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Climate change and macroeconomic policy space in developing and emerging economies

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This paper addresses the macroeconomic challenges stemming from the double affectedness of climate change and dependence on external finance in peripheral countries. The paper uses the Post-Keynesian concept of an asset's own rate of return to assess how susceptibility to the combined effects of erratic capital flows and the vulnerability vis-à-vis the physical and transitional risks of climate change reduces macroeconomic policy space. Climate change and mitigation strategies are said to contribute to financial instability ensuing flight-to-quality of international investors. This translates into higher external financial fragility in low income countries with a high degree of commodity dependence – with increased exchange rate volatility and devaluating pressure deteriorating affected countries' currencies liquidity premia and the expectation of their short-term exchange rates as result. Consequently, policy-makers in affected countries are forced to commit to investor-friendly policies and high interest rates to uphold their currencies' acceptance. The susceptibility to the physical risks of climate change and mitigation hence contribute the self-perpetuating nature of international monetary asymmetries and hierarchies.

Keywords: climate change, policy space, commodity dependence, financial subordination, core-periphery relations, currency hierarchy

Subject classification codes: B22, B50, E12

1 Introduction

> "we simply do not have the money, the fiscal space or the policy space needed to build the green, the resilient and inclusive development of which we speak especially after this last year of fighting Covid"
>
> Mia Mottley (2021), Prime Minister of Barbados and Chair of the Joint World Bank-International Monetary Fund Development

The Covid-19 crisis has once more demonstrated the deleterious effects of international uncertainty for macroeconomic stability in developing and emerging economies (DEEs) which hold a subordinate position in the international monetary system. DEEs'

susceptibility to global financial cycles has proven to diminish policy autonomy when flight-to-quality becomes financial investors' primary concern causing slumps of exchange rates, domestic recessions, gaping sovereign spreads, inflated external debt, and balance-of-payments difficulties (Brooks et al. 2020; Brooks and Fortun 2020; Hofmann et al. 2020; UNCTAD 2020). Events disruptive of the financial system will become more frequent as climate change accelerates rendering it a Green Swan Event (Bolton et al. 2020; Taleb 2008): physical disasters destroy wealth held as assets on economic agents' portfolios and mitigation strategies, shifting investment strategies, and climate policies increase transitional risks through the strong linkage between the financial system and the carbon-intense industries (Carnevali et al. 2019; Dafermos et al. 2018; IPCC 2018).

At the same time, climate change is projected to fundamentally reduce growth potentials through a multitude of channels: the destruction of capital stocks, a reduction of labor factor productivity (Dafermos et al. 2017) as well as that of the agricultural sector (e.g. Lesk et al. 2016); the destruction of wealth of firms and households which reduces their solvency, damages banks' balance sheets and hence impedes loan emission (Batten et al. 2020); capital investments are inhibited when resources are diverted for adaption and mitigation measures needed when capital goods fall victim to natural disasters (Batten 2018, 6; for an empirical account in the European context: Leiter et al. 2009); higher uncertainty inhibits entrepreneurship (Hallegatte 2009); growing inequality rates[1] reduce effective demand (Dennig et al. 2015; Diffenbaugh and

[1] Climate change is said to increase inequality levels because its burdens are disproportionately borne by poorer households and countries and the costs for climate mitigations and adaptions measures might be prohibitively high (Diffenbaugh and Burke 2019; Porter et al. 2014, 503; Roxburgh et al. 2020). This also holds for climate policies such as CO_2-taxing: because of the

Burke 2019; Porter et al. 2014, 503; Roxburgh et al. 2020); and global supply chains ripped by natural disasters interrupt just-in-time global production patterns (e.g. Batten 2018; Wei and Chase 2018, 9).

Notwithstanding the growing set of literature on the destabilizing effects of climate change, Batten et al. (2020, 15) purport that climatically induced shocks on macroeconomic policy-making are still under-researched – which is particularly the case for monetary policy and in the context of DEEs. This is a severe lacuna for two reasons. Firstly, DEEs are disproportionately affected by the physical and transitional risks coming with climate change (for a distinction see Batten et al. 2020, 6) – the exposure to which is here subsumed as climate (transition) vulnerability. Climatically induced disasters are most severe around the equator, where climate adaption measures are scarce (IPCC 2014; 2019). Additionally, decarbonization efforts will hit DEEs most because of the concentration of mining of fossil fuels in the Global South as result of colonial continuities and the relocation of carbon-intense industries during the past decades (Bolton et al. 2020, 15; Malm 2015; Mitchell 2011). Secondly, DEEs' subordinate integration into the international monetary system means that the monetary and financial implications of climate change will have a disproportionate impact on the space of monetary policy making in these countries. Complementing Dependency and World System theory with a monetary focus, the Post-Keynesian and Neo-Marxist literature on currency hierarchy has shown how the hierarchic structure of the international monetary system severely limits DEEs' monetary policy space through the need to offer higher interest rates, low inflation, and costly exchange rate stabilization

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high pass-through of carbon-pricing into wholesale electricity prices, CO_2-taxes would also affect lower income groups more and hence aggravate inequality (Batten et al. 2020; Dennig et al. 2015).

policies (e.g. Post-Keynesians Berlin School: Lüken-Klaßen 1993; Herr and Hübner 2005; for Latin-American structuralist school of thought see e.g.: Paula et al. 2017; Fritz et al. 2018; Médici 2020; Prates 2017). More recent literature has shown how these constraints are aggravated in the context of international financialization, that is the growing importance and changing nature of finance in DEEs (e.g. Bonizzi 2013; 2017; Bonizzi et al. 2019; Bortz and Kaltenbrunner 2017; Kaltenbrunner 2015; Kaltenbrunner and Painceira 2018; Kvangraven et al. 2021; Powell 2013).

This paper builds on this literature to investigate the implications for monetary policy making in DEEs in the context of international financialization and climate change. Its central argument is that climate (transition) vulnerability reduces policy space in countries ranking low in the international currency hierarchy by aggravating their susceptibility to financial subordination, i.e. the reduction in policy space rooted in a currency's subordinated position in the current monetary system. Using the heuristic devices of the international currency hierarchy and an asset's own rate of return, it argues that climate (transition) vulnerability deteriorates investors' confidence in a currency's liquidity premium and the stability of its exchange value. As these two components of the own rate of return are largely exogenous to policy-making in the Global South, policy options – at least in the short to medium term – are here reduced to deregulating domestic financial markets in order to reduce carrying costs of DEEs' currencies and/or increasing their yield pay-offs by increasing the interest level to uphold the demand for these currencies.

