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Three Essays on the macroeconomic effects of liquidity cycles: an SFC growth models approach

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GUILHERME LEONEL SINGH

THREE ESSAYS ON THE MACROECONOMIC EFFECTS OF LIQUIDITY CYCLES: AN SFC GROWTH MODELS APPROACH

Tese apresentada ao Programa de Pós-Graduação em Economia, da Faculdade de Ciências Econômicas da Universidade Federal de Minas Gerais, para obtenção do título de Doutor em Economia, área de concentração em Economia Aplicada.

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Resumo

A presente tese aborda como os ciclos de liquidez afetam uma economia emergente (EME) em três ensaios independentes utilizando os modelos pós-Keynesianos de crescimento com consistência estoque-fluxo (SFC). O primeiro ensaio avalia como uma desvalorização da taxa de câmbio reverbera macroeconomicamente via balanço patrimonial dos agentes, utilizando um modelo SFC para pequenas economias abertas com taxas de câmbio endógenas. Se inova com um processo de determinação endógena da taxa de câmbio, com base no mercado de curto-prazo de divisas bem como no comportamento dos agentes heterogêneos operando no mercado cambial. A ocorrência ou não do efeito *pass-through* sobre o saldo da balança comercial também é avaliado. Os experimentos revelam efeitos contracionistas após a desvalorização, independente da ocorrência do efeito *pass-through* ou de diferentes participações de agentes heterogêneos no mercado cambial. Desvalorizações também podem causar aumento na vulnerabilidade externa por conta nos aumentos no passivo externo liquido relativo (*currency mismatch*) e achatamento na maturidade média dos ativos domésticos (*maturity mismatch*).

O segundo ensaio discute a ocorrência de ciclos internacionais de liquidez em economias emergentes, o engajamento do setor privado em dívida externa e o surgimento de novas formas de vulnerabilidade externa. Os ciclos de liquidez financeiras são tratados em dois experimentos que emulam as fases de euforia e colapso. Esse ensaio avança com a descrição do processo decisão do setor produtivo em contrair empréstimos estrangeiros, a depender de indicadores de desempenho financeiro e da liquidez internacional. Complementarmente, se inova ao descrever formalmente o processo de decisão do setor bancário sobre a emissão de títulos privados no exterior, diferentes normas de gerenciamento de balanço e a escolha por financiamento externo. Resultados indicam a existência de interdependência entre as diferentes fontes de dívida privada externas. Por conta dessa relação, empresas e bancos apresentam desempenhos conflitantes, um setor se beneficiando em relação ao outro, dependendo da fase do ciclo de liquidez.

O terceiro ensaio explora a relação do investimento com os ciclos de liquidez, inovações financeiras e aspectos distributivos. O objetivo é reavaliar as hipóteses do esvaziamento do investimento produtivo por conta de inovações financeira (*financial crowd-out*), mudanças organizacionais das firmas em favor de maiores dividendos (*shareholder-value*) e por conta do aumento nos níveis de incerteza. O ensaio inova ao incluir ativos financeiros como parte da decisão de portfólio da firma, também por incorporar o endividamento na função de investimento de modo a representar o "princípio do risco crescente" de Kalecki em conjunto com um processo de escolha de portfólio. Os resultados indicam efeitos deletérios na acumulação de capital decorrente dos fatores estudados, entretanto, a causalidade desse efeito negativo deriva da maior necessidade de fundos emprestados em um contexto de crescente aversão ao endividamento.

Em conjunto, a tese avança com a teoria pós-Keynesiana no âmbito dos modelos de crescimento do tipo SFC. Em especial, um novos quadros analíticos para a investigação da transmissão dos ciclos de liquidez são desenvolvidos. Se avança na descrição formal de pequenas economias abertas, destacando propriedades típicas de países emergentes. Abertura econômica, inovação financeira, vulnerabilidade externa e fragilidade macroeconômica são aspectos de destaque que ocupam essa tese.

Palavras-chave: Macroeconomia. Ciclo financeiro. Modelos de crescimento *stock-flow consistent*.

Abstract

This dissertation presents three essays that discuss the effects of the financial cycle, financial development, and financial integration on emerging market economies (EME) using stock-flow consistent (SFC) models. The first essay develops a stock-flow consistent growth model for a small open emerging market economy with an endogenous exchange rate. The main goal is to assess the consequences of exchange rate devaluation transmitted via sectoral balance-sheet to the economy. This essay advances with an endogenous exchange rate determination that encompasses the short-term foreign currency market and heterogeneous dealers operating on the currency market. This setting enables for the evaluation of the different shares of "chartists" dealers, and for the occurrence of the pass-through effect of the exchange rate to import prices. Experiments show a negative effect of a devaluation, regardless of the existence of a pass-through effect on the exchange or different composition of heterogenous dealers. Devaluations also might lead to the increase of the external vulnerability of the domestic economy because of the rise in gross external debt (currency mismatch) and increase the public debt maturity (maturity mismatch).

The second essay discusses the occurrence of international liquidity cycles, the private sector's engagement on external debt, and the emergence of new forms of external vulnerability in emerging market economies. The international liquidity cycles are examined in two experiments, emulating the boom and the bust phases. The work advances with the firms' external debt allocation response to financial performance indicators. Also, private banks' decision to issue bonds abroad is described considering different strategies for the balance-sheet management and depending on the phase of the cycle. Results suggest that private debt is interconnected and related to the new forms of external vulnerability. Firms' funding decision affects banks' balance-sheet, triggering different reactions. A conflicts relation between firms and banks is reported, with each sector taking advantage over the other depending on the phase of the cycle.

The third essay explores accumulation and its relations with the liquidity cycle, distribution, and financial innovation. The goal is to reassess the hypothesis of the crowd-out of investment due to higher financial investment, profit distribution, and higher uncertainty. The model innovates by including financial assets as a part of the firm's portfolio decision, also, by encompassing the leverage rate in the investment function to emulate Kalecki's "increasing risk principle". Results confirm a deleterious effect on accumulation due to the factor analyzed. Nonetheless, the causality seems to run from a higher leverage rate to lower investment via the increasing risk principle.

Altogether, the dissertation advances with the post-Keynesian theory and with the SFC tradition of growth models. In particular, each model advances with the discussion about the transmission of the liquidity cycles on emerging open economies, and the respective macroeconomics consequences. Open economy issues, financial innovation, external vulnerability, and macroeconomic fragility consist of topics that populate this dissertation.

Keywords: Macroeconomics. Financial cycle. Stock-flow Consistent growth models.

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List of Symbols

B	Bills
BL	Bonds
BL^*	Bonds held by foreigners
BL_f	Bonds held by firms
B_{ba}	Bonds issued by banks
B_{bk}	Bills held by private banks
B_{cb}	Bills held by central bank
BLR	Banks liquidity ratio
BUR_f	Firms' financial burden
BUR_b	Banks' financial burden
CA	Current account
CA_{fin}	Financial account
CG	Capital gains
cfr	Cash-flow ratio
D	Deposits
E	Equities
E_h	Equities
E^*	Equities
F	Firms profit
FI	Financial income
FU	Firms undistributed profits
FD_h	Profits distributed to households
FD^*	Profits distributed to foreigners
F_b	Banks profit
F_{cb}	Central bank profit
G	Government expenditure
g_{row}	Rest of the world rate of growth
I	Investment
I_f	Investment in financial assets
K	Capital stock
L_h	Household loans
L_f^d	Firms demanded loans
L^*	Firms foreign loans
L_f	Firms domestic loans
lev	Leverage rate
mkp	Mark-up on interest rates
D^{fx}	Demand for foreign currency
S^{fx}	Supply for foreign currency
xr	Short-term exchange rates
xr^{fx}	Currency market exchange rate
p_e	Prices of equities
p_{bl}	Prices of bonds
R	Foreign currency reserves
r_k	Return on capital
s	Savings rate
SAV_h	Households savings
SAV_g	Government savings
SAV^*	Foreign savings
T	Taxes
TQ	Tobin's Q
TB	Trade balance
EX	Exports
IM	Imports
u	Capacity utilization
W	Wages
Y	Output
Y_d	Disposable income
Y_{fc}	Full capacity output
V_h	Household wealth
V_g	Government debt
V^*	Foreign wealth

Contents

1 Introduction

The present dissertation contributes to the post-Keynesian literature and the stock-flow consistent (SFC) macro-modeling approach by developing three independent essays on the effects of liquidity cycles and financial development on emerging market economies. The emphasis is laid on the transmission of an international liquidity cycle and how financial development affects emerging market economies. The SFC approach is adopted because of the diligent integration of the product and income accounts with the flow of funds generated from integrated balance-sheet (DOS SANTOS, 2006), resulting in a full combination of real and financial aspects. The motion is prioritized rather than the equilibrium (CARVALHO, F., 1984), the demand is prevailing over the supply to explain output fluctuations (SETTERFIELD, 2002) and the macrofoundations are dominant and precedent to the microfundations (CHARPE et al., 2011). Building on the theory of the demand-led growth model of post-Keynesian macroeconomics, this work highlight the transition from the short-term equilibrium through the medium-term adjustment. Numerical simulations are conducted to evaluate the systemic reactions following exogenous shocks on parameters.

The dissertation is organized as follows. Chapter 2 explores the balance sheet effects of a devaluation, advancing with an endogenous specification for the exchange rate which is determined by the disequilibrium in the short-term foreign currency market and the composition of different behavior of dealers acting in this market. The devaluation is presented solely and coupled with the two scenarios, the pass-through effect of exchange rate variation to net trade, and the higher participation of *chartists* dealers on the foreign currency market. Experiments reveal contractionary effects induced by the devaluation, due to the decrease in aggregate demand. Devaluation leads to higher external vulnerability, because of the higher external debt and the correlation with the currency and the maturity mismatches. The pass-through effect is revealed as a crucial determinant that guarantees the positive effects after a devaluation in mainstream macroeconomics. The higher participation of *chartists*in the currency market implies stabilizing speculation in the exchange rate trajectory. Flexible exchange rates failed to promote a stabilizing mechanism.

Chapter 3 investigates the linkages between the international liquidity cycle and the private sector's external debt and the consequences to external vulnerability departing from an emerging market economy (EME) perspective. A large body of literature has explored the external vulnerability (EV), also numerous scholars have related EV with public debt, both domestic and foreign. However, in recent decades the EME's private financial institutions have intensified their engagement in more complex financial relations. The main goal is to analyze how the private sector adapts to different phases of the international liquidity cycle, and particularly, how the private banks' bond issuing abroad connects with the firms' cross-border funding. A stock-flow consistent (SFC) model is developed to evaluate the emergence of the securitization pro-

cess and the relation with private external debt in an open and growing economy. Focusing on the firm's funding and the private banks bond issuing the model explores how the international liquidity cycle drives the domestic economy. International interest rates, capital flights, equities emissions, and regulation on banks' balance-sheet are considered as the channels through which international liquidity spread domestically, affecting economic performance and causing an external vulnerability. Experiments regarding the ascendence and the decline of international liquidity are conducted. Simulations reveal stagnation and higher external vulnerability in both the ascendant and the descendant phases of the cycle. The firm's decisions regarding funding have a direct impact on private banks, which couples with the banks' active balance sheet management, and lead to foreign bond issuance and higher private external indebtedness. Private external debt interconnection also affects the domestic sector performance adversely, often opposing banks' and firms' profitability depending on the phase of the cycle.

Chapter 4 develops the third essay, which evaluates how accumulation is influenced by new opportunities of financial investment, distribution, and uncertainty. A stock-flow consistent model formalizes a novel framework with the main goal of investigating the relationship between capital accumulation and financial investment. The model advances firms' portfolio allocation including the possibility of investing in financial assets. Experiments are devised regarding the propensity to invest in financial assets, retention rates, and liquidity. The crowd-out hypothesis of accumulation due to the investment in financial assets and the shareholder-value orientation are assessed through the broader lens of Kalecki's "increasing risk principle". Simulations reveal the financial mechanisms driving the firm's portfolio allocation under funding constraints. Results confirm that investment in financial investments and uncertainty enforces negative effects on accumulation and growth, caused by the negative correlation between leverage and investment.

Altogether the dissertation supports the post-Keynesian theory and the stock-flow consistent tradition in several aspects. The work revisits the stock-flow tradition of modeling open economies and argues in favor of small-open economies with growth. The thesis advances with approach emphasize the financial interconnections with the real economy, evaluating scenarios in which financial cycles and financial innovations can potentially be harmful to emerging economies. The way financial cycles connect to emerging market economies is explored from different perspectives and reveals destabilizing mechanisms. In sum, the analysis supports the literature by advancing with the SFC growth models, especially regarding the open economies modeling.

2 Macroeconomic effects of a devaluation: small open economy SFC growth model with endogenous exchange rates

Abstract

This paper presents a stock-flow consistent (SFC) growth model for a small open emerging market economy (EME) with endogenous exchange rates, aiming to explain how an increase in international uncertainty causes an exchange rate devaluation by triggering contractionary balance-sheet effects on EMEs. A novel framework for endogenous exchange rates encompassing both the short-term foreign currency market and the behavioral component of agents in this market. In particular, the model conveys heterogeneous traders dealing in the foreign currency markets, implying the formation of the exchange rate. Further, different participation of these heterogeneous agents is tested. Emphasis is also laid on the occurrence, or not, of the pass-through effect of the exchange rate to import prices. Results suggest a negative effect of a devaluation, regardless of the existence of a pass-through effect on the exchange rate. Different agents' behavior did not affect the long-term result, however, it can provoke a more acute downward effect during the traverse. Devaluations also might lead to the increase of the external vulnerability of the domestic economy because of the rise in gross external debt (currency mismatch) and increase the public debt maturity (maturity mismatch).

Keywords: Contractionary effects of devaluation, Balance-sheet effects of devaluation, exchange rate modelling

2.1 Introduction

Since the early 1970s world economy has experienced an expressive growth in international capital flows and also the widespread adoption of floating exchange rates. Commercial and financial liberalization has been the driving force in the political sphere and the emerging market was induced to adopt liberal guidelines to have access to external liquidity (KREGEL, 2004). In the late 1990s, a series of currency crises disrupted the emerging market economies (EME), showing that external debt can potentially lead to contractionary effects after a devaluation, in opposition to the traditional economics based on the Mundell- Fleming approach (GALINDO et al., 2003). The embeddedness of this view among mainstream economics traces from the Bretton Woods agreement, backed by international financial institutions, such IMF, claim on the perils of sustaining a devaluated currency to gain an *unfair* competitive advantage internationally. Notably, international financial crises come in cycles, as described by Hyman Minsky (2008). Frankel (2010) surveys these recent rounds of international liquidity, classifying these cycles in three rounds, ending in 1982, 1997, and 2008 respective international financial crisis. Notwithstanding, the 2008's financial crisis shed light on the incapacity of the mainstream framework to cope with meaningful questions about the international financial cycle.

The mainstream perspective on financial cycle is divided in three generations of models connecting currency crisis and international speculation [1]. The first, sustain that changes in macroeconomic fundamentals may cause capital flights (FLOOD; GARBER, 1984). The second view claims that capital flights are a consequence of the speculative financing operating on the self-fulfilling properties of the exchange rate expectations (SACHS et al., 1996). The third asserts that the self-fulfilling dynamics of expectations depend on the institutional agent's balance sheets (KRUGMAN, 1999). From this orthodox approach, international financial fragilities arise from misguided economic policies and weak domestic institutions. The recommendations for avoiding a foreign financial crisis include liberalizing domestic financial markets, pursuing sound public finance and, letting the exchange rate float (CABALLERO et al., 2005).

However, evidence suggests that the liquidity in central economies' financial markets largely affects emerging market economies regardless of the exchange rate flexibility (FRENKEL; RAPETTI, 2009). Rey (2015) shows how the central economies' monetary policy affects the financial cycle in emerging markets through higher leverage and financial flows. Accordingly, the flexible exchange rate regime "cannot" insulate the economies from the global financial cycle, when capital is mobile" (pp. 21). Charpe et al. (2011) summarizes that "there appear to be a destabilizing mechanism at work from which even a flexible exchange regime cannot escape (pp. 15)". Exchange rate volatility consists of a flagrant detrimental effect of the financial integration in emerging markets (FRENKEL; RAPETTI, 2009). This paper contributes to rethinking the role played by international capital flows and exchange rate dynamics in EMEs.

From a critical account of financial crises and cycles, it is claimed that sound domestic finance is not enough to guarantee financial stability. Alternatively, financial crises are caused by intrinsic features of the capitalist system (MINSKY, H., 2008; KREGEL, 2004). Financial liberalization and the consequent increase in cross-border flows have been analyzed as a cause for more vulnerabilities in EMEs (KALTENBRUNNER, 2010). As suggested by Harvey (2009), the post-Keynesian (PK) theory on the financial cycle derives from Keynes and the institutionalist theory, consolidating the perception of the market as a social institution and rejecting the traditional economics belief on natural and rigid social norms (MINSKY, H. P., 1996). This junction has allowed for better treatment of the expectation formation process from micro and macro perspectives.

In emerging economies, liberalization increased the volatility of crucial markets, such as the commodities, bonds, and currencies markets. To distinguish between countries' disparities is crucial for understanding open economies' issues. Borio and Disyatat (2015) pointed out divergence in resources constraints, the financing conditions, and the behavior of aggregate demand components as inherent features of emerging economies that differs from central economies. Moreover, due to the international financial liberalization, the fewer barriers to capital flows stimulated an increase in speculative capital inflows in EMEs, these flows characterize by the

[1] For a detailed review see Gandolfo (2017, pp. 392) and Charpe et al. (2011, pp. 16).

preference for short-termed assets and high expected returns. Because of the liquidity differentials among countries (ANDRADE; PRATES, 2013), higher yield differentials are also expected to compensate the liquidity premium and attract foreign finance. Kaltenbrunner (2015) argue that this increases exchange rate volatility, and introduces an inherent tendency to the devaluation of the exchange rate in the emerging market economies, an important element for the author's definition of the new forms of external vulnerability. Further, these considerations are boiled down to the assumption of imperfect capital mobility and imperfect capital substitutability of assets traded internationally.

This paper discusses how international liquidity cycles are channeled to the EMEs through exchange rates, and how the balance-sheet effects triggered by a devaluation potentially affect the macroeconomic dynamics. Also, a novel approach for the exchange rate in stock-flow consistent models for small open economies is developed, which combines the short-term currency market variations (GODIN; YILMAZ, 2020) with the behavioral formation of expectations (LAVOIE; DAIGLE, 2011). To examine the effects of the devaluation, we distinguish the agents speculating in the foreign currency spot market between two types. The model follows Carnevali et al. (2020) by adopting different specifications for the pass-through effect from exchange rates to the trade balance. We assume imperfect capital mobility and imperfect capital substitutability [2], therefore, international interest rate gaps might persist without motivating and auto-correctional international capital flows.

The model advances by transposing the Dos Santos and Zezza (2008) benchmark for growing economies to an open economy framework [3]. The swings in international liquidity connect with the domestic macro-dynamics through exchange rate variations and the consequent balance-sheet effect. We provide an alternative to the benchmark of two-or-more for flexible exchange rates in SFC. The small open economy approach is not new in the SFC tradition, Taylor and Taylor (2004, Ch. 10) presented the possibility of devising flexible exchange rates based on the interest parity assumptions (covered and uncovered). Our approach differentiates from these perspectives by devising a flexible exchange rate mechanism based on the foreign currency markets and complemented by the behavior of the agents operating in such markets.

The stock-flow consistent approach is adopted because the way real and financial aspects are fully combined, the accountable structures allow for complexity without losing consistency, and it provides an insightful analysis of the traverse from the short-term to the medium and the long term. The assumption of timeless equilibria implemented in traditional models, as Branson and Henderson (1985), obscures the important transitional dynamics which conduct the model to the long-term. Instead, the present work relies on the PK-SFC tradition, keeping the focus on trac-

[2] Based on the notion of liquidity as presented in Keynes´ Chapter 17 transposed to national currencies, as in (ANDRADE; PRATES, 2013).

[3] According to the stock-flow consistent literature, small open economies characterizes by not exerting influence on real or financial global trends, following Godin and Yilmaz (2020), Meijers et al. (2015) and others.

ing the stocks and flows precisely through time (TAYLOR, 2004; GODLEY; LAVOIE, 2005). This methodology offers an alternative and a complement to mainstream models (REIS, 2018; BEZEMER, 2010) and it also holds the flexibility needed to accommodate complex mechanisms, the ability to integrate real and financial aspects and intrinsic path-dependent mechanics (SILVA; SANTOS, 2009).

Particularly, the model assumes a small open SFC, this implies the focus on the domestic economy based on the assumption that an EME potentially exerts a null effect on global financial imbalances. Then, the world economy is represented in a stylized way, which gives for investigating international imbalances prioritizing the domestic economy. However, this description of the exogenous variables comes with a cost. The assumption of exogenous foreign sector weakens the SFC modeling feature of presenting "no black holes", since some of the model's dynamics now come from outside the domestic economy. These leakages on the system are still rigorously accounted for and subject to scrutiny, also, they are described in line with the prevailing tenets of post-Keynesian economics. The benefit of the present approach, on the other hand, is clear: more emphasis could be laid on the domestic economy, allowing for a degree of complexity that could be impracticable within traditional two-or-more open economies SFC models.

Results suggest that exogenous shocks on international liquidity affect negatively the domestic economy dynamics. Contractionary effects of the devaluation are more severe if the Marshall-Lerner condition is not satisfied. The exchange rate is determined by the short-term market of foreign currency with the behavioral composition of traders exerting influence on the traverse to the medium-term equilibrium. External vulnerability is likely to increase after a devaluation, with increasing currency mismatch, maturity mismatch, and gross external obligations. The rest of the paper proceeds as follows. Next, the relevant literature, subdivided into three topics. First, we present the transmission channels of the international liquidity cycle to EMEs. Second, we show the post-Keynesian theory of the exchange rate determination, focusing on the stock-flow consistent tradition. Finally, we discuss the implications of an exchange devaluation to the domestic macroeconomy of an emerging economy. Then, an SFC model is developed departing from the accountable structure, which unfolds to the whole equations presented by sectors. The model is solved via numerical simulations and results are analyzed. Finally, the results are summarized and collated with the literature in the conclusion section.

2.1.1 International Financial Cycle and Emerging Markets Economies

Traditional international macroeconomics developed a consensus regarding policy recommendations around the notion of the "trilemma" (REY, 2015). According to this view, an independent monetary policy requires flexible exchange rates if there is capital mobility. A developed financial institution should feature liberalized financial flows and international trade, plus flexible exchange rates and interest targeting regimes Thus, fragility is caused by weak domestic

fundamentals and underdeveloped financial institutions. The concept of original sin is presented by Hausmann and Panizza (2002) and stands for the countries unable to fund abroad with domestic currencies. Kaltenbrunner (2010) shows that the mainstream recommendations for emerging markets avoiding the "original sin" are pursuit institutional enhancement, letting the currency float, providing sound public finance, and fully open domestic finance to foreign investors.

Presently we rely on the PK literature to explain the endogenous financial cycles which trace from Keynes and Minsky. Accordingly, fundamental uncertainty prevails and liquidity and expectations are central. Also, we resort to the structuralist view to qualify the distinction between an EME and a central economy. Two similar approaches for structuralism are presented, both consonant and compatible. The Latin American tradition of structuralism, based on ECLAC seminal ideas (BIELSCHOWSKY, 1998), and the post-Keynesian monetary structuralism (CARVALHO, F. J. C. de, 2013). The former accounts for the broader features that convey peripheral features to EMEs, the latter deal with the endogeneity of money and opposes the "horizontalist" approach for money within the PK theory.

The SFC literature has significant contributions to the international macroeconomic theory, mainly due to the detailed and hermetic description of the interconnections between international finance and domestic macrodynamic. Assessing the short to medium-term adjustment consist of one of the remarkable features of the SFC models, which allows "peering over the edge" of the short-term Keynesian analysis (SILVA; SANTOS, 2009). The benchmark for open economies analysis in the SFC literature is the OPENFLEX model of Godley and Lavoie (2006, Chapter 12), which advances with an innovative perspective for the endogenous exchange rate, following Godley's previous works (GODLEY; LAVOIE, 2005). Various contributions derived from this approach, encompassing topics such as behavioral exchange rate determination (LAVOIE; DAIGLE, 2011), extending the two-economies framework to three or more economies (LAVOIE; ZHAO, 2010; MAZIER; VALDECANTOS, 2015). However, much of this literature is designed for considering economies at a similar level of development and, capable of influencing the international sphere.

Exchange rate determination and the effects of exchange rate variation on aggregate demand are both established topics in economics, regardless of the lack of consensus among the competing views. Presently, we focus on an endogenous rate determination based on the currency market and the influence of heterogeneous dealers on that market, then, the possibility of contractionary effect after a devaluation is considered through an interlinked sectoral macro-dynamic model. Building on the notion of the fundamental uncertainty and the formation of social conventions on market participants the "fundamental are whatever economic agents expect them to be embedded in the specific context and temporality" (KALTENBRUNNER, 2015, pp. 427). Harvey (2009) is referenced as a remarkable point of convergence on exchange determinations from the PK structuralist point of view. Next, we introduce these topics with a description of the

economic cycles from the perspective of an emerging market economy.

The international financial system development has introduced new disparities between central economies if compared to EMEs, as well reinforced older sources of dissemblance. These differences, that have been cemented through time in a path-dependent process, are brought to attention by the structuralists (PREBISCH, 2000) and by early development theorists (LEWIS, 1979). Emerging and market economies differentiate from the central capitalist economies because of their financial and productive structures. From the productive perspective, the emerging economies are traditionally dependent on low added value export bases, whereas central economies are more likely to have mature and high-end industries of high value-added to the exports (BIELSCHOWSKY, 1998). The technical progress generation is uneven among countries, also each economy has a unique capability of channeling the existing technical progress to enhance productivity. Nelson (1993) explore these discrepancies through the national innovation system lens, accordingly, the national innovation system is weaker in EMEs. This leads to productive heterogeneity (FAJNZYLBER, 2000), both domestically and internationally, and reflects qualitatively on the trade balance (THIRLWALL, 1979).

The financial sphere in EME is partially explained by the financial hierarchy theorists (ANDRADE; PRATES, 2013), which credits institutional features of the EMEs financial structure to a currency hierarchy, arising inherently among different currencies due to liquidity discrepancies. With the emergence of the international financial system, the U.S. dollar has assumed the role of denominating international transactions (KREGEL, 2004). Therefore, positioning at the top of the currency hierarchy and implying different liquidity premiums for the assets that are not denominated in central currencies. Consequently, enforcing a yield gap among central and peripheral economies (KALTENBRUNNER; PAINCEIRA, 2014).

Financial liberalization and orthodox macroeconomic policies were adopted in EMEs as a requirement to access international capital flows, but decades later the benefits of liberalization have not caused the positive spiral of growth preconized by mainstream theorists (CARVALHO, 2002). Finance domination (MEDEIROS, 2008) and currency hierarchy (ANDRADE; PRATES, 2013) concepts are introduced to qualify the EME according to their peripheral position in the international monetary system. According to Medeiros (2008), the outward-oriented integration of most of the EMEs contributed to placing those countries in a dependent financial position, characterized by the dependence on the exports of primary goods and a relatively large stock of external debt. The currency hierarchy approaches transpose the Keynesian approach of the “own interest rate” to national currencies (KEYNES, 1982, Ch. 17). Consequently, each asset carries its intrinsic return, which is determined by its liquidity and return, therefore, central economies’ currencies’ seizes “exorbitant” privileges because of this inherent liquidity gap (EICHENGREEN, 2011). Charpe et al. (2011) presents stylized facts from the literature on financial cycles. Financial crises are often preceded by current account deficits, the sudden reversal of capital flows, and the devaluation of the currency. Following a financial crisis, it is

likely that domestic interest rates increase and asset prices fall and, a slowdown in growth (pp. 17).

The SFC tradition is a suitable framework for addressing the real-financial interconnections that permeate the investigation of the financial cycles, we highlight some contributions of this literature that focus on the international financial cycle. Botta, Godin, et al. (2016) shows how primary exports and deregulated finance, coupled with conservative macroeconomic management, can potentially lead EME to a fragile path. Caldentey and Vernengo (2015) argue that the exogenous liquidity cycle can stimulate a boost in exports of EME, in that case, this export-led growth can occur without being constrained by the external account. The author also highlighted that developing countries that rested in an export-led path during the capital inflows are less susceptible to the harmful effects of the downturn phase than countries that relied on a private debt-led regime (CALDENTEY; VERNENGO, 2015). Detzer (2018), advancing from Hein (2012), investigates distributional paths due to three different types of growth regimes, export-led and, debt-led private-demand boom. Pedrosa and Biancarelli (2015) develop an SFC model to investigate capital surges in peripheral economies, defining the net trade in line with the balance-of-payments constraint growth models. Accordingly, the growth rate converges to the one specified by Thirlwall's Law (THIRLWALL, 1979), and despite positive effects during the surge period, the output growth level decreases permanently in the long run, alongside the current account and the fiscal balance deterioration. Raza et al. (2019) approaches the case for capital controls to curb the destabilizing effects of the cyclicality of international speculative capital. Bortz (2014) advances with an SFC growth model with endogenous exchange rates and foreign debt, marking the case for active management of exchange rates based on the inadequacy of both flexible and fixed exchange rates, depending on the circumstances.

Moreover, the stock-flow modeling tradition has significant contributions to the assessment of exchange rate determination and the effects of a devaluation. Kohler (2017) explores the effects of a devaluation with analytical solutions in a neo-Kaleckian perspective, showing that the existence of foreign currency-denominated debt increases the chances for the contractionary effects after a devaluation. More complex SFC models employ similar analysis by a different approach. Notably, Godley and Lavoie (2006, Chapter 12) OPENFIX model tests a devaluation plus a decrease in the domestic trade balance, higher government expenditure, and changes in domestic financial markets, further the authors advance with the OPENFLEX model, presenting the benchmark for flexible exchange rates within the SFC literature. Lavoie and Daigle (2011) employs experiments with a devaluation and a higher propensity to imports to reveal the behavioral processes behind exchange rate determination. Carnevali et al. (2020) assesses the Marshall-Lerner condition using the two-economy OPENFLEX structure, finding that the degree of pass-through influences the results and the transitional path towards equilibrium. Bortz (2014) explores a devaluation, higher domestic interest rates, higher international leverage, and a higher profit rate. Analogously, Godin and Yilmaz (2020) employs an indirect devaluation,

achieved through higher foreign interest rates and capital flights, the author also advances with an innovative approach for determining the exchange rates endogenously.

Emerging market economies experience intense effects from the exogenous financial cycles, especially channeled through the exchange rates (KALTENBRUNNER, 2010). As the domestic currency performs as a passport for foreigners to invest in domestic financial assets, therefore, any liquidity variation leads to a run from domestic assets and, consequently, also from the domestic currency. Exchange rate volatility, therefore, is closely related to international liquidity swings and short-term maturities of domestic assets. There is a consensus that the existence of external debt can potentially lead to fragility, yet, the mechanism in which international liquidity impacts exchange rates is not a passive point. The arguments regarding the exchange determination and the effects of a devaluation within the PK-SFC are presented next.

2.1.2 Post-Keynesian Exchange Rate Determination and the Effects of a Devaluation

The post-Keynesian (PK) synthesis for exchange rate is not confined to a single approach, instead, there are distinct approaches and ramifications. The main reference is the structuralist approach of Harvey (2009), which is complemented by the minskyan variation of Kaltenbrunner (2015). Besides, the dominant approach within the SFC branch is the balance-sheet approach of Godley and Lavoie (2006, Chapter 12) and its connections with the behavioral view (DE GRAUWE; GRIMALDI, 2006; LAVOIE; DAIGLE, 2011). Presently, we make the case for an endogenous exchange rate approach for small open economies with growth (GODIN; YILMAZ, 2020) where behavioral mechanisms also take place. Orthodox economics, departing from a flexible exchange rate combined with free capital mobility, credit international arbitrage as the main determinant of the exchange rate [4]. The neoclassical assumption of the price adjustment mechanism is rejected, therefore, the equilibrium in the goods market is not inherent to the model dynamics. Instead, we base on the empirical grounds that the main factors determining exchange rate are connected with the variety of international capital flows and primarily influenced by expectations and swings in liquidy (HARVEY, 2009).

Meese and Rogoff (1983) disrupted a theoretical controversy among the exchange rate theorists by identifying that the random walks models outperformed structural models on out-of-the-sample predictions. Notwithstanding, the MF tradition, which is still influential, has responded to this criticism by improving on the technics used to estimate structural models [5]. As a consequence of the findings of Meese and Rogoff, the dissent from the traditional theory increases, and so does the urge for advancing technical analysis separately from the theory. The possibility of identifying patterns in exchange rate movements and then applying those patterns

[4] Lavoie (2014) clarify that mainstream theory has a specific "fundamental" depending on the length of the analysis. Interest rate gaps and consequent international portfolio adjustments are the main determinants of short-term exchange rate fluctuations. Trade balance dominates the influence over the exchange rate in the medium-term and the relative purchase power parity will be the benchmark for the long-term equilibrium (pp. 492).

