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International capital, multiple equilibria and finance-led dynamics in a BoPconstrained growth model

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International capital, multiple equilibria and finance-led dynamics in a BoP-constrained growth model

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Abstract
In this paper, we present a Balance-of-Payments (BoP)-constrained center-periphery growth model extended for the inclusion of international finance and the accumulation of external debt. With respect to previous works in this stream of literature, we show how the long-run BoP-constrained growth rate changes endogenously alongside the evolution of periphery's external position. We describe a complex non-linear system that may feature multiple equilibria with different stability properties. A stable equilibrium characterized by high long-run BoP-constrained growth and low external indebtedness is paired with a saddle-path unstable one in which a more fragile external position associates with lower growth. We also show that periods of (temporary) financial "bonanza", i.e., surges in foreign capital pouring into the economy, may modify the long-run growth trajectory of the periphery and its overall macro stability. Financial bonanza can boost economic growth in the short term. However, it can also give rise to tougher debt service payments and possibly lead to cases of premature de-industrialization. Despite short-term benefits, the periphery may well get worse off in the long run. If the financial boom is strong and protracted enough, it can even generate radical instability driving the periphery towards default on external debt. In the final part of the paper, we discuss the policy implications of the model, namely the role of capital controls as part of a broader development strategy aimed at taming finance-led instability and boosting structural change in the periphery.

Keywords: External constraint; international capital; financial bonanza; premature de-industrialization

JEL code: E12; F43; F62; O11

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1. Introduction

Since the beginning of the 1980s, the literature on the external constraint to growth has extended the original "Thirlwall" model (1979) in several directions. Blecker (2022) provides a rich survey of such efforts. If we neglect empirical contributions, we can probably account for five different but often overlapping "areas of development": (i) models that provide a "Pasinetti-type" multi-sectorial specification of the so-called Thirlwall law (Cimoli, 1988; Araujo and Lima, 2007); (ii) models that endogenize the import-export income elasticity ratio (Botta, 2009; Oreiro *et al.*, 2015); (iii) models that focus on the role of (changes in) the real exchange rate in relaxing (or not) the external constraint (Porcile and Lima, 2010; Razmi, 2016; Ribeiro *et al.*, 2016); (iv) models that combine the long-run Balance-of-Payments (BoP)-constrained growth rate of the economy with short-to-medium-run cycles (Davila-Fernandez and Sordi, 2019; Spinola, 2020); (v) finally, models that investigate how international capital affects BoP restrictions. Thirlwall himself, together with Hussein, first contributed to this last stream of analysis back in 1982 when he included international capital flows in his initial formulation of the BoP "vinculum" (Thirlwall and Hussain, 1982). Since then, other contributions have reshaped and re-modelled the concept of BoP-constrained growth as the rate of expansion of the economy that is consistent with a sustainable external debt (McCombie and Thirlwall, 1997; Moreno-Brid, 1998 and 2003; Barbosa-Filho, 2001, among others)[1].

In this paper, we aim at further expanding the analysis of the role of international capital as driving factor of center-periphery dynamics in the context of BoP-constrained growth models. The motivation for this study comes from the observation of some empirical facts of paramount importance for the economic dynamics of most emerging and developing (ED) countries in the last four decades: (i) the rising integration of such economies in the global financial system since mid-1980s (albeit still at a lower level than what observed in developed countries) – see UNCTAD (2019) and Erten *et al.* (2021); (ii) waves of foreign capital to ED countries that give rise to boom-and-bust cycles (Rodrik, 1998; Frenkel and Rapetti, 2009; Palma, 2013) and, this way, may also affect their long-run growth trajectories (Cerra and Saxena, 2008); (iii) the possible occurrence of structural phenomena such as finance-led premature de-industrialization that may equally bear deep consequences for the growth potential of ED economies (Benigno *et al.*, 2015; Botta *et al.*, 2023). More specifically, we present a center-periphery model that addresses two aspects often overlooked in previous works in this area of analysis. On the one hand, following Barbosa-Filho (2001), we consider how the BoP-constrained growth rate of peripheral economies[2] evolves endogenously through time when trade is unbalanced and international capital fills a current account deficit. Differently from Barbosa-Filho (2001) though, we frame our analysis according to a more rigorous BoP equation that properly disentangles interest payments on external debt from country's net borrowing. Rather than a mere technical detail, this point enables us to better capture how debt service influences the accumulation of external debt, its sustainability and, ultimately, the long-run growth rate of the economy. On the other hand, we formally describe the mechanisms driving the economy towards its long-run equilibrium. Whilst previous contributions either neglect or take convergence by assumption (see Barbosa-Filho (2021), Davila-Fernandez and Sordi (2019a and 2019b), for instance)[3], we show how it is actually shaped by

[1] Moreno-Brid (1998 and 2003) and Barbosa-Filho (2001) define external account sustainability as a stable current account deficit-to-GDP ratio. Following McCombie and Thirlwall (1997), given the long-run growth rate of the economy, this is in turn equivalent to assuming a stable external debt-to-GDP ratio.

[2] For the sake of simplicity, in this paper we use interchangeably the expressions "peripheral" and "emerging and developing" (ED) economies. We also acknowledge that the quite rough dualistic partition between central and peripheral economies does not capture the differences that may exist among ED countries themselves, think about the quite traditional distinction between China and successful East Asian countries on the one side and Latin American ones on the other. Yet, this approach may be helpful to shed some light on the influence of international capital over the medium and long-run dynamics of externally indebted peripheral countries in a global system that persistently features deep asymmetries between developed and emerging and developing countries.

[3] Porcile and Spinola (2018) model the adjustment of the actual (or effective) growth rate of the economy towards the BoP-constrained one via changes in expectation-driven autonomous components of aggregate demand. However, they do

the interaction between actual growth, its gap with respect to the BoP-constrained one, and the external position of the economy. In this process, foreign capital affects the transition towards the equilibrium on top of contributing to determine the equilibrium itself. Foreign capital can jointly influence the medium and long-term dynamics of ED countries by feeding initial booms then often followed by balance-sheet contractions and/or protracted stagnations. It is even the more so when (temporary) surges in international capital are accompanied by structural phenomena such as the premature de-industrialization and/or re-primarization (Bibi, 2025) of the recipient ED economies.

We obtain two main results. First, multiple long-run equilibria may exist. A "virtuous" equilibrium featuring a sustained (BoP-constrained) growth rate of the economy and a low current account deficit-to-GDP ratio may co-exist alongside a "perverse" one. In this last case, lower long-run growth goes hand-in-hand with a more vulnerable external position (read a higher current account deficit-to-GDP ratio). Perhaps more importantly, also stability properties change. Whilst the "virtuous" equilibrium is locally stable, the "perverse" one is characterized by saddle-path instability. This fact opens space for unstable dynamics towards financial crashes in the event of shocks that cause external debt to get excessively high. Second, periods of financial "bonanza" may eventually lead to a slower-growth more-vulnerable long-run macroeconomic environment after the initial growth acceleration spell is over. This is particularly true when such episodes of financial euphoria bring about "regressive" structural changes in the host economy that deteriorate export capabilities and increase dependence on imported goods. If strong and protracted enough, such events may even give rise to radical macroeconomic instability that ultimately ends up in external debt crises. From a policy perspective, these theoretical findings stress, once more, that capital controls can be extremely useful tools for macro stabilization purposes but also as complements to industrial policy in order to feed pro-growth structural changes or, at least, avoid "regressive" ones.

The paper is organized as follows. Section 2 offers a brief review of the core points of BoP-constrained growth models with international capital flows that pave the way to our theoretical framework. In Section 3, we present our model and the case of multiple long-run equilibria that likely results from endogenous center-periphery imbalances and externally-constrained (periphery) growth rate. Section 4 focuses on the lasting effects of episodes of financial bonanza over the long-run equilibrium and macroeconomic stability of ED countries. Section 5 draws some policy implication from our study and concludes.