In marrying the concern with DEEs' monetary subordination and their exposure to climate change, the paper uniquely combines two strands in economic research: ecological economics which so far has only marginally considered macroeconomic literature focusing on global asymmetries laying in the international monetary system;

and the critical macro-finance literature which up to now has not considered the macroeconomic impacts of climate change for the most vulnerable countries. After an introduction to the literature on the currency hierarchy and the balance-of-payments constraint (section 2), and international financialization (section 3), the paper elaborates the concept of financial subordination in the fourth section. After, we assess what effects climate (transition) vulnerability has on each component of a currency's own rate of return distinguishing between components of an asset's own rate of return exogenous (a currency's liquidity premium and expectations concerning its exchange rate; section 5); and endogenous to domestic policy-making (carrying costs and yields; section 6). The last section concludes.

2. The currency hierarchy and the policy constraint

The mechanisms through which climate (transition) vulnerability impairs macroeconomic policy space in DEEs cannot be analyzed without considering the international monetary system, which is characterized by two key features: (1) a hierarchical structuring of currencies (the *currency hierarchy*); and (2) the recent process of *international financialization* which has changed the size and nature of DEEs' exposure to international financial markets.

Currencies are competing against each other in respect to the confidence they are bestowed with which determines the readiness to hold them in economic agents' portfolios or accept them as means to settle liabilities. This is represented in the currency hierarchy. The currency hierarchy is an analytical concept which describes the hierarchical ranking of currencies along the level of their liquidity premium – a Post-Keynesian concept to capture currencies' differing ability to fulfill the functions of money as means of transaction, means to store value and unit of account internationally (Herr and Hübner, 2005, 113; Paula et al. 2017, 7). The significance of the liquidity

premium of financial assets is laid out in Keynes' liquidity preference theory. As a high liquidity premium comes with a "power of disposal" which implies a "potential convenience or security" (Keynes 1936, 226), disposing over a currency with a high liquidity premium helps economic agents to hedge against fundamental uncertainty. When uncertainty rises e.g. in times of financial turmoil, so does the need to hedge against this uncertainty. This induces a heightened liquidity preference in economic agents where the precautionary motive in the determination of financial portfolio decisions outweighs the speculative motive and more liquid assets are preferred (de Carvalho 2010). What follows is a portfolio shift from less liquid assets (e.g. peripheral currencies) to liquid ones (safe havens as US-American T-bills); a phenomenon described as flight to-quality (Andrade and Prates 2013; Arestis and Glickman 2002; Carvalho 2010, 723; Koutsobinas 2011).

Under fundamental uncertainty, liquidity is founded in confidence meaning the psychological assessment of how liquid an asset is by market participants (Herr and Hübner 2005, 100). What underlies this confidence in a currency is pivotal in the Post-Keynesian Berlin School of thought and was later extended by Minskyans. The Berlin School of Post-Keynesianism (Herr 2001; Herr and Hübner 2005; Lüken-Klaßen 1993; Riese 1986) focuses on a country's balance-sheet's asset side to locate its currency's liquidity premium. In this view, a currency's ranking in the currency hierarchy strongly correlates with a country's position in the international trade structure, i.e. its position in global value chains and the complexity of its export goods, which determine a country's "foreign-exchange-productivity" (Herr and Hübner 2005, 107; own translation). The Berlin School authors highlight a currency's ability to store value as primary determinant of the confidence level a currency is bestowed with (Herr and Hübner 2005, 100). They here focus on the internal value of a currency: whilst inflation implies

a depreciation of creditors' positions and increases the uncertainty whether the interest rate adjusts quick enough to compensate for this depreciation, deflation inflates real debt levels. Both high inflation and even small levels of deflation can imperil the monetary system as a whole (Herr 2001, 163–165).

Building on the Berlin school analysis, the Minskyan school of thought (Bonizzi and Kaltenbrunner, 2019; Kaltenbrunner 2010; 2015; Ramos 2019) identifies the liability side of a country's and private actors' balance sheets as primary determinant of a currency's liquidity premium. A currency's acceptance is upheld by the need to settle external liabilities in this currency. The liability structure which sets the structural condition for a currency's acceptance is rooted in historical path dependencies and current socio-economic, geo-political and military power relations which can explain why the international monetary system is marked by colonial and imperial heritage (see e.g. for the CFA-Franc zone: Koddenbrock and Sylla 2019). Hence, countries with the past or current ability to define the denomination of debt positions, occupy the higher ranks of the hierarchy. The lower ranks, on the other hand, are distributed according to a country's outstanding liability stock (Kaltenbrunner 2015, 429). A high foreign liability stock and the pressure to generate foreign exchange (FX) to service these liabilities comes with a long-term depreciation of the domestic currency: a country is forced to export itself out of the debt (e.g. with the help of an undervalued domestic currency to increase competitiveness); or to sell off domestic currency on international currency markets which equally puts pressure on domestic exchange rates (Kaltenbrunner 2015, 437). Liquidity from a Minskyan perspective is hence – additionally to the stability of its value and FX-productivity of the current account – determined by the stock of outstanding external obligations of a nation and the timely accessibility and convertibility of domestic assets into the currency hegemon at the top of the currency

hierarchy (i.e. the US-Dollar) at no loss (Bonizzi and Kaltenbrunner 2019, 426; Kaltenbrunner 2015, 431).[2] A country's currency's liquidity premium has therefore three major determinants: a country's external liability position, its capacity to service those liabilities through external trade, i.e. its FX-productivity, and the convertibility of the domestic currency, its institutional liquidity respectively (Kaltenbrunner 2015, 441).

From this discussion, it follows that there is a two-directional relationship between the liquidity premium and a country's balance-of-payments. On the one hand, because only currencies in the higher ranks of the currency hierarchy are accepted as means to settle international obligations, the currency hierarchy establishes the external or balance-of-payments constraint, i.e. policy constraints arising from the necessity to inter-temporally align financial liabilities and assets. Here, the asset side corresponds to a country's FX-productivity, whilst the liability side corresponds to a country's external liability stock. One the other hand, the structure of the balance-of-payments also feeds back into a currency's liquidity premium which depends on a country's ability to manage the balance-of-payments constraint, the need to secure sufficient core currencies when due, respectively.