[5] See Rogoff and Stavrakeva (2008).

to predict future movements, without an elaborated theoretical explanation. Forecasters relying upon technical chart analysis (“chartists”) emerged in opposition to the “fundamentalist” and theory-based predictions (GANDOLFO, 2017, pp. 351). For example, Gandolfo (2017) criticizes the single-equation type of models for explaining exchange rates, “In fact, since the exchange rate is just one of the endogenous variables of an economy-wide model, its determination occurs in conjunction with the determination of the other endogenous variables, in a general (dis)equilibrium setting where stock and flows, real and financial variables, etc., all interact” (GANDOLFO, 2017, pp. 351).

According to the structuralist view, the exchange rate is driven by expectations, which derives from the short-term financial market. Kaltenbrunner (2015) expands Harveys´ framework by encompassing the concept of currency hierarchy. As put by Andrade and Prates (2013, pp. 400), “the chief trait of this approach is the idea that short-term capital flows play an effective, autonomous function in the determination of the exchange rates. Currency prices depend heavily on dealers’ and foreign investors’ portfolio decisions. thus, expectations are of the utmost importance". Building upon the concepts of fundamental uncertainty and the transposition of the “own rate of return” to national currencies (KEYNES, 1982, Chapter 12 and Chapter 17) combined with the structuralist view of the international financial system (HARVEY, 2009). Capital flows dominate the currency market, consequently, exchange rate dynamics depend more on the expectations rate than on any fundamental. Within this view uncertainty and liquidity plays a major role Harvey (2009) and Lavoie (2014). The structuralist theorist discards any notion of a fundamental value for the exchange rate, instead, the concept of fundamental represents the volatile expectation of economic agents. This approach is compatible with the SFC framework, from the currency-market perspective (GODIN; YILMAZ, 2020) to the behavioral approach (LAVOIE; DAIGLE, 2011).

The theory of exchange rate determination has advanced within the SFC literature since the seminal works of W. Godley (GODLEY, 1999; GODLEY; LAVOIE, 2005), and have on the OPENFLEX model (GODLEY; LAVOIE, 2006, Ch. 12) its benchmark (NIKIFOROS; ZEZZA, 2017). Based on two similar, independent, and interconnected economies, the exchange rate is determined by a simultaneous allocation of international assets, which relies on the household’s decision-making process. The reciprocal demand for foreign assets culminates in determining the endogenous exchange rate level, resembling the open economy portfolio such as Branson and Henderson (1985) without resorting to the concept of timeless equilibria.

This paper advance as an alternative for the “two-or-more” economies SFC framework. The multiple countries alternative is suitable for representing large market economies which performance feedbacks significantly to the rest of the world. Rather, we do not believe this assumption is suitable for representing EMEs.Bortz (2014) is a remarkable example that is possible to overcome these problems and still use the OPENFLEX benchmark to encompass EME’s particular financial dynamics in an economic environment with growth. However, such an approach ends

up relying on intense mathematical complexities and consequent tractability challenges. Recent advances have pointed to alternative approaches for modeling small open economies, in line with the PK argument that the short-term currency market and expectations are the main drivers of the exchange rates.

Godin and Yilmaz (2020) proposes an SFC model with exchange rate determination based on the difference between the demand and the supply of foreign currency, as presented in Charpe et al. (2011, Ch. 2). According to this approach, the nominal variation in the spot exchange rate is positive whenever there is a relative excess of supply for foreign currency. Godin and Yilmaz (2020) also adopt a treatment for the expectations, attaching the expectations with the uncovered parity assumption, instead of the behavioral explanation adopted herein. Other articles pursuit the same approach for the exchange rate determination for small open economies. Raza et al. (2019) adapts the two-economy benchmark of Godley and Lavoie by setting the rest of the world to grow exogenously.

The role of capital movements and speculation in determining the spot exchange rate movements is also explored by Gandolfo (2017), separating between long-term and short-term capital flows. Long-term international flow is determined by the portfolio investment and by the firm´s strategies regarding foreign direct investment [6]. Exchange rate variations relate to short-term capital movements and are often posed with an ambiguous theoretical correlation. The "stabilizing speculation" is based on the notion that buying when prices are down and selling when the prices are high enforces smoother fluctuations of the prices. On the other hand, the bullish and the bearish types of behavior enforce a "destabilizing speculation", because these agents reinforce the past tendencies and further affect the price in the same direction (GANDOLFO, 2017, pp. 389).

Finally, the literature on behavioral finance complements the PK view with valuable insights on the heterogeneous expectation formation and the implications for exchange rate dynamics (DE GRAUWE; GRIMALDI, 2006), and has contributed as a practical alternative to the mainstream microfoundations of rational expectations. This view is embedded with the same principles of the PK literature on social conventions (LAWSON, 1993). Under fundamental uncertainty agents´ decisions are strongly influenced by past behavior and, to make inherent complexities more tractable, simple rules of action are considered (LAVOIE; DAIGLE, 2011). De Grauwe and Grimaldi (2006) propose a model to explain how agents form their expectations regarding the future movements for the exchange rates. The fundamentalist's (or the conventionalists, as in Lavoie and Daigle (2011)) agents forecasts and trade based on a stochastic process, or the simplified exogenously determined version as in Lavoie and Daigle (2011). The chartist's agents trade foreign currency expecting a continuity on the variation observed in the near past.

[6] Whereas the author recognizes that the FDI allocation differs from the agents´ portfolio optimization, due to the complications arising from transnational corporations' strategies. Also, there is a important clarification between "*real* and *financial* aspects of direct investment"

According to Lavoie and Daigle (2011), chartists represent the typical “trend-following speculator who continuously pushes the price up after an initial price increase” (pp. 442), this is also the behavior linked to the technical analysis based on chart analysis.

Presently, a novel approach for exchange rate determination within the PK-structuralist view is advanced. An open-economy model is developed, in which the interconnection to international finance is achieved with an exogenous “rest of the world” institutional sector. In this respect an adaptation of Godin and Yilmaz (2020) is developed in discrete time, encompassing behavioral mechanics for the endogenous exchange rate determination (LAVOIE; DAIGLE, 2011). Following, we present the selected literature for the balance-sheet effect succeeding an exchange rate devaluation, clarifying the case for contractionary effects.

2.1.3 Devaluation Effects

The effects of an exchange rate variation can be classified into three different literature branches. First, and the most influential, the pass-through of a devaluation to the import prices represented by the Marshall-Lerner effect in the Mundell-Fleming tradition. Second, according to the neo-Kaleckian argument a devaluation might lead to a contraction due to distributional effects and international competitiveness (BLECKER, 1989). Third, the literature on the balance-sheet effects of the devaluation, in which a devaluation leads to a jump in domestic economy external obligations (GALINDO et al., 2003).

The exam of the effects of devaluation on the productive structure and productivity is a steemed topic within the heterodox tradition. The exchange rate level influences the productive structure through international price competitiveness. On the one hand, price competitiveness might be improved because exports are cheaper after the devaluation. On the other hand, the devaluation might inflate the prices on intermediate inputs, harming the price competitiveness. Consequently, the exchange rates affect the international imbalances and the constraints that the balance of payments inflict on growth rates. However, the assessment of structural change would require a detailed and disaggregated description of the productive sector.

The capacity of devaluation in improving trade balance is a cornerstone of the Mundell-Fleming tradition and the Marshall-Lerner condition plays a decisive role in achieving this result. The most remarkable effect of a devaluation consists of a positive change in the trade balance, as described by the Marshall-Lerner approach. The “J” curve illustrates that an initial fall in net trade ends up catching up and improving. The Marshall-Lerner condition assumes that export prices do not absorb a change in the exchange rate, while the import prices fully increase at the same amount of a devaluation, which implies declining terms of trade and consequent net trade improvement. Devaluation triggers unbalanced price adjustment between exporters and importers, leading to changes in quantities and value. The improvement phase is due to the temporarily increasing domestic value for export goods, nevertheless, the adjustment process

leads to a permanent contraction of the imports.

However, the Mundell-Fleming assumption is also subject to criticism. Carnevali et al. (2020) shows that the ML condition implies that the exporters do not adjust their price strategically after exchange rate variations. Therefore, the ML condition is proven to be a specific case within the general condition for assessing the effects of devaluation on the trade balance. Departing from a general approach for the terms of trade [7]. Export and import prices are determined by the output deflators for domestic and foreign currencies and by the exchange rate. Additionally, real trade is governed by the term of trade (import prices and export prices), domestic and foreign inflation, domestic and foreign output growth. Therefore, the trade balance of a country will improve "*if and only if* the sum of *wighted* price elasticities of export and import is greater than the difference between the pass-through coefficients of imports and export prices" [8]. Instead, exchange rate changes fully impact the international competitiveness of exporters.

The contractionary effects of devaluations are not confined to the changes in the trade balance. Besides the non-fulfillment of the Marshall-Lerner condition, distributional effects in favor of profiting and the balance-sheet revaluations. Kohler (2017) explores the balance sheet effects of devaluations in countries with foreign liabilities. Accordingly, whereas the mainstream theory points to the expansionary effects of a devaluation, evidence and theoretical works are pointing to the opposite. The contractionary effects of devaluation remarkably derive from the profit-share varying upward after a devaluation and if there is a relatively large amount of debt denominated in foreign currency. Also, the author point to the ML condition as a crucial factor in determining the expansionary effects of the devaluation. Krugman (1999) added the private external debt as another channel for a worse economic performance after devaluations. Galindo et al. (2003) surveys the empirical analysis which focused on the determinants of the debt denominated in foreign currency and the consequences of exchange rate volatility on economic activity.

The distributional effects of an exchange variation stem from wages rigidity and income distribution. After a devaluation import prices increase, which is not followed by an increase in wages. Lower relative wages lead to lower consumption and consequently to a contraction in output. Moreover, the effect of a devaluation on aggregate demand is ambiguous when it comes to the income distribution between profits and wages because workers and capitalists have different propensities to save.

Godin and Yilmaz (2020) summarizes three transmission channels connecting lower international liquidity with the domestic economy of an emerging market. First, the trade channel can improve growth, as the capital flight tends to devaluate domestic currency, leading to better performance for the tradable sectors, while increasing costs on import goods [9]. Second, the balance

[7] See the (GODLEY, 1999)´s model for two open economies which base foreign trade in the SFC literature.
[8] Carnevali et al. (2020) page 5, authors´ emphasis.
[9] Nonetheless, (CARNEVALI et al., 2020) call attention to the strong dependence of the traditional positive

sheet channel arising from devaluation, which potentially inflates gross external liabilities and causes a negative wealth effect. And third, the credit market is affected negatively as external credit becomes more expensive following a devaluation.

The next section develops a growing small open economy SFC model to address the causations and effects of a devaluation. To model comprises a novel specification for the endogenous exchange rate. As well, the framework is devised to encompass heterogeneous agents' expectations formation of the exchange rate and different degrees for the pass-through effect. Presently, we focus on the ML condition and the balance-sheet effects, leaving the exploration of distributional issues for further research. Altogether, the arguments and concepts presented will now subsidize the SFC model that follows among the set of assumptions and constraints.

2.2 The Model

The present article develops a model to explore the consequences of changes in international liquidity, essentially, that a higher uncertainty at the international level causes the devaluation of EME´s exchange rate, causing a contractionary balance-sheet effect in the domestic economy. The model emulates an emerging market economy, therefore we assume that the domestic economy does not affect international relations. Such simplification affects the models‘ accountable structure, as international flows are set as exogenous to domestic accountability they entail "holes" on the hermetic SFC imbalances. Regardless, the accountability is still consistent and the "leakages" can be tracked and evaluated. Therefore, this approach implies prioritizing a detailed description of the domestic economy dynamics, rather than the international interdependence between different economies. The traverse to a new steady-state is examined, given a specific set of values for the parameters, and the macroeconomic effects of the devaluation are analyzed. Due to the ability to trace stock through time portfolio models gained prominence to deal with open economy issues. The effects of a devaluation are investigated, considering the Marshall-Lerner assumption and the balance-sheet effects of a devaluation.

Inflation is never neutral from the asset owners' perspective. Price changes drive stock revaluations, which might have significant effects on the systemic outcome. Nevertheless, we adopt a simplified prices system, with the sole purpose of evaluating the pass-through to the import prices. The work assumes that the prices are normalized and labor productivity growth is constant. Therefore, the impact of changes in the terms of trade to general prices is assumed away [10]. The pass-through effects occur via changes in the mark-up and, changes in the relative costs of the inputs of production, or due to distributional effects. Presently, the underlying assumption is that devaluations affect only via mark-up, causing changes in prices. Growth, wealth, and dis-

effects of a devaluation on the Marshall-Lerner condition.

[10] Prices implications, both domestic and foreign, are important aspects of international finance. Price changes can lead to changing terms of trade and consequently on international competitiveness, also, price changes affect purchasing power, wealth distribution, consumption, and savings. Nevertheless, these implications are simplified to keep the focus on the real linkages of the balance of payment with the exchange rate determination process.

tributional issues are analyzed alongside a detailed description of the international accounts, the public accounts. Public accounts are also explored and the impacts of the devaluation on public accounts and monetary policies are disclosed. External vulnerability is investigated through a precise accounting for external debt, public and private, coupled with the observation of the changes in the valuation of the external obligations caused by exchange rate variation.

The model innovates by introducing a novel design for the exchange rate determination, contributing with an alternative for the "two-or-more economies" framework for endogenous exchange rates. Precisely, the foreign currency market approach (CHARPE et al., 2011, Ch. 2)[11] is combined with the behavioral determinants of the exchange rate fluctuations based on De Grauwe and Grimaldi (2006), as presented by (LAVOIE; DAIGLE, 2011). As a result, a medium-term tendency is determined by the currency market as the transitional path depends on the heterogeneous composition of the participants on the currency market. The key determinant on this exchange rate approach is the balance of the international market for foreign currency *vis-à-vis* the market for domestic currency. Next, the accountability is presented, then, the equations are derived based on theoretical assumptions and subject to accountability constraints, finally, the model is solved via numerical simulations.

Table 2.1 comprises the three SFC matrices, the balance-sheet matrix (BSM), which, accounts for the assets and liabilities of each agent; the transaction matrix (TM), accounting for the transactions and cash-flows; and the flow of funds matrix (FoF), which summarizes the end-of-period balances for each sector as a result of a simultaneous portfolio allocation. Institutional sectors encompassed households, firms, private banks, the central bank, the government, and the rest of the world. Financial and real assets are bank deposits (D); the stock of capital (K); Government bills (B); long-term bonds (BL); equities (E); domestic loans (L), foreign loans (L^*) and international reserves (R). Assets are denoted with a "+" sign and liabilities with a "-" sign. The denomination of every asset and liability is in domestic currency, therefore, foreign-denominated assets are converted to domestic currency by the spot exchange rate. The only foreign currency denominated assets are the foreign loans, which demand depends on the international interest rate gap, and the stock of international currency reserves, that act as the buffer of international transaction. If there is a surplus on the balance of payments, the stock of international reserves tends to increase. Hence, the balance sheet effects of the devaluation that are conveyed to the model originate from these two sources.

The "rest of the world" (RoW) column represents all the transactions with the exogenous foreign sector. The foreign sector buys public bonds and domestic equities. The assets converted to domestic currency by the spot exchange rate are the international loans and the foreign currency reserves. Firms exert influence in both equities and bonds markets, as an issuer and a source of demand respectively. Each column in Table 2.1 represents a sector and each line represents an asset. "The budget constraint for each sector describes how the balance between flows of

[11] Presented in an SFC model by (GODIN; YILMAZ, 2020).

expenditures, factor income, and transfers generate counterparts changes in stocks of assets and liabilities" (GODLEY; LAVOIE, 2006, pp. 38).

The aggregate demand (Y) is our starting point. Households consume from firms (C), firms invest in physical capital (I) causing growth, government expends (G) and regulate financial markets, the foreign sector buys the domestic exports and supplies the imports ($X - xr.IM$). The foreign sector also acts in both financial markets of equities and bonds, only as an exogenous source of demand.

$$Y = C + I + G + X - xr.IM \tag{2.1}$$

The stock-flow accountability provides a set of identities that serve as the basis for the rest of the model. Lines on the matrices correspond to each asset identity, conversely, columns account for sectoral identities. Both sets of accountable identities are mutually consistent with each other. Unfolding from the accountability presented in Table 2.1, the full set of equations in the model is presented next. We start with the external sector because it centers works´ main contributions, following the productive dynamics is presented with the firm's equations, demand structure is presented mainly with the households´ equations.

External Sector

The external sector is modeled as exogenous to prioritize the detailing of the domestic economy. The model rejects the perfect capital mobility and the perfect asset substitutability. Instead, we assume the imperfect mobility of capital, based on the hierarchical approach for national currencies (ANDRADE; PRATES, 2013). Therefore, the international interest rate gap does not necessarily imply a continuous auto-regulative international financial flow, as in the Mundell-Fleming models with perfect capital mobility. Consequently, domestic assets have to compensate for the intrinsic lower liquidity by enforcing higher interest rates if compared to central economies. Hence, the international interest rate gap does not imply incoming or outgoing flows that lead to the equalization of domestic and international interest rates in the long run.

The exchange rate novel specification combines two mechanisms. First, the short-term market for foreign assets, which derives from the balance of payments transactions. Second, a behavioral component is encompassed, differentiating currency dealers. Different from the SFC benchmark for open economies, the present approach presents the external sector as exogenous, this allows for this different closure for the exchange rate. The benchmark of (GODLEY; LAVOIE, 2006, Ch. 12) and the models that follow rely on an exchange rate closure based on the crossed demand of internationally traded assets, such an approach guarantees that the model presents "no black holes" since the two-or-more economies are fully connected. However, such a framework is not under the presumption that a small economy does not exert significant influence on the world economy. Following the small open economy assumption, a less usual approach emulates the benchmark structure by focusing on the imbalance of internationally traded assets, setting an exogenous growth rate for the foreign economy (RAZA, 2016). A

Table 2.1: Accountable Matrices

BSM	HH	Firms	Banks	CB	GOV	RoW	Σ
(A) Dep.	$+D$		$-D$				0
(B) K stock		p.K					p.K
(C) B	$+B_h$			$+B_{cb}$	$-B$		0
(D) BL		$+p_{bl}.BL_f$			$-p_{bl}.BL$	$+p_{bl}.BL^*$	0
(E) Eq.	$+p_e.E_h$	$-p_e.E$				$+p_e.E^*$	0
(F) L		$-L_f$	$+L$				0
(G) Ext. L		$-L_f^*.xr$				$+L^*.xr$	0
(H) Res.				$+R_{cb}.xr$		$-R.xr$	0
(I) A			$+A$	$-A$			0
Net Worth	$+V_h$	0	0	0	$-V_g$	$+V^*$	0
TM	HH	Firms	Banks	CB	GOV	RoW	Σ
(1) Cons.	$-C$	$+C$					0
(2) Invest.		$+I$ / $-I$					0
(3) G		$+G$			$-G$		0
(4) Exp.		$+X$				$-IM^*$	0
(5) Imp.		$-IM.xr$				$+X^*.xr$	0
(6) Tax.	$-T$				$+T$		0
(7) Wgs.	$+W$	$-W$					0
(8) Firm P.	$+FD_h$	$-F$ / FU				$+FD^*$	0
(9) Bank P.	$+F_b$		$-F_b$				0
(10) CB P.				$-F_{cb}$	$+F_{cb}$		0
(11) Int. B	$+i.B_{h-1}$			$+i.B_{cb-1}$	$-i.B_{-1}$		0
(12) Int. R				$+i^*.R_{cb}.xr$		$-i^*.R.xr$	0
(13) Int. BL		$+BL_{f-1}$			$-BL_{-1}$	$+BL^*_{-1}$	0
(14) Int. D	$+i_d.D_{-1}$		$-i_d.D_{-1}$				0
(15) Int. L		$-i_l.L_{-1}$	$+i_l.L_{-1}$				0
(16) Int. L^*		$-i_{l^*}.L^*_{f-1}.xr$				$+i_{l^*}.L^*_{-1}.xr$	0
(17) Int. A			$+i_a.A_{-1}$	$-i_a.A_{-1}$			0
Sav.	$+SAV_h$	$FU-I$	0	0	$+SAV_g$	$-SAV_w$	0
FoF	HH	Firms	Banks	CB	GOV	RoW	Σ
ΔD	$-\Delta D$		$+\Delta D$				0
ΔB	$+\Delta B_h$			$+\Delta B_{cb}$	$-\Delta B$		0
ΔBL		$-p_{bl}\Delta BL_f$			$-p_{bl}\Delta BL$	$-p_{bl}\Delta BL^*$	0
ΔE	$-p_e\Delta E_h$	$+p_e\Delta E$				$-p_e\Delta E^*$	0
ΔL		$+\Delta L_f$	$-\Delta L$				0
ΔL^*		$+\Delta L^*_f.xr$				$-\Delta L^*xr$	0
ΔR			$-\Delta R.xr$	$-\Delta R.xr$		$+\Delta R.xr$	0
ΔA			$-\Delta A$	$+\Delta A$			0
Σ	0	0	0	0	0	0	0

more usual approach for the flexible exchange rate in small open economies SFC model consists of using the interest parity as the main mechanism, as presented in Taylor and Taylor (2004, Ch. 10). Such an approach has been criticized because of reliance on the uncovered interest parity (UIP), a relation with bad performance in applied approximations. However, this path is promising if adapted to the covered interest parity (CIP), a relation with statistical validation for EMEs because includes a liquidity parameter. The approach adopted in the present work relies on the currency markets to close the exchange determination, as in Godin and Yilmaz (2020), in line with the post-Keynesian theory for exchange rates Harvey (2009) and harmonious with the EME assumption.

Exchange rates denominate imports, foreign loans, and foreign currency reserves. The volume of imports is weighed by the spot exchange rate, because "imports are associated with a different price index", affecting its real value in domestic currency (LAVOIE, 2014, pp. 529). The trade balance represents the real connection of the domestic economy with the rest of the world. Simplifications were adopted to minimize the influence of trade balance on aggregate demand. Given the purpose of the present work a detailed description of how the devaluation might affect the productive structure is spared. The adoption of such causal relations, which represents a central claim of the heterodox tradition, leads to the question of whether the quality of the exports is dependent on the exchange rates. However, this would require the disaggregation of the productive sector that could overly increase the model's complexity and harm the tractability.

Changes in the terms of trade, the ratio between export and import prices, are not explicit, instead, it is that devaluation straight affects the propensities to import and export. Therefore, changes in international prices, decurrent from exchange rate variations or not, are implicitly considered within the trade balance dynamics. The literature emphasizes two channels connecting the exchange rates with trade balance: the cost effect and the competitiveness effect. Presently, we narrow the focus to the cost channel of the pass-through, with the devaluation implying the full transmission to the price of imports. The Marshall-Lerner Assumption (MLA) is designed to convey the pass-through effect to the model. The usual assumption of full pass-through to import prices is not introduced to the baseline model [12]. Rather, the present model allows for testing different degrees for the pass-through effect. The variables p_{im} and p_{im}^{mla} entail a simplified version of the MLA to the model. A full pass-through ($mla = 1$) implies that imports are contracted in foreign currency and exporters do not change their markups strategically in response to changes in the exchange rate. Therefore, import prices go up by the full amount of the devaluation. The model is calibrated with no pass-through effect ($mla = 0$) in the baseline, and a partial pass-through is tested further as a particular scenario.

International trade is described in a simplified manner, based on the assumption that both ex-

[12] For a detailed description of the MLA in SFC open economies see Carnevali et al. (2020) and (GODLEY; LAVOIE, 2006, Ch. 12), where prices of imports and exports are presented endogenously, alongside a general inflationary process both in domestic and foreign economies. Those descriptions are detached for the sake of simplicity.

ports and imports depend on domestic growth (equations 2.2 and 2.3). This specification for exports is not in line with the traditional specification for international trade, instead, we describe the exports endogenous to domestic product. Implicitly, this relation shows that the foreign demand for domestic goods is constant and the capacity of producing those goods grows as the economy grows. Practically, this specification enforces a balanced international trade that circumvents the problems of a constrained balance of payments and clarifies the endogenous exchange rate dynamics.

$$X = p_{x0} + p_x * Y \tag{2.2}$$

$$IM = p_{im0} + \begin{cases} p_{im}^{mla} * Y, & \text{if mla>0} \\ p_{im} * Y, & \text{otherwise} \end{cases} \tag{2.3}$$

$$p_{im}^{mla} = \varepsilon_{im0} - \varepsilon_{im1}.\Delta xr^{e} \tag{2.4}$$

The exchange rate (xr) is determined endogenously. Building on the assumption that the systemic demand and supply for foreign currency determines the equilibrium on the short-term currency market (xr^{fx}), as in Charpe et al. (2011, Ch. 2) and Godin and Yilmaz (2020). The term $\frac{D^{fx}-S^{fx}}{D^{fx}}$ in equation 2.6 represents foreign currency short-term market. The variable ($\bar{xr}$) corresponds to the numeraire for the exchange rate, representing a stable short-term state for expectations [13]. This specification advances with the endogenous exchange rate determination in SFC models.

According to Godin and Yilmaz (2020) "there should be no excess demand for foreign currency at the steady-state" to ensure that the exchange rate is stationary. Presently, this assumption is valid to net trade (except for evaluating the full pass-through to import prices), both exports and imports are specified with identical parameters and endogenous to the domestic output. Nevertheless, financial accounts and official settlements also affect the excess demand for foreign currency. As a result, the short-term foreign currency market is not neutral, as in Godin and Yilmaz (2020)(pp. 28), because we do not rely on the same simplifying assumptions regarding the financial account. Instead, we calibrate the parameter to offset these imbalances and achieve a neutral exchange rate ($xr = 1$) at the baseline.

The variable $\bar{xr}$ represents the autonomous elements regarding the price formation of the foreign currency in terms of the domestic currency. The parameter (w_c, share of "chartists" dealers in the currency market) represents the participation of each type of dealer in the currency market, "chartists" dealers use chart analysis for trading, therefore, this type of behavior reinforces current tendencies on the exchange rate variations. Instead, the "fundamentalists" dealers expect that the exchange rate converges to a fundamental level, the level determined on the short-term

[13] Latter, this the variable ($\bar{xr}$) will be subject to a positive shock the emulates the exogenous component of the devaluation.

currency market.

$$xr = xr_{-1} + w_c.\Delta xr + (1 - w_c).(xr_{-1} - xr^{fx}) \tag{2.5}$$

$$xr^{fx} = \bar{xr} + \frac{D^{fx} - S^{fx}}{D^{fx}} \tag{2.6}$$

Demand for foreign currency (D^{fx}) is defined by the sum of imports ($xr.IM$), distributed profits (FD^*), payments for the domestic bonds (BL^*_{-1}) held by foreigners, variation of foreign currency reserves held by the central bank ($xr.\Delta.R$), and repayment on foreign loans ($xr.i^*_l.L^*_{-1}$). The supply of foreign currency (S^{fx}) is given by the exports plus the interest payments for holding foreign reserves (X), foreign direct investment ($p_e.\Delta E^*$), investment in bonds ($p_{bl}.\Delta BL^*$), and new foreign loan contracts ($xr.\Delta L^*$). Those variables will be explained in more detail with the respective sector equations.

$$D^{fx} = xr.IM + FD^* + BL^*_{-1} + xr.\Delta.R + xr.i^*_l.L^*_{-1} \tag{2.7}$$

$$S^{fx} = X + xr.i^*.R_{-1} + p_e.\Delta E^* + p_{bl}.\Delta BL^* + xr.\Delta L^* \tag{2.8}$$

Therefore, the spot exchange rate (xr) increases if there is an excess of demand for foreign currency ($D^{fx} > S^{fx}$), depending on the adjustment process, which is based on heterogeneous dealers constituting the currency market. This approach does not claim that the exchange rate converges to a fundamental value or any long-term tendency, instead, it laid the focus on the motion to perform a better exam of the medium-term traverse.

The determinants of the financial account are considered as exogenous. International financial markets invest in equities (E^*) and bonds (BL^*) issued by the domestic economy, which are governed by the exogenous parameters ξ^* and β^*, respectively, following Pedrosa and Biancarelli (2015). Domestic investors do not invest abroad. Therefore,

$$BL^* = \xi^*.BL \tag{2.9}$$

$$E^* = \beta^*.E \tag{2.10}$$

The current account identity, equation 2.11, encompasses all international transactions. Since the trade balance is assumed to be in equilibrium in the baseline, the current account is determined by the financial account. Godin and Yilmaz (2020) uses the international remittances as a buffer stock that ensures the income account will also be balanced, we do not rely on such assumption. Instead, the financial account is composed by profit remittances for foreign investors (FD^*), return on foreign bond (BL^*_{-1}), foreign loans repayments ($xr.i^*_l.L^*_{-1}$) and, return (or repayment) on foreign currency reserves ($xr.i^*.R_{-1}$). The capital account and official settlements (KABOSA) register capital transactions, including a counterpart of the changes in international

reserves.

$$CA = TB + CA_{fin} + FA \tag{2.11}$$

$$TB = X - xr.IM \tag{2.12}$$

$$CA_{fin} = xr.i^*.R_{-1} - xr.i_l^*.L_{-1}^* - FD^* - BL_{-1}^* \tag{2.13}$$

$$FA = xr.\Delta L^* + p_e.\Delta E^* + p_{bl}.\Delta BL^* - xr.\Delta R \tag{2.14}$$

$$\Delta R = X - IM.xr + \Delta L^* + p_e.\Delta E^* + p_{bl}.\Delta BL^* + xr.i^*.R_{-1} - xr.i_l^*.L_{-1}^* - FD^* - BL_{-1}^* \tag{2.15}$$

Changes in international currency reserves respond to changes in the current account, plus capital gains resulting from the financial account (FA), which traces changes in international trades stock. Current account cumulative results are captured by the variation on the foreign currency reserves stock.

Firms and production

Firms invest according to the post-Kaleckian investment function. The expectations are represented by the parameter υ_0, the capacity utilization (u_{-1}) affects the investment positively, and also does the profit share ratio (π). combined with the concepts of desired and effective investment rate. The capacity utilization (u) consists of the relation between the output and the full capacity output (Y_{fc}), which depends positively on the stock of capital level, and equation 2.16 describes the law of motion of physical capital.

$$\frac{I_d}{K_{-1}} = \upsilon_0 + \upsilon_u.u_{-1} + \upsilon_\pi.\pi \tag{2.16}$$

$$u = \frac{Y}{Y_{fc}} \tag{2.17}$$

$$Y_{fc} = \sigma K_{-1} \tag{2.18}$$

$$K = I + (1 - d_k)K_{-1} \tag{2.19}$$

Profits (F) are retained (FU) and distributed (FD) depending on the saving rate (s). Foreign profits (FD^*) and domestic profits (FD_h) are distributed according to the domestic and foreign share of ownership (β^*).

$$F = \pi.Y - i_l.L_{f-1} - i_l^*.L_{f-1}^* + BL_{-1}^{fir} \tag{2.20}$$

$$FU = s(\pi Y - i_l.L_{f-1} - i_l^*.L_{-1}^*) \tag{2.21}$$

$$FD = F - FU \tag{2.22}$$

$$FD^* = \beta^*.FD \tag{2.23}$$

$$FD_h = FD - FD^* \tag{2.24}$$

Equities are issued (E^s) as a fixed proportion of the stock of capital. Firms demand loans depending on funding needs (L_f^d) and decide whether to contract those bonds abroad (L^*) or domestically (L^{bk}).

$$E^s = \Psi.K \tag{2.25}$$

$$L_f^d = I - FU - pe.\Delta E + p_{bl}.\Delta BL^{fir} \tag{2.26}$$

$$L^* = \lambda.L^d \tag{2.27}$$

$$L^{bk} = L^d - L^* \tag{2.28}$$

Long-term bonds (BL^{fir}) are also demanded by the firms, as a fixed proportion of the capital stock and weighed by the bond´s prices (p_{bl}).

$$BL^{fir} = \Psi_{bl}.\frac{K_{-1}}{p_{bl}} \tag{2.29}$$

Firms play an important role in contributing to the aggregate demand with capital formation, which affects output growth. Also, the implications on distributional issues depend significantly on firms´ profit distribution, which response exogenously to the parameter (s) and also on profitability levels [14].