2. Foreign capital in center-periphery BoP-constrained growth models

In the literature on BoP-constrained growth, Thirlwall and Hussain (1982) first extended the original Thirlwall's formulation of the external constraint in order to consider international capital flows. They did so to analyze how foreign capital may affect BoP restrictions and, thus, peripheral countries' growth potential. Equations (1) – (3) below are the backbones of such an extension. Equations (1) and (2) describe the volumes of exported and imported goods (and services), with Y (Z) as periphery (center) real GDP, Q the real exchange rate, "a" and "f" ("b" and "h") the price and income elasticity of periphery's exports (imports). Differently from Thirlwall (1979), Thirlwall and Hussain (1982) amend the condition for balanced trade and assume trade relations to be initially unbalanced thanks to capital inflows to the periphery[4]. This is formally stated in equation (3), where "P" ("P^*") stands for the price level in the periphery (center) and "E" is the nominal exchange rate:

not consider, at least explicitly, the role of external imbalances and of the accumulation of net foreign liabilities that occur when such rates are different in the determination of the adjustment path and of the final equilibrium itself. In their model, the BoP-constrained growth rate is given by the simple external balance between import and export flows. A series of contributions, including Porcile and Spinola (2018), also discuss formal mechanisms to reconcile the BoP-constrained growth rate of the economy with the Harrodian "natural" one. This topic goes beyond the scope of the present paper. See Blecker and Setterfield (2019) for a comprehensive analytical survey and comparison of these models.

[4] In line with Thirlwall and Hussein (1982), here we assume that foreign capital takes the form of internal credit, i.e, international bank lending or foreign portfolio investment in peripheral public and/or private bonds. Foreign capital may also be of different nature though, such as Foreign Direct Investment (FDI) or equity (portfolio) investment. In these

$$X = Q^a Z^f \qquad (1)$$

$$M = Q^{-b} Y^h \qquad (2)$$

$$PX + EP^*C = EP^*M \qquad (3)$$

In equation (3), "C" represents *real net resource transfers* between central and peripheral economies (expressed in terms of center-made good). More precisely, "C" is the difference between net financial flows and net payments (income) on foreign debt (assets). It thus put together items that are normally recorded in two different voices of the BoP, the former in the financial account and the latter in the current account. Positive (negative) values of "C" represent net resource transfer to (from) the periphery.

Let assume that "C" is positive, so that the periphery generally runs a trade balance deficit, pays interests on accumulated external debt (not explicitly considered by Thirlwall and Hussein (1982)), and receives positive net capital inflows covering for the overall current account deficit. If we express equation (3) in growth rates, we get:

$$\theta\left(\hat{P} + \hat{X}\right) + (1-\theta)\left(\hat{E} + \hat{P}^* + \hat{C}\right) = \hat{E} + \hat{P}^* + \hat{M} \qquad (4)$$

Where "hat" variables stand for proportional rates of change and $\theta = (PX/EP^*M)$ is the export-import ratio (with $\theta < 1$ given the assumption of initial trade balance deficit). Taking the rates of changes in the volumes of exported and imported goods (and services) from equations (1) and (2), noting that $\left(\hat{E} + \hat{P}^* - \hat{P}\right) = \hat{Q}$, and after assuming that the variation of the real exchange rate is zero (i.e., $\hat{Q} = 0$)[5], we get:

$$\hat{Y}^E = \frac{\theta f \hat{Z} + (1-\theta)\hat{C}}{h} \qquad (5)$$

Equation (5) represents the extended version of the well-known Thirlwall law once we allow for international resource transfers and, more specifically, for its proportional variation "$\hat{C}$". Equation (5) tells us that, *ceteris paribus*, increasing positive resource transfers to the periphery (a rise in $\hat{C}$) may boost ED countries' growth since they will be allowed to expand aggregate demand faster and raise import flows. Equation (5) also implies that international finance can enable peripheral growth to get higher than what stated in the original Thirlwall law (i.e., $f\hat{Z}/h$) when ($\hat{C} > f\hat{Z} = \hat{X}$)[6].

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cases, from a legal point of view, positive net capital inflows do not constitute an increase in the external debt. The problem of external debt sustainability may thus appear as less compelling. Yet, non-debt capital inflows can equally make the current account position of ED countries hardly sustainable if they give rise to increasingly large negative income transfers in the form of dividends and profit repatriations (see Singh, 2003; Cornia, 2020). Capelli and Vaggi (2016), Botta *et al*. (2016) and Bibi (2025) analyze the case of various ED countries that, over the years, have recorded substantially negative net primary income and overall current account balances due to initial surges in FDI and/or portfolio equity investment. In all these cases, soon or later, the need for international credit filling such current account deficits will materialize again, together with the requirement of keeping external debt sustainable.

[5] For the sake of simplicity, in this paper we assume that the real exchange rate "Q" remains constant. This does not imply by any means that Q is irrelevant to determining the long-run BoP-constrained growth rate of the periphery. In line with available empirical evidence and the extensive discussion on this point offered by Blecker and Setterfield (2019), we rather assume that the *level* of the real exchange rate more than its percentage variation influences the external constraint to growth. For instance, protracted periods of real exchange rate appreciation (depreciation) may curtail (boost) economic dynamics in the periphery by hampering productive (read manufacturing) development and thus tightening (relaxing) the external restriction. Temporary overvalued levels of the real exchange rate is one of the mechanisms considered in Section 4 of this paper through which periods of financial bonanza can generate "regressive" structural changes in the periphery and eventually make the macroeconomic environment of ED countries more fragile. See Ribeiro *et al.* (2020) for a more skeptical perspective on the role of an undervalued real exchange rate as positive stimulus to economic growth instead.

[6] It is easy to see that $\frac{\theta f \hat{z} + (1-\theta)\hat{C}}{h} > \frac{f\hat{z}}{h}$ only if $\hat{C} > f\hat{Z}$.

Equation (5), albeit useful to capture some effects of international capital over peripheral growth records, does not consider whether finance-led growth is sustainable given the corresponding accumulation of external debt. Moreno-Brid (1998) addresses this issue by re-elaborating equation (5) under the assumption of a stable current account deficit-to-GDP ratio[7]. Imposing $\hat{C} = \hat{Y}$ in equation (5) so that $(EP^{*}C/PY) = \rho$ remains constant through time, we get:

$$\hat{Y}^{E}_{\rho=\bar{\rho}} = \frac{\theta f \hat{Z}}{h-(1-\theta)} \qquad (6)$$

In equation (6), $\hat{Y}^{E}_{\rho=\bar{\rho}}$ represents the long-run equilibrium growth rate of the periphery consistent with (positive) international resource transfers and a constant current account deficit-to-GDP ratio ($\rho = \bar{\rho}$). Interestingly, equation (6) indicates that the seemingly expansionary effects of positive capital inflows over peripheral growth cannot be taken for granted once we duly consider a condition for external debt sustainability. Indeed, if we derivate $\hat{Y}^{E}_{\rho=\bar{\rho}}$ with respect to θ, we get:

$$\frac{\partial \hat{Y}^{E}_{\rho=\bar{\rho}}}{\partial \theta} = \frac{(h-1) f \hat{Z}}{[h-(1-\theta)]^{2}} \qquad (7)$$

With $\frac{\partial \hat{Y}^{E}_{\rho=\bar{\rho}}}{\partial \theta} > 0$ if $h > 1$.

Equation (7) shows that $\hat{Y}^{E}_{\rho=\bar{\rho}}$ will increase alongside a higher contribution of international capital to total periphery's receipts, i.e., a lower value for θ, only if import income elasticity is lower than one (i.e, $h < 1$), quite an unrealistic assumption in the case of most ED countries. If, more credibly, $h > 1$, larger capital inflows (with respect to imports) will eventually curtail long-run growth. With $h > 1$, large capital inflows that could potentially raise growth above what strictly allowed by export dynamics will induce imports to rise even faster and more proportionally than income. In this event, also the current account deficit-to-GDP ratio will be on the rise and it will violate the condition for sustainable external debt. The requirement to keep "ρ" in check will eventually hold capital inflows and income dynamics down, so that $\left(\frac{\theta f \hat{Z}}{h-(1-\theta)} < \frac{f \hat{Z}}{h}\right)$[8]. Other way around, whilst large capital inflows may initially help the economy to expand faster, in the long run, the productive and technological capabilities of the periphery will prevail in shaping its sustainable growth trajectory. Regardless of international finance, poor productive diversification, reduced technological capabilities and, hence, a large technological gap with respect to the center, here captured by $h > 1$, will force the periphery to slow down its growth process to keep it sustainable in the eyes of international investors.