The balance-of-payments constraint can either be managed through current account surpluses or capital inflows, though only current account surpluses can do so without simultaneously increasing a country's liability stock. Both ways to manage the balance-of-payments constraint come with perils and pitfalls for DEEs. To solve the balance-of-payments constraint via exports is particularly burdensome for countries where primary commodities constitute the main exports (*commodity dependence*). As

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[2] Whilst Minsky's writing was primarily concerned with balance sheets of private international investors (e.g. Minsky 2004), more recent literature focuses on public sheets, as is done in this paper.

demonstrated by the Latin-American Dependency Theory and the research program following its tradition (see e.g. Kvangraven 2020), primary commodities are a poor source of FX-income because of their volatile prices and long-trend deterioration of terms-of-trade vis-à-vis manufactured goods as described in the Prebisch-Singer-hypothesis (Singer 1950; Prebisch 1950). When strong commodity dependence comes with low FX-productivity, capital inflows to manage the external constraint become necessary rendering state actors active promoters of (subordinate) financialization (Alami 2018; Karwowski 2019; Rethel and Thurbon 2019). Trying to solve the balance-of-payments constraint via capital inflows results in financial instability and Ponzi-natured external liability structures (Kregel 2004; Médici 2020). The interdependent trias of low FX-productivity due to high commodity dependence, resulting balance-of-payments difficulties, and a currency with a low liquidity premium are underlying the self-reproducing nature of the asymmetries caused and perpetuated by the international monetary system (Herr and Hübner 2005; Kaltenbrunner 2015).

To attract capital inflows crucially depends on a country's ability to become attractive as investment destination. The Post-Keynesian heuristic concept of an asset's own rate of return *(r)* can help to analyze currencies' structural position internationally and their demand by investors (Andrade and Prates 2013, 400; Kaltenbrunner 2012, 90; 2015). Analyzing peripheral currencies' *(r)* in relation to core currencies cannot only analytically capture their asymmetric positions in the international monetary system but also the corresponding reduction in policy space (Andrade and Prates 2013; Kaltenbrunner 2015; Ramos 2019). Using *(r)* as analytical category therefore helps to address the question of whether and how climate (transition) vulnerability cuts policy space in DEEs.

(r) is represented in the following equation (Chick 1983):

$$r = (q - c) + a + l \quad (1)$$

The first component of the equation consists of the difference between an asset's yield *(q)* and its carrying costs *(c)*. In the context of the currency hierarchy literature, *(q)* is most commonly interpreted as the interest paid on the assets denominated in the currency or – along Minskyan lines the "cash flows from the asset side of a balance sheet" (Bonizzi and Kaltenbrunner 2019, 426). The definition of *(c)* is equivocal in Post-Keynesian literature. Keynes originally thought of carrying costs in terms of the storage and securing costs of an asset (Keynes 1936). For Andrade and Prates (2013), *(c)* are transaction costs for investors when capital account openness is restricted (e.g. through capital controls (Andrade and Prates, 2013, 411f.). In contrast, reflecting their Minskyan approach, Kaltenbrunner (2015, 437) and Bonizzi and Kaltenbrunner (2019) read carrying costs as the cash-flow that has to be generated to service external liabilities. We follow Andrade and Prates' (2013) interpretation of carrying costs as costs arising from any restrictions on the free movement of capital across borders.

The other two components of the own rate of return equation comprise *(a)*, the expected (short-term) changes of a currency's exchange rate against the key currency acting as numeraire (currently the US-Dollar); and *(l)*, the currency's liquidity premium. *(a)* does not only incorporate the value of a currency but also the risk of exchange rate volatility. Higher exchange rate volatility translates into more pessimistic assessments of the currencies' short-term exchange value by market participants because the latter cannot be certain about the exchange rate of the day on which the conversion of the peripheral currency into the currency hegemon falls.

3. International financialization and the policy constraint

A second key feature of the international financial system, which mediates the impact of climate change on DEEs' policy space, is the process of international financialization. The past decades have seen a replacement of traditional, more patient forms of external finance (such as aid, and bi- and multilateral debt and commercial loans) by market-based external finance – a process described in the literature on international financialization, i.e. the increasing prevalence, importance and international mobility of short-term portfolio flows (Alami 2018; Bonizzi et al. 2019; Kaltenbrunner and Painceira 2018; Powell 2013). It encompasses quantitative increases in cross-border investment flows into new destinations captured in the literature on financial globalization, as well as qualitative changes. These flows are marked by a greater share of portfolio investors such as pension, mutual and hedge funds rendering international capital markets the single most important source of external finance globally (Grabel 1996; Kaltenbrunner and Painceira 2018, 297). Further qualitative changes are represented by the mere number of investors participating in international capital markets as well as the frequency of trades on these markets made possible by technological advances (Kaltenbrunner 2010, 301).

International financialization facilitates currency speculation via carry trade transactions[3] with higher-yielding peripheral currencies as targets (Bortz and Kaltenbrunner 2017, 380). It is estimated that about 80% of transactions on FX-markets can be traced back to speculation (Hache 2019, 34). This is made possible through an

[3] In carry trade transactions, debt in low-interest bearing core currencies (funding currencies) is taken out and reinvested in short-term assets denominated in high-interest bearing peripheral currencies (asset currencies). This is done to profit from higher interest and in the hope of favorable (that is upward pressure on the local currency) exchange rate developments – which is often a self-fulfilling prophecy when the volume of carry trade is large relative to the size of the economy (Bonizzi et al. 2019, 9; Bortz and Kaltenbrunner 2017, 380).

integration of peripheral currencies in FX trading which doubled from the beginning of the 2000s in comparison to 2013 (Ramos 2019, 649) and is mainly mediated through exchange traded funds with high turnovers (Andrade and Prates 2013, 404; Bortz and Kaltenbrunner 2017; Converse et al. 2020; Hache 2019, 34; Kaltenbrunner 2015). Though the share of assets from DEE held in investors' portfolios is small in nominal terms, it is large in relation to the size of the originator economies (Kaltenbrunner and Painceira 2018, 297; Ramos 2019, 649). Currency speculation on FX markets renders exchange rates of DEE-currencies notoriously instable through the higher relevance of herd behavior which also translates into expectations concerning their future stability and value (e.g. Davidson 1999; Ramos 2019). International financialization is the breeding ground for this kind of speculation because of the higher mobility (enabling noise trading and flight-to-quality) and transparency of economic conditions market-based finance comes with (Grabel 1996, 1767). Currency speculation renders peripheral currencies means of generating profits for international investors, while policy makers in peripheral countries are left with the task to accommodate the subsequent in- and outflows of capital as well as the volatility of their currencies' exchange rates.

