UNIVERSIDADE ESTADUAL DE CAMPINAS
INSTITUTO DE ECONOMIA

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SHORT-RUN OPEN ECONOMY MACROECONOMICS AND EXTERNAL CONSTRAINTS: GOING BEYOND THE TRILEMMA FRAMEWORK

MACROECONOMIA ABERTA NO CURTO PRAZO E RESTRIÇÕES EXTERNAS: PARA ALÉM DO TRILEMA DE POLÍTICA MONETÁRIA

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Resumo

As discussões sobre política monetária em economias abertas frequentemente chegam à proposição do trilema de política monetária. De acordo com este quadro teórico, não é possível se obter mais de dois dos três objetivos desejáveis da política monetária: taxa de câmbio estável, livre mobilidade de capitais e autonomia (ou independência) de política monetária. Esta tese aborda as limitações desta literatura para o debate sobre políticas macroeconômicas de curto prazo e propõe uma perspectiva alternativa que incorpora elementos pós-keynesianos e estruturalistas na análise. O capítulo 1 aborda o estreitamento das discussões em torno da análise de política em economias abertas e discute os pressupostos teóricos que contribuíram para este resultado. Já o capítulo 2 investiga os vários "-lemas" da literatura Novo Keynesiana e argumenta que as afirmações teóricas e conclusões empíricas de redução de autonomia de política monetária em economias abertas derivam de diferentes entendimentos sobre o que é autonomia. O capítulo 3 apresenta como a literatura pós-keynesiana incorpora a estrutura do trilema nas suas recomendações de política e aponta as suas limitações. Porém, este capítulo também incorpora as suas contribuições num quadro alternativo para discutir o espaço de política e as restrições externas num contexto de assimetrias produtivas, monetárias e financeiras. Finalmente, o capítulo 4 apresenta um modelo pós-keynesiano agregado simples e de curto prazo para estudar o efeito de um choque monetário externo no espaço de política econômica. O argumento é que as condições financeiras externas nem sempre afetam mecanicamente a demanda agregada, mas têm um impacto direto sobre a restrição externa.

Palavras-chave: política monetária ; taxa de câmbio; integração financeira; balanço de pagamentos; restrição externa; espaço de política econômica; economia keynesiana

Abstract

Discussions of monetary policy in open economies often lead to a proposition derived from the trilemma framework. This framework posits that policymakers cannot achieve more than two out of three desirable goals: stable exchange rates, free financial flows, and monetary policy autonomy (or independence). This dissertation addresses the limitations of using the trilemma framework in this debate and proposes an alternative perspective that incorporates post-Keynesian and structuralist elements into the analysis. Chapter 1 addresses the narrowing of discussions surrounding open-economy macroeconomic analysis. This chapter critically discusses the evolving hypothesis made in the model during the 1960s that led to the Mundell-Fleming result and popularized the monetary policy trilemma. Chapter 2 investigates the various "-lemmas" derived from the Mundell-Fleming (M-F) framework, as adapted by the New Keynesian literature with a post-Keynesian lens. It argues that the theoretical claims and empirical findings of reduced monetary policy autonomy in open economies derive from different understandings of what autonomy is. Chapter 3 discusses how the post-Keynesian literature incorporates the trilemma framework into its policy recommendations. The chapter points to its limitations but also integrates their contributions into an alternative framework to discuss policy space and external constraints in a context of productive, monetary, and financial asymmetries. Finally, chapter 4, presents an aggregate small-scale short-run post-Keynesian model to discuss policy space after an external monetary shock. The argument is that external financial conditions do not always mechanically affect aggregate demand but can directly impact the external constraint in the short-run.

Keywords: monetary policy; exchange rates; financial integration; balance of payment; external constraints; policy space; Keynesian economics

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List of Symbols

Latin letters

A	total autonomous demand
A^e	exogenous demand
b	real interest rate's impact on aggregate demand in New Keynesian models
BP	balance of payment
D^i	debt inflows
D^o	debt outflows
DA	debt amortization
C	total consumption
c_1	impact of the exchange rate on exports in New Keynesian models
c_2	impact of the exchange rate on the inflation rate in New Keynesian models
c_w	propensity to consume out of wages
d_{max}	maximal amount of debt to export ratio
E	real exchange rate with PPP
e	nominal exchange rate
e^e	nominal exchange rate expectatations
e_0	nominal exchange rate conventinal value in the short-run
FDI	exogenous foreign direct flows
FA	financial account
F^i	total financial inflows
F^o	total financial outflows
f	negative effect of the exchange rate in New Keyensian IS curve
i	nominal interest rate
i^{cb}	Central Bank policy rate
i^f	external nominal interest rate
i^{lr}	nominal domestic long-term interest rate
i^{br}	nominal banks' lending rate
i^n	natural (or stabilizing) interest rate in New Keynesian models
i^{floor}	interest rate floor
I	total investment
M	total imports
NBF	net bank flows

NPF	net portfolio flows
NX	net exports
p^d	domestic price level
p^f	foreign price level
$\hat{p}^T$	inflation target
$\hat{p}^d$	domestic inflation
$\hat{w}$	wage inflation
R	international (or foreign) reserves
rer	real exchange rate
r_d	sensitivity of external risk to the
u_n	normal capacity utilization rate
w	wage share
w^k	firms' target real wage
w^w	workers' target real wage
X	total exports
X_a	autonomous exports
x_k	firms' ability to readjust their prices
x_w	workers' ability to readjust their prices
Y_p	potential output
Y	aggregate demand
y	output in the New Keynesian model
y_n	constant-inflation output in the New Keynesian model
Z	risk premium in Smithins' uncovered interest rate adaptation

Greek letters

α	inflation inertia in the New Keyenesian model
β	share of external risk in the country risk premium
γ	sensitivity of demand to the interest rate
δ_1	sensitivity of inflation to deviations betwen output and constant-inflation output
δ_2	central bank's aversion to inflation deviations
ϵ_2	temporary shocks on the inflation rate
ϵ_1	demand shocks in the New Keynesian model
ε_x	price elasticity of exports
ε_m	price elasticity of imports
ε_f	negative effect of the exchange rate in the dilemma IS curve
η_m	propensity to import out of income
η_f	propensity to resort to external financing
ι	size of international investors in local bond markets

λ_{er}	effect of the exchange rate on long-term rates
λ_{er}	term premium on long-term rates
ν	sensitivity of investment to demand
ρ	sensitivity of portfolio flows to the interest rate
σ_0	exogenous risk
σ_1	sensitivity of the country risk to the key-currency
σ_2	sensitivity of the country risk to changes in the exchange rate
ϕ	paramenter that reduces the weight of past debt
ψ	impact of the real exchange rate on real wage desired by firms
Ω	impact of capacity utilization on real wage desired by workers

Contents

Introduction

Keynesian debates about the consequences of opening the economy to managing economic policies can be traced back to the 1950s when Meade (1951) highlighted the tools available to achieve a national policy goal of full employment (internal balance) and equilibrium in the balance of payment (external balance) simultaneously. In the context of dollar shortages after the Second World War, old Keynesians were also concerned with the balance of payment being a constraint to achieving full employment (Kahn, 1972a). At the same time, Prebisch (1949) - founding father of Latin-American Structuralism – stressed that peripheral (or developing) countries[1] , with underdeveloped and less diversified productive structures, were more vulnerable to external shocks due to their specific type of commercial integration into the world economy, characterized by technological and productive asymmetries. Therefore, in these economies, the balance of payment constraint was more binding since import and/or external financing needs could impair growth and development.

During the 1960s, open economy debates morphed into a discussion of the effectiveness of fiscal and monetary policy in achieving full employment under different exchange rate regimes, and the potential problems of a balance of payment constraint were abstracted. With perfect asset substitutability, and unlimited capital flows, the balance of payment could quickly adapt, but the control of the money base was lost under a fixed exchange rate regime (Mundell, 1963, Fleming, 1962). The loss of control of the money supply and the resulting ineffectiveness of monetary policy in a fixed exchange rate regime was defined as a loss of monetary policy autonomy or independence by Obstfeld (1998). As a result, Obstfeld (1998) argued that monetary policy is faced with a trilemma (or impossible trinity): without capital controls, monetary policy can only be autonomous when the exchange rate is allowed to float. Given the theoretical preference for monetary policy over discretionary fiscal policy in monetarist, neoclassical, and New Consensus models, a floating exchange rate regime has become the policy recommendation derived from those perspectives when considering this policy trade-off.

In the early 2000s, New Keynesian and New Consensus models incorporated the actual operation of monetary policy (i.e., the interest rate as central banks' operational target), which was already present in the old-Keynesian view (Meade, 1951, Kaldor, 1982, Kahn, 1972c). With sterilization, monetary authorities can set the policy rate (short-term interest rate) at the desired level. Still, in a fixed exchange rate regime, they face a limit to their ability to lower interest rates determined by the foreign interest rate because capital outflows could make the peg unsustainable. Consequently, a flexible exchange rate was still preferred while the monetarist

[1] In these thesis, peripheral countries/economies and developing countries/economies will be used as synonymous.

approach to opposing fiscal policy prevailed (Romer, 2018). As a result, although the challenges of a floating exchange rate for developing economies are recognized (Calvo and Reinhart, 2002), modern discussions on implementing domestic policies in open economies are bound to come across the monetary policy trilemma framework and its variations, such as the dilemma (Rey, 2013) and the quadrilemma (Aizenman, 2019).

The modern trilemma states that a country can only choose two out of three policy options to achieve three different policy goals: free capital mobility (aiming for financial integration with the rest of the world), a fixed exchange rate (to achieve exchange rate stability) and monetary policy autonomy (to achieve a domestic goal). Nevertheless, while it is easier to outline a distinction between the first two policy options (flexible exchange rate and free capital mobility) and goals (exchange rate stability and financial integration), this distinction is not always evident in the third case. This stems from the blurred concept of monetary policy autonomy (also refer to as independence). The New Keynesian literature put forward two definitions of such autonomy: (i) the capacity of monetary policy to choose and define its policy instrument (or operational target, such as the short-term rate) independently of external factors to achieve its domestic goal (Aizenman et al., 2008, Obstfeld et al., 2004), or (ii) the capacity of the chosen policy instrument (the policy rate) to affect the policy goal (for example, aggregate demand) in the predicted direction effectively without influence from external factors. In this last approach, monetary policy autonomy means policy effectiveness (Rey, 2013, 2016).

Although the empirical literature has found that countries do indeed adopt a combination of the three policies, partially achieving the desired objectives (financial integration, exchange rate stability and a domestic goal), some authors argue that the trilemma framework is still relevant to study how exchange rate flexibility expands monetary policy autonomy (Aizenman et al., 2008). While in the quadrilemma, foreign exchange rate reserves allow policymakers to combine an open capital account, exchange rate management and monetary policy autonomy (Aizenman, 2013), in the dilemma, monetary policy autonomy is only possible when capital controls are implemented, independently of the exchange rate regime (Rey, 2013, Passari and Rey, 2015). Notwithstanding, the understanding that a flexible exchange rate increases space for monetary policy still stands, and, therefore, the trilemma lives on (Gopinath, 2019).

However, the establishment of flexible exchange rate systems after the collapse of Bretton Woods in 1973 did not imply the automatic adjustment of balances of payments in different countries, as predicted in the 1960s by Mundell (1963) and Friedman (1953). On the contrary, it was observed an increase in exchange rate volatility, creating additional challenges for economic policies, especially in developing economies that – besides their asymmetrical technological and productive integration - have an asymmetric monetary and financial integration in the current International Monetary and Financial System (IMFS) (Prates, 2005).

The monetary asymmetry refers to the hierarchical character of the current IMFS, organized around a key currency (the fiat dollar), which fulfills all monetary functions and has the highest liquidity premium at the international level. Currencies issued by the other center

countries are in an intermediate position, while countries at the periphery are at the bottom (Conti et al., 2014). These peripheral currencies are usually not accepted for external debt denomination and, in some cases, not even for long-term debt within the national territory (Eichengreen et al., 2005)). The resulting currency mismatch adds an extra concern for macroeconomic management since exchange rate depreciations have negative balance-sheet effects on the public and private sectors indebted in foreign currency, ensuing a contractionary impact in aggregate demand and output instead of the positive impact implied in the Mundell-Fleming model (Vernengo and Caldentey, 2019, Serrano and Summa, 2015). The financial asymmetry, in turn, refers to the drivers of capital flows towards peripheral economies, which depend more on external shocks (or push factors), and the marginal insertion of these economies' financial assets in global investors' portfolios. Consequently, the boom-bust capital flow cycles have critical destabilizing effects on their exchange rate and domestic financial markets (Ramos, 2016, Prates, 2005).

Although post-Keynesians and the currency hierarchy literature are critics of both the Mundell-Fleming model and the New Keynesian framework, some authors still frame much of the discussion of macroeconomic policies in open economies under the trilemma framework terms that focus on monetary policy autonomy and the choice of the exchange rate regime (Wray, 2015, Wray and Sardoni, 2007, Smithin, 2018, Kaltenbrunner and Painceira, 2017, Cömert, 2019, Conti et al., 2014).

The main research question of this thesis concerns the economic challenges financially integrated economies face in the current IMFS and how well they can be analyzed under the trilemma framework in short-run macroeconomics. The hypothesis is that the trilemma framework represents a narrowing of macroeconomic policy discussions compared to old Keynesian and structuralist debates and is not suited to understanding open economy policy trade-offs.

Considering the problems with the trilemma framework and inspired by such debates, this dissertation will argue that, even as a first approximation, both concepts of monetary policy autonomy described earlier can be problematic for economic analysis. In an interconnected world, policy goals will not be absent from foreign influences, and policymakers will usually make decisions taking this into account. However, it is necessary to update the old Keynesian and structuralist considerations on the balance of payment performance as an external constraint for macroeconomic policies, especially for peripheral countries.

This dissertation will advance a post-Keynesian approach to analyze the contemporaneous macroeconomic policy challenges of open economies, anchored on the concepts of external constraints and policy space, as defined below.

The concept of external constraints proposed for short-run open macroeconomic analysis updates the original concept – external financing needs associated with the technological and productive asymmetries as a balance of payment constraint for aggregate demand – to the current IMFS. More specifically, it incorporates the challenges that stem from the monetary and financial asymmetries, including an interest rate floor for domestic interest rate setting as a second external constraint. This floor aims to avoid depreciation pressures on the exchange rate

during the bust phase of the capital flow cycles, which has spillovers on external financing costs and impacts other domestic variables. Those external constraints, in turn, are constraints (that can be relaxed) and not determinants of domestic policies.

As such, policy space (in the short run) can be understood as the space a country has to implement demand management policies or other policies to affect aggregate demand (such as industrial policy) , which is determined by the gap between the current output level and the output consistent with the balance of payment constraint. This definition is in line with the long-run analysis of Prebisch (1949) and Thirlwall (1979), where the balance of payment-constraint output is determined by the level of export and the propensity to import (or import coefficient) and Bhering et al. (2019) that includes the role of external finance on the balance of payment constraint. In the current IMFS, the U.S. has full policy space because, given the dollar's role as the key currency, it can finance trade deficits indefinitely without incurring increasing costs. Countries with low import needs or more access to external financing, usually center countries, have more policy space than the peripheral countries. For monetary policy in particular, the interest rate floor determines the policy space to reduce the interest rate level. In this latter case, there is also an asymmetry of policy space between center and peripheral currencies due to their position in the currency hierarchy.

Overall, the main contribution of the thesis is to incorporate the concepts of policy space and external constraints in analytical terms, separating the effects of external conditions on such constraints from their effects on aggregate demand. Those propositions, in turn, are illustrated in a post-Keynesian open economy model inspired by the old Keynesian and structuralist debate.

To investigate the research question, besides this introduction and conclusion, chapter 1 presents the "big picture" of policy options and the balance of payment constraint derived from old Keynesians and structuralist authors and critically assesses how the trilemma framework compares to the earlier open economy concerns. More specifically, it discusses which hypothesis transformed Meade's (1951) flexible model of policy choices into the monetary policy trilemma.

Chapter 2 discusses the New Keynesian literature that aims to incorporate potential problems of flexible exchange rate regimes associated with the effects of the global liquidity cycle on monetary policy outcomes. We do so with a simple representation of the New Consensus approach to short-run macroeconomic analysis and by critically reviewing the empirical literature that aims to assess monetary policy autonomy under different exchange rate regimes.

Chapter 3 discusses the use of the trilemma framework in the post-Keynesian literature and proposes an alternative approach based on the concepts of policy space and external constraints as defined above, going back to the old Keynesian and structuralist "big picture" while incorporating the challenges imposed by monetary and financial asymmetries in the current IMFS stressed by the currency hierarchy literature.

Finally, chapter 4 proposes a short-run model that integrates the post-Keynesian principles of effective demand, conflict inflation, and endogenous money with the risk-adjusted

interest rate floor as an external constraint for monetary policy setting and a balance of payment constraint imposed by the need to acquire external financing.

Chapter 1

Monetary policy and the open economy: old debates and its neoclassical narrowing

1.1 Introduction

In the 1950s, James Meade developed a macroeconomic model outlining the main tools available for a country to address the conflicts that might arise when it seeks to simultaneously achieve full employment (internal balance) and equilibrium in the balance of payments (external balance). His work inspired the development of the Mundell-Fleming model, which became the workhorse of Keynesian analysis for open economies and is at the core of the monetary policy trilemma. This monetary policy trilemma, also called the impossible trinity, is still considered an important analytical framework for discussing open economy policy trade-offs and states that countries can only choose two out of three policy options: free capital mobility, a fixed exchange rate system and monetary policy autonomy defined as a monetary policy directed toward domestic goals (Obstfeld, 1998). Although some authors have more recently stated that countries face a dilemma instead (without capital controls, monetary policy cannot be autonomous, regardless of the exchange rate regime) (Rey, 2013, Passari and Rey, 2015), the understanding that a flexible exchange rate increases space for monetary policy still stands, and therefore, the trilemma lives on (Gopinath, 2019).

In contrast, this chapter argues that the Mundell-Fleming framework and its policy recommendation (to float to increase monetary policy autonomy) represent a narrowing of the sources of policy space and external constraints relevant to open economy policy discussions raised in the 1950s. This narrowing, in turn, results from a combination of simplifying assumptions for modeling strategies and also from the definition of external and internal equilibrium in the trilemma framework.

The remainder of the text is organized as follows. In section 1.2.2, we present Meade's (1951) model that highlights the tools available to address the possible conflicts between a national policy goal of full employment (internal balance) and equilibrium in the balance of payments (external balance) and their meanings. We also incorporate discussions by early Keynesian and Structuralist economists to distinguish between external balance and our interpretation of the balance of payments as an external constraint (balance of payment constraint)

derived from this literature. In section 1.4, we present the Mundell-Fleming model and discuss which hypotheses drove a flexible model of policy choices towards a model of monetary policy restriction. Section 1.5 concludes.

1.2 Policy Options and the balance of payment

In the first volume of his seminal book series, called "The Theory of International Economic Policy," Meade (1951) deals with the international aspects of what are for him two closely related problems: preserving, at the same time, the internal and external balance in the economy.

While internal balance is defined as maintaining full employment domestically[1], Meade (1951, p.3) argues that preserving an external balance (equilibrium in the balance of payment) needs further explanation because there is *"(...) one sense in which the balance of payment can never be out of equilibrium"*. In this section we discuss the meaning of external balance and the tools available for achieving internal and external balance simultaneously.

1.2.1 The meaning of external balance

As an accounting identity, the asset and the liability sides of the balance of payment must be equal since they merely enumerate the uses and sources of a country's purchasing power. Thus, to present an economic interpretation of international payments (im)balances, Meade (1951) states that is useful to divide transactions between *autonomous* and *accommodating*.

While *accommodating* transactions take place only because other items in the balance of payments change, the *autonomous* ones occur regardless of the size of other items. For example, autonomous receipts contain commercial exports, emigrants' remittances or reparation payments as well as all *"capital movements which are taking place on the initiative of private enterprises because it appears more profitable to invest capital in one country rather than another"*(Meade, 1951, p.11). One example of accommodating receipt is *"the loss by the central bank of its holding of gold or the sale of its holdings of foreign currencies in order to provide importers in the country in question at the current rate of exchange the foreign currencies needed to finance their purchases from foreign countries (...)"*(Meade, 1951, p.12). What matters to assess the balance of payments difficulties is the balance of *autonomous* trade and transfers and

[1]As Meade (1951) puts it: *"we define financial policy for internal balance as the control of total domestic expenditure by fiscal or monetary measures for the purpose of achieving whatever is considered on domestic grounds to be the best form of stability of demand for home production and for home employment, though for short-hand we shall often talk of this as being synonymous with the maintenance of full employment"*. The assumption was that with a level of demand compatible with full employment, prices would be reasonably stable. Later, however, Meade (1978) declared that he should have done "*the underlying analysis not in terms of the reconciliation of the two objectives of external balance and internal balance, but in terms of the reconciliation of the three objectives of equilibrium in the balance of payments, full employment, and price stability"*

equilibrium is interpreted as a state of a country's balance of payment, which can be sustained with a stable exchange rate without intervention.

In Meade's (1951) model, external balance can be summarized by autonomous exports (X) and imports (M) - which determine the trade balance (NX) - and autonomous capital inflows (F^i) and outflows (F^o) which affect the net capital account (NFF)[2].

$$BP = (X - M) + (F^i - F^o) \tag{1.1}$$

Deficits or surpluses in the trade balance ($NX < 0$) that can be sustained without intervention (abstracting from capital movements and external credit) depend on a set of parameters derived from an integrated approach of the balance of payment adjustment process, that is, of a combination of the elasticity and the trade multiplier approach[3].

According to the elasticity approach, changes in the exchange rate (e) on the terms of trade (price effect) when imports are denominated in foreign currency and exports in domestic currency [4] and, as a result, the trade balance depends on supply and demand elasticities for exports and imports. Because the supply of both exports and imports is assumed to be fully elastic [5], the final effect will depend on the price elasticities of exports (ϵ_x) and imports (ϵ_m). Since an exchange rate devaluation increases the total value of imports in terms of national currency and, simultaneously, can increase the volume of exports due to a competitiveness effect, the final result will depend on which effect predominates and the initial situation of the balance of payment.

Starting from a balance of payments equilibrium position, exchange rate devaluations will have a positive net effect on the trade balance if the sum of the demand elasticities of exports and imports exceeds unity. This condition, known as the Marshall-Lerner (or the Bickerdicke-Robinson [6]) is represented in equation 1.2[7]. It implies that if the sum of the elasticities is not large enough, the initial effect of a real exchange rate depreciation is a deficit in the trade balance.

[2] Meade (1951) includes in the capital account both borrowing from (and lending to), capital payments by (and capital repayments to) as well as sales of assets to (and purchase of assets from) foreigners. In the current methodology of the balance of payments, the financial account corresponds to the former capital account (IMF, 2009).

[3] The combination of the elasticity approach by the addition of a multiplier effect of price changes on income and output was put forward initially by Robinson (1947) and later incorporated in Meade's (1951) analysis. See Metzler, Alexander, and Tsiang (1961) for the history of the debate.

[4] As in Gandolfo and Federici (2016), when the terms of trade (ϕ) are a result of the relative export and import prices adjusted by the exchange rate $\phi = \frac{p_x}{ep_m}$. Since prices are kept fixed, the exchange rate directly affects the terms of trade.

[5] This means that supply adjusts to demand with no price adjustment.

[6] According to Gandolfo and Federici (2016), it would be more correct to call it the Bickerdicke-Robinson due to the doubtful contribution of Marshall and the earlier treatment of this conditions by Joan Robinson and even earlier by Bickerdicke.

[7] Note that in the general case, that is, when the economy starts at a disequilibrium position $NX \neq 0$ for a depreciation to improve the trade balance would be $(\frac{p_x}{ep_m})\epsilon_x + \epsilon_m > 1$. This means that the initial condition matters. See Gandolfo and Federici (2016) for a derivation of these results.

$$\left.\begin{array}{l} \dfrac{\partial NX}{\partial e} > 0 \quad \text{if} \epsilon_x + \epsilon_m > 1 \\ \\ \dfrac{\partial NX}{\partial e} < 0 \quad \text{if} \epsilon_x + \epsilon_m < 1 \end{array}\right\} \tag{1.2}$$

However, the total effect of a real exchange rate devaluation must also consider its effect on income changes, i.e., the demand elasticities of imports (η_m) and exports (η_x). In this perspective, devaluation will only positively affect the trade balance if it induces an increase in domestic output greater than the increase in domestic expenditure by domestic residents. Additionally, the trade balance can be affected by changes in demand. When the elasticity of the domestic demand for imports (η_m) is high, it can deteriorate the trade balance.

Although not fully explored, Meade's (1960) model also allows for capital movements (NPF) in the balance of payments. The autonomous component (i.e., the part that is not accommodating finance) is influenced by the difference between the external interest rate (i^f)and the domestic policy rate, or short-term interest rate, (i) but can also result from speculation against the exchange rate.

$$NPF = \rho(i - i^f + \Delta e^e) \tag{1.3}$$

Speculation can be carried out by financial traders, but also by importers and exporters when they anticipate or delay their transactions based on expected exchange rate movements. Under the assumption that speculators anticipate the future nominal exchange rate reasonably accurately ($e^e \simeq e_t$), and if there is a large number of speculators in the market, their transactions can make the exchange rate more stable and *"ease the mechanism of price adjustment in restoring equilibrium to a disordered balance of payments"* (Meade, 1951, p. 221). In this scenario, deficits in the trade balance would be fully accommodated by autonomous capital flows. The implicit assumption is that the exchange rate will move in accordance with the trade balance result ($\Delta\ e_t = \frac{NX_t}{NX_{t-1}}$ - 1). Conversely, when speculators do not correctly anticipate the course of exchange rate movements, *"the difficulties of adjustment of the balance of payments may be intensified instead of mitigated by speculation"* (Meade, 1951, p. 221). However, these flows are less deeply discussed than the changes in the trade balance since, given the historical period, those flows did not predominate.

Since changes in the stock of international reserves of the economy are considered accommodating transactions, the external balance ultimately depends on the result of equation 1.1 or what Meade (1951, p.15) also calls the "potential balance of payment deficits", that is *"the amount of accommodating finance which would be necessary to provide in any period in order to avoid any depreciation in the exchange rate"*.

A similar definition is given by Kahn when discussing the "dollar shortage" in Europe after the War, which emphasized the role of international credit as an accommodating transaction that would be consistent with external equilibrium:

> *By balance of payments equilibrium I mean a situation in which any adverse balance of payment on income account is matched by overseas borrowing of the kind which is perfectly ' acceptable '. In one sense there is no equilibrium so long as any borrowing is taking place, because a stream of lending cannot last indefinitely, and because the mere fact of borrowing alters the situation by piling up liabilities. But from a commonsense point of view it is possible to distinguish lending which is normal, in the sense that it can be expected to continue for a considerable time and that it is matched by investment in the borrowing country which, directly or indirectly, provides for interest payments.* (Kahn, 1972a)

Thus, the adjustment of the external balance can be interpreted as depending ultimately on the trade elasticity parameters (ϵ_X, ϵ_M, η_X, η_M), the way speculation affects the exchange rate , the level of reserves in the absence of 'acceptable' lending and policy actions. When an accommodating demand/supply is not met by the provision of accommodating finance (either automatically or due to a discretionary policy decision with reserves), the price of foreign currency or the level of demand can adjust to affect autonomous transactions. However, since those variables can also affect the internal balance, the policy-maker may need to intervene in order to achieve both targets simultaneously. The set of policy tools is discussed next.

1.2.2 A set of policy tools for internal and external balance

In Meade's (1951) analysis, monetary policy and fiscal policy are combined in what he calls "financial policy" to refer to expenditure increasing/reducing policies, which can be used to maintain either internal balance or external balance. In other words, financial policy (the interest rate and government expenditures and taxes) can be used to affect total domestic expenditure and to prevent an unsustainable deficit in the balance of payment.

As usual, fiscal policy refers to a decrease in taxes or an increase in government expenditure (G) conducted by the fiscal authority aiming to expand domestic expenditure and directly affect aggregate demand. Monetary policy, in turn, works through *"alterations in terms of which capital funds can be lent or borrowed (a change which we shall, for short, call a change in the interest rate)"*(Meade, 1951, p.99). This means that the supply of money will passively adapt itself to whatever the demand for money might be at the constant interest rate.

A reduction in interest rate (i) will expand the total amount of domestic expenditure by making it easier to borrow money for expenditure on capital goods. Thus, by acting indirectly on aggregate demand, monetary policy will only have the same expansionary or deflationary effect as the fiscal policy when domestic expenditure (Y) is very sensitive to the interest rate, i.e., when the interest rate sensitivity to demand b in equation 1.4 is high.

$$b = \frac{\partial Y}{\partial i} \tag{1.4}$$

Moreover, unlike fiscal policy, monetary policy would also have a direct effect on the amount of foreign lending. That is, while fiscal policy does not affect capital movements, the method of reducing interest rates *"may cause a significantly larger increase in the transfer of capital funds abroad and thus involve a significantly larger unfavorable movement in its total balance of payments"*(Meade, 1951, p.104). Therefore, the impact of monetary policy on the balance of payment will also depend on the sensitivity of the net financial flows to the interest rate differential ρ, i.e, the magnitude that capital inflows and outflows are impacted by the difference between the national interest rate and the external interest rate (i^*) as in equation 1.5.

$$\rho = \frac{\partial NFF}{\partial(i - i^f)} \tag{1.5}$$

Given the possibility of destabilizing speculation in exchange rate markets discussed previously, monetary authorities could counteract this adverse effect by moving government funds in the opposite direction through an "exchange equalization fund". However, this policy has an asymmetrical power to sustain increases and decreases in the exchange rate. While the fund can run out of its foreign currency holdings when trying to contain national exchange rate depreciation, there is no technical limit to support appreciation (Meade, 1951)[8].

This exchange equalization fund could, therefore, be used to manage the exchange rate in a type of price adjustment policy both in a fixed and flexible exchange rate regime. In the first case, the monetary authority would be allowed to change the peg in line with its objectives; in other words, the level of the exchange rate to affect net exports subject to the Marshall-Lerner condition. In the second case, in turn, the fund could be used to compensate for the destabilizing speculation described in the previous section.

Another type of price adjustment is wages. However, it can be noted that Meade (1951, p. 171-173) considers that a wage flexibility policy to achieve internal balance will only be effective when combined with a financial policy to equilibrate the balance of payment. This policy combination can be briefly described as follows: reducing money wages will impact the prices of domestic products and, consequently, the terms of trade (by making export prices more competitive), thus improving the balance of payment. When combined with a financial policy to prevent trade imbalances (in this case, reducing surpluses), the authorities can expand total expenditure, increasing the demand for imported products and ultimately restoring the balance of payment equilibrium. Nevertheless, old-Keynesians such as Kahn (1972d), and Keynes in particular, opposed these price adjustment policies:

[8]As Meade explains: *"It is always possible for the banking system in B to create additional supplies of B's money and to use it to purchase in the foreign exchange rate market additional holdings of A's currency"*(Meade, 1951, p.225). Note that this occurs assuming that a country issues its own currency

> *Put in a more sophisticated way, there are two objections to movements in the rate of exchange, to neither of which you do justice. The first relates to the effect on the terms of trade (...). The first relates to the effect on the terms of trade (...) in certain conditions of the elasticities involved, a depreciation in the rate of exchange may actually worsen the balance of payments, and it is easy to imagine cases where, even if equilibrium is restored, it is at the cost of a serious and unnecessary reduction in the standard of life. In the second place, in the modern world, where wages are closely linked with the cost of living, the efficacy of exchange depreciations may be very considerably reduced.* (Keynes, 1978, p.288)

Besides financial and price adjustment policies, the authorities still have a third set of policies at their disposal: direct controls (financial, commercial and capital movements controls). A summary of these policies is presented in Table 1.1[9].

Financial controls are divided between exchange rate controls, the use of multiple exchange rates in a country and fiscal controls. *Exchange rate controls* work by using legal restrictions to ration and monopolize the purchase and sale of foreign exchange by an 'exchange rate control authority'. In other words, it forces residents in the country to purchase and sell foreign currency (at the official exchange rate) from the exchange control authority (or an authorized agent). When effective, the control authority can ration the available foreign currency at a single official rate and decide how much is used for different purposes (Meade, 1951, p.264-268). However, the authority can also impose *multiple exchange rates*, charging higher prices for different products. *Fiscal controls*, in turn, refer to the "(...) use of taxes and subsidies for the purpose of influencing the various items of a country's balance of payment" and "(...) imports and exports are the things which lend themselves most readily to a simple tax or subsidy" (Meade, 1951, p.272-274). Services and other "invisible" items such as tourists' expenditure, in turn, are seen as difficult to regulate. Taxation on capital movements are also included in this subset of policies, but will require an exchange rate control authority (Meade, 1951).

Commercial controls can be used to set a "limitation upon the amount (or value) of a particular product which may be imported or exported" and "is more likely to be applied to 'visible' commodity imports and exports since it can be readily reinforced when the commodity in question passes over the country's frontier." Those policies are denominated as *quantitative restrictions* to restore the balance of payment equilibrium (Meade, 1951, p.276). The implementation of *tariff quotas* resembles the previous type of policy but is characterized by allowing a determined amount of imports without (or low) tariff and charging higher duties on an additional amount of imports aiming at reducing the profitability of what is determined as an excess amount of imports or exports. The creation of *State trading monopolies* could also be implemented in order to impose "quantitative restrictions through the issue of a limited quantity of import or

[9]Note that discussing the advantages and disadvantages of the different types of policies is outside the scope of this chapter. We only aim to present the different range of options that authorities have in order to achieve internal and external balance simultaneously.

export licenses" (Meade, 1951, p.288) *Financial controls*, on the other hand, can be used to regulate of capital movements in order to avoid "noxious speculative movements" (Meade, 1951, p.231).