Households

Households allocate their wealth (V_h) in bills (B_h), deposits (D_h), and equities (E_h). Wealth is determined by savings (SAV_h) plus capital gains (CG_h). The savings consist of the household´s net inflow for each period, in equation 31 the income (left-hand brackets) is composed of assets´ revenue and wage bill, and expenditure (right-hand brackets) by consumption (C) plus taxes (T).

$$V_h = V_{h-1} + SAV_h + CG_h \tag{2.30}$$

$$SAV_h = [WB + FD_h + F_b + i_b.B_{h-1} + i.D_{-1}] - [C + T] \tag{2.31}$$

$$CG_h = \Delta p_e.E_h \tag{2.32}$$

Consumption (C) consists of the counterpart of the savings, depending on the propensities to consume out of wealth (V_h) and out of disposable income (Yd). Following the Haig-Simons approach as described by Godley and Lavoie (2006, pp. 104).

$$C = \alpha_1.YD + \alpha_2.Vh_{-1} \tag{2.33}$$

[14] Different approach to profit distribution are possible and call for further advances, which is not the purpose of the present work. For example, the parameter s can be endogenized, or, the household sector can be subdivided into workers and capitalists.

$$YD = (1-\pi)(1-\theta)Y \tag{2.34}$$

Past wealth is allocated in assets according to the Brainard Tobin principles (BRAINARD; TOBIN, 1968) [15], considering each rate of return altogether with accumulated wealth. Equations 2.35 and 2.36 shows the household's allocation of funds in financial assets considers both rates of return (i_b and r_k). Each asset relates positively with their own rate of return and negatively with the other. Households retain all the residual equities (E_h^d) in the equity market, at the prices (p_e) that clears the market. Deposits close the household portfolio allocation as the buffer that closes de budget constraint.

$$B_h = V_h.(\lambda_{20} + \lambda_{22}.i_b - \lambda_{23}.r_k - \lambda_{24}.\frac{YD}{V_h}) \tag{2.35}$$

$$p_e = V_h.\frac{(\lambda_{30} + \lambda_{32}.r_k - \lambda_{33}.i_b - \lambda_{34}.\frac{YD}{V_h})}{E_h} \tag{2.36}$$

$$E_h^d = E^s - E^{*d} \tag{2.37}$$

$$D = V_h + L_h - B_h - p_e.E_h \tag{2.38}$$

Banks

Private banks have an accommodative role in the model, as usual in the SFC literature [16]. The financial sector takes households' deposits as demanded (D^s), also supplying domestic loans for firms(L_s^{bk}). Therefore the loans consist of the main asset and the latter the main liability in banks´ balance-sheet.

$$D^s = D_h^d \tag{2.39}$$

$$L_s^{bk} = L_d^{bk} \tag{2.40}$$

Banks close their balance sheet by contracting advances (A) with the central bank. Banks resulting profits (F_b) are remitted to the capitalist household's ownership, registered as a financial income (equation 2.31).

$$A = D - L \tag{2.41}$$

$$F_b = i_l.L_{-1} + i_a.A_{-1} - i_d.D_{-1} \tag{2.42}$$

Government and Central Bank

Government and Central Bank act together to enforce the exogenous basic interest rate defined

[15] See Godley and Lavoie (2006, pp. 104) for a detailed description.

[16] The simplified design of the financial system in SFC models is a problem pointed by authors such as Taylor (2008) and others. The criticism is that the limited number of financial sectors and financial assets and, therefore, unfit to accommodate the complexity of the financial system, especially since the surge of financial innovations since the 1990s. Regardless, the cost in detailing the financial structure might result in obfuscating the present goals.

by CB. Therefore, the central bank enforces the basic interest (i_b) rate by acquiring (or selling) the outstanding bills of the domestic financial market (B_{cb}) to achieve the desired level of short-term interest rates.

$$B_{cb} = B - B_h \tag{2.43}$$

$$A^s = A^d \tag{2.44}$$

The central bank also clears the market for foreign reserves (R).

$$R = R_{-1} + \Delta R \tag{2.45}$$

$$\Delta R = X - IM.xr + \Delta L^* + p_e.\Delta E^* + p_{bl}.\Delta BL^* + xr.i^*.R_{-1} - xr.i_l^*.L_{-1}^* - FD^* - BL_{-1}^*$$ [17]

Profits of losses from central banks (F_{cb}) are automatically absorbed by the government.

$$F_{cb} = i_b.B_{cb_{-1}} + i^*.R_{-1} - i_a.A_{-1} \tag{2.46}$$

The Government does not invest in fixed capital, spends autonomously (G), and taxes uniformly (T). Also, after-tax deficits are financed with bonds and bills emission. The expenditure function (equation 2.47) is associated with the stock of capital. As shown in Table 2.1, the Government sector does not have assets on its balance sheet, just bonds (BL), and bills (B) as liabilities. The bond market connects the households with the foreign sector and the Government, whereas the bill's market links the Central Bank with the private banks.

$$G = \gamma K_{-1} \tag{2.47}$$

$$T = \theta[(1-\pi)Y + F_b + BL_{h-1} + i.D_{-1} + FD_h] \tag{2.48}$$

The long-term bond market defines the long-term interest rate (i_{bl}), reflecting the market condition, engendered by the household and the foreign sector. The prices of the bonds ($\bar{p_{bl}}$) exogenously determine the interest long-term rate of the economy. Bonds are supplied as demanded by foreign and domestic buyers.

$$i_{bl} = \frac{1}{\bar{p_{bl}}} \tag{2.49}$$

$$BL^s = BL^{fir} + BL^* \tag{2.50}$$

The government sector is assumed to be in deficit, therefore accounting for negative savings (SAV_G). The emission of bills (ΔB) is the buffer variable that closes the gap between the current deficits and the rolling of the debt.

$$SAV_G = [T + F_{cb}] - [G + i_b.B_{-1} + BL_{-1}] \tag{2.51}$$

[17] *Idem* equation 2.15.

$$\Delta B = G + i_b.B_{-1} + BL_{-1} - [T + F_{cb}] - p_{bl}\Delta BL + \Delta p_{bl}.BL_{-1} \tag{2.52}$$

The next section proceeds with the experiments. Due to the large number of endogenous equations featuring this medium-scale SFC model, analytical solutions are not possible. Therefore, the experiments are designed to be solved with numerical simulations.

To exam the model´s properties systemically a balanced steady-state solution is required. A baseline scenario is reached by calibrating the model parameters and initial values with plausible or estimated values recurrent in the SFC literature (NIKIFOROS; ZEZZA, 2017). The inclusion of growth implies that stock variables are not stationary in level. Besides, analyzing the results systematically requires a steady-state solution. Therefore, the baseline solution and further simulational results consist of the main variables taken as a share of GDP, which should be stable in the steady-state (DOS SANTOS; ZEZZA, 2008). As consequence, displayed results are very sensitive to changes in output growth. Proceeding with the experiments and results requires the verification of models´ consistency. The fundamental identity consists of the main constraint to ensure the models´ consistency (LAVOIE, 2014, pp. 259). As shown below, the fundamental identity corresponds to the sum of respective sectoral savings. Accordingly, all sectoral savings when summed should equal zero if the model accountability is correct. Formally,

$$SAV_h + SAV_f + SAV_g - CA = 0$$

This means that each sectoral savings are stabilized as a share of the GDP and, the resulting domestic savings equal foreign exchanges. Regarding the open economy nature of the model and the focus on the exchange rates determination, some simplifying assumptions were required. Due to the choice for modeling exchange rates as a determinant of the short-term currency market, the exchange rate is very sensitive to the balance of payments movements, therefore, a neutral trade balance is assumed in the baseline by setting the same specification for imports and exports. Further, we assume homogenous export and import prices and domestic and foreign general prices. As result, the exchange rate level is largely determined by international financial flows, instead of being dominated by real flows (GODIN; YILMAZ, 2020, pp. 24). Next, the experiments to be performed are described.

2.2.1 Experiments

The experiments aim to assess the medium-term macrodynamic effects of a devaluation, the analysis is complemented with an assessment of the occurrence of the pass-through effect to import prices and heterogeneous dealers operating in the currency market. The comparative dynamics of the model are obtained after the baseline scenario is submitted to parametrical changes, forcing the model from one steady-state solution to another.

The solution is archived via numerical simulations. Because the model presents growth, vari-

ables are presented as a percentage of GDP. The baseline scenario requires a balanced systemical result, in which the variables are growing at compatible rates [18]. As noted by Dos Santos and Zezza (2008) models solved by numerical might present more than one stable solution, even though just one of these possible solutions emerge at time, as a result of the specificities of the model's calibration. The baseline solution is shocked with a one-step devaluation in Scenario 1, the remaining scenarios replicate this same devaluation collated with two different specifications. In Scenario 2, following Lavoie and Daigle (2011), we test for different behavioral expected exchange rates. Scenario 3 focuses on the effect of devaluation with a positive pass-through regime to import prices (CARNEVALI et al., 2020). The structure of the experiment is summarized as the following:

- Baseline.
- Scenario 1: Devaluation.
- Scenario 2: Devaluation with more "chartists" operating on the exchange rate markets.
- Scenario 3: Devaluation with exchange rate pass-through to import prices.

The main shock is enforced in the autonomous level of the exchange rate determined by the currency market (xr^{fx}), the parameter ($\bar{xr}$). Intuitively, this represents an exogenous change in liquidity perception. The devaluation of the exchange rate is emulated with a 5 p.p. increase on $\bar{xr}$ (from 1 to 1.05), this shock is the same for scenarios one to three. Scenario 2 presents the case for higher chartist participation in the foreign currency market, in this case, parameter w_c increases from 0.5 to 0.9. Scenario 3 emulates the well know Marshall-Lerner Assumption, which is not part of the baseline model, of a partial exchange rate pass-through to the import prices ($mla = 0.5$)[19].

Figure 2.1 discloses the investment and output dynamics, evaluating the existence of a contractionary effect of the devaluation. Figure 2.2 focuses on the exchange rate determination dynamics. Figure 2.3 reveals the international flows outline through a detailed presentation of the balance of payments and the consequences for each scenario. Figure 2.4 detail the changes taking place within the productive sector. Finally, Figure 2.5 show the implication of the scenarios for the public sector.

The different lines represented in the figures are described as follows. The baseline scenario is represented by the thin dotted line that remains unchanged after the shock. Scenario 1 (solid line) represents the sole effect of the devaluation. Scenario 2 (densely dashed line) emulates a different conformation of the exchange rates with higher participation of the chartist type of trades. Scenario 3 (loosely dashed line) displays different specifications for the trade balance

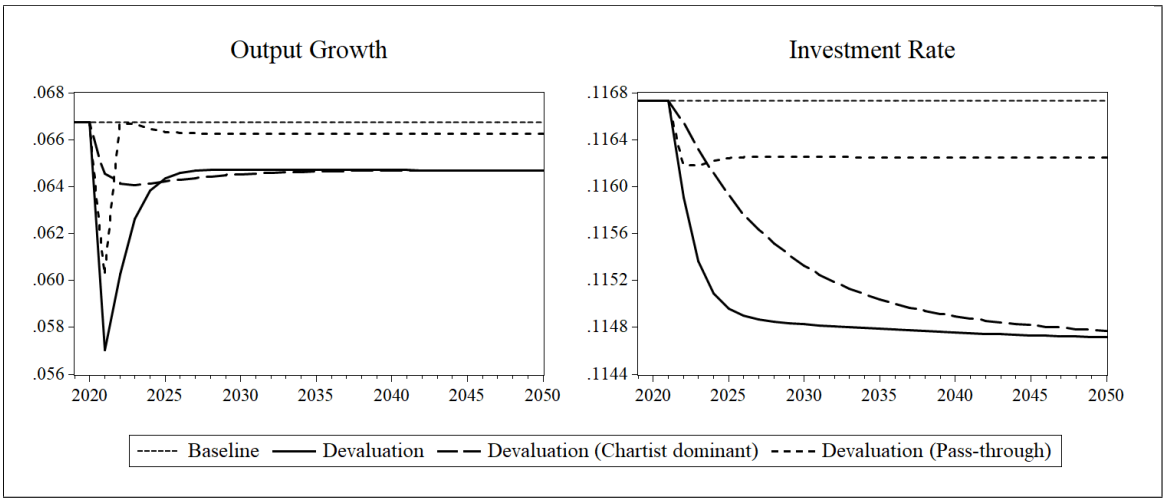
[18] Model's convergence to the steady-state is achieved in longer time spam, visually some variables seem to convey a non-convergent result because plots are in reduced time spam.

[19] Based on the empirical work of Campa and Goldberg (2005). We adopt the simplifying assumption that the pass-through effect is independent of the degree of the exchange rate variation.

determination, assuming a positive pass-through effect of the exchange rates to the imports function.

Results suggest that the macroeconomic effects of the on-step devaluation are closely related to the dynamics of the aggregate demand. Figure 2.1 displays the changes in the output growth and the investment rate. Scenario 1 shows how the devaluation can cause slower growth, moreover, how a devaluation, with a balanced proportion of chartists and fundamentalists and without the pass-through effect, enforces the worse performance to the domestic economy. The investment rate dives permanently, conveying an acute fall in output growth, which stabilizes in a lower growth rate. Additionally, the balance of payments also The causality of the contractionary cycle runs from lower profitability for firms, caused by higher debt burden, that leads to lower investment, which is amplified negatively on the output due to the multiplier effect [20].

Figure 2.1: Growth and Investment



Scenario 2 couples the devaluation with higher participation of chartists in the currency market, enabling experiments with different behavioral processes determining the exchange. As result, the chartist-dominant environment conveys a smoother trajectory toward the new steady-state value of the spot exchange rate. The exchange rate is driven by the short-term foreign currency market, the higher the share of the chartists the slower the convergence to the values determined by that market. The milder devaluation has important macroeconomic effects for Scenario 2. Precisely, the output growth decreases to the same steady-state of Scenario 1, however, the recession phase is less acute in Scenario 2. Therefore, the contractionary effects of the devaluation are curbed [21].

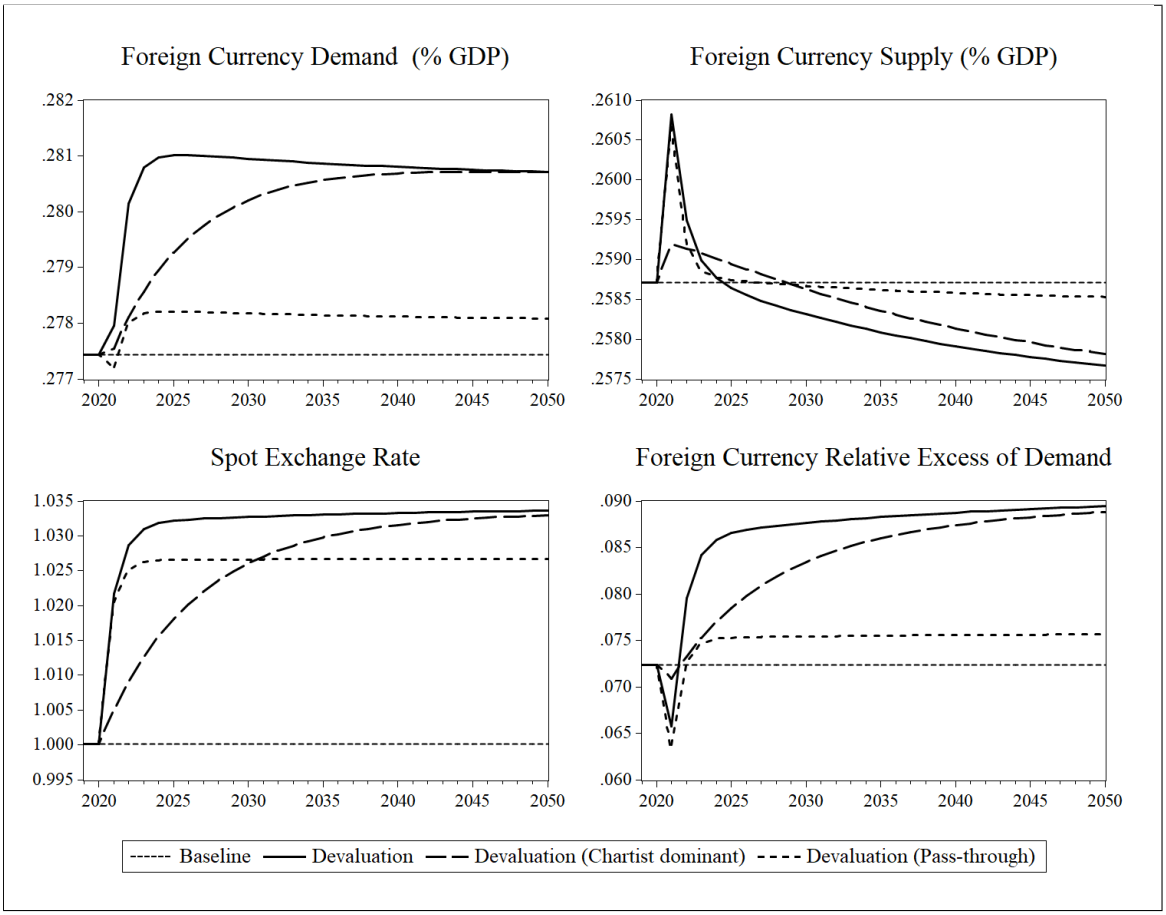
Figure 2.2 clarifies the foreign currency market dynamics and the exchange rate determination.

[20] See Figure 2.4.

[21] Lavoie and Daigle (2011) also consider that chartists dealers expect the past values to prevail in the present, nevertheless, the author finds that the higher participation of chartist dealers has a destabilizing effect. However, the authors have a different approach for the exchange determination, using the without growth two-economies setup, also employs a different shock (higher propensity to import for the domestic economy).

The relative supply and demand of foreign currency are both affected by the one-step devaluation that succeeded the increase in the autonomous component ($\bar{xr}$) of the market-determined exchange rate. The spot exchange rate is determined by the short-term foreign currency markets and weighed by the past value of the spot exchange rate. Additionally, the excess of demand or supply of foreign currency is determined by the balance of payments independent relation, the agents operate the short-term currency market based on heterogeneous behavior.

Figure 2.2: Exchange Rates Determination



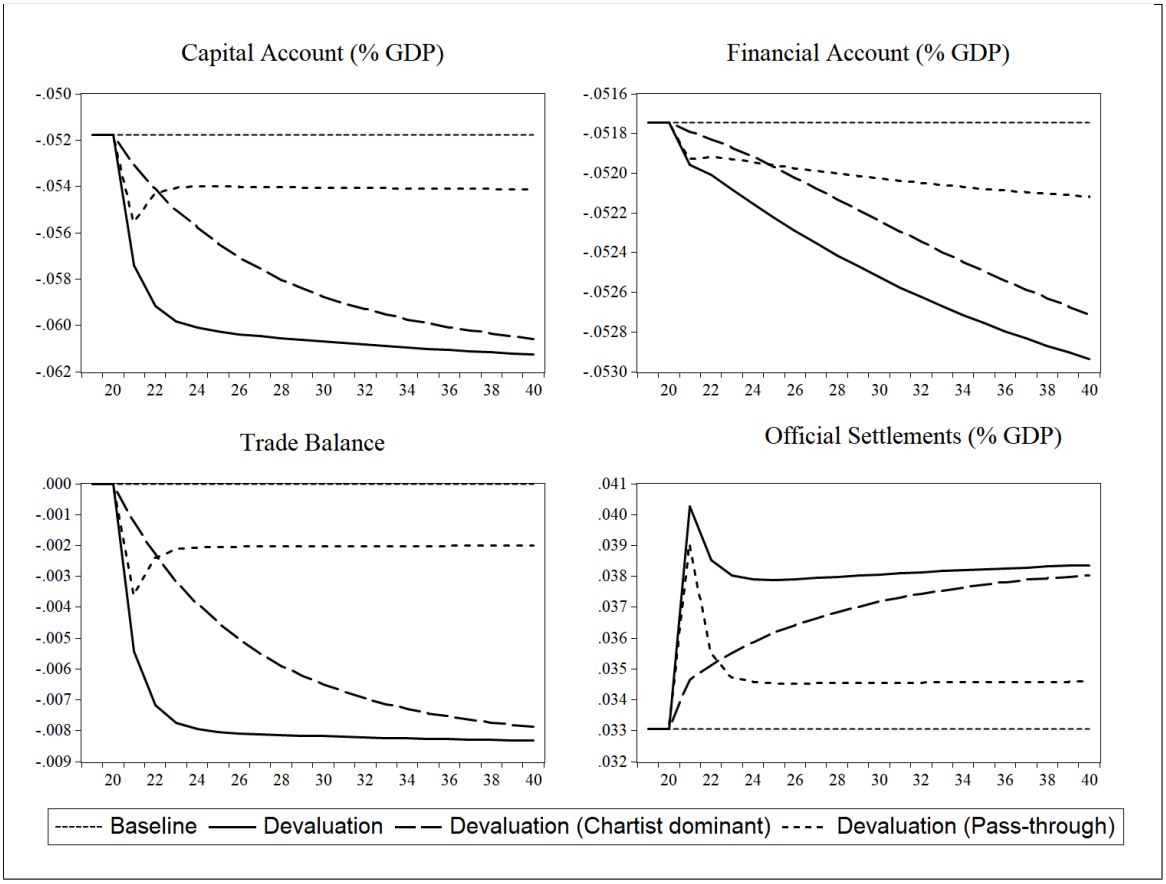
The short-term foreign currency market (Figure 2.2, bottom left panel) stabilizes at the steady-state around 7%. The baseline induces an excess of demand in the foreign currency market (Figure 2.2, bottom right panel). The demand for foreign currency out of GDP (Figure 2.2, upper left panel) is 2.7% in the baseline, whereas the supply of foreign currency (Figure 2.2, upper right panel) stabilizes at 2.5% of GDP, meaning that in the steady-state there is a small excess of demand for the foreign currency.

From this currency market perspective, the results suggest that the one-step autonomous devaluation causes a short-termed tendency to appreciation, as indicated at the bottom right panel in Figure 2.2. Nevertheless, the final steady-state reached after the medium-term traverse show that the devaluation prevails and a net devaluation of 3,3% is observed. This reversal can be

explained by the components of the foreign currency market. Precisely, it derives from the behavior of the supply of foreign currency, which spikes one period after the shock, recovering and increasing in the subsequent periods. Whereas the exports are stable and there is a significant yet temporary increase in the financial inflows, except for the interest payments on foreign reserves.

Figure 2.3 shows the implications on the balance of payments of the experiments. Trade balance (bottom left) reveals the importance of devaluation to the results: the volume of international trade changes in real terms, due to the increased import prices. Therefore, the devaluation enforces a contraction on the aggregate demand. The pass-through assumption registers the best trade performance on the scenario in which the pass-through is positive. The financial account (upper right panel) responds to the resulting changes in the current account. The current account (upper left panel), the financial account, the account for official settlements, and the trade balance are shown separately. The capital account consists of the sum of the other components. The higher deficit in the financial account translates to the higher deficit in the current account, despite the positive influence of the account for official settlements. Official Settlements (OS) accounts (bottom right) register international changes in valuation deriving from changes in prices, the permanent increase of OS in Scenario 1 is due to the decrease in output growth. The main components of the OS registered a temporary decrease, except for the foreign loans which permanently increase (as a share of GDP and as a share of the OS).

Figure 2.3: Balance of Payments

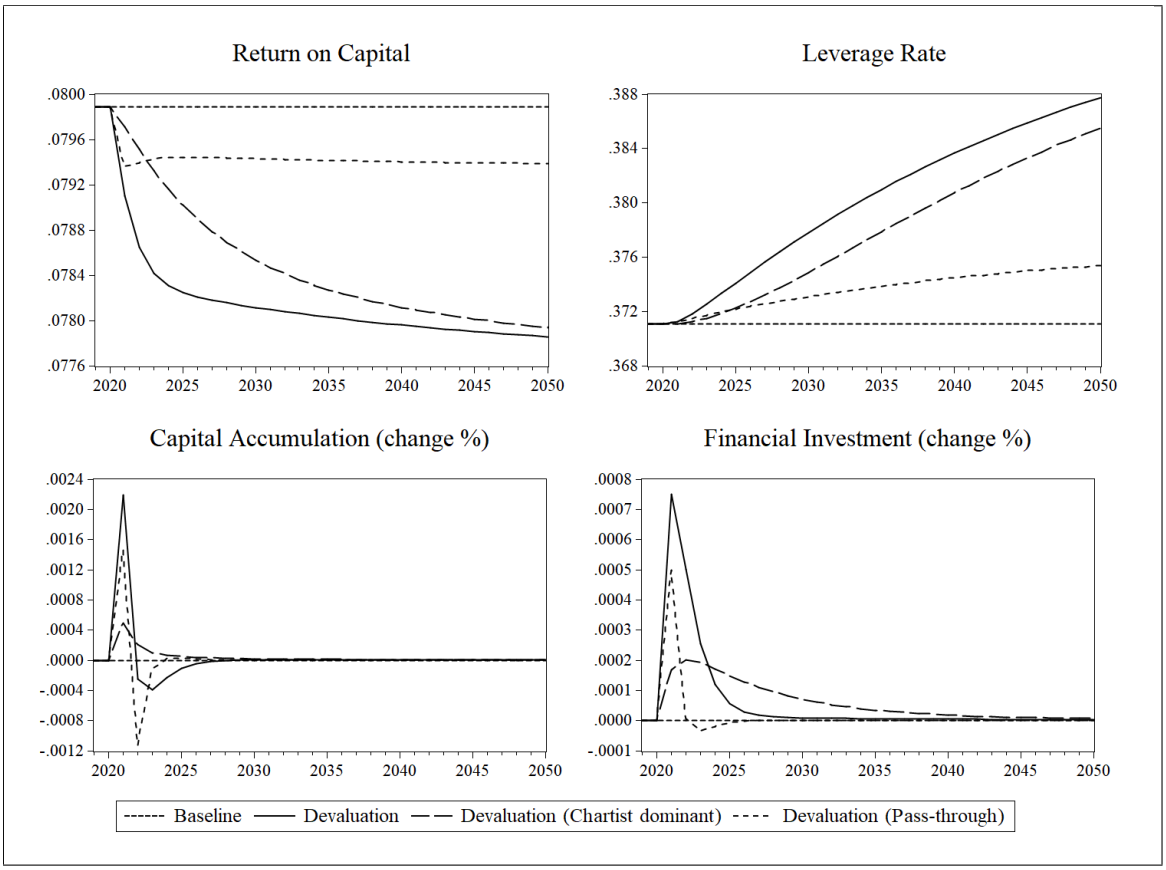


The pass-through effect of the devaluation to import prices is analyzed in Scenario 3. Because of the existence of the pass-through effect to the import prices, and consequently, to the propensity to import, Scenario 3 is the only one to present a positive change in the real trade balance. Without the pass-through effect to import prices (Scenarios 1 and 2) the nominal value of the imports increases regardless of the real value remains unchanged. This is due to the valuation effect exerted by the devaluation on imports, but not on exports. On the other hand, Scenario 3 experience a similar rapid decrease in growth, but because of the improvement in the trade balance (Figure 2.3), Scenario 3 conveys the fastest recovery and the smallest decrease, indicating that the pass-through effect reducing the real imports is responsible for the best performance registered at the current account. In general, the pass-through effect after a devaluation improves trade balance and consequently results in the best, yet negative, performance for the GDP growth (Figure 2.1).

The balance-sheet effects after the devaluation are due to the valuation effect on foreign currency-denominated assets: firms´ foreign loans and foreign currency reserves. The increase in firms´ leverage due to the devaluation leads to decreasing profitability, as displayed in Figure 2.4 by the lower level of return on capital. As result, the investment rate decreases leading to further contraction due to the multiplier effect. New loans contracted abroad by firms and foreign investment in financial assets (foreign equities and foreign bonds) experience sharp and tempo-

rary increases after the devaluation, due to the balance-sheet effect. Profits remitted to foreign ownership decreases, foreign payment to domestic bond owners increases, repayment of foreign loans increases, and a further decrease on the negative stock of foreign currency reserves.

Figure 2.4: Firms



Devaluation triggers negative effects within the productive sector, precisely, it causes higher leverage and lower returns on capital for all three scenarios, with the devaluation alone (Scenario 1) presenting the worst scenarios for firms. The devaluation causes a higher financial burden for firms, due to the presence of foreign funding. Among the causes behind the higher leverage are the higher use of funds, boosted by the higher financial investment and investment in accumulation. Firms´ performance indicators contribute to a better understanding of the changes occurring within the domestic economy. Figure 2.4 displays firms´ leverage (upper right panel) and the return rate on capital stock (upper left panel).

Additionally, despite the volume of imports remaining unchanged the face value of the trade balance decreases because the imports become expensive after the devaluation. Therefore, the aggregate demand decreases ultimately causing a lower accumulation and a consequent contractionary multiplier effect. Figure 2.4 reveals pernicious dynamics on investment. The devaluation causes a much more volatile path to investment in physical capital (bottom left panel) and a smaller increase if compared to financial investment (bottom right panel). Therefore, dur-

ing the crises provoked by the devaluation firms tend to invest proportionally more in financial assets than in physical assets, without any explicit assumption governing this effect.

Figure 2.5 shows the impact of the devaluation on the public sector. The remaining balance-sheet effect of the devaluation takes place within public accounts, not providing direct signaling to other institutional sectors. The higher deficit in foreign currency is absorbed by the emission of short-term public bills. The slowdown in growth, caused by a devaluation, leads to a relatively higher level of government spending, which is also financed by higher public debt (upper left panel). Higher governmental deficits are financed by the emission of short-termed bills.

Figure 2.5: Government

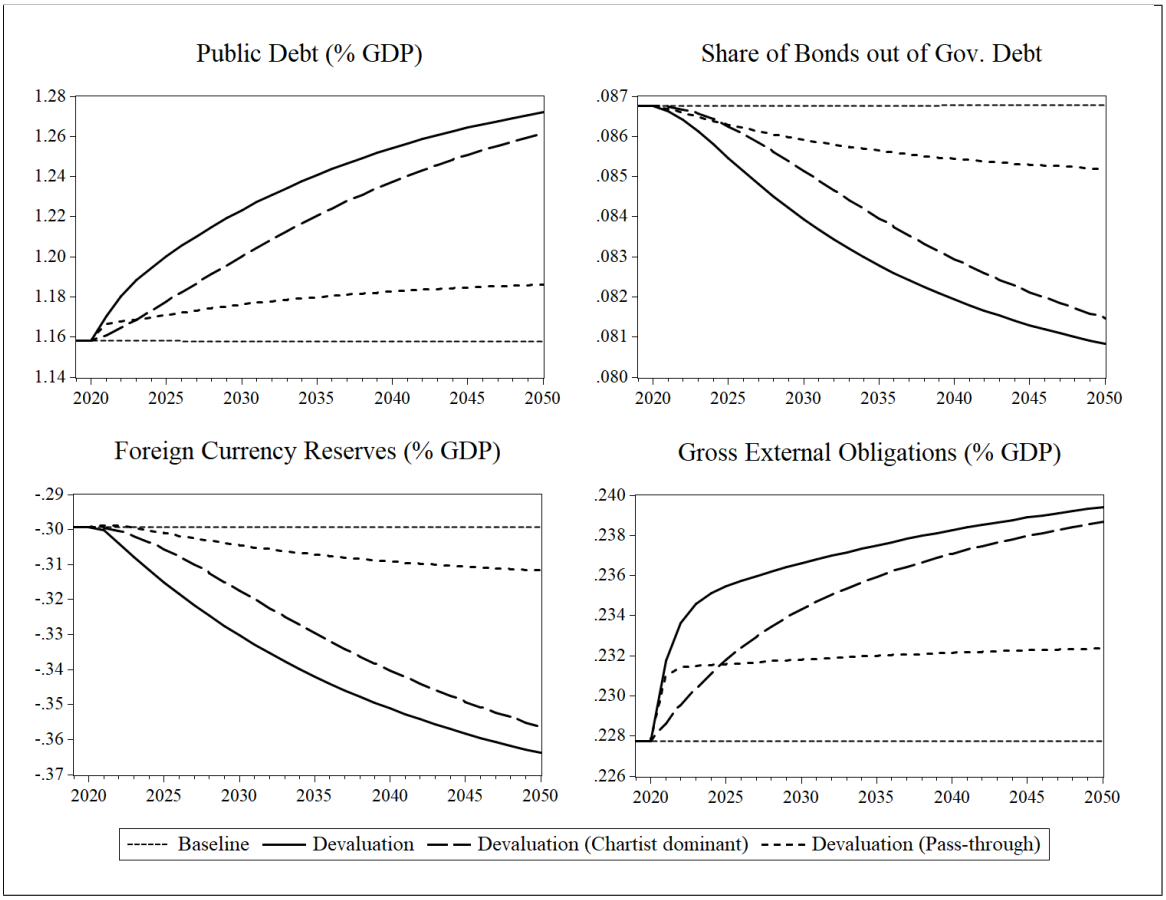


Figure 2.5 shows other important conclusions of the model, consonant with the literature on external vulnerability, as Hausmann and Panizza (2003) and Kaltenbrunner and Painceira (2014). The increases in public debt are followed by a higher percentage of this debt directed to shorter maturities, and the maturity mismatch increases (upper right panel). Additionally, the model also presents evidence of higher currency mismatches. The foreign currency reserves (bottom left panel) are negative, meaning a deficit position, deriving from the negative current account. Another indicative of higher external vulnerability is also found in Figure 2.5, bottom right panel, showing significant increases of gross external obligations of the domestic economy. At last, the next section summarizes the conclusions reached by this paper.

2.3 Conclusion

International liquidity transmission to emerging market economies has posed several challenges to economists. Most EME has to rely on international liquidity to finance the balance of payments and, frequently, this relationship is marked by abrupt reversals that are harmful to these economies. More importantly, due to past misconceived arguments regarding the exchange rate behavior and policy, the institutions of the currency markets in EMEs have reinforced detrimental mechanisms from within the EME financial system. In this paper, a stock-flow consistent model was developed, addressing some of the problems faced by EMEs regarding international liquidity transmission and exchange rate analysis. The focus was laid on disequilibria rather than on equilibrium, this is achieved by a framework of comprehensively interconnected balance-sheet, which allows for traverse analysis and tracking of stocks and flows through time.

Results can be divided into three main categories, the general effects of the devaluation, the increase of the external vulnerability, plus the specificities of the international integration devised by the scenarios. Generally, the model found the devaluation to be contractionary due to the balance-sheet detrimental effects on aggregate demand, which dampers the output level and leads to sequential and interconnected macroeconomic consequences. There is additional evidence on the crow-out of private accumulation in favor of investment in financial assets. Higher external vulnerability is observed in several indicators, most flagrant are the increase of the gross external obligations in general, and in the private external debt in particular. Also, the public sector indicators show evidence for vulnerability, with higher public debt and the lower maturity of this debt (maturity mismatch). The deficit international investment position is reinforced by the devaluation, leading to a further decline in already negative foreign currency reserves (currency mismatch). From the behavioral experiment, we found that the higher participation of chartist traders in the currency market attenuates the volatility of the exchange rate exogenous shock. Additionally, the model confirms the role played by the Marshall-Lerner assumption for conveying positive effects after a devaluation. When the pass-through effect from exchange rate to import prices is positive, also positive is the effect of valuation on net trade, due to the change in the relative international prices.

