrium in the short- to medium-run (or in the beginning of the traverse), as contractionary effects on income through exchange rate devaluation or fiscal consolidation would not be enough to bring the balance of payments to equilibrium. It is important to highlight, however, that in light of the compensation thesis described in section 3.1, this is a dilemma in the case of an increase in foreign interest rates, in the boom phase of a Global Financial Cycle, but not a constraint in the opposite scenario. With better external conditions a government could choose to accumulate reserves or respond with different combinations of expansionary policies.[57] It corresponds then to an asymmetrical dilemma in line with the open-economy demand-led growth asymmetry represented by the BoP as a ceiling but not as a floor, as discussed in section 4.5.

In the case in which $\delta(i - i_f) < \phi_u$, exchange rate and fiscal policy may bring equilibrium through lower aggregate demand and lower imports. In choosing between the two policies the country is faced with a trade-off between diminishing the wage share or restricting fiscal policy,

[57] It is important to notice that it might still be the case empirically that Central Banks in developing countries follow lower foreign interest rates with lower domestic rates. Central Banks could do so because of an aversion to exchange rate appreciation or simply because Mundell-Fleming ideas might be present on their staff which fear inflation tendencies from money inflows. Nevertheless, it would make as an interesting empirical investigation on whether Central Banks around the world follow the Fed as much in the boom as in the bust phase of the Global Financial Cycles.

by decreasing government expenditure. The country could also restore the balance of payments through higher domestic interest rates in this context. However, when $i_x > g_x$, although an increase in domestic interest rates eases BoP in the first periods, it decreases long-run balance of payments results as interest payments on net external debt increase. Policymakers would have to take into consideration not only the different effects of each policy tool on growth and income distribution, but also on the time-adjustment of such policies, which depend on the country-specific parameters.[58]

The model then presents 5 channels through which a deterioration of external conditions might limit fiscal policy: (1) through a spiral of external debt when $i_f > g_x$;[59] (2) through a devaluation that increases the external debt in domestic currency, in a context of lack of international reserves and export revenues; (3) through an increase in domestic interest rates or a (4) decrease in GDP growth that can lead domestic debt to GDP to spiral up; or (5) directly through the need to keep fiscal expenditure low to keep aggregate demand within the BoP limit. Except for the last one, these are all channels of transmission through which a balance of payments crisis (or even the prospect of a balance of payments crisis in the future) might lead to fiscal crisis in developing countries.[60]

It is also important to notice that the medium-run dynamics partial derivatives recorded for each policy tool show that the three policies are not complementary, with the implementation of more than one at the same time offsetting the effects of the other ones on international reserves.[61] All the policies are also contractionary. Moments of high foreign interest rates are in general also

[58] A future version of this article may include simulations that bring insights into these adjustment dynamics.
[59] Notice that this follows our assumption that we are dealing with a debtor country. Everything else constant $i_f > g_x$ would mean that interest on reserves increases faster than exports, the denominator. Taking isolated this would mean a theoretical explosion of international reserves, not of external debt. However, if we take into consideration that $i_x > i_f$ and $d > r$, then the interest payment in the numerator would grow faster than the denominator (exports) leading to an explosive downward dynamic of r.
[60] Here a fiscal crisis is understood simply as the instability of external (domestic) public debt to exports (to GDP), leading to exploding debt levels. Although external debt is the only one that will lead to default, the latter will also most probably lead to strong fiscal constraints if one considers that domestic debt levels matter (even if only politically) to the determination of fiscal policy. Exploding domestic debt would also mean increasing transfers from the state to rentiers, increasing income inequality.
[61] In reality, it is often the case that these policies are implemented simultaneously. The most common example being a partial devaluation with higher interest rates. The fact that the policies are not complementary does not mean they may not be stronger or more effective when applied at the same time, it just means that the relative effect of each one is diminished and not amplified or left at the same rates when applied at the same time. This can be seen on equations 62, 71, 78 by observing the effects of higher π and i or lower α on the other partial effects.

moments of less international demand, this means all three policies can be considered pro-cyclical which mean the simultaneous implementation of all of them may be very harsh for the economy in a downturn. Especially higher fiscal expenditure can have an important anti-cyclical impact on growth.

In this section we have looked at the deterioration of external conditions as an increase in i_f, but similar results could be found if we consider an increase in risk perception (ε) or a sudden decrease in export growth (g_x) for example due to a fall in food prices for food exporting countries. Indeed, Cline and Vernengo (2016) highlight the deterioration of terms of trade (the export and import price relation) as the other main cause of external crises (apart from higher foreign interest rates). They also highlight that historically foreign interest rate hikes seem to follow increases in commodity prices, exactly with the objective of deflating those prices (or their effects on the central country's domestic economy). This means times of improving terms of trade may follow tightening of external conditions in advance.[62]

Here we considered the negative shock of the interest rates as persistent. In the case of a temporary increase in foreign interest rates, however, the country could be able to sustain expansionary policies for longer time if it has foreign reserves to spare. The massive accumulation of foreign reserves since 1997 and their partial expenditure by many countries during the US interest rate increases started in 2015 and in 2022 can be a reflect of both the looser external space during the previous two decades and the hedging against a turnaround of this situation. Countries may choose to not make use of full external space to growth in periods of good external conditions to be able to maintain economic policy space and higher growth rates by spending its foreign reserve stocks in times of external constraint. This goes in the opposite direction of the common interpretation of international reserve accumulation. Most studies find that reserve accumulation represent an opportunity cost of around 1% of GDP (Cruz and Walters, 2008), as countries would not be using