Table 1.1: Policies for Internal and External Balance

Financial		Price Adjustment		Direct Controls						
Monetary policy	Fiscal policy	Exchange Rate Management	Wages	Financial			Commercial			Control on capital movements
				Exchange rate controls	Multiple exchange rates	Fiscal controls	Quantitative restrictions	Tariff quota	State trading monopolies	

In line with Jan Tinbergen's rule of economic policy, which states that achieving 'n' policy targets requires an equal number of independent policy instruments, the authorities in each country can select any two out of its five potential instruments to simultaneously achieve internal and external balance. Yet, in Meade's (1960) two-country model, the exchange rate and the balance of payment can be, respectively, a policy instrument and target under the influence of both countries. Consequently, if both countries choose the exchange rate as an adjustment policy to achieve different policy objectives, the system will have two targets and only one instrument - the system would be over-determined. If, conversely, both countries decide to offset any disturbance on the balance of payment (as a common objective) with the same expenditure-switching policy, the system is under-determined unless there is a combined rule for policy coordination (Meade, 1951, 1960). The result of the analysis was that to achieve both targets simultaneously (internal and external balance), it would be necessary to have one policy directed to manage the level of demand (expenditure-increasing/reducing policies) and another to manage the composition of expenditure on foreign and domestic goods (expenditure-switching).

In short, the book's core thesis is that a nation can attain both internal and external balance by implementing financial policies, such as monetary or fiscal instruments, to address the former, and exchange rates or other forms of control to achieve the latter. Since some of these policies can take the form of price adjustment or direct volume control, the choice between these two instruments would depend on the speed of adjustment of international trade to prices:

> *"(...) if demand in international trade is reasonably sensitive to changes in relatives prices, so that one country's products will displace another's if the price of the former's falls relative to the latter's, then the methods of price adjustment are greatly preferred. But if demand in international trade is insensitive, then, perforce, reliance must be placed on direct controls." (Meade, 1951, p.viii)*

Therefore, both internal and external targets can be achieved simultaneously when a wide range of policy instruments are available.

1.3 Policy tools and the balance of payment as an external constraint

From the former description, it is possible to conclude that Meade (1951, 1960) offered a very flexible model and tool of analysis. However, it did not come without criticism regarding some abstractions, assumptions, and mechanisms. A remark made by Nurkse (1952, p. 605), for example, is that, despite the model's flexibility, particularly concerning capital movements, a general *"[t]heory of international investment cannot get very far without distinguishing between countries of different types and at different stages of economic development. On the level of abstraction on which Meade's analysis moves, such distinctions hardly appear at all."* Nevertheless, it can be argued that the framework allows for different designs of policies in the context of dollar shortage, as advocated in Kahn (1972a), and by structuralist authors such as Prebisch (1950) and Furtado (2000), who were concerned with policies aimed at changing the productive structure of peripheral countries to deal with the balance of payment constraint in a context of uneven development. [10].

In this subsection we present the meaning of the balance of payment as an external constraint that resembles the concept of "dollar shortages" used by Kahn (1972a) and make a brief presentation of the policies discussed in Kahn (1972d) to deal with balance of payment problems.

1.3.1 Balance of payment constraint and policy tools

In the previous section, we presented Kahn's (1972a) understanding of balance of payment equilibrium. We turn now to a different but related concept, the dollar shortage:

> *It sometimes appears to be argued that dollar shortage prevails only to the extent that consumption and investment exceed production, i.e. that a country is 'living beyond its means '. According to the definition here proposed, the fact that a country's imports exceeded its exports would denote dollar shortage, except in so far as the deficit was financed by acceptable' lending, but dollar shortage can exist in the absence of such a divergence (import restrictions - or internal depression*

[10] According to Boianovsky (2010, p.237) Furtado attended James Meade's lectures on trade while he was working on a model that highlighted how balance of payments disequilibrium caused by a high imported coefficient of the investment sector could constraint the growth process in developing countries and could *"lead to the "strangulation" of the growth process unless the planning of the import-substitution process succeeds in increasing domestic production of capital goods (...) He showed the paper to Meade at the time, who remarked that the way out of external disequilibrium in underdeveloped economies was the resumption of capital exports by industrialized countries to their pre-1929 levels (Furtado 1985, 225; 1987a, 252). Furtado agreed, but replied that that would not rule out structural problems in late-industrializing countries. As recalled by Furtado (1985, 225; 1987a, 252), Meade "did not take seriously what I was saying. . . . He was undertaking a great theoretical effort to dynamize a neoclassical macroeconomic production function model. . . . There was no reason to infect economic science with institutional impurities" (see Meade 1961)."*

- operating to keep imports down to the level of exports) (Kahn, 1972a, p.38)

For Kahn, a situation of dollar shortage occurs when a country cannot finance trade deficits with acceptable lending [11], when it needs to resort to import restriction or to unemployment (or internal depression), which reduces the demand for imports. Kahn (1972a) therefore stresses that a balance of payments deficit, as an alternative to the latter two situations, *"is open only so long as the deficit can be financed"*.

We can interpret a situation of dollar shortage as what Thirlwall (1979) referred to as a balance of payment constraint: a situation where economic growth is constrained to achieve its maximum amount (or full-employment) due to imbalances in the country's current account. As discussed in Cripps and Godley (1976, p.341), if the economy seeks to achieve a minimum target for the current account (abstracting from the capital flows), the balance of payments may be a constraint on domestic policies because it can affect the maximum level of national income that could be achieved. This maximum can be below full employment.

In the context of a dollar shortage (or a balance of payment constraint), Kahn (1972c) argued that expenditure-reducing policies (fiscal and monetary[12]) are counter-productive for being painful and slow, and because they would put "the burden of adjustment on industrial capital development, on which technical progress so much depends"(Kahn, 1972c, p.68) while also generating useless unemployment[13].

Nevertheless, the influence of the interest rate on capital movements was recognized. According to Kahn (1972c), there is an asymmetric use of the interest rate with this objective. When the country is losing monetary reserves or attempting to replenish them after a loss, authorities tend to raise the interest rate, ignoring its effect on domestic demand. However, a favorable balance of payments does not exert the same pressure in the opposite direction, *"because it is far less important to avoid gaining monetary reserves than to avoid losing them"* (Kahn, 1972b, p. 127).

Kahn (1972a) was also skeptical about the existence of an exchange rate that would lead to a balance of payment equilibrium through free trade. As a result, price adjustment through exchange rate flexibility could be ineffective and lead to unidirectional cumulative

[11] Although Kahn (1972a) does not specify precisely what acceptable lending or distress borrowing is, we will assume that the former refers to low interest rates, while the latter refers to external finance at higher interest rate.

[12] Given the context of the Bretton Woods system, discussions of monetary and fiscal policy were mostly restricted to its effect on trade flows, implying a low level of ρ in equation 1.5. As a result both fiscal and monetary policy were aimed primary at affecting domestic demand.

[13] It must be noted that Kahn did not see monetary policy as particularly strong to increase investment and agreed that it could be more effective as a restrictive measure. Monetary policy has a direct influence mainly on investment in durable capital, including house building, more particularly in the private as opposed to the public sector, and therefore, monetary policy could not be disregarded. As he puts it: *It will be clear that I attribute to monetary forces a substantial influence on investment, though I regard it as slow in coming into effect and unpredictable in its results. At the same time I certainly take the view that there are other methods of influencing investment when it needs to be influenced. While considerable reliance should be placed on these other methods, this does not mean that monetary forces should remain completely impassive in the face of changing circumstances. There always must be a monetary policy* (Kahn, 1972b, p.128)

movements due to speculation in foreign exchange markets. Although the improvement of the external balance through devaluations was admitted in the long run, even when export and import elasticities may be low in the short run, he noted that devaluations could negatively impact distribution and inflation. As he explains, *"devaluation, taken beyond a certain point (...) will reduce the average standard of living because the adverse movement of the terms of trade will outweigh the benefit of a greater resort to international division of labour"*(Kahn, 1972a, p.49). .

As a result, he argued that flexibility could lead to exchange rate instability. However, the exchange rate should be adjusted according to the circumstances, while other tools, such as direct controls, should also be used.

According to Kahn (1972b, p.67), the unemployment experienced in Britain at the time was "largely due, directly and indirectly, to the loss of export markets which lay behind the balance of payments difficulties." In this context, contractionary fiscal and monetary policies curtail not only consumption but also investment, which could reduce the dependence on imports or allow for more competitive exports. As a result, these policies do not go *"to the roots of the balance of payments trouble...indeed, permanent damage will have been inflicted by the loss of potential improvements in productive capacity and efficiency"*.

Instead, policies to improve the balance of payment required discriminatory measures, such as direct controls along with policies that induced investment in the exporting industries and industries capable of substituting imports:

> *"The desirable course would be, if it were possible, positively to stimulate investment in the exporting industries and in those capable of replacing imports, especially where productive equipment is the bottleneck - while discouraging investment everywhere else. Monetary restriction can only with difficulty, and within rather narrow limits, be imbued with discriminatory bias. Here par excellence arises a strong case for some of the alternative methods of discouraging investment, and especially for those which operate by way of direct control."*(Kahn, 1972b, p.136)

Therefore, in Kahn's view, in the context of dollar shortage, the improvement in the balance of payment should not only be directed solely at increasing exports and diminishing imports, *"and **consequently** enabling the country to enjoy more imports (...)"*(Kahn, 1972a, p.45-46). Devaluation alone could be unwise due to its impact on income distribution and inflation and its slow adjustment, while contractionary policy generates unemployment. As a result , *"[o]ther, less orthodox, measures have to be considered"*(Kahn, 1972a, p.45-46)[14]

However, these other less orthodox measures were criticized at the time by other authors, such as Lerner (1951), who argued against the imposition of restrictions on imports as a means of restoring the balance of payment equilibrium. Although he had a stronger opposition to deflation and depression, he argued that retaliation from other countries could offset the gains and

[14]Following this footprint, when Britain observed similar problems in the late 1970s, the recommendation of some scholar of the Cambridge Economic Policy Group recommended a combination of fiscal expansion and direct control of imports to restore full employment (Cripps and Godley, 1976).

prevent the economy from making *"the best use of international division of labor."*(Lerner, 1951, p.345). Therefore, when current account problems arise, the exchange rate should be allowed to depreciate, and fiscal policy, should always be implemented to maintain full employment (Lerner, 1951).

Thus, during this period, the debate among old Keynesians concentrated on the best use of the different policy tools to achieve balance of payment equilibrium while also maintaining full employment with a preference for fiscal policy and some sort of direct control. It is interesting to note that Kahn (1972a) was concerned not only with solving short-term balance of payment equilibrium, but also changing the productive structure of the economy. A similar discussion was also put forward by structuralist authors such as Prebisch (1962). In fact, according to Thirlwall (2013, p.85), Prebisch (1959) discussion can be considered the "true forerunner of the balance of payment constraint growth model". We will present Prebisch (1949, 1962) view in the next section.

1.3.2 Balance of payment constraint and uneven development

The adverse impact of a dollar shortage or, a balance of payment constraint, on growth and development was among the main concerns of Latin-American structuralist authors, such as Prebisch (1949) and Furtado (2000). They emphasized the role of different economic structures in late-industrializing countries, which made them more prone to the balance of payment constraint in the new international economic order (after the Second World War) under the monetary hegemony of the U.S as the 'principal center country' (Prebisch, 1962). From the structuralist perspective, countries at the 'periphery' are characterized by an underdeveloped and less diversified productive structure, and their exports are specialized mainly in commodities (with low price elasticity). As a result, they have a high imported coefficient with a significant amount of high-income elasticity products (Prebisch, 1962).

Prebisch (1962, p.25-26) observed that, since the nineteen thirties, the 'principal cyclical center' (the U.S) had reduced its imported coefficient while *"other external payments were also considerably reduced, by the cessation of the foreign loans made by the United States"*. In the context of the dollar shortage in the 1930s in the wake of the great depression, 'center countries' were able to change their import coefficient[15], especially from the United States, and reduced other payments in dollars. In Latin America, specifically, the reaction was similar ", namely, a reduction of the import coefficient through depreciation of the currency, higher tariffs, import quotas, and exchange controls". However, the implementation of industrializing and import substitution policies in some of those countries was not sufficient to change their structural characteristics. According to Prebisch (1949), between 1870 and 1948, the terms of trade were mostly unfavorable in the periphery, which represented an additional constraint on the

[15]Prebisch (1962) refers particularly to a group of eleven countries: Australia, Canada, Denmark, France, Germany, Japan, the Netherlands, New Zealand, Norway, Sweden, and the United Kingdom.

capacity to import due to a relative decline in the price of their exports that are not responsive to prices – the so-called deterioration of terms of trade.

Due to the high demand elasticity of imports that persist in peripheral countries, when the domestic economic activity level rises, imports also tend to grow, causing them to exceed exports. Exports, on the other hand, depend on income in the center, "which in turn are closely linked with investment." (Prebisch, 1962). As a result, in the downward phase of the growth cycle led by the center countries, exports in the periphery are at their cyclical low, and "that quantity is not sufficient to cover the imports required to maintain maximum employment" (Prebisch, 1962, p.53). In other words, while center countries could promote economic stability through government expenditure and promoting investment to achieve full-employment, in peripheral countries, the lack of capacity to pay for the structurally high amount of imports required could curb the employment goal.

The capacity to generate the exports needed to pay for the import is mainly subject to exogenous factors that could relax the constraint during the upward phase of the cycle (Prebisch, 1962). As Medeiros and Serrano (2001) noted, the high-income elasticity of imports is, therefore, the central point for the structural balance of payment problems. Thus, state-led policies are required to promote industrial policies and to adjust and direct the available foreign currency to essential imports. Additionally, the low demand and price elasticity of exports, which are the basis for the 'pessimism of elasticities,' means that price mechanisms such as changing the exchange rate are not very efficient in circumventing the constraint (Amico, 2020, Medeiros and Serrano, 1999).

Similar to Kahn (1972a), Prebisch (1962) also identified the dollar shortage as the major obstacle to achieving full employment. However, in developing economies, this was a structural problem resulting not only from the reduction of the flow of dollars through trade or finance from the U.S. economy (the principal center country) but also due to the particular characteristics of peripheral economies.

The role of additional finance, such as foreign direct investment (FDI) and bank loans were not disregarded, but since they come at a cost and would need to be repaid, the capacity to import still fundamentally depends on the ability to export and the price relationship between its exports and imports (the terms of trade when exports and imports are denominated in the foreign currency)[16].

Taking this into account means that the level of exports is strategic for any country that does not issue the key currency (Medeiros and Serrano, 1999); however, the balance of payment constraint is higher for countries at the periphery.

[16]As noted in Prebisch (1949, p.15): *"Of course, foreign-capital investments affect import capacity, but the ability to make the interest and amortization payments on these investments also depends on the total volume of exports and their relative prices."*

1.3.3 An interpretation of balance of payment constraint and policy space

Summing up, we saw in the previous section that Meade (1951) presented a flexible analytical model to serve as a tool for dealing with complications that can arise in economic policymaking, taking the balance of payment into account. In this section, we discussed how early Keynesians such as Kahn (1972a), the Cambridge Economic Policy Group (CEPG), and structuralist authors incorporated discussions on how the balance of payment (more specifically, the trade imbalance), may be a constraint on domestic policies. Still, policymakers can use a combination of instruments to increase domestic demand and other policies to change economic structures. Moreover, in this discussion, the exchange rate regime does not play a predominant role, and the exchange rate can be regarded both as an essential policy variable and one of the many available tools.

From the former discussion we can interpret a balance of payment constraint as the inability to achieve full employment due to a lack of capacity to pay for the imports required to increase economic activity levels. In other words, it is an external constraint imposed by the balance of payment that limits the policy space to achieve full employment. This constraint will be higher, the higher the import coefficient (and the demand-elasticity of imports), but can be relaxed when the capacity to export increases either due to a structural change (change in price elasticities) or to conjectural and exogenous factors such as an increase in the external demand for home products and an improvement in the terms of trade associated with external cyclical components (such as a commodity price cycle). *Policy space*, in turn, can be understood as the space to implement demand management policies, which is determined by the gap between the current output level and the output consistent with the balance of payment constraint.

As a result, more than using two instruments (available from the broad policy toolkit) to achieve two targets (internal and external balances in Meade's term), structuralist authors advised countries at the periphery to implement industrial policies and reduce their dependence on external strategic imports to delink their policy space from being tied to cyclical external movements. Nevertheless, this constraint can also be relaxed in the presence of "acceptable" lending, as suggested by Kahn (1972a). However, if external credit is restricted or credit conditions are prohibitive - in the sense that the external debt service is too high - the level of exports and importing needs remain the most important variables.

1.4 From a menu of choices to the impossible trinity

In order to obtain a proper policy proposition from the flexible analytical framework provided by Meade (1951), the model must be simplified and some assumptions regarding some parameters should be made[17]. According to Meade (1960, p.46), *the simplifications can be carried out in various ways which may be appropriately chosen to illustrate particular problems*.

[17] In a footnote in page 33 Meade (1951) counted for no less than 28.781.143.379 ways of closing his model.

While in the 1950s, due to the context of Breton Woods agreements, policies discussions emphasized the role of trade flows, in the 1960s, financial flows were at the forefront of open-economy macroeconomic analysis. Therefore, the impact of these last flows on monetary and fiscal policies' outcomes was at the heart of Mundell (1963) and Fleming (1962) analysis.

It is interesting to note that in the 1950s, according to Fleming (1951, p.48), *"the principal stabilising device of the old system-variation in employment, production and incomes is now generally regarded with disfavor"*. Therefore, *alternative techniques*, such as import restrictions and the use of substantial gold reserves, were the focus of policy analysis. Furthermore, during the late 1950s and throughout the 1960s, discussions on the appropriate choice of the exchange rate regime also advanced. However, some of the simplifications chosen to address those issues in a Hicksian type of analysis for balance of payments theory compromised the assessment and management of balance of payment constraints. To address this claim, in this section, we first make a brief description of some controversies on the appropriate exchange rate regime derived from Meade's framework. Then, we outline the Mundell-Fleming model that ultimately resulted in a different type of constraint than the one discussed by earlier Keynesians such as Kahn (1972a), the Cambridge Policy Group, and structuralist authors.

1.4.1 The role of the exchange rate regime

In Meade's (1951) framework, there is no *a priori* preference between a flexible or fixed exchange rate system, as long as the Tinbergen's rule is followed. In a later work, however, Meade (1988) explicitly favored a variable exchange rate system and a world of free trade. Still, some observations can be made. First, he explicitly restricted his analysis to Britain [18] , assuming that *"sensitivities to price adjustments are likely to be amply large enough to make the price mechanism workable"* (Meade, 1988, p.164). Secondly, the choice of *"letting the exchange rate go"* meant the abandonment of the Golden Standard and a fixed pegged and not necessarily a pure floating adjustment. He pointed out that a system of variable exchange rates may take different forms, and the adjustment would also depend *"upon the movements of speculative funds between the currencies concerned"* (Meade, 1988, p.165). Two types of a system of variable exchange rates are the adjustable peg and the free variation or, in modern language, a free-floating exchange rate. While the first allows for some adjustments on the peg whenever the authorities consider it necessary, the second is a pure adjustment mechanism by the free market that, *"so far as I am aware, has never been tried for any major currency as the normal*

[18] Meade (1988, p.161) starts the paper as follows: *"I still hold the old-fashioned view that freeing of world trade is in the interest of this country. We import essential raw materials and food-stuffs, which we cannot make for ourselves; and in return we export manufactured goods which other countries can more and more readily make for themselves. This is not to say that there is no valid exceptions to the free-trade rule. In the first place, there is some force in the 'infant-industry' argument; the underdeveloped countries have a good case for giving some special state help to the introduction of some new lines of activity into their economies. Secondly, while greater freedom of trade all around is undoubtedly to our interest, unilateral freedom of trade is not necessarily good for us; we might turn the terms of trade against us if we greatly increased our demand for the products of other countries without they liberating simultaneously their own demand for our goods."*

method of adjustment" (Meade, 1988, p.166). Speculation can be problematic in both systems when they are "ill-informed"[19]. However, if they are formed in a direction that would close the trade balance gap, it can help to stabilize a flexible exchange rate system. Free-floating, however, is not considered flawless. It could add risk and uncertainty to the economy and increase the probability of domestic inflation (Meade, 1988).

However, as Meade (1988, p.166) highlights, *"[t]hese two methods are only the extreme forms of a whole range of possible systems of variable exchange rates*. An intermediate possibility, for example, consists of the institution of a national Exchange Equalization Account for intervention in the foreign exchange market, fixing an upper and lower limit for the exchange rate. Such limits could be fixed far apart or close together, publicly stated or remain undisclosed, and be frequently or infrequently revised.

According to Irwin (2011, p.36), just like Friedman (1953), Meade *"advocated flexible exchange rates because it allowed countries to pursue independent monetary policies while also preserving open trade."*. According to this interpretation an interwar policy trilemma that consisted of i) the preservation of the golden standard parity; ii) an independent monetary policy and; iii) open trade was implied in authors in favor of a flexible exchange rate system at the time.

Yet, in our interpretation, Meade (1988) analysis does not imply a loss of monetary policy independence, defined as the control of the policy instrument - the interest rate. In fact, the assumption that the supply of money will passively adapt itself to whatever the demand for money might be at the constant interest rate, was criticize by Tsiang (1961) and the monetary approach to the balance of payment[20]. From Meade's (1988) analysis, an intermediate regime would be preferable and will not make monetary policy less effective. Even with some sort of exchange rate management a country will still have freedom to choose and experiment in policies for domestic and external stabilization. For Friedman (1953), on the other hand, under the monetarist assumption that the central bank should use the money supply as its policy instrument, we can find a similar conclusion of the trilemma:

> *In effect, flexible exchange rates are a means of combining interdependence among countries through trade with a maximum of internal monetary independence; they are a means of permitting each country to seek for monetary stability according to its own lights, without imposing its mistakes on its neighbors or having their mistakes impose to them.*(Friedman, 1953, p.200)

Although some insights on latter discussions of monetary policy trilemma were already present in the 1950s, specifically under Friedman (1953), the precise mechanism of a loss

[19]Meade (1988) believed that the increasing development of the forward exchange rate market would help to make speculation well-informed. Thus, a free-floating exchange rate would be preferable to the gold standard.

[20]Tsiang (1961, p.914) specifically argued that this approach *"obliterates all possible influences the supply of money and the interest rate might have on his solution for the effect of a devaluation (..) and imply instability in the balance of trade and the exchange rate"*

of monetary policy was not established nor modeled. In this regard, despite not being their objective, it was Mundell (1963) and Fleming (1962) models that served as a theoretical framework for the modern "-lemma" discussions and will be presented in the following subsection.

1.4.2 The Mundell-Fleming model and the trilemma

In 1961, according to Mundell (2001), his first task at the International Monetary Fund (IMF) was to work on the appropriate policy mix for the United States, considering that the country did not want to alter the exchange rate or impose trade controls. With one less set of policy instruments than in Meade's (1951) model, monetary and fiscal policies should be paired to obtain two policy goals (internal and external balance). While monetary policy can directly affect the capital account with interest rate changes (when $\rho > 0$), fiscal policy can only affect the balance of payment indirectly through a reduction of the demand for imports. As a result, the higher the size of parameter ρ in the economy and the lower the propensity to import, the higher the effect of the interest rate relative to fiscal policy on the external balance. Mundell (1960) labeled this result as the *principle of effective market classification* and states that policy instruments should be assigned to the target where they exert a stronger relative effect[21]. Therefore, *"monetary policy ought to be aimed at external objectives and fiscal policy at internal objectives, and that failure to follow this prescription can make the disequilibrium situation worse than before the policy changes were introduced"* (Mundell, 1962, p.70).

Nevertheless, in a subsequent paper, *"Capital Mobility and Stabilization under Fixed and Flexible Exchange Rates"*(Mundell, 1963), the conclusions about the appropriate choice between monetary and fiscal policy for internal balance became subject to the chosen exchange rate regime in a context of high capital mobility. In this last paper, the specific concerns are the *"theoretical and practical implications of the increased mobility of capital"* that, under certain circumstances, could complicate the operation of domestic stabilization policies in a small open economy (Mundell, 1963, p.475). That is, an economy too small to influence foreign income and external interest rates. Besides the validity of the Marshall-Lerner condition, the main assumptions for the balance of payments are:

(I) Perfect capital mobility also means that securities are perfect substitutes. This means that the sensitivity of capital flows is extremely high ($\rho \to \infty$ in equation 1.5) and since securities of different countries are perfect substitutes, this also means that a country cannot maintain an interest rate level different from the world's level.

(II) As long as there are no shocks, existing levels of exchange rates will persist indefinitely. There is no speculation, and spot and forward exchange rates are considered to be identical.

[21]This means that it is insufficient to follow a Tinbergen rule of an equal number of targets and instruments. Policies can also be classified according to their relative efficiency.

The absence of speculation, combined with assumption (I) results in an immediate response of the exchange rate and the capital account to an interest rate shock.

Mundell (1963) based his exposition similar to the Hicksian IS-LM framework where the IS and LM curves denote respectively the equilibrium points in the goods and services market and in the money and securities markets. He added a BP curve for the equilibrium in the foreign exchange market[22] and explicitly wrote the conditions of sectoral equilibrium. In Table 1.2, the rows indicate how the expenditure in each sector is financed: a budget deficit (G-T), for example, can be financed by an increase in public debate or a reduction of public cash balance. The columns, in turn, are the markets restraints.

Regarding the market of goods and services, one important assumption adopted by Mundell (1963) is that investment depends on the interest rate. More precisely, a high interest rate sensitivity of demand, that is, $b \to \infty$ in equation 1.4 from Meade's (1951) framework.

One important distinction from the previous analysis relates to the description of monetary policy operation. While in Meade (1951) the policy instrument is the interest rate (and is therefore a policy parameter), in Mundell (1963) the policy parameter is the money supply (M^s) instead. As a result, the interest rate becomes an endogenous result of the (exogenous) money supply and demand for money by the private and foreign sectors. The demand for money ($L(Y, i)$), in turn, is an increasing function of income and a decreasing function of the interest rate, which explain the positive inclination of the LM curve.

$$LM : M^s = L(Y, i) \tag{1.6}$$

Table 1.2: Sector and Market Equilibria

Sector \ Market	Goods	Securities	Money	International Reserves	
Government	T-G	Government Borrowing	Government Dishoarding	$*$[23]	$\sum 0$
Private	S-I	Private Borrowing	Private Dishoarding	$*$[24]	$\sum 0$
Foreign	M-X	Capital Outflow	$*$[25]	Increase in Reserves	$\sum 0$
Banking	$*$[26]	Open Market Sales	Monetary Expansion	Foreign Exchange Sales	$\sum 0$
	$\sum 0$	$\sum 0$	$\sum 0$	$\sum 0$	$\sum 0$

Having set the stage, Mundell (1963) analyzes the possible different results of a domestic monetary poly in this small open economy under two different exchange rate regimes.

[22] More precisely, Mundell (1963) denominates the curves as, respectively XX, FF and LL. We present the curves differently to highlight their equivalence to the IS-LM-BP model that was latter derived from his approach.

[23] Negligible Treasury holdings of foreign exchange

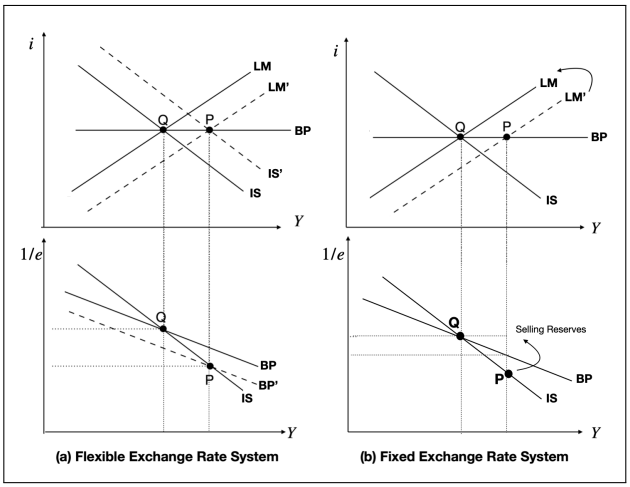
[24] Negligible: non-bank public's holdings of foreign exchange

[25] Negligible: Foreigners' holdings of domestic money (domestic money is not key currency)

[26] Negligible contribution of the banking system to goods account

Under a flexible exchange rate system, an expansionary monetary policy consists of an open market purchase of domestic securities. This leads to an increase in bank reserves and, consequently, an expansion of money and credit. The excess supply of money puts downward pressure on the interest rate. However, as $\rho \to \infty$, this also leads to capital outflows and a deficit in the balance of payment. In Figure 1.1 (a), this is represented by a shift of the LM curve in the upper quadrant to LM', generating excess liquidity. In the lower quadrant, due to the disequilibrium in the foreign exchange market, the currency depreciates and moves the curve BP to BP', reaching the equilibrium with the IS market in point P. The exchange rate depreciation is assumed to improve the trade balance, stimulating (by the multiplier process and assuming the Marshall-Lerner condition) income and employment. The IS curve then moves to IS' in the first quadrant, and the new equilibrium increases income from point Q to point P. A fiscal policy, on the other hand, would be ineffective in changing aggregate demand. An increase in government spending in this model would lead, initially to an increase in the interest rate by shifting the IS to the right. A higher interest rate will increase the amount of capital inflows and result in a foreign exchange rate appreciation. As a result, exports will be less competitive and decrease (Marshall-Lerner condition), moving the IS and the income level back to its initial point.

Figure 1.1: Monetary Policy and Perfect Capital Mobility



Source: Adapted from Mundell (1963). Author's elaboration.

In the fixed exchange rate system, an expansionary monetary policy generates an excess money supply, reduces the interest rate, and exerts upward pressure on the national currency. As Figure 1.1 illustrates, with the exchange rate fixed in panel (b), the increase in the money supply initially shifts the LM curve and creates a balance of payment deficit. However, in this case, the monetary authority intervenes in the foreign market, selling international reserves at a fixed price to avoid exchange rate movements. Since the central bank sells foreign exchange and buys domestic currency, the monetary supply is restored to the initial level, and the LM returns to its original position. With no shift of the IS and the LM curves, monetary policy does

not affect aggregate demand but only the level of reserves[27]. Fiscal policy, on the other hand, is an effective instrument. The increase in government spending shifts the IS curve to point P. This expansion exerts upward pressure on the interest rate and increases capital inflows, pressuring the exchange rate upwards. To keep the rate fixed, the central bank buys foreign currency, increasing the domestic money supply. As a result, the LM shifts to the right, and the economy stabilizes at a higher level of output and reserves.

A different outcome for monetary policy arises if the central bank also relies on sterilization operations, offsetting the increase in the money supply. In the case of an expansionary monetary policy, if the central bank buys securities at the same rate that it sells foreign reserves, it neutralizes the effect of the exchange rate intervention on the monetary base. As a result, with sterilization, an increase in the money supply is accompanied by an increase in the supply of government bonds (open market purchases by banks and an increase in government borrowing in table 1.2). However, according to Mundell (1963), this result does not satisfy an equilibrium in the goods and foreign exchange markets simultaneously, making the system inconsistent. The disequilibrium can only occur until the level of reserves is exhausted. As it is assumed the $\rho \to \infty$, keeping the interest rate lower than the external level will lead to further capital outflows. Since the reserve level is limited, the balance of payment will not equilibrate unless the public's demand for money changes, which can only occur with changes in private income. Thus, the exchange rate must float to restore the trade deficit and increase exports, or the interest rate will return to its previous level. In Figure 1.1 (b), the initial movement of the LM curve to LM' leads to a disequilibrium position in the IS market. In the lower quadrant, sterilization to point Q is possible, but to equilibrate the goods market with the money and securities market, the exchange rate returns to the initial point Q. Thus, the sterilization policy would only perpetuate the disequilibrium in the money market until the world level of interest rate falls or foreign exchange reserves are exhausted. Therefore, since monetary policy exerts no direct impact on the income level in this model and acts only indirectly through its effect on the exchange rate, this policy becomes ineffective when the exchange rate is not allowed to float.

The loss of effectiveness in monetary policy under a fixed exchange rate system, with perfect capital mobility was also a result of Fleming's (1962) work. The adjustment process in Fleming (1962), resembles much of Mundell's (1963), but his analysis does not deem monetary policy ineffective when the exchange rate is fixed, nor a situation of disequilibrium is discussed. Fleming's (1962) argument in favor of a flexible exchange rate system relies on the assumption that while in the fixed exchange rate regime, monetary policy only acts through the positive effect of a reduction of the interest rate on investment and consumption (both directly and via the Keynesian multiplier effect). In contrast, in a flexible exchange rate system, the positive effect of

[27] Regarding Table 1.2, the expansionary monetary policy reduces government borrowing and increases its dishoarding (money supply). This leads to a reduction in the interest rate and capital outflows. For the money and securities markets to equilibrate in this condition, the private sector must alter its demand for money. That is, the IS curve must change in Figure 1.1 (b). However, since there is no mechanism that will make this possible, the system remains inconsistent unless the interest rate returns to its previous level.

a depreciation on exports is added. Therefore, the final effect of an expansionary monetary policy under the floating exchange rate system will be the greater, the higher the responsiveness of the international capital flow to movements in the rate of interest (ρ), just as in Mundell (1963).

However, differently than Mundell (1963), Fleming (1962) saw sterilization as an effective tool, but that could only last for a limited period. Also, like Meade (1951), Fleming (1962, p.370) highlights that under a floating exchange rate, the impact of exchange speculation varies and can be destabilizing depending on whether it results in a unidirectional trend. In a fixed exchange rate regime, speculation can destabilize the system when confidence in the peg is lost.