The present work has provided theoretical contributions to the existing literature. A new exchange rate closure for open and growing small open economies was developed, encompassing a currency market component and a behavioral component on the exchange rate determination. Agents´ heterogeneous expectations and different pass-through regimes were considered. Precisely, we have explored how lower international liquidity affects an emerging market economy through a one-step devaluation. The devaluation is evoked with the argument that higher uncertainty leads to devaluation of the domestic currency, due to the peripheral features of an emerging market economy. Further, theoretical issues were coupled to the analysis as different scenarios were designed. The examination of the pass-through effect on import prices confirmed the importance of the Marshall-Lerner assumption for guaranteeing the positive outcome after

a devaluation in traditional international macroeconomics. Regarding the behavioral profile of agents in the foreign currency market, results suggest that higher participation of chartists has stabilizing effects, or what Gandolfo (2017, pp. 16) called “stabilizing speculation”. The endogenous exchange rate mechanism devised in this paper provides a useful and adaptable approach for analyzing the macroeconomics of international capital flows. Exchange rates are determined by short-term capital flows, which depend heavily on international investors’ behavior. Devaluation of the exchange rates has shown negative macroeconomic effects, reinforcing the argument in favor of currency market intervention as an active policy tool.

As a medium-scale SFC model, it was possible to enhance the complexity of the analysis, if compared with other PK growth models with analytic solutions. Notwithstanding, instead of wholeness, we have delivered a flexible and rigorous framework designed for providing the basis for additional explorations. For example, is eminent to investigate different settings for the agent’s behavior and exchange rate formation. Exchange rate formation calls for advances regarding the relations between the spot exchange rate and the future values for the exchange rates. As well, a more detailed explanation of the links between international finance and domestic yield curve formation. Other types of balance of payments closures are encouraged, for example, deriving from a balance of payments constraint condition, or relying on different specifications for international trade and finance. Different types of intervention in the currency market, i.e. foreign currency sterilization, can be investigated further, as well as a more realistic description of expectations. We believe that the present work provided an adaptative framework capable to support further research.

Appendix - Chapter 2

Parameters: in order of appearence

Parameter	Value	Parameter	Value
p_{ex}	0.25	θ	0.24
p_{im}	0.25	λ_{20}	0.30
ε_{im0}	0.2324	λ_{22}	1.1
ε_{im1}	1	λ_{23}	0.32
w_c	0.5	λ_{24}	0.03
ξ^*	0.2	λ_{30}	0.30
β^*	0.2	λ_{32}	1.1
υ_0	-0.01	λ_{33}	0.32
υ_u	0.1	λ_{34}	0.03
υ_π	0.09	γ	0.12
σ	0.54	i_b	0.032
μ	0.6666	i_{bl}	0.037
Ψ	0.1	i^*	0.020
Ψ_{bl}	0.04	i_l	0.039
α_1	0.9	i_l^*	0.022
α_2	0.07	i_a	0.035
π	0.4	i_d	0.027

3 International Financial Cycle, Private External Debt and External Vulnerability

Abstract

The present essay investigates the linkages on the private sector's international indebtedness and its relations with external vulnerability departing from an emerging market economy (EME) perspective. A large body of literature has explored the external vulnerability (EV), also numerous scholars have related EV with public debt, both domestic and foreign. However, in recent decades the EME's private financial institutions have intensified their engagement in more complex financial relations. Particularly, the present work explores how private banks' bond issuing abroad connects with the firms' cross-border funding, also how the private external debt relates to financial fragility and external vulnerability. A stock-flow consistent (SFC) model is developed to evaluate the emergence of the securitization process and the relation with private external debt in an open and growing economy. Focusing on the firm´s funding and the private banks bond issuing the model explores how the international liquidity cycle drives the domestic economy. International interest rates, capital flights, equities emissions, and regulation on banks´ balance-sheet are considered as the channels by which international liquidy spread domestically affecting economic performance and external vulnerability. Experiments regarding the rise and the decline of international liquidity are conducted. Results suggest that stagnation and higher external vulnerability take place in both ascending and descending phases of the cycle. The firm´s decisions regarding funding influence private banks to issue equities abroad due to active balance sheet management. Private external debt interconnection also affects the domestic sector performance in a conflicting way, often opposing banks' and firms' profitability depending on the phase of the cycle.

Keywords: External Vulnerability, Private External Debt, Securitized Banking.

3.1 Introduction

Since the early 1970s world economy has experienced expressive growth in international capital flows. Commercial and financial liberalization coupled with deregulation has been the driving force in the political sphere. Developing and emerging countries were induced by international financial institutions to adopt those political guidelines as a condition to have access to international financial liquidity and international development projects. The US dollars assume the central role of denominating international capital flows concomitantly the US economy consolidates as the leading political actor.

Capital flows expansion motivated a movement toward the higher interest rates with short-termed returns, at the same time investment institutions crystallized the perception of some emerging markets as a safer destination for investment. Therefore, the Emerging Market Economies

(EMEs) become a desired destination for speculative capital flows. Liquidity fluctuations become more frequent and severe among the EMEs, and the solution adopted to cope with external finance volatility was usually to contract more loans abroad (MEDEIROS, 2008). Nevertheless, by the beginning of the new millennium the benefits of the liberalization process "seemed elusive at best" (CARVALHO, 2002). The distribution of the external liquidity among countries was unequal and the flows entailed a very volatile path. Succeeding periods of abundance and scarcity were registered, countries at first benefited by the high degree of liberalization ended up suffering from intense macroeconomic instability.

A large body of literature has explored the External Vulnerability (EV) (RODRIK; VELASCO, 1999; PALMA, 2012), a problem that is generally related to capital liberalization and financial flow volatility. Whilst external vulnerability is commonly related to an EME's problem (PALMA, 2012), there are significant divergences on its causes and the consequences. Numerous scholars, from both mainstream and heterodox perspectives, have argued about the public debt, internal and external, as a major source of EV (FRENKEL; RAPETTI, 2009; REINHART; ROGOFF, 2010). Nevertheless, recent literature has shown that, due to the liberalization, and securitization process, the private sector in EMEs has progressively engaged in foreign debt, or some other forms of external liability (BIS, 2007; KALTENBRUNNER, 2010). The complex set of relations that the EME's private sector establishes with international finance consists of a topic that calls for further attention. IMF (2015) shows how during the decade of 2000 EME's private sector has engaged progressively on external debt, furthermore, with diminishing participation of loans in favor of bonds. In this sense, Kaltenbrunner and Painceira (2014) presents the concept of the New Forms of External Vulnerability, relating financial innovations with the features of EME's financial integration.

The securitized banking system consists of a set of financial innovations that allows the private sector to circumvent regulation and increase profitability. The importance of a securitized financial system relates to two aspects. First, it displays a clear and contemporary manifestation of financial innovations and how these advances are developed to increase financial profitability, above all reasons. Second, it conveys a channel for international financial flows toward EME that are ultimately motivated by international interest rate gaps, as a consequence of the hierarchy among national currencies. Presently, we highlight that securitization consists of a private bond issuing process supported by the public enforcement of monetary policies. Also, we shed light on the tendency that private banks realize active management of their asset side of the balance sheet. In this sense, the present description of the financial system contributes to advancing the limited role that banks play in SFC models [22]. A securitized system contributes as an important factor in the disruption of the 2008 financial crisis, marking the decline of the securitization in developed economies, at the same time, registering a remarkable growth in de-

[22] SFC models, despite significant advances in connecting real and financial sides of macroeconomics, have traditionally relied on a simplified financial structure, which confines banks' behavior to accommodate the demands of the other private sectors, as noted by Taylor (2008).

veloping economies (see Figure 3.2) (AFFINITO; TAGLIAFERRI, 2010). International return gaps are motivated for institutional discrepancies according to the liquidity preference principle (ANDRADE; PRATES, 2013). Such assumption derives from the assumption that international assets are not substitutible and capital mobility is imperfect, therefore, international interest rate differential exists without motivating a self-regulating process as in the Mundell-Fleming tradition with perfect capital mobility. Additionally, the costs of securitization are often transferred to the public sector and the financial gains destinate to the private financial sector, both domestic or foreign (JOBST, 2006). Therefore, banks do not fund abroad, rather, they take advantage of the international interest rate gaps in a context that the public sector is committed to regulating liquidity.

The present work's main goal is to explore how the international financial cycles can influence the external vulnerability in EMEs, highlighting private external debt interlinks and a securitized banking system. Domestic private sector engagement in debt denominated in foreign currency is investigated, also the linkages between different private external debt are considered. A private bond issuing mechanism is developed to express the private sector's ability to issue unregulated liquidity in the financial market, whether to avoid capital requirements or to ensure profits. Also, firms' propensity to invest funds abroad is considered. The motives and the implications of these kinds of foreign exposure are investigated in association with external vulnerability. In a nutshell, different types of private external debt are interlinked and subject to international liquidity, influencing external vulnerability, public debt, and macroeconomic performance. The firms' access to foreign credit markets is designed considering the possibility of sudden stops, depending on central economies' liquidity. Private banks issue securitized bonds abroad, motivated by international arbitrage on interest rate gaps and, responding closely to banks' balance sheets, which depend on firms funding decisions. Also, private banks rely on public repos to fund and sustain profits. The treasury provides repurchase agreements because of the need for controlling bank liquidity, and consequently smooth exchange rate volatility.

Contributions lie in the field of critical literature on international financial liberalization, covering the discussion on external vulnerability, international financial cycle, and financial instability. Theoretically, the work advances with the SFC growth models for small open economies. This option prioritizes the analysis of a domestic economy, avoiding the complications involved in describing two-or-more economies. An exogenous foreign sector implies losing the hermetical flow of funds, a remarkable feature of the SFC approach. Notwithstanding, accountability is still an important element and the exogenous components are subject to scrutiny. EMEs are assumed to exert a negligible effect on the rest of the world, therefore, we believe the small open SFC model is a suitable option for exploring international integration of EME with the lens of the post-Keynesian view for international finance. H. Minsky's definitions for financial fragility, financial instability, and cycles are merged with the concept of financial domination (MEDEIROS, 2008) to qualify the EME according to their peripheral position in the inter-

national monetary system and its consequences. Developing from the post-Keynesian theory on endogenous money (TAYLOR; TAYLOR, 2004, Ch. 8), the concepts of private banks securitization (BOTTA; CAVERZASI, et al., 2018; MEIJERS et al., 2015), the new forms of external vulnerability (KALTENBRUNNER, 2010), and the firm's foreign funding (BORTZ, 2014) are assessed and combined in order to explain how private external debt is interlinked and affects external vulnerability. The model establishes a link between different types of private sector external debt that contributes to increasing external vulnerability due to the features of the securitized banking system. More precisely, the firm's funding and cross-border loan demand connect with private bank's bonds issued abroad via balance-sheet interconnections. Experiments regarding the international liquidity cycle are conducted to evaluate the impacts of the international liquidity cycle on external vulnerability and domestic macroeconomic performance. Therefore, the external vulnerability in EME is explored with the focus on its new forms, related to the emergence of securitized banking.

The paper is organized as follows. First, the EME's financial development is revised and the resulting institutional features are described. Definitions of external vulnerability, private external debt, and securitized banking are discussed. Second, the Stock-flow Consistent model is developed, the accountable structure is presented followed by the commented behavioral equations. Third, the model is solved via numerical simulations and submitted to comparative dynamics exercises. Finally, results and conclusions are presented.

3.1.1 Financial Integration and Dependency in Emerging Markets Economies

The international financial integration in EMEs[23] has been prominently outward-oriented, based on an export model coupled with external funding. The present section outlines the historical and institutional context that lead to the present-day EME's financial institutions. The development of international financial institutions is interpreted as a path-dependent process, and so, the peripheral international position is continuously reinforced. Medeiros (2008) shows that international integration of most of the EMEs has over-relyed in international trade and/or in international finance to promote economic development. The author argues that this strategy has led to a dependent position in the international financial system. Financial dependency disclosed in production and trade specialization less sophisticated products, in a large stock of external debt, and to the centrality of flexible exchange rates combined with an interest rate targeting rule. EME economies coupled this international finance path with a "fiscal and internal credit self-restriction". The author analyzes the EME financial institutions' development accounting for three phases: first, the finance-export age, that took place from the colonial period to the 1970s; second, the debt-led growth that started in the 1970s, and; third, the external

[23] The term Emerging Markets follows the IMF classification which accounts for countries with mature and internationally integrated financial institutions, that still catching up with the wealth levels of the developed economies. Nevertheless, this broad and heterogeneous group of countries is posed in terms of the center-periphery theoretical background, which aims to provide a critical view of the economically dependent countries.

financial cycle the goes from the 1990s to the 2008 crises.

The capital inflows surge during the 1970s, which led the EMEs to an overborrowed position in the international financial markets, relied on the following motives: the increasing liquidity in the US dollar caused by the spiking in oil prices; the liberalization and deregulation of the EME's financial system; the adoption of the floating exchange rates regime; the higher domestic interest rates; the incentives to contract loans abroad (such as interest rate gap, development programs of international and public financial institutions and, excess of liquidity in the US private banking).

The external instability in many EMEs was deflagrated with the positive shock in the international interest rate in 1979. Sequentially, Mexico's default of 1982, the end of the prevailing cycle was imposed, leading to abrupt exchange rate devaluations and capital flights. Because of the prevalence of the "Washington Consensus", international loans were subject to the creditor's requirements. Sound finance and domestic deregulation were considered essential to cope with the crises. Countries that succeeded in adopting liberal prescriptions would be more susceptible to bargain funds (MEDEIROS, 2008). Conversely, the 1990s brought a wave for capital inflows to EMEs, motivated by higher interest rates, privatization opportunities, and the maturation of the institutional alignment with international financial institutions. The expansive monetary policy enforced by the U.S., as in all preceding cycles, conveyed lower international interest rates and, consequently, shifted the international capitals toward the peripheral financial systems. Both private (mutual funds and pension funds) and public (the Brady Plan Bonds) international financial investors funded this capital inflow to EMEs. Essentially, the capital inflows were bound with strong conditionality on the institutional liberalization reforms.

The long-dated relation of EME's Central Banks with the IMF, defined by the rigorous counterparts to be adopted by the borrowers, escalated during the 1990s. "In order to control the outflow pressures and attract new capital, a high rate of interest was the main policy and the issue of public bonds indexed to the dollar was the main instrument" (MEDEIROS, 2008, pg. 94). The institutional development of EME's financial system has reinforced the challenges faced by those who intend to catch up with the group of developed economies. Regarding those challenges, the next section explores the connections between financial integration with financial stability and external vulnerability in EMEs.

3.1.2 The New Forms of External Vulnerability

Vulnerability mainly refers to the susceptibility to an economic crisis. Domestic financial fragility, as described by Minsky (1986), endogenously leads to instability and potentially to macroeconomic vulnerability. Otherwise, external vulnerability stands for the possibility of absorbing a crisis generated elsewhere. Nevertheless, scholars have argued in disagreement about the causes and consequences of this type of vulnerability.

From the mainstream perspective, external vulnerability derives from the Mundell-Fleming framework (MUNDELL, 1963) that emerges in the 1970s. In this vein, three generations of models explain external vulnerability, mainly based on misalignment with the orthodox prescriptions and/or high levels of external debt. The first one credits the vulnerability to the deterioration of the macroeconomic fundamentals (KRUGMAN, 1979). The second generation includes a possible trade-off between macroeconomic policies and the attempts to control the exchange rate to a fixed level (OBSTFELD; ROGOFF, 1995). Lastly, the third generation managed to incorporate the short-term external debt and foreign reserves management into the framework (RODRIK; VELASCO, 1999). This literature advises for the following policy recommendations for coping with external vulnerability: i) sound macroeconomic policy, ii) the reduction of the public sector presence, iii) the adoption of the floating regime to the exchange rate, and iv) promote the development of the domestic derivatives market and the further flexibilization to international capital flows (CABALLERO et al., 2005).

From a critical perspective, external vulnerability is explained as an endogenous phenomenon. This tradition relies on contributions as the structuralist tradition, which traces from R. Prebisch and M. Kalecki, the Harrod-Domar open economy model, and is summarized by the post-Keynesian literature by authors like H. Minsky and W. Godley. According to this post-Keynesian view, financial crises in developing and emerging economies are deeply rooted in international liberalization. Frequently, the presence of large capital flows and exchange rate volatility are presented as central elements for understanding external vulnerability. Medeiros (2008) argues on two determinants of the excessive accumulation of claims in foreign currency. First, the loan-pushing process, which encompasses a set of pressures from financial actors from developed countries that enforces a large push of cross-border lending and foreign bonds to EMEs. Second, the over-borrowing mechanism is endogenous to the peripheral countries, as mechanisms for excess borrowing emerge from domestic decisions.

Also in a critical vein, the determinants of the "original sin" are presented by Hausmann and Panizza (2003). The original sin corresponds to the inability of a country for borrowing abroad on its domestic currency, explained by the EME's over-reliance on foreign funding. Discrepancies on the currency composition of the debt (currency mismatches) and the short-termed domestic liabilities profile (maturity mismatch) are both characteristics that define a country incurring in the original sin. The most important practical result is a limited ability to implement monetary policy, additionally, higher volatility on output, exchange rates, and financial flow are frequently observed. Accordingly to Medeiros (2008) the argument of the "original sin" theorists, that a large share of debt denominated in foreign currency is due to the imposition of the international markets, is valid. But, the author stresses this as only a part of the story, as the peripheral countries also adopt internal credit and fiscal self-restriction and over-borrowing to "fulfill the game rules" of international finance for small open economies.

The currency hierarchy approach transposes the Keynesian concept of the "own interest rate"

(ANDRADE; PRATES, 2013), which states that each asset carries an intrinsic return, determined by liquidity and yield (KEYNES, 1982, Ch. 17), to national currencies. Top liquidity currencies benefit from an "exorbitant" privilege of denominating international claims, whereas peripheral currencies have to compensate for the lower liquidity by offering a higher yield. Since EMEs are considered riskier destinations for foreign capital, the offered return should be higher. Therefore, the national currency liquidity premium of emerging markets reflects this peripheral position in the international financial system. Kaltenbrunner (2010) departs from this peripheral condition of EME's currencies to develop the concept of the New Forms of External Vulnerability (NFEV), showing how domestic financial exposure has changed due to the rising participation of foreign investors and a more complex set of short-term domestic assets. The NFEV occurs in countries that have a large presence of a foreign investment in short-termed liabilities denominated in domestic currency, therefore, a problem related to the EMEs. The NFEV approach calls special attention to the disruptive potential of financial innovation. EME's national currency act as a passport required for investing in the riskier yet high-yielding domestic financial assets. Therefore, exchange rates are subject to liquidity in international markets, since the withdrawing of foreign-owned domestic assets leads promptly to currency exchange. Consequently, volatility and depreciation bias consists of remarkable features of EME's currencies which present the new form of external vulnerability. Therefore, the NFEVs arise endogenously via exchange rate appreciation because of the inability to generate the currency that denominates external liabilities (KALTENBRUNNER, 2015). The domestic financial exposure of EMEs has changed due to the rising participation of foreign investors in a more complex set of short-term domestic assets. The author argues that international integration in EME characterizes not only by an increase in international capital flows but also entails qualitative changes in the way economic agents interact.

The NFEV have been caused by the increasing share of foreign investor combined with the intensification of financial innovation. A rising number of short-term domestic assets emerged aiming to achieve higher profits from trading and capital gains. Four links of financial innovations and the emergence of NFEV in EMEs are discussed by Kaltenbrunner (2010). First, a higher foreign presence in domestic assets denominated in foreign currency can lead to large exchange rate movements, independent of domestic fundamentals. Second, foreign operations with domestic currency impact exchange rates instantaneously, as the funding currency (normally the US dollar) has to be automatically converted in domestic currency to be domestically invested. Therefore, the domestic currency acts as a required passport to domestic investment. Third, the NFEV creates a currency mismatch within the international investors' balance sheet, as a domestic currency asset is funded in foreign currency. Then, the capital account and the exchange rate volatility increases due to the higher sensibility of international investors to the expected exchange rate movements. Fourth, when a system relies more upon financial income than in cash-flows it is inherently more fragile.

To explore further how the private sector funding might lead to the EV is necessary to advance from the traditional banking framework. The next section links the Minskyan conception of financial innovation to the rapidly growing phase of securitized banking in recent years.

3.1.3 Private External Debt and External Vulnerability

The present section presents some concepts and stylized facts about the emergence and maturation of securitized banking in EMEs, connecting the emergence of those practices with the occurrence of the new forms of external vulnerability. Private bond issuing is presented as a central element of securitized banking, in EMEs private bonds are likely to be issued abroad due to the international interest rate gap, caused by monetary hierarchy, and the possibility of capital gains decurrent of exchange rate variations. Lavoie (2012) explains the banking activity as dependent on confidence and creditworthiness, concluding that as long as the trust is maintained, banks can create credit and even issue more assets[24]. Private banks are pivotal in the Keynesian theory of money because of the privileged channel with the central bank, which allows for money creation, as long as banks are willing to accept each other's liabilities as a means of payments.

In recent decades, EME seems to have overcome the problems with the public foreign debt burden, that dominates the vulnerability debate since the 1970s. Nevertheless, as IMF (2015) has identified a "growth and changing nature" of EME corporate debt. Cross-border lending and bond issuing gained prominence as the liberalization and financialization agendas progressed. Whilst in the years before the 2008 financial crisis the so-called shadow banking system was seen as stable and beneficial, this view changed significantly after the subprime burst. Adrian and Shin (2010) credit the rise of shadow banking to the banks' appropriation of the financial innovations of the capital markets, with private banks and private bond issuing placed as pivotal elements. Botta, Caverzasi, et al. (2018) stress the concept of shadow banking, as a designed practice of financial institutions, that aim to control leverage by exploiting structural arbitrage and ensuring financial profitability.

Securitized banking gains attention under the sign of shadows banking system, more specifically in the aftermath of the 2008 financial crisis, comprehending several instruments and actors. The term refers to a banking practice designed outside the traditional regulatory framework, strongly relying on financial innovations. Securitization consists of a broad term addressing the practice of pooling contractual obligations and selling the related cash flows to a third party. Traditional banking activity consists of issuing and holding loans on the asset side of the balance sheet

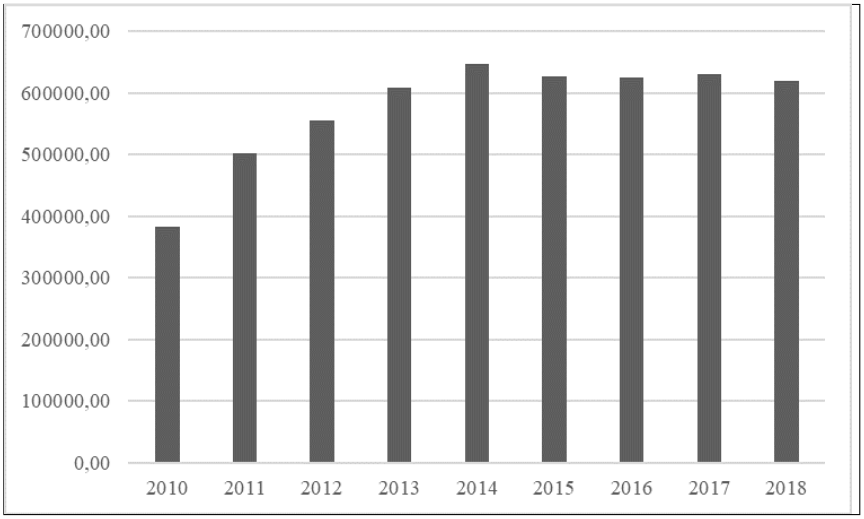
[24] According to the traditional view on monetary policy, money creation is exogenous and controlled by monetary authorities. The endogenous (or post-Keynesian) account for monetary theory claims that the economic system endogenously through private bank's credit being issued as demanded by creditworthy borrowers (PALLEY, 1996, Ch. 7). Whist the short-term interest rate, the basic instrument for monetary policy, is enforced by the Central Bank, the long-term interest rate is determined by the interaction of the agent's portfolio choice (GODLEY; LAVOIE, 2006, Ch. 5).

and holding deposits on the liability side. Securitized banking consists of pooling the loans for sale, often involving the removal of the loans of the asset side of the balance sheet. Therefore, banks alienate the inherent risk associated with the original loans, motivating new speculative activities (GORTON; METRICK, 2012). Whilst traditional banking holds a fraction of the deposits as reserves, to guarantee its solvency, securitized banking denotes solvency by backing the bond issuance with a share of the cash flows or using assets as assurance.

Accordingly to Cardone-Riportella et. al. (2010) securitization consists of a financial technique designed to transform a bundle of illiquid assets into a liquid tradable instrument. Nevertheless, this structure can be interpreted from distinct perspectives. The literature is often divided between the surging and optimistic phase, and the pessimistic and regulation-oriented phase starting in the aftermath of the 2008 global financial crisis. The optimistic view reinforces the positive aspects due to dispersing credit risk. "From an issuer perspective, securitization registers as an alternative, market-based source of refinancing profitable economic activity in lieu of international debt finance." (JOBST, p. 70. 2006). The outbreak of the 2008 financial crisis shed light on the pessimistic view of the securitization process. The increasing importance of the shareholder-value orientation led to diminishing attention to the risks, therefore the bad loan's securitized bonds are passed forward as a "hot-potato" (SHIN, 2009). Additionally, as a balance-sheet management tool, securitization can be categorized as a liability-side or asset-side practice. According to Lavoie (2012, pp. 228.), the early meaning of securitization is closely related to a liability-side operation, since the asset side (loans and mortgages) are kept, and bonds are issued. The securitization practices evolved to a second sense as asset-side management was introduced. The assets started to support the bond issuing and being removed from the balance sheet, requiring a more complex set of agents and financial instruments, which allowed banks to alienate the risks associated with their securitized assets (pp. 228.).

Latin American economies consist of a remarkable group within the emerging economies yet bear considerable heterogeneity. Figure 1 shows Latin American private external debt, showing the soar of the corporate debt from 2010 to 2014. Moreover, the study of IMF (2015) shows how the composition of this debt has also changed in favor of bonds, suggesting that the rapid growth of EME corporate debt traces from 2004, and accelerates in EME from 2008.

Figure 3.1: Private External Debt Stocks - Latin America (current US$)



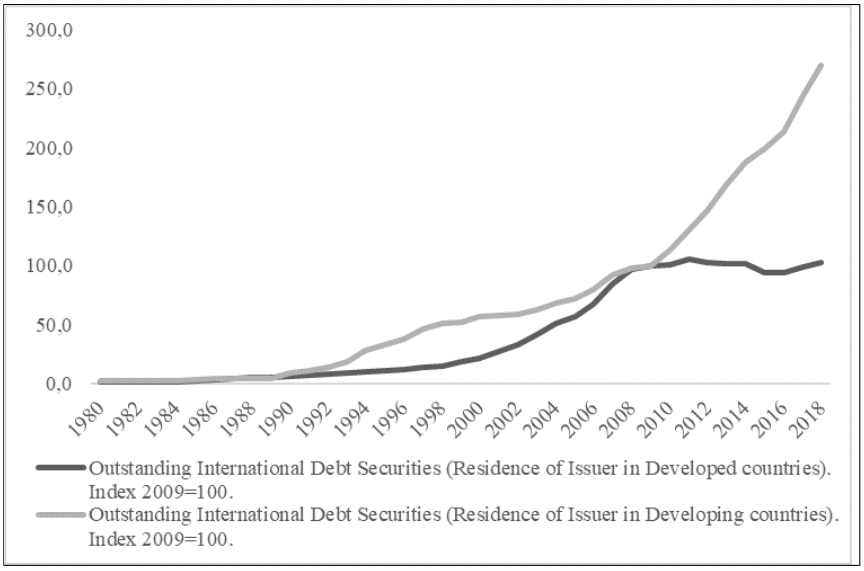
Author's elaboration based on World Bank International Debt Statistics.

The expansionary monetary policy in the central economies favored the leverage of EMEs corporations due to the relaxation of the peripheral borrowing constraint. Central economies' monetary policy causes EME's vulnerability as the accumulated leverage of the corporate sector has to face increasing debt-services costs when foreign interest increases. "In addition, local currency depreciations associated with rising policy rates in advanced economies would make it increasingly difficult for emerging market firms to service their foreign currency-denominated debts if they are not hedged adequately" (IMF, pg. 86, 2015). As stressed by IMF (2015), the distress in the corporate sector is likely to rapidly spread toward the financial sector. As the firm's leverage consists of an important fraction of the private bank's balance sheet, shocks in corporate sector lending can engage a vicious cycle. As the financial sector reduces lending, lower loan supply decreases, and via aggregate demand reduces the access for funding and consequently the economic growth.

Cardone-Riportella et al. (2010) point to three main reasons that lead banks to securitize their assets: first, the need for liquidity; second, minimize credit risk; third, match capital requirements. Additionally, the authors point out that securitization may lead to financial fragility because securitize loans do not bear the risk of default, banks increase lending without considering the borrower's creditworthiness. Affinito and Tagliaferri (2010) add the search for new profitable opportunities as a fourth determinant. Figure 2 shows how the securitized banking system experimented with rapid growth since the 1990s. The 2008 international crisis acted as a turning point for both developing and developed countries. Whilst developed issuers reduced the growth of international debt securities, the developing group of countries accelerates the expansion of this kind of foreign liabilities. This pattern might suggest that regulation and macroprudential policies in the aftermath of the global crises were more intense in the developed countries. As a consequence, emerging economies become the main stage for international

securitization.

Figure 3.2: Outstanding International Debt Securities



Author's elaboration based on Federal Bank of St. Louis - Economic Research Division

The securitization system depends on a stable source of liquidity and cash-flows to be implemented. Gorton and Metrick (2012) revels a dramatic run to the sales and repurchase market (the repo market) in the aftermath of the 2008 crisis. The authors argue that the repos operations act as collateral and funding for a wide range of financial transactions, especially in the securitized bonds market. Precisely, the importance of the repo market for securitization is crucial: "Securitized banking is the business of packing and reselling loans, with repo agreements as the main source of funds" (GORTON; METRICK, 2012, pg. 425). McCauley et al. (2015, pp. 38) note that in EMEs the outstanding dollar bonds have grown faster than dollar loans since 2009. "The point to stress is that offshore dollar bond issues can show up in external debt statistics in a variety of ways. To the extent that dollar debt is obscured, corporate vulnerabilities can be understated." Ghosh et al. (2012, pg. 2) points out risks associated with the deepening of a securitized banking system: "the uses of nondeposits sources of collateralized funding [*securitized bond and repos*] can facilitate high levels of leverage since these assets can be used as collateral to raise more funds (hence amplifying procyclicality)". Additionally, securitized banking relies on wholesale funding practices, which can lead to sudden large-scale withdraws that can bring instability to the wider financial system. The securitized banking system potentializes the transmission of systemic risk by its connections with traditional banking and also to the government sector (via repo market). Finally, "(. . .) [*securitized banking*] could be used to circumvent the tighter regulations imposed on banking institutions".

The links of securitization with domestic vulnerability are summarized by Nikolaidi (2015) in three points. First, by allowing the alienation of the risk by removing the loans from the

balance sheet, the creditworthiness of the borrower losses importance and lead to excessive lending. Second, securitization promotes distortions in the credit markets, which resonates in the real markets (e.g. the securitization of housing mortgages leads to expansion of this type of credit affecting the housing prices). Third, credit-rating agencies tend to underestimate the risks associated with securitized bonds.

From the EME's perspective, external vulnerability decurrent from private external debt is even more significant. Many emerging markets reformed financial institutions to allow and strengthen local securitization markets, on the promise of fostering more favorable external debt dynamics. The public sector has repeatedly securitized future export receivables, such as oil and other commodities and credit card receivables. Also, subnational authorities have securitized future revenue on taxes, natural resources, and toll roads. Since the 1980s developing and emerging economies have sold future cash flow as securitized bonds, as a form of refinancing. Corporations and banks provide securities denominated in foreign currency on the promise of future revenues. The public sector on emerging markets also engaged in cross-border securitization on the same premise, by alienating the forthcoming taxes (JOBST, 2006, pp. 70).

The public sector support consists of a crucial aspect of the private banks' bond issuing in some EMEs. The NFEV affects the monetary policy by imposing both volatility and tendency to an appreciation of the domestic currency. Because of the influence of the exchange rate on prices and the commitment to an inflation targeting regime, Central Banks have adopted the orthodox toolbox to control the international capital flows and to curb its domestic effects. Painceira (2010) explores the policymaking of the Central Bank in South Korea and Brazil, showing that emerging economies' control over domestic liquidity deteriorates in the presence of intense international capital flows. In South Korea, the Central Bank played a fundamental role as a source of capital gains for foreign investors. Brazillian Central Bank, on the other hand, relied on public debt to back repos operations and compensate short-term capital flows. Therefore, in Brazil, the short-term nature of the international reserves also shaped the profile of the public assets controlling reserves fluctuations (PAINCEIRA, 2010, pp. 287-288). "It is necessary to stress the fundamental role of public debt once those repos are the first financial asset to be acquired by the domestic banking system, and being risk-free and very liquid assets, they allow domestic banks to take other financial asset position, and more importantly to implement better management of foreign investors' positions with them." (PAINCEIRA, 2010). Kaltenbrunner and Painceira (2017) shows how the Brazilian central bank employs monetary sterilization operations to control monetary expansions decurrent to its foreign currency purchase. Repos are contracted with domestic private banks to drain excessive banks' reserves, bolstering banks' willingness to increase liabilities. Therefore, Brazillian banks manage their portfolios largely relying on government short-term assets as collateral to expand liabilities.