Currency speculation and an increased reliance on market-based finance exposes DEE to global financial cycles including sudden margin-calls and fire-sales as result of changed liquidity preferences and independent of country-specific conditions (Akyüz 2013; Andrade and Prates 2013, 410; Converse et al. 2020; Kaltenbrunner 2012, 90; 2015; Kaltenbrunner and Painceira 2018; Ocampo 2010; Ramos 2019; Rey 2018). Here, changes in interest rates in core countries usually ignite a new financial cycle (Rey 2018). The vulnerability associated with an exposure to portfolio flows increases when confidence levels deteriorate: international financial distress and economic downturn come with higher uncertainty resulting in higher liquidity preferences and ensuing

flight-to-quality. In times of risen uncertainty, peripheral assets such as those denominated in DEE currencies are here the “first victims” (Andrade and Prates 2013, 401) of investors scrambling to secure their funds. In fact, DEEs depend on over-liquidity in the Global North and suffer most from liquidity crunches (Becker et al. 2010, 242).

International financialization hence makes the disposal over liquidity, both for investors and policy makers in DEEs, more important. Liquidity for investors gains relevance through international financialization because the latter shortens financial cycles, asset re-pricing and margin calls become more sudden and international financial spill-over effects more severe – increasing overall levels of financial fragility and the level of uncertainty against which investors have to safeguard. Consequently, the question of liquidity (preference) management and the subsequent need to align policies with this trajectory becomes more pressing for DEEs through the mechanics of the international financialization. As DEEs rely more and more on international capital markets they become more and more susceptible to the flight-to-quality phenomenon.

The exposure to the financial cycle through international financialization has hence important implications for policy space in DEEs as it comes with domestic macroeconomic repercussions transmitted through the exchange rate. Volatile capital in- and outflows introduce politically unmanageable financial boom-bust-cycles as described in the literature on the *financial Dutch Disease* (Botta 2015). Once the animal spirits turn pessimistic, capital outflows ensue a fall in confidence in the currency, with a sudden depreciation of the exchange rate, a depletion of reserves and risen interest rates as result. Expectations of imminent depreciations are self-fulfilling prophecies when they trigger large exits by investors. International FX-markets are characterized by performative feedback loops between expectations and portfolio restructuring

(Andrade and Prates 2013, 400; Bonizzi et al. 2019; Davidson 1991; Harvey 2009; Kaltenbrunner 2015, 441; 2017). But even without currency portfolio shifts and capital outflows, altered liquidity preferences or profitability considerations effectuate a change of exchange rates when expectations of future exchange rates impact spot prices of currencies through arbitration (Palludeto and Abouchedid 2016).[4] Whilst the depreciation of the local currency inflates external debt in real terms and reduces the purchasing power of the local population waged in the depreciated currency for imported goods reducing domestic demand, the high real interest rates introduce domestic recessionary pressure. The capital flight combined with impeded export revenues as result of international contractions ensue a reduction of reserves and eventually FX-crunches accumulating in balance-of-payments crises (Andrade and Prates 2013; Bonizzi et al. 2019; Grabel 1996).[5]

These harmful transmission mechanisms of the exchange rate are behind policy makers rationale to build up costly FX reserves positions as stabilization or safeguarding funds to ensure solvency (Akyüz 2013; Bonizzi et al. 2019; Bortz and Kaltenbrunner 2017; Rodrik 2006). Taylor (1998, 668) highlights the importance of the state as instance guaranteeing a certain degree of exchange rate stability to protect the domestic economy. Safeguarding funds have been the primary policy tool of DEEs' reaction to the great financial crisis and consequently increased from 23% to 35% of GDP from 2001 to 2011 in emerging market economies (Ramos 2019, 655). Reserves

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[4] Similarly, Harvey (2009, 42) highlights that the mere declaration of a current account deficit is more performative in putting pressure on the exchange rate than the deficit itself.

[5] The adverse effects of large-scale capital outflows was demonstrated in the Latin-American and Asian debt crises in the 1980s and 1990s (see e.g. Arestis and Glickman [2002] and Eichengreen [2004]). In fact, the Asian crises in the 1990ies can be explained by the interlocking of early and late Asian industrialisers via carry trade (Ramos 2019, 644).

are used to conduct FX-market interventions to protect domestic agents against excessive exchange rate volatility via sterilization policies,[6] establishing a "dirty" floating regime where central banks act as market-makers- or swappers-of-last-resort (Andrade and Prates 2013; Gabor 2016; for the case of Brazil see: Macalos 2017; Gonzalez et al. 2019; see also the literature on fear of floating e.g.: Hausmann et al. 2002), but also in the hope of avoiding balance-of-payment-difficulties. This insurance motive – and not the mercantilist endeavor to maintain a competitive exchange rate – is behind the massive accumulation of FX-reserves in DEEs since the 1990s, and contributes to a perpetuation of the asymmetry of the international monetary order (Andrade and Prates 2013; Gallagher and Shrestha 2012). Scarce public funds much needed for fiscal policies and development strategies are diverted into these unproductive FX-funds, which are in some cases as high as 30% of the countries' GDP, and sacrificed to avoid balance-of-payments crises. Since most countries hold them in low interest-bearing US-American T-bills, the opportunity costs are as high as 1% of their GDP (Feldstein 1999; Rodrik 2006).

In sum, by increasing the structural pressure to secure liquidity, international financialization reinforces the adverse effects of the international currency hierarchy for

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[6] Here central banks buy up FX flowing into the country via capital flows which are then "parked" in low-yielding government bonds issued by centre countries. This is done in the attempt to counter the sudden appreciation of the domestic currency to protect the export sector for instance. Sterilization policies are yet another demonstration of the conflicting policy objectives peripheral countries face: When conducting sterilization policies, central banks risk inflationary pressure, which is already effectuated by the additional demand induced by the capital inflow. When the heightened inflation is fought against by raising the policy rate, the domestic economic development is stifled and the export sector harmed due to loan crunches – hence the initial policy trajectory is reversed.

countries in the lower tiers. Because DEEs currencies are the first victims of flight-to-quality by internationally operating investors, these countries experience massive outflows and subsequent balance-of-payments difficulties once uncertainty rises and liquidity becomes scarce. This has important implications for the policy space viable in DEEs as elaborated in the next section.