It is interesting to mention that the role of speculation was not ignored by Mundell. In an earlier paper Mundell (1960) argued that in the fixed exchange rate system, speculation is subject to the confidence of speculators on the peg that, in turn, relates to the level of reserves:

> *Other things the same, confidence is higher the larger are the central bank holdings of foreign exchange: an increase in reserves makes a speculator more bullish with regard to the exchange value (or degree of convertibility) of a currency. The balance of payments therefore becomes a function of the level of exchange reserves with an improvement in the latter stimulating a capital inflow or restraining a capital outflow. But is a system based on this type of speculative response stable? Intuition leads one to suspect that it may be stable or unstable depending on the strength of opposing forces.(Mundell, 1960, p.246)*

Since central banks are not committed to a peg in a flexible exchange rate system, they do not need to hold foreign exchange reserves and are not subject to this type of speculation but to how speculators react to a change in the exchange rate. If they interpret the current exchange rate change as a signal for further changes in the same direction, the system is deemed to become unstable (Mundell, 1960).

Nevertheless, the two main messages for monetary policy analysis in Mundell (1963) and Fleming (1962) are the same: i) when capital is mobile, monetary policy is more effective when the exchange rate is allowed to float than in the fixed exchange rate system, and ii) this occurs given the expansionary effect of an exchange rate depreciation.

Although the model attempted to advance open economy policy discussions by highlighting the role of capital flows that were obscured in the 1950s, it actually resulted in a narrowing of focus. For instance, it solely concentrates on the relative effectiveness of policies to move current output to full employment in different exchange rate regimes and abstracts from other policy instruments that can be combined. Additionally, the discussion of a balance of payment constraint is absent. In 'old Keynesian' discussions, the achievement of full employment with the available policy instruments was always possible unless a balance of payment constraint appeared. In Mundell's and Fleming's models, a restriction for monetary policy is imposed due to the lack of control of the interest rate by monetary authorities.

1.4.2.1 The monetary policy trilemma

According to Boughton (2003) the combination of both Mundell (1963) and Fleming (1962) analysis resulted in an extension of the IS-LM model proposed by Hicks (1937) and Hansen (1953) and became known as the Mundell-Fleming model after Dornbusch (1980) works in the late 1970s[28]. The model maintains all the hypotheses present in Mundell (1963), but allows for the analysis of imperfect capital mobility (while maintaining perfect asset substitutability).

In its early appearance in text-books, the model reassembled much of Mundell's (1963) analysis and assumptions of: i) perfect capital mobility and perfect asset substitutability; ii) constant exchange rate expectations, and iii) a central bank aiming to control the money stock as its policy strategy to increase aggregate demand. As discussed earlier, under these assumptions, with an open capital account, monetary policy loses its capacity to set the value of the interest rate through changes in the money supply. Additionally, in a fixed exchange rate regime, monetary policy also loses its capacity to affect aggregate demand. This occurs because the excess liquidity that would increase consumption and investment due to an expansionary monetary policy is drained out to keep the parity. Since the money supply acts on aggregate demand only indirectly through the exchange rate, when the currency's value does not change, there is no effect on aggregate demand from an increase in exports. Obstfeld and Taylor (1998) labeled this the last result as the "monetary policy trilemma" or "inconsistent trinity":

> *Secular movements in the scope for international lending and borrowing may be understood, we shall argue, in terms of a fundamental macroeconomic policy trilemma that all national policymakers face: the chosen macroeconomic policy regime can include at most two elements of the "inconsistent trinity" of (i) full freedom of cross-border capital movements (ii) a fixed exchange rate, and (iii) and independent monetary policy oriented toward domestic objectives. If capital movements are prohibited (element [i] is ruled out), a country on a fixed exchange rate can break ranks with foreign interest rate and thereby run an independent monetary policy. Similarly a floating exchange rate (element [ii] is ruled out) reconciles freedom of international capital movements with monetary-policy effectiveness (at least when some nominal domestic prices are sticky). But monetary policy is powerless to achieve domestic goals when exchange rate is fixed and capital movements free (element [iii] is ruled out), since intervention in support of the exchange rate parity then entails capital flows that exactly offset any monetary-policy action threatening to alter domestic interest rate.*(Obstfeld and Taylor, 1998, p.345-355)

According to Obstfeld and Taylor (1998) definition of the trilemma, financial integration under a fixed exchange rate compromises monetary policy independence (the control of the interest rate) and its outcome (achievement of domestic goal). In order to keep the exchange

[28] See Darity Jr and Young (1995) and Young and Darity (2004) for a detailed history of the IS-LM and the IS-LM-BP model.

rate unchanged, the domestic interest rate must follow the external monetary policy and will not be effective in achieving its domestic goal.

1.4.3 The Trilemma without the LM Curve

Three main assumptions are essential for the trilemma result. The first two are the absence of speculation and perfect asset substitutability (assumptions (I) and (II) from Mundell (1963)) that explain the immediate response of the exchange rate and the capital account to differences between the internal and the external interest rate. The third, in turn, is the role played by monetary aggregates in the model. When domestic and external interest rates are different, the inflow or outflow of capital directly affects the monetary base, and the authorities cannot set the interest at the level they wish (or different than the international rate). This last assumption has received increased criticism from economists of different strands and as Romer (2000, p.155) states, *"(...) an essential part of the traditional monetarist critique of policy was that central banks were not targeting the money supply"*.

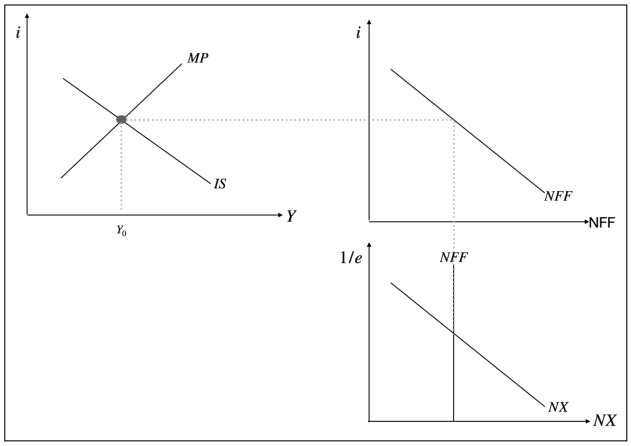
As a result, the mainstream literature - the New Keynesian or the New Consensus framework - has incorporated the alternative view that monetary policymakers pay little attention to money aggregates and target the interest rate instead. Just as in Meade (1951), the central bank sets the interest rate, while the monetary aggregate endogenously adjusts (Romer, 2000, Woodford, 2003). However, regarding its results for the open economy, the trilemma remains valid (Blanchard, 2021, Aizenman et al., 2008), but, as we will discuss, it is less binding in the presence of foreign reserves. According to Romer (2000, p.165), for example, *"although the desire to fix the exchange rate does not completely determine monetary policy, it constrains it"*. Moreover, monetary policy is preferred to fiscal policy (even in a close economy) and therefore, discussions on the relative effectiveness of both instrument are not at the forefront as it was during the 1950s and 1960s.

In Romer's (2018) model, deviations of the domestic interest rate from the world interest rate are possible (implicitly dropping assumptions (I) and (II) in the short-run, which allows the central bank to conduct an independent monetary policy to achieve its domestic goal. The model thus replaces the LM for a monetary policy curve MP in which the central bank raises the interest rate when output rises and lowers it when output falls[29]. As a result, although the curve is upward-sloping, just like the LM, it is not a result of a market mechanism. Instead, it is a variable that the central bank controls just as in Meade (1951), but it also adjusts it in a way that makes it an increasing function of output as a policy choice. Figure 1.2 shows the graphical representation of the model when exchange rates are allowed to float. The first diagram is the equivalent of the $IS - LM$ model presented in Figure 1.1, where the MP curve replaces the

[29]This assumption derives from the New Consensus model that the role of monetary policy is to react when inflation goes up (or down) by setting a nominal interest rate, otherwise (due to the acceleracionist Phillips curve) the model would be unstable. Since inflation is regarded as a demand-led phenomenon, or as Gordon and Hall (1985) puts it: *"Inflation is always and everywhere an excess nominal GNP phenomenon, at least in the long run"*. Therefore, the central bank has to increase the nominal interest rate when output rises.

LM. The BP, on the other hand, is not explicit in quadrant $i - Y$, but it is determined in the second (up-right) and third new diagrams (down-right) where capital outflows. The result derives from re-arranging equation 1.1 where net exports (NX) have to match net capital outflows ($NFF < 0$) for BP equilibrium. By a given interest rate level, the model determines the corresponding net capital outflow, assuming they are a decreasing function of the interest rate (second diagram). From the level of capital outflows, the model determines the exchange rate (e) in the upward right panel and net exports in the downward panel.

Figure 1.2: Romer's New Keynesian model: Flexible Exchange Rate



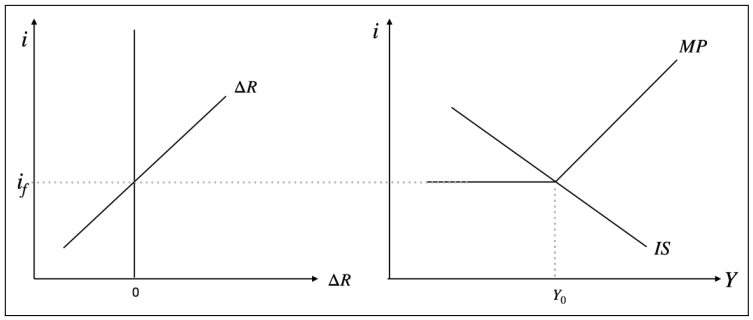
Source: Adapted from Romer (2018). Author's elaboration.

In the fixed exchange rate regime, on the other hand, when the exchange rate is not allowed to adjust, BP is determined by the level of international reserves (equation 1.7) and is represented in Figure 1.3.

$$\Delta R = (X - M) - NFF \tag{1.7}$$

Although the central bank would like to increase the interest rate when output rises and lower it when it falls (the upward-sloping portion of the MP curve in the right-hand panel), it can only do it to the point i_f, where $\Delta R > 0$ in the left-hand panel. That is the flat portion of the MP curve and represents the limit of the central bank's ability to conduct expansionary policy.

Figure 1.3: Romer's New Keynesian model: Fixed Exchange Rate



Source: Adapted from Romer (2018). Author's elaboration.

As Romer's (2018) summarizes:

> *This discussion shows how fixing the exchange rate constrains monetary policy. The central bank is free to set a high interest rate, since this only leads foreigners to want to purchase domestic currency to obtain high-yielding domestic assets, and it can meet this demand by printing money. But it faces a limit to its ability to lower interest rates. When domestic interest rates are low, people want to convert domestic to foreign currency. And since the central bank cannot print foreign currency, it has a limited ability to meet this demand.*(Romer, 2018, p.44)

In short, according to this New-Keynesian amendment, the trilemma result is still valid (because a flexible exchange rate is preferable) but is less binding since the constraint for monetary policy in a fixed exchange rate regime is asymmetric[30]. Although this analysis is a closer approximation to how monetary policy operates, it still emphasizes the exchange rate regime's role in policy outcomes. The preference for a flexible exchange rate depends on the elasticity optimism hypothesis. If depreciation does not increase aggregate demand, for instance, because the Marshall-Lerner condition does not hold or because devaluations harm income distribution and inflation (as argued by Kahn (1972a)), a flexible exchange rate regime will not lead to a smooth adjustment in the balance of payment. It also abstracts from the balance of payment constraint or dollar shortage discussions of old Keynesians, which can be a constraint for achieving full employment. The optimism around exchange rate flexibility also disregards important aspects of the current International Monetary and Financial System (IMFS) and the balance of payment constraints for countries in different developmental stages.

[30]It is perhaps worth noting that in this framework, interest rate differentials are only allowed to persist in the short run, or when the purchasing power parity (PPP) does not hold. In the long run, with the level of the exchange rate determined by the PPP, changes in the domestic interest rate will be offset by exchange rate changes, and domestic nominal and real interest rates cannot differ from the foreign interest rate. Since our focus is the short run, we do not extensively present and discuss those results. For a discussion of these mechanisms, see Carlin and Soskice (2006).

These considerations have been put forward by the more recent post-Keynesian and structuralist literature and will be discussed in Chapter3[31].

1.5 Conclusion

In the 1950s, Meade introduced a flexible model for pointing out the various economic tools available to achieve full employment and balance of payment equilibrium in open economies. His model laid the foundation for Keynesian short-run macroeconomic modeling in open economies and is considered one of the first attempts to merge Keynesian insights with the neoclassical approach, which inspired the development of other models during the 1960s, such as the Mundell-Flemming model. This last model, which is still considered the workhorse for open economy macroeconomics, served as the basis for the monetary policy trilemma. However, the idea of lack of autonomy or independence is absent in Meade's and other earlier Keynesians'. Instead, discussions during the 1950s suggested that countries could freely choose effective instruments for achieving their targets even though some policy conflicts between internal and external balance could eventually arise. Specifically, monetary policy was seen as one among many other independent and effective policy instruments that could be combined to achieve policy targets. Also, there is no *a priori* preference between a flexible or fixed exchange rate system, as long as Tinbergen's rule is followed.

Nevertheless, the framework falls short due to the overemphasis on the trade balance, which was reasonable in the 1950s. It also fails to consider the external constraint that can reduce the policy space in peripheral economies that structuralist authors advanced. In this last perspective, the balance of payment can be a constraint for achieving full employment with fiscal and monetary policies. Therefore, from their discussion, it was possible to derive an interpretation of the balance of payment constraint as a possible constraint (and not determinant) to domestic policies that aim to move the current demand towards its full-employment level. This constraint is ultimately dependent on the level of exports and the propensity to import and, therefore, affects countries with different productive and technological structures differently. The constraint, in turn, can be relaxed according to some conjectural factors, such as external demand levels and commodity cycle.

The Mundell-Fleming model tried to advance the first shortcoming, reducing the emphasis on the trade balance and putting financial flows at the forefront. However, it narrowed policy discussions in open economies by focusing solely on the relative effectiveness of fiscal and monetary policy in changing aggregate demand under different exchange rate regimes while abstracting from the balance of payment constraint. In fact, by incorporating the monetarist assumption that central banks target the money supply, hence losing control over the short-term interest rate, monetary policy can only be effective when the exchange is allowed to float. In

[31] Note that this approach also abstracts from particularities of developing economies pointed by other New Keynesian such as Calvo and Reinhart (2002) that recognized the problems of exchange rate flexibility in those countries.

addition to this last assumption, two others help explain this result: perfect asset substitutability and the absence of destabilizing speculation in the foreign exchange rate markets. The policy trilemma that derives from this model, in turn, is even narrower since it only refers to monetary policy.

In the late 1990s, the Mundell-Fleming model passed through changes with the New Keynesian amendment. The assumption that central banks target the money supply was replaced with an interest rate rule, thus allowing domestic interest rates to differ from the world interest rate. Nevertheless, the policy recommendation for open economies stayed the same, and reflections on policy tools were not broadened. Because monetary policy is the preferred policy instrument and a flexible exchange rate does not impose any constraints, it is the preferred system. The optimism regarding the flexible exchange rate system in the model results from not considering the problems with depreciations. In the next chapter, we will review the advances of the New Keynesian literature to deal with this last consideration.

Chapter 2

Trilemma, dilemma and quadrilemma? A critical interpretation of the "-lemmas" debate

2.1 Introduction

Since the beginning of the 2000s, the IS-LM model has been replaced by the New Keynesian (or New Consensus) model (NCM), known as the 3-equation New Keynesian model, as the benchmark model for macroeconomic policy analysis (Carlin and Soskice, 2005, 2006, Blanchard, 2021). The NCM maintains the IS curve, where the real interest negatively affects aggregate demand. The LM curve, however, is substituted by an interest rate-based monetary policy rule that responds to deviations of inflation from its target and output from its potential. Additionally, it incorporates the existence of an accelerationist Phillips curve, where inflation is determined by deviations of output from its potential, past values of inflation, and random shocks. For the open economy, in the short run, the model adds a risk-adjusted uncovered interest rate parity that determines the nominal exchange rate. Despite the differences with the IS-LM model, in the open economy, the policy recommendation for a flexible exchange rate to increase monetary policy autonomy prevailed (Romer, 2000).

This literature has advanced other types of '- lemmas' to account for the dollar's role as the key currency since the collapse of Bretton Woods, but the trilemma is still seen as a useful concept in this literature (Gopinath, 2019). Looking at the large amount of international reserves accumulated by developing economies and the empirical results that countries usually choose intermediate regimes, Aizenman (2019), for instance, has replaced the trilemma with a quadrilemma. On the other hand, (Rey, 2013) has argued that the U.S. monetary policy affects other countries' financial conditions regardless of the exchange rate regime, transforming the trilemma into a dilemma instead.

In Chapter 1 we presented Romer's (2000) adaptation of the IS-LM framework for the New Keynesian approach without making explicit the main set of equations that leads to his result when an inflation targeting regime is considered. In this Chapter, we make these equations explicit in an illustration of the 3-equation model for an open economy under different

assumptions (or a 'toy model' representation in Blanchard's (2018) terms[1]) to illustrate the different results of the '- lemmas' discussion in section 2.2. Section 2.3 presents a critical review of the empirical literature and discusses the problems of the definition of monetary policy autonomy in this framework. Section concludes.

2.2 The trilemma framework in the New Keynesian literature and its recent extensions

In the Mundell-Fleming model, the central bank uses the money supply as its policy instrument to achieve its desired domestic goal. In this context, combined with a flexible exchange rate regime, monetary policy effectively expands aggregate demand (the final policy target) through its effect on the interest rate (intermediate target) and, therefore, on expenditure decisions through the effect of the exchange rate movements on exports. With a fixed exchange rate, on the other hand, the central bank loses its policy instrument (money supply), eliminating the effect on aggregate demand through investment and exports.

In Romer's (2000) adaptation of the IS-LM framework for the New Keynesian approach, the monetary authority directly controls the short-term interest rate (policy rate), both in fixed and flexible exchange rate regimes, setting it according to its domestic objectives. When central banks have a stock of foreign reserves, policy-makers have more flexibility to, at the same time, implement the desired monetary policy (different from abroad) and manage the exchange rate. However, if the central bank also aims to maintain an exchange rate parity when foreign reserves are exhausted, the interest rate should be set following the foreign rate. Since the fixed exchange rate can restrict monetary policy (depending on the level of reserves), while the flexible exchange rate does not, the latter is seen as the preferred option for open economies. In contrast, some NK authors have questioned the gains regarding policy results of exchange rate flexibility, resulting in the "dilemma" extension. In this section, we present a simple NK open economy model to illustrate the workings of these different results. The section has a similar purpose to that of Bofinger et al. (2009) and Froyen and Guender (2022), that discuss the costs and benefits of fixed and flexible exchange rates in a simple static framework. However, we expand the discussion of flexible exchange rates by incorporating two more recent claims by Gourinchas (2018), Rey (2013), and Casas et al. (2017): the financial effect of the exchange rate on aggregate demand (due to currency mismatches), the impact of external conditions (due to the global financial cycle) and the dominant currency paradigm in international trade.

[1]According to Blanchard (2018, p.53) toy models *"allow for a quick first pass at some question, and present the essence of the answer from a more complicated model or from a class of models"*

2.2.1 The simple NK open economy model: main set of equations

New Keynesian macroeconomics morphed into a New Consensus Macroeconomics (NCM) paradigm by combining the assumption of wage and price rigidities with neoclassical features such as the rational expectations hypothesis and natural rates of interest, output, and unemployment (Arestis, 2009). It is considered the workhorse for macroeconomic modeling short and medium-run analysis and can be represented in a 3-equations setting that includes: an IS curve, a Phillips curve, and a monetary policy rule in an inflation-targeting (IT) regime (Carlin and Soskice, 2006). The monetary policy implication of this approach is that the central bank can effectively achieve both price stability and output stabilization by controlling the policy rate. More precisely, by focusing on keeping inflation stable (on target), monetary policy could keep output close to its potential - this is the "divine coincidence" assumed in most of these models (Blanchard and Galí, 2007).

In NCM models, implementing the IT regime defines the strategy for monetary policy. In this paradigm (unlike the original Mundell-Fleming), the policy instrument is the short-term nominal interest rate and the mechanism through which the economy adjusts embodies an interest rate rule (Carlin and Soskice, 2006). Whenever the economy is disturbed, the central bank sees steering inflation back to its constant-inflation output level y_n as its task, which it achieves by changing the short-term nominal interest rate. These changes in this interest rate, in turn, are expected to act through (mainly) five channels in open economies: i) the interest rate channel; ii) the long-term interest rate (or asset price) channel; iii) the credit channel; iv) the expectations channel and; v) the exchange rate channel (Agénor and Da Silva, 2019, Arestis and Sawyer, 2003). Through these channels, monetary policy can affect aggregate demand in the short and medium run and effectively respond to shocks[2]. Still, it cannot affect the "natural" output and unemployment levels towards which the economy converges in the long run. As a result, the discussion about monetary policy in an open economy in these models is restricted to the short and medium run and focuses on how monetary policy can respond to disturbances.

The negative impact of the real interest rate (r) on aggregate demand (y) depends on the parameter b in the IS equation 2.1. The real interest rate, in turn, is a function of the nominal interest rate, i, discounted by the inflation rate $\hat{p}$, so that $r = i - \hat{p}$. For simplicity (and since we assume that starting from equilibrium the central bank will react to changes in inflation), we will include the nominal interest rate into our IS curve. The term ϵ_1 is included to account for demand shocks or any autonomous component, and the parameter c_1 represents the impact of the E on exports[3] and, thus, on aggregate demand. When $c_1 > 0$, an increase in the exchange rate (depreciation) expands aggregate demand through its effect on exports. An underlying assumption is that the terms of trade improve with a nominal depreciation because

[2]For the sake of simplicity and since we are illustrating the static version of this approach in the following representation we will abstract from the expectation channel.

[3]Since the PPP is generally assumed to hold in the New Consensus models, in the short-run we can simplify the expositions by assuming real and nominal exchange rates are equal.

it raises the price of imports relative to exports and, as a result, improves competitiveness and improves the trade balance (the Marshall-Lerner condition). As a result, the flexibility of the exchange rate, with its effect on exports results in a balance of payment equilibrium.

$$y = -bi + c_1 E + \epsilon_1 \tag{2.1}$$

Monetary policy can act through two channels on aggregate demand: interest rate channel and the exchange rate channel. By changing the nominal interest rate i^{cb}, monetary policy can affect the short-term rate, which in turn spreads to the long-term rates (longer maturity bond yields) and affects investment and durable goods consumption ($i = f(i^{cb})$). Changes in interest rates can also affect the exchange rate, assuming that the risk-augmented Uncovered Interest Rate Parity (UIP) holds. We represented the UIP condition in equation 2.2, where i^f and i are the nominal foreign and domestic interest rates, and $risk$ is the risk premium. With this last parameter, the assumption of perfect asset substitutability is dropped and domestic and external interest rates are allowed to differ (contrary to the Mundell-Fleming model). Moreover, $\rho > 0$ measures the sensitivity of the exchange rate to interest rate differentials: the higher capital mobility is, the higher will be the response of private flows to interest rate differentials. For simplicity, we will abstract from changes in exchange rate expectations - as done in Gourinchas (2018), Froyen and Guender (2022), Kalemli-Ozcan (2019)[4]

$$E = \rho(i^f - i + risk) \tag{2.2}$$

When decreases in the domestic policy rate result in an exchange rate depreciation, the model assumes that it also depreciates the terms of trade (imports become more expensive and exports cheaper), increasing the level of exports and positively affecting aggregate demand in equation 2.1 through its effect on exports. Therefore, in canonical NK models, as in the Mundell-Fleming, the effect of an exchange rate depreciation magnifies the overall impact of a reduction in the interest rate on demand (Clarida et al., 2001). This channel has been recently questioned by Casas et al. (2017), arguing that, since international trade is mostly denominated in US dollars, terms of trade can become insensitive to the exchange rate - in the short run. However, "[o]ver time, the traditional exchange rate mechanism through both export and import volumes reemerges" (Casas et al., 2017, p.24). According to Gopinath (2019, p.310), depreciation can still work on increasing exports through the effect on tourism and by affecting markups and profits of exporters in non-dominant-currency countries that can raise production and export capacity in the longer run. Therefore, even with the US dollar's dominant role in international trade, this approach still incorporates a final positive effect of exports on aggregate demand, although recognizing that it can be tepid and take time.

[4]When expectations are included, they usually follow the purchasing power parity (either in the short-run or in the long run) and are therefore stable overall. See, for example, (Bofinger et al., 2009).

A crucial assumption of the model is the existence of a natural (or stabilizing) interest rate i^n that equates y and y_n. The Central Bank sets the policy interest rate, and no automatic mechanism guarantees the convergence of the current short-term real interest rate to the natural interest rate. As a result, the IS curve can also be written in terms of deviations from the output gap and the stabilizing interest rate, considering the effect of the exchange rate.

$$y - y_n = -b(i - i^n) + c_1 E \tag{2.3}$$

The equation that determines the inflation rate ($\hat{p}$) is presented in equation 2.4, it incorporates the role of current expectations of future inflation ($\hat{p}^e$), the difference between the actual output and its natural level (Y_n) - the output gap[5] and the sensitivity of inflation to this variable δ_1 -, plus temporary shocks on the inflation rate ϵ_2 and the expectations. When expectations are fully passed to the level of inflation ($\alpha = 1$), and expectations depend on their past values ($\hat{p}^e$ = $\hat{p}_{t-1}$) the model incorporates an accelerationist form of the Phillips Curve. While one shock increases inflation to a permanent higher level, permanent shocks increase inflation constantly and, since ϵ_2 is assumed to average out to be zero in the long run, the main drivers of inflation are demand shocks.

$$\hat{p} = \alpha \hat{p}_{t-1} + \delta_1(y - y_n) + \epsilon_2 \tag{2.4}$$

The assumption that the exchange rate has no permanent impact on consumers' domestic inflation and is a source of transitory shock instead - was the approach of canonical NK models but has been relaxed in recent models (Monacelli, 2013, Froyen and Guender, 2022) and can be represented with the incorporation of parameter $c_2 > 0$ in the augmented Phillips Curve 2.5.

$$\hat{p} = \alpha \hat{p}_{t-1} + \delta_1(y - y_n) + c_2 E + \epsilon_2 \tag{2.5}$$

In the NCM framework, monetary policy has a central role in stabilizing the economy after shocks reacting when inflation goes up (or down) by setting a nominal interest rate. Since bringing inflation back to its previous level comes at a cost of decreasing output, the interest rate rule derived from this approach is a result of the central bank's attempt to minimize the loss function (equation 2.6), where δ_2 represents the inflation aversion. With $\delta_2 > 1$, the central bank attaches more importance to the inflation target than to the output target.

$$L = (y_- y_n)^2 + \delta_2(\hat{p} - \hat{p}^T)^2 \tag{2.6}$$

[5]The potential output is commonly defined as the maximum amount of goods and services that an economy can produce. In New Keynesian models, the output gap ($Y - Y_n$)is the key variable determining the evolution of inflation, and it can also be defined as the level (or growth rate in long-run models) at which there is no pressure for inflation to either increase or decrease.

In order to derive a formula for the interest rate rule, we first substitute the Phillips curve in the loss function and minimize it with respect to y - the variable that central banks aims to affect with interest rate changes. As a second step, we include the IS curve 2.3 and, in a closed economy ($c_1 = c_2 = 0$), the model arrives at the rule of equation 2.7. An important outcome of this configuration is that when inflation increases, the central bank will increase the real interest rate by increasing the nominal interest rate by more than one for one. This is the "greater than one" principle, or the "Taylor principle".

$$i = i^n + \frac{1}{b(\delta_1 + \frac{1}{\delta_1 \delta_2})}(\hat{p} - \hat{p}^T) \tag{2.7}$$

In an open economy the policy interest rate also needs to respond to changes in the exchange rate. As Carlin and Soskice (2006), assuming for simplicity that the central bank gives equal weight to output and inflation ($\delta_2 \approx 1$), and that the effect of the output gap on inflation is high ($\delta_1 \approx 1$)[6] when the exchange rate only affects the IS Curve ($c_1 > 0$ but $c_2 = 0$) we arrive at an optimal policy response of equation 2.8).

$$i = \frac{b}{(b + \rho c_1)} i^n + \frac{1}{2(b + c_1)}(\hat{p} - \hat{p}^T) + \frac{\rho c_1}{(b + \rho c_1)}(i^f + risk) \tag{2.8}$$

Although the inclusion of the cost-push channel of the exchange rate is not a common feature of open economy New Keynesian models, with some exceptions such as Froyen and Guender (2022) and Monacelli (2013), we incorporate the possibility ($c_2 > 0$) to explore the different transmission channels of external conditions on domestic variables and the monetary policy response that can arise from the "-lemmas" discussion . If the exchange rate has a strong effect on inflation, as is the case in developing economies, some New Keynesian authors have pointed out that it might be an optimal response to incorporate this variable into the mandate of the central bank (Agénor and Da Silva, 2019). The policy response in this case can be seen in equation 2.9, assuming that the exchange rate stability is an additional objective of monetary policy in a broader mandate.

$$i = \frac{1}{2(b + \rho(c_1 + 0,5c_2))}(\hat{p} - \hat{p}^T) + \frac{b}{(b + \rho(c_1 + 0,5c_2))} i^n + \frac{(c_2 + 2c_1)}{2(b + \rho(c_1 + 0,5c_2))}(i^f + risk) \tag{2.9}$$

Summing up, the NCM simple model presented here consists of four equations: the IS Curve 2.1, an exchange rate determination equation 2.2, a Phillips Curve that can include a cost-push effect of the exchange rate depending on the parameter c_2 (equations 2.5 and 2.4 respectively), and an optimal monetary policy rule that depends on whether the exchange rate is included or not in the Phillips curve. Having set these main equations, we can study how the

[6]With this assumptions in the closed economy we arrive at similar results of the Taylor rule where $i - i^n = 0,5(\hat{p} - \hat{p}^T) + 0,5(y - y_n)$

optimal monetary policy will adjust under a fixed and flexible exchange rate regime if it follows the optimal rule-like approach. Regarding the balance of payment adjustment, the implicit assumption is that a flexible exchange rate is sufficient to drive the balance of payment into a sustainable equilibrium path.

2.2.2 The trilemma result from the NK model

As pointed out earlier, the Mundellian trilemma refers to the loss of monetary policy autonomy in a fixed exchange rate regime due to the lack of control of the policy instrument and the resulting policy ineffectiveness. In contrast, from the New Keynesian perspective, monetary authorities control their policy instrument (the policy rate) regardless of the exchange rate regime. However, under a fixed exchange rate regime, monetary policy may need to follow the external rate because there is a limited amount of reserve losses that a central bank can sustain. That is, if it wishes to maintain the parity when reserves are exhausted, it will have to set the interest rate at a level high enough to attract capital flows, which might be inconsistent with domestic goals.

As in Romer (2018), let's assume that the current account is solely influenced by net exports NX, which tend to increase with currency depreciation and, therefore is a positive function of the exchange rate. Additionally, net private financial inflows NPF, are a positive function of interest rate differential ($i - i^f$) adjusted by risk ($risk$). The higher capital mobility, the higher the response of private flows to interest rate differentials. Under this premise, we can derive an equation (2.12) that describes the changes in international reserves (ΔR).

$$NX = f(E) \tag{2.10}$$

$$NPF = g(i, i^f, risk) \tag{2.11}$$

$$NX(E) - NPF(i, i^f, risk) = \Delta R \tag{2.12}$$

In the flexible exchange rate, the interest rate differential will determine the exchange rate and the balance of payment equilibrium. The higher the mobility of capital, the faster the adjustment. In the case of fixed exchange rates, greater capital mobility means that a change in the domestic interest rate has a larger effect on the central bank's foreign currency reserves. If mobility is almost perfect, even a small departure from the world interest rate causes enormous reserve losses or gains. When the central bank has no reserves, or when reserves are exhausted, it faces the constraint in equation 2.13. As Romer (2000, 2018) explains, differently than in the Mundell-Fleming mechanism, the policy limitation emerges only when monetary policy sets a domestic interest rate lower than the external rate. Note that the limitation is asymmetric. While changes in reserves cannot be negative, there is no limit to foreign currency accumulation. That

is, *"the central bank is free to pursue policies that create reserve gains, but beyond some point cannot pursue policies that create reserve losses"* (Romer, 2000)

$$\Delta R \geqslant 0 \tag{2.13}$$

Therefore, when an expansionary policy also leads to financial outflows and the central bank keeps the exchange rate fixed, its stock of reserves falls. If outflows continue or the central bank continues to cut the interest rate and reserves reach zero, either the peg falls, or the interest rate will need to be higher. In contrast, monetary policy is free to set the interest rate as high as it wishes, *since this only leads foreigners to want to purchase domestic currency to obtain high-yielding domestic assets, and it can meet this demand by printing money* (Romer, 2018, p.44). Thus, with a fixed exchange rate, the interest rate level implied by monetary policy rules directed towards domestic goals can result in imbalances between the supply and demand of foreign currency that are inconsistent with the asymmetric constraint.

As a result, in the fixed exchange rate regime, monetary policy will be represented in a two-part rule. When reserves are positive, the central bank will set the interest rate in a rule-like fashion of equation 2.7. Since the central bank keeps the exchange rate fixed, it will not impact the IS or the Phillips Curve. In contrast, when reserves are too low, it must either abandon the peg or the interest rate rule, setting it instead accordingly to r_{bp}. This interest rate level, in turn, derives from the UIP parity and the degree of capital mobility. Therefore, the *baseline assumption [of the Mundell-Fleming model] that the domestic real interest rate must equal the world real interest rate is a special case of the model* (Romer, 2000, 165).

$$i = \begin{cases} \frac{1}{b(\delta_1 + \frac{1}{\delta_1 \delta 2})}(p - p^T) + i^n & R \geqslant 0 \\ \rho(i^f + risk) & otherwise \end{cases} \tag{2.14}$$

Another way to look at the trilemma within this New Keynesian framework is to derive the advantages of a regime of flexible exchange rates using the partial derivatives of equations 2.8, 2.9 and 2.17 as a measure of policy autonomy as in Froyen and Guender (2022) and Gourinchas (2018). In other words, comparing the optimal monetary policy reaction function to changes in the foreign rate across different exchange rate regimes.