In sum, the peripheral integration of the EMEs to the international monetary system featured the principles of flexible exchange rates, liberalized capital flows, and exchange rate targeting

regimes. Thus, this institutional framework reinforced the EV by creating conditions for new forms of external debt to arise.

The next section develops an SFC model aimed to investigate the international liquidity cycle with a focus on the relationship between the private bank's securitization process with the firm's foreign indebtedness. The model is designed alongside the post-Keynesian theory and advances by encompassing a more complex set of private external debt relations in a small open economy. Securitization emerges from an active balance sheet management of banks and is closely related to a firm's capacity to contract loans abroad. Additionally, the cycle-taker aspect of EME's financial integration is considered as the international liquidity cycle consists of the background for the experiments.

3.2 The Model

International liquidity cycles are conveyed as exogenous, influencing international liquidity and emulating the ascendant and the descendant phase of the cycle separately. The external vulnerability is posed in terms of the private external debt and the macroeconomic performance. A private foreign bond issuing process is governed by the private banks, influenced by independent actions of the firms towards external funding, and implies the governmental budget. To understand private external debt linkages and consequences to EV in EMEs the present work develops an SFC [25] model addressing private external debt relations. The procedure used is in line with the post-Keynesian literature on open economy growth models. More specifically, we follow models such as Dos Santos and Zezza (2008), Zezza and Dos Santos (2006) and Pedrosa and Biancarelli (2015).

Accountable matrices are developed, behavioral equations are designed and calibrated in line with the literature. Then, numerical simulations are conducted and subjected to comparative dynamics exercises to test the occurrence of regulation and capital flights. Table 3.1 shows the Balance Sheet Matrix (BSM), which supports the accountable identities and behavioral equations. The heading row displays the institutional sectors and each subsequent row presents an asset. The columns represent each sector balance sheet, in which each asset (liability) mirrors another sector's liability (asset). The last row accounts for the accumulated wealth of the institutional sectors.

The relations of the domestic economy with the foreign sector are partially exogenous, as a result, the model presents "holes" in the financial system. Regardless, the models' accountability is still valid, thus it is possible to pinpoint and trace those leakages. Due to the focus on an EME, our strategy prioritized the domestic dynamics instead of detailing the international

[25] The SFC model encompasses detailed accountability linking the institutional sector's financial relations, and a path-dependent solution in which the long-run equilibrium is achieved by a succession of short-term systemic interactions. See Nikoforos and Zezza (2017) for a detailed survey.

interconnections. We assume that EME exerts a negligible effect on the rest of the world economy, therefore, emphasizing a feedback relationship with the world economy would represent a costly detour. The small open economy also enables the model for encompassing the discussion of the international interest rate gap, an indispensable feature for modeling EMEs. In opposition to the Mundell-Fleming tradition, the present model assumes imperfect capital mobility and international assets substitutability, therefore, international interest rate gaps must persist without promoting an auto-regulative capital inflow (or outflow). Instead, based on the hierarchy approach for foreign currencies, our model encompasses further the concept of liquidity into the analysis. As result, the higher yield should be presented in EME's financial assets to compensate for the lower liquidity preferences.

Table 3.1: Balance Sheet Matrix

BSM	HH	Firms	Banks	CB	GOV	RoW	Σ
(A) Dep.	$+D$		$-D$				0
(B) K stock		p.K					p.K
(C) B			$+B_{bk}$	$+B_{cb}$	$-B$		0
(D) BL	$+p_{bl}.BL_h$				$-p_{bl}.BL$	$+p_{bl}.BL^*$	0
(E) Eq.	$+p_e.E_h$	$-p_e.E$				$+p_e.E^*$	0
(F) L	$-L_h$	$-L_f$	$+L$				0
(G) Ext. L		$-L^*$				$+L^*$	0
(H) Bank B			$-B_{BA}$			$+B_{BA}$	0
(I) Res.				$+R$		$-R$	0
Net Worth	$+V_h$	0	0	0	$-V_g$	$+V^*$	0

Households, Firms, Private Banks, Central Banks, Government, and the Rest of the World constitute the institutional sectors of the model. Table 3.1 matrix consists of the starting point of the model because it sets the logical and accountable relations between sectors. Parameter values are presented in the Appendix. Accountable identities derive from the three matrices, for example, row C in Table 3.1 corresponds to the accountable identity of the market for government bills (B), where the liability is held by the government sector in form of domestic public debt, and the assets counterparts are held by commercial banks (B_{bk}) and central bank (B_{bk}). The market-clearing mechanism is represented by the last column where, except for the capital stock, all assets sum up to zero. The last row shows the accumulated net worth of each sector (except firms, private banks, and the central bank, which does not accumulate wealth because the resulting surplus (or deficit) registered in each period is distributed). Households (V_h) and the rest of the world (V^*) accumulate wealth and the government accumulates debt (V_g). Firms and private banks distribute profits to the households (respectively FD_h and F_b) and the central

bank distributes all profits or losses to the government (F_{cb})[26].

Table 3.2: Transaction Matrix

TM	HH	Firms	Banks	CB	GOV	RoW	
(1) Cons.	$-C$	$+C$					0
(2) Invest.		$+I$ / $-I$					0
(3) G		$+G$			$-G$		0
(4) Exp.		$+X$				$-IM^*$	0
(5) Imp.		$-IM$				$+X^*$	0
(6) Tax.	$-T$				$+T$		0
(7) Wgs.	$+W$	$-W$					0
(8) Firm P.	$+FD_h$	$-F$ / FU				$+FD^*$	0
(9) Bank P.	$+F_b$		$-F_b$				0
(10) CB P.				$-F_{cb}$	$+F_{cb}$		0
(11) Int. B			$+i.B_{bk-1}$	$+i.B_{cb-1}$	$-i.B_{-1}$		0
(12) Int. R				$+i^*.R$		$-i^*.R$	0
(13) Int. BL					$-i_{bl}.BL_{-1}$		0
(14) Int. D	$+i_d.D_{-1}$		$-i_d.D_{-1}$				0
(15) Int. L		$-i_l.L_{-1}$	$+i_l.L_{-1}$				0
(16) Int. L^*		$-i_{l^*}.L^*_{-1}$				$+i_{l^*}.L^*_{-1}$	0
(17) Int. B_{BA}			$-i_{ba}.B_{BA-1}$			$+i_{ba}.B_{BA-1}$	0
Sav.	$+SAV_h$	$FU-I$	F_b	F_{cb}	$+SAV_g$	$-CA$	Σ

The transaction flow matrix, represented in Table 3.2, describes the flows that arise from the balance-sheet matrix after a period. The last row of Table 3.2 corresponds to the net savings of each sector, representing the resulting sector's net balance for each period. Regarding the consistency of the model, this identity is checked as follows, resembling the Godley (1999) "fundamental identity"[27] that should hold. Table 3.2 last column corresponds to the closing balance for the flows generated from each asset or liability. For example, line 11 shows that the government debt burden on bills ($-i_b.B$) as a counterpart as positive flows for private banks ($+i_b.B_{bk}$) and central bank ($+i_b.B_{cb}$). Firms and banks distribute profits to households. That can be observed by rows 8 and 9 in Table 3.2 and the last row of Table 3.1.

At last, Table 3.3 shows the flow of funds for the model. This matrix corresponds to the resulting allocation in the balance sheet of each sector at the end of each period. For example, the households column represents the portfolio allocation (equations 3.6 to 3.8) of the household savings (SAV_h).

The model consistency derives from the strict interconnection between these three matrices. The variables described in Table 3.3, are the consequence of the transactions represented in Table 3.2, feedbacks into Table 3.1 as the initial values for the forthcoming period. Essentially, the

[26] See Table 3.2.

[27] $SAV_h + SAV_g - CA = 0$.

Table 3.3: Flow of Funds Matrix

FoF	HH	Firms	Banks	CB	GOV	RoW	Σ
ΔD	$-\Delta D$		$+\Delta D$				0
ΔB			$+\Delta B_{bk}$	$+\Delta B_{cb}$	$-\Delta B$		0
ΔBL	$-p_{bl}\Delta BL_h$				$-p_{bl}\Delta BL$	$+p_{bl}\Delta BL^*$	0
ΔE	$-p_e\Delta E_h$	$+p_e\Delta E$				$-p_e\Delta E^*$	0
ΔL	$+\Delta L_h$	$+\Delta L_f$	$-\Delta L$				0
ΔL^*		$+\Delta L^*$				$-\Delta L^*$	0
ΔB_{BA}			$+\Delta B_{BA}$			$-\Delta B_{BA}$	0
ΔR				$-\Delta R$		$+\Delta R$	0
Σ	0	0	0	0	0	0	0

long-term is composed of an interlinked sequence of short-term realizations. The accountable identities that emerge from this structure integrate the model equations, causing a loss of degrees of freedom, but implying a logical accountable framework. Output (Y, equation 3.1), from the demand optics, is composed of consumption (C, equation 3.2), investment (I, equation 3.10), government expenditure (G, equation 3.29), and net exports (X-IM, equations 3.23 and 3.24).

$$Y = C + I + G + X - IM \tag{3.1}$$

Households

The households consume (equation 3.2) based on current disposable income $[\alpha_1.(1-\pi).(1-\theta).Y]$ and accumulated wealth $(\alpha_2.Vh_{-1})$ (where the parameter α_1 and α_2 corresponds to the propensity of consuming out of disposable income and out of the wealth, respectively. Parameters π and θ correspond to the profit rate and the tax rate). Savings and capital gains determine the wealth evolution, which is allocated in bonds, equities, and deposits (equations 3.6 to 3.8).

$$C = \alpha_1.(1-\pi).(1-\theta)Y + \alpha_2.Vh_{-1} \tag{3.2}$$

Household savings correspond to the resulting identity that emerges from the households column in Table 3.2. The following equation expresses this identity, the first term of the expression refers to the income, encompassing wages (W, output minus the profit-share $W = (1-\pi).Y$), distributed profits (FD_h and F_b) and financial income ($BL_{h_{-1}} + i.D_{-1}$). The second term relates to the expenditure and is composed of consumption (C), taxes (T), and the loans' costs.

$$SAV_h = [W + FD_h + F_b + BL_{h_{-1}} + i.D_{-1}] - [C + T_h + i_l.L_{h-1}] \tag{3.3}$$

The households demand for loans (equation 4) is considered part of wealth component on the

portfolio allocation and is negatively influenced by the interest rate on loans ($-\lambda_1$).

$$L_h = (\lambda_0 - \lambda_1.i_l)[(1-\pi)Y + FD_h + F_b + BL_{h-1} + i.D_{-1}] \tag{3.4}$$

Household wealth (V_h, equation 3.5) correspond to accumulated wealth from past periods plus savings, plus capital gains. Capital gains, or losses, originates from equities and bonds price variations[28].

$$V_h = V_{h-1} + SAV_h + \Delta p_{bl} BL_{-1} + \Delta p_e E_{-1} \tag{3.5}$$

The portfolio allocation is endogenous for bonds and equities and the deposits act as the buffer stock. Households' wealth allocation on bonds (equation 3.6) will depend positively on the interest rates, the households' demand for equities (E, equation 3.7) varies negatively with the return on bonds.

$$BL_h = \frac{(\varepsilon_0 - \varepsilon_1.i_{bl})(Vh_{-1} + L_h)}{p_{BL}} \tag{3.6}$$

$$E = \frac{(\delta_o - \delta_1.i_{bl})(Vh_{-1} + L_h)}{p_e} \tag{3.7}$$

Equities prices (p_e, equation 3.8) clear the market and depends on the household demand for bonds, also the foreign demand for bonds, determined by the parameter β^*. That is, households and the foreign sector interact in the bonds market causing the interest rates on bonds (i_{bl}), and in the equities market causing price (p_e).

$$p_e = \frac{(\delta_0 - \delta_1.i_{bl})(Vh_{-1} + L_h)}{(1-\beta^*)E} \tag{3.8}$$

Deposits (D) closes the portfolio allocation acting as a buffer stock, accomodating the households' budget constraint.

$$D = V_h + L_h - p_{bl}.BL_h - p_e.E_h \tag{3.9}$$

Firms

The firm's production and investment are described as follows. The investment function (3.10) is based on the post-Kaleckian version, following Dos Santos and Zezza (2008). Responding positively to profit-share (3.11) (μ corresponds to the mark-up rate) and capacity utilization (3.12).

$$\frac{I}{K_{-1}} = \upsilon_0 + \upsilon_u.u_{-1} + \upsilon_\pi.\pi \tag{3.10}$$

$$\pi = \frac{\mu}{1+\mu} \tag{3.11}$$

[28] Capital gains = $\Delta p_{bl} BL_{-1} + \Delta p_e E_{-1}$.

$$u = \frac{Y}{Y_{fc}} \tag{3.12}$$

$$Y_{fc} = \sigma.K_{-1} \tag{3.13}$$

Capital stock (3.14) grows according to investiment and depreciation.

$$K = I + (1 - d_k)K_{-1} \tag{3.14}$$

Firms profit (F, equation 3.15) is determined by output, profit-rate and debt burden. Firms fund their investment (I) and profit distribution (FD_h and FD_f) with loans and undistributed profits (FU)[29].

$$F = \pi.Y - i_l.L_{f-1} - i_l^*.L_{-1}^* \tag{3.15}$$

Profit distribution (equations 3.16, 3.17 and 3.18) is determined exogenously represented by firms' retention rate (parameter s) and by the foreign equities' ownership β^*. The retention rate governs the relation between distributed and undistributed profit. For example, a lower retention rate represents a higher shareholder-value orientation, since it directs a higher share of profit for households and foreign owners.

$$FU = s.(\pi Y - i_l.L_{f-1} - i_l^*.L_{-1}^*) \tag{3.16}$$

Profit distributution end up with the distinction between international and domestic owners (3.17 and 3.18).

$$FD_h = (1 - \beta^*).(1 - s).F \tag{3.17}$$

$$FD_f = \beta^*.(1 - s).F \tag{3.18}$$

Equities emission (equation 3.19) responds to the firms' stock of capital and the propensity to issue equities (Ψ).

$$E = \Psi.K \tag{3.19}$$

Firms fund the investment with retained profits and equities emission and by contracting loans (L^d, equation 3.20). Loans are contracted to close the funding required for the investment and distribute profits to the shareholders. Additionally to the undistributed profits (FU), firms also fund by equities emission revenue.

$$L_f^d = I - FU - pe.\Delta E \tag{3.20}$$

Advancing from Bortz (2014), firms can contract loans abroad (L^*, equation 3.21), subject to the propensity to contract loans abroad (λ). A value close to the unit represents that the majority

[29] From Table 3.2 is possible see profit distribution explicitly ($F = FU + FD_h + FD_f$).

of the loans contract by domestic firms are issued abroad.

$$L^* = \lambda . L^d \tag{3.21}$$

$$L_f = L^d - L^* \tag{3.22}$$

Whenever the parameter λ decreases, a larger share of firms' demanded loans (L_f^d) are contracted with domestic private bands (L_f) instead of external funds (L^*). Therefore, λ description allows for emulating changes on the firm's external funding.

$$\lambda = lb_0 + lb_1 . i^* + lb_2 . (CFR - BUR_f) \tag{3.23}$$

$$CFR = \frac{FU}{Y}$$

$$BUR_f = \frac{(i_l . L + i_l^* . L*)}{Y}$$

The present model has an interlink mechanism connecting the firm's funding with the private bank's balance sheet (see equation 3.46). Therefore, the firm's decision regarding the source of funding exert a broader effect on the domestic economy.

External Sector

The domestic economy is assumed to exert a null effect on the rest of the world's performance, still open to international trade and subject to international capital flows. The foreign sector balance sheet has the currency reserves (R) held by the domestic Central Bank as the sole liability. The foreign sector invests in real assets (equities, E) and financial assets such as long-term bonds (BL) and private bank's bonds (B_{ba}), also domestic firms can contract loans abroad (L^*). The model assumes imperfect capital mobility and imperfect international assets substitutability. This implies the rejection of the self-correcting mechanism as devised in the Mundell-Fleming models, which means that international interest rate gaps do not necessarily enforce capital flows that restrain monetary policy under flexible exchange rates. In particular, money is endogenous and grants to the monetary authority control over the short-term interest rates. International interest rates differential might persist in a balanced steady-state situation, based on the national currencies´ liquidity discrepancy that has to be compensated. Exchange rates are normalized to the unit and assumed away, another prices complications arising from international prices, of imports and exports, are also minimized for the sake of simplicity.

The export (X) function responds exogenously to international economic growth (g_{row}), the imports (IM) are a function of the domestic output. Because the focus is on the short to medium-term transition there is no explicit reference to the balance of payments constraining growth. However, the description of international trade and the other balance of payments relations

influence result in a way that resembles the tradition inaugurated by Thirlwall (1979) without emphasizing the income elasticity of the terms of trade.

$$X = X_{-1}.(1 + g_{row}) \tag{3.24}$$

$$IM = \iota_0 + \iota_1.Y \tag{3.25}$$

Foreign sector invests in the equities (E^*, equation 3.26) and the bonds (BL^*, equation 3.27) domestic markets. International presence whitin those markets are determined by the foreign participation in the equities and bond markets (parameters β^* and ξ^*, respectively).

$$E^* = \beta^*.E \tag{3.26}$$

$$BL^* = \xi^*.BL \tag{3.27}$$

$$B^d_{ba} = B^s_{ba} \tag{3.28}$$

The current account (CA, equation 3.29) registers all the transactions between the domestic and the foreign economy. Besides net trade, this identity encompasses the internationally distributed profits (FD^*), foreign bonds (BL^*_{-1}), interests on loans ($i^*_l.L^*_{-1}$) and interests on private bonds ($i_{ba}.B_{ba-1}$).

$$CA = X - IM + i^*.R_{-1} - FD^* - BL^*_{-1} - i^*_l.L^*_{-1} - i_{ba}.B_{ba-1} \tag{3.29}$$

Following Godley and Lavoie (2006) the completeness of the foreign currency variations (ΔR), accounted by the Central Bank, requires the inclusion of the capital account (KA, equation 3.30).

$$KA = p_e.\Delta E^* + p_{bl}.\Delta BL^* + \Delta L^* + \Delta B_{ba} \tag{3.30}$$

Government

Government expenditure (G) is determined as a share of previous period capital stock and taxes consist of a share (γ) of domestic revenue.

$$G = \gamma.K_{-1} \tag{3.31}$$

Taxes (T, equation 3.32) are collected based on the domestic revenue according to the tax rate (θ).

$$T = \theta[(1 - \pi)Y + F_b + BL_{h-1} + i.D_{-1} + FD_h] \tag{3.32}$$

Interest on bonds (i_{bl}) are endogenous to the level of bond's prices (p_{bl}), following Godley and

Lavoie (2006, chapter 5) and more closely Pedrosa and Biancarrelli (2015).

$$i_{bl} = \frac{1}{p_{bl}} \tag{3.33}$$

The bond issuing (ΔBL) is designed to maintain the bond's prices within a certain range.

$$BL^s = BL_{-1}.(1+g_{bl}) \tag{3.34}$$

Whenever bond's prices (p_{bl}) are outside the boundaries (p_{bl}^{min} and p_{bl}^{max}) the government responds by changing bonds' issuing rate (g_{bl}). The foreign sector investment in domestic bonds impacts the interest of those bonds, which in turn affects the whole economy through households' portfolio allocation.

$$p_{bl} = \frac{\delta_{bl}(Vh_{-1}+L_h)}{(1-\xi^*)BL} \tag{3.35}$$

$$g_{bl} = \begin{cases} \dfrac{\delta_{bl}(Vh_{-1}+L_h)}{(1-\zeta)p_{bl}^{max}BL_{-1}} - 1, & \text{if } \dfrac{\delta_{bl}(Vh_{-1}+L_h)}{(1-\zeta)BL_{-1}(1+g_{y-1})} \geq p_{bl}^{max}; \\ \dfrac{\delta_{bl}(Vh_{-1}+L_h)}{(1-\zeta)p_{bl}^{min}BL_{-1}} - 1, & \text{if } \dfrac{\delta_{bl}(Vh_{-1}+L_h)}{(1-\zeta)BL_{-1}(1+g_{y-1})} \leq p_{bl}^{min}; \\ g_{y-1}, & \text{otherwise} \end{cases} \tag{3.36}$$

The government sector savings (equation 3.37) consists of a deficit by assumption. The only stable source of revenue consists of taxes since the central bank automatically transfers profits or losses.

$$SAV_g = T - G + F_{cb} - i_{b_{-1}}.B_{-1} - BL_{-1} \tag{3.37}$$

Therefore, bills are issued ($\Delta B = B_{-1}$) to finance government deficits, closing the governmental fiscal budget.

$$\Delta B = B_{-1} - SAV_g - p_{bl}.\Delta BL \tag{3.38}$$

Central Bank

Central Bank holds foreign currency (equation 3.39) according to the cumulated values of the current account (CA) and the capital account (KA).

$$R = R_{-1} + CA + KA \tag{3.39}$$

Profits or losses (F_{CB}, equation 3.39) are distributed to the government.

$$F_{CB} = i.B_{cb_{-1}} + i^*.R_{-1} \tag{3.40}$$

The short-term interest rate level is achieved due to the market-clearing function exerted by the central bank. That is, the central bank is responsible for enforcing the interest rate on bills (i_b) by absorbing the outstanding bills not acquired by the households (B_{cb} equation 3.40).

$$B_{cb} = B - B_{bk} \tag{3.41}$$

Private Banks

Within the SFC tradition, the domestic financial system is often simplified, resembling a portrait of the banks in the 1970s, accommodating the demands of the private sector and relying on a limited class of agents and assets, as noted by Taylor (2008). Rebuilding these simplifications would increase the complexity of the analysis to a degree that the development of elements other than the domestic financial system would be impracticable and exceed the scope of this paper. Notwithstanding, the present work advances on the task of enhancing the realism of the financial sector in the SFC model by improving some aspects that are related to the purpose of this analysis. Our focus is on private banks‘ stylized securitized system and the possibility of firms for also funding abroad. Private Banks supply the demand for household deposits (equation 3.42) and also provide funding (L^s, equation 3.43) for firms and households as demanded.

$$D^s = D^d \tag{3.42}$$

$$L^s = L_h + (L_f^d - L^*) \tag{3.43}$$

Advancing from Meijers et al. (2015) private banks issue their own loans abroad. Because of the international interest rate gap, on the assumption that exist a interest rate structure that arose from institutional factors ($i_b > i_b a > i^*$)(ANDRADE; PRATES, 2013), all private bank's bonds supplied are absorbed by the foreign sector.

$$B_{ba}^d = B_{ba}^s \tag{3.44}$$

The Bank Liquidity Ratio (BLR, equation 3.44), is defined in line with Godley and Lavoie (2006, Ch. 11). It represents an approximation to the bank's asset-liability ratio. This distinction might be useful to unveil the determinants of changes in BLR.

$$BLR = \frac{L^s + B_{bk}}{D + B_{ba}} \tag{3.45}$$

Precisely, the BLR indicator consists of an aggregate measurement that includes traditional banking (BAR_t) and securitized banking asset-liability ratio, respectively, the former is used in the result section as an indication of leverage and fragility for private banks. The private bank's bond issuing is designed in two different ways, resulting in two different versions of the model. Equation 3.46a advances the emergence of the private bank's bond issuance. In normal times, a

private bank's bonds correspond to a fraction of the loan supply ($\tau_{ba1}.L^s$).

$$B_{ba} = \tau_{ba1}.L^s \tag{3.46a}$$

The BLR expression is also transformed to endogenize the private banks' bond issuance (equation 3.46b). The second form for the private bond issuance is achieved by rearranging the equation 3.46b and setting the BLR^T value as the targeted value for the BLR. Therefore, implying that changes that emerge from the traditional banking branch, via deposits or loan supply, affect the securitized branch of banking. This specification is used to represent the mature securitization system, in which private banks' bond issuing assumes the value necessary to achieve the targeted threshold of the overall liquidity ratio.

$$B_{ba} = \frac{L^s + B_{bk}}{BLR^T} - D \tag{3.46b}$$

Finally, the completeness of the securitization process is achieved with the mechanism that backs the private bond issuance by domestic indirect support from the government sector, via the market for bills. The repos in the present model take the form of bills that are held for private banks (B_{bk}), to finance a share of their outstanding deposits and also to match the bond issuing (equation 3.47). The private bank's reliance on the repo market emulates the private ability to transfer a share of their liability burden to the government sector.

$$B^d_{bk} = \tau_{bk1}.D + \tau_{bk2}.B_{ba} \tag{3.47}$$

Private Banks' profits (or losses) are automatically transferred to the household sector as a fraction of the financial income of the capitalists.

$$F_B = i.B_{bk_{-1}} + i_l.L^s_{-1} - i_d.D_{-1} - i_{ba}.B_{ba-1} \tag{3.48}$$

The following section presents the model solved via numeric simulation and also some comparative dynamics exercises.

3.2.1 Experiments

The model is subject to numerical simulation to evaluate dynamic properties with a focus on external vulnerability and macroeconomic performance of a foreign induced cycle. Two experiments are designed to capture the minskyan aspect of the international financial cycle, the first emulating the surge phase and the second the burst phase of the international financial cycle. Results are dependent on the parameters and initial values of the variables, therefore, they represent a single solution out of the universe of other possibilities. Hence, the implications are to

illustrate a given phenomenon on the grounds of a plausible set of economic assumptions. Each experiment is composed of three scenarios, encompassing the perspectives of the international interest rates, the foreign investment, and plausible domestic responses to each phase of the cycle. Additionally, each experiment differs on the specification for the private banks' bond issuing. The private interconnections concerning international indebtedness consist of the main locus of the analysis.

Experiment I emulates the surging phase of the cycle, with the increasing international liquidity affecting the demand for domestic financial assets. The private bank's bonds issuance responds passively to the changes on the total supplied loans (Equation 46a). Therefore, the scenarios reflect this phase of the cycle. There is an increase in the influx of foreign capital (Scenario *b*), a decrease on foreign interest rates (Scenario *a*), and, as a domestic response, firms' choose to increase the equities emission (Scenario *c*). Experiment II consists of the reversion of the international liquidity cycle, which manifests in a foreign interest rate increase (Scenario *a*), a capital flight (Scenario *b*), and regulation on private banks (Scenario *c*). Additionally, private banks install a benchmark-oriented international bond issuing mechanism, that is more sensitive to firms' funding distribution. The new specification for the bond issuance uses a targeted value for the Bank Liquidity Ratio which also encompasses the securitized branch of the banking sector (Equation 46b). The following table shows the fundamental distinctions between the two experiments.

Table 3.4: Experiments

		Experiment I		Experiment II	
Bank's bond issuing		$B_{ba} = \tau_{ba1}.L^s$		$B_{ba} = \frac{L^s + B_{bk}}{BLR^T} - D$	
	Scenario	Baseline	Shocks	Baseline	Shocks
International Liquidity	a	i^*=0.002	i^*=0.0015	i^*=0.002	i^*=0.0025
	b	β^*=ξ^*=0.5	β^*=ξ^*=0.6	β^* =ξ^*= 0.7	β^*= ξ^*= 0.6
Domestic Response	c	Ψ_a = 0.05	Ψ_a = 0.07	BLR^T = 1.1	BLR^T = 1

The results as displayed in four graphs for each experiment. Figures 3.3 and 3.7 accounts for the firms' performance indicators (cash-flow ratio and financial burden), Figures 3.4 and 3.8 for the firms' debt profile (foreign share of loans, total demand for loans, and foreign demand for loans), Figures 3.5 and 3.9 show the private bank's indicators, bank's profitability is collated with the bond issuing mechanism and balance-sheet composition. Figures 3.6 and 3.10 present the external vulnerability indicators. Four indicators are adopted to evaluate external vulnerability. Following the traditional external vulnerability literature, the international reserves and the gross external liabilities are considered. The private external debt is included for accounting as a new form of external vulnerability[30]. At last, the Central Bank remittances for the Treasury

[30]Precisely, the PED correspond to $B_{ba} + L^*$ and the Gross External Liabilities account for $B_{ba} + L^* + E^* + BL^*$.

are considered.

Experiment I: High international liquidity

Experiment I emulates the surging phase of the international liquidity cycle to the EME. These channels consist of FDI and investment on bonds, governed by the parameters β^* and ξ^*, respectively[31]. Also, the decreasing foreign interest rate (i^*). Additionally, the domestic economy interacts with the foreign cycle by increasing the equities' emission rate (Ψ_a) during de ascendence. During this surging phase of the cycle, the private banks' bond issuing is assumed to respond to changes in the supply of loans (Equation 3.46a). Figures 3.3 and 3.4 present some of the results for the firms. Firms' profitability results, cash-flow ratio, and financial burden show a better performance for all the scenarios. The foreign interest rate decrease scenario benefits the firms the most, followed by the capital inflow scenario. The permanent increase in the equities emission effects installed is only temporary. All the scenarios translate to a lower financial burden and also an increase in the cash-flow ratio due to the increase in total profits.

Figure 3.3: Experiment I: Firms' Performance Indicators

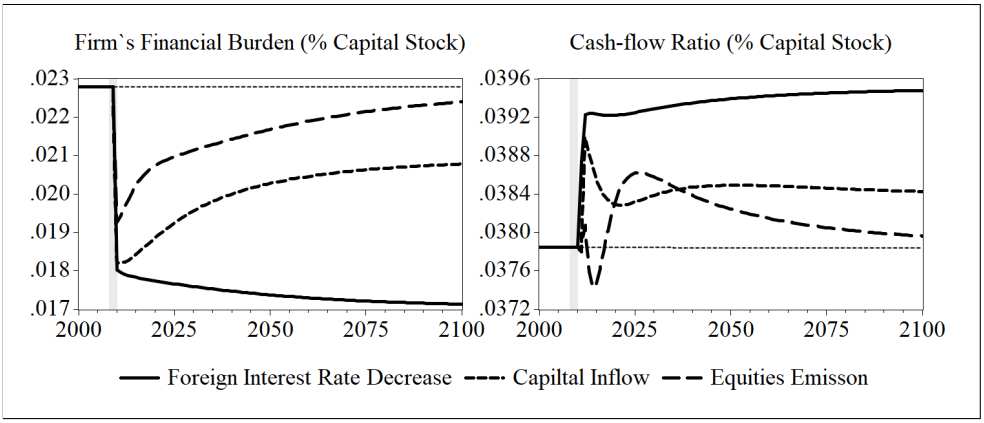
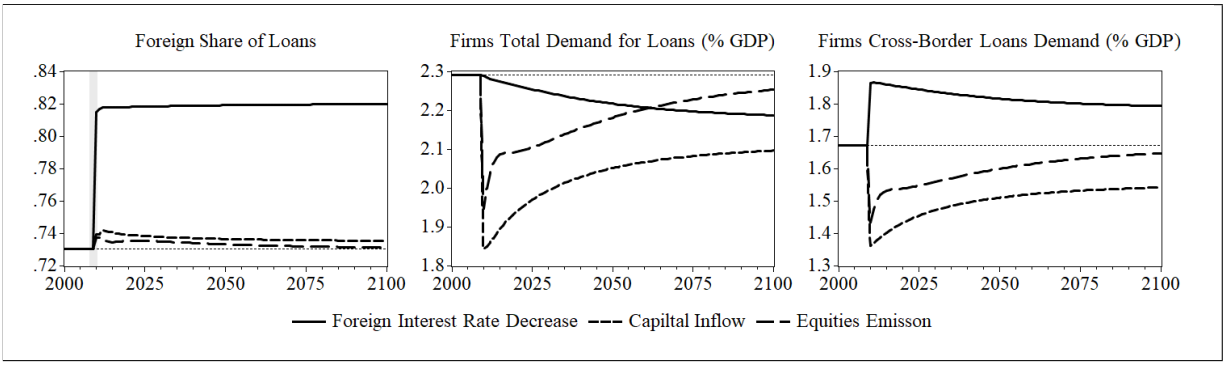


Figure 3.4: Experiment I: Loans demand and cross-border loans



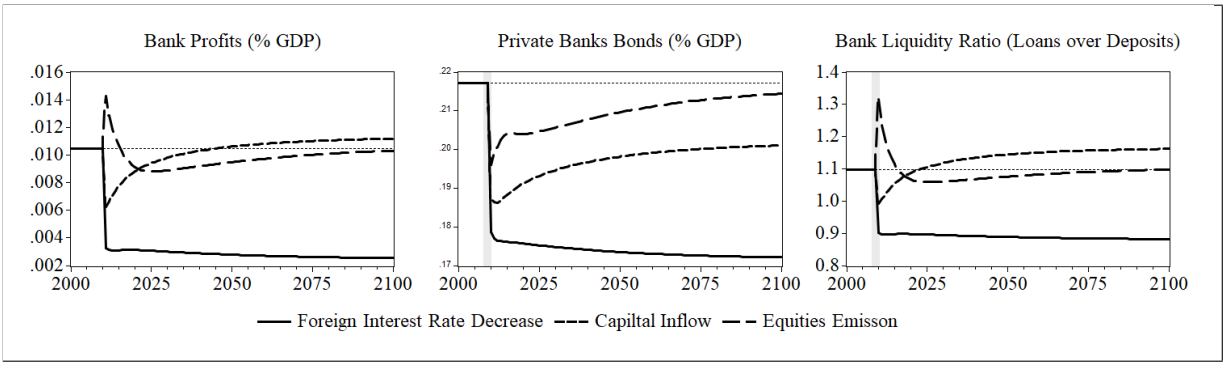
Firms' results suggest that the expansionary phase of international liquidity might lead to positive performance for the productive sector. The resulting increase in profitability is represented

[31] Following Pedrosa and Biancarelli (2015).

by the cash-flow ratio, which is derived from the declining financial burden. This is caused by the composition and costs of the outstanding loans since the domestic interest on loans is relatively higher. Figure 3.4 shows that the better performance of the firms is mainly due to the lower costs of foreign loans and higher profitability. Also, Figure 3.4 shows that lower foreign interest rates lead to permissive foreign borrowing for domestic firms (higher λ, equation 3.23). Due to the increase in profitability, represented by the higher cash-flow ratio for all scenarios in Experiment I, firms' needs for funding decreased. Consequently, the financial burden is also lower. The international interest rate decrease scenario is the only which couple a lower total demand for loans with a higher cross-border loan level. This discrepancy is due to the abrupt increase in international loan allocation.