4. Financial subordination as loss of policy space

As highlighted in the currency hierarchy literature, DEE-currencies' subordinate position in the international monetary system severely limits these countries' policy space. Policy makers are forced to secure the acceptance of their currency either via export surpluses or capital inflows (Bonizzi et al. 2019; Médici 2020). These pressures require them to pursue export-friendly policies and to adhere to investors' taste for profit and security by creating an investor-friendly climate. This limitation of policy space, caused by their subordinate position in the international monetary system – and recently exacerbated by international financialization – is what we call financial subordination (for a review of the financial subordination literature see: Kvangraven et al. 2021). More concretely and following the literature focusing on implications of international financial flows for policy space (Gallagher 2011; Maxfield 1997; Paula et al. 2017; Prates 2020) this paper defines financial subordination as the subjugation of autonomous macroeconomic policy-making under internationally operating financial investors' preferences and global financial cycles as result of a country's low position in the currency hierarchy (see Figure 1). Though the focus on policy space has been criticized for its statism, for falling into the fallacious dichotomy of national-international and for being oblivious to class relations (Alami 2018; Powell 2013, 139), it is nevertheless a helpful perspective to shed light on the structural conditions of policymaking (beyond class interests) and the implicit costs of defying certain sets of

policies.

Figure 1

The degree of financial subordination a country experiences is mediated through a currency's *(r)*. *(r)*'s components differ in how much they can be influenced by domestic policies. The liquidity premium *(l)* is the most important, structurally determined component of *(r)*. As elaborated above, it is the result of a country's position in international trade structures, historical path dependencies and resulting liability stocks, and therefore exogenous to macroeconomic policy-making in DEEs. The same applies to the expected change and stability of the exchange rate against the currency hegemon *(a)*, which is rooted in the sentiments of market participants vis-à-vis conditions of the financial cycles. Policies, such as FX-market interventions to stabilize the domestic currency, can only sooth market sentiments as long as FX reserves are ample. Once a country's stabilization FX-reserves are rapidly depleting, *(a)* is fully exogenous, i.e. subjugated under conditions imposed by financial cycles (see Andrade and Prates 2013).

With *(l)* and *(a)* being largely exogenous, *(c)* and *(q)* constitute policy makers' leeway to influence the domestic currencies' *(r)*. *(c)* can be reduced by refraining from capital controls and by demonstrating a commitment to the free convertibility of the currency in the future, for instance, by applying policies that can improve the institutional convertibility of the currency. Ex-ante "confidence building policies" (Bresser-Pereira 2016, 15), such as liberalization of the capital account and a deepening of the domestic financial market, aim to demonstrate commitment to market-friendly policies and privatization programs which provide investment opportunities by generating marketable asset classes. *(q)* can be upheld by contractionary fiscal and monetary policies which keep interest rates high and inflation rates low, therefore

securing positive real interest rates (Herr and Hübner 2005). Additionally, the suppression of strong unionism and austerity measures works anti-inflationary (Grabel 1996, 1764).

In sum: With capital flight hanging over the economy like a Damocles sword, policy makers in DEEs have to subjugate their monetary and fiscal policies under the preference of investors in an attempt to uphold the domestic currency's *(r)* to avoid triggering or aggravating capital flight. Ranking low in the currency hierarchy against the backdrop of international financialization hence implies a severe reduction of economic policy space for DEEs dependent on market-based external finance, in other words high susceptibility to the adverse effects of international financialization and financial subordination. Whilst currencies high up in the currency hierarchy exhibit high and stable *(l)* and *(a)*, allowing for (q – c) to be negligibly small (or even negative) without imperiling the acceptance of their currency, DEEs have to compensate their structurally low liquidity premium by conducting policies influencing (q – c) in their attempt to uphold their currencies' acceptance. Assessing the impact of climate change on peripheral currencies' *(l)* and *(a)* is hence centerpiece when assessing countries' policy options vis-à-vis international financialization and climate change. The following section assesses climate (transition) vulnerability's impact on *(l)* and *(a)*.

5. Climate (transition) vulnerability deteriorates the exogenous components of a currency's own rate of return

This paper argues that the physical and transitional risks of climate change have negative effects on the liquidity premia *(l)* of DEEs' currencies and the volatility of expectations of short-term exchange rate *(a)*. These negative effects are the result of a grown stock of external liabilities and greater exposure to capital markets and climatically induced repercussions in financial and commodity markets. We will discuss

these effects in turn.

First, with regards to the current account, climate (transition) vulnerability is likely to deteriorate the external position of DEEs. Here, the adverse effects of climate (transition) vulnerability, high commodity dependence and a low position in the currency hierarchy collude. Commodity exporters are disproportionately affected by physical as well as transitional effects of climate change. Especially the agricultural sector is severely harmed by the direct physical effects the climate emergency comes with when droughts, temperatures shocks and floods destroy harvests, and fertile soil disappears due to salinization or desertification (Porter et al. 2014). This is supplemented with transitional risks arising from climate policies in core countries affecting commodity exporters of fossil fuels. Energy transition towards e-mobility and biofuels put pressure on the prices of fossil fuels with adverse macroeconomic effects on the grown number of oil exporters and a weakening of the OPEC-cartel. Divestment away from fossil fuels will further reduce export revenues from oil, coal and gas (IEA 2019). CO2-import-taxes in core countries like the European Carbon Border Adjustment Mechanism further undermine exporting DEEs' competitiveness and hence their export potentials. Another transitional risk that disproportionately threatens commodity dependent countries comes in the form of climatically-induced recessionary pressure in the world economy. As once again showcased by the COVID-19 shock (UNCTAD 2020, 5), commodity prices decline more in economic downturns in comparison to manufactured goods due to their higher price-elasticity in respect to demand. Table 1 summarizes how climate (transition) risks affect the export revenues of exporters of agricultural goods and fossil fuels.