Two more fundamental contributions to the modelling of BoP-constrained growth with international capital are worth discussing for the sake of our analysis. First, Barbosa-Filho (2001) shows that, given the initial condition of unbalanced trade, the BoP-constrained growth rate stated in equation (6) becomes endogenous since that also the export-income ratio $(PX/EP^{*}M) = \theta$ endogenously changes in time. As such, Barboza-Filho (2001) demonstrates that, under the assumption of $h > 1$ and of a constant real exchange rate, a more complex system emerges. This system is stable only if θ converges to 1 and the long-run growth rate of the economy eventually correspondent to the one indicated by the very fundamental Thirlwall law with balanced trade and no

[7] Consistent with McCombie and Thirlwall (1997), Moreno-Brid (1998) also shows how this condition is equivalent to assuming a stable external debt-to-GDP ratio.

[8] Under the assumption of a constant real exchange rate Q, we have $\dot{\rho} = \rho(\hat{C} - \hat{Y}) = 0$ only if $\hat{C} = \hat{Y}$. Large capital inflows that push peripheral economic expansion above what stated by the stricter version of the Thirlwall law in turn imply $(\hat{C} > f\hat{Z})$, with $\left(f\hat{Z} > \frac{\theta f \hat{Z}}{h-(1-\theta)}\right)$ if $(h > 1)$. It is now easy to verify that, whenever $\hat{C} > \frac{\theta f \hat{Z}}{h-(1-\theta)}$, $\hat{C} > \hat{Y}$ and a boundless growing current account deficit-to-GDP ratio eventually emerges.

net international resource transfers. Second, Moreno-Brid (2003) explicitly disentangles current transfers in the form of interest payments on foreign liabilities from "pure" capital flows[9]. By doing so, it offers a better description of the evolution of the current account deficit (as a mirror of the capital account surplus), which could now change not only because exports differ from imports, but also due to the need of taking care of debt service payments. Moreover, he shows how a higher debt service burden may reduce the BoP-constrained growth rate of the periphery that is consistent with a constant current account deficit-to-GDP ratio.

To better see this last point, let's take equation (3) and explicitly consider *current* resource transfers abroad (say interest payments on foreign debt) as additional current account outlay on top of imports. We get:

$$PX + EP^*K = EP^*M + EP^*R \qquad (8)$$

In equation (8), R stands for real net current income transfers from the periphery to the center (in terms of center-made good). K, instead, represents "pure" net capital inflows that, differently from variable "C" in equation (3), does not include any sort of income transfer. As usual, take equation (8) and express it in terms of proportional growth rates under the assumption of a constant real exchange rate. We obtain:

$$h\hat{Y} = \theta_1 f\hat{Z} + (1 - \theta_1 + \theta_2)\hat{K} - \theta_2\hat{R} \qquad (9)$$

In equation (9), $\theta_1 = (PX/EP^*M)$ and $\theta_2 = (EP^*R/EP^*M)$ are the export and current transfer-to-import ratios, respectively. $(1 - \theta_1 + \theta_2) = (EP^*K/EP^*M)$ is the ratio between net capital flows and imports. It gives the amount by which import purchases are "paid out" by net capital inflows (on top of exports). This ratio may exceed 1 given that the periphery may also have to collect additional funds to honor outstanding debt payments R. If we impose the standard sustainability condition that the current account deficit-to-GDP ratio $\kappa = (EP^*K/PY)$[10] must be stable in the long run, we get:

$$\hat{Y}^E_{\kappa=\bar{\kappa}} = \frac{\theta_1 f\hat{Z} - \theta_2\hat{R}}{h - (1 - \theta_1 + \theta_2)} \qquad (10)$$

Equation (10) clearly shows that a rise in interest payments on foreign debt (i.e., $\hat{R} > 0$) will cause the long-run BoP-constrained rate of growth $\hat{Y}^E_{\kappa=\bar{\kappa}}$ to decrease. This is due to the fact that, *ceteris paribus*, a higher amount of foreign exchange collected via exports and net capital inflows will be used for servicing foreign debt rather than for feeding economic expansion and, hence, "paying" for the rising imports' bill.

Even though Moreno-Brid (2003) provides a more accurate accounting of the constraint posed by BoP outlays to peripheral economies' expansion, he still maintains θ_1 and θ_2 to be exogenous. The initial condition of unbalanced trade, however, implies that they change throughout the growth process. Other way around, similar to Barbosa-Filho (2001), the BoP-constrained growth rate $\hat{Y}^E_{\kappa=\bar{\kappa}}$ is endogenous and varies through time until a final "rest" position is finally achieved. Moreover, the models considered so far identify the growth rate of the periphery that is consistent with a sustainable

[9] Similar to Moreno-Brid (2003), Meyrelles Filho *et al*. (2013) analyze how different combinations of BoP-constrained growth rates and sustainable external debt may emerge from different compositions of foreign capital, i.e., whether international lending prevails or not over non-debt flows, say FDI. In a series of numerical simulations, they show that a higher contribution of FDI to net capital inflows to the periphery may lift periphery's sustainable long-run growth upward. This final result may change in presence of FDI-related profit repatriations and/or international dividends transfers though. In this case, increasing negative net primary income balances would need ever rising FDI or hardly sustainable foreign credit to compensate for the ensuing worsening overall current account deficits.

[10] In this version of the BoP-constrained growth model, we use the symbol κ instead of ρ to better identify the case where net current income transfers are explicitly separated and disentangled from capital flows.

external position. However, they do not explain how *actual* growth $\hat{Y}$ converges to $\hat{Y}^E_{\kappa=\bar{\kappa}}$. In Barboza-Filho (2001), for instance, the self-stabilizing dynamics of actual growth towards the long-run equilibrium is introduced by assumption. The economic mechanisms behind it are not spelled out in detail though. A more realistic description of peripheral economies' macro dynamics should consider that international capital may well influence the growth rate of the economy consistent with sustainable foreign debt as well as its actual one. In the case of the latter, foreign capital very frequently affects ED countries' growth in boom-and-boost fashion leading it to temporarily depart from its long-run "attractor" $\hat{Y}^E_{\kappa=\bar{\kappa}}$. The BoP-constrained growth model we present in Section 3 deals with these two issues.

3. Capital flows, actual growth and the adjustment towards the BoP-constrained equilibrium

A fundamental goal of our paper is to describe the adjustment mechanism through which actual growth $\hat{Y}$ may converge to its long-run attractor $\hat{Y}^E_{\kappa=\bar{\kappa}}$. More than this, we want to explicitly show how international finance, the evolution of the current account balance (to-GDP ratio), and of foreign creditors' perceived risk about periphery's external position may be the leading forces behind the transition towards the long-run equilibrium. To this end, let's assume that actual economic dynamics in the periphery follows what assumed in Lavoie (2006) and mathematically formalized in equation (11):

$$\hat{Y} = a - bi \qquad (11)$$

Equation (11) is nothing but a modified version of the very standard IS curve where actual economic growth in the periphery (instead of output level) is a negative function of the nominal interest rate "i". Parameter "b" captures economic growth's sensitivity to the interest rate. "a", instead, catches all those at least partially exogenous components of demand that contribute to growth regardless of the interest rate.

In a peripheral economy that is (partially) opened to international capital flows and influenced by the state of global finance, it is reasonable to assume that the domestic interest rate is a positive function of the one prevailing in the center (i^*), as well as of the country-factor risk that international creditors attach to the periphery itself. International creditors, for instance, may consider the external position of peripheral economies to be riskier the higher is the current account deficit-to-GDP ratio (κ). More formally, we have:

$$i = \chi(i^* + \phi(\kappa)) \qquad (12)$$

With $\chi'(.) > 0$ and $\phi_\kappa > 0$

Once described in a very simple way the actual economic dynamics of the periphery, let's focus on the evolution of the current account balance-to-GDP ratio. Under the assumption of a constant real exchange rate, it is easy to see that $\kappa = (EP^*K/PY)$ evolves according to the law of motion (13) reported below:

$$\hat{\kappa} = \left(\hat{K} - \hat{Y}\right) \qquad (13)$$

From equation (9), taking foreign capital as the adjusting variable that allows the periphery to run a current account deficit, we have:

$$\hat{K} = \frac{h}{(1-\theta_1+\theta_2)}\hat{Y} + \frac{\theta_2\hat{R}}{(1-\theta_1+\theta_2)} - \frac{f\theta_1}{(1-\theta_1+\theta_2)}\hat{Z} \qquad (14)$$