Whilst, at first glance, the firms' loan allocation solely affects financial performance internally, some important changes take place in banks' balance-sheet. Private banks' balance-sheet is composed of deposits plus central bank bills on the asset side, and loans and private bonds on the liability side. Therefore, when firms change loan denominations a simultaneous response occurs within private banks' balance sheets. Some of these relations are displayed in Figure 3.5.

Figure 3.5: Experiment I: Private banks performance and bond issuing

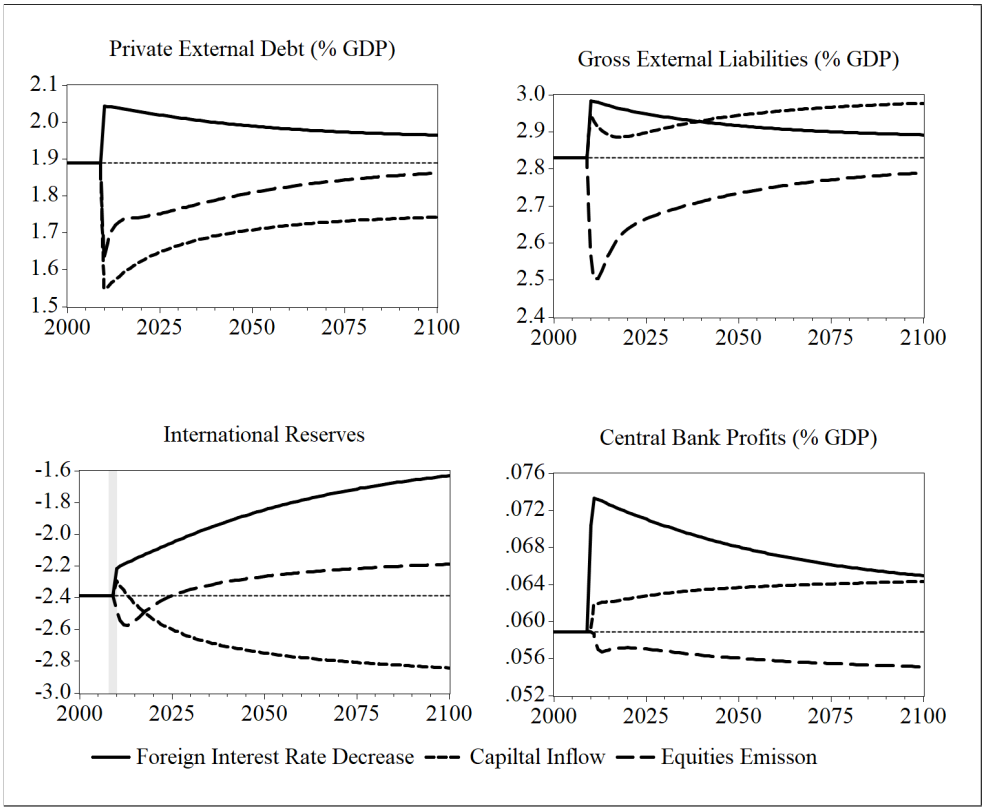


Private banks' financial performance depends primarily on their balance sheet composition. Figure 3.5 shows how the bank's liquidity ratio determines the banks' profitability. Declining demand for domestic loans causes a negative variation on banks' liquidity ratios and, consequently, on banks' profitability. Since private bond issuing follows the total loan supply, therefore, private banks' foreign debt is related to firms' domestic demand for loans (firms' total demand for loans minus firms' cross-border loans) plus the household demand for loans. Reducement of firms' external debt may stimulate private banks to engage in bigger and more costly international private debt. Figure 3.5 also shows that all scenarios on the ascendant phase of the international cycle lower the banks' bond issuing, due to the decrease in the loan supply. Nevertheless, the foreign interest rate decrease is the only scenario that installs a negative effect on bank profits. The discrepancy between bond issuing and the liquidity ratio is due to the household deposits, which presents permanent decreases for all the scenarios. In sum, the surge

in international liquidity affects the domestic financial sector positively.

External vulnerability indicators are presented in Figure 3.6. The ascendance phase of the international cycle does not induce a generalized improvement for the external vulnerability indicators. Instead, because of the private external debt interconnection and the effect of the capital inflow on the overall external liabilities, the opposite occurs.

Figure 3.6: Experiment I: External Vulnerability indicators



Private external debt increases when the foreign interest rate decreases (Scenario *a*) (Figure 3.6). Since the private bond issuing decrease in all three scenarios (Figure 3.5), the rise in private external debt is credited to firms' cross-border loan allocation (Figure 3.4). The inflow of capital (Scenario *b*) increases gross external liability, suggesting higher external vulnerability. Additionally, the capital inflow leads to a worse situation for the international reserves deficit, due to the higher remittances to foreigners. Increasing the equities emission rate (Scenario *c*) is the only case conveying to a lower private external debt and external liabilities. Nevertheless, because private banks' bond issuing process is backed by the reliance on central banks' bills, used as collateral and source of funds. A higher share of the costs of these practices is reverted to the Central Bank and consequently to the Government. Therefore, a negative correlation is expected between the banks and the central bank's profits. Figures 3.6 and 3.5 reveal that this negative correlation holds, except for the capital inflow scenario.

Experiment I suggests that a positive stimulus from the foreign sector might lead to domestic

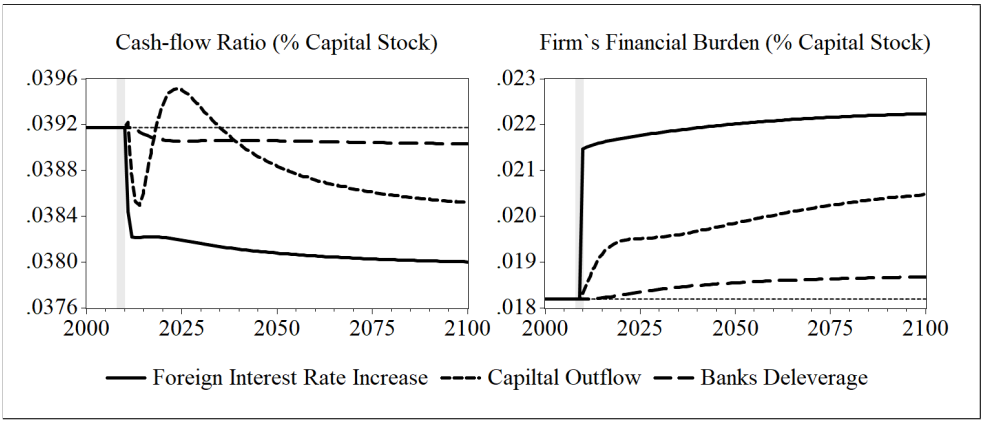
fragility and external vulnerability. A negative correlation is observed for the private profitability, denoting that the ascendant phase of the international cycle benefits firms at the expense of a worse performance of the banks. Gross external liability increases in two out of three scenarios and private external debt are either neutral or negatively related to the foreign stimulus.

Experiment II: Lower international liquidity

Experiment II extends the investigation by emulating a descendant phase of the international liquidity cycle. Therefore, instead of a foreign interest rate decrease, an increase is observed (Scenario *a*), and, instead of a capital inflow, a capital flight is registered (Scenario *b*). The domestic reaction corresponds to a capital regulation aiming to deleverage private banks' asset-liability ratio (Scenario *c*). Coupled with this experiment a developed version for the private bank's foreign bond issuing is assumed, with the bond issuing responding to the liquidity ratio and capital regulation.

The firms register a decrease in profitability in all three scenarios (Figure 3.7). A higher financial burden decreases the profit rate, causing a permanent decrease in the cash-flow ratio.

Figure 3.7: Experiment II: Firms' Performance Indicators



Firms' funding decisions that cause changes in profitability are shown in Figure 3.8. The firms' total demand for loans permanently increases in all cases, due to lower profits and consequent higher funding needs. The higher demand for loans causes the increase of the cross-border loans to demand, except for Scenario *c*, due to the intense retrenchment toward domestic funding caused by the higher international interest rates. The capital flight scenario registers the higher increase in the total loan demand because of the negative effect that the capital outflow exerts on equities valuation (equation 3.8).

Figure 3.8: Experiment II: Loans demand and cross-border loans

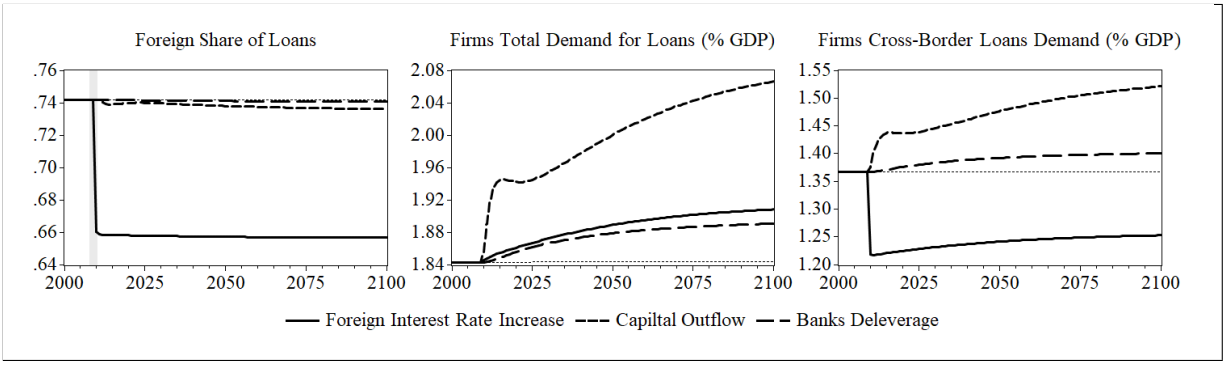


Figure 3.9 shows the private bank‘s indicators. The interest rate increase scenarios disclose the higher increase for banks' profits, despite the higher increase of bond issuing, mainly due to the increase of the loan over deposits ratio. The worst performance for the private banks' profits is registered in the regulation scenario (Scenario *c*). To control possible excessive domestic lending, monetary authorities anticipate imposing a lower bank liquidity ratio on banks. Interestingly, the resulting loan-to-deposit ratio increases instead of decreasing. Because loan supply increase is coupled with the households' deposits decrease the result is lower profits despite the increased asset side of the balance sheet. This conflicting result is due to the mature securitized bond issuing process (devised by equation 3.46b). The private bank bond issuing now acts as a buffer, and instead of controlling loan supply, the result of a lower targeted asset-liability ratio is increasing bond issuance. Therefore, the securitized branch of banking led to the disconnection of the overall bank liquidity ratio with the traditional branch of banking liquidity ratio. That is, the regulation attempts affect the traditional branch of banking in an unwanted way and have collateral effects on the securitized branch of banking.

Figure 3.9: Experiment II: Private banks performance and bond issuing

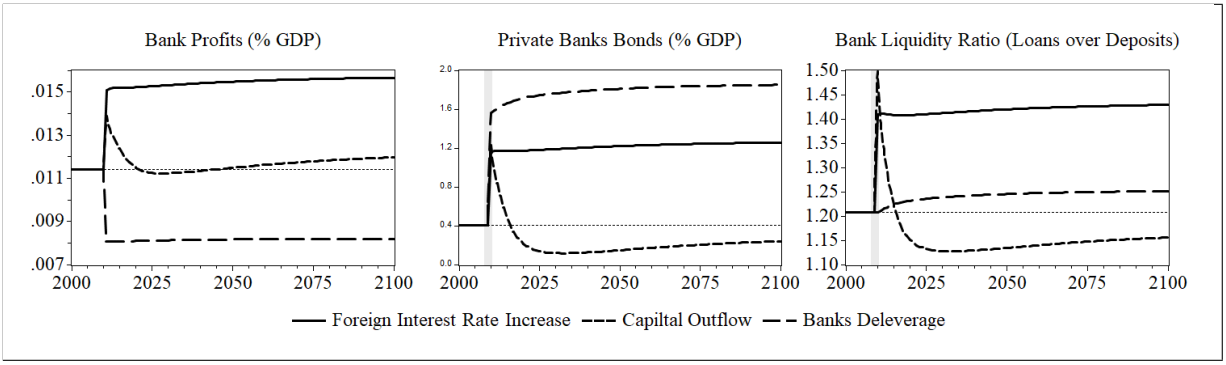
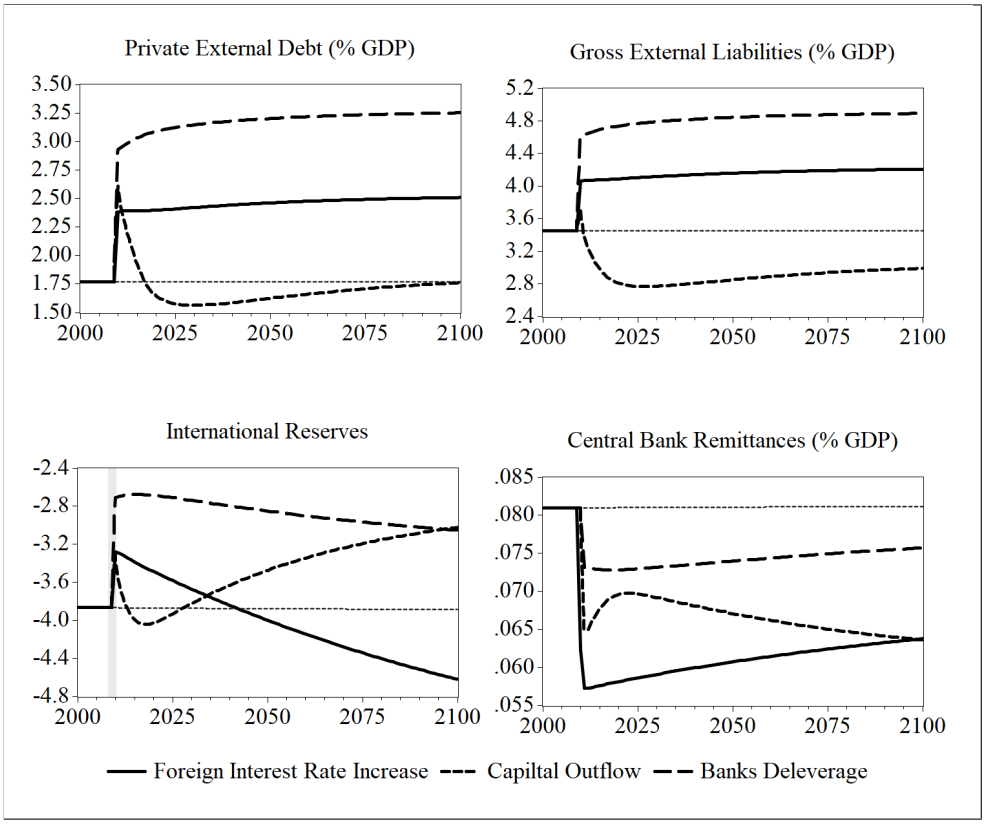


Figure 3.9 displays that the capital flight scenario causes an increase in household demand for deposits, which implies a decrease in the bank's loan over deposits ratio. Consequently, capital flight (Scenario *b*) is the only scenario causing a decrease in private bank bond issuance. The external vulnerability indicators show how the descendant phase of the international liquidity

cycle might lead to a more fragile position. Figure 3.10 shows that the interest rate decrease causes an increase in external vulnerability according to all the indicators.

Figure 3.10: Experiment II: External Vulnerability indicators



The capital outflow scenario (Scenario *b*) does not have the expected effect of enforcing a robust decline in external debt, instead, the private external debt level maintains constant. Despite the sharp decline in cross-border loans (Figure 3.8), both the gross external liabilities and the private external debt increase in this scenario (Figure 3.10). The reason behind this is the private debt interlinkages, connecting firms, and banks' external indebtedness, which forces banks' external debt to go up when firms' foreign loans decrease.

The international interest rate increase scenario (Scenario *a*) is the most harmful for international reserves, because of the effects on the international financial accounts. Finally, the intent of regulating the loan supply (Scenario *c*) leads to the worst level of private external debt and also to the gross external liability, because of the strong reaction of the securitized branch of banking. Therefore, a domestic regulation aiming at stability has the opposite effect when it comes to external vulnerability. The experiment of descending international liquidity shows that the interest rate transmission channel benefits the banking sector at the expense of the firm's sector financial performance. Attempts to regulate bank liquidity might have the opposite effect on the balance sheet and also produce harmful effects for both banks and firms.

3.3 Conclusion

This paper has investigated the EME's private sector interlinkages and the consequences that the international liquidity cycle exerts on external vulnerability and domestic macroeconomic performance. In general, the findings suggest that the firms' and the private banks' external debt are connected by the securitized banking system and these links might lead to higher external vulnerability. Precisely, the replacement of firms' external debt may stimulate private banks to engage in even bigger and costlier international private debt. Even the ascending phase of the international liquidity might lead to the jeopardizing of domestic economic performance and external vulnerability. Firms and Private Banks have contrasting performances depending on the phase of the cycle. Whereas the productive sector suffers from a higher debt burden on the expansionary phase of the cycle, the financial sector experiments a better performance. These results suggest the existence of a dispute within the domestic private sector, for benefiting from the cycle ascendance and avoiding the losses during the decline.

The paper has contributed to providing a framework dedicated to private external debt analysis. Additionally, this paper has provided relevant insights for understanding the implications of international finance to aggregate demand and economic growth. The volatile nature of international capital is revealed to jeopardize an EME's domestic private sector, both in the ascendence and in the downturn phases. International arbitrage was considered a relevant factor for explaining the external vulnerability from the perspective of the private sector, due to the foreign international interest rate consisting of a dominant driver of cross-border loans. Because the private banks bond issuing relied strongly on the public bond markets, an increase in banks' profitability caused higher costs for monetary policy and lower central bank remittances. Therefore, securitization is a private mechanism capable of draining public resources toward the domestic and foreign private financial sector. Moreover, capital controls are inefficient to curb external vulnerability, depending on the institutionality of the domestic private financial sector.

The research has highlighted the importance of dealing explicitly with the EME features and also the disruptive potential of financial innovation. Naturally, the present analysis is not total and further developments are promising. Exchange rate complications consist of a notable topic for advance, alongside the more detailed description of the securitized banking system. A further description of the influence that international finance exert on domestic finance is also encouraged.

Appendix - Chapter 3

Parameters: in order of appearence

Parameter	Value	Parameter	Value
α_1	0.9	γ	0.08
α_2	0.06	lb_0	1
λ_0	1	lb_1	15
λ_1	10	lb_2	2
ε_0	0.4	g_{row}	0.035
ε_1	1	ι_0	1
δ_0	0.4	ι_1	0.25
δ_1	1	δ_{bl}	
υ_0	-0.07	$\tau_{ba}1$	0.2
υ_u	0.12	$\tau_{bk}1$	0.7
υ_π	0.1	p_{bl}^{min}	14.28
μ	0.6666	p_{bl}^{max}	33.33
π	0.4	ζ	0.5
σ	0.4	i_b	0.032
β^*	0.5	i_{bl}	0.037
ξ^*	0.5	i^*	0.020
s	0.3	i_l	0.039
θ	0.24	i_l^*	0.022
χ_{bl0}	0.1	i_a	0.035
χ_{bl0}	1	i_d	0.027

Appendix - Chapter 3

Parameters: in order of appearence

Parameter	Value	Parameter	Value
α_1	0.9	γ	0.08
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δ_0	0.4	ι_1	0.25
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υ_π	0.1	p_{bl}^{min}	14.28
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σ	0.4	i_b	0.032
β^*	0.5	i_{bl}	0.037
ξ^*	0.5	i^*	0.020
s	0.3	i_l	0.039
θ	0.24	i_l^*	0.022
χ_{bl0}	0.1	i_a	0.035
χ_{bl0}	1	i_d	0.027

4 The effects of financial investment, profit distribution and liquidity on accumulation

Abstract

The present essay evaluates how changes in liquidity and new opportunities for financial investment affect firms' accumulation and distribution. A stock-flow consistent model formalizes a novel framework for investigating the relationship between capital accumulation and financial investment. The model advances firms' portfolio allocation including the possibility of investing in financial assets. Precisely, experiments are devised regarding the propensity to invest in financial assets, retention rates, and liquidity. The crowd-out hypothesis of accumulation due to the investment in financial assets is assessed through the broader lens of the increasing risk principle. Simulations reveal the financial mechanisms driving the firm's portfolio allocation under funding constraints. Results confirm that investment in financial investments and shrinking liquidity enforce negative effects on accumulation and growth, suggesting that the increased risk principle is a major determinant of the negative correlation between leverage and investment.

Keywords: Financial investment, increasing risk principle, accumulation.

4.1 Introduction

The effects that the financial market exerts on investment consist of a disputed topic, even more in the last decades, when financial development has induced changes in the financial behavior of non-financial corporations. The preference for short-term returns, higher liquidity, combined with the possibility of capital gains over fixed capital has led to institutional changes within the non-financial private sector. Short-termism strategy combined with deregulated financial markets contributed to changes in investment behavior, with consequences to growth and distribution. Two aspects emerge when considering the relations of financial investment with capital accumulation. First, the funding constraints, related to the financial frontier literature and with Kalecki's increasing risk principle (IRP) (KALECKI, 1971). Second, the portfolio theory of investment (TOBIN et al., 1965), when considering funds allocation altogether, given the return rates, liquidity, and the possibility of capital gains. The work suggests that the argument denying the financial crowd-out of accumulation due to financial motives or changes in liquidity often relies on the assumption of unlimited external funds. Based on Kalecki's increasing risk principle we argue that a shortage of external funds is likely to emerge, not just by the lender's willingness to supply new credit, but also due to a firms' self-impositions. This work provides an illustrative example of the mechanics behind this discussion using an SFC model.

Financial development in a Minskyan sense derives from the notion that financial innovations are a potential source for deregulation and financial fragility. Barely regulated financial markets

contribute to the fragility that arises from the tendency of agents to ignore such fragilities during a period of surging liquidity (MINSKY, H. P., 1992). The debate regarding the effects of new financial opportunities and investment traces from works such as Fazzari and Mott (1986), the relationship between investment in financial assets and capital accumulation depends on the financial market conditions plus the firms' endogenous decisions. Internationally, countries diverge on the type and level of development of financial institutions. Domestically, firms face differences in funding options, due to size, the performance of financial indicators, and risk perception. The higher liquidity on financial assets balances the higher yield presented by real venues.

The development of the financial sector in recent decades increased the awareness regarding the detrimental effects that finance exerts on accumulation and growth. The literature dedicated to explaining these institutional changes, notoriously, the crowd-out of the investment emerged claiming that the diversion of funds from accumulation to the acquisition of financial assets (ORHANGAZI, 2008). Presently, an entrenchment is observable in two competing views. The optimistic view of finance-led growth advocates that the financial markets have facilitated portfolio decisions by providing accurate information and diversification of opportunities (BOYER, 2000; KING; LEVINE, 1993; BECK et al., 2014). A more pessimistic view rather focus on the negative effects of increasing financial opportunities have caused in investment due to diversion of funds (ORHANGAZI, 2008; DEMIR, 2007; TORI; ONARAN, 2018).

Among the several implications of financial development to the macroeconomic level, the present work focuses on the harmful effects on capital accumulation. To circumvent the extensive scope of the term "financialization" we follow Davis (2017a) classification of the literature according to the respective empirical indicators. This approach leads to three main strains. First, the asset side of the balance sheet and financial sources of income (STOCKHAMMER, 2004; KRIPPNER, 2005; DEMIR, 2007; DEMIR, 2009b; ORHANGAZI, 2008). Second, the liability side of balance sheets and financial payments (TREECK, 2009; MASON, 2015; KLIMAN; WILLIAMS, 2015). Third, the shareholder-value orientation (STOCKHAMMER, 2004; MASON, 2015; ORHANGAZI, 2008; TREECK, 2009).

At this point, is important to remark how the increasing risk principle differentiates from the broader process of financialization. The most usual definition of financialization is the increasing importance of financial practices and financial motives in business (EPSTEIN, 2005), frequently targeting higher profits and avoiding committing to an illiquid investment. On the other hand, the IRP stands for a theoretical assumption that firms are likely to avoid over-indebtedness. Therefore, higher external funds are seen as a source of risk, compelling firms to contain the use of funds, including accumulation. In essence, the IRP encompasses the notion of limited external funds to the concept of liquidity preference.

This essay discusses the effects of financial investment and liquidity on capital accumulation.

Employing a stock-flow consistent framework, the focus is on the long-term consequences of the firms' short-term decisions regarding portfolio allocation subject to the profit rate, the retention rate, and the funding constraints. Ultimately, an examination of the effects of financial investment, and decreasing liquidity, have on accumulation and growth is carried out. The literature financial frontier is critically reassessed and reconciled tenets with the portfolio theory of investment and with the increasing risk principle. The "profit-growth puzzle" is condensed to the increasing risk principle, thus connected to the portfolio view of the investment. Leverage tolerance, profit rate, and distribution consist of other relevant aspects of firms' financial behavior considered in the present analysis. A formalization for firms' investment in financial assets is devised, encompassing a complete set of integrated institutional sectors which determines a long-term solution, unfolding from cumulative short-term systemic interactions.

The stock-flow consistent framework is the most suitable option for the present study, because of the intrinsic relation between real and financial assets and the intrinsic path-dependent mechanics designed to traverse analysis. This is in line with the point made by Fernando Carvalho (1984), for focusing on the motion, not in the states. Another advantage relies on sectoral connections and interdependence, which allows for exploring a wide range of aspects, such as household wealth and distribution, private banks' leverage and liquidity, central bank's monetary policy enforcement, and public deficits. We formalize how changes in firms' financial behavior unfold and cause widespread institutional consequences to the economy. The present work contributes to this modeling tradition by encompassing a novel perspective for the financial sector, developing the possibility for firms' financial investment, a new function for accumulation [32].

Experiments regarding the propensity to invest in financial assets and retention rates are conducted to examine the firm's portfolio allocation under funding constraints. Kalecki's increasing risk principle is collated with some traditional manifestations of financialization, revisiting the debate on the importance of internal funds and external funds to sustain investment levels. The results provide illustrative exercises for many theoretical claims related to the declining accumulation due to financial motives. Particularly, the investment registers a decrease after the increase of investments in financial assets, and also after the increase in the distribution of profits to shareholders. However, the mechanics leading to these results derive from the increasing risk principle rather than to other diversionists or distributive motives. In other words, our work suggests that profit diversion or higher shareholder-value orientation does not crowd-out investment directly, instead, those phenomena are relevant because ultimately affect firms' leverage, contributing to higher risk perception and leading to measures for curbing this risk.

Advances to the literature are made by merging the concept of the financial frontier with the portfolio view of the investment, and the firm's governance regarding profit distribution. A

[32] However, we still rely on a simplified description of the financial system, regarding the myriad of participants and assets that characterizes contemporary capitalism, as noted by Taylor (2008).

novel macrodynamic framework is developed to assess the relationship between financial development, growth, and distribution. Also, the debate regarding the harmful effects of finance on investment is critically reassessed. Moreover, the analysis addresses a new macroeconomic description for the surge in financial assets based on the firm's behavior regarding investment and funding. In a nutshell, the present investigation considers that firms' investment decision relies simultaneously on growth, generating future cash-flows that sustain this expansion, and are restricted by the funding conditions. Disentangling the mechanism that causes capital accumulation requires a close examination of how the firms allocate their portfolio, fund operations, and distribute dividends. Capital accumulation, investment in financial assets, profit distribution, and funding conditions consist of the main components for this analysis.

The rest of the paper is structured as follows. In Section 4.2 the literature on financial development and investment is critically revised, collated with the empirical evidence that sustains the debate. Section 4.3 discusses the main features of a framework that encompasses the effects of financial investment on capital accumulation. Section 4.4 advances with the dynamic simulation experiments regarding the effects of financial assets on investment. The final section comments on the main results.

4.1.1 Financial Opportunities, Increasing Risk Principle and Investment

The present section combines the financial frontier and the portfolio view of the investment, thus, reassessing the factors that determine a firm's investment and capital accumulation and further the possible impacts of increasing financial opportunities. The financial frontier (WOOD, 1975) emphasizes the relationship between profits, funding growth concerning the firm's objectives. Recent works have investigated how an increasing share of financial investment impacts a firm's expansion frontier (DALLERY, 2009), but, with a dominant focus on changes in firms' behavior.

Scholars have been relating profit and growth since the Cambridge equation, which echoed in Kaldor's neo-Pasinetti theorem. This literature leads to the financial frontier hypothesis and further developments, which encompassed other relevant elements, such as investment in financial assets and leverage costs. Internal funds represent an important factor in determining investment function, which has significant support from the evidence (FAZZARI; HUBBARD, et al., 1987; HUBBARD, 1997; BLUNDELL et al., 1992; BROWN et al., 2009). Recent studies have emphasized the link between financial opportunities and investment explicitly. Orhangazi (2008) pioneered the econometric estimations of financialization effects on investment. Demir (2009b) and Demir (2007) explored econometrically the portfolio view of the investment when comparing the influence of the return rate gap between fixed capital and financial assets on the investment function. Dallery (2009) advanced a useful version for the present investigation integrating investment in financial assets, new equities issued, new loans, and interest on loans.

Regarding the long-term strategy, post-Keynesian firms seek to ensure their existence by expanding power measured by growth. Therefore, profitability consists of a mean, or a prerequisite to ensure growth, as the profits ease the financial constraints on accumulation (WOOD, 1975). This is a clear distinction from the mainstream theory tenet of profitability as the only goal pursued by firms (GALBRAITH, 1967). Wood (1975) financial frontier hypothesis has identified a potential trade-off between profitability and growth, as to indicates the maximum growth rate that an individual firm can achieve with a given profit rate.

Stockhammer (2004)'s "profit-grow puzzle" advances upon the financial frontier theory by introducing financial-induced changes in firms' governance. This literature argues that financialized capitalism induced changes in corporate behavior, which had traversed from a growth-biased to a profit-biased strategy. The argument is that firms' governance shifted to accommodate the increasing dominance of the shareholder over the managers, favoring a rentier behavior. These alleged changes led to the rise of the financialized firm, to detriment of the typical Galbraithian view of the firms that focus mainly on growth rather than exclusively on profitability (GALBRAITH, 1967).

More generally, the profit-growth puzzles and the crowd-out argument are placed under the broad agenda of "financialization". The seminal contributions on financialization relies on Crotty (2005), Stockhammer (2004, 2005), Boyer (2000) and Aglietta and Breton (2001), among others. The most used definition of financialization is presented by (EPSTEIN et al., 2005), which is characterized by increasing financial practices and financial motives. The diversity of measures due to this broad definition contributes to challenging financialization as unifying literature. Financialization is related to a variety of research topics: household credit, an increase of financial flow, central bank policy focused exclusively on prices, owners increasing influence on corporate governance, and increasing leverage. According to Van der Zwan (2014), this concept encompasses the following features: accumulation subordinated to financial motives, the corporate ideology of the shareholder-value orientation and, the spread of financial practices. Epstein et al. (2005) argue that the "financial motives" have emerged as a driving force in business, crediting the ongoing institutional changes in finances to behavioral reasons. Firms started to engage in financial activities not just for a supportive reason [33], rather, Epstein et al. (2005) argues on the rise of active finance, with financial venues consisting of a significant share of a non-financial corporation operation. This work pays closer attention to the tenets of production and funding according to the post-Keynesian theory of the firm, therefore, stepping back to the roots of the financialization agenda.

Shareholder-value orientation is interpreted as a shift in corporate governance, from managers to owners. Within this view, growth becomes secondary as higher profit distribution becomes

[33] Supportive finance notion derives from Robinson (1952) and assembles passive financial activities that support the main business. Activities such as complement of directed credit and insurance and equipment leases can be cited as an example.

the main goal to be pursued. The post-Keynesian theory links firms' profit distribution with the recent contributions on the shareholder-value orientation, also, the Kaleckian tradition is embedded in the PK tradition of growth and distribution. Retention rate, and consequently the cash-flow rate, emerges as a pivotal element, being an important variable of control influencing firms' decisions regarding investment and funding (CHARLES, 2008). This importance derives from the internal funds being the sole funding source generated internally.