When the exchange rate is not included in the Phillips curve, the optimal monetary policy response to changes in the foreign interest rate is given by equation 2.15.

$$\frac{\partial i_{c_1>0}}{\partial i^f} = \frac{c_1}{b + c_1} \tag{2.15}$$

$$\frac{\partial i_{c_1>0, c_2>0}}{\partial i^f} = \frac{2c_1 + c_2}{2b + 2c_1 + c_2} \tag{2.16}$$

If a country opts for a fixed exchange rate and, and assuming that reserves are either low or fall below a predefined minimum threshold, the central bank will systematically adjust

its policy rate based on the external interest rate. This rule-like adjustment aims to mitigate any potential impact stemming from this external variable, as illustrated in equation 2.17.

$$\frac{\partial i_{R<0}}{\partial i^f} = 1 \tag{2.17}$$

Therefore if the economy is reserve constraint, the monetary policy will not follow the optimal response (according to its domestic goals) and its reaction to changes in the foreign rate will be higher than in the flexible exchange rate regime[7].

$$\underbrace{\frac{\partial i_{R<0}}{\partial i^f}}_{\text{Fixed ER no reserves}} > \underbrace{\frac{\partial i_{c_1>0,c_2>0}}{\partial i^f}}_{\text{Flex ER with cost channel}} > \underbrace{\frac{\partial i_{c_1>0,c_2=0}}{\partial i^f}}_{\text{Flex ER}}$$

Thus, the central bank can determine the policy interest rate at its desired level in each case. However, it tracks the external interest rate as an optimal response regardless of the exchange rate regime. In the canonical model (Flex ER), where the exchange rate has only a positive effect on aggregate demand, an increase in the external rate will result in an optimal response of increasing the domestic interest rate (because the initial depreciation of the exchange rate will increase aggregate demand , deviating it from the potential output level). When, in addition to the demand shock, the exchange rate also acts directly on prices (Flex ER with cost channel), the response will need to be higher. However, in the latter case, the response will still be lower than when monetary policy follows the UIP (Fixed ER no reserves). As a result, a flexible exchange rate would be the preferred option for a lower response from monetary policy to external monetary shocks.

2.2.3 Flexible exchange rates and the dilemma

The gains from exchange rate flexibility have been recently challenged within the NCM by the "dilemma" put forward by Rey (2013). However, this approach (e.g., Rey (2016) and Gourinchas (2018)) does not suggest that a fixed exchange rate is preferable for open economies. Instead, it pertains to the limitations of monetary policy in flexible exchange rates and calls for capital controls, an option disregarded in the previous exposition. In this perspective, the global financial cycle - the co-movements of financial flows and assets across different jurisdictions - affects all financially integrated economies regardless of the exchange rate regime and transforms the trilemma into a dilemma. Other authors within the mainstream literature have already raised concerns regarding the spillover effects of external financial conditions on domestic economies, especially for developing economies (Mohanty and Scatigna, 2005, Calvo and Reinhart, 2002).

[7]Note however, that in the presence of sufficient reserves, the central bank could disregard external monetary shocks. Yet, if it wishes to keep reserves constant ($\Delta R = 0$) net exports will need to be equal do net portfolio flows. That, is $c_1 E = \rho(i + i^f - risk)$. With $\rho = 1$, the policy response to an external shock will still be equal to 1.

However, Rey's novel approach comes from the impact of external conditions on monetary policy transmission channels through an international credit channel.

In the model presented in the previous section, the treatment of the financial market is oversimplified and the policy interest rate directly affects the long-term interest rate relevant to changing aggregate demand. Specifically, we focused on two transmission channels of monetary policy: the interest rate and the exchange rate channel. The argument by Rey (2016) is that the U.S. interest rate is the primary driver of the global financial cycle, which, in turn, can affect financial asset prices (asset price channel) and the credit channel of monetary policy.

In a closed economy, the asset price channel acts through the effect of the policy rate on bonds, stock markets, and real estate prices, as they are inversely related to long-term interest rates, which follow the short-term rate. When these assets' prices increase, consumption and investment expand (Agénor and Da Silva, 2019).

Moreover, the credit channel stems from market frictions and banks' credit rationing, which are core assumptions of the New Keynesian theory. A tight monetary policy can negatively affect credit supply through this channel in two ways. First, it can deteriorate banks' balance sheets when a policy-induced interest rate hike increases the amount of non-performing loans. Second, by altering the value of assets that can be present as collateral, an increase in the interest rate can reduce the number of customers considered creditworthy by banks and the demand for credit more broadly (Mohanty et al., 2008). According to Rey (2013), in the open economy, these two channels are affected by the external interest rate (the U.S. policy rate). The term used by Rey (2016) to describe this effect is the *international credit channel* in addition to the "balance sheet channel" *"according to which exchange rate depreciation worsen the balance sheets of firms that mainly earn in local currency but borrow in dollars and leading to lower investment"* (Gopinath, 2019, p.311).

In line with long-noted conclusions that "push" factors are the major determinants of international capital flows (Calvo et al., 1993), Rey (2013) emphasizes that external financial conditions, determined by the U.S. policy interest rate, drive volatile and pro-cyclical international credit and portfolio inflows. These flows, in turn, affect asset prices and credit in other economies, changing monetary conditions (by affecting the channels of monetary policy). When changes in the U.S. policy rate lead to an increase in financial flows and an exchange rate appreciation, it affects external activity and inflation through the balance sheet and the exchange rate channel. According to Rey (2013), given how global banks operate, when U.S. policy rate falls, banks channel U.S. dollar liquidity to other markets and, therefore, credit flows affect the international credit channel:

> *"Foreign bank branches in the U.S. were raising large quantities of funds in dollars and transferring them to overseas markets. European global banks were not only intermediating savings back in the U.S. market but were also serving Asian, Latin American, African and Middle Eastern markets. I will therefore treat the leverage of European banks as a key variable of the analysis. The dollar is the main currency*

> *of global banking. Since surges in capital flows are especially credit flows are associated with increases in leverage worldwide, a natural interpretation is that monetary conditions in the centre country are transmitted worldwide through these crossborder gross credit flows." (Rey, 2013, p.11)*

The effect of the U.S interest rate credit flows is explained by changes in the perception of risk (proxied by the VIX[8]) on the exchange rate and other financial asset valuations and through a "risk-taking channel" of banks Bruno and Shin (2015), where a lower risk perception enables Value-at-Risk constrained banks to take on greater leverage and then invest across different jurisdictions. As a result, Rey (2016) highlights that capital flows and the leverage of global financial institutions play a crucial role in transmitting US monetary conditions to other economies, regardless of their exchange rate regime:

> *The Trilemma misleads us by assuming that domestic monetary and financial conditions shaping the macroeconomic situation of a country can be conveniently summarized by this one single variable, the short-term interest rate (...) Yet, in a world of globalized finance with different types of capital flows and financial market imperfections, key countries' monetary policies may affect other countries' monetary conditions and financial stability in several ways. Financial imbalances may arise and, as a consequence, domestic output may be affected later on. Or the presence of foreign debt may lead to powerful balance sheet effects that will alter the effect of a monetary loosening, say, in the domestic economy. In such a world, letting the exchange rate float may not be enough to insulate the domestic economy, even if it is a large country, from global factors and permit monetary policy independence*.(Rey, 2016, p.2)

In the simplified version of the New Consensus model developed in this chapter, the international credit and balance sheet channels will act in the same way as in Gourinchas's (2018) approach. Those channels imply that a decrease in financial flows and currency depreciation resulting from a monetary tightening in the U.S. weakens domestic balance sheets, forces deleveraging, limits credit growth, and consequently can reduce spending decisions and economic activity domestically. In this case, an exchange rate depreciation would have the opposite effect on the IS equation 2.1 and is captured by the parameter f in the new IS equation .

$$y = -bi + c_1 E - f_0 E + \epsilon_1 \tag{2.18}$$

Additionally, since in this approach, the existence of a global financial cycle results from changes in the external interest rate that affects the risk aversion sentiment, we will decompose the parameter $risk$ that affects net financial flows and the exchange rate according

[8]The CBOE Volatility Index (VIX), calculated by the Chicago Board Options Exchange as the implied volatility of the S&P 500 options index, is am indicator of expected market volatility and a widely used measure of global risk aversion (Adrian and Shin, 2008).

to the equation 2.19 as done in Gourinchas's (2018) model. While $risk_a$ is an exogenous risk component,$risk_i$ captures the risk sensitivity to the U.S. interest rate.

$$risk = risk_a + risk_i i^f \tag{2.19}$$

When both channels are considered, it results in equation 2.20 assuming $\rho = 1$. The overall impact of the external monetary shocks on aggregate demand will depend on the strength of the parameters f_0 and $risk_i$. If the sum of the balance sheet effect and the spillover effect of changes in external monetary policy, i.e., $f_0 + risk_i > c_1 - \rho$, then an increase in the external interest rate will lead to a domestic contraction. In that case, the expansionary effect of exports is not sufficient to compensate for the adverse effects of external spillovers.

$$y = i[\rho(f - c_1) - b] + i^f[\rho(1 + risk_i)(c_1 - f)] \tag{2.20}$$

While increases in the domestic policy rate negatively affect demand by reducing internal demand and exports, it will have a positive effect when currency appreciation also stimulates demand by altering agents' financial balance sheet f_0 (equation 2.21). This effect has been interpreted as a reduction in monetary policy effectiveness since a contractionary policy can have a positive effect instead or even fail to affect aggregate demand in the desired way (Passari and Rey, 2015). In the model, this will occur when the condition 2.21b is satisfied. When the balance sheet effect and the exchange rate response to the UIP condition are high relative to the sensitivity of aggregate demand to the interest rate, monetary policy expansion will be less effective in increasing economic activity. This effect is denominated by Gourinchas (2018) as a "perverse" domestic monetary policy transmission; when the domestic monetary authority raises the policy rate, the effect on domestic output is expansionary.

$$\frac{\partial y}{\partial i} = \rho(f - c_1) - b \tag{2.21a}$$

$$f_0 > c_1 + \frac{b}{\rho} \tag{2.21b}$$

As in previous exercises, we solve the model assuming that changes in the exchange rate do not affect the Phillips curve, and derive the optimal policy response to an increase in the external interest rate, resulting in equation 2.22.

$$\frac{\partial i_{c_1>0, f_0>0, risk_i>0}}{\partial i^f} = \frac{\rho(c_1 - f_0)(1 + risk_i)}{b + \rho(c_1 - f_0)} \tag{2.22}$$

The optimal response becomes more complex, but two main results derive from this interpretation if we simplify the response with $\rho = 1$. First, when financial spillovers are low $f_0 \approxeq 0$ and $risk_i \approxeq 0$, we expect the same result as in the case where only the expansionary effect of exports operates. Even if a depreciation causes some contraction, the optimal result is to

either park the interest rate or reduce it and let the currency depreciate further - a result that does not invalidates the trilemma. A flexible exchange rate regime is still required - even if there is a reduction in the effectiveness of the monetary policy. However, suppose financial spillovers are high and exchange rate depreciation has a final contractionary effect on the domestic economy. In that case, the optimal response will be to increase the policy rate to appreciate the exchange rate. If equation 2.23 is satisfied, this increase will be higher than one.

$$f_0 > c_1 + \frac{b}{risk_i} \tag{2.23}$$

The policy response of the fixed exchange rate regime with the impact of the global financial cycle will also be higher than in the trilemma case, and is presented in equation 2.24.

$$\frac{\partial i_{R<0}}{\partial i^f} = 1 \tag{2.24}$$

Therefore, if the slightest response of the domestic policy rate is the benchmark for choosing between different exchange rate regimes, the decision will ultimately depend on the size of the parameters. A fixed exchange rate is only preferable to a floating regime when the balance sheet effect and the international credit channel are so strong that they eliminate the traditional insulating power of the exchange rate due to its effects on exports[9].

Thus, the dilemma framework argues that all countries, even with flexible exchange rates, will "feel" or "import" financial conditions from abroad because financial assets and firms' balance sheets respond to the U.S. interest rate. How this affects monetary policy optimal response will depend on the strength of these spillovers. They can create additional challenges for monetary policy if sufficiently high, but external monetary shocks do not prevent the central bank from following the optimal rule. If devaluations lead to a contraction, it can reduce the interest rate to overcome this effect. If reserves are exhausted, or the central bank does not want to lose reserves in a fixed exchange rate regime, it will follow the policy from abroad.

Therefore, the optimal response is still compatible with the trilemma framework. Monetary policy can be directed toward domestic goals if the exchange rate is free to float. This may not be feasible in the case of a pegged exchange rate. Moreover, the magnitude of the policy response will be lower than in a fixed exchange rate regime when the spillovers are not so strong.

[9] An effect of an imperfect transmission mechanism between the policy rate and long-term rates could also be included as another consequence of the global financial cycle as presented in Kalemli-Ozcan (2019) model. The following equation could explicitly incorporate this in our New Keynesian toy-model representation:

$$i = i^{cb} + risk \tag{2.25}$$

where i^{cb} is the actual policy rate and i is the interest rate that affects spending decision in the IS curve. It, therefore implies that when $risk_1 \neq 0$ the pass-trough of monetary policy to the relevant interest rate is not one-to-one and depends on the risk premium.

2.2.4 Relaxing the trilemma instead: quadrilemma and foreign exchange interventions

Another strand of the New Keynesian literature suggests that the trilemma has morphed into a quadrilemma instead and states that the key message of the trilemma is the scarcity of policy instruments compared to the number of policy targets. In this line, we can find two related theoretical approaches within the New Consensus literature.

The first approach focuses on the importance of foreign reserves, as well as sterilized interventions. The key factor is whether these interventions are effective in influencing both the level and change of exchange rates. The effectiveness of international reserves in relaxing the trilemma, therefore, depends on whether there is sufficient stock and if it can effectively impact the exchange rate in the desired direction. This point was, until recently, very controversial in mainstream literature. As outlined previously, for Mundell (1963) and the canonical Mundell-Fleming model, sterilized interventions are neither feasible nor appropriate over anything but the very short run, and this is due to the hypothesis of perfect asset substitutability and perfect capital mobility. This view was the consensus during the 1980s. However, it was challenged since the 1990s, especially after the successful exchange rate interventions following the September 1985 Plaza Accord (Sarno and Taylor, 2001) and in the 2000s after the increased amount of reserves accumulation by developing economies (Mohanty and Scatigna, 2005, Daude et al., 2016, Menkhoff, 2013). Recent studies confirm the effectiveness of intervention (Patel and Cavallino, 2019), especially to tame volatility (Fratzscher et al., 2019).

The two primary mechanisms whereby interventions can affect the exchange rate in this literature are the portfolio balance and signaling channels. The first relies on the assumption that agents regard assets denominated in different currencies as imperfect substitutes and, therefore, the UIP does not hold. The second is the impact of central interventions on "market participants" expectations about macroeconomic fundamentals or future policy"(Patel and Cavallino, 2019, p.30)[10].

By incorporating interventions explicitly, Steiner's (2017) model shows that these operations can be used as an extra policy tool to make the original three goals simultaneously attainable when assets of different countries are imperfect substitutes in the short and medium run. A similar result derives from Ghosh et al. (2016) model, where a monetary policy regime that combines an inflation target rule for its interest rate setting with sterilized interventions, used to avoid extreme volatility in the exchange rate, leads to a better result than a pure free-floating exchange rate regime. However, the extra-flexibility is asymmetric. While there is no limit for accumulating foreign exchange rate reserves, the ability to resist currency depreciation is restricted by the stock of foreign exchange rate reserves and access to international credit lines (Romer, 2000, Mohanty and Scatigna, 2005). Similarly, Bofinger (2012, p.2) has thus argued that

[10]A discussion of the theoretical channels discussed within this literature is beyond the scope of this section and can be found in (Sarno and Taylor, 2001), Abenoja (2003), Bank for International Settlements (2005) and Domanski et al. (2016) among others.

the existence of managed floating regimes transforms the "impossible trinity" into a "possible trinity".

As such, these claims are not very different from Romer's (2018), where a fixed exchange rate can be combined with a monetary policy rule directed at domestic goals when the central bank has sufficient reserves. However, using exchange rate interventions to control domestic currency volatility also means that monetary authorities may respond less (than in the dilemma cases where flexibility increases policy response) to foreign shocks in a flexible exchange rate regime due to the relative stability of the exchange rate achieved through interventions. If the central bank tames the exchange rate in a managed float, it will not significantly change domestic consumers and firms' balance sheets. The three targets can be attainable regardless of the exchange rate regime when the monetary authority has enough international reserves.

In the second approach of the quadrilemma results, instead of an additional limitation for monetary policy conduction, the increasing financial integration and resulting spillovers add financial stability as an extra goal for monetary policy. This additional goal, in turn, can and has been addressed with extra policy instruments such as accumulating (and using) international reserves and macroprudential regulations to achieve this goal (Aizenman, 2019). Challenging the dilemma interpretation, Aizenman's (2019) points out that *Mundell's trilemma does not argue that countries can insulate themselves from global shocks propagated by large countries. A valid interpretation of Mundell (1963) concerns trade-offs and mitigations. (p.451).*

In the model outlined in the previous section, an external shock acts on the exchange rate and domestic financial conditions due to parameters f_0 and $risk_i$. The policy response is higher when exchange rate considerations are in place both in the trilemma and dilemma perspectives. In the trilemma, this occurs when the exchange rate impacts the Phillips Curve. In the dilemma, on the other hand, the higher response is explained by the effect of the exchange rate on firm's balance sheet. In both cases, monetary policy has two targets (stabilizing the exchange rate and achieving the domestic monetary policy target) but only one instrument (the interest rate). When sterilized foreign exchange rate interventions can be used as an additional tool, the trilemma can be relaxed. Additionally, central banks can also use prudential regulation or capital controls to reduce the size of parameter f_0, which accounts for the balance sheet effects on aggregate demand, thereby achieving financial stability.

2.3 An assessment of the New Keynesian "-lemmas" debate

From the above theoretical representation of the New Keynesian '-lemmas,' it can be argued that external variables do not determine the policy interest rate in neither the flexible nor fixed exchange rate regime, as in the Mundell-Fleming model. Since the interest rate in both regimes responds to external variables as an optimal response to achieve its desired target, it implies that with financial integration, there is no insulation from abroad. However, proponents of

the trilemma view argue that (in the absence of exchange rate reserves), a floating exchange rate provides more flexibility for pursuing domestic goals because the optimal interest rate responds less to the external interest rate. In other words, even if the transmission mechanism of the policy rate to the domestic economy is affected by external conditions, a flexible exchange rate regime is still considered more efficient in achieving the desired policy goal. Without the adjustment mechanism of the exchange rate, in a fixed exchange rate the peg can become unsustainable, and the interest rate will ultimately follow the UIP condition instead of the monetary rule directed at its internal objective.

However, this description is not always evident in the literature and different authors use different definitions of monetary policy autonomy to assess its empirical validity. In this section, we briefly review the empirical literature and discuss its limitations.

2.3.1 A critical review of the method and results

At the beginning of the 2000s, Obstfeld et al. (2004, 2005) presented a study contrasting different exchange rate regimes and the use of capital controls across a long span of period. Overall, they found evidence of the trilemma predictions across time - from the gold standard period (starting in 1870) until the post-Bretton Woods era (ending their analysis in the year 2000). Using a panel regression of co-movements between short-term interest rates (market discount rate) of different countries, they validated the trilemma predictions across time: Countries that pegged their exchange rate were found to react more to changes in the base rate. Yet, they noted that *"non pegs are never purely free floats, as even countries that are not pegging their currencies do often choose to follow the base interest rate to some degree"* (Obstfeld et al., 2005, p.435).

Later in the 2010s, Aizenman et al. (2008) developed a methodology to represent the trilemma prescription using three indexes to measure exchange rate stability, financial integration, and monetary policy autonomy. While exchange rate stability is calculated as an index of the annual standard deviation of the monthly exchange rate between the home and base countries, financial integration is measured using the Chinn and Ito (2008) index of *de jure* capital account openness. Monetary policy autonomy, in turn, is measured as the annual correlation of the monthly interest rates between the home country and the base country using money market rates. If the domestic policy rate does not closely follow the central country, this is understood as evidence of monetary policy autonomy. As a change in one of the indexes induced a change with the opposite sign in the weighted average of the other two, their trilemma index imposes trade-offs among the policy choices. With this index, the empirical literature that follows this approach has focused on a two-step strategy: first, assessing the sensitivity of the domestic interest rate to the external one, and, second, how this sensitivity affected the achievement of output and inflation (two domestic goals). Their empirical evidence suggested that countries usually adopt a combination of the three policies (avoiding corner solutions) and

partially achieve the desired objectives (exchange rate stability, financial integration, and stable output and inflation). However, the results also implied that countries whose interest rates were less sensitive to financial conditions had exchange rates that float more and, in turn, were more efficient in achieving their desired domestic policy goals. Consequently, the conclusion was that the trilemma was valid (it was a binding constraint) (Aizenman et al., 2016, 2008, Obstfeld et al., 2005).

In contrast Rose (2011), did not detect any systematic differences between economic outcomes, in terms of output and inflation, between economies that fixed or float their exchange rates nor between hard currency pegs and inflation targeting regimes for small economies during the Global Financial Crisis and its aftermath (Rose, 2014). More recently, Cheng and Rajan (2019) documented a "2.5-lemma", or "something in between" the trilemma and the dilemma in developing economies by examining the co-movements of internal and external interest rates. Their results indicate that exchange-rate flexibility results in less co-movement between short-term rates. Additionally, they document the existence of an asymmetric pattern where non-pegged countries also responded more to a rise in the external interest rate than to a fall in it. They interpreted their result as an indication that in a floating exchange rate regime, developing countries lose some degree of monetary policy autonomy due to a fear of *"fear of capital reversal"* or a *"fear of reserve loss"*[11], especially when the stock of international reserves is low. Nevertheless, when the stock of reserves was high, their data indicated that short-term rates did not co-move regardless of the exchange rate regime, indicating that their result could also be interpreted as an indication of a quadrilemma, or that the trilemma is not binding when a country has a sufficient stock of reserves.

At this point, it's worth mentioning some shortcomings of this empirical strategy. The first one involves assessing monetary policy autonomy as the correlation or sensitivity of internal and external interest rates and how this sensitivity affects monetary policy targets (output and inflation). Co-movements between interest rates do not necessarily indicate that an instrument cannot be independent. In other words, this strategy does not test whether the central bank chooses to move the interest rate in line with other rates precisely to achieve its domestic goals. A similar point is raised by Caceres et al. (2016, p.3), who stresses that co-movements of short-term interest rates *"could alternatively reflect the behavior of fully independent central banks that react to synchronized and interdependent economic cycles."* In our previous representation, the central bank's policy instrument responds to the external interest rate, yet it does not lose control of its instrument. The optimal response of the central bank depends on how (and through which channels) changes in external rates affect the domestic economy and the policy goals of maintaining inflation within the target and output near potential. Therefore, as stated by Bernanke (2017, p.27), "[i]n general, strong financial correlations across countries are entirely

[11]This is the opposite result documented in Han and Wei (2018, p.206) that found that in a flexible exchange rate regime, developing countries have more autonomy when the US country raises its interest rate than when it lowers it. Therefore, they argue that instead of *"fear of floating" mostly takes the form of "fear of appreciation"*

compatible with the standard Mundell-Fleming model." A similar point is also made by Froyen and Guender (2022).

Another shortfall of this empirical strategy relates to the measurement of capital mobility. Since it does not account for transactions among residents denominated in foreign currency, it does not reflect the entire policy decision of financial openness. Also, adopting an index based on legal restrictions for capital movements might be useful to assess policy intentions but not its result (financial integration), which might be more relevant for monetary policy outcomes (or that can affect the spillover and balance sheet effects). There might be cases where there are no legal restrictions in an economy. However, the size of capital moving in and out of an economy might be relatively small compared to other countries, as these flows are ultimately a decision of international financial investors. For this purpose, a de facto index might be more appropriate. Furthermore, using the standard deviation to measure exchange rate stability does not capture a policy option and might also not be a good measurement of its outcomes. As argued by Ramos (2016, p.271), can be a misleading measure of volatility as it only partially captures the three aspects of volatility: velocity, predictability and direction. These problems are also recognized by Aizenman (2013, p.12) who stated that *"[t]esting the predictions of the trilemma paradigm remains work in progress, as there is no unique way to define and measure the degree of exchange rate flexibility, monetary autonomy, and financial integration. Proper modeling of limited financial integration and limited substitutability of assets remains a challenge."*

Instead of relying on the correlation between domestic and external interest rates, Ghosh et al. (2011) estimated domestic interest rate reaction functions (Taylor rules) for a sample of IMF member countries between 1980 and 2007 - an approach that aligns with the New Keynesian theoretical model presented in the previous section. Their results indicated that countries with intermediate and floating exchange rate regimes reacted to inflation and the output gap, while those with pegged exchange rates did not respond as strongly to these variables. However, when examining the impact of exchange rate regimes on inflation across the full sample of countries, they found that inflation was lower, especially under *de jure* pegs. Concerning economic growth, intermediate regimes outperformed - particularly in emerging market economies. However, their findings are not integrated with an analysis of financial integration.

As discussed in section 2.2.3, Rey's (2013), skepticism about the applicability of the trilemma framework has as its primary focus the impact of external conditions on the transmission mechanisms of monetary policy. To evaluate whether a flexible exchange rate regime gives a country monetary policy autonomy, the empirical question tested by Rey (2016) is whether the external interest rate affects other relevant financial variables that exert an impact on domestic financial conditions, such as long-term rates and mortgage rates. In her exercise, a U.S. monetary policy tightening immediately affects credit conditions, as measured by the mortgage spread of a sample of inflation targeting and free floaters in advanced countries. As a result, lack of autonomy

is not measured as co-movement of the policy rates but on the degree of the transmission channel between the external rate and other local interest rates.

This was recognized by Obstfeld (2015), who tested both short and long-term interest rates (the primary monetary policy transmission mechanism in this literature) and found that countries with a floating exchange rate regime have indeed more autonomy at the short-end but long-term rates (10-year government bonds), are more highly correlated across countries regardless of the exchange rate regime. For Obstfeld (2015, p.19), however, since *"policy interest rate feeds through to other domestic interest rates and demand"* the central bank has more capacity to *"steer the economy, and the capacity is greater the more the bank is willing to allow exchange rates to fluctuate and depart from the US interest rate."*

In a similar approach, Ricci and Shi (2016) test the two measures of autonomy discussed so far: i) the short-term response of domestic local currency policy rates to foreign rates, and ii) the co-movement of other local interest rates with the domestic policy rate and the external interest rate. Using the first measure, they found that countries that pegged their exchange rate had highly correlated domestic policy rates with the U.S. rate. In the case of floaters, the correlation size was considerably heterogeneous. The authors explain the heterogeneous response by floaters due to different policy decisions. While some might have responded to changes in the U.S. interest rate due to a fear of floating or because their business cycles correlate with the U.S., others could have chosen not to follow (Ricci and Shi, 2016). However, it is unclear why floaters would have more autonomy than peggers using this explanation. Like floaters, peggers may also follow the U.S. interest rate to address domestic concerns. Moreover, when testing for the second measure of autonomy, Ricci and Shi (2016, p.27) find that *"the local policy rate is the major channel through which foreign rates influence the short end of the local interest rate curve (up to a two-year maturity), while the long end of the curve (ten-year) is mainly affected by the direct effect of U.S. long-term interest rates, with only a small pass-through from the local policy rate."* As a result, floaters had some control of their yield curves, but this control was mainly concentrated at the short end, while Rey's argument was valid for longer maturities.

2.3.2 Autonomy, the balance-of-payment constraint and the New Keynesian '-lemmas' debate

The New Keynesian literature usually discusses monetary policy autonomy in terms of the economic policy trilemma, but there is no agreement on what monetary policy autonomy means and how it is linked with adopting a flexible exchange rate regime. Although we have already pointed out two different definitions, in this section, we critically discuss the concepts that appear in the literature.

When presenting the policy trilemma, Aizenman (2013) notes that opening financial markets and implementing a fixed exchange rate system are policies that aim to achieve two different goals: financial integration and exchange rate stability. Monetary policy independence,

conversely, is described both as a policy option and a policy goal, which can be confusing. In other words, while the first two objectives of the trilemma are clearly separated between a means and an end, the same is not done with monetary policy autonomy. One possible interpretation of this definition is that it relies on the assumption that controlling the policy instrument and policy effectiveness are considered the same. *Monetary policy autonomy* has also been previously defined by this author Aizenman (2010) as ‘*‘the ability of a country to determine its own monetary policy to meet its economic objectives, mostly by means of changing the supply of money (the monetary base) and changing policy-determined short-term interest rates."*

Yet, defining autonomy as the ability of central banks to control the money supply to affect the short-term rate is inconsistent with the view that a market mechanism does not determine the policy interest but that it is exogenously set by the central bank Romer (2000). If *autonomy* is defined as the ability to set the policy rate, there would be autonomy regardless of the exchange rate regime since following the external interest rate is also a decision taken by the monetary authority. Moreover, defining autonomy as a synonym for policy effectiveness can be misleading since an independent instrument does not guarantee that it will attain its intended effect nor that the target will be achieved. Monetary policy is recognized to have a weak link with aggregate demand within this framework (Taylor, 1999).

Additionally, the limits of monetary policy pointed out by its critics do not necessarily relate to open economy issues (Sawyer, 2009). After the 2008 global financial crisis, limitations of monetary policy due to the Zero Lower Bound have been admitted by authors' within this literature (Summers, 2015). Since policy effectiveness can also be limited in a closed economy, it might not be appropriate to directly linked autonomy and effectiveness with the exchange rate regime.

On the other hand, the definition of monetary policy autonomy as the capacity of the central bank to affect other domestic interest rates (or financial conditions) does not seem to depend on the exchange rate regime as documented by Ricci and Shi (2016). They label this result as a "Greenspan conundrum" in the long end of the curve that is found to be stronger in developing economies than in advance economies which might indicate the role of other relevant structural characteristics besides the exchange rate regime and size of integration.

Finally, to relate the *degree of monetary policy autonomy* to the size of the Taylor rule response to the external interest rate, as done in our theoretical exercise in Section 2.2 and in studies such as Froyen and Guender (2022), and in Ghosh et al.'s (2011) empirical test, indicates that the final outcome also depends on structural parameters that determine how the exchange rate affects the domestic economy. Thus, this can suggest that the degree of autonomy that each regime provides depends on the structure of the economy.

All these different definitions can generate some misconceptions about monetary policy options for different countries. A dictionary definition can be helpful to clarify the problems of such a terminology for economic analysis. According to the Oxford English Dictionary, autonomy refers to the *"condition or right of a state, institution, group, etc., to make*

its own laws or rules and administer its own affairs" or, more generally, the *"liberty to follow one's will; freedom from external influence"*[12]. When used interchangeably with monetary policy being independent, it has a similar meaning. Another look at the dictionary can justify this assertion since independence is a condition that relates to *"exemption from external control or support; freedom from subjection, or from the influence of others"*[13].

Using the term "autonomy" or "independence" to define a monetary policy that is free from external influences can result in an empty concept. It is very unlikely for macroeconomic variables to be absent of foreign influences in an interconnected world and policymakers cannot make decisions without taking these into account. On the other hand, having a policy instrument freely set by the monetary authority does not guarantee that it will achieve its intended effect or that the target will be met. Thus, while implementing the desired monetary policy is always possible, in a context of commercial and financial integration, policymakers have to consider external factors to achieve their goals. The New Keynesian literature, however, misses one crucial consideration discussed in the previous chapter—the balance of payment.

Although the New Keynesian literature attempts to advance understanding of how external conditions can affect the domestic economy, it primarily focuses on the direct impact of the exchange rate on aggregate demand. When problems of cost-push inflation arise in some authors (that include the exchange rate in the Phillips Curve), the implications (such as income distribution) are not extensively discussed. Potential problems of continuous appreciation or depreciation trends in this regime are not discussed.

Moreover, the possibility of a balance of payment constraint does not appear. The literature implicitly assumes that, in a flexible regime, the exchange rate will stabilize at a level compatible with a trade balance equilibrium, even if it takes time (Casas et al., 2017). Therefore, in contrast with early Keynesian concerns, New Keynesians do not see the balance of payment as a relevant constraint. In other words, the possibility that the balance of payment-constraint output is lower than potential output is not addressed in the "-lemmas" debate. Therefore, the possible conflicts between internal and external stabilization are not fully incorporated.

2.4 Conclusion

This chapter reviewed the '-lemmas' debate derived from the trilemma reincarnation framework in the New Keynesian literature. While in the presence of foreign exchange rate reserves, the trilemma is considered less binding in one strand of the literature, discussions about a monetary policy dilemma or the reduced autonomy of monetary policy in open economies derive from an adverse effect of the exchange rate on aggregate demand. By incorporating other transmission channels of financial conditions to aggregate demand (besides the interest rate channel), the New Keynesian literature arrives at the possibility of contractionary depreciations

[12] See: "autonomy, n.".OED Online.December 2021.Oxford University Press.
[13] See: "independence, n.".OED Online.December 2021.Oxford University Press.

and expansionary appreciations (contrary to the Mundell-Fleming model result). This means that the exchange rate no longer absorbs external shocks but, instead, can intensify them. It also means that the policy rate has less control over the term structure, meaning they are less efficient in affecting their transmission mechanism to their target variables (output and inflation).

There is still an agreement that pegged regimes impose greater constraints on monetary policy, regardless of the definition of autonomy. When looking at the empirical findings, however, the results are mixed. Moreover, although the stock of reserves seems to be an important part of the story, one can suspect that there might be other relevant variables that explain the different response of domestic interest rates to the U.S. rate, as well as the policy effectiveness measured in terms of output and inflation volatility. Therefore, the outcomes of financial integration for monetary policy autonomy and effectiveness are blurred in this theoretical and empirical literature.