Equation (14) simply clarifies that net capital inflows must rise faster the higher is actual peripheral growth $\hat{Y}$ (since also imports will increase faster), and in presence of more pronounced increases in the debt service burden $\hat{R}$. A more substantial increase in peripheral countries' exports will in turn reduce peripheral countries' search for additional external funding. If we plug equation (14) into (13), we get:

$$\hat{\kappa} = \frac{h}{(1-\theta_1+\theta_2)}\hat{Y} + \frac{\theta_2\hat{R}}{(1-\theta_1+\theta_2)} - \frac{f\theta_1}{(1-\theta_1+\theta_2)}\hat{Z} - \hat{Y}$$

It is now easy to see that $\hat{\kappa} > 0$ if $\frac{h}{(1-\theta_1+\theta_2)}\hat{Y} + \frac{\theta_2\hat{R}}{(1-\theta_1+\theta_2)} - \frac{f\theta_1}{(1-\theta_1+\theta_2)}\hat{Z} - \hat{Y} > 0$, which corresponds to $\hat{Y} > \frac{f\theta_1\hat{Z}-\theta_2\hat{R}}{h-(1-\theta_1+\theta_2)} = \hat{Y}^E_{\kappa=\bar{\kappa}}$. In a very simple way, we can restate the low of motion of the current account deficit-to-GDP ratio as a (positive) function of the gap between actual growth $\hat{Y}$ and the long-run BoP-constrained one $\hat{Y}^E_{\kappa=\bar{\kappa}}$:

$$\dot{\kappa} = \kappa\left(\hat{K} - \hat{Y}\right) = \kappa\xi\left(\hat{Y} - \hat{Y}^E\right) = \kappa\xi\left(\hat{Y}(\kappa) - \frac{f\theta_1\hat{Z}-\theta_2\hat{R}(\kappa)}{h-(1-\theta_1+\theta_2)}\right) \qquad (15)$$

In equation (15), "dot" variables stand for derivatives with respect to time. We also suppres the subfix $\kappa = \bar{\kappa}$ so that $\hat{Y}^E = \hat{Y}^E_{\kappa=\bar{\kappa}}$ in order to keep notation as simple as possible. Finally, we assume that the growth rate of the debt service $\left(\hat{R}\right)$ is a positive function of the current account-to-GDP ratio κ. In fact, consistent with equation (12), whenever peripheral countries incur in larger current account deficits, international creditors get more skeptical about the sustainability of such external position. They adjust peripheral countries' risk upward and ask for a higher premium to keep on investing there. As a result of this, $\hat{R}$ will likely increase.

What about the definition of the BoP-constrained growth rate $\hat{Y}^E$? As said, given the initial condition of unbalanced trade, $\hat{Y}^E$ changes endogenously all along the traverse towards its final rest position. If we take $\hat{Y}^E$ from equation (10) and differentiate it with respect to time, we get:

$$\dot{\hat{Y}}^E = \frac{(f\hat{Z}\dot{\theta}_1-\hat{R}\dot{\theta}_2)}{[h-(1-\theta_1+\theta_2)]} - \frac{\hat{Y}^E(\dot{\theta}_1-\dot{\theta}_2)}{[h-(1-\theta_1+\theta_2)]} = \frac{1}{[h-(1-\theta_1+\theta_2)]}\left[\left(f\hat{Z}\dot{\theta}_1 - \hat{R}\dot{\theta}_2\right) - \hat{Y}^E\left(\dot{\theta}_1 - \dot{\theta}_2\right)\right]$$

If we define $\dot{\theta}_1 = \theta_1(f\hat{Z} - h\hat{Y})$ and $\dot{\theta}_2 = \theta_2(\hat{R} - h\hat{Y})$, and we substitute them into the above expression, we finally get:

$$\dot{\hat{Y}}^E = \frac{1}{[h-(1-\theta_1+\theta_2)]}\left\{\left[f\hat{Z}\theta_1\left(f\hat{Z} - h\hat{Y}\right) - \hat{R}\theta_2\left(\hat{R} - h\hat{Y}\right)\right] - \hat{Y}^E\left[\theta_1\left(f\hat{Z} - h\hat{Y}\right) - \theta_2\left(\hat{R} - h\hat{Y}\right)\right]\right\} \qquad (16)$$

Equations (15) and (16) form a complex non-linear system of two differential equations. They generate complex dynamics in the space for $\left(\kappa, \hat{Y}^E\right)$. The features and the stability properties of such a system can be understood by studying the Jacobian matrix (J) that grasps the partial derivatives (evaluated in the steady state) of equations (15) and (16) with respect to "κ" and "$\hat{Y}^E$":

$$J = \begin{array}{c} \dot{\kappa} \\ \dot{\hat{Y}}^E \end{array} \begin{bmatrix} J_{\kappa,\kappa} & J_{k,\hat{Y}^E} \\ J_{\hat{Y}^E,\kappa} & J_{\hat{Y}^E,\hat{Y}^E} \end{bmatrix} \qquad (17)$$

We provide a complete and detailed formal analysis of the components of the Jacobian matrix (17) and, hence, of the stability of the system in the mathematical Appendix A.1. In what follows, instead, we focus on the economic interpretation of the dynamics and of the possibly multiple equilibria characterizing it via standard phase diagrams.

Based on the assumptions underlying equations (15) and (16), the partial derivative $J_{\kappa,\kappa} = (\partial\dot{\kappa}/\partial\kappa)$, once evaluated at the steady state, can be either positive or negative. On the one hand, a higher current account deficit-to-GDP ratio will slow down actual growth $\hat{Y}$ due to its detrimental effect on the country factor risk and, hence, via equation (12), on the domestic interest rate "i". On the other hand, it will also reduce the long-run BoP-constrained growth rate $\hat{Y}^E$ by accelerating the evolution of debt service payments $\hat{R}$. Quite reasonably, we may assume that $\left(\partial\hat{R}/\partial\kappa\right) \approx 0$ when both κ and, hence, external liabilities are low. In this case, foreign lenders have little to fear about the sustainability of periphery's external position. On the contrary, $\left(\partial\hat{R}/\partial\kappa\right) > 0$ may become increasingly positive at higher values of κ when, say, $(\kappa > \tilde{\kappa})$, and periphery's external position becomes "shacky". In the end, If the former effect prevails on the latter, $J_{\kappa,\kappa}$ will turn out to be negative: a higher current account deficit-to-GDP ratio will have a stabilizing effect on its own dynamics. In the opposite case, instability will kick in.

The sign of the partial derivative $J_{k,\hat{Y}^E} = \left(\partial\dot{\kappa}/\partial\hat{Y}^E\right)$ is more straightforward. From equation (15), it immediately emerges as positive. Combining $J_{\kappa,\kappa}$ to $J_{k,\hat{Y}^E}$, we can infer the slope of the isocline for $(\dot{\kappa} = 0)$. Based on our discussion above, $(\dot{\kappa} = 0)$ may either slope downward or take the form of a U-shaped curve if $\left(\partial\hat{R}/\partial\kappa\right) > \left|(\partial\hat{Y}/\partial\kappa)\right|$ when $(\kappa > \tilde{\kappa})$ – see the mathematical analysis of this point in Appendix A.1.

The study of the shape of the isocline for $(\dot{\hat{Y}}^E = 0)$ is quite articulated. Once again, it is fully developed in the mathematical Appendix A.1. For the time being, suffice to say that, under reasonable assumptions, the combination of $\left(\kappa, \hat{Y}^E\right)$ values such that $\hat{Y}^E$ is constant takes the form of an inverted U-shaped curve[11].

The phase diagram representing the long-run evolution of the periphery puts together the two isoclines for $(\dot{\kappa} = 0)$ and $(\dot{\hat{Y}}^E = 0)$. In Figure 1, we portray the scenario in which the locus for $(\dot{\kappa} = 0)$ is downward-sloped. In Figure 2, instead, we have the case of a U-shaped isocline for $(\dot{\kappa} = 0)$. What is relevant, from an economic point of view, is that the long-term dynamics in the periphery may be characterized by the existence of two different equilibria with different stability properties. Point A in Figures 1 and 2 stands for a "virtuous" locally stable equilibrium in which the periphery is characterized by a high actual and long-run BoP-constrained growth rate ($\hat{Y} = \hat{Y}_A^E$) and, at the same time, a low current account deficit-to-GDP ratio κ_A. Consistent with McCombie and Thirlwall (1997) and Moreno-Brid (1998), this implies a low external debt-to-GDP ratio. Overall, the external position of the periphery is solid, and the domestic interest rate is low. The ensuing fast economic dynamics increase the probability of center-periphery convergence. Moreover, small shocks that could temporarily move the periphery away from equilibrium A won't have long-lasting repercussions. Local stability implies that the economy will eventually return to point A.