[62] World Bank (2023) data shows this has been especially relevant for Latin America and Sub-Saharan Africa in the period of 2015-2020. While Asian countries remained with positive growth differentials to high-income nations throughout the decade, countries in these two regions did not maintain the differential for the whole period. The end of the boom of commodities in 2014-2015 accompanied by the end of Quantitative Easing and beginning of interest increase in the US turned the tide in terms of external conditions, hitting harder countries with higher percentage of primary goods in their exports. For matters of simplicity and inspired by the Structuralist and Currency Hierarchy traditions, throughout this paper we have treated developing countries as a block. It is evident, however, that these countries present very heterogenous structures of production and that this matters for the external constraint. As we mentioned in section 4.5, g_x and ϕ_u should be greatly affected by the structure of production in our model. As well as ε, μ, and interest rate levels, although these might be more affected by monetary than real variables.

their full external space. The exercise seems to show that although the extra external space corresponds to lower growth rates, if these reserve stocks help sustain anti-cyclical policies during temporary external shocks, they might guarantee higher average growth. Making it much more complex to correctly measure "opportunity costs" of reserve accumulation.

This also characterizes again the asymmetry of open-economy demand led growth. While a shift in external conditions restricting external space imposes important limitations and restrictions to growth, an easing of external conditions does not necessarily lead countries to grow more. The policy decision to use or not this extra external space becomes crucial. In moments of stable lower foreign interest rates, countries have more macroeconomic policy space for expansionary policies. Which might have been a motor of growth in the developing world in the last two decades, with low international interest rates. In fact, not using the whole external space to accumulate reserves was a policy choice that might make a whole difference now during the Fed interest hike started in 2022. Foreign interest still remains at low rates compared to historical levels, non-oil commodity prices are still at relative high prices for the moment, and countries accumulated historical levels of international reserves in the past years. It seems some developing countries may be more protected against external shocks now than in 1982 or 1997. On the other hand, smaller economies with open capital accounts and low international reserve stocks may face turbulent times ahead.

Lastly, it is important to mention that all findings from our model and exercise are based on the balance-of-payments-constraint which has in its core the necessity of access to a currency not issued domestically to trade abroad. The recent expansion of direct swap trade on local currencies under current exchange rates may also represent a way out of this constraint. We also have not dealt in depth with capital flow management policies in this work, but they could help diminish the magnitude of external shocks on the balance of payments (through lower δ).[63]

7. Conclusion

This paper has presented a stock-flow-consistent Supermultiplier model in which growth is led by exports and government expenditure, considering endogenous money creation, domestic and external debt dynamics, and capital flows led by their own determinants. Our model is compatible with main findings from several open economy Post-Keynesian strands – namely Neo-Kaleckian,

[63] See Botta et al. (2023) for more on this.

Sraffian, Kaldorian, Structurualist, and the New Cambridge school. It argues the balance of payments poses an open economy asymmetry of demand-led growth to countries trading majorly on foreign currency. While the balance of payments represents a ceiling to growth it does not necessarily represent a floor, with economies being able to grow below balance-of-payments-constrained growth rates for a long time, although not indefinitely. In the very long-run growth is determined by the structure of production through its effects on export and import content. Industrial and commercial policy play central role on this maximum long-run growth rate. Macroeconomic policies have important effects on the traverse (on average growth rates) and on the maximum external indebtedness level. It also points out that domestic debt stability depends on GDP (or capital) growth being higher than domestic interest rates, while external debt and international reserves stability depend on export growth being higher than foreign interest rates. Although on the case of domestic debt the constraint is partially attenuated by consumption and tax-payment out of interests. It also points out that stock-flow relations, or stock-flow norms, can greatly contribute to the understanding of interactions between semi-autonomous demand components in the evolving Supermultiplier tradition (after Serrano, 1995; Freitas and Serrano, 2015; Lavoie, 2016; Nah and Lavoie, 2017; Hein, 2018; Morlin, 2022; Dvoskin and Torchinsky Landau, 2023b).

The paper then presented a comparative dynamics exercise looking at different policy responses to a tightening of external space led by higher US Fed interest rates. It introduces a somehow innovative methodology as it applies the dynamic path in a long-run growth model to a medium-run policy reactions' analysis. Which the paper holds as particularly useful for the analysis of balance of payments dynamics and external crises, given the nature of these crises. An increase in foreign interest rates correspondent to a long-run balance of payments constraint imposes limitations to countries already in the medium-run. The government must choose between selling its stocks of international reserves (and risking a speculative attack) or implementing contractionary measures. Which highlights the balance of payments dynamics as a constraint also on average growth not only on long-run growth rates.

Expansionary fiscal, monetary and exchange rate policies - and average growth - are severely restricted by deteriorations in the external scenario. A finding in line with recent Structuralist works that defend that developing countries face narrower external policy spaces than advanced

economies (Vernengo and Perez-Caldentey, 2020; Porcile and Yajima, 2021). The degree of capital openness may impose an asymmetrical policy dilemma - a version of Rey's (2015) dilemma compatible with the Compensation Thesis. In the case in which exchange rate devaluation and fiscal austerity can still bring BoP to equilibrium, the choice between them poses a trade-off between public expenditure and income inequality. Furthermore, if domestic interest rates are too high relative to growth rates they might lead to domestic debt instability, but if they are too low relative to foreign rates, they may lead to capital outflows and a possible external crisis. Five channels of external shocks on fiscal constraints are also described, with four of them potentially leading to fiscal crises. Which extends Cline and Vernengo (2016) argument of the causality from external to fiscal crises, showing that even the perspective of a currency crisis may lead to fiscal crises depending on policy responses. Some external space left unused for the accumulation of reserves during international booms may help temporarily sustain expansionary policies during times of external constraint. Which brings new insights on the effects of international reserve accumulation on average growth. Lower interest rates in the past decades may have allowed for higher growth and record reserve accumulation in the developing world, which may help some countries on the current situation of foreign interest rate hike.

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