Portfolio allocation theory consists of the remaining base to the present analysis. This literature derives from Chapter 17 of Keynes' General Theory and, more recently, is associated with the Brainard Tobin principles (BRAINARD; TOBIN, 1968). Further, James Tobin provided advances by formalizing how a portfolio allocation simultaneously considers every assets' rate of return. Thus, if the returns of different assets differ, the share of each asset on the portfolio should respond to the relative return (TOBIN et al., 1965). The existence of a reliable financial system allows the wealth owner the opportunity of changing their stock of assets at every moment. The increasing share of the financial assets suggests that financial investment competes with other investments. Higher return rate, the possibility of capital gains, lower risk, and higher liquidity consist of the main feature determining the demand for financial assets. Therefore, portfolio allocation is not determined solely but the return rate, rather other factors also play an important role. The portfolio view of investment considers that the interest gap between capital and financial assets does not need to be positive to the firms' having an inventive investment in financial assets. Short-termed maturities and low risk are considerable advantages over investment in physical capital, therefore, justifying changes toward financial assets even if presenting lower yields (TOBIN et al., 1965).

The availability of funds consists of a vital element in the PK theory of the firm. Most importantly, internal funds and external funds play a major role. Tori and Onaran (2018) highlight that availability of internal funds is an important determinant of investment (FAZZARI; HUBBARD, et al., 1987; BLUNDELL et al., 1992), especially for those firms that face credit constraints (DENIS; SIBILKOV, 2010). The idea that funds are limited, i.e. a lower cash-flow rate or credit constraints, suggests that financial and physical assets are substitutable. That is, if funds are scarce, investing in new financial opportunities implies defunding real business enterprises. Nevertheless, such a conclusion can be shortsighted if other crucial factors are neglected.

Uncertainty, liquidity, and the possibility for capital gaining also influence portfolio allocation. Portfolio allocation, funding decisions, and finance constraints consist of different but integrated aspects of firms' financial management. For example, the trade-off between physical capital and financial assets may not exist when there is unlimited access to external funds (KLIMAN; WILLIAMS, 2015). A financial constraint serves as an indication that financial investment causes the diversion of funds from capital accumulation. Therefore, these elements should be encompassed in a common framework. The debate concentrates on whether the financial

constraints are relevant and, if so, how this restriction manifests.

The post-Keynesian theory of the firm considers growth, and power, ahead of profit as the main reasoning of the productive sector. Thus, countering the short-term profit maximization principle, which is at the core of mainstream economics. Although, profits are not overlooked once growth is considered as a prerequisite for long-term profiting. Notwithstanding, there is no consensus regarding whether there is a divorce in managerial goals and owners' goals are relevant. The distinction between owner-controlled or manager-controlled firms does not present significant differences in performance or strategies (LAVOIE, 2014, p. 131). Accordingly, the investment is financially financed by both internal funds and external funds. Internal funds correspond to the cash-flow rate or the retained profits and the external funds consist of loans and the new equities issues. Capital accumulation is considered to be an independent process that encompasses a variety of independent variables, including the capacity of utilization, the profit rate, the cash-flow ratio, the valuation ratio (or, Tobin's Q). The investment function may also present a negative relation with firms' leverage rate, therefore, as the increasing use of funds requires the expansion of the external funds, at the same time, investment decreases and compensate the initial pressure on the use of funds.

Kalecki's principle of increasing risk stands as the reasoning behind the negative relation between external funds and investment, asserting that firms are unwilling to sustain the leverage rate above a certain level due to the increasing possibility of bankruptcy. The same principle can be transposed to the banks' credit rationing practices, only providing loans to an already profitable and not excessively leveraged firm [34]. "This means that firms will be free to borrow as much as they desire within the limits that they have set, based presumably on some multiple of retained earnings" (LAVOIE, 2014). The greater the level of external funds, the higher the possibility of higher the financial costs on the liabilities. As argued by Wood (1975), the firm has more concerns about their survival than lenders, therefore, a ceiling for the borrowing level should emerge is likely to emerge endogenously to the firms. Davidson (1972) offers a similar perspective, pointing out that firms protect against uncertainty by limiting the possibility of being unable to meet future obligations.

> It would impossible for a firm to borrow capital above a certain level determined by the amount of its entrepreneurial capital. [...] the expansion of the firm depends on its accumulation of capital out of current profits. This will enable the firm to undertake new investments without encountering the obstacle of the limited capital markets or 'increasing risk' (KALECKI, 1971, pp. 106).

During an economic downturn, the constraints on external funds can change abruptly and cause bankruptcy. Then, firms become more willing to fund their activity externally, because of the

[34] For the orthodox literature a similar concern emerges in the relationship between banks and loan demand. Credit supply is a multiple of the internal funds, which become infinitely elastic for firms with large cash-flow ratios, but indebted or not in a hedge position are subject to credit rationing(LAVOIE, 2014)

lower level of retained profits and the lower interest rates on loans. On the other hand, banks are more likely to ration credit due to changes in leverage and risk perception. Hyman Minsky (2008) argues the importance of credit when agents determine their portfolios.

The investment diversion hypothesis derives directly from the financial frontier approach. Diversion of investment refers to the reallocation of funds from capital accumulation to financial investment. This phenomenon is also labeled with the term "crowd-out", due to the idea that new financial opportunities drain funds of investment in fixed capital, harming accumulation. Precisely, the crowd-out hypothesis analyzes the negative effect that financial income might exert on investment (ORHANGAZI, 2008). The financial frontier expresses the existence of a trade-off between growth and profit. Accordingly, the investment is funded by both undistributed net profits and borrowing, with the latter being limited by the increasing risk principle. Wood (1975) pioneered the discussion approaching the finance frontier by the minimal profit rate required to finance the level of investment. The resulting relation suggests that the share of investment financed by internal resources is equivalent to the share of external funds covered by net undistributed profits. Also, the financial crowd-out traces from the portfolio allocation principles. Importantly, the yield differential is not considered to be the sole determinant of portfolio allocation, because factors such as liquidity and arbitrage are also considered. Therefore, internal and external funds can be considered to be limited, financial and real inversion are substitutable to some degree, and therefore, higher investment in financial assets is negatively related to capital accumulation.

The profit-growth puzzle literature has also been subject to criticism. Kliman and Williams (2015) argue that the micro-level decision regarding resource allocation does not imply investment diversion at the macro-level. The argument is that portfolio allocation precedes investment in financial assets. Therefore, no funds are diverted from any specific use, given that the fund has been priorly subject to portfolio allocation. The authors claim that a faster increase in financial investment does not necessarily imply diverging funds from capital accumulation. Instead, diversion can only occur "if and only the increases in financial purchases and payments depress the share of profits that is invested in production". Departing from the identity between the uses of funds (investment in capital and financial assets) and the counterpart on the source of funds (profits plus the borrowings), the diversion of productive investment occurs only if the increases in financial purchases depress the share of profits that is invested in production. In other words, the diversion takes place if "the percentage growth rate of financial purchase and payments above new borrowing is greater than the percentage growth rate of profits" (p. 5).

Kliman and Williams (2015) argue on the impossibility of a trade-off on firms' portfolio investment, because of the availability of external funds. The authors suggest that the decline in the investment rate is due to the fall in the profit rate. Particularly, the crowd-out hypothesis is contested, because a shift in the use of resources does not imply diversion if it occurs before the actual purchase of the financial asset. This approach implies in two separate stages, the portfolio

allocation between financial and physical assets occurs after the decision regarding profit retention and external funds demand. Additionally, from a macroeconomic perspective, the "sellers" of the financial asset may also apply this revenue to the productive sector, which weakens the crow-out argument. The authors also claim that "If they [firms] borrow more, and invest the borrowed funds in productive assets, then dividends and productive investment can both be bigger in relation to profit" (pp. 12). Results for the regression for the US economy, from 1989 to 2007, show a weak positive relationship between net dividends and investment. Also, a positive correlation between net borrowing and investment. However, Kliman and Williams (2015) analysis lacks further considerations on the case for credit constraints or firms' caution on over-indebtedness. Nevertheless, such analysis seems to ignore the increasing risk principle, as noted by Fiebiger (2016), using external funds to meet dividends indicates a Ponzi scheme.

Another point of view is provided by Skott and Ryoo (2008). The authors show that if all firms pursue the expansion of the profits the aggregate demand, then "the micro tradeoff may not be stable". Accordingly, if at the micro-level a firm prioritizes profits to the detriment of growth will lead to a fall in the aggregate demand at the macro-level. Therefore, the whole argument is weakened due to oversimplified firms' financial decisions and constraints. Moreover, the financial implications for other sectors are neglected. At last, a more optimistic perspective on the possibility of a crowd-in in accumulation, decurrent to the introduction of new financial opportunities. Recently, this strain can also be associated with the "finance-led accumulation regime", as proposed by Boyer (2000). The crowd-in argument is also present in Kliman and Williams (2015) since external funds are not constrained financial inflows pooling internal funds. Therefore, investment in financial assets can be interpreted as a "heading mechanism", providing additional cash-flow, causing a positive effect on long-term investment decisions (DEMIR, 2009b). Analogously, a higher proportion of financial profits over total profits might lead to portfolio allocation towards financial assets.

The present section has made clear the need for a detailed appreciation of financial conditions when considering firms' investment and funding decisions. The possibility of financial earning can improve the internal fund's limitations, and foster the investment. Otherwise, firms without credit rationing are always able to borrow more for investing without harming the investment. Therefore, systemic implications of the investment in financial assets should be addressed to properly analyze the possibility of crowd-out in investment. Next, the investigation on firms' financial decisions advances on the grounds of profit distribution, presenting the links between the retention rates with the behavior approach of the shareholder-value orientation.

4.1.2 Profit retention and the shareholder-value orientation

The profit-growth puzzle literature (STOCKHAMMER, 2004; DALLERY, 2009) often poses the crowd-out problem as a direct consequence of changes in the firm's governance. Accordingly, the shift in business behavior regarding investment has taken place since the 1970s, in-

duced by financial and institutional developments. The separation of interest between managers and owner emerges as a pivotal element on the theory of the firm, since the institutionalists authors, such as Veblen (1938), noticed that the "absentee ownership" externalize the center of the decision to the owners' interests, which prioritize pecuniary reasons.

Non-financial corporations have been explained within the PK thought by the lens of the Galbraithian firm, aiming for coping with the intrinsic uncertainty of long-term investments while increasing their power measured in growth terms. Growth is considered as a straightforward way to achieve power in an uncertain world (GALBRAITH, 1967). Nonetheless, Lavoie (2014) point to the circularity of the relationship between growth and profit maximization. "Firms can grow because they made profits that allow them to finance their expansion. But, reciprocally, the growth of firms allows them to be profitable." (p. 136).

The shareholder-value orientation presumes a negative correlation of profit distribution and accumulation because changes in firms' managerial objectives lead to prioritizing payouts rather than growth. Additionally, the terms also refer to a short-term orientation of the investment, as a strategy of seeking higher returns with a minimal compromise with maturity or risk. Lazonick and O'Sullivan (2000) call attention to the deepening of the shareholder-value ideology, characterized by the implementation of the "downsize and distribute" principles, instead of the "retain and reinvest" which have prevailed till the early 1980s. Davis (2017a) remarks that the institutionalization of financial investors, the expansion of stock-based managers' payment, regulatory changes are among the factors that lead to this organizational change.

Stockhammer (2004) distinguishes the firm's management between managerial's objectives (growth-maximizing) and ownerships' objectives (profit-maximizing), the former focusing on growth and the latter on profits. Whitin Wood's (1975) financial frontier framework, financial constraints plus the profit-growth trade-off are considered as the main determinants of the firm's investment. The financial constraints are supply-sided, once the banks only lend after evaluating creditors' past profitability. Therefore, the profit-growth trade-off assumes that, under specific circumstances, the higher investment can dimmish future profits. Thus, choosing short-term market-share expansion might occur at some cost in the profit rate. This literature advances with the works of Dallery (2009), Hein and Van Treeck (2010), and others. Changes in managerial objectives toward shareholders' preferences end up decreasing investment as a condition to increase profits.

Skott and Ryoo (2008) discusses the macroeconomic implications of the investment-profit puzzle, arguing on the theoretical gap between the micro-foundations of Stockhamers's (2004) financial frontier and the implication to the macro level. Individual firms moving along the expansion frontier to increase profit reducing growth, lead to a decrease in the aggregate demand at the macro level. Because changes in accumulation and financing influence the aggregate demand "the micro trade-off may not be stable" (pg. 5).

Fiebiger (2016) points out that despite the lower investment level, firms from developed economies have turned their expansion to overseas markets. Therefore, despite not being accounted for as an investment in the capital these uses of funds can be related to growth. Auvray and Rabinovich (2019) revise the financialization and the investment diversion through the lens of internationalization. The non-financial corporation has been organizing around the global value chains around the same period that financialization is claimed to have emerged. In line with Fiebiger (2016), the author points out that offshoring can be traced as a reason behind domestic investment decrease, without implying a de-growth strategy designed by owners antagonizing managers. Sen and Dasgupta (2018) advance on the corporate investment diversion by transposing the discussion to the emerging markets institutional framework. Additionally, the authors provide an elucidative analysis by accounting for the source of funds altogether with the investment decision. Tori and Onaran (2018) reaches contrasting evidence regarding the country's level of financial development, with a strong negative effect on investment registered in developed economies.

The present section presented some of the theoretical issues regarding the effects of higher profit distribution on accumulation. The shareholder-value orientation explains how behavioral changes in management might have led to institutions that prioritize profits rather than growth. Based on the PK literature and relying upon strong assumptions, this strain has outlined a channel by which a negative correlation between profit distribution and accumulation is explicated. However, other important tenets of the PK were not explicitly mapped, as the interactions between investment and funding, the relations between other sectors (households, public and banks). Additionally, the higher payout ratios change the firm's financial constraints, therefore, a circularity between leverage and credit constraint might arise. Next, the empirical literature regarding the crowd-out hypothesis and the shareholder-value orientation is revised.

4.1.3 Empirical literature

Departing from the complete survey present on Davis (2017), which reviews the effects of financialization on investment, selecting only references that directly infers on investor relations. As noted by Davis (2017), financialization constitutes an ambiguous definition that "obfuscates distinctions underlying analyses of financialization and investment". The crowd-out effect consists of a portfolio shift towards financial assets that affect negatively capital accumulation. Demir (2007) and Orhangazi (2008) influential empirical works investigated whether the higher financial returns have led to portfolio changes, favoring financial assets, and hampered capital formation. Empirically, this relation is tested by including the financial revenues or differential rates in the estimation of the investment function. The mixed results suggest the need for investigating the conditions that can lead to crowd-out of capital accumulation (DAVIS, 2017a). At the micro-level, exam the balance sheets consist of a solid path to assess the effects of financial investment in capital accumulation. Additionally, firms' financial flows also consist of

a recurrent proxy for financial investment and governance changes.

Orhangazi (2008) finds a significant negative relationship between financial profits and investment, however, this result is valid only for large firms, while the full sample of USA firms provides a positive but insignificant relationship. Stockhammer (2004) departs from an aggregative approach to find a negative relationship between financial profits and investment in the USA and the UK, however, countries such as France and Germany do not follow the same pattern. However, when the financial profits are filtered by financial payments the negative relationship becomes insignificant. Due to this mixed evidence,Davis (2017b) alert for the need to examine the conditions that can contribute to the crowd-out of investment due to the financial shift in a firm's balance sheet. Tori and Onaran (2018) found a strong and negative relationship between financial payments and investment, but for firms in developed countries. Tori and Onaran (2018) use an index for financial development as an independent variable, a panel-data model that accounts for fourteen European countries and the period of 1995-2015. Countries with a higher level of financial development present a consistent crowd-out effect of financial revenue. Whereas, countries with a lower level of financial development present insignificant effects for larger firms, yet, small firms within this group presents a crowd-in effect for a higher financial income. Therefore, the author found distinct results for financial income and financial payment.

The availability of internal and external funds emerges as a relevant complementary hypothesis to proceed with the empirical validation of the investment crowd-out. Davis (2017) notes, however, that the elimination of internal funds is likely to be more significant when the financial earnings are canalized to the pool of internal funds, which also can be used to fund accumulation. Additionally, the availability of external funds should also play an important role in sustaining these empirical relations. The use of funds and whether distribute retain, or more directly invest in financial or physical are topics often posed as a direct trade-off and associated with changing trends in contemporary capitalism. Therefore, much of the literature rejecting the idea of a trade-off, often rely on the assumption of unlimited external funds.

Considering the internal fund's availability, Demir (2009a) finds a positive relationship between financial investment and investment for Turkey. However, this positive effect is smaller for higher cash flows, which suggests that financial incomes can reinforce internal funds and also act as a hedge against uncertainty. Thus, reinforcing the optimistic argument of the crowd-in with financial operations supporting riskier and long-termed investment. In this sense, Davis (2017b) point to a positive short-term influence of financial profits and investment, but exclusively for the largest quartile of firms. Davis (2017a) also considers the influence of larger firms engaging in supportive (or, captive) finance, as identified by Froud et al (2006).

External fund availability, which alleviates the financial constraints, can offset the trade-off between financial and physical investment. Kliman and Willians (2014) found that, since the

1950s, USA firms' have funded financial assets investment almost exclusively with borrowed funds. Davis (2017a), however, ponders that the aggregate feature of the data used by the authors obfuscates the precise source and use of funds. Borrowed funds serve to the variety of firm's uses of funds: investment (financial and physical), cover funding costs, and distributed profits. Davis (2016) and Palley (2007) found robust evidence of increasing firms' leverage in the USA economy, mainly after the 1980s, the decision regarding the use of such funds is not clear. Nevertheless, another bulk of works has identified a "de-link" between new loans and physical investment ((Kliman and Willians, 2014; De Souza and Epstein, 2014). Mason (2015) document a decreasing correlation between loan acquisition and investment in physical capital. Also, De Souza and Epstein (2014) identify a decrease in the share of investment funded with new loans. As summarized by Davis (2017) the de-linking argument is based on two rationales, the strengthening of the relationship between borrowing and shareholder's payouts (Dumenil and levy, 2011; Klinman; Mason; Fieberger, 2016) and, the investment in new financial assets (Foud et al, 2006). Froud et al. (2006) also identifies the firm's expansion toward banking and other financial activities.

Despite the dominant focus on the US economy, this literature has an increasing awareness of the specificities of emerging markets and developing economies (BONIZZI, 2013; DEMIR, 2009b; SEN; DASGUPTA, 2018). Naturally, indicators rely on theoretical tenets such as the interest rate gap (DEMIR, 2007), financial profits (DAVIS, 2017), or total financial earnings (TORI; ONARAN, 2018; ORHANGAZI, 2008; STOCKHAMMER, 2005). Emerging markets firms' analysis unveil strong evidence for the crowd-out effect, according to Demir (2009). The author also credits these results to capital market imperfection, signaling the inefficiency of financial liberalization in promoting financial development in emerging market economies, alerting for the fact that emerging markets firms are more likely to face credit constraints than firms based on central economies. Thus, corroborating the argument that the trade-off between physical and financial assets need not take place if there is full availability of external funds.

Regarding the profit distribution, Blume and Keim (2012) indicates that the institutional investor predominates the firms' ownership in the USA, rising from a third to more than two-thirds of ownership share from 1980 to 2010. Davis (2017) points to a shrink in stock turnover, indicating for higher short-termism of firms' payouts. Additionally, Lazonick and O'Sullivan (2000) argue on the linking of executives' payments on stock price performance, which contributes to short-termism based on stock repurchases. Tori and Onaran (2018) estimates different financial channels that affect investment, suggesting that financial payments and financial income harm accumulation. Moreover, the analysis underlines that different investment behavior also depends on the firms' size. Smaller firms reveal a smaller crowd-out effect if compared to large firms. The size of the firm is determinant when considering the relevance of the financial frontier for capital accumulation. Smaller firms are more likely to face credit constriction due to the increased risk principle (DÖGÜS, 2016).

According to Davis (2017), the main proxy for the shareholder value orientation in the aggregative analysis is the share of renters' income out of firms' profits, and, at the sectoral level are interests and dividends received by firms. Stockhammer (2004) finds a negative relation between renters' income and investment in the USA. Orhangazi (2008) identifies that financial payments to the owners impact negatively the investment, but restrict to larger firms. However, Davis (2017) contends that the shareholder approach is limited concerning its relations with investment because financial payments do not distinguish between creditors and owners. Van Treeck (2008) finds that investment suffers a negative influence of both interest and dividends payments, with a higher coefficient for dividends.

To sum up, the empirical literature tends to confirm the stylized fact that accumulation has declined and financial activities have expanded during the past decades (STOCKHAMMER, 2004; SKOTT; RYOO, 2008). Nevertheless, the evidence is not clear on defining the linkages between these two processes (KLIMAN; WILLIAMS, 2015; DAVIS, 2017a). In the next section, a formal analysis is conducted to clarify how this relationship develops in a system that fully encompasses real and financial spheres within a multi-sectoral macro framework.

4.2 The Model

The exam of the firms' portfolio investment, funding, and its systemic implications require a framework that encompasses the links between financial a real assets in a multi-sectoral perspective. The stock-flow consistent tradition suits this task, due to the emphasis on the transitional path from short-run to long-run, and the rigorous accountability that guarantee the consistency of the results, even for larger-scale models [35]. Furthermore, this framework provides rigorous links between financial and real aspects of the macroeconomic process. We depart from the basic output identity (equation 4.1), unfolding this equation into a system following the post-Keynesian and SFC principles.

A medium-scale stock-flow consistent model is designed to be solved by numerical simulation, as usual in this literature. The detailed financial systems and the multi-sectoral approach convey complexity to the model, making analytical solutions unfeasible. As shown by Caverzasi and Godin (2014), numerical SFC models are solved when the growth rate of main variables stabilizes paired to the output growth. This implies that the steady-state variables are not a deterministic trend, rather outcomes of a path-dependent process. Steady-state values for variables are the result of cumulative sequences of short-run equilibria, in opposition to the idea of the trend (SILVA; SANTOS, 2009). Therefore, the focus is on the motion rather than in the states. The SFC approach provides the explicit transitional path from an initial steady-state equilibrium to another, emphasizing the adjustment process during this traverse.

[35] For a complete survey on the stock-flow consistent methodology see Nikiforos and Zezza (2017) and Caverzasi and Godin (2014).

The Balance Sheet Matrix (BSM) (Table 4.1) contains the core of the accountable structure, relating to all institutional sectors. Households, Firms, Banks, Central Bank, and Government. Further, the respective assets and liabilities are Deposits (D), Loans (L), Capital Stock (K), Bills (B), Bonds (BL), Equities (E), and Advances (A). The transactions that unfold from these sectoral balance sheets correspond to the Transaction Matrix (TM), and the end of the period results and consequent allocation of savings takes place in the Flow of Funds (FoF) matrix (both represented in Table 4.2). This sequence occurs within one period and feeds the inputs for the subsequent period.

Accountable identities arise from the matrix-based accountability (Tables 4.1 and 4.2), which links every asset to a respective liability in a multi-sectoral framework. The interlinkages between the three matrices add to the model an intrinsic SFC dynamic. To validate the consistency of the model all accountable identities must hold simultaneously, allowing for no "black holes". That is, each row and column of those matrices enforces an accountable identity that must hold, certifying that everything that comes from somewhere goes somewhere.

The models' consistency is validated by the following steps. First, all accountable identities that emerge from the matrices should hold. In Table 4.2 the last row of the transaction matrix computes sectoral savings. According to the fundamental identity, the sum of these sectoral savings should equal zero, denoting that a sectors' surplus is funded by the other sectors' deficits. The model's fundamental identity is found at the bottom line of the TM matrix in Table 4.2, summing up the sectoral savings to zero. The Fundamental Identity derives from the works of W. Godley (GODLEY; CRIPPS, 1983) and describes a flow identity linking the economic sectors. The private sector savings (SAV_h), the Governmental Deficits (SAV_g), and the Balance of Payments, in the case of an open economy, should be equivalent if the model has no accountable flawns. This implies in the corollary that one sector's deficit (surplus) is equivalent to the other sector's surplus (deficit). Second, a hidden equation that emerges from the model specification implies that two independent processes generate the same value [36]. At last, models' stock variables show growth at the same rate in equilibrium, this implies stabilized steady-state values when stock is measured out of GDP.

Firms represent the productive sector, financing the investment with loans(L_d), equities emission(ΔE), and retained profits (FU). An extended version of the post-Kaleckian investment function is adopted, the adjustment on the capital accumulation is determined by capacity utilization, encompassing other recurrent determinants. The increasing risk is added via a negative relation with the leverage rate (equation 4.13), plus, the portfolio choice is introduced via the return rate gap (equation 4.21). Importantly, when firms invest in physical capital it accumulates physically in the next period (Flow of Funds Matrix), but it also appears as a transaction in the Transaction Flow Matrix, because firms buy the capital good from themselves (DOS SANTOS; ZEZZA,

[36] That can be observed in the equality of the central bank's advances for banks (equation 4.28) and central banks' bills (equation 4.30).

2008). Inflation is never neutral from the point of view of the assets‘ owners, regardless, we assume prices normalized to the unit and labor productivity is constant.

Next, the SFC accountability is presented. First, the Balance-Sheet matrix (BSM) shows how the institutional sectors allocate wealth, also, it designates that every asset has a counterpart as others' sector liability. Second, the Transaction (TM) and the Flow of Funds (FoF) matrices are depicted in Table 4.2. The transaction matrix accounts for every transaction taking place within a period of time-lapse, an asset accounted in BSM represents a source of income, conversely, a liability a financial expenditure. Finally, the FoF matrix closes each period, by designating the destination of the net income generated. Also, the FoF matrix has the important role of feeding up the results of a period to the next period, providing the temporal link between each short-run equilibrium.

Table 4.1: Balance Sheet Matrix

BSM	HH	Firms	Banks	CB	GOV	Σ
(A) Dep.	$+D$		$-D$			0
(B) K stock		p.K				p.K
(C) B	$+B_h$			$+B_{cb}$	$-B$	0
(D) BL		$+p_{bl}.BL_f$			$-p_{bl}.BL$	0
(E) Eq.	$+p_e.E_h$	$-p_e.E$				0
(F) L		$-L_f$	$+L$			0
(G) A			$+A$	$-A$		0
Net Worth	$+V_h$	0	0	0	$-V_g$	0

Each column in Table 4.1 comprises a sectoral balance sheet, whereas each row represents the respective asset/liability ownership. Table 4.1 last row consists of each sectors' net worth, sector presenting zero net worth means that end of the period results is distributed to other sectors rather than accumulating. The interconnectedness of each sectors' balance sheets guarantees the model stock-flow consistency. Similarly, each line of the three matrices corresponds to an asset identity, whereas each column identifies three sectoral identities. Next, the behavioral equations provide the model dynamics.

Households

Households accumulate wealth (Vh_{-1}, equation 4.7) accordingly to each period savings, choosing the consumption (C, equation 4.2) level based on disposable ($\alpha_1(1-\pi)(1-\theta)Y$) income and wealth. The household income derives from wages (W) and financial income (FD_h and F_b). For the sake of simplicity, some simplifications are assumed regarding the subdivision between workers and renters, or other social cleavages.

$$YD = (1-\pi)(1-\theta)Y \tag{4.1}$$

Table 4.2: Transactions and Flow of Funds Matrices

TM	HH	Firms	Banks	CB	GOV	Σ
(1) Cons.	$-C$	$+C$				0
(2) Invest.		$+I$ / $-I$				0
(3) G		$+G$			$-G$	0
(6) Tax.	$-T$				$+T$	0
(7) Wgs.	$+W$	$-W$				0
(8) Firm P.	$+FD_h$	$-F$ / FU				0
(9) Bank P.	$+F_b$		$-F_b$			0
(10) CB P.				$-F_{cb}$	$+F_{cb}$	0
(11) Int. B	$+i.B_{h-1}$			$+i.B_{cb-1}$	$-i.B_{-1}$	0
(13) Int. BL		$+BL_{-1}$			$-BL_{-1}$	0
(14) Int. D	$+i_d.D_{-1}$		$-i_d.D_{-1}$			0
(15) Int. L		$-i_l.L_{-1}$	$+i_l.L_{-1}$			0
(18) Int. A			$+i_a.A_{-1}$	$-i_a.A_{-1}$		0
Sav.	$+SAV_h$	$FU-I$	0	0	$+SAV_g$	0
FoF	HH	Firms	Banks	CB	GOV	Σ
ΔD	$-\Delta D$		$+\Delta D$			0
ΔB	$+\Delta B_h$			$+\Delta B_{cb}$	$-\Delta B$	0
ΔBL		$-p_{bl}\Delta BL_f$			$-p_{bl}\Delta BL$	0
ΔE	$-p_e\Delta E_h$	$+p_e\Delta E$				0
ΔL		$+\Delta L_f$	$-\Delta L$			0
ΔA			$-\Delta A$	$+\Delta A$		0
Σ	0	0	0	0	0	0

$$C = \alpha_1.YD + \alpha_2.Vh_{-1} \tag{4.2}$$

$$W = (1-\pi)Y \tag{4.3}$$

$$SAV_h = [W + FI] - [C + T] \tag{4.4}$$

$$FI = FD_h + F_b + i_b.B_{h-1} + i.D_{-1} + CG_h \tag{4.5}$$

$$CG_h = \Delta.p_e.E_{h-1} \tag{4.6}$$

$$V_h = V_{h-1} + SAV_h \tag{4.7}$$

$$B_h = V_h.(\lambda_{20} + \lambda_{22}.i_b - \lambda_{23}.r_k - \lambda_{24}.\frac{YD}{V_h}) \tag{4.8}$$

$$p_e = V_h.\frac{(\lambda_{30} + \lambda_{32}.i_f - \lambda_{33}.r_k - \lambda_{34}.\frac{YD}{V_h})}{E_h} \tag{4.9}$$

$$D = V_h - B_h - p_e.E_h \tag{4.10}$$

Wealth is allocated on equities ($p_e.E$), bills (B), and deposits (D), based on the Tobinesquee portfolio principles, considering the return rates altogether [37]. The equities market is cleared by households, therefore the equities prices (p_e) emerge as an outcome from households' portfolio allocation. The deposits act as a buffer for the households' portfolio allocation. The present setting allows for a distinction between workers and rentiers, despite the same propensity to save. While workers receive their wage (equation 4.3), the rentiers receive a financial income (equation 4.5) from bills, equities, deposits, and capital gains (equation 4.6).

Firms

The main focus of the present analysis is on the productive sector due to the accumulation process and the possibility of diverging funds towards shareholders (equation 4.24) or financial assets (equation 4.15). Investment (equation 4.13) is governed by profit rate, capacity utilization leverage rate and, interest rate gap. The negative influence that leverage exerts on accumulation is key to the present analysis, intuitively, it represents the increasing risk principle as the higher the leverage the lower is the willingness to commit illiquid assets. Financial investment (equation 4.19 to 4.21) in bonds consists of a function of the return on capital stock, Tobin's Q [38] plus a constant that captures liquidity preference. Therefore, the slow down in accumulation entails the same effect in financial investment indirectly, through the direct negative effect that leverage exerts on investment in capital stock.

The model includes the leverage rate in the investment function plays an important role in the model because it manifests firms' self-imposed constraints over external funds, in line with

[37] See Godley and Lavoie (2006) and Nikiforos and Zezza (2017) for a detailed explanation on the portfolio principles

[38] Accordingly to Brainard and Tobin (1968) the valuation ratio, or Tobin's Q, greater than the unity implies in a valuation greater than the cost of replacement of the capital stock.

Kalecki's increasing risk principle [39]. Since firms are not willing to expand their outstanding liabilities without limits, negative feedback from leverage to the investment emerges [40]. This argument emphasizes the role of internal funds in promoting investment, because of the limited role that external funds play on accumulation. For example, higher leverage could be linked to a higher amount of available funds and stimulate the investment, only if the limited nature of external funds is disregarded. Moreover, the inclusion of the interest rate gap is important to elucidate the portfolio principles in the analysis of the firm. The possibility of a bank's credit rationing is assumed away, and the leverage constraint on investment consists of the main factor for mitigating excessive indebtedness.

Firms´ use of funds consists of accumulation, financial investment, debt repayment, and distributed profits. On the other hand, the sources of funds are revenues and equities emission. Firms cannot choose freely the levels of new debt, equities issues, and investment. Rather, one of these variables has to act as a buffer that ensures the identity (RYOO; SKOTT, 2008). The new borrowings (equation 4.24) act as a buffer that passively accommodates firms´ funding needs, as usual in the literature. Equities emission (equation 4.22) constitute the other source for external funding, responding to changes in the capital stock. The main internal source of internal funds consists of the undistributed profits (equation 4.20), which is the counterpart of profits minus distributed profits.