[11] As discussed in full details in Appendix A.1, such result hinges upon the self-stabilizing effect of $\hat{Y}^E$ over its own dynamics. This in turn requires that, in equilibrium, $\dot{\theta}_1 > \dot{\theta}_2$. From a mathematical point of view, in an infinite time horizon with $t \to \infty$, such condition may ultimately lead to $(1 - \theta_1 + \theta_2) < 0$. This fact, however, would be inconsistent with the very existence of a current account deficit, as $(1 - \theta_1 + \theta_2) < 0$ implies an external surplus instead. From an economic point of view, this result is line with Barbosa-Filho (2001). It simply means that in countries that feature a high dependence on imported goods, (i.e., $h > 1$), external stability will inevitably force them to run balanced or, as in our case, surplus trade (or current account) balances. Put in a different perspective, the very long-run sustainability of the growth process in the periphery is achievable only via the structural change of its own economy. This will imply, among other things, a progressive reduction of the dependency on imported goods and, therefore, of the import income elasticity (i.e., h will progressively tend towards values closer or even lower than one). In this paper, we assume that the time horizon of our model is in line with the one considered by Perez Caldentey and Moreno-Brid (2019), for whom "semi-industrialized nations have been on long-term growth paths with persistent trade deficits whose magnitudes do not expand significantly relative to GDP (Perez Caldentey and Moreno-Brid, 2019, p.478)". In a way, we could say that our long-run view goes well beyond the mere business cycle but does not extend that far until the end of time!

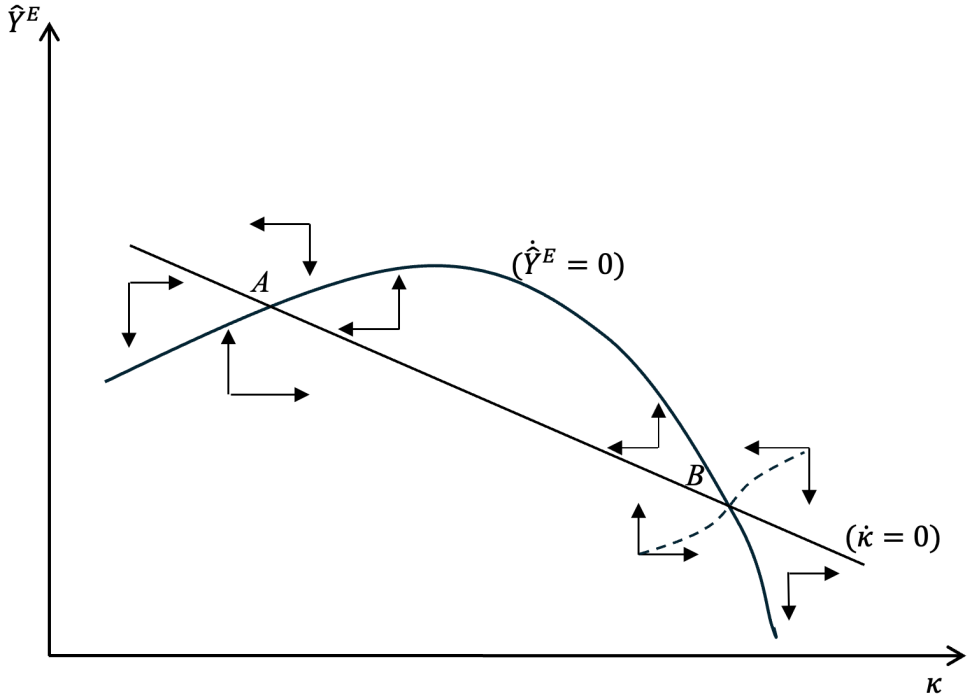

Figure 1 – Periphery's long-run equilibria in the case of a downward-sloped isocline for $(\dot{\kappa} = 0)$.

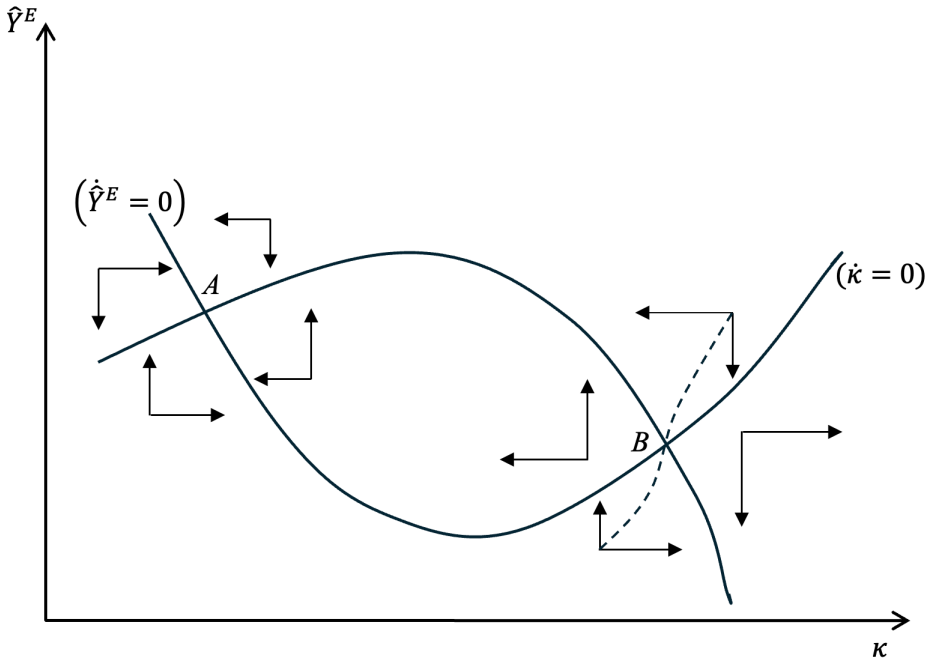

Figure 2 – Periphery's long-run equilibria in the case of a U-shaped isocline for $(\dot{\kappa} = 0)$.

Differently from A, point B represents a "bad" equilibrium in which slower growth $(\hat{Y} = \hat{Y}_B^E)$ is associated to a higher current account deficit-to-GDP ratio. The latter curbs the former by raising the interest rate bill that the periphery has to pay on accumulated external liabilities. In this scenario, the periphery will more likely fall behind the center. Perhaps more importantly, point B is characterized by saddle-path instability. Whenever the economy is shocked and moved away from equilibrium B, it will permanently drift away from it unless ad-hoc policies manage to locate the economy on the

specific adjustment path (dashed thin black line in Figures 1 and 2) driving back to point *B*. In this sense, note that an even temporary shock that moves the economy to the right of point *B* could trigger off unsustainable economic dynamics where a constantly rising current account deficit-to-GDP ratio associates with plummeting long-run growth. This process will inevitably conduce to crisis and default on rising external debt.

4. Exposure to global financial cycles and the long-run consequences of financial "bonanza"

An expanding body of studies address the effects of global financial cycles and episodes of financial "bonanza" over peripheral economies. Switches in global finance's moods and/or policy changes in the center first affect medium-term macro performance and available policy options in the periphery (Ocampo, 2015; Rey, 2015). Global cyclical dynamics may reverberate in "local" economic cycles. Initial periods of financial "exuberance", i.e., credit, real estate and stock exchange booms, lead to economic expansions and high-growth spells. A move to more cautious if not pessimistic "sentiments" may then trigger off credit retrenchments, the burst of asset bubbles and, ultimately, (abrupt) economic downturns. Other works point to the structural consequences of financial "bonanza" over the productive and technological capabilities of peripheral countries by spotting the case for finance-led premature de-industrialization (Benigno *et al.*, 2015; Botta *et al.*, 2023).