However, this literature advances on the potential problems arising from a flexible exchange rate regime in financially integrated countries. Moreover, incorporating other policy instruments, such as the level of reserves and the role of capital controls, represents an advance relative to the traditional Mundell-Fleming framework. Nevertheless, in this "modern reincarnation" of the trilemma framework, the exchange rate regime and the degree of capital mobility are still considered the main determinants of monetary policy autonomy. Therefore, its limitations result from terminology problems that obscure the discussions on policy space, as defined in Chapter 1, the lack of a meaningful definition of external constraints, and an overemphasis on the role of the exchange rate regime. As such, it is too narrow to analyze the conflicts between different policy objectives and can provide limited guidance for monetary policy and exchange rate management in small, open economies.

Chapter 3

Beyond the Trilemma Framework: A post-Keynesian approach to policy space and external constraints

3.1 Introduction

The *Mundellian* trilemma which states that financially integrated countries must choose between monetary policy autonomy and a fixed exchange rate, was for decades the centerpiece of policy recommendations for small open economies. More recently, however, this framework has been challenged by some New Keynesian scholars, leading to several empirical and theoretical studies. As discussed in Chapter 2, despite some controversies, the exchange rate regime and the degree of capital mobility remain the main determinants of monetary policy autonomy.

Post-Keynesians are critics of both the Mundell-Fleming model and the New Keynesian framework. Nevertheless, these authors frame much of the discussion on monetary policy autonomy and the choice of the exchange rate regime under the trilemma terms. For instance, while some authors argue that a floating currency provides more policy autonomy (or independence), referring to the trilemma (Wray, 2015, Smithin, 2018), others assert that a fixed exchange rate system will also allow for monetary policy autonomy when the country has enough international reserves (Angrick, 2018, Lavoie, 2001) and results in a quadrilemma (Laurentjoye, 2022). Moreover, similar to the dilemma approach, another strand of the post-Keynesian literature points out that in a context of broad financial integration, monetary policy autonomy is lost under any exchange rate regime (Kaltenbrunner and Painceira, 2017, Cömert, 2019, Flassbeck, 2001, Conti et al., 2014).

In contrast, this chapter contends that the trilemma framework is an inadequate tool to understand the macroeconomic challenges faced by financially integrated developing economies in the current International Monetary and Financial System (IMFS) because it does not take into account external constraints related to the balance of payments and uses a controversial definition of monetary policy autonomy. After the critical review of the post-Keynesian literature, we revisit the concepts developed in Chapter 1 and update them with more recent post-Keynesian

contributions. The remainder of the chapter is organized as follows: Section 3.2 critically reviews the policy autonomy definition and trilemma/dilemma results in different post-Keynesian strands, presenting how they arrive at conflicting results regarding the space that the exchange rate regime gives to monetary policy. Section 3.3 presents the elements for an alternative framework that takes into account the monetary and productive structure of different economies. Section 3.4 concludes.

3.2 The post-Keynesian trilemma framework: an assessment

As aforementioned, in the post-Keynesian literature, monetary policy autonomy is often discussed in terms of the policy trilemma derived from the Mundell-Fleming (M-F) model in which the exchange rate regime and the degree of capital mobility play prominent roles. Although the presence of foreign exchange reserves "relaxes" the framework according to some post-Keynesian authors (Laurentjoye, 2022), there is still a debate if flexible exchange rates increases (Wray, 2015) or reduces the degree of autonomy (Cömert, 2019).

This section discusses this literature, stressing the different definitions of monetary policy autonomy (sometimes explicit but often implied) and making an appraisal of the various -lemmas results in the post-Keynesian framework. The focus is on countries with monetary sovereignty – defined here as countries that issue their own currencies[1].

3.2.1 The trilemma and interest rate setting

Following the recommendation embedded in the Mundell-Fleming model some authors, have favored a flexible exchange rate arguing that this ensures *"independent domestic policy (usually described as an interest rate peg)"*, *"gives more domestic policy space"* (Wray, 2015, p.129), or is a necessary condition to retain "the power to implement autonomous economic policies" (Wray and Sardoni, 2007, p.5). More specifically, in this perspective, monetary policy autonomy is considered to be the ability (or the policy space) of the monetary authority to set the domestic policy rate permanently zero or *"as low as it wants"* to achieve the final policy target of financial stability and full employment, and a flexible exchange rate regime is a necessary condition to achieve this (Wray, 2020). A necessary, but not sufficient condition, since it *"cannot, of course, guarantee that effective domestic policies are chosen and implemented. It is only a necessary condition for gaining policy independence"*(Wray and Sardoni, 2007, p.20).

[1]The determinants of monetary sovereignty and whether there can be different degrees of such sovereignty are beyond the scope of this chapter. On these issues, see Wray (2015), Tymoigne (2020), Bonizzi et al. (2019) and, Prates (2020). For a definition of sovereignty that includes its effectiveness, see Murau and van't Klooster (2022). While for some authors, a flexible exchange rate is a necessary condition for monetary sovereignty (Smithin, 2016, Wray and Sardoni, 2007, Wray, 1998), this is not the approach taken here. Instead, as in Tymoigne and Wray (2015, p.24), we assume that *"a monetarily sovereign government can choose among alternative exchange rate regimes"*, which may impact domestic policy space.

In this approach, the policy rate (or the short-term rate) is considered an exogenous variable under the control of the central bank regardless of the exchange rate regime, but while a flexible regime allows keeping the interest rate at very low levels, in a fixed exchange rate regime, the interest rate might have to be set according to the external interest rate (Forstater and Mosler, 2005, Wray, 2020). Additionally, in a flexible exchange rate regime, current account deficits are not considered a serious problem, and the monetary authority can freely set the short-term rate as low as it wishes, without taking the external interest rate and external financing into account (Wray, 2015). In a fixed regime, on the other hand, a deficit can become unsustainable:

> *A nation that adopts a fixed exchange rate must hope that the conditions that generate external stability will also happen to coincide with those that permit internal stability. The nation that floats can enjoy the net benefits of a trade deficit, improved real terms of trade (a trade deficit means that the "real" cost in terms of exports is lower), and domestic full employment somewhat offset by the possible costs of currency depreciation and higher prices. The nation that fixes the exchange rate may not be able to "afford" a trade deficit (because of exchange rate pressures) and will probably have to use domestic unemployment as the means to maintain its peg. For these reasons, a flexible exchange rate preserves "policy space" for independent policy formation (Wray and Sardoni, 2007, p.16).*

Therefore, unlike the M-F model, the policy instrument is under the central banks' control, yet the final policy outcome depends on the exchange rate flexibility. This occurs because the main problem of a floating currency is related to an appreciation trend that might compromise national industries' competitiveness, and, therefore, in some cases, the definition of a flexible exchange rate regime allows for sporadic interventions in the foreign exchange rate market *in the case of rapid revaluations to ease competitive pressures arising from an overvalued currency. However, achieving domestic, internal stability would be the primary goal of policy, with full employment the most important domestic policy objective* (Wray and Sardoni, 2007, p.20). On the other hand,in this perspective, currency depreciation is not considered a major problem and does not require a policy response. In fact, since it is assumed that exchange rate depreciation improves a country's external competitiveness when combined with a policy of full employment, the benefits of a weakening currency are considered to offset its costs (Wray and Sardoni, 2007).

It is worth highlighting that while changes in the policy rate aim to affect aggregate demand in the M-F model, under this post-Keynesian approach, monetary policy has a different role. Because the sensitivity of economic activity to the interest rate is assumed to be low, the focus of the central bank should not be to *fine-tune* aggregate demand but to promote financial stability (Wray, 2020), which in turn will facilitate the achievement of the main objective of macroeconomic policy: full-employment. Additionally, in this perspective, changes in the policy rate can have a detrimental effect on financial stability due to their impact on the cost of borrowing and other prices. Consequently, the best policy option is to keep the policy interest

rate low (preferably to zero) and avoid much variation in it (Forstater and Mosler, 2005, Wray, 2020). Additionally, in this perspective, changes in the policy rate can have a detrimental effect on financial stability due to their impact on the cost of borrowing and other prices. Consequently, the best policy option is to keep the policy interest rate low (preferably zero) and avoid varying it (Forstater and Mosler, 2005, Wray, 2020).

Similar to this approach, Smithin (2018, p.172-174) also explicitly favors a flexible exchange rate regime as a condition for monetary policy autonomy or what he calls "full monetary sovereignty", meaning the ability to set the short-term rate of interest as they see fit, based on domestic economic conditions. Although not stated explicitly, we make this interpretation due to his explanation of policy space using the premium-adjusted Uncovered Interest Rate Parity (UIP), as in equation 3.1. There, i and i^f are, respectively, the domestic and foreign nominal interest rates, e is the nominal exchange rate at the current period t, and Z is a risk premium derived from the absence of perfect asset substitutability between financial instruments denominated in different currencies. In this perspective, this last premium Z is also seen as an 'uncertainty premium' (Smithin, 2016, p.70) and guarantees that, in general, under a floating exchange rate regime *"nominal interest rate can and do deviate from foreign interest rate."*

$$i - i^f = \frac{(e - e_{t+1})}{e} + Z \tag{3.1}$$

While exchange rate flexibility results in an uncertainty premium, a fixed exchange rate or 'hard peg' does not, *"as the regime is supposed to be irrevocable, it would be logical to assume that $Z = 0$"* (Smithin, 2018, 175). Therefore, with $Z = 0$ the exchange rate fixed ($\frac{(e-e_{t+1})}{e}$=0) domestic policy rate cannot deviate from i^f. A 'fixed but adjustable' exchange rate, in turn, would allow for domestic control over the policy rate because even if the exchange rate is not expected to change, the possibility of an adjustment would be "priced into all relevant contracts" and reflected in Z. The underlying result is that it is the existence of uncertainty or *"the lack of firmness about exchange rates that provides the policy space"*(Smithin, 2018, 175). Yet, the preference for a floating rate is maintained since there would be no extra benefits of adopting an intermediate regime:

> *"What is not clear, however, is whether there is any real benefit for the domestic economy in having this regime [fixed but adjustable] rather than a floating rate (Smithin 2013, pp. 292–297). In spite of the name, a putative hard peg for the exchange rate (a metallic standard, a 'credible' fixed exchange rate regime, a currency board with no loopholes), is actually an unstable regime outright and will eventually, but inevitably, break down."(Smithin, 2016, p.69)*

The definition of monetary policy autonomy in Smithin (2018, 2016) can be interpreted as similar to that of Wray (2015), with the difference that the former recommends a real (and not a nominal) interest rate target. In this perspective, pegging a nominal interest rate will lead to inflationary (or deflationary) instability and will not be distributionally neutral. Therefore,

the central bank's ability to set the policy rate should be used to target a low level of real interest rates that would *"promote financial stability, inflation stability, high growth, full employment, and higher real wages"* (Smithin, 2020, p.391). [2].

Hence, autonomy is understood as the capacity to set the short-term rate (both nominal and real) at the desired (low) level. The role of monetary policy is to promote stability in the economy, and the best way to resolve this - or at least to avoid adding more instability to the system—is to pursue a "park-it" policy with respect to the real interest rate through changes in the policy rate.

Moreover, in contrast to the trilemma framework of Wray (2015), Smithin's (2018) analytical model takes into account the external credit position. However, even in this case, a flexible exchange rate combined with a permanently low real interest rate yields higher economic growth and strengthens the foreign credit position (due to credit outflows and current account improvement) compared to alternative regimes (fixed and managed), despite a higher inflation rate. Although the final effect on the exchange rate level is ambiguous, it is considered that depreciation has a final positive effect on the external credit position:

> *"This occurs because if lower real interest rates can be achieved then in addition to its direct effects on growth this will also cause capital outflow. In turn, this means that the current account of the balance of payments will improve. Interestingly enough, the effect on the real exchange rate of a lower target real rate of interest is ambiguous. It depends on the initial conditions. It is quite possible that a cheap money policy will actually improve the economy so much that in the end the real exchange rate appreciates. Therefore, fears that a cheap money policy will always lead to real exchange rate depreciation are unfounded. In general, in an open economy with flexible exchange rates the real exchange rate simply adjusts to whatever the new situation is. It may either appreciate or depreciate without there being any major consequences for the growth rate itself."(Smithin, 2016, p.184)*

Therefore, despite some differences between Wray's (2015) and Smithin's (2018) framework for monetary policy space, in both cases there is no consideration for the negative effects of depreciations and the exogenously determined capital flows cycle.

3.2.2 The trilemma and its discontents

Briefly, in the two versions of the post-Keynesian trilemma framework outlined in the previous subsection, monetary policy autonomy is defined as the ability to set the short-term interest rate without taking the external scenario into account for decisions, which is only possible in a flexible exchange rate regime. Under a fixed, or even a managed float, policy space is reduced. Although the objective of monetary policy is different from the mainstream approach

[2]For other proposals of real interest rate targets see, for example: Aspromourgos (2011), Rochon and Setterfield (2007) and Lavoie and Seccareccia (1999)

of managing aggregate demand and inflation, the interaction of monetary and exchange rate policy mirrors the New-Keynesian and the Mundell-Fleming results.

However, the view that a flexible exchange rate regime allows a central bank to set its policy rate differently from the foreign short-term interest rate, while a fixed exchange rate hinders this task, has been contested by other post-Keynesian authors. Instead, there is policy space under a fixed exchange rate regime (Angrick, 2018) and some constraints under a flexible exchange rate regime (Serrano and Summa, 2015) that are often disregarded in the trilemma framework. For instance, while the compensation thesis explains why and how foreign exchange rate interventions allow central banks to set the policy rate even in a fixed exchange rate regime (Lavoie, 2001), other authors have highlighted that a flexible exchange rate can constraint interest rate setting for developing economies when a currency depreciation leads to economic contraction (Vernengo and Caldentey, 2019).

Following the endogenous money approach, post-Keynesians emphasize that the policy rate is the exogenous instrument of monetary policy, which means that *"any decision to increase or decrease [the short-term] interest rates is an administrative decision taken by central bankers and not the result of automatic forces"* (Rochon and Setterfield, 2007, p.19-20). As discussed by Lavoie (2014, 2001), the compensation principle extends this approach to open economies and explains the mechanism through which changes in international reserves are compensated, or sterilized, in the central bank's balance sheet and do not lead to an increase in the reserves held by banks nor in the monetary base. The central bank can initiate a sterilization transaction. However, it can also occur autonomously by the private sector, either because banks will try to repay part of their debt to the central bank (in an overdraft system) or because banks will try to get rid of these additional reserves that pay little or no interest. In terms of Mundell's (1963) model presented in Table 1.2, this means that under a fixed exchange rate, sterilization does not make the system inconsistent since the private sector demand for money and bonds, in fact, changes. Thus, the central bank faces no technical constraints to sterilize foreign exchange inflows. In contrast, the sterilization of foreign outflows is limited by the stock of foreign exchange reserves and/or the availability of its emergency credit lines (Lavoie, 2014, Angrick, 2018). As a result, although with some asymmetry, *"even in fixed-exchange rate regimes, the interest rate is under the control of the central bank. Thus, the exchange rate regime is not the key aspect; what matters is whether there is a surplus or a deficit in the balance of payments as the latter case will lead to a reduction in reserves and hence eventually generate an unsustainable position"* (Lavoie, 2021, p. 16).

Therefore, when the domestic currency is under appreciation pressures, it is possible for the central bank to keep the exchange rate fixed and at the same time sterilize the financial flows keeping the interest rate at the level it wishes [3]. Under depreciation pressures, in turn, it

[3] Angrick (2018) and Boshinovska (2015) provided econometric evidence of the compensation thesis in five East Asian economies and Macedonia that have a fixed exchange rate regime, and Gerioni et al. (2022) recently documented more evidence of this principle under the managed floating regime of the Brazil.

will only be possible until the foreign exchange rate reserves are exhausted and access to foreign currency is absent.

This remark implies that using the UIP of equation 3.1 (with stable exchange rate expectations) as a benchmark to analyze whether interest rate can be set differently or without considering the external rate, as in Smithin (2018), can be problematic. Under the compensation thesis, it is precisely when there is no risk of breaking the parity (or accordingly to Smithin (2018) when assets would be considered similar, $Z = 0$) because there are still foreign exchange rate reserves, that the interest rate can also be set independently. When the currency is under attack and the risk perception increase $Z \neq 0$, either the parity has to be abandoned or the interest rate will have to change to attract capital inflows. Adding this consideration invalidates the assumption that interest rate setting is not possible under a fixed or managed exchange rate regime and implies that the ability to keep the interest rate at the desired level is also possible in a fixed exchange rate regime, but has an asymmetric limit (Lavoie, 2014, Serrano and Summa, 2015), making the trilemma more flexible than initially thought.

While the assertion that a fixed exchange rate regime does not permit interest rate setting has been contested by the compensation thesis, other post-Keynesian authors have highlighted the potential problems of setting the interest rate independently from the external rate in a flexible exchange rate regime.

This relates to the asymmetric position of developing economies in the current International Monetary and Financial System (IMFS). Besides the fact that different securities can be associated with different types of risks, the hierarchical structure of the IMFS establishes that currencies and securities denominated in different currencies are hardly perfect substitutes. As emphasized by Prates (2002) and Conti et al. (2014), in the current IMFS one key currency - the dollar - fulfills all monetary functions (unit of account, means of payment, and reserve of value) at the international level. Thus, similar to the national currency in a closed economy, it possesses the highest international liquidity premium. Currencies issued by other central countries hold an intermediate position, being liquid but to a lesser extent. At the bottom of this hierarchy are the currencies issued by developing economies, which generally do not function as money outside their national borders and, consequently, are not considered liquid at the international level. This currency hierarchy results in a monetary asymmetry between the key currencies and other currencies but also in an asymmetry between center and developing currencies. The latter are mostly demanded based on external factors, primarily the liquidity preference of global investors over external financial cycles.

The monetary asymmetry also explains what Eichengreen et al. (2005) labeled as *"original sin"*, referring to the inability of developing economies to borrow abroad in their domestic currency. That is, developing economies' currencies are not accepted for international indebtedness and, in some cases, not even for long-term debt within their national territory. Consequently, the accumulation of external and internal liabilities denominated in foreign currency leads to exchange rate depreciation, reducing the capacity for repayment and the

stability of the national financial system. Given this currency mismatch and the higher impact of the exchange rate on their inflation indexes, this approach argues that policy (including monetary) autonomy, is diminished under a flexible exchange rate regime. (De Paula et al., 2017).

The financial asymmetry in the IMFS, in turn, refers to the relative marginal magnitude of capital flows directed at the periphery and the small financial sectors of developing countries for long-term financing. As a result, despite being marginal relative to total international flows, flows directed at the periphery can exert significant pressure on peripheral countries' foreign exchange markets (Prates, 2005).

Due to these asymmetries, the currencies of developing countries face significant depreciation pressures during periods of external downturns, driven by shifts in external liquidity conditions or when *"investors [...] reassess their investment decisions"* (Andrade and Prates, 2013, p.410). The adoption of exchange rate flexibility under such circumstances leads to more pronounced exchange rate fluctuations, with potential adverse effects on other macroeconomic variables (Andrade and Prates, 2013, Kaltenbrunner, 2015, Ramos, 2016).

Moreover, other post-Keynesian authors have also pointed out that, due to the underdeveloped and less diversified productive structure, most of these countries exhibit a high propensity to import manufactured products and a higher share of imported inputs in their productive structure. Additionally, their price index includes a high share of commodities whose prices are set in the international market and denominated in the key currency (Farhi, 2007). Therefore foreign exchange rate becomes more relevant both for the inflation rate (due to the higher pass-trough) and growth (due to the need to obtain foreign currency for importing foreign intermediary and capital goods) and can have relevant distributive effects (Vernengo and Caldentey, 2019, Thirlwall, 1979).

3.2.3 Dilemmas and policy effectiveness

In the post-Keynesian trilemma framework presented previously, the ability to keep the policy rate permanently at a low (or close to zero) level aiming at financial stability and supporting other policies to achieve full employment is conditional on the adoption of a flexible exchange rate regime. While the claim that a fixed exchange rate regime would impair this task has been challenged by the compensation thesis, other post-Keynesian authors have questioned the ability of a flexible exchange rate regime to ensure the achievement of the ultimate policy objective. That is, another strand of the literature has proposed a different definition of monetary policy autonomy focused not on the control of the domestic short-term rate, but on policy *effectiveness*.

In this approach, monetary policy faces a dilemma - instead of a trilemma - meaning that *central banks have largely lost the ability to implement effective/independent monetary policy regardless of existing exchange rate regimes* (Cömert, 2019).

While the benefits of a floating exchange rate are questioned by the currency hierarchy approach focusing on developing economies, according to Cömert (2012, 2013) the loss of policy effectiveness and, thus, autonomy is felt even by the issuer of the key currency. However, the dilemma is considered more binding in developing countries due to the higher impact of exogenously driven international financial flows on the inflation rate and growth - the main macroeconomic variables that monetary policy aims to affect.

In the context of broad financial integration, Cömert (2019) argues that international financial flows affect growth of any economy mainly through the credit and asset channels [4]. Via the credit channel, it is argued that in periods of favorable international financial conditions (i.e., a boom of capital flows), non-financial corporations can increase their borrowing from abroad, contributing to the investment capacity. Banks, in turn, with access to cheaper credit,would be able to increase credit at lower interest rates. Additionally, the improvement of banks' and firms' balance sheets - due to the appreciation of the domestic currency - also contributes to boosting aggregate demand even if the monetary policy does not change.

Furthermore, financial flows can impact bond and stock prices as well as the exchange rate through the asset channel. This channel operates on the assumption that an increase in capital inflows can boost demand for public bonds, thereby driving up their prices and lowering their interest rates. Increases in stock prices due to foreign demand can also lead to a cheaper source of funding for firms issuing stocks - boosting investment - and have a wealth effect on agents holding stocks, thereby increasing consumption. Changes in the exchange rate driven by capital flows, in turn, affect agents' balance sheets when currency mismatches are in place. An appreciation, for instance, decreases the value in domestic currency of foreign currency denominated debt and can, therefore, influence consumption and investment decisions. The exchange rate is also considered to have a direct effect on the inflation rate, and therefore, appreciations can increase the purchasing power of agents, helping to boost growth. Thus, this approach considers that *interest rates of central banks become empty signifiers and exchange rate regimes implemented in developing countries become irrelevant* (Cömert, 2019, p.226).

Another path to the dilemma result was put forward even earlier by Flassbeck (2001, p.4), that replaces *"the impossible trinity by an "impossible duality" (...), arguing that no monetary regime can effectively isolate a country with an open capital account"*. Instead of focusing on the transmission mechanism of monetary policy, this approach relies on the argument of divergent inflation, on the problems of an appreciation trend to external competitiveness, and on the difficulties of managing the exchange rate.

A fixed exchange rate in relation to the key currency is considered a good strategy to provide a stable monetary framework for developing countries, as it can help control a crucial macroeconomic variable. However, it can also prove to be a mixed blessing. While a stable nominal exchange rate can lead to real appreciation when domestic inflation is high, resulting in

[4]This approach is closely related to Rey's (2016) explanation on how external financial conditions transforms the trilemma into a dilemma.

a loss of the country's external competitiveness, combating inflation with higher interest rates may also be detrimental to output and employment. The reduction in unit labor costs (or wage suppression) does not provide a solution, as it may increase competitiveness but reduce demand and profits. In the best scenario, this could lead companies to cut prices, thus restoring the real income of workers. However, as Flassbeck (2001, p.35-41) notes, *"[e]ven if the positive effects of an improvement in international competitiveness materialize, the negative effects on domestic demand far outweigh the positive ones."* Consequently, attempting to *"keep rates stable without destroying the production potential and job opportunities in these countries is an extremely ambitious and in many cases insolvable task"* (Flassbeck, 2001, p.35-41).

In a flexible exchange rate system, if countries choose to control higher inflation rates by raising domestic interest rates, as prescribed by the inflation targeting regime, this policy can lead to higher interest rate differentials and a lower nominal exchange rate. Exchange rate movements are influenced by these differentials and exchange rate expectations, which often deviate from purchasing power parity. The higher interest rates can result in a continuous increase in the total expected return, contributing to an appreciation trend. This trend can worsen the reduction in external competitiveness, making it difficult to achieve a balanced current account sustainably. Unlike the post-Keynesian trilemma approach, this perspective acknowledges that deficits cannot be financed indefinitely and that they have consequences for the exchange rate path. Therefore, both fixed and flexible exchange rate regimes can experience overvaluation due to diverging inflation rates driven by exchange rate appreciation, which is detrimental to the domestic economy. The policy recommendation is that, *"given the unavoidable shortsightedness of the market, the PPP [Purchasing Power Parity] rule has to be enforced by governments and/or central banks and cannot be left to the market"*(Flassbeck, 2001, p.15).

Moreover, although there is no limit for exchange rate intervention by the central bank when there are appreciation pressures, Flassbeck (2001, p.11) argues that they would be ineffective in changing the trend since they will *"usually add to the confidence of international investors as international reserves increase."* Kaltenbrunner and Painceira (2017, p.452) also put forward this argument for the Brazilian case, concluding that the combination of a managed floating and an open financial account with an inflation targeting regime (ITR) *"is not only impossible but also potentially counterproductive"*. In an ITR, while exchange rate appreciations can help the central bank to achieve its inflation target, depreciation negatively affects inflation and, thus, increases the stimulus for policy intervention that would help achieve the policy target. Since the Brazilian central bank did not aim at halting the appreciation but at smoothing it, while speculative investors knew about the incentive to contain the level of the exchange rate to avoid upward pressures on prices, they could be confident that losses could be limited in case of depreciation reducing the risk of investment and fostering more capital inflows (Kaltenbrunner and Painceira, 2017). Thus, in this dilemma perspective, what intervention can achieve is considered limited both in depreciation and appreciation trends.

The post-Keynesian dilemma framework, therefore, has a different definition of monetary policy autonomy than the ability of central banks to set the policy interest rate at low levels and "park it" - as in the trilemma result - and focuses on policy effectiveness and the insulation of domestic variables, such as the long-term rates, asset prices, and the exchange rate, from external financial conditions similar to the New-Keynesian framework discussed in Chapter 2.It assumes that monetary policy follows an inflation-targeting regime and concludes that in this context, without capital controls, no exchange rate regime can isolate the domestic economy from external influences regardless of the exchange rate regime.

3.2.4 A critical appraisal of the dilemma approach

The post-Keynesian dilemma approach offers an interesting perspective for understanding how the external financial environment can affect domestic macroeconomic conditions and impose challenges to monetary policy. However, the strength of some of the transmission mechanisms of external shocks is subject to debate. The role played by the credit channel is perhaps the most controversial issue within the post-Keynesian literature, which embraces the endogenous money approach as one of its main features. Two points warrant consideration.

First, the assumption that capital inflows and access to lower external interest rates have a substantial impact on the amount of credit available implies that the economy was credit-constrained in their absence. Although in a post-Keynesian perspective there is room for the existence of a group of potential borrowers who are denied credit, this is more likely to be related to asymmetric expectations about future profits (Wolfson, 1996, 2012). Therefore, the assumption that increased financial flows augment the amount of credit suggests that agents deemed creditworthy have not received the required credit, or that external banks, guided by more optimistic outlooks, lend to customers not considered creditworthy by national banks. In any case, positive expectations about future prospects of the economy, should be guided by an already growing demand.

Second, the assertion that firms with access to lower interest rates will increase their demand for credit and, consequently, their investment decisions can be interpreted to mean that the price of credit is the main determinant of bank credit, rather than aggregate demand. Although the interest rate levels can influence housing market lending (Deleidi, 2018) and business investment by affecting firms' cash flows (Fazzari et al., 2008), emphasizing the role of access to international finance for firms' investment decisions contrasts with the view that investment is mainly influenced by expected permanent changes in aggregate demand Kaldor (1982), and that the interest elasticity of fixed investment is low (Wray, 2020).While maybe firms prefer to borrow abroad when external interest rates are lower in a context of internal economic growth and rising profit expectations, this is more likely to be an exacerbation of a trend in an already growing economy rather than the primary cause. Thus, even if increase in financial inflows increases lending, this does not necessarily imply a causal effect on economic activity.

The increase in foreign credit could indeed heighten financial fragility and negatively impact the balance of payments, especially in the presence of currency mismatches (Kohler and Stockhammer, 2022). However, if the central bank aims to counteract these effects, it can implement some measures. For example, it can lower the domestic interest rate to make borrowing in domestic currency more attractive. In countries where public banks play a role, they can also be used to narrow the spread between the short-term interest rate and the interest rate on loans. Finally, the monetary authority can also use macro-prudential measures and financial regulations.

The strength of the asset channel and the influence of financial flows on it can also be questioned. Compared to financial center countries, the size of stock markets might be less relevant in many developing economies to generate a significant wealth effect. Yet, the asset channel also relates to the impact of the external liquidity cycle on long-term domestic government bonds. However, the claim that monetary policy actions cannot affect long-term domestic government bond rates requires further explanation.

While it is true that central banks focus on the short-term interest rate (the policy instrument) and that financial flows can influence long-term interest rates, this does not necessarily imply that there is no room for an effective monetary policy response. As Keynes (1978, p.206) suggested, *" monetary authority often tends to focus on short-term debt and let the price of long-term debt be affected by delayed and imperfect reactions of the price of short-term debt; - although, again, there is no reason why it should do so"*. Therefore, as Lavoie (2021) notes, the institutional characteristic, that is, whether the central bank is able (and willing) to buy government bonds in the secondary market, can also play a role. In the event of an increase in demand for domestic bonds, due to large foreign capital inflows, *"the central bank could sell the long-term bonds it holds to increase the supply of long-term securities in line with the increase in demand"*(Lavoie, 2021, p.18).

In the case of capital outflows, however, taming the long-term rate by the central bank purchase of domestic bonds might be harder in developing economies. Assuming the post-Keynesian claim that long-term interest rates are the result of a markup on the policy rate and that both liquidity preference and convention can influence this rate, one can also claim that *"if monetary authorities are sufficiently insistent and consistent, a shift in interest rate differentials [due to liquidity preference] can only be temporary"*(Lavoie, 2022c, p.248) and, *"precisely because the convention is not rooted in secure knowledge, it will not be always unduly resistant to a modest measure of persistence and consistency of purpose by the monetary authority."*(Keynes, 2018 [1936], p.178-179).

In fact, in the case of the U.S. currency, the liquidity preference (at the international level) does not change once we open up the economy. However, liquidity preference plays a critical role in developing economies, which issues currencies not considered liquid by international investors(Conti et al., 2014). This feature may affect the extent of intervention needed to contain long-term interest rates and its ultimate effectiveness if we assume that the

external global risk aversion sentiment has an impact on the spread between short-term and long-term interest rates. In that case, in times of crisis or high uncertainty, the monetary authority may have more difficulty setting long-term interest rates effectively if financial flows are large. Therefore, while it is easier for the U.S. central bank to increase demand for its assets, it may be more difficult for developing economies in moments where the risk aversion sentiment of domestic and international players is high. Thus, what happens to the long-term interest rate in developing economies ultimately depends on institutional characteristics and the phase of the external liquidity cycle.

Additionally, when foreign investors sell their government bonds denominated in domestic currency, they can exert pressure on the domestic foreign exchange market especially if the position of foreign investors is important and not hedged, a case that is more likely in developing economies (Onen et al., 2023). Given the small size and liquidity of the derivatives market in these economies, hedging the foreign exchange rate risk can be costly. If the central bank wishes to avoid this, it can make a sterilized intervention, which has asymmetric limitations discussed in the previous section. Therefore, in good times, the constraints are less stringent. Therefore, in good times the constraints are less stringent.

Therefore, as advocated by the dilemma framework and authors discussed in section 3.2.2, the flexible exchange rate is not enough to insulate domestic monetary conditions from the global financial/liquidity cycle and macro-prudential policies, financial regulation and capital controls are more effective in taming possible detrimental consequences of boom and bust eternal financial cycles, than relying on pro-cyclical exchange rate movements of the exchange rate. Even when controls on capital flows are in place and assuming they are efficient in limiting the size an exchange rate regime still needs to be chosen. For example, under free trade, if a country wants to maintain competitiveness in the face of inflation differentials, it still has to decide how to devalue (Flassbeck, 2001) or not to appreciate its currency without harming other, non-exporting sectors of the economy. For countries with a high share of imports and commodities products in the consumption basket, that are denominated in foreign, currency-devaluation leads to a higher inflation rate and thus undermines the achievement of the policy objective. The efficiency of monetary policy will still be compromised with capital controls. Therefore, there still is interdependence between countries but that does not mean that there are no policy options (although asymmetric). Monetary policy can still influence interest rate differentials, long-rates, credit policies, and exchange rate dynamics.

3.3 Abandoning the Trilemma Framework

The different post-Keynesian results for monetary policy in an open economy within the trilemma framework contribute to understanding monetary policy dynamics in an open economy and how external conditions may impact its outcomes. However, the trilemma approach tends to overemphasize the role of the exchange rate regime. Consequently, while abstracting

from external influences on policy decisions and their effects on macroeconomic variables might lead flexible exchange rate proponents to an overly optimistic scenario, the argument that there is no room for a monetary policy response in a financially integrated setting results in a deterministic outcome.

In this section, we argue that the post-Keynesian theory contains sufficient elements to construct an alternative framework for analyzing the interdependence of monetary policy with external financial conditions, without relying on the neoclassical framework. Using these elements, we outline an alternative theoretical description that goes beyond the traditional focus on the exchange rate regime, highlighting the role of structural and institutional characteristics. To do so, we shift the focus to policy space (instead of autonomy or independence) and revisit the concept of balance of payment constraints discussed in Chapter 1. Additionally, we incorporate considerations raised by critics of a flexible exchange rate regime to broaden the concept of external constraints.