Table 1

Because a sudden decrease in living standards via cuts in imports is politically viable only to a limited extent (Harberger 1950; Laursen and Metzler 1950) or domestic export industries depend on imported inputs or capital, a reduction of export revenues triggered by climate change is likely to deepen structural trade deficits. Additionally, climate vulnerability necessitates more imports such as foodstuff, when harvests are destroyed, but also for mitigation and adaption measures such as air-conditioning devices, reconstruction material, and capital goods to replace destroyed ones. The same applies to transitional risks: oil exports are projected to be curtailed by as result of climate policies. International trade in energy is projected to get reduced by 10–70% by 2050 and 40–74% by 2100 (IPCC 2014, 475). This is already in part incorporated in currency markets assessments of fossil-currencies. Recent research has shown that the perception of transitional risks exercises significant pressure on fossil-commodity currencies (Kapfhammer et al. 2020). When the deficits are financed out of external debt, the gross debt position comes with a reduction of affected currencies' *(l)* which exercises devaluation pressures on them in the long run.

In addition to these structural pressures on their liquidity premium, DEEs' currencies will also experience more volatile expectations with regards to their short-term movements as a result of climate change and policies. This is so for two reasons: Firstly, in times of international financialization, when climate (transition) vulnerability deepens trade deficits, external financing needs will be satisfied by turning to international capital markets increasing the subordination under global financial conditions. This implies a higher level of external financial fragility, which makes the economy more susceptible to the financial cycle, i.e. external shocks coming in the form of changes in the US-American interest rates level or drastic changes in domestic exchange rates (Kregel 2008; Paula and Alves 2000, 597).

The second reason why DEE's currencies' exchange rates will be more volatile lies in the overall growth of climatically-induced instabilities, namely the increased risk of financial crises and commodity price swings. This leaves financially subordinated countries with the permanent threat of sudden sharp depreciations which translates into more volatile, self-fulfilling assessments of their prospective exchange rates. The likelihood of climatically-induced financial crises stems from the deflationary pressure (and resulting inflation of debt burdens in real terms) climate change comes with when global productivity levels drop; sudden price shocks of primary commodities (price hikes in agricultural goods and drops in fossil fuels); fire sales of stranded fossil assets and assets (e.g. real estate) devalued by threats posed by natural disasters; subsequent damages to the balance sheets of financial institutions like insurance companies and banks holding affected assets engendering spill-over effects such as interbank market credit crunches and liquidity problems (Batten et al. 2020; Bolton et al. 2020, 19f.) – to give some examples. Supply- and demand-sided shocks directly and indirectly resulting from climate change lead to the destruction of collaterals and financial losses, portfolio restructuring and sudden asset re-pricing which might potentially ignite liquidity problems and panic reactions in financial markets. What is more, inequality – which is aggravated by climate change and its side-effects is also said to increase the likelihood of financial crises (Piketty 2014).

Another climatically-induced source for instability of exchange rates in DEE's stems from the connection between commodity prices and DEEs' currencies. Because they are perceived to be of a similar risk structure, primary commodities and currencies are treated as substitutes by investors, which results in a co-movement of DEEs' currencies and commodities re-enforcing volatility (Kaltenbrunner 2017, 19). Paralleling the increased number of extreme weather events, volatility of prices of

primary commodities, has already risen (Batten et al. 2020; Porter et al. 2014, 503). Changes in the supply of commodities (e.g. the destruction of harvests) and subsequent price hikes and slumps are amplified, and intervals of re-evaluation are shortened when markets for commodities are subject to speculation (Hache 2019, 34; Nissanke 2011).

The structural depreciation pressures on DEEs' exchange rates and their increased volatility rooted in the combined effect of climate change as well as its transitional effects and financial cycles are likely to have severe repercussions for policy space as the exchange rate is the most important adjusting macroeconomic variable in DEEs (Davidson 1991; Harvey 2009; Kaltenbrunner 2015). Climate (transition) vulnerable countries might try to safeguard against excessive volatility of their exchange rates by holding stabilization FX-funds. However, these funds are costly, require FX-income and will not be sufficient to counter the massive fluctuations in capital flows coming with climate change (Kaltenbrunner 2015; for the example of Mexico during the outbreak of the 2008 financial crisis, see: Sidaoui 2014; for the examples of Indonesia and Turkey in reaction to the QE-shock see: Eichengreen and Gupta 2014). These funds divert scarce public funds and hence diminish the room for maneuver of the developmental state which is key in (green) industrialization (see e.g. Amsden 2008; Chang 2002). As only manufactured goods are a reliable source of FX income, exchange rate volatility and attempts to insure against them hence indirectly contribute to a lowering of the liquidity premium by diminishing fiscal space necessary to escape commodity dependence and the lower ranks of the currency hierarchy.

Figure 2

The combination of climate (transition) vulnerability and the asymmetric integration of the international monetary system will hence a have negative impacts on DEEs' currencies' *(l)* and *(a)* as represented in Figure 2. The deterioration of peripheral

currencies' *(l)* will be especially severe as grown levels of instability heighten the overall level of liquidity preference. The next section addresses the resulting rationales for policy-makers in respect to *(q)* and *(c)*.

6. Resulting policy imperatives of climate (transition) vulnerability

The previous section showed that a country's climate (transition) vulnerability negatively impacts peripheral currencies' exogenous components, i.e. its structural liquidity premium *(l)* and the expectations of the short-term exchange rate *(a)*. Policy makers in climate (transition) vulnerable peripheral countries will therefore need to resort to offering higher returns *(q)* and/or ensuring costless conversion by reducing *(c)* as elaborated below.

In line with literature that views carrying costs as transactions costs associated with capital account restrictions (Andrade and Prates 2013, 411), carrying costs (or the expectations thereof) can be reduced by refraining from measures that hamper the free mobility of capital flows and by committing to liberalized and deep financial markets. With DEEs' currencies' *(l)* and *(a)* negatively impacted by climate (transition) vulnerability, the pressure on DEEs to refrain from managing capital flows increases – paradoxically at a time when the need for such measures to mitigate the adverse effects of the global financial cycle becomes increasingly recognized (Kregel 2009; Rey 2018). Despite the growing acceptance by the IMF, only few DEE dared to upset financial markets and experience reputational losses by applying them – even in the face of massive capital outflows (Fritz and Prates 2014; Gallagher 2014; Grabel 2015). This flexing of political muscles might be even less of a viable option in countries where climate change and its side-effects aggravate the pressure to adhere to investors' preferences. What is more, the positive effects on policy space will only be temporary

as investors will demand higher interest in the future to make up for this loss in confidence.