In order to capture some of these effects in the context of our model, let assume that there is a substantial reduction in the international interest rate "i^*" as a consequence of bold expansionary monetary policy in the center. Alternatively, we could also think about an exogenous reduction in the risk aversion of international investors (i.e., a lower ϕ) given abundant liquidity in international financial markets. Both cases could well represent ultra-expansionary monetary stances and quantitative easing in the center in the aftermath of the 2007-2008 financial shock. On the one hand, these shocks give momentum to economic growth in the periphery – see equations (11) – (12). On the other hand, if surges in net capital inflows to the periphery last long enough, they could jeopardize productive and technological development by causing the premature de-industrialization and re-primarization of the economies. This may happen if large capital inflows lead to an appreciated *level* of the real exchange rate (Rodrik and Subramanian, 2009; Oreiro *et al.*, 2020; Sait çakir and Aydemir, 2022). Moreover, international capital often feeds the relative expansion of non-tradable sectors, real estate for instance, with respect to tradable non-traditional ones (Chui *et al.*, 2016; Perez Caldentey *et al.*, 2019). In the end, whilst actual economic growth $\hat{Y}$ may temporarily jump up, export potential may be permanently compromised (i.e., export income elasticity "f" decreases) and the economy becomes more dependent on imports (i.e., import income elasticity "h" rises).

In our model, we can qualitatively assess the macro implications of these finance-led phenomena via shifts of the two isoclines for $(\dot{\kappa} = 0)$ and $(\dot{\hat{Y}}^E = 0)$. For the sake of the exposition, we focus on Figure 2 only, but nothing would change if we considered Figure 1 instead. Let consider the locus for $(\dot{\kappa} = 0)$ first. *Ceteris paribus*, the finance-led acceleration in peripheral economy's *actual* growth above the initial equilibrium (either in point *A* or *B*) causes a first-round deterioration of the current account balance (i.e., $\dot{\kappa} > 0$). The worsening of the current account balance is further reinforced by the reduction in parameter "f" and the parallel increase in "h". In fact, both tend to reduce the long-run BoP-constrained growth rate $\hat{Y}_B^E$. Based on the effects κ produces on its own evolution $(\dot{\kappa})$ when the locus for $(\dot{\kappa} = 0)$ is U-shaped, stabilizing the current account deficit-to-GDP ratio and counter-acting the effects of financial bonanza requires the isocline for $(\dot{\kappa} = 0)$ to move upward. Indeed, insofar as $J_{\kappa,\kappa} < 0$, a higher value of κ will tend to reduce $(\dot{\kappa})$ and bring it back equal to zero. When $J_{\kappa,\kappa}$ turns positive, on the contrary, κ must decrease to stabilize $(\dot{\kappa})$. Figure 3 portrays the finance-led upward move of the locus for $(\dot{\kappa} = 0)$ – see red dashed U-shaped curve. Appendix A.2 provides a formal mathematical analysis of this process instead.

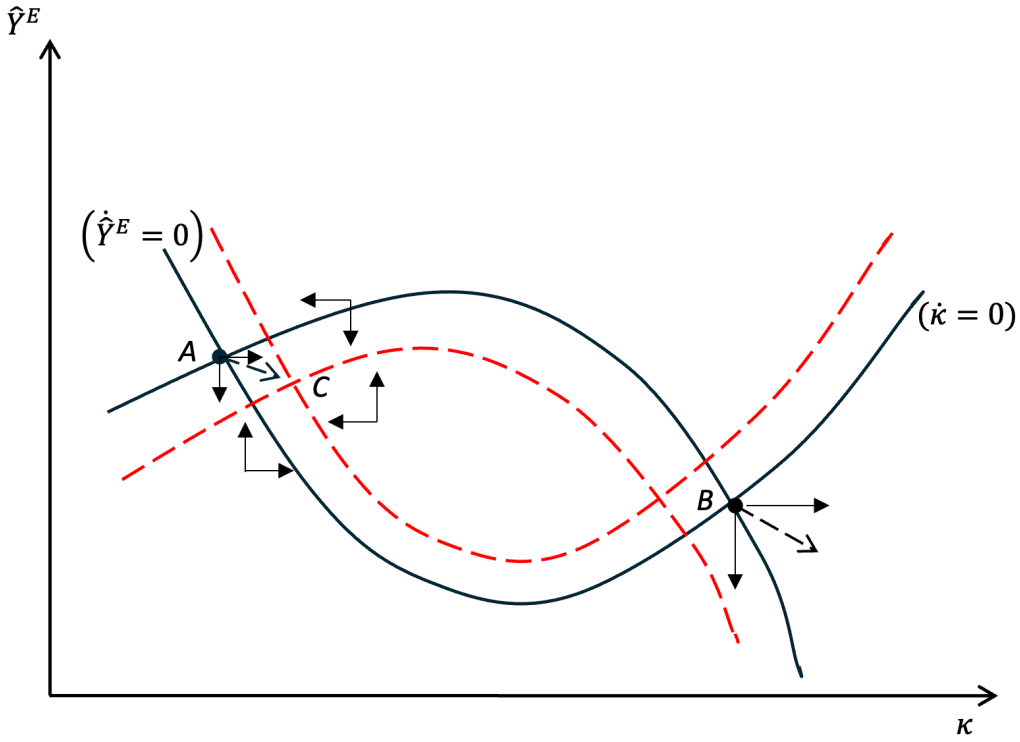

Figure 3 – Finance-led premature de-industrialization and the implication for long-run economic dynamics in the periphery

When we move the attention to the isocline for $(\dot{\hat{Y}}^E = 0)$, large capital inflows influence the evolution of the endogenous BoP-constrained growth rate through several channels – see equation (16): the actual growth rate of the economy $\hat{Y}$; the structural parameters "f" and "h"; the evolution of θ_1 and θ_2. The final effect is hard to gauge. The formal analysis carried out in Appendix A.2, however, tells us that we could likely have $\left(\partial\dot{\hat{Y}}^E/\partial d_K\right) < 0$, where "d_K" stands for the variation in the external financial conditions of the periphery induced by the expansionary phase of the global financial cycle. From the mathematical study conducted in Appendix A.1, we also know that $J_{\hat{Y}^E,\hat{Y}^E} = \left(\partial\dot{\hat{Y}}^E/\partial\hat{Y}^E\right) < 0$: the BoP-constrained growth rate $\hat{Y}^E$ displays a stabilizing effect on its own dynamics. The combination of $\left(\partial\dot{\hat{Y}}^E/\partial d_K\right) < 0$ and $\left(\partial\dot{\hat{Y}}^E/\partial\hat{Y}^E\right) < 0$ bring us to conclude that an episode of financial "bonanza" will shift the locus for $(\dot{\hat{Y}}^E = 0)$ downward. We portray this in Figure 3 – see the red dashed inverted U-shaped curve.

What emerges in Figure 3 is a dismal long-term outcome of (temporary) surges in capital inflows to the periphery. Despite the initial economic acceleration, the periphery may eventually find itself stuck in a long-run equilibrium featuring a lower long-run BoP-constrained growth rate $\hat{Y}_C^E$ and a higher current account deficit-to-GDP ratio κ_C (hence a higher external debt burden) with respect to the pre-boom equilibrium. This undesirable outcome is represented by the new equilibrium C in Figure 3. More importantly, macro instability may unfold in the event the economy is initially located in the "bad" equilibrium B. From point B, peripheral countries may progressively move rightward and be caught in a process where worsening external imbalances and collapsing long-run growth

prospects will inevitably lead to default. Reverting this process will likely require the adoption of painful structural adjustment policies, tough public budget cuts for instance[12].

Our analysis suggests that increasing exposure to the global financial cycle and episodes of financial euphoria may narrow stability margins in the periphery, i.e., the region lying in between $(\dot{\kappa} = 0)$ and $(\dot{\hat{Y}}^E = 0)$ in Figure 3. Things can get even worse if the financial shock is strong and protracted enough such that the stability region completely disappears, and radical instability settles in. Figure 4 portrays this scenario. For some post-shock critical values of the structural parameters "f" and "h", the two isoclines for constant values of κ and $\hat{Y}^E$ may move far away from each other and not intersect any more. The system will not feature any equilibrium. Regardless from the initial condition the periphery is, whether in point A or point B, the economy will inevitably head rightward and progressively move closer to a situation of unsustainable external debt and, ultimately, default.