3.3.1 Terminological considerations: what is monetary policy autonomy?

A crucial element of the trilemma framework and the conflicting results in the literature are the different definitions of monetary policy autonomy. As discussed in the previous section, proponents of the trilemma define monetary policy autonomy or independence as the ability of the central bank to set the domestic short-term interest rate (i.e., the policy rate) without considering external context, while the authors of the dilemma use the terms monetary policy autonomy and efficiency interchangeably.

The trilemma definition of monetary policy autonomy may be too narrow from an endogenous money perspective. In a post-Keynesian perspective, money is endogenous and demand-driven since banks make loans independently of their reserve position (Kaldor, 1982, Moore, 1988, Fullwiler, 2006, 2017). Therefore, the central bank can control the short-term interest rate and does not target the stock of money or any monetary aggregate. In an open economy, the compensation thesis emphasizes that the sterilization of foreign inflows and outflows can be either automatic by banks looking to change their reserve position or initiated by the central bank to maintain the policy rate at its target level under both a fixed and a flexible exchange rate (Lavoie, 2001, 2014).

If one follows this approach, the definition of monetary policy autonomy as policy rate setting can be seen as tautological or short of meaning for an open economy. As long as foreign exchange is available, the central bank can set the interest rate under a flexible and fixed exchange rate regime. However, little is said about whether and how external considerations affect the policy decision and its ultimate objective. Because countries operate in an increasingly interconnected world rather than in a vacuum, policy decisions (and reactions) typically consider the favorable or unfavorable external context.

On the other hand, the dilemma definition - monetary policy autonomy as the effectiveness of insulating domestic monetary conditions from the global financial cycle (Cömert, 2019) - can be misleading. In an integrated economy, there can be interdependence between countries, even when capital controls are in place. However, that does not mean there are no policy options (although asymmetric). Monetary policy can still influence interest rate differentials, long rates, credit policies, and exchange rate dynamics within some limits - specially when external risk aversion is low - in financially integrated economies. Moreover, limits to monetary policy do not need to mean a lack of space to act, nor that the policy will undoubtedly be ineffective.

As a result, the definition of monetary policy autonomy as freedom from external influences on the policy instrument or the policy outcome can be problematic for economic analysis. As discussed in Chapter 2, it is very unlikely for macroeconomic variables to be absent of foreign influences in an interconnected world and for policymakers to make decisions without taking this into account. On the other hand, although it is harder for a non-autonomous monetary policy to be effective, having an independent instrument does not guarantee that it will attain its intended effect nor that the target will be achieved.

Thus, the first step to abandoning the trilemma framework is to stop characterizing monetary policy as autonomous or independent. Although implementing the desired monetary policy is always possible, in a context of commercial and financial integration, policymakers have to take external factors into account to achieve their desired goals. The way external factors affect policy outcomes, in turn, depends on the external constraints that are structural but can be relaxed or tightened due to conjectural factors and will be discussed next.

3.3.2 External constraints in center-periphery approach: the interest rate floor and balance of payment constraints

Another important aspect of building an alternative framework involves distinguishing the policy space and external constraints faced by different countries. To do so, we draw on the work of Latin American structuralist economists that divide the world into two asymmetric poles: the "center" and the "periphery" (Prebisch, 1962, Ocampo, 2018). We will first revisit the balance of payment constraint discussed in Chapter 1, which highlights the role of developing economies' technological and productive characteristics for their increasing external import and financing needs. In doing so, we will incorporate the challenges faced by this latter group of countries within the current IMF framework, as highlighted by the authors discussed in the previous section (Conti et al., 2014, Serrano and Summa, 2015, Vernengo and Caldentey, 2019, Prates, 2020).

In this perspective, the productive structure and the type of integration of peripheral countries into the global value chains result in a balance of payment constraint. Given their less diversified industrial structure, these countries must import a higher share of manufactured products with high income and low price elasticity. Simultaneously, their export content is

predominantly dependent on low-value-added products and commodities that do not compete through prices (UNCTAD, 2002). As discussed in section 1.2.2, the high import coefficient results in a structural balance of payment constraint since increasing income levels can deteriorate the current account.

Although currency depreciation can increase the profit and income of the exporting (commodity) sectors, it can adversely affect inflation and real wages due to the strong transmission of exchange rate changes to domestic price levels (pass-through). Given that developing economies have a high share of imported components in their production chain, a depreciation will result in higher prices and inflation (Bastian and Setterfield, 2020). Furthermore, the price indexes of these countries have a higher share of primary products, reflecting their greater relative weight in the basket of household consumption, which is more sensitive to changes in the exchange rate (Farhi, 2007), which is detrimental to real wages. On the other hand, a prolonged downward trend of the nominal exchange rate can increase access to foreign products and improve real wages, but, if persistent, it may lead to de-industrialization and a less developed and diversified productive structure (Bresser-Pereira, 2012).

Incorporating monetary and financial asymmetries of the periphery discussed in the previous section means that countries at the periphery are subject to external credit conditions to obtain the foreign currency needed for increasing production or credit without long-term domestic finance. Since external debt[5] is limited, increasing indebtedness may affect the perceived country risk and worsen external borrowing conditions. Although the size of external debt, level of reserves, and other domestic factors can play a role, in the currency hierarchy literature, 'push' factors (subject to external liquidity cycles) are the predominant determinants of risk perception and access to better financial conditions (Andrade and Prates, 2013, Kaltenbrunner, 2015, De Paula et al., 2017).

Since in the current IMFS, some currencies are mostly used as a speculative asset class in international financial markets, expectations about future movements in exchange rates (Δe^e) and risk-reward considerations are taken into account when international investors direct flows to those currencies and assets denominated in them (Andrade and Prates, 2013, Orsi et al., 2020). However, besides using foreign reserves to tame exchange rate volatility, monetary authorities can use the policy interest rate to influence interest rate differential (Serrano et al., 2021).

Taking this into account, if policymakers aim to avoid depreciation pressures in the exchange rate coming from their policy rate, we can determine a floor for interest rate setting i^{floor} as an additional external constraint in developing economies determined by the key-currency interest rate and exchange rate expectations and risk considerations.

[5]According to UNCTAD (2023), *external debt* can refer to (i) debt issued in the international financial market denominated in foreign currency; (i) external debt refers to debt owed by foreign investors, issued abroad or in the domestic market.

$$i^{floor} = (1 + i^f)(1 + risk)\Delta e^e \tag{3.2}$$

Risk considerations, in turn, can be split, as in equation 3.3, between domestic and external factors according to parameter β. In the interpretation proposed here, following Andrade and Prates (2013), the currency premium exists due to the different degrees of liquidity across currencies depending on their position in the currency hierarchy (and, therefore, are imperfect substitutes). The perceived risk, therefore, can vary according to exogenous liquidity cycles or other external effects, and one would expect countries at the bottom of the hierarchy to have a higher β, i.e., a higher share of the risk premium influenced by external financial conditions (Aidar and Braga, 2020, Kohler et al., 2023).

$$risk = \beta risk_e + (1 - \beta) risk_d \tag{3.3}$$

As a consequence of these monetary, financial and productive asymmetries, the incorporation of the currency hierarchy approach means that while the policy rates can be set operationally at the level chosen by the monetary authority (for both fixed and flexible exchange rates), there is a floor for its level when exchange rate depreciation has detrimental effects on other important macroeconomic variables. As currencies at the bottom of the hierarchy must offer a liquidity premium to be demanded, developing economies may find it impractical to set the policy rate at zero and park it. Instead, they will also consider the liquidity preference of global investors when financial fragility, inflation, and/or economic activity are the ultimate policy objectives. However, besides the domestic interest rate developing countries can also use their stock of foreign reserves, and financial regulation[6] as complementary, avoid or prevent sharp movements in their exchange rate.

3.3.3 Monetary Policy and the Global Financial Cycle

The third step for introducing an alternative framework is to stress the different monetary policy transmission channels, their strength, and how they may be more or less affected by the external scenario. In this subsection we will discuss the impact of monetary policy on activity levels through its impact on long-term and lending rates and the exchange rate.

The direct impact of the policy rate on economic activity can be divided into two different stages. The first refers to the effects on the interest rates relevant to investment decisions, i.e., bank lending rates and long-term interest rates on securities issued by the private sector. In the post-Keynesian approach, bank lending rates are determined as a markup over long-term public bonds with a premium for private bonds with default risk. Bond yields, in turn, (i^{lr}) are

[6]We use the term capital flows regulation as in Prates and Fritz (2016) to include prudential regulation, capital controls, and foreign exchange derivatives regulation. While prudential regulation refers to policies that affect the assets and liabilities positions of resident financial institutions, capital controls seek to regulate the volume, composition, and allocation of inflows of international private capital flows.

determined in the financial market (3.4) by adding a term premium for longer maturities (λ_{tp}) to the short-term policy rate set by the central bank. This premium and the spread between short and long public bond rates are influenced by expectations about future monetary policy (in the case of fixed-rate bonds) but can also be affected by policy action. The central bank can influence the term structure of interest rates by changing the short-term interest rate and narrowing the spread between the short-term and long-term interest rates by buying bonds in the secondary market when it is entitled to do so (Lavoie, 2022b).

In an open economy without capital controls, private and public bonds can be held by foreigners. When these agents hold bonds denominated in the domestic currency, they may consider not only the risk and a term premiums, but also the risk of a reduction in the value of the bond when converted into the foreign currency, called patrimonial .If these bonds are already denominated in a foreign currency, external default risk is added instead. Thus, in both cases, an additional external risk aversion parameter can be included related to developments in the foreign exchange rate market and the global financial cycle (GFC).

Therefore, in both cases, the term structure can still feel the impact of international investors' preference for the reserve currency. Adding this consideration our framework incorporates the effect of the global liquidity cycle on the demand for domestic assets, without the deterministic result of the dilemma literature. That is, the additional risk parameter associated with the external financial cycle on demand for assets denominated at a lower level of the currency hierarchy can influence the term structure but does not render monetary policy powerless. It merely adds that in both cases, the impact of the short-term interest rate on long-term bonds requires a joint analysis of what is happening in the foreign exchange rate market and leads to an asymmetric power of monetary policy depending on the phase (boom or bust) of the global financial cycle. This is illustrated with equation 3.4, where ι is a parameter that captures the relative size of external investors and λ_{er} reflects either the default (original sin) or patrimonial risk.

$$i^{lr} = i^{cb} + \lambda_{tp} + \iota\lambda_{er} \tag{3.4}$$

In the upward phase of the cycle, if λ_{er} decreases, an increase in the policy rate to counter-act its effect directly impacts long-term rates. During a boost, on the other hand, when λ_{er} increases, reducing the interest rate may not be sufficient to reduce long-term rates and might require a combination of foreign exchange interventions to be effective.

In the case of original sin, changes in external risk aversion exert depreciation pressures on the exchange rate market and increase λ_{er}. In the case of a fixed exchange rate or a managed float regime, i.e., when the central bank wants to keep the currency's value constant or smooth currency movements with sterilized official intervention, the policy response mainly occurs on the foreign exchange rate market. The effectiveness of this strategy in alleviating pressure on the term structure depends on the magnitude of this pressure and on the central bank's

access to foreign currency, either through international reserves, external credit (from multilateral institutions such as the IMF), or swap arrangements with other central banks. This means that the scope for policy action ultimately depends on access to the key-currency. When international reserves are low, their use may create a feedback loop on expectations, intensifying pressure on default expectations. Another available tool is to raise the policy rate to make bond yields more profitable to compensate for the increased risk. However, the efficacy of this approach depends on the level of return demanded by investors. Therefore, in this case, policy space is contingent on external conditions, such as risk aversion sentiment and the level of the external interest rate.

Conversely,in the original sin redux, if foreign investors predominantly hold bonds denominated in the domestic currency, a rise in the risk aversion sentiment can trigger a sell-off of domestic bonds by international investors seeking the safety of the key currency and assets denominated in it. When institutional arrangements allow, the monetary authorities can counteract this trend by acting as the counterpart, purchasing bonds to prevent an increase in the spread. However, a side effect of this operation is heightened pressure on the exchange rate market when these international investors convert domestic currencies into foreign ones.

Suppose the central bank does not intervene in the foreign exchange rate market. In that case, this currency depreciation may, in turn, further increase the sell-off of domestic bonds, particularly when international investors operate without hedging. The effectiveness of the central bank's actions in the foreign exchange and bond markets depends on the share of foreign investors in the domestic bond market. Capital controls can play a crucial role, either by increasing the cost of the flight to quality (through implementing a financial tax or quantitative controls on outflows) or by restraining inflows of non-resident portfolio investments during the boom phase of the cycle through capital controls (De Paula et al., 2020, Carstens and Shin, 2019).

In some cases, the demand by national investors can also play a role. For example, when there is a relevant share of institutional investors in the domestic financial market, they can act as a counterpart when foreign investors sell their bonds. In this case, they can increase the policy space since they can reduce the need for policy action. However, if there is no control for the outflows of these national investors, they can also exacerbate the depreciation pressure. Financial regulations, such as an obligation to a certain share of public bonds on banks' and institutional investors' balance sheets, can also increase the efficiency of central bank intervention. When the central bank is not allowed to act on the secondary market, on the other hand, it cannot act as a purchaser of last result, and financial markets might exert a greater influence on long-term interest rates (Lavoie, 2022b). As a result, depending on some institutional characteristics, the central bank can still have some control over the term structure of the interest rate in an open economy[7]. Thus, when the exchange rate risk is in international

[7]The previous analysis on the impact of the policy rate on the term structure is conditioned to the existence of a deep public bond market. However this might not be the case in many developing countries and as a result the transmission of the short-term rate to the ones relevant for aggregate spending can be more blurred.

investors' balance sheets, policy space will depend on these agents' impact on the exchange rate market, on the size of the impact of exchange rate movements on other relevant policy variables, on the effectiveness of capital flow regulation and the institutional setting that allows the central bank to act on the secondary bonds market.

In terms of the final effect of changes in the policy rate on the credit and private bond markets during the different phases of the global financial cycle, these effects can also be asymmetric. Since the lending rates in these markets are formed by adding a mark-up to the base rate, an increase in the policy rate will invariably lead to an increase in the credit market rate. As *"commercial banks have to recover costs of refinancing and have to gain minimum profits."*However, a decreasing base rate may not necessarily result in a corresponding decrease in the credit market rate. This can happen if commercial banks' liquidity and risk premia increase due to rising uncertainty in an economic and financial crisis, or if banks' profit aspirations increase (Hein and Stockhammer, 2011, p.116).

In our open economy framework, the GFC can only indirectly influence these rates through its impact on the exchange rate, provided it affects profit expectations and the risk of default σ_r in equation 3.5. For instance, if the external interest rate rises, triggering an exchange rate depreciation and deteriorating firms' balance sheets due to currency mismatches, it can increase σ_r. Consequently, commercial banks will raise their lending rate. However, the size of this effect depends on domestic firms' degree of external indebtedness. Even if this effect is in place, the central bank can avoid a negative outcome by acting on the foreign exchange rate market. A monetary policy response, in turn, will have the same asymmetric effect as in the closed economy. That is, the policy interest rate will be more effective in raising bank rates than reducing them.

$$i^{br} = i_{lm} + \sigma_r \tag{3.5}$$

Thus, the global financial cycle can influence long-term rates due to its impact on the risk premium and financial agents' expectations, but it will not determine the monetary policy action. The central bank has policy space to react - if it so wishes - but it will be constrained by structural characteristics (such as the currency of denomination of the external debt and access to foreign currency), the institutional setting (i.e., the relative share of international investors in the domestic bond market and the institutional setting of the central bank) as well as the effectiveness and existence of capital controls and financial regulation.

A related question - the second stage - is how strongly the policy interest rate can affect economic activity. While the central bank can control long-term nominal interest rates within certain limits, the impact of the interest rate on economic activity depends on the sensitivity of aggregate demand to this variable. In the post-Keynesian theory, the interest rate is considered to have a limited impact on aggregated demand. Consumption, for instance, is more influenced by habits and current output than by the interest rate. Similarly, investment responds

more to expected permanent changes in aggregate demand than to the interest rate (Kaldor, 1982). Consequently, fiscal policies or other measures directly affecting aggregate demand are considered to have a more substantial influence on investment than policies impacting the cost of capital (Fazzari, 1993).

Therefore, as put forward by many post-Keynesians even in a closed economy, there are limits to what monetary policy can do, but limits do not mean a lack of policy space. Monetary policy can affect consumption and investment through different channels. First, it can influence the demand for credits for purchasing durable consumption goods and the demand for mortgages which can affect new residential investments (Deleidi, 2018). It can also influence business investment decisions indirectly by affecting the cash flow available to firm (Fazzari et al., 2008), but also directly on the investments of smaller firms that rely more on external financing.

The effect of monetary policy on the real exchange rate (which impacts investment decisions), on the other hand, is uncertain since it depends on the dynamics not only of the nominal exchange rate dynamics but also of domestic inflation that can be affected by external factors. While real depreciation can positively impact exports and aggregate demand, it can also reduce real wages and, as a result, consumption, investment and growth (Ribeiro et al., 2020, Vernengo and Caldentey, 2019).

However, the exchange rate, as a transmission channel, is directly affected by the external scenario. Following the post-Keynesian literature on exchange rate determination (Andrade and Prates, 2013, Kaltenbrunner, 2015, Harvey, 2009, Ramos, 2016), depending on the degree and type of the currency internationalization the impact of the boom and bust cycle on the domestic currency can be exacerbated. Still monetary policy can within some (asymmetric) limits influence the trajectory of the exchange rate through profitability and expectations. During booms, when the central bank keeps the exchange rate fixed or wishes to reduce appreciation pressures, it can either reduce its interest rate, impose taxes on inflows - reducing the profitability to invest in domestic currency - or intervene on the foreign exchange rate. Although there is no limit to interventions - and the efficacy has been empirical documented (Arango-Lozano et al., 2020, Fratzscher et al., 2019, Mohanty and Berger, 2013) - the efficiency, that is the effort it will have to make, will depend on the degree of financial integration. In a downturn, the maintenance of the peg (and the efficacy of reducing volatility and the downward trend in a managed float) will depend on the previous amount of the level of reserves and access to other sources of foreign financing (current account surpluses, swaps agreements, etc). In a peg, however, when the central bank is losing reserves too quickly, this reinforces speculation against the domestic currency and can result in a regime change or an interest rate increase high enough to compensate for the increasing risk. Although a flexible exchange rate is not subject to this type of speculation, the central bank will also need to increase the interest rate if it wishes to avoid high volatility and the downward trend of the price of the domestic currency.

Therefore, as Levrero (2022, p.13) explains, what the theory suggests is that the final effect of monetary policy on economic activity *"varies according to circumstances and passes*

through channels which are less "mechanical"" and can also be asymmetric because it has a more direct influence on the term structure when the base rates rises than when it decreases. The last assertion is still valid when we incorporate the impact of the global financial cycle channels both under a fixed and a flexible exchange rate regime.

3.3.4 Incorporating the monetary regime and policy interdependence

While the effect of monetary policy on aggregate demand is not systematic, in the post-Keynesian theory it undoubtedly exerts an influence on income distribution. Directly, an increase in interest rates redistributes income from debtors to creditors (Argitis and Pitelis, 2001). Indirectly, the increase in the interest rate, if it reduces economic activity, can increase unemployment and workers' bargaining power and reduce the wage share (Smithin, 2003, Hein, 2006, Rochon and Setterfield, 2007)[8].

Therefore, since the policy rate is the policy variable under the control of the central bank and operates directly on income distribution instead of investment and inflation, post-Keynesians criticize central banks' strategy of fine-tuning the economy with the final aim of achieving an inflation target and have alternative policy recommendations. Rochon (2017) has identified two groups of proposals: the parking-it and the activist. While the first group argues in favor of changing the interest rate to achieve-related targets (such as employment, economic growth or capacity utilization), the second stresses the difficulties of using the interest rate to fine-tune the economy. This last approach advocates rules that aim at maintaining the distribution of income unchanged. However, while it is true that fiscal policy is better suited to target demand variables in an open economy, keeping the distribution of income fixed with a park-it approach might be more activist and have a greater (indirect) impact on the economic activity of peripheral countries than in the closed version due to its impact in the exchange rate.

If the interest rate is set below the floor imposed by the currency hierarchy and causes a nominal exchange rate depreciation, it can have a detrimental final effect on real wages. It can also increase domestic firms' competitiveness (increasing their realized markup) (Blecker, 2011) and have an automatic effect on the export sectors' revenues (Rossi and Galbraith, 2016). Both effects end up reducing the wage share. Therefore, in an open economy, monetary policy will have a different partial effect on the wage share, and the final result will depend on the strength of each of the transmission channels, but also on the inflationary sources and the institutional framework (Rolim and Marins, 2022). Furthermore, the distributive effect can later have an impact on economic activity if we assume that workers have a higher propensity to consume.

As a result of the exchange rate transmission channel, changes in the global financial cycle that affect the risk premium terms can also affect income distribution if changes in monetary policy do not offset this effect. Thus, in the alternative framework to the trilemma approach presented here, monetary policy cannot be decoupled from exchange rate policy and financial

[8]For a detailed description on these and other mechanism see Rolim and Marins (2022)

regulation, regardless of the final macroeconomic objectives. Consequently, discretion and flexible targets over tight rules are preferable.

3.4 Conclusion

The post-Keynesian literature on the interaction of monetary policy and the exchange rate regime brings important contributions to how external conditions can influence policy decisions and outcomes. However, different understandings of monetary policy autonomy can lead to different appraisals of the various lemmas results. In fact, the simple definition of autonomy is already very controversial. Thus, the framework proposed here starts by abandoning the non-consensual terminology of autonomy and focusing on policy space, interdependence, and external constraints. Yet, it incorporates the insights from the -"-lemmas" discussion, such as the possible problems with a fixed exchange rate regime (trilemma) and the different effects of financial flows and global financial conditions on domestic variables (dilemma), as well as the importance of accumulating exchange rate reserves (quadrilemma). Moreover, we also include the exogenous theory of interest rates, but in the context of balance of payment constraints, and consider the interdependence between economies according to the international financial cycle linked by policy targets and policy reactions.

Therefore, beyond the exchange rate regime and capital mobility, constraints for monetary policy space in open economies derive from the productive, financial, and monetary asymmetry (as highlighted by structuralist economists). Nevertheless, those constraints can be relaxed depending on the global financial and commodity cycle phase. Additionally, some institutional characteristics can help assess the size and ability to respond even in a financially integrated economy: i) the monetary policy regime and policy target (if the country follows an inflation targeting regime, the level of the rate target, the time horizon, and price index are of particular interest); the role of the central bank in the secondary market and the size of the domestic financial system; and the exchange rate market (size and instrument available).

Chapter 4

A simple post-Keynesian model on monetary policy space and external constraints

4.1 Introduction

In this chapter, we present a simple post-Keynesian model with different assumptions from the Mundell-Fleming and the New-Keynesian framework that led to the trilemma and dilemma results to highlight what might be more important sources of policy space and external constraint consistent with the post-Keyensian tradition. As a result, we go back to Meade's 'Big Picture' presented in Chapter 1 and highlight the role of the balance of payment constraint, or dollar shortages as the primary constraint, and the use of different instruments as a source of monetary policy space.

The post-Keynesian literature has already provided not only critiques but also alternatives to the Mundell-Fleming model (Godley and Lavoie, 2005, Lavoie, 2014, Serrano and Summa, 2015) and to the closed version of the New Keynesian model (Lavoie, 2006, Kriesler and Lavoie, 2007). However, not much has been presented as an alternative to the New Keynesian framework for monetary policy results in open economies and, therefore, for the "modern" trilemma (and the dilemma). Important exceptions that deal with those issues are the stock-flow consistent models of Godley and Lavoie (2005) and Laurentjoye et al. (2022). However, besides a different modeling approach, the strucuture presented here does not focus on the fixed exchange rate regime as in the latter nor model the exchange rate in the flexible regime as stable (or stabilizing) as in the former. Summa (2016), in turn, discusses the impact of the inflation targeting regime and flexible exchange rates for growth and distribution but does not impose a balance of payment constraint. Other authors have also provided simple open economy models dealing with the impact of the exchange rate as a complementary policy target of the monetary authority (MA), such as Vera (2014) and Drumond and Jesus (2016). However, one limitation of the former models is the assumption that the exchange rate has to adjust to preserve equilibrium in the balance of payment, that the authorities know this particular level and endogenously adjust it accordingly. Thus, they implicitly abstract from the level of reserves and the impact of

external debt denominated in foreign currency. Although Porcile et al. (2011) discusses those issues, the assumption of the uncovered interest rate parity in the model is inconsistent with the post-Keynesian theroy of exchange rate determination.

To contribute to the literature, this chapter follows and expands the arguments of Godley and Lavoie (2005) and Lavoie (2014) that the Mundell-Fleming model should be abandoned and incorporates the external constraints discussed in Vernengo and Caldentey (2019) and Serrano and Summa (2015) in a small scale post-Keynesian simulated model to highlight the role of the distance of a country to its balance of payment constraint and the external risk-adjusted interest rate (or the interest rate floor). As argued in Chapters 1 and 3, monetary policy space and external constraints do not arise primarily from the exchange rate regime but from two additional sources. The first constraint results from the need to acquire external currency to pay for necessary imported inputs and finished goods for production and consumption. Since international credit is usually limited for countries at the bottom of the currency hierarchy, there may be times when a country experiences a dollar shortage that can lead to inflation and restrictive economic conditions, reflecting a constraint in the balance of payments. Thus, it incorporates a balance of payment constraint similar to Bhering et al. (2019), which can also be biding in the short run. The second is the interest rate floor, which is impacted by the external interest rate and changes in exchange rate expectations.

A recent discussion on the role of the external interest-risk adjusted interest rate for monetary policy (the second constraint) was recently formalized in De Lucchi (2022)), where the external interest rate also represents a floor and stabilizes the balance of payment through its effect on financial flows. Instead this model, this rate is endogenized through the impact of exchange rate expectations in the country risk premium. The remainder of this Chapter is organized as follows. Section 4.2 describes the main characteristics of the model, while section 4.3 discusses the simulation results. Section 4.4 concludes.

4.2 An alternative short-run model to the trilemma framework

The model put forth in this chapter draws on existing post-Keynesian open economy models with conflict inflation (Hein and Vogel, 2008, Blecker, 2011), but focuses on the short-run with an IS curve that is flexible to account for elasticity optimism and balance sheet effect as in Kohler and Stockhammer (2022). For the sake of simplicity, there is no government sector explicitly modeled besides a central bank that controls the short-term interest rate[1] (horizontal LM curve). The economy modeled here is one whose currency is at the bottom of the currency hierarchy.

[1]We are using the nominal short-term and the policy rate as synonym.

4.2.1 The Demand Side

The income generating process follows the traditional components of aggregate demand Y, that is, induced consumption C and investment I, an autonomous component A_t, exports X and imports M.

$$Y_t = C_t + I_t + A_t + (X_t - M_t) \tag{4.1}$$

Induced consumption depends only on consumption out of wages ($c_\omega = 1$), and on the wage share (ω_t):

$$C_t = c_\omega \omega_t Y_t \tag{4.2}$$

For simplicity, we assume that induced investment is determined by past demand as a proxy for expected sales νY_{t-1} in equation 4.3.

$$I_t = \nu Y_t \tag{4.3}$$

We also assume the existence of autonomous expenditures A_t in the system that can reflect changes in exogenous "animal spirit" or any investment that is not dependent on the level of demand A^e, but is also partly a function of the real interest rate rA_r that can reflect, for example, residential investment or other private consumption trough debt as in Serrano et al. (2020).

$$A_t = A_t^e - \gamma r_t \tag{4.4}$$

In the post-Keynesian approach taken here, the term structure of the interest rate, i.e., long-term interest rates include a term premium and lending rates are determined as a markup over the long-term rate. However, for simplicity, we abstract from those variables and consider that the real interest rate r only depends on the short-term nominal policy rate i^{cb} and the current inflation rate $\hat{p}_t$:

$$r_t = \frac{(1 + i_t^{cb})}{(1 + \hat{p}_t)} \tag{4.5}$$

How the central bank determines its policy rate to affect not only the cost of borrowing abut also other macroeconomic variables depends on the monetary policy framework and its institutional objectives.

Exports, in turn, respond to the (lagged[2]) real exchange rate rer_t, according to parameter ε_x, if one assumes that an increase in nominal exchange rate or improvements in terms

[2]This is done to to formally account for the delay in the exchange rate due to the fact that export orders are usually placed in advance

of trade $\frac{p_t^f}{p_t^d}$ increase the value and volume of exports. The level of external demand for domestic products X_a is assumed to be an exogenous variable and is kept fixed in the model.

$$X_t = \varepsilon_r rer_{t-1} + X_a \tag{4.6}$$

Imports depend on the propensity to import out of income η_m, and since in developing economies imports can have low price elasticity, for simplicity we assume that the sensitivity of imports to the real exchange rate is negligible in this short-run model $\varepsilon_m = 0$.

$$M_t = \eta_m Y_t \tag{4.7}$$

By definition, the real exchange rate rer is given by equation 4.8 where p_t^f and p_t^d are respectively foreign and domestic prices. The nominal exchange rate (e), in turn, will be determined according to the chosen exchange rate regime.

$$rer_t = \frac{e_t p_t^f}{p_t^d} \tag{4.8}$$

Solving for the current level of output in equilibrium will be equal to:

$$Y_t = \frac{1}{(1 - \nu - c_\omega \omega_t + \eta_m)}[-\gamma r_t + \varepsilon_x rer_t + A_t^e] \tag{4.9}$$

Assuming that $\varepsilon_x > 1$, a real exchange rate depreciation improves the trade balance and aggregate demand. In the trilemma literature, both in its mainstream and post-Keynesian versions, the external sector exerts its influence on the domestic aggregate demand only through this last effect of the exchange rate on the trade balance. The final positive effect of an exchange rate depreciation on aggregate demand - usually called an elasticity optimism - is also present in works of other heterodox authors such as Bresser-Pereira (2012) and Frenkel and Rapetti (2014). However, some authors have contested this elasticity optimism hypothesis. The post-Keynesian literature has also highlighted that the existence of currency mismatches in firms' and consumers' balance sheets can have a contractionary effect. This effect is incorporated in equation 4.10 trough an adverse effect of the nominal exchange rate on spending decisions ($\varepsilon_f e_t$), similar to the approach taken by Kohler and Stockhammer (2022). As a result, in equation 4.10 Y_t^f is the output adjusted for balance sheet effects and the parameter ε_f captures the negative effect of the real exchange rate on autonomous investment and consumption and $\varepsilon_x = \varepsilon_r \frac{p_t^f}{p_t^d}$ is the elasticity or price effect of exports on aggregate demand.

$$Y_t^f = \frac{1}{(1 - \nu - c_\omega \omega_t + \eta_m)}[-\gamma r_t + (\varepsilon_x - \varepsilon_f) e_t + A_t^e] \tag{4.10}$$

However, there is a growing post-Keynesian literature that highlights the role of the exchange rate as a distributional variable affecting real wages, which in turn can affect

consumption and also exert a contractionary effect. This impact can be derived from the conflicting-claims inflation model and will be discussed next.

4.2.2 Price Adjustment, Conflict Inflation and Distribution: The role of the exchange rate

In post-Keynesian conflicting-claims inflation models, price changes are explained by the class conflict between workers and capitalists over income distribution. A key contribution of this literature is that inflation dynamics are often associated with movements in income distribution. Since prices are primarily based on costs, this conflict materializes in adjustments in nominal wages and profit margins as each class tries to achieve its desired income. Moreover, in an open economy, imported materials must also be considered. Consequently, inflation in this context is explained mainly by rising mark-ups, growth in nominal wages above labor productivity, and changes in the relative prices of imported materials used as means of production (Hein and Vogel, 2008, Hein et al., 2012, Lavoie, 2022a).

We based our model on Serrano et al. (2023), where the domestic inflation rate $\hat{p}d_t$ depends on the difference between the actual real wage rate w in the previous period and firms' target real wage w^f and a parameter x_k that denotes firms' ability to readjust their prices, or an inflation inertia:

$$\hat{p}_t^d = (w_{t-1} - w_t^f) + x_k \hat{p}_{t-1}^d \tag{4.11}$$

The target real wage by firms is assumed to be a decreasing function of the real exchange rate, as in Blecker (2011):

$$w_t^f = w_{max} - \Psi rer_{t-1} \tag{4.12}$$

Similarly, wage inflation is a result of the difference between labor unions target real wage w^w and the actual real wage rate w in the previous period, and a parameter x_w that denotes some wage inflation inertia.

$$\hat{w}_t = (w_t^w - w_{t-1}) + x_w \hat{w}_{t-1} \tag{4.13}$$

The wage share desired by workers is also assumed to be an endogenous variable, which increases with capacity utilization rate (Sasaki et al., 2013)

$$w_t^w = w_{min} + \Omega u_t \tag{4.14}$$

The degree of capacity utilization is defined in terms of a potential output Y^p that is initially fixed in our short-term model due to our focus on the short-to-medium run dynamics.

$$u_t = \frac{Y_t}{Y^p} \tag{4.15}$$

In equilibrium and without changes in productivity, real wages and the wage share will be:

$$\omega_t = \frac{(1 - x_k)w_t^w + (1 - x_w)w_t^f}{(1 - x_k) + (1 - x_w)} \tag{4.16}$$

When substituting equations 4.12 and 4.13:

$$\omega_t = \frac{(1 - x_k)(w_{min} + \Omega u_t) + (1 - x_w)(w_{max} - \Psi rer_{t-1})}{(1 - x_k) + (1 - x_w)} \tag{4.17}$$

As a result, our model considers that nominal exchange rate increases will reduce real wages and the wage share as in Hein and Vogel (2008). Therefore, depreciation has distributive consequences that can negatively impact the economic activity level through the induced consumption component ω_t. When this effect is higher than the export effect, depreciation will have a final contraction effect. However, if the export effect is higher, depreciation will have a negative effect on inflation and distribution but economic activity will increase. Therefore, economic activity can increase by improving or worsening workers' positions which can lead to ambiguous results depending on the parameters as in Blecker (1989, 2011).