Another form of confidence-building policies to demonstrate the commitment to open capital accounts (and hence low carrying costs) which relates to climate change comes in the form of derisking policies attached to green finance (see e.g. Müller 2020). Markets for green financial assets financing renewable energy projects have grown considerably from practical non-existence in 2012 to over US$200bn in 2018 (Fender et al. 2019, 54). Whilst green finance opens up opportunities for some countries to enter international capital markets for the first time, green finance is highly interwoven with the logic of derisking clauses such as recourse-to-the-lender clauses, collateralization, the pledging of cash-flows and securitization – in other words public guarantees, political risk insurances, currency and liquidity risk mitigations among others (Gabor 2019; ICMA 2021; IRENA 2016).

Green finance is an expression of a new financial market-based approach to finance SDGs-related projects as promoted by international development institutions and central banks in core countries, and comes with a deep restructuring of domestic financial markets. This financial asset class is particularly important in financing renewable energy infrastructure projects which are an important pillar of climate mitigation efforts. Derisking measures seek to incentivize private investors to go into assets otherwise deemed too risky. The World Bank, for instance, encourages DEEs to introduce derisking measures to escort portfolio flows into ‘sustainable’ new asset classes that finance green infrastructure, education and health project – something Gabor (2019; 2018) termed the Wall Street Consensus. To do so, public services are privatized, marketed as financial investment opportunities in local currency bond markets and securitized to be palpable for international investors. Upfront and off-take

risks are taken on public balance sheets via Public-Private-Partnership (PPP) arrangements e.g. in the form of buy-back prices for electricity and pledged FX-funds for safeguarding and stabilization measures. These FX-funds aim to ensure convertibility where the central bank acts as swapper-of-last-resort and exchange rate risks are shifted from private to public balance sheets (Gabor 2018, 12; 2019, 22). The Wall Street Consensus is hence at its core a project whereby countries in the Global South assume some of the carrying costs by structural transformation policies targeting the local financial system (e.g. IMF and WB 2020).

Green finance exemplifies how climate (transition) vulnerability is directly associated with the growing dependence on portfolio flows with adverse effects on recipient countries' policy space. These governmental pledges of investment profitability divert scarce public funds and hence diminish the potential of developmental state policies. What is more, policies positively influencing expectations concerning the commitment to liberalized capital accounts only gain credibility in the course of time and might not suffice to fully compensate for the deterioration of the exogenously determined components *(l)* and *(a)*.

Jacking up real yields is consequently the most important instrument policy-makers have to influence their currencies' own-rate of return in the short to medium term (Kaltenbrunner 2015). The adherence to contractionary policies to keep the real interest rate level up and inflation rates low is another structural imperative subjugating policy space under investors' preferences (Paula, Fritz, and Prates 2017). However, because of the role exchange rates, food and energy prices play in the determination of inflation in DEEs, climate change renders inflation levels in DEE even more unmanageable: evidence indicates that food inflation will rise whilst energy prices will fluctuate more due to climate (transition) effects (Batten et al. 2020; Debelle 2019). The

necessity to uphold high real yields by contractionary policies takes away policy-makers' ability to fight the domestic recession climate (transition) vulnerability is associated with and once more reduces fiscal space of the developmental state solidifying the low ranking of peripheral currencies.

The interest demanded to compensate for climate change risks is enormous: Buhr et al. (2018, 11) find that climate vulnerability is associated with an increase of costs for debt by 117 basis points leading to an on average 10-percentage-points increase in interest. Because the public sovereign profiles act as "sovereign ceiling", i.e. a yardstick by which other financial assets originating in the country are judged (Eichengreen 2004, 276), higher climate risk assessment of also translates into higher refinancing costs for the private sector in this country (Buhr et al. 2018, 8). These estimations say that between 2008 and 2018, the most climate vulnerable countries paid additional US$ 62 billion in interest on external debt as risk mark-up for their climate vulnerability, out of which US$ 40 was government debt. These calculations might underestimate the real additional financial burden as they only consider direct physical and no indirect physical or transitional risks exposure – though the latter might have more severe implications for investors' risk perception (Buhr et al. 2018, 12). As climatically induced catastrophes are expected to become more frequent, the mark-up for climate vulnerability will rise substantially. This interlocks with other factors negatively impacting sovereign profiles such as a low level of economic diversification, infrastructure, and fiscal space (Moody's Investors Service as quoted in: Buhr et al. 2018) – i.e. other factors underlying financial subordination. An extreme case of financial subordination arises when interest on external liabilities become too high and emergency finance coming with conditionality provided by the IMF and WB externalizes policy-making entirely (Grabel 2013; Taylor 1998).

Whilst climate (transition) vulnerability pushes interest on external liabilities in DEEs up, core countries will react to the climatically-induced global recession by applying expansionary monetary measures including QE, when the zero-lower bound is near or even met. The subsequent interest-spreads is another channel through which financial subordination is reinforced: on the one hand, they drive international investors into high interest-bearing assets from the periphery for speculative gains (Bonizzi 2017). On the other hand, central banks in center countries will resort to QE when open market operations fail and hence reduce the available amount of safe-havens for private investors. When QE comes to a sudden stop and core interest rates are expected to rise again, capital outflows from DEEs are sparked (Kaltenbrunner 2015, 435). Monetary policies in core countries as reaction to climatically induced recessions and crises will hence render investor more jittery, coming with a heightened liquidity preference, and shorten assessment horizons.

7. Conclusion

This paper assesses the impact of climate change on developing and emerging economies with respect to their subordinated position in the international monetary system and its implications for policy space. We used the Post-Keynesian heuristic device of an asset's own rate of return to demonstrate how international monetary hierarchies – in themselves already self-perpetuating – are exacerbated by the asymmetric affectedness by climate change and mitigation measures. We here focus on DEEs' local currencies' dual position as means of speculation in carry-trade transactions, on the one hand, and the mainstay of DEEs' policy makers' leeway on the other hand. We find that climate change and its transitional effects are likely to further financial subordination through several channels transmitting through the balance-of-payments: climate (transition) vulnerability contributes to subordinate financialization

because it deteriorates affected countries' currencies' liquidity premia by increasing their external liability stocks. What is more, liquidity preference levels can be expected to rise in the face of higher levels of financial instability making liquidity premia spreads more severe for countries ranking low in the international currency hierarchy. Additionally, expectations concerning the value and stability of DEEs' exchange rates' are rendered more pessimistic as result of shortened financial cycles and more volatile commodity prices both rooted in physical and transitional risks coming with climate change. Policy makers in DEE are therefore confronted with the policy imperative of streamlining their macroeconomic policies with the aim to uphold their currencies' acceptance by influencing the other components of the currency's own rate of return: firstly, by jacking up the interest level; and, secondly, by further liberalizing their financial sectors to dissipate investors' fears of capital controls or other hindrances to free capital mobility. Climate change and accompanying processes hence reinforce the subjugation under global financial cycles and their adverse impact on DEE countries' policy space rooted in the currency hierarchy intensified by international financialization.