The fact that episodes of financial "bonanza" are usually temporary won't help that much either. When the initial financial boom is over, the two isoclines may well move back to their original positions or even generate wider stability regions at the cost of tough economic contractions that usually accompany the burst of financial bubbles. However, the process of premature de-industrialization the periphery has gone through in the meantime may be largely irreversible (Cimoli *et al.*, 2020). Lower productive and technological capabilities (i.e., lower "f" and higher "h") with respect to the pre-shock scenario will permanently drag the long-term BoP-constrained equilibrium down. Moreover, stabilizing forces may kick in too late after the periphery is already outside any credible stability region, i.e., it has moved to the right of point B. In this scenario, default cannot be avoided any more.

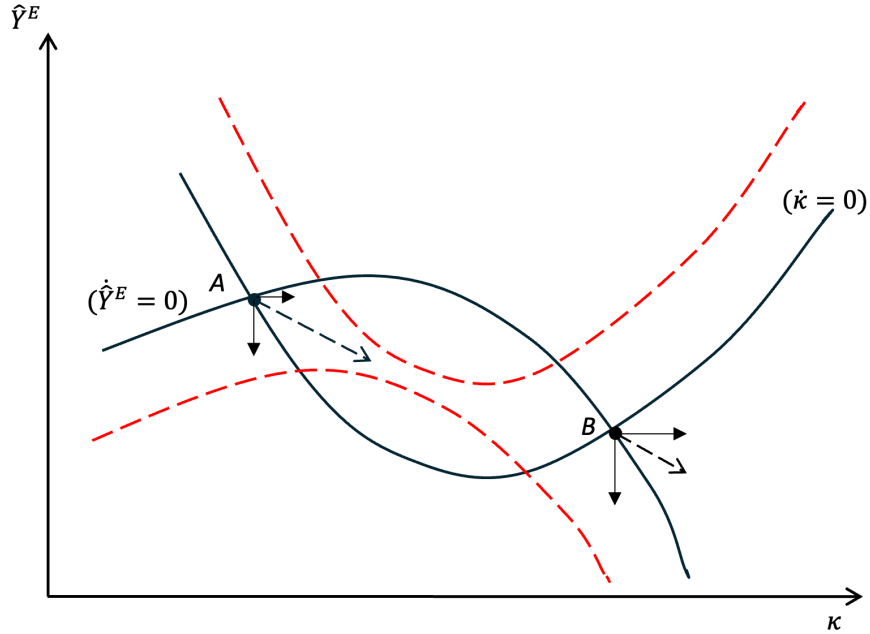

Figure 4 – The case for no equilibria and radical finance-led instability

Figure 5 finally synthetizes, from a graphical point of view, the short-run gains and long-run pains of temporary surges in capital inflows to the periphery. More specifically, it tracks the possible evolution of actual growth $\hat{Y}$ when the economy moves from equilibrium A to the new equilibrium C (see Figure 3) as a consequence of an episode of financial bonanza. The economy initially grows at the BoP-

[12] In this model, we may represent upfront fiscal consolidation as substantial reductions in parameter "a" in equation (11). This could certainly cause economic slowdown if not deep recession. However, via equation (15) it could also restore external sustainability by contributing to reduce the current account deficit.

constrained rate $\hat{Y}_A^E$. Financial bonanza starts at time "$t^{fin.boom}$" and lifts actual growth up well above the original long-run equilibrium value. Growth acceleration brings winder external imbalances and the accumulation of a higher stock of external debt (to-GDP ratio) with it. The deterioration in the external position of the economy induces the positive effect of the expansionary global finance over the domestic interest rate to progressively fade away. The domestic interest rate "*i*" rises dragging actual growth down. The possible structural consequences of the financial boom over the productive structure of the periphery manifest themselves in the meantime. Lower export capabilities (lower "*f*") and higher dependency on imports (higher "*h*") cause the reduction of the BoP-constrained growth rate from $\hat{Y}_A^E$ to $\hat{Y}_C^E$. Economic dynamics will finally converge towards such a new "inferior" long-term growth path with respect to the initial one. The economy will end up burdened by a higher stock of external debt and caught in an enduring (at least relative) stagnation trap.

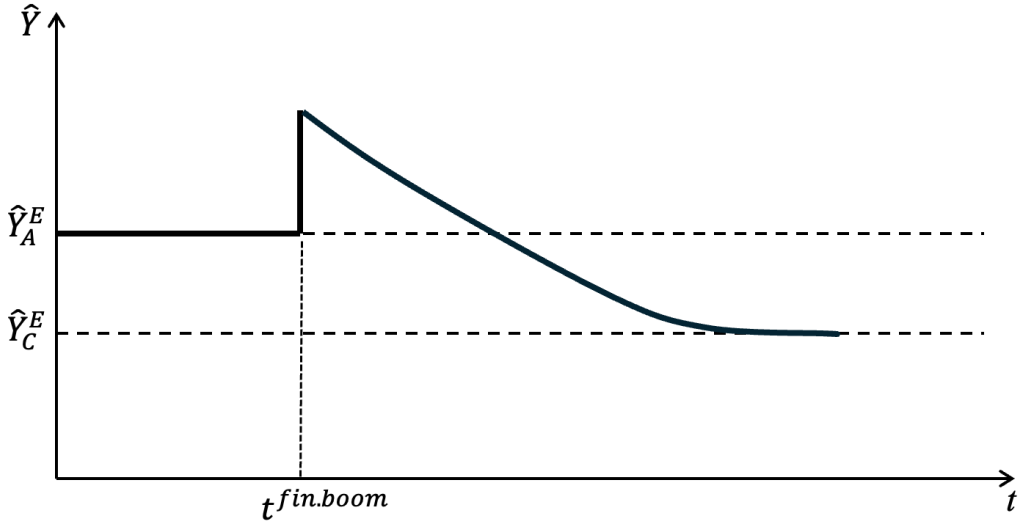

Figure 5 – Actual growth in the periphery before and after financial bonanza

Note that financial bonanza may generate even more pronounced long-run "growth losses" than what portrayed in Figure 5 in the event it triggers off radically unstable macro-financial dynamics (see Figure 4) that usually come along with heightened growth volatility and abrupt contractions on top of lasting stagnation. The long history of (finance-led) ED countries' crises and lost decades (or so) should vividly remind us of the risks of ephemeral and short-lived periods of financial euphoria.

5. Final remarks

In this paper, we contribute to the literature on BoP-constrained growth by presenting a theoretical model in which international finance plays a leading role in the determination of the long-run equilibrium and of the transition towards it. In this model, given the initial condition of unbalanced trade, the BoP-constrained growth rate of the economy evolves endogenously until it achieves the final "rest" position. The adjustment of actual growth to the BoP-constrained one is driven by the co-evolution of the current account deficit-to-GDP ratio, the accumulation of external debt, and peripheral countries' (perceived) financial risk. Multiple equilibria may exist in the long run, so that economic shocks may bear lasting consequences on the growth trajectory of the economy and path dependence take place.

Given this framework, we discuss the possible outcomes of peripheral countries' exposure to global financial cycles and periods of (temporary) financial bonanza. If we extend our analysis beyond initial finance-led economic spurts, the macro-financial environment of the periphery may

well worse off with respect to the pre-boom one since that a more fragile external position may eventually drag economic growth down. This is even the more so if surges in capital inflows bring about "regressive" changes in the productive structure of ED countries by feeding cases of premature de-industrialization and/or re-primarization. If strong and protracted enough, radical instability may ensue leading the initial boom to end up in a crash.

These findings are consistent with the expanding body of empirical literature casting doubts on the desirability of increasing integration in the global financial system. Moreover, they implicitly support the arguments in favor of the adoption of capital account management policies, namely capital controls. Capital controls may first help to smooth finance-led business cycles by taming initial booms and increasing resilience to bursts (Erten and Ocampo, 2016). They do so by giving domestic macro policies, monetary policy in particular, more degrees of autonomy. Capital controls allow monetary policy to more easily take counter-cyclical stances (restrictive during booms and expansionary in downturns) with less risk of turning self-defeating, i.e., encouraging even larger capital inflows (outflows) in the expansionary (contractionary) phase of the cycle. In terms of our model, capital controls reduce the sensitivity of the domestic interest rate "i" to foreign interest "i^*" and to country risk "ϕ". In times of abundant cheap liquidity in international financial markets, domestic monetary authorities can raise the domestic interest rate without fear of carry trade getting momentum and larger foreign capital pouring into the economy. In terms of Figure 5, this will certainly curb the initial finance-led expansion. However, it will also avoid winder external imbalances to emerge together with the ensuing negative consequences on long-run growth. Lower short-term growth is the price that is certainly worth paying to achieve a more sustained long-run BoP-constrained one.