Internal funds generation is measured by the cash-flow ratio ($cfr = \frac{FU}{K}$). A higher cash-flow ratio indicates a hedge position and a lower might indicate that the firm is in a Ponzi scheme. Also, two indicators demonstrate firms' rentability, distributed profits over the capital, and equities yields. Therefore, the retention rate plays an important role by exogenously determining the shareholder-value orientation.

$$Y = C + I + G \tag{4.11}$$

$$\pi = \frac{\mu}{1+\mu} \tag{4.12}$$

$$\frac{I}{K_{-1}} = \upsilon_0 + \upsilon_u.u_{-1} + \upsilon_\pi.\pi - \upsilon_{lev}.lev + \upsilon_{gap}.(r_k - i_{bl}) \tag{4.13}$$

$$u = \frac{Y}{Y_{fc}} \tag{4.14}$$

$$Y_{fc} = \sigma K_{-1} \tag{4.15}$$

[39] A more sophisticated version of this relation would consider an inverted "U" curve, denoting that the negative effect of leverage on accumulation intensifies after a threshold. Nevertheless, the simplified version adopted here captures the basic intuition behind this relation.

[40] Because firms rely on two different sources of external funding, equities and loans, the Modigliani-Miller (1958) theorem does not apply. As noted by Dos Santos and Zezza (2008) the present framework emphasizes Minskyain features, therefore, liabilities ratios are a valuable source of information about firms' finances, which are impossible in a single debt framework such as the one proposes by Modigliani-Miller.

$$K = I + (1 - d_k)K_{-1} \tag{4.16}$$

$$r_k = \frac{FD_h}{K} \tag{4.17}$$

$$lev = \frac{L_d}{K} \tag{4.18}$$

$$BL_f^d = \Psi_{bl}.\frac{K}{p_{bl}} \tag{4.19}$$

$$\Psi_{bl} = \Psi_{bl-1} + \gamma_{bl}(\Psi_{bl}^T - \Psi_{bl}) \tag{4.20}$$

$$\Psi_{bl}^T = xi_0 + xi_1.(i_{bl} - r_k) + xi_2.TQ \tag{4.21}$$

$$TQ = \frac{L_d + p_e.E}{K} \tag{4.22}$$

$$I_f = I_{f-1} + \Delta.BL_f$$

$$F = \pi.Y - i_l.L_{f-1} + \sigma_{bl}.BL_{-1} \tag{4.23}$$

$$FU = s(\pi Y - i_l.L_{f-1}) \tag{4.24}$$

$$FD_h = F - FU + (1 - \sigma_{bl}.BL_{-1}) \tag{4.25}$$

$$\Delta E = \Psi.K \tag{4.26}$$

$$L_f^d = I - FU - pe.\Delta E + p_{bl}.\Delta BL_f - CG_f \tag{4.27}$$

$$CG_f = \Delta p_{bl}.BL_f - \Delta p_e.E \tag{4.28}$$

The destination of the financial revenues are determined by the parameter σ_{bl}, which for the sake of simplicity is set at zero, implying a total distribution of financial income. The opposite ($\sigma_{bl} = 1$) implies that the financial revenues are pooled into gross profits, reducing firms external funding needs, and consequently the leverage ratio, but the magnitude not sufficient to reverse effects on investment. Depending on the firm's objectives regarding the shareholder-value orientation the financial profits can pool the internal funds as a component of the profits, or, these profits can go straight to distributed dividends.

Two sources for capital gains are considered, from price changes in both equities and bonds. Financial bonds, despite paying long-term interest rates, are considered short-term assets in opposition to the long-term feature of investment in physical capital. Bonds are compensated every period, and the long-termed feature of this asset is represented by the price-interest formation presented below (See Godley and Lavoie (2006) Chapter 5 for a detailed presentation).

Banks

The private financial system plays a passive role in the model, providing deposits (D^s) and loans (L^s) as demanded, and using advances to close the balance sheet. Banks' profits (equation 26)

are distributed to households.

$$D^s = D_h^d \tag{4.29}$$

$$L^s = L^d \tag{4.30}$$

$$F_B = i_l.L_{-1} + i_a.A_{-1} - i_d.D_{-1} \tag{4.31}$$

$$A = D - L \tag{4.32}$$

Advances from the Central Bank consist of the buffer variable that closes banks' balance-sheet. This variable consists of the redundant equation of the model, with the same values of the bills held by the Central Bank.

Central Bank and Government

Central Banks act to set the basic interest rate at any level by market-clearing the bills, buying all the short-term bills (i_b) that households are not willing to hold. Advances to banks are provided as demanded. Central Banks' profits (or losses) (F_{CB}) are distributed to the Government.

$$F_{CB} = i_b.B_{cb_{-1}} - i_a.A_{-1} \tag{4.33}$$

$$B_{cb} = B - B_h \tag{4.34}$$

$$A^s = A^d \tag{4.35}$$

$$i_a = i_b + mrkp_a$$

Besides short-term bills, the Government also issues long-term bonds (ΔBL) as a source of funds. The long-term interest rate (i_{bl}) consists of the interest on bills plus a mark-up, and the inverse of the long-term bills represent the prices on bonds (p_{bl}).

$$G = \gamma K_{-1} \tag{4.36}$$

$$T = \theta[(1-\pi)Y + F_b + i_b.B_{h-1} + i_d.D_{-1} + FD_h] \tag{4.37}$$

$$BL^s = BL^d \tag{4.38}$$

$$p_{bl} = \frac{1}{i/i_{bl}} \tag{4.39}$$

$$SAV_G = [T + F_{cb}] - [G + i_b.B_{-1} + BL_{-1}] \tag{4.40}$$

$$\Delta B = B_{-1} + SAV_G - p_{bl}\Delta BL \tag{4.41}$$

Bonds are considered as long-termed, still, accounted as a short-term asset because of each period consolidation. Long-term bonds are issued as demanded by firms. The fluctuations of the long-term bonds are not considered in an endogenous mechanism. Nevertheless, changes in the mark-up for the long-term bonds generate fluctuation in prices and, therefore, capital

gains or losses. We assume that the government sector runs permanent deficits represented by savings (SAV_g). Short-term bills are the buffer stock for the Government, and new bills are issued to sustain the deficits.

4.2.1 Experiments

Present sections disclose the numerical simulation as the resultant of the experiments. The crow-out hypothesis is investigated in Experiment A, a higher uncertainty is explored in Experiment B. As a consequence of the use of a complete set of institutional sectors the model achieved enough complexity to preclude analytical solutions, therefore, numerical simulations are employed. Solving SFC models numerically requires a steady-state solution, which is acknowledged as the medium-term outcome rather than a tendency. The steady-state is achieved when main variables are growing at the same and stabilized as a share of GDP. To employ comparative dynamics analysis, the system is shocked with permanent parametrical changes, that conduct the model through a traverse towards the new steady-state [41]. Each experiment follows both the SFC and the empirical literature, which aims to emulate the literature tenets on financial development and capital accumulation (SKOTT; RYOO, 2008; TORI; ONARAN, 2018; DAVIS, 2017a).The experiment advances from seminal works such as Treeck (2009) by encompassing the investment in financial assets and, more importantly, accounting for the ascendant and descendant phases of the financial cycle.

Experiments are summarized in Table 4.3, combining four independent scenarios. The underlying goal is to investigate changes in the firm's sector induced by financial changes. Particularly, the first experiment pays close attention to the crow-out hypothesis, induced via financial assets diversion and shareholder-value orientation. The second experiment compares two manifestations of a higher uncertainty: run from equities and higher interest rates.

Table 4.3: Experiments

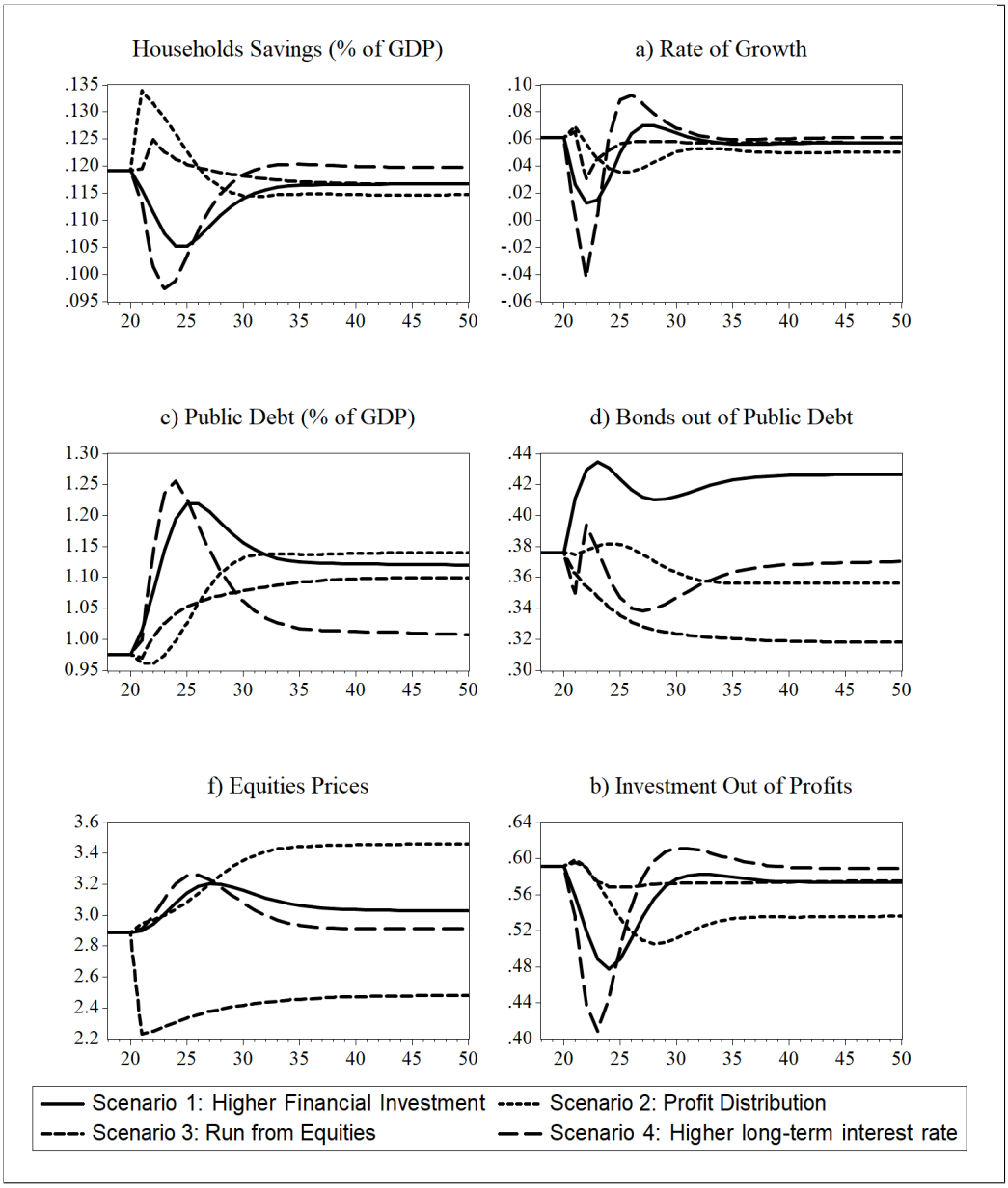
Scenarios	**Description**	**Baseline**	**Shock**
Experiment 1:	**Crowd-out**		
Scenario 1	Financial Investment	$xi_0 = 0.05$	$xi_0 = 0.1$
Scenario 2	Profit Distributin	$s = 0.42$	$s = 0.37$
Experiment 2:	**Higher Uncertainty**		
Scenario 3	Run from Equities	$lambda_{20} = 0.30$ $lambda_{30} = 0.30$	$lambda_{20} = 0.35$ $lambda_{30} = 0.25$
Scenario 4	Interest rate Increase	$mkp_{bl} = 0.005$	$mkp_{bl} = 0.01$

Experiment A combines the first and second scenarios and focused on the examination of the

[41] The model is run through 500 periods, the baseline steady-state solution emerges after 40 iterations. Periods are subjective and do not correspond to an actual measurement of time.

crowd-out hypotheses. Scenario 1 describes an autonomous increase in firms' willingness to allocate funds in financial assets. Scenarios 2 displays a decrease in the retention rate, implying higher profit distribution and, consequently, lower internal funds. Experiment B couple Scenario 3 and Scenario 4, focusing on uncertainty. While Scenario 3 accounts for the households' portfolio allocation change from equities to bonds, Scenario 4 shows the effect of an increase in the long-term interest rate, emulating a higher liquidity premium on bonds.

Figure 4.1: Selected results for all scenarios



Before proceeding with the particular results of the experiments, Figure 4.1 covers some selected macroeconomic results for all the scenarios. The upper left panel shows how households' savings have responded negatively to all scenarios. The upper right panel shows the negative impact on output for all the scenarios. Also, the middle panels show some implications for the

public sector. Public debt out of GDP has increased for all scenarios (middle-left panel). At the same time, bonds share out of public debt have decreased for all scenarios (middle-right panel). Botton left panel shows that the prices of equities increase in most of the scenarios, except for Scenario 3, precisely because of the lower preference for equities emulated through the parametrical change on household's preferences. The share of investments out of the profit rate decreases (bottom left panel), suggesting the confirmation of the crow-out of the accumulation. Altogether, these results indicate a worse public debt performance both in terms of deficit and also on debt maturity. Next, each experiment is analyzed separately focusing on the productive sector in Figures 4.2 and 4.3.

In Figures 4.2 and 4.3, the top panels show the share of investment in financial assets out of the stock of capital (equation 4.19), the investment rate (equation 4.13), and the return on capital (equation 4.17), respectively. The middle panel display other firms' financial indicators: the cash-flow ratio ($cfr = \frac{FU}{K}$), the leverage rate (equation 4.18), and the share of equities out of capital ($\frac{p_e.E_{-1}}{K}$). At last, the bottom panel displays the financial share of the financial income out of distributed profits ($\frac{BL_{f-1}}{FD_h}$), the equities yield ($\frac{FD_h+CG_f}{p_e.E_{-1}}$) and, the valuation ratio (or the Tobin's Q, equation 4.22).

The investment in financial capital out of the stock of capital and the investment rate represents the destination of funds, therefore, it captures firms' portfolio allocation. Also, the cash-flow rate represents the internal source of funding, while both the leverage rate and the share of equities out of capital represent the external sources of funding. Additionally, the financial share of the financial income indicates, from the shareholder perspective, the weight of finance revenues on non-financial business. The variable return on capital and equities yield represents the firm's profitability from different perspectives. And the valuation ratio, or the Tobins'Q, accounts for the market's perceived value over the replacement cost of capital.

Experiment A: The crowd-out effect of financial investment and profit distribution

This experiment assesses the crowd-out of investment, conveyed by investment in financial assets and profit distribution. The higher financial investment (Scenario 1) is achieved with an autonomous increase in firms' willingness to invest in financial assets. This shock manifests as a higher targeted financial investment, allowing for an evaluation of the crowd-out effect on accumulation (ORHANGAZI, 2008). Additionally, Scenario 2 displays changes in profit distribution, following the literature on the changes in corporate behavior and the shareholder-value orientation (CHARLES, 2008; STOCKHAMMER, 2004). Dividend distribution, which is governed by the parameter s (equation 4.24), is related to the firm's internal funds availability. A lower retention rate leads to higher profit distribution and, consequently, to lower internal funds. Therefore, higher payouts to shareholders imply directly in the external funds demand and higher leverage.

Figure 4.2: Experiment A

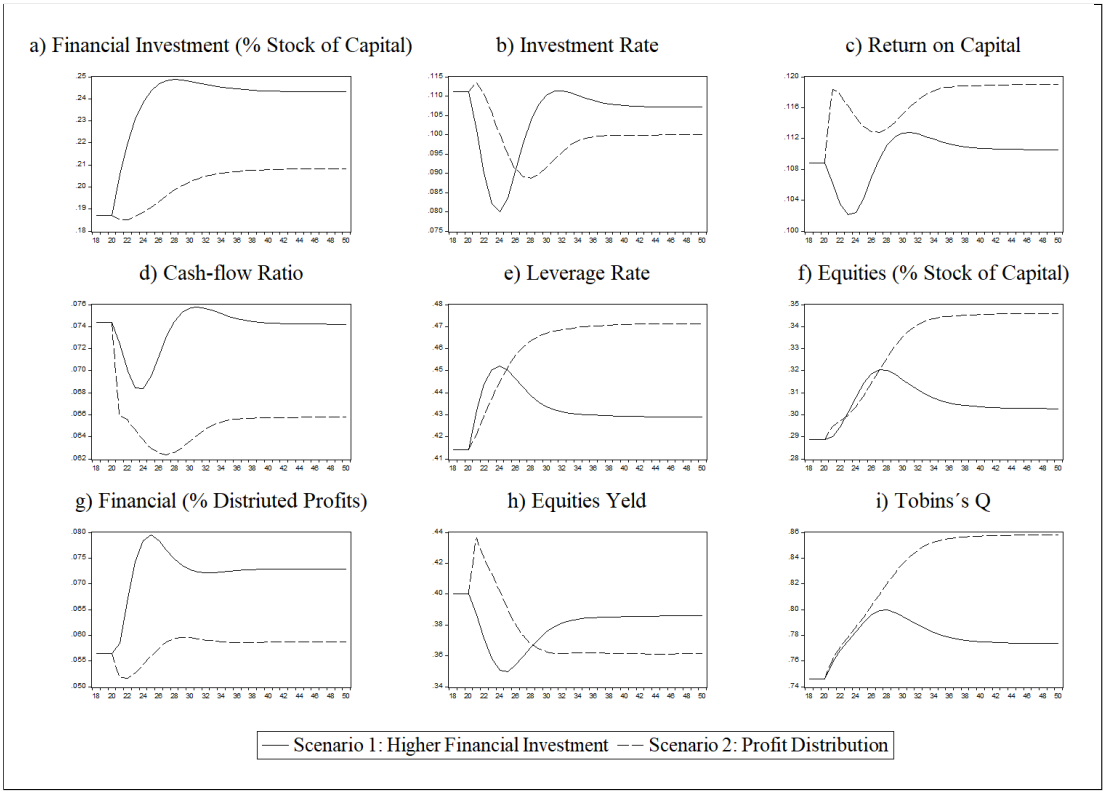


Figure 4.2 emphasizes some important results of Experiment A. The financial investment expands in both scenarios (panel *a*), presenting the higher increase in Scenario 1, as consequence the financial share of distributed profits increases. Gross profits out of GDP decreases in Experiment A, indicating that profitability decrease is more intense than the observed in the whole economy. Additionally, the fall of the profits out of the capital stock (Figure 4.1) is a common element within this experiment. Higher leverage (panel *e*) and lower investment (panel *b*) consist of a common result for both scenarios on Experiment A. Also, increasing participation of equities on external funds is registered (panel *f*). Distributed profits (return on capital, panel *c*) are higher for both Scenarios 1 and 2, affected by the higher payout rate, attenuated by the decrease in capital stock. Yet, the equity yield ratio falls for both scenarios (panel *h*), due to the pressures on equities prices (Figure 4.1).

The valuation ratio (panel *i*) increases reflecting the fact that Tobin's Q ratio accounts for the market value of the firm, which includes the totality of the external funds. Interestingly, while the return on capital remains slightly unchanged in Scenario 1, the equities' yield experienced a significant decrease. This divergence emerges from changes in equities prices (Figure 4.1), that cause the market value of the stock of equities to increase. Ultimately this consists of a wealth effect on households' portfolio allocation, which leads to higher equities prices.

Particularly, in Scenario 2 the higher profit distribution affects directly the return on capital, which increases in expense of internal funds generation, as the cash-flow ratio drops from 7,4%

to 6,5%. The lower the internal funds the higher the need for external funds, therefore, leverage and equities, both out of capital stock, increase to compensate for the decrease of the cash-flow ratio. The investment rate decreases by 6% (panel *i*), as a consequence of the higher leverage. Despite such negative indicative, the valuation ratio increases following the wealth effect on equities prices and the higher outside funding. Also, capital gains register expressive growth, led by the growth in equities prices, which boosts households' wealth increase. Scenario 2 corroborates the "paradox of greed", the effect of a higher payout rate is rather a decrease in profitability. Despite the minor increase in the rate of return on capital, which is due to the lower accumulation, profits out of GDP register the deepest decrease among all four scenarios (Figure 4.1). Moreover, is possible to link the increasing household's wealth with the higher financial income (panel *g*), which suggests an increasing preference of the financial investor over financial assets.

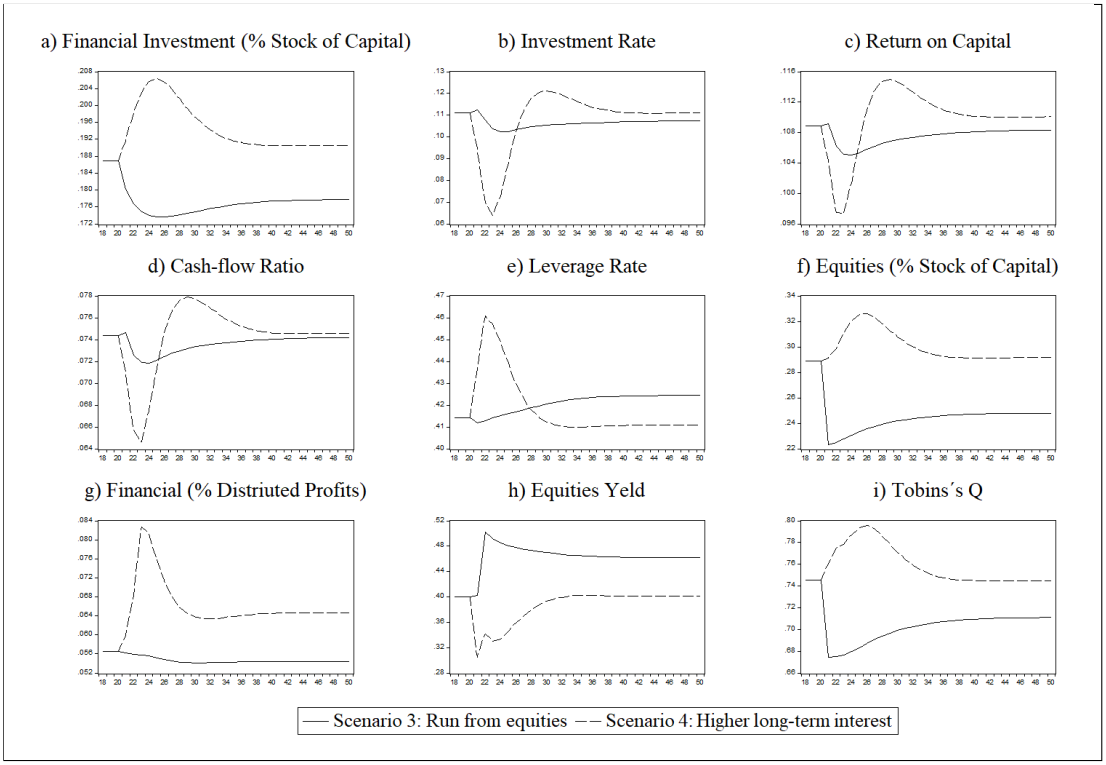
Results suggest that distribution leads to downsizing, via the negative effect that higher leverage exerts on accumulation. Scenario 2 is consonant with the "downsize and distribute" process described by Lazonick and O'Sullivan (2000), but suggests the opposite causality. Furthermore, the present work argues the causality of such a relation. Additionally, the decreasing investment in accumulation and the increasing financial investment are due to the higher leverage and the increasing risk principle, rather than an explicit diversion.

Experiment A confirms the negative influence that higher leverage causes on firms' gross investment. Thus, corroborating the crowd-out argument caused by higher financial investment and profit distribution. However, the causality of the model indicates that the investment contraction is due to the increasing risk principle rather than a portfolio diversion.

textbfExperiment B: Higher uncertainty, run from equities and higher interest rates

Experiment B examines a higher uncertainty, emulating the collapsing phase of the liquidity cycle. The escape of the investors from the stock market (Scenario 3) and, increased interest rates (Scenario 4). As result, both scenarios on Experiment B harm accumulation, nevertheless, the magnitude of the final value is minor if compared with the scenarios in the previous experiment. Similarly, in all the performed scenarios, the negative effects that firms' leverage rate exert on accumulation play a major role. Results are displayed in Figure 4.3.

Figure 4.3: Experiment B



Scenario 3 shows the effects of a households' run from the equities market toward short-term bills. Thus, a higher uncertainty causes the rentier sector of the households to reallocate wealth, aiming for a lower risk. This liquidity shock implies a reducing share of wealth allocated on equities, which is channeled to public bonds. To preserve the portfolio allocation principles, a rising preference for an asset implies a decreasing preference for other assets. Therefore, as shown in Table 3, this experiment displays two parametrical changes representing the same behavioral change. The first and most direct consequence consists of an abrupt decreasing equities price (Figure 4.1, panel *f*), as consequence the number of equities held by households increases, yet the liquid amount pondered by prices decreases. Therefore, both financial investment and accumulation fall in Scenario 3. Accumulation decrease (panel *b*) is due to both higher leverage (panel *e*) and lower return on capital (panel *c*). Financial assets stabilize at a lower level because of lower valuation ratio (panel *i*) and also lower return on capital, yet, this variable has shown highly volatile traverse due to being weighed by the decreasing capital stock. Scenario 3 is the only one to display decreasing prices on equities as an immediate effect of households' changes on the portfolio (Figure 4.1). The equities share on capital stock and the valuation ratio both decrease significantly after the shock. The opposite effect manifests on the equities yields. Scenario 3 is the only one to display a decreasing financial share of distributed profits decreases (panel *g*).

Scenario 4 conveys an increase in the long-term interest rates due to a higher liquidity premium. This emulates the effects of a higher liquidity premium due to higher uncertainty. Higher long-

term interest rates [42] imply lower prices, leading to a revaluation of assets and liabilities and, capital losses for firms. Scenario 4 is the most recessive experiment (Figure 4.1) and, unlike the previous experiments, most of the selected results present only temporary changes and converge back to the baseline values. Among all scenarios, the interest rate increase leads to the smallest increase in the households' wealth. The abrupt fall in accumulation on the first periods after the shock (Figure 4.2, panel *b*), fully recovers. The output growth follows the same path and stabilizes at the same level that prevailed before the shock.

In Scenario 4 firms register significant capital losses, which impact negatively the leverage and the accumulation rate. Despite the negative effects that these capital losses have on profit, the interest rate gap favors firms' investment in financial assets, which reinforces the negative pressures on leverage in the immediate periods after the shock. Yet, these negative signals are not perceived by the shareholders, which experiment a higher distributed profits due to higher participation of the financial revenues. Also, the leverage rate tends to stabilize at the baseline value after the sharp increase (panel *e*). Capital accumulation remains unchanged in the long term (panel *b*) because the negative effect the interest rate gap exerts on the accumulation rate is offset by the positive effect caused by the lower leverage ratio. And, unlike the previous experiment, this is the only scenario in which households' wealth stagnates. Capital gains are positive for households and negative for firms because prices of bonds decrease and equities prices increase. Firms' equities prices increase temporarily, so does the portfolio increase in-equities. The temporary and intense increase in relative households' wealth leads to portfolio reallocation that prioritizes short-term bills over deposits. Experiment B reinforces the results displayed in the previous experiment, that the collapse of the liquidity cycle is connected with a decreasing capital accumulation.

4.3 Conclusion

The essay advance with a novel framework that encompasses the systemic implications of firms' internal decisions and changes in financial conditions, providing an evaluation of how a higher financial investment, profit distribution, and uncertainty impact accumulation and growth.

The model advances with a systemic macroeconomic framework that encompassed the increasing risk principle, providing valuable insights on the aggregate implications of a firm's decision or unexpected liquidity changes. For all the different scenarios the investment out of profits ratio has declined, providing an illustrative exercise for Stockhammer (2004) argument on the profit-growth trade-off. Also, results are consonant with the literature of the negative effects of financial investment (ORHANGAZI, 2008; STOCKHAMMER, 2004; TORI; ONARAN, 2018), confirming that financial investment and uncertainty led to the slowdown in accumulation. Notwithstanding, the reason behind these contractionary effects relied on the increasing

[42] Reflecting the claim made by endogenous interest rate theorists that the long-term interest rate is determined by the interaction between the government and the market (MODENESI et al., 2013).

risk principle (higher leverage).

This essay suggested that, due to high liquidity and short maturity, the investment in financial assets is not directly constrained by indicators such as higher leverage rates. Simulations confirmed some of the negative effects that financial assets can exert on investment. The results provide an antagonistic portrait of the mainstream claim that more finance leads to higher growth and development. Because such results are dependent on the parameters and initial values for the variables, they should be interpreted as an illustrative exercise. The model has addressed the possibility for uncertainty affecting the equilibrium via exogenous changes on liquidity premium. Finally, results have shown that the investment decision is complementary to the decision on external fund acquisition. Therefore, our results are consonants with Kaleckis' increasing risk principle. If no credit constraints or other restriction to external funding takes place it is unlikely that the profit-growth puzzle emerges.

This paper opens possibilities for further research, especially for a more complete or empirically oriented analysis. For example, a natural extension would open the economy to the rest of the world, treat the long-term interest rate as endogenous to the market interactions, disentangle the private banks' active balance-sheet management, add for the possibility of household's debt and, consider the distinction between workers and households.

Appendix - Chapter 4

Parameters: in order of appearence

Parameter	Value	Parameter	Value
θ	0.24	π	0.4
μ	0.6666	α_1	0.9
λ_{20}	0.30	α_2	0.07
λ_{22}	1.1	γ	0.12
λ_{23}	0.32	σ	0.54
λ_{24}	0.03	γ_{bl}	0.5
λ_{30}	0.30	ξ_0	0.05
λ_{32}	1.1	ξ_1	1
λ_{33}	0.32	ξ_2	0.28
λ_{34}	0.03	s	0.42
υ_0	0.1	i_b	0.032
υ_u	0.08	i_{bl}	0.037
υ_π	0.09	i_l	0.039
υ_{lev}	-0.15	i_a	0.035
υ_{gap}	0.4	i_d	0.027

5 Conclusion

This dissertation has presented three essays that discussed aspects of financial development and financial integration in emerging market economies, and the harmful effect that the liquidity cycles. Particularly, it focused on the real macroeconomic manifestations that emerged from financial aspects. The work relied on the stock-flow consistent modeling due to its potential to link real and financial aspects and track the sequence of short-term interaction through time. The analysis is supported by the post-Keynesian economic theory, featuring the rejection of the mainstream notions of equilibrium and natural tendencies.

Chapter 2 explored the causes and consequences of an exchange rate devaluation. The model proposed an alternative for endogenous exchange rates in stock-flow consistent modeling, addressing the issues faced by the emerging market economies from an innovative perspective. The exchange rate is determined by the short-term currency market and by the behavior of dealers in this market. Simulations demonstrated the contractionary effects of the devaluation. The pass-through effect appears as a crucial element for guaranteeing the positive effect after a devaluation, a typical claim in mainstream macroeconomics. The larger participation of chartist dealers in the currency market conveyed a smoother pattern to the exchange rate trajectory.

The external vulnerability of emerging market economies has been credited to public external indebtedness. Nevertheless, financial development conveyed a new form of external vulnerability for those countries. Chapter 3 discussed how the private sector, firms, and banks, engaged in external debt and its implications. Experiments emulated the effects of an international liquidity cycle on an emerging market economy, discriminating between the boom and the bust phases. Results revealed that the private sector's international indebtedness is potentially interconnected since firms' funding impacts banks' balance sheet management. Financial innovations were assumed to facilitate the interconnection between different types of private external debt, this work suggested that this connection leads to external vulnerability. Firms and banks displayed antagonistic performance depending on the phase of the cycle: on the surge, the firms benefited while banks' was profitability was reduced, the opposite occurred on the contractionary phase of the international liquidity cycle.

Chapter 4 assessed how financial innovation, profit distribution, and liquidity affect accumulation. Recent literature on financial development effects on accumulation was critically reassessed. Particularly the crowd-out effect of financial assets on accumulation, the effect of higher uncertainty, and the shareholder-value orientation approach were summarized within the "increasing risk principle" approach. A model was developed enabling parametrical shocks that emulated those features systemically. Experiments mimic a firms' higher willingness to buy financial assets, to distribute more profits, and also a higher state of uncertainty channeled through a households' run from equities and higher interest on bonds. Results suggested that the elements under analysis have led to the contraction of the investment, with the causality

running from the leverage rate to a lower accumulation rate.

In sum, the dissertation supports the post-Keynesian literature in several aspects. Particularly, within the SFC tradition, the medium-scale growth models were prioritized to cope with the issues faced by developing and emerging market economies. The liquidity cycles, and particularly the international liquidity cycles, permeated the dissertation and our analysis disclosed some deleterious effects of these cycles on growth and distribution. Chapter 2 and Chapter 3 innovates on the field of the models with growth representing small open economies, as an alternative for the predominant SFC models of two economies without growth, also, these essays are dedicated to exploring the new forms of external vulnerability. Chapter 2 presented a new framework for the determination of exchange rates in SFC growth models, also provided a detailed analysis of the macroeconomic effects of exchange rate variation, transmitted through balance sheets. Liquidity cycles, both domestic and international, and financial development connect the three essays and provide the theoretical background to the dissertation. Chapter 4 turned the focus from the international aspects to the endogenous sources of liquidity changes and fragility, advancing with a general approach that connects distinct explanations for the slowdown in growth. In Chapter 4 the endogenous emergence of fragility is a consequence of the adoption of financial innovations as a form to profit without compromising with physical investment. Finally, the dissertation provided support for forthcoming efforts on the modeling of SFC models with growth, encouraging the promising research agenda of disclosing the effects of financial development in emerging market economies.

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