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Table 1. Climate (transition) risks and export revenues in commodity dependent countries. Own representation.

	Physical risks	**Transitional risks**
Agricultural exporters	Reduced productivity of the agricultural sector	CO_2-import taxes reduce competiveness of non-local producers
Exporters of fossil fuels	Destruction of production sites and infrastructure	Reduction of demand of internationally traded fossil fuels as part of climate policies and changing consumption patterns

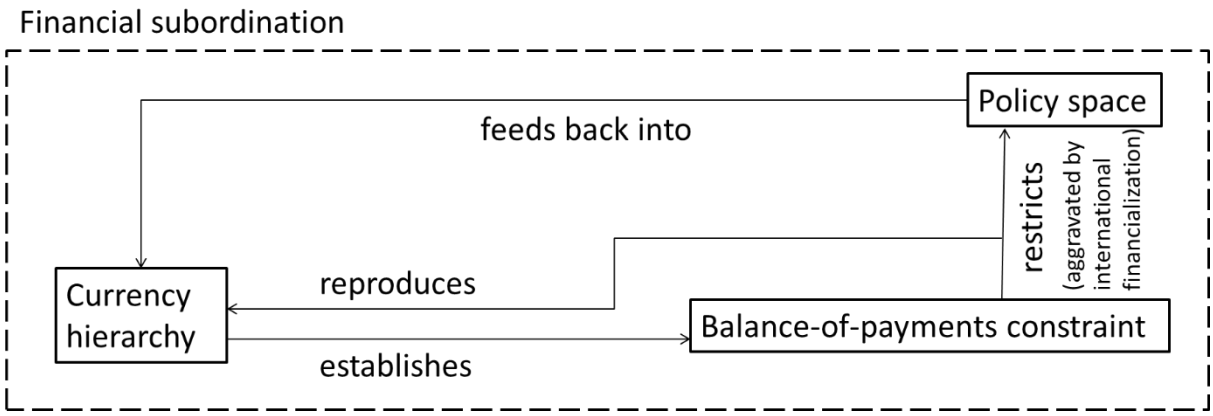

Figure 1. A schematic representation of the mechanics behind financial subordination. Own representation.

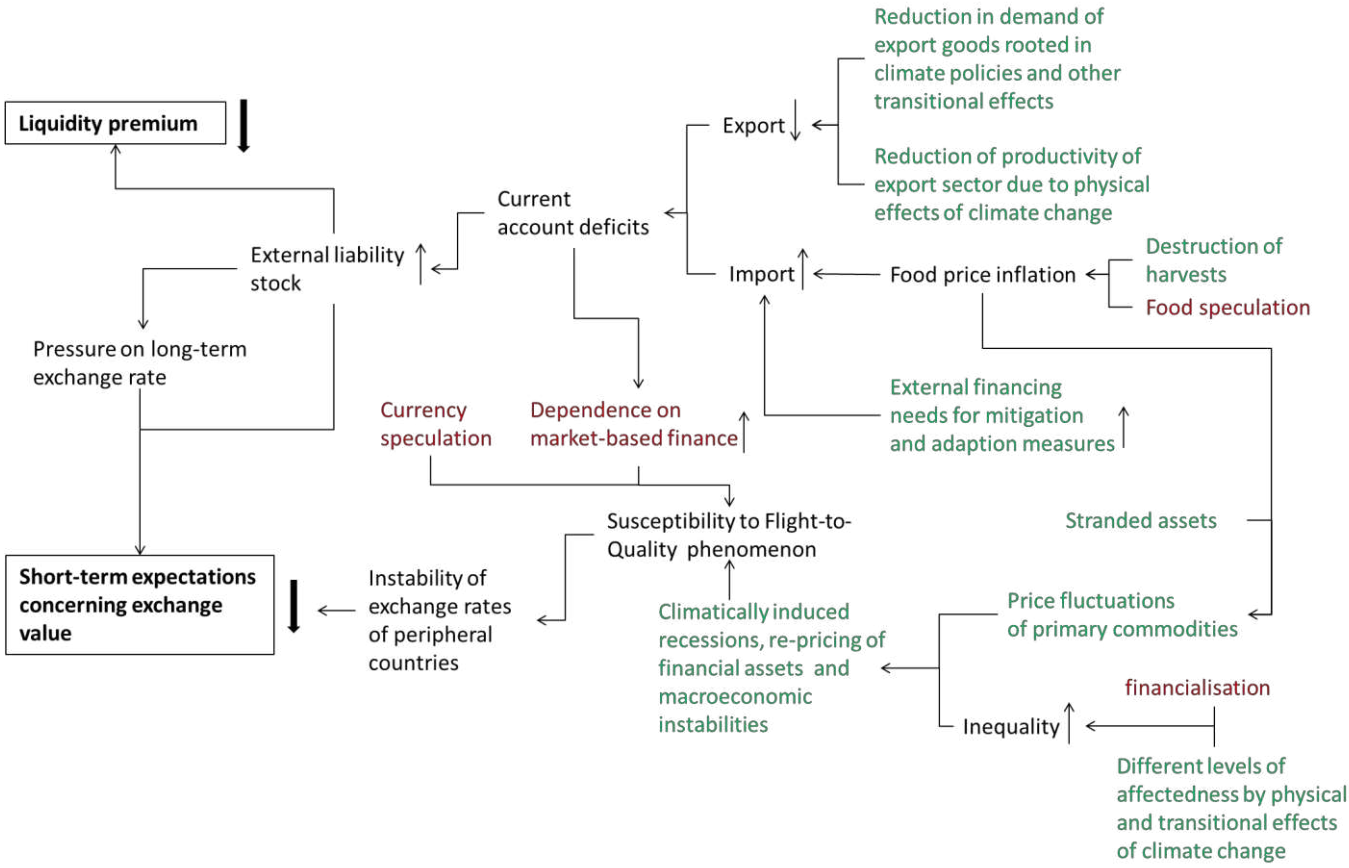

Figure 2. The impact of the international financial system (in red) and climate change (in green) on components of a peripheral currency's (*l*) and (*a*). Source: Own representation.