Capital controls may also complement industrial policy aimed at fostering productive and technological progress in the periphery. Capital controls, for instance, tend to counteract pressures to overvalued real exchange rates during financial booms (Erten and Ocampo, 2016). More generally, they help ED countries to maintain stable and competitive *levels* of the real exchange rate, which may in turn support structural change and productive diversification. Capital controls may also alter the composition of foreign capital away from short-term portfolio debt flows towards more long-term production-oriented FDI (Ostry *et al.*, 2012). Capital controls can thus promote the development of production, technological and export capabilities if they stimulate FDI that expand "non-traditional" industries instead of primary commodities and low-tech low-skill labor-intensive ones. Policy makers should explicitly consider such possible sectorial implications and complementarity with industrial policy in the designing of capital controls. In our model, we can capture these last consequences of capital controls via changes in parameters "f" and "h". Whilst the former increases, the latter gets lower. Contrary to what portrayed in Figures 3 and 4, the isocline for $(\dot{\kappa} = 0)$ moves downward whilst that for $(\dot{\hat{Y}}^E = 0)$ moves up. These changes may first widen the stability region and reduce the likelihood of episodes of radical instabilities. Second, they may raise the BoP-constrained growth rate associated to equilibrium A. Third, they may induce economies originally located in equilibrium B to drift away from it and progressively move towards point A.

Consistent with the structuralist tradition, Chang and Lebdioui (2020) have recently argued that economic diversification is the most promising way to ensure macroeconomic stability. Structural change and productive/technological development are hardly the result of unfettered market forces, certainly not the financial ones. Deeper integration in the global financial system and episodes of financial bonanza can actually obstacle or even revert economic diversification. The effective implementation of a "developmentalist" policy agenda in the periphery requires the challenging integration and coordination of coherent industrial/technological and macro policies. Capital controls that may enable ED countries to pursue counter-cyclical macro stances stand out as crucial elements of such a toolkit.

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Mathematic Appendix

Appendix A.1

Section 3 of this paper presents a system of two non-linear differential equations, one for the current account deficit-to-GDP ratio κ (equation (15)), and the other for the long-run BoP-constrained growth rate of the periphery $\hat{Y}^E$ (equation (16)). The stability properties of this system can be captured by studying the Jacobian matrix (17) that we also report below for the sake of our exposition:

$$J = \begin{matrix} \dot{\kappa} \\ \hat{Y}^E \end{matrix} \begin{bmatrix} J_{\kappa,\kappa} & J_{k,\hat{Y}^E} \\ J_{\hat{Y}^E{}_{,\kappa}} & J_{\hat{Y}^E,\hat{Y}^E} \end{bmatrix} \qquad (17)$$

With $J_{\kappa,\kappa} = \left.\frac{\partial \dot{\kappa}}{\partial \kappa}\right|^E$; $J_{k,\hat{Y}^E} = \left.\frac{\partial \dot{\kappa}}{\partial \hat{Y}^E}\right|^E$; $J_{\hat{Y}^E{}_{,\kappa}} = \left.\frac{\partial \dot{\hat{Y}}^E}{\partial \kappa}\right|^E$; $J_{\hat{Y}^E,\hat{Y}^E} = \left.\frac{\partial \dot{\hat{Y}}^E}{\partial \hat{Y}^E}\right|^E$

Let's compute the partial derivatives included in matrix (17) one by one and study their signs according to the economic analysis carried out in the main text.

1) $J_{\kappa,\kappa} = \left.\frac{\partial \dot{\kappa}}{\partial \kappa}\right|^E = \kappa^E \xi\left(\hat{Y}_\kappa - \hat{Y}_\kappa^E\right) \lesseqgtr 0$ with $\hat{Y}_\kappa = \frac{\partial \hat{Y}}{\partial \kappa} < 0$; $\hat{Y}_\kappa^E = \frac{\partial \hat{Y}^E}{\partial \kappa} = -\frac{\theta_2 \hat{R}_\kappa}{h-(1-\theta_1+\theta_2)} < 0$

The partial derivative $J_{\kappa,\kappa} = (\partial \dot{\kappa}/\partial \kappa)|^E$ can be either positive or negative as both $\hat{Y}_\kappa$ and $\hat{Y}_\kappa^E$ are negative. Whilst an increase in κ will tend to have a stabilizing effect on its own dynamics via $\hat{Y}_\kappa$, destabilizing forces take place via $\hat{Y}_\kappa^E$. As discussed in the main text, we may reasonably assume that $\left(\partial \hat{R}/\partial \kappa\right) \approx 0$ and, hence, $\hat{Y}_\kappa^E \approx 0$ at low values of κ and of accumulated external liabilities. We might have $\left(\partial \hat{R}/\partial \kappa\right) > 0$ and $\hat{Y}_\kappa^E > 0$ at higher values of κ when, say, $\kappa > \tilde{\kappa}$ and periphery's external position is considered increasingly risky and hardly sustainable. If the former effect prevails on the latter, we will have $J_{\kappa,\kappa} < 0$. If $\hat{Y}_\kappa^E$ gets larger, in absolute value, than $\hat{Y}_\kappa$, $J_{\kappa,\kappa}$ will turn out to be positive instead (i.e., $J_{\kappa,\kappa} > 0$). We may have a more complex scenario with $J_{\kappa,\kappa} < 0$ for $\kappa < \tilde{\kappa}$ and $J_{\kappa,\kappa} > 0$ for $\kappa > \tilde{\kappa}$.

2) $J_{k,\hat{Y}^E} = \left.\frac{\partial \dot{\kappa}}{\partial \hat{Y}^E}\right|^E = -\kappa^E \xi < 0$. The partial derivative $J_{k,\hat{Y}^E}$ is certainly negative.

3) $J_{\hat{Y}^E,\hat{Y}^E} = \left.\frac{\partial \dot{\hat{Y}}^E}{\partial \hat{Y}^E}\right|^E = -\frac{[\theta_1(f\hat{Z}-h\hat{Y}^E)-\theta_2(\hat{R}-h\hat{Y}^E)]}{[h-(1-\theta_1+\theta_2)]} = -\frac{(\dot{\theta}_1^E-\dot{\theta}_2^E)}{[h-(1-\theta_1+\theta_2)]} < 0$

The sign of the partial derivative $J_{\hat{Y}^E,\hat{Y}^E}$, once evaluated at the equilibrium, is apparently uncertain. Whilst the denominator is assumed to be positive to have economically meaningful values of the long-run BoP-constrained growth rate of the periphery, the sign of the numerator is initially unknown. However, using the definition of the current account deficit-to-GDP ratio (EP^*K/PY), we have:

$$\frac{EP^*K}{PY} = \frac{EP^*M}{PY} + \frac{EP^*R}{PY} - \frac{PX}{PY} = \frac{EP^*M}{PY} + \theta_2 \frac{EP^*M}{PY} - \theta_1 \frac{EP^*M}{PY} = (1-\theta_1+\theta_2)\frac{EP^*M}{PY}$$

Using the equation for the volume of peripheral imports $M = Q^{-b}Y^h$, we get:

$$\frac{EP^*K}{PY} = (1-\theta_1+\theta_2)Q^{(1-b)}Y^{(h-1)}$$

Under the assumption that "Q" is constant and that the imports' income elasticity "h" is higher than 1, a stable current account deficit-to-GDP ratio requires that $(1-\theta_1+\theta_2)$ decreases whenever Y rises. Other way around, in a growing economy, stability in the current account deficit-to-GDP ratio requires $(-\dot{\theta}_1+\dot{\theta}_2<0)$, that is $\dot{\theta}_1>\dot{\theta}_2$. The numerator of the partial derivative $J_{\hat{Y}^E,\hat{Y}^E}$ is positive, so that $J_{\hat{Y}^E,\hat{Y}^E}<0$.

4) $J_{\hat{Y}^E,\kappa}=\frac{1}{[h-(1-\theta_1+\theta_2)]}\{-\theta_1 f\hat{Z}h\hat{Y}_\kappa-\hat{R}_\kappa\dot{\theta}_2^E-\theta_2\hat{R}(\hat{R}_\kappa-h\hat{Y}_\kappa)-\hat{Y}_\kappa^E(