This contractionary channel differs from the financial effect of the exchange rate on the IS curve from the dilemma literature, where the exchange rate directly affects investment and decisions. This mechanism would lead to the IS curve 4.10, where the negative effect of the exchange rate is higher than the positive effect on exports (i.e., an elasticity pessimism instead of optimism). Since we are focusing on a demand-driven investment function, we consider that this financial channel of the exchange rate on the IS may or may not directly occur. However, it always affects the economy, reflected in the cost and access to international credit directly affecting the restricted balance of payment output, which will be presented in the next section.

Since capacity utilization increases with economic activity, and economic activity is negatively affected by the interest rate while the exchange rate increases with decreasing interest rate, as will be presented in 4.2.4, we incorporate two partially conflicting effects of monetary policy on income distribution discussed in Rolim and Marins (2021). Through the economic activity channel, a reduction in the interest rate can have a positive income on workers' bargaining power; however, if it also results in an exchange rate depreciation and this channel exerts a detrimental effect on real wages. The hypothesis taken here is that this exchange rate channel is stronger than the economic channel in developing economies, and the economy can grow with a worsening in workers' position.

4.2.3 Balance of Payment Flows

As an accounting identity, the Balance of Payment (BoP) can never be out of equilibrium in the sense that the total receipts of a country are bound to be equal to all the payments. However, some components of its different accounts can be in surplus or deficit, having different impacts on the economy. External imbalances can impair long-term growth in developing economies due to dollar shortages (Thirlwall, 1979) but can also affect their policy space in the short to medium run in the presence of destabilizing capital flows that put pressures on the exchange rate and alter the level of foreign reserves (Vernengo and Caldentey, 2019, Prates, 2020). Yet most open economy models simply aggregate financial flows as the counterpart of trade imbalances, hiding some balance of payment dynamics (Kohler, 2022). To make explicit these dynamics, we start with a discussion of the major Balance of Payment (BoP) accounts: the current account balance (CA) and the financial account (FA) as usual. Yet, differently from other open economy models, we do not assume that net financial flows merely accommodate changes in the current account. Instead, we model each gross flows separately and incorporate endogenous trade financing as in Harvey (2019) and Kohler (2022).

The current account can be broadly simplified as the result of the trade balance described in equations 4.6 and 4.7 ($X - M$), and the primary income balance, or net foreign income, that records net flow of profits, interest and dividends from investments in other countries and net remittance flows from migrant workers[3]. In financially integrated developing economies countries where financial flows result in a high amount of interest profits and dividends payments, net income balance tends to be negative and can be written as a function of the return of the current stock of past portfolio inflows ($SPFI_t = \sum_n^T NPFI_{t-n}$), mediated by the $\gamma_{pi} > 0$. The higher the domestic interest and the higher the exchange rate appreciation relative to the previous investment period n, the higher the profits, interest, and dividends repatriated by foreigners. However, we will abstract from this effect in our simplified analysis, which focuses on the short run.

$$CA_t = (X_t - M_t) \tag{4.18}$$

The financial account (FA) is decomposed into net portfolio investment (NPF), foreign direct investment (FDI) and other investments (BF). Portfolio investment results from short-term investments in bonds, equity and other securities issued domestically or in foreign markets, and from longer foreign direct investment flows(FDI) that are exogenous in our model [4]. The key component of the other investment variable, in turn, is cross-border bank flows BF_t.

[3]For simplicity, we abstract from the balance of service and secondary income in our analysis. Although the balance of service can be important, as it was during the COVID pandemic due to changes in shipping costs, this will be regarded as exogenous for our analysis.

[4]When the investment involves a controlling claim that is defined as a stake of at least 10% of the company, it is registered as a foreign direct investment flow. Giving the fine line of distinction between these flows and the portfolio flows the former present a similar behavior as short-term flows.This is case, for example in Brazil as documented by Correa et al, 2012 and Pereira e Correa, 2016. Nevertheless, foreign investment can also be

$$FA_t = NBF_t + NPF_t + FDI \tag{4.19}$$

As in Kohler (2022) and Harvey (2019), we will assume endogenous trade financing and decompose BF_t in inflows (D_t^i) and outflows. The latter flows, in turn depend on external debt payments (DA_t).

$$NBF_t = D_t^i - DA_t \tag{4.20a}$$

In our simplification, the demand for external debt (and thus, D_t^i) depends on aggregate demand adjusted by parameter η_f that accounts for the external financing needs (or a propensity to resort to external financing) of the small open economy[5]. Therefore, differently than Bhering et al. (2019) assumption we are not modelling the debt inflows only as a result of trade (or import) finance but include external finance needs more broadly.

Outflows, in turn, depend on the payments of previous debt. That is, from amortization DA_t of previously contracted debt, including interest.

$$D_t^i = \eta_f Y_t \tag{4.21a}$$

We assume that the amortization part of the external debt paid each period can be represented by equation 4.22, where the parameter ϕ is included to reduce the weight of past value of paid debt and i_t^{fb} is the foreign interest rate:

$$DA_t = \sum_{j=1}^{t} \phi^j D_{t-j}(1 + i_{t-j}^{fb}) \tag{4.22}$$

Portfolio flows, in turn are determined according the expected short-term return that can be assumed to be a function of a risk- adjusted interest rate differentials between the domestic and the external policy rate ($i^{dif} = \frac{(1+i_{cb})(1+risk_t)}{(1+i_{fcb}}$)[6]. For simplicity, we will abstract from the direct impact of exchange rate expectations on these flows. In equation 4.23, the parameter ρ proxies an amount of flow driven by this speculative motive, or the sensitivity of financial flows to interest rate differential between the domestic nominal rate i_t^{cb} and the external rate i_t^f adjusted by considerations regarding a country risk premium $risk_t$. Since changes in the exchange rate affect the final return on the investment expectations of its future movements e_t^e are also incorporated in equation 4.23.

driven by longer term expectations on growth and the specific integration into global value chains of each country. Therefore, we keep these flows as an exogenous variable and assume that the speculative part is included in portfolio flows.

[5]We are therefore abstracting from interest rate differentials (that can stimulate demand for external credit) and from the search for yield during boom phase of the cycle by foreign banks as a supply side determinant of bank inflows.

[6]We are therefore assuming that portfolio flows mostly consist on fixed income investments.

$$NPF = \rho[\frac{(1+i_t^{cb})}{(1+i_t^f)(1+risk_t)(\frac{e_t^e}{e_t})} - 1] \tag{4.23}$$

4.2.3.1 External Debt Limit and the Balance of Payment Constraint

We can write the current stock of external debt D as a result of the previous period stock plus the newly incurred debt (or import) and deduct it from amortization and new flows of foreign currency coming from current exports:

$$D_t = D_{t-1} + D_t^i - DA_t - X_t \tag{4.24}$$

Following (Bhering et al., 2019) creditworthiness is modeled considering the ratio of external debt to exports ($d_t = \frac{D_t}{X_t}$) as the adequate indicator for measuring the capacity to repay external debt and that there is a limited level of foreign financing determined by a maximum ratio (d_{max}) above which banks will no longer finance external deficits. Therefore, we can write equation 4.24 as:

$$d_t = \frac{D_{t-1}(1+i_t^f)}{X_t} + \frac{D_t^i}{X_t} - \frac{DA_t}{X_t} \tag{4.25}$$

If in period $t+1$ debt equals this maximal amount, and the current exports are used to pay for debt amortization so that $D = D_{t-1}$, we can find the maximal amount that this economy can import D_{max}^i:

$$D_{max}^i = X(d_{max} - d(1+i_f)) \tag{4.26}$$

This imposes a limited amount of debt inflows when debt reaches high levels and the maximal amount of external debt is ultimately dependent on creditworthiness considerations of foreign lenders and not by net portfolio inflows[7].

When the economy has already reached this maximal amount $D_{max}^i = D_{t-1}^i$, we can use equations 4.21 and 4.26, to find an endogenous maximal level of output consistent with the balance of payment constraint in equation 4.27, or in other words a balance of payment restricted output.

$$Y_t^{bp} = \frac{X[d_{max} - d(1+i_f)(1+risk_t)]}{\eta_f} \tag{4.27}$$

Substituting the level of exports from equation 4.6 in equation 4.27 results in:

$$Y_t^{bp} = \frac{(\varepsilon_x rer_{t-1} + X_a)[d_{max} - d(1+i_f)(1+risk_t)]}{\eta_f} \tag{4.28}$$

[7]One limitation: the maximal amount is treated as exogenous. Nothing is said on what determines this maximum limit. It can be structural but it can also vary with external financial conditions, such as the US dollar interest rate and the risk aversion sentiment

Thus, the maximal amount of external debt and its cost (credit conditions) can restrict production when exports increase less than debt. However, it can be relaxed both through cyclical and structural changes. While the propensity to restore to external finance η_f and the elasticity of exports ε_x change with policies that aim at structural changes (such as import substitution policies) , X_a can increase by gaining market share or due to a boom phase of the price of its exports (for instance, a commodity boom when this is the main export item or due to an increase in external demand). The maximal amount of d_{max} and the total cost of external borrowing ($(1+i_f)(1+risk_t)$), in turn, change cyclically according to the different phases of the global liquidity cycle (Biancarelli, 2007, Medeiros, 2008). The presence of an accumulated stock of international reserves from previous period that can be use to pay for the extra amount of foreign currency needs could also be included as an extension to the model. The balance of payment restricted output therefore closely follows the result from Bhering et al. (2019). However, the denominator of the balance of payment constraint is determined not only by the propensity to import η_m but by external financing needs more broadly.

Therefore, in our model, this restricted output acts as a ceiling for current output ($Y_t \not> Y_t^{bp}$) that does not necessarily coincide with potential output (Y^p). As a result, we incorporate earlier Keynesian concerns in open economy discussions where moving the current output towards its full-employment level can face an obstacle imposed by dollar shortage that is not dependent on the exchange rate regime in the short run (1). This outcome is also consistent with Thirwall's Law, which states that growth will be limited unless a country can finance ever-increasing deficits in the current account. However, it is important to note that in the model developed here, the balance-of-payment constraint does not determine the country's income level. Instead, it simply determines a constraint for increases in current demand through monetary and fiscal policies. A policy can also aim to change the structural parameter related to import demand elasticity through an import substitution policy or direct controls, as proposed by Kahn (1972a) and Prebisch (1950), among other Keynesian and structuralists authors.

Additionally, if we assume that the relationship between current output and the maximal output imposed by the balance of payment constraint can be a measured of how hard it is to obtain imported inputs ($u_{bp} = \frac{Y}{Y^{bp}}$), this constraint can also effect inflation if firms' desired wage rate also decreases when imported inputs are harder to obtained. This is briefly discussed in the appendix 4.4.

4.2.4 Endogenous Exchange Rate: the floating exchange rate regime with anchored expectations

In a floating exchange rate regime, exchange rate changes are determined by the demand and supply of foreign currency in the foreign exchange rate market, which are closely

related to the determinants of the balance of payment flows described above[8]. This foreign exchange rate market FX is determined by the net result of the demand and supply of foreign currency for commercial, or transactional, motives ($D^t - S^t$) and for speculative motives ($D^s - S^s$) in equation 4.29a. Since we are assuming endogenous trade financing, commercial flows result from the trade balance and debt flows from equations 4.18 and 4.20, while the net speculative demand for foreign currency derives from portfolio flows (equation 4.23). Therefore, including equations 4.18, 4.20and 4.23 in 4.29a, results in equation 4.29b.

$$FX = (D^t - S^t) - (D^f - S^f) \tag{4.29a}$$

$$FX = (M_t - X_t) + (DA_t - D_t^i) - \rho[\frac{(1 + i_t^{cb})}{(1 + i_t^f)(1 + risk_t)(\frac{e_t^e}{e_t})} - 1] \tag{4.29b}$$

When $FX > 0$ (or $FX < 0$) there is an excess (supply) demand for foreign currency, that will exert pressure on the nominal exchange rate. Therefore, in equilibrium $FX = 0$ and we can determine the exchange rate in equation 4.30b

$$FX = 0 \tag{4.30a}$$

$$e_t = e_t^e \frac{(1 + i_t^f)(1 + risk_t)}{(1 + i_t^{cb})}[1 + (\frac{DA_t - X_t - D_t^i}{\rho})] \tag{4.30b}$$

Exchange rate expectations in the above equation will be simplified based on the assumption that they are formed as a weighted average of past values (4.31) and are anchored in a conventional value e_0, resulting in equation 4.32:

$$e_t^e = \sum_{j=1}^{t} \phi^j e_{t-1} \tag{4.31}$$

$$e_t = e_0 + e_t^e[\frac{(1 + i_f)(1 + risk_t)}{(1 + i_{cb})}][1 + (\frac{DA_t - X_t - D_t^i}{\rho})] \tag{4.32}$$

These assumptions are in line with the post-Keynesian approach on exchange rates where the exchange rate is driven both by past period values – i.e., expectations that assume that the latest change in the exchange rate will be repeated in the future (Schulmeister, 1987, Lavoie, 2022c) and by a conventional value (Vernengo, 2001)[9]

[8] Some differences between the transactions in the foreign exchange market and in the balance of payment can be related to the registration and occurrence of transaction (for accounting reasons, for cancellation of the transaction or, for instance, because exporters prefer to keep their foreign currency abroad when the country regulation allows it), as well as the effect of banks positions that my occur without direct flows both in the spot and derivative market. Although we abstracted from inter-bank loans in our balance of payment equation, they can be important drivers of exchange rate movements.

[9] This specification gives certain stability to the flexible exchange rate regime. The implicit assumption is that the central bank uses its international reserves to avoid big deviations from this conventional value, anchoring

4.2.4.1 The risk-adjusted rate as an external constraint

With static exchange rate expectations, the risk-adjusted interest rate is given by the sum of the external interest rate and the risk premium. This rate is crucial in our model since it affects portfolio flows, the cost of external debt, and the exchange rate. If the domestic interest rate is set below this value, speculative net flows in the foreign exchange rate market will decrease or become negative, exerting devaluation pressures. Since devaluations have inflationary and distributive effects discussed in section 4.2.2, the risk-adjusted rate can be seen as a floor for the monetary authority if it wishes to avoid price increases and worsening income distribution.

While external variables largely influence this rate, it can also be subject to an internal component. Therefore, the risk premium can be decomposed into an exogenous or systemic risk ($risk_{e,t}$) that can vary according to developments in the international financial market and can influence all currencies at the bottom of the currency hierarchy in the same direction (Conti et al., 2014), and an internal risk ($risk_d$), that relates to how foreign agents perceive the capacity of the domestic economy to repay its external debt as discussed in 3.

$$risk_t = risk_{e,t} + risk_{d,t} \tag{4.33}$$

The external risk aversion sentiment can incorporate external financial spillovers if one assumes it to be a function of an exogenous component σ_0 and of the external interest rate i_t^f, in equation 4.34, while the parameter σ_1 can be interpreted as a liquidity preference for the key-currency (Ramos, 2016). The internal risk, in turn, relates to how external investors and creditors perceive the capacity of the country to settle its external debt and is modeled as a function of changes in the exchange rate Δe_t

$$risk_t = \sigma_0 + \sigma_1 i_t^f + \sigma_2 \Delta e_t^e \tag{4.34}$$

The incorporation of exchange rate changes to our risk variable aims to capture a patrimonial effect of the exchange rate. That is, when the external debt is s denominated in domestic currency, investors will take into account the risk of a reduction in the value of the bond when converted into foreign currency. If these bonds are already denominated in a foreign currency, there is an external default risk instead. In both cases, exchange rate depreciation can result in a higher spread for external borrowing[10].

When exports are denominated in dollars and firms borrow in foreign currency, our model implies a natural hedge and, therefore, stability on the debt-to-export ratio. However,

expectations. This would be possible to be endogenized in our model as a managed float, since it stabilizes with positive exchange rate reserves. Without anchored expectations (e_0) the model stabilizes with a higher exchange rate and becomes very unstable after changes in any variables that affect the expected speculative return.

[10] An alternative way to incorporate increasing debt in our risk variable similar to Kalecki's (1937) "principle of increasing risk", would be to model it as a function of the debt-to-export ratio (Δd_{t-1}) instead and would result in similar effects.

by incorporating a default risk, we could capture that not all firms are exporters; therefore, a domestic currency depreciation could increase a more general risk perception.

As a result, temporary changes in exchange rate expectations, even when they do not lead to an unstable behavior, will increase external debt and, as a result, the balance of payment constraint (reducing the output consistent with equilibrium) and can also have a contractionary effect even in the presence of an 'elasticity optimism' or when the Marshall-Lerner condition holds.

The external risk-adjusted interest rate, therefore, is written as $i^{risk} = (1 + i^f)(1 + risk_t)$ and can be interpreted as the floor for the domestic short-term interest rate if the central bank aims to avoid pressure in the exchange rate market derived from speculative flows, similar to equation 3.2 from Chapter 1.

4.3 Dynamics and Simulation Results

The model described in the previous section is coded in R. Three scenarios are simulated to capture the impact of the domestic monetary policy and external shocks that affect the risk-adjusted interest rate and the balance of payment constraint under different effects of the exchange rate on aggregate demand. We report the results with a scenario of increased and reduced space by changing the parameter related to autonomous exports. The scenarios and parameters that change across them are reported in Table 4.1.

Table 4.1: Parameters and scenarios

	Balance of Payment Space		Balance of Payment Constraint	
	Elasticity optimism (EO)	Elasticity pessimism (EP)	Elasticity optimism	Elasticity pessimism
	$\varepsilon_x > \varepsilon_f$	$\varepsilon_x < \varepsilon_f$	$\varepsilon_x > \varepsilon_f$	$\varepsilon_x < \varepsilon_f$
Baseline	X_a = 50 i_{cb}= 0,10; i_f = 0,05; $risk_t$ = 0,05 $i_{cb} = i_f + risk_t$		X_a= 60 i_{cb} = 0,10; i_f = 0,05; $risk_t$ = 0,05 $i_{cb} = i_f + risk_t$	
Domestic Monetary Shock	X_a = 50 i_{cb} = 0 $i_{cb} < i_f + risk_t$		X_a = 60 i_{cb} = 0 $i_{cb} < i_f + risk_t$	
External Monetary Shock	X_a = 50 i_f = 0,07 $i_f + risk_t > i_{cb}$		X_a = 60 i_f = 0,07 $i_f + risk_t > i_{cb}$	

4.3.1 Balance of payment and policy constraints

Let us consider the first scenario where the current output is close to its balance-of-payment restricted level and the policy rate is at its lowest level, relative to the risk-adjusted rate, as shown in Figure 4.1. In this situation, there may be limitations on implementing expansionary policies that could result in output expansion as it would quickly exceed this balance-of-payment restricted level (Y_{bp}).

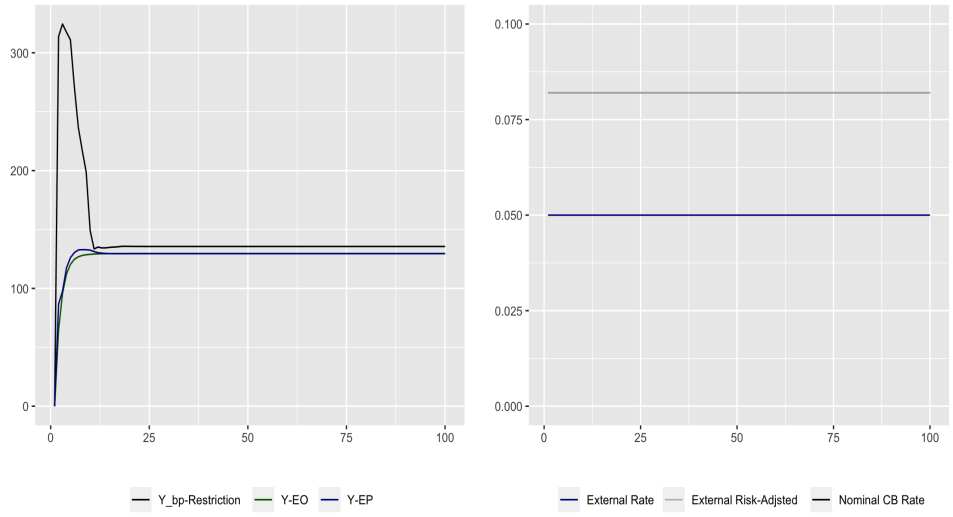


Figure 4.1: Baseline - Balance of Payment Constraint

For instance, if the central bank would follow the Kansas City rule of $i_{cb} = 0$, despite the external constraint and ignoring the risk-adjusted interest rate the immediate theoretical effect implied in the model would be a depreciation of the domestic currency that would also increase the perceived risk (equation 4.34) and lead to a reduction of the balance of payment restricted output (equation 4.27). This is shown in 4.2[11].

[11] If the policy rate is set at any level below the risk-adjusted rate the external constraint of the model will increase. However, if the decrease of the interest rate is not that high, say that it is set at 8% instead of 10%, the constraint increase would not be binding if elasticity optimism is in place because the increase in aggregate demand will also not be as high. This result is also reported in the appendix 4.4, figure 4.12.

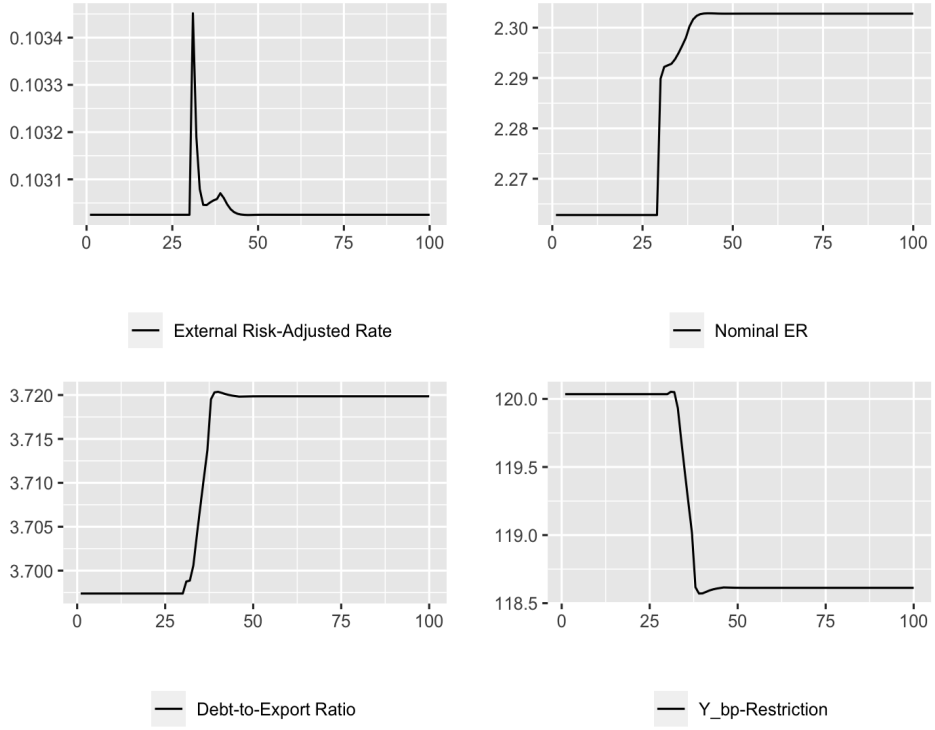


Figure 4.2: Balance of Payment Constraint after a Domestic Monetary Shock

The direct effect on aggregate demand, in turn, will depend on the specific parameters of equation 4.10, namely, according to the elasticity optimism (Y_{EO}) or pessimism hypothesis (Y_{EP}). If we assume that the positive effect of the exchange rate increase, after a reduction in the interest rate, output will be higher than the balance of payment-restricted output $Y_{EO} > Y_{bp-Restriction}$, as shown in the right-hand graph of Figure 4.3 and therefore, the economy may not be able to increase. On the other hand, if the exchange rate depreciation leads to a reduction in the IS-curve (Y_{EP}), the space for a countercyclical policy exists if the decline in the balance of payment-restricted output is lower. In any of those cases, however, the results indicate that depreciation will lead to an increase in the inflation rate and a worsening in income distribution as shown in Figure 4.3.

The higher the value of parameter σ_2 in equation 4.34, the higher will be the instability of the system before arriving at its final level. That is, when the weight of exchange rate expectations is high for risk perception, a devaluation of the exchange rate will lead to similar final result but with higher instability (see Figure 4.13 in the appendix 4.4). This also means that when expectations are unstable, for instance in times of crises, the flexible exchange rate system can lead to unstable outcomes.

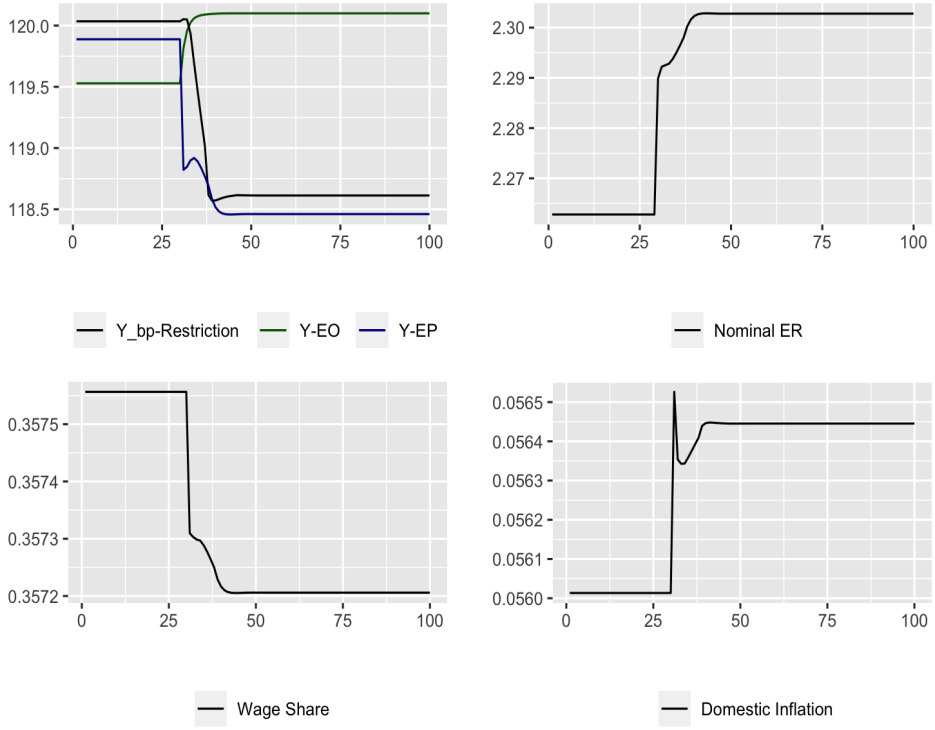


Figure 4.3: Domestic Variables after a Domestic Monetary Shock

An external shock would lead to similar results, as reported in Figures 4.4 and 4.5. A tightening in the foreign monetary policy increases the risk-adjusted interest rate directly and indirectly because it also affects the variable related to external risk. This results in a permanent increase in the external rate, indicating a shift in the global liquidity cycle.

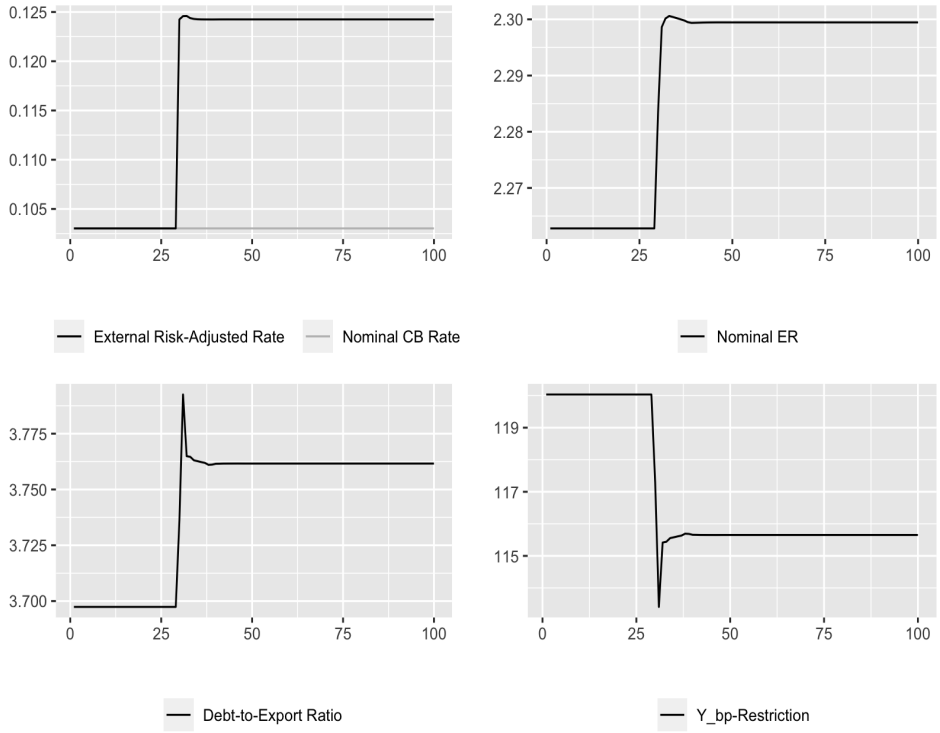


Figure 4.4: Balance of Payment Constraint after an External Monetary Shock

In this scenario, the balance of payment constrains economic activity and can lead to a recession. The economic activity level will fall even without the elasticity pessimism hypothesis since the economy will not be able to acquire external finance needed to increase production or to import the inputs needed for production if output increases with an elasticity optimism [12]. Moreover, the contractionary effect of the balance of payment is higher than in the elasticity pessimism scenario because the economic expansion with a positive effect of exports in aggregate demand leads to an increase in the level of debt and its cost.

[12] Although in this baseline model the mechanism is not modeled we discuss this limitation and a possible extension in section 4.4

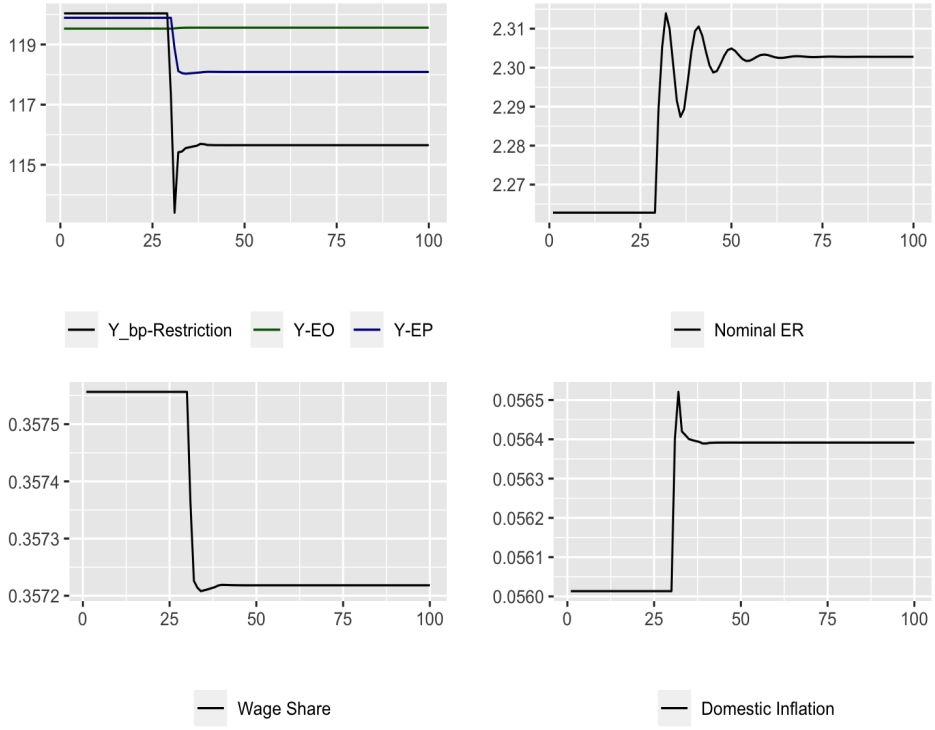


Figure 4.5: Domestic Variables after an External Monetary Shock

In this case, demand management instruments do not seem adequate to overcome the shock and relate to the old Keynesian concern of a dollar-shortage problem. Capital controls can help mitigate financial outflows and sharp exchange rate devaluations, but they do not guarantee that an increase in external financing costs will be avoided. A pro-cyclical monetary policy can help to stabilize the external constraint. Still, it can also negatively affect aggregate demand depending on the size of the parameter and, therefore, would need to be combined with a countercyclical policy that can affect aggregate demand (such as fiscal policy). Therefore, as suggested by Kahn (1972c) and Prebisch (1949), other structural policies are also needed, such as direct controls and import substitution policies that could reduce the necessity to import.

4.3.2 Balance of payment and policy space

If we assume, instead, that the economy is in a better relative position to its balance of payment constraint output, as shown in Figure 4.6 we can discuss more policy options after both internal and external monetary shocks, although the determinants of the constraints stay the same.

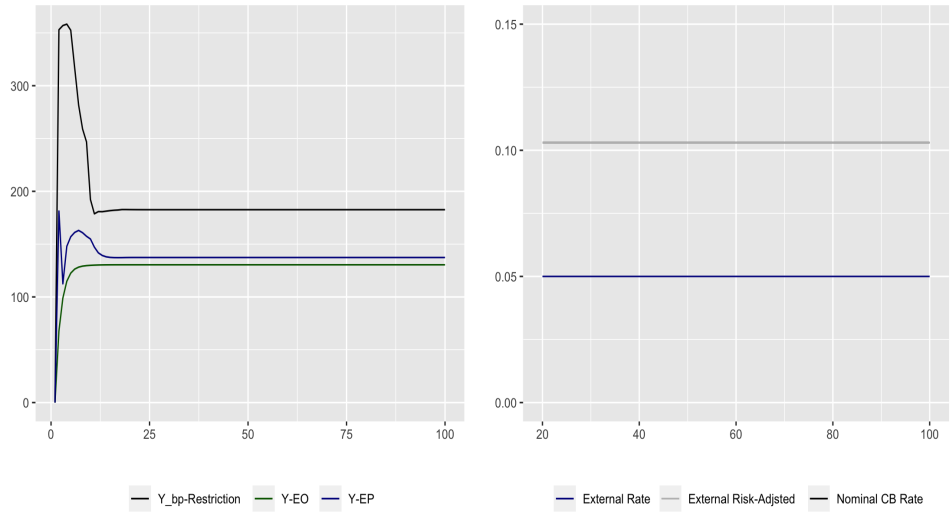


Figure 4.6: Baseline - Balance of Payment Space

In the first scenario, presented in Figure 4.7, after a reduction of the policy rate to zero we observe a temporary increase in the perceived risk variable resulting from the exchange rate depreciation that feeds back into exchange rate expectations.

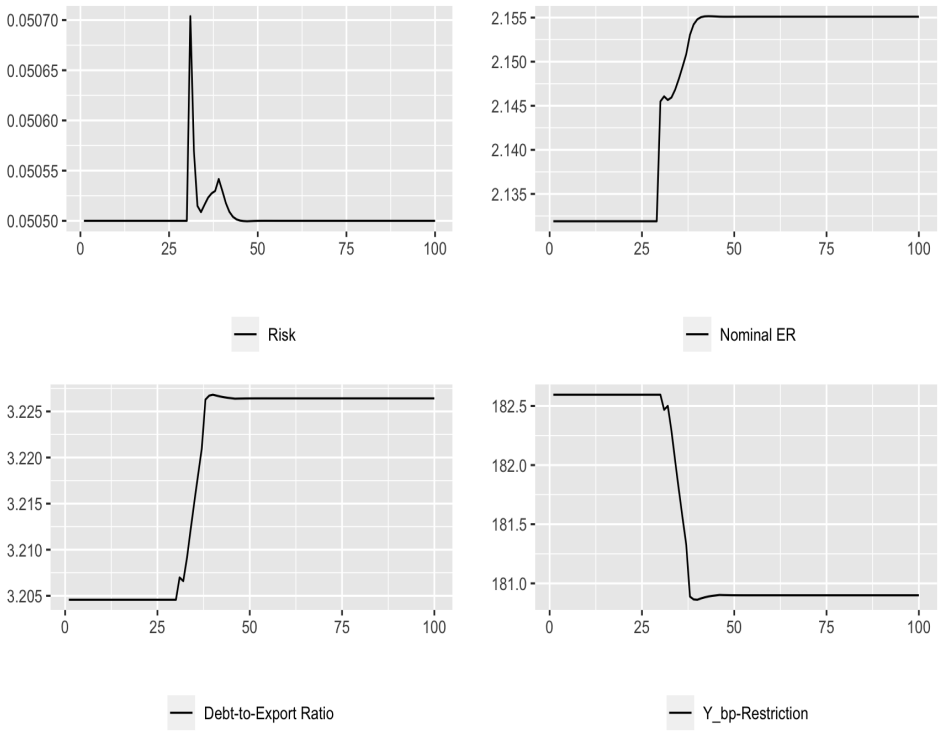


Figure 4.7: Balance of Payment Space after a Domestic Monetary Shock

The rise in the cost of external credit increases the debt-to-export ratio and reduces the balance of payment-restricted output. However, as shown in Figure 4.8, the economy does not hit the balance of payment constraint although there is an increase in the inflation rate and a

worsening in workers' position. Therefore, there is still room for other demand policies that can help increase output levels.

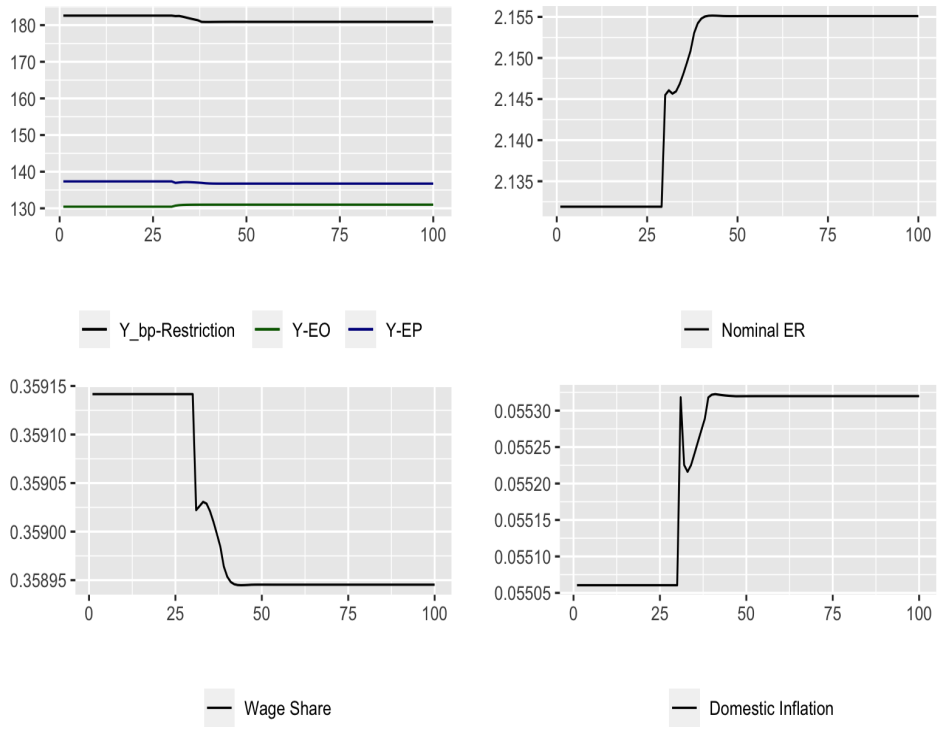


Figure 4.8: Domestic Variables after a Domestic Monetary Shock

If the balance of payment restricted output declines when the domestic interest rate rate is below the risk-adjusted rate, the question that arises is whether applying other policies directed at increasing demand (such as industrial policies, or fiscal policy) would lead to a better scenario. Although we don't have a government in our model, we can assume that this would resemble a positive shock in the autonomous expenditure A_t^e in equation 4.4. While the left-hand graph in Figure 4.9 shows the result of an expansion of autonomous expenditure with a zero nominal domestic policy rate, the right side presents the same shock with an interest rate equal to the external risk-adjusted rate. In both cases, the increase in aggregate demand increases the amount of imports more than the increase in exports. As a result, total debt and debt outflows also increase, which puts pressure on the exchange rate and the risk premium. However, when the domestic policy rate also decreases, there is extra pressure on the exchange rate and the balance of payment output falls more than in the case where only a shock on autonomous expenditures was applied.

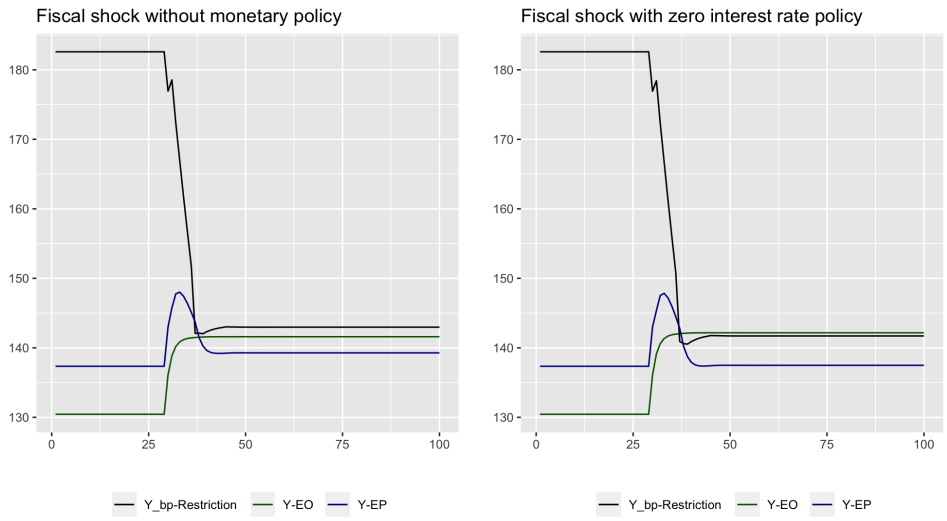


Figure 4.9: Fiscal Shock and Balance of Payment Space

If we assume the elasticity optimism hypothesis in the scenario with increase in autonomous expenditures, but without monetary policy changes, the economy can growth without reaching the balance of payment constraint[13]. If we have an elasticity pessimism hypothesis instead, an increase in autonomous expenditures would lead to an expansionary effect that would be partly compensated by an ex-post exchange rate depreciation on agents' balance sheets. The final effect would be expansionary and the economy would still have room to increase its activity level. In this case, it is interesting to separate what are the determinants of aggregate demand and the balance of payment constraint. If the balance-sheet effects are lower the economy could end up at a better position, but the limit would be the balance of payment constraint .

Let us now consider the case of an external monetary shock when the domestic economy has more policy space as in Figure 4.10. In this case, the risk-adjusted rate would be permanently higher, the debt-to-export ratio would rise due to the increase in the cost of the external debt and the balance-of-payment-restricted output would fall.

[13]Note that if we assume that the initial baseline scenario of the balance of payment restricted output was also the point of full-employment although the activity level rises, it won't be enough to achieve internal equilibrium. If, however, full-employment level was lower than Y_bp after its decline both internal and external targets could be achieved.

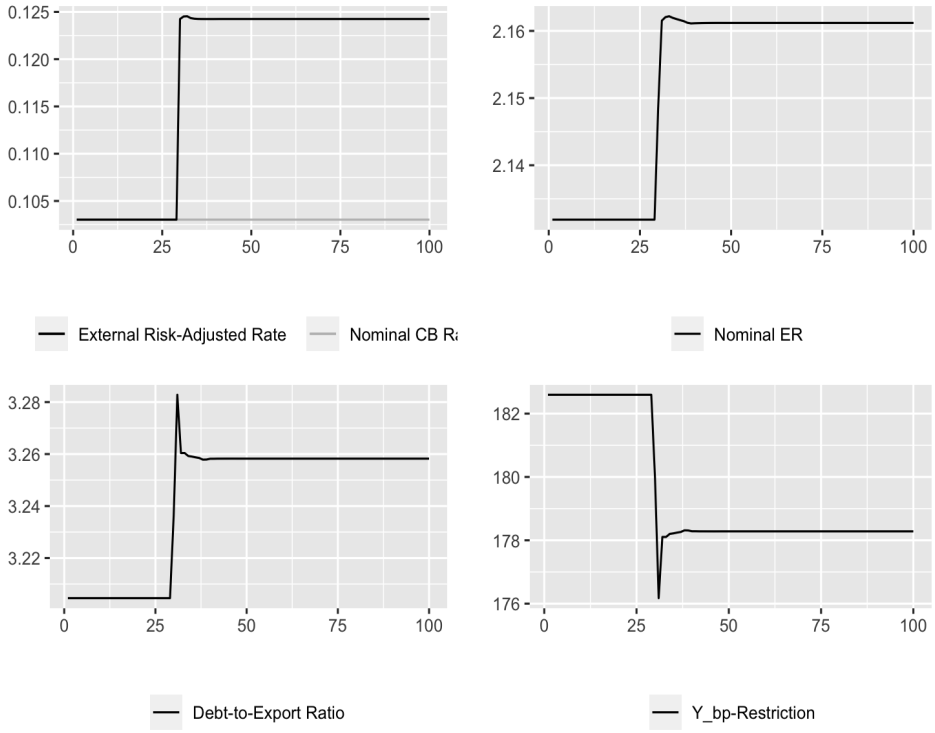


Figure 4.10: Balance of Payment Space after an External Monetary Shock

However the external constraint imposed by the balance of payment is not binding and the economy could still have space to implement counter-cyclical policies if it so wishes. It could do it by responding with a higher interest rate to partly compensate for the exchange rate depreciation and/or use other policy that directly affects demand (such as fiscal or industrial policies) to rise the level of activity.

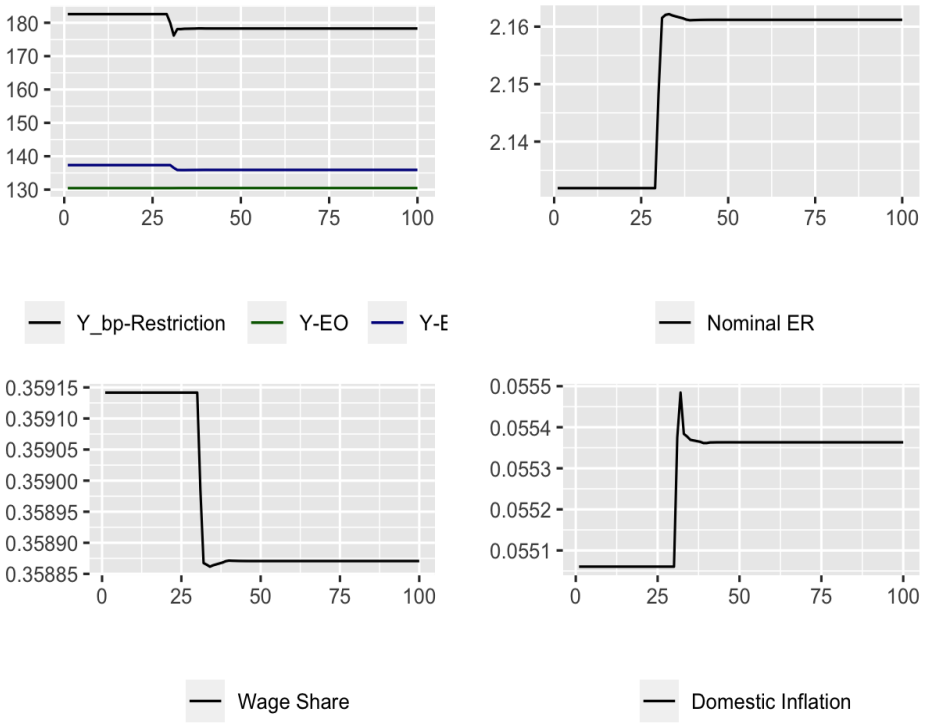


Figure 4.11: Domestic Variables after an External Monetary Shock

Therefore, external or domestic monetary shocks can affect the balance of payment-restricted output because they directly or indirectly affect the risk-adjusted interest rate that is the benchmark for external debt cost. The final impact of these shocks depends on some structural parameters, such as the propensity to import and the size of previously accumulated debt. However, whether the increase or decrease in policy space will affect aggregate demand can also be subject to specific policy choices and specific structural parameters of each particular economy (such as the size of balance-sheet effects or the elasticity pessimism/hypothesis). Regarding short-term policy choices, using increases in autonomous expenditures to expand aggregate demand would be better than decreasing the interest rate because the negative effect on the external constraint of the interest rate is higher and more direct than a devaluation resulting from an increase in imports.

4.4 Conclusion

This chapter presented an aggregate small-scale short-run post-Keynesian model with an aggregate demand function, conflicting claims inflation, and endogenous but limited international credit. By doing so, we extend previous models to establish a dialogue with the trilemma framework approach, which states that a floating exchange rate regime impairs policy action. In the approach taken here, although external conditions can impose constraints on policy conduction, they are not deterministic.

Instead of relying solely on the size of the balance sheet effect for the limitation and space for policy outcomes, we incorporated two alternative constraints. The first was the international rate plus external risk, which imposes a floor for the domestic interest rate if the depreciation of the exchange rate wishes to be avoided. The second was a balance of payment-restricted output that resulted from the possibility of international credit constraint. This constraint changes with structural (the propensity to import) and cyclical parameters (the external interest rate and exogenous variables). As a result, the space for fiscal (or any policy that increases autonomous expenditures) and monetary policy depends on the distance between the current output and this balance of payment constraint.

Conclusion

Old, new, and post-Keynesians have debated the consequences of opening the economy to manage macroeconomic policies. This thesis pointed to the limitations of using the trilemma framework in this debate and proposed an alternative perspective that incorporates post-Keynesian and structuralist elements into the analysis.

Chapter 1 investigated the origins of this debate and discussed the different assumptions that resulted in the trilemma. Old Keynesian discussions during the 1950s suggested that countries could freely choose effective instruments for achieving internal and external balances. They also argued that price adjustment policies could be counterproductive and ineffective. Therefore, direct controls were preferred. Due to the balance of payment constraints considerations put forward by structuralist authors, industrial policies, besides direct controls, would also be needed to reduce the productive and technological asymmetries and increase the policy space. However, the Mundell-Fleming model of the 1960s framed the discussion as the relative advantage of fiscal and monetary policy in different exchange rate regimes under free capital mobility, reduced the policy toolkit, and abstracted from the balance of payment constraint. This model inspired the concept of the trilemma, which is still used as a reference for current open economy policy discussions. However, we concluded that the overemphasis on the role of the exchange regime, the disregard of other policy instruments, and the abstraction of the balance of payment constraint and potential problems with the exchange rate as the adjustment mechanism narrowed the discussion in the trilemma framework relative to old-Keynesian and structuralist views.

Chapter 2 dealt with a modern reincarnation of the trilemma framework in the New Consensus literature using a simple model representation. It showed that the narrowing of open economy policy discussions, from the old to the New Keynesian model discussed in Chapter 1, still negatively affects the modern New Consensus debate. Although this approach contested the mechanics of monetary policy in the Mundell-Fleming model, changing the policy instrument from the money supply to the short-term interest rate led to similar results, while fiscal policy was abandoned. One strand of this literature considers that the trilemma is less binding in the presence of foreign exchange rate reserves (quadrilemma). On the other hand, by incorporating other transmission channels of financial conditions to aggregate demand, the dilemma arrives at the possibility of contractionary depreciations (contrary to the Mundell-Fleming model result). This means that the exchange rate no longer absorbs external shocks but, instead, can intensify them. Although other instruments (such as macro-prudential policies and international reserves) can be used and are recommended, the quadrilemma and the dilemma do not alter the trilemma's

main message. Exchange rate flexibility is still an essential source of monetary policy autonomy in all the "lemmas" variations of the New Keynesian approach. The chapter concluded that terminology problems with the concept of monetary policy autonomy obscure sources of policy space and external constraints. These problems are also reflected in the empirical strategy of this literature, which is inconclusive regarding the optimal exchange rate regime despite the theoretical literature advocating for exchange rate flexibility.

Chapter 3 presented how the post-Keynesian literature incorporated the trilemma framework into policy recommendations and discussed its limitations. While a flexible exchange rate is often preferred in the neoclassical and New Keynesian frameworks because of the reliance on market mechanisms to address external shocks, the recommendation for a flexible exchange rate by some post-Keynesians is the result of abstracting from its potentially harmful effects on price and financial stability, and income distribution. Although foreign exchange reserves relax the framework, it does not mean it completely isolates countries from external shocks. While the abstraction from external influences on policy decisions and the effect on other macroeconomic variables may lead proponents of the flexible exchange rate to an over-optimistic scenario, the opposite argument put forward by other Post-Keynesians - that there is no room for a monetary policy response in a financially integrated scenario - leads to a too-deterministic outcome. As a result, using the trilemma framework and its controversial definitions of monetary policy autonomy inherit the limitations of this framework (discussed in Chapter 2). The chapter proposed that, when analyzing challenges and options faced by different countries dealing with external shocks, the concepts of policy space and external constraints derived from old Keynesian and structuralist discussions and adapted to the asymmetries of the current IMFS (emphasized by the currency hierarchy literature) are more suitable for discussing economic policy options in open economies and can be an initial step to a broader analytical framework.

Chapter 4 presented a simple analytical model with post-Keynesian and structuralist assumptions incorporating the two main sources of external constraints derived from Chapters 1 and 3: the interest rate floor (determined by the external risk-adjusted interest rate) and the balance of payment constrained output (determined by external financing needs, external financing costs and the level of exports). The model was used to illustrate that it is possible to distinguish between the effect of external conditions on the balance of payment and its direct effects on aggregate demand. Therefore, changes in liquidity and commodity cycles or other sources of external shocks may or may not impose restrictions on the level of aggregate demand (depending on its impact on the balance of payment constraint output) and, therefore, on the space for demand management policies. We also show that in the case of monetary policy, the constraint is imposed by the external risk-adjusted interest rate if policymakers want to avoid worsening in income distribution and inflation. This occurs because setting the interest rate lower than the floor results in capital outflows exerting depreciation pressures, increasing risk perception, and tightening external credit conditions. The result indicates that discretion in monetary policy is needed to navigate external shocks, while other demand management policies

are required to increase aggregate demand until the level that is consistent with the balance of payment-constraint output. However, structural policies are required to shift this curve since there is no guarantee that this output level is consistent with full employment, just like in the old Keynesian and structuralist approaches.

In sum, this thesis concludes that the trilemma framework is inadequate for analyzing the consequences of opening the economy to the management of economic policies. It argues that external constraints in different economies are determined by their different technological and productive structures and explains the relevance of export levels that generate "free-of-cost" revenues in foreign currency in developing economies. However, the specific type of monetary and financial integration into the current IMFS also plays a role since they affect the size of external debt and the speculative demand for the currencies and assets denominated in them. These constraints, which determine the policy space in the short run for demand management policies, can be relaxed or tightened according to external demand growth and commodity and liquidity cycles.

Although the thesis advances on the sources of policy space and external constraints, the analysis was mainly restricted to a flexible exchange rate regime. Discussions on reserve management still need to be incorporated into our framework. Additionally, sources of space and constraints were summarized in the interest rate floor, and the balance of payment-constrained output. The thesis, therefore, abstracted from deeper discussion and analytical study of other important institutional characteristics that can affect the ability of monetary policy to respond to external shocks, such as the monetary regime and its policy target, the role of the central bank in the secondary market, and its ability to affect long-term rates in times of stress as well as the size and institutional features of the exchange rate market and instruments available. Those characteristics could be incorporated into an analytical model and country-case studies for a more nuanced analysis of policy space and external constraints.

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Appendix: Baseline scenario values

Table 4.2: Parameters and initial conditions

Parameter	Description	Value
A_a	autonomous demand	60
Aa_{di}	autonomous demand in the dilemma	85
FDI	exogenous foreign direct flows	1000
NPF	initial value of net portfolio flows	1000
X_a	autonomous exports	50
Y	initial output value	100
Y_p	potential output	150
c_w	propensity to consume out of wages	1
d_{max}	maximal amount of debt to export ratio	6
e	initial nominal exchange rate	2
i_{cb}	central bank policy rate	0.15
i_f	external nominal interest rate	0.13
r_d	sensitivity of external risk to the	0.03
rer	initial real exchange rate	2
u_n	normal capacity utilization rate	0.15
p^d	initial domestic price level	1
p^f	initial foreign price level	1
$\hat{p}^d$	initial domestic inflation	0.05
$\hat{w}$	initial wage inflation	0
x_k	firms' ability to readjust their prices	0.1
x_w	workers' ability to readjust their prices	0.1
w	initial wage share	0.3
w^k	firms' target real wage	0.35
w^w	workers' target real wage	0.4
γ	sensitivity of demand to the interest rate	5
ε_x	price elasticity of exports	2
ε_f	negative effect of the exchange rate in the dilemma IS curve	50
η_m	propensity to import out of income	0.7
η_f	propensity to resort to external financing	0.7
ν	sensitivity of investment to demand	0.5
ρ	sensitivity of portfolio flows to the interest rate	100
ϕ	paramenter that reduces the weight of past debt	0.3
σ_0	exogenous risk	0.02
σ_1	liquidity preference for the key-currency	0,01
σ_2	sensitivity of the country risk to changes in the exchange rate	0.03
ψ	impact of the real exchange rate on real wage desired by firms	0.02
Ω	impact of capacity utilization on real wage desired by workers	0.01

Appendix: Other results from the simulation

In Chapter 4 the experiment conducted referred to a zero nominal interest rate (as prescribed by Wray (2020)). If we establish the interest rate at zero real interest rate instead (that is, change the nominal interest rate to achieve the desired real value), we will arrive at similar results. In Figure 4.12, we report an intermediate exercise where the decrease in the policy rate is low. If, for instance, this rate is set at 8% instead of 10%, that would be consistent with the external-risk adjusted interest rate and will not necessarily result in a decrease in aggregate demand in the case of elasticity optimism $Y - EO$, because the decrease in the balance of payment restricted output will not be so large). In the case of elasticity pessimism $Y - EP$, the output will decrease. However, the resulting depreciation will negatively affect the inflation rate and real wages in both cases.

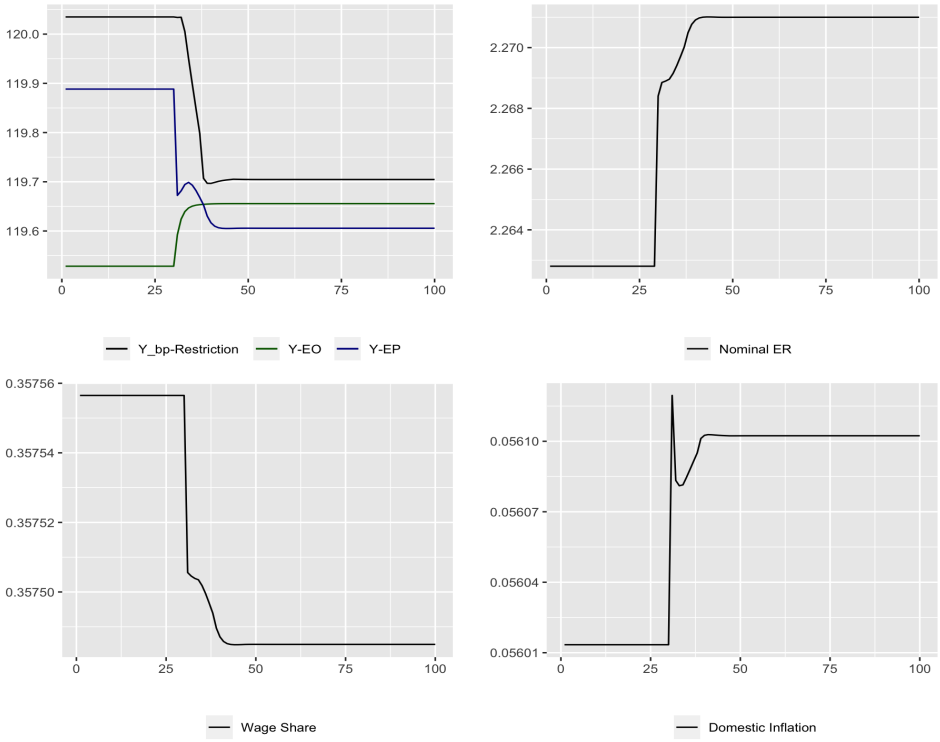

Figure 4.12: Domestic Variables after a Domestic Monetary Shock with $i_{cb} = 0,05$

An additional experiment was conducted to see the impact of reducing the policy rate to zero in a context of higher σ_2. That is, when exchange rate expectations have a more significant effect on risk perception and, therefore, on the exchange rate and external financing costs. As

shown in Figure 4.13, this will lead to instability in the system before the new equilibrium is reached.

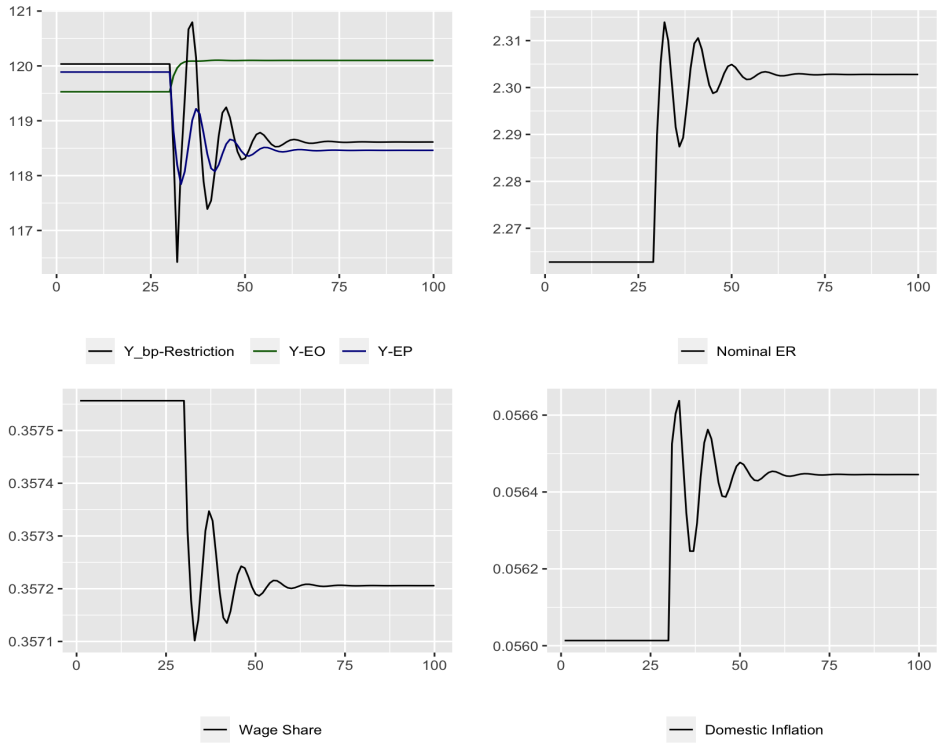

Figure 4.13: Domestic Variables after a Domestic Monetary Shock with higher exchange rate expectations sensitivity

Appendix: Possible extensions

The model presented in Chapter 4 seeks to highlight the different effects of monetary (domestic and external) shocks on the external constraint that ultimately depends on the balance of payment, or 'dollar-shortages.' However, the model was kept as simple as possible, resulting in several limitations. In this appendix, we present some possible extensions of the model that could help to expand the model and improve its central claim. One would be the incorporation of a monetary policy rule (such as the inflation targeting regime), an explicit modeling of the interaction of the balance of payment constraint and aggregate demand and the discussion of other exchange rate regimes.

Endogenizing capacity utilization with the balance of payment restricted output

In order to make capacity utilization a function of the balance of payment restricted output, we can modify equation 4.15 as in 4.35.

$$u_{bp} = \frac{Y_t}{Y^{bp}} \tag{4.35}$$

If we further assume that when the economy is getting close to the balance of payment-restricted output, firms' costs are increasing either because the external credit they need is becoming more expensive or because they are finding it harder and more costly to import the inputs they need, they might want to pass this cost into price, and therefore reduce the target real wage in equation 4.36 according to parameter Ψ_2.

$$w_t^f = w_{max} - \Psi rer_{t-1} + \Psi_2 u_{bp_t} \tag{4.36}$$

Monetary policy regimes and policy reaction functions

One possible way for the central bank to determine its policy rate is to follow an inflation-targeting regime as done by Rolim and Marins (2021) to analyze the impacts of monetary policy and foreign shocks on income distribution. As such, the nominal interest rate is determined by equation 4.37, according to which the interest rate increases (decreases) if the average inflation rate in the last four periods is above (below) the target.

$$i_t^{cb} = \rho_0 i_{t-1}^{cb} + \rho_d(\frac{\sum_{i=1}^{T_i} \hat{p}_{t-i}^T}{T_i} - \hat{p}^T)) \tag{4.37}$$

where $\rho > 0$ is the sensitivity of the nominal interest rate to the inflation gap, T_i is the number of periods considered by the monetary policy rule, $\hat{p}_{t-i}$ is the inflation rate considered by the monetary authority (growth rate of p_t^{IT}), and $\hat{p}^T$ is the inflation rate target.

Including interventions

We can include interventions in our model, if we assume that the central bank wishes to maintain the exchange rate at this conventional level $e^T = e_0$ and buys/sells foreign currency to drive the current exchange rate to this level $e_t = e^T$. Adding this considerations to equation 4.32 we can find equation 4.38 for the size of interventions at each period, where Ψ_I is a parameter that accounts for the strength of these interventions.

$$e_t = e^T + e_t^e[\frac{(1+i_f)(1+risk_t)}{(1+i_{cb})}][1 + (\frac{DA_t - X_t}{\rho})] - \Psi_i I_t \tag{4.38}$$

$$I_t = \frac{(e^T - e_t) + e_t^e[\frac{(1+i_f)(1+risk_t)}{(1+i_{cb})}][1 + (\frac{DA_t - X_t}{\Lambda})]}{\Psi_i} \tag{4.39}$$

Interventions, however will be limit by the amount of reserves (equation 4.40) that depends on its initial stock, debt repayments, exports and the amount of intervention:

$$R = R_{t-1} - I + X - DA + NPF \tag{4.40}$$

When reserves are exhausted, the central bank might then use monetary policy to achored expectations with its target:

$$i_t^{cb} = \begin{cases} i_{t-1}^{cb} & R_t > 0 \\ \frac{e_t^e[(1+i_f)(1+risk_t)][1+(\frac{DA_t - X_t}{\rho})]}{(e^T + e_t)} & otherwise \end{cases} \tag{4.41}$$

Long term rates

In our model, we only capture the influence of changes in the global financial cycle in aggregate demand trough balance sheet effects. However, as discussed in Chapter 3, long-term rates can be affected by external factors. To assess the result of policy response after a shock on those variables, we could incorporate equations 3.4 by substituting it in equation 4.5 for lending rates will result in 4.42.

$$r_t = \frac{(1 + i_t^{cb} + \lambda_{tp} + \iota\lambda_{er})}{(1 + \hat{p}_t)} \tag{4.42}$$

Therefore, the challenge for monetary policy will be higher during the downward phase than during the upward phase of the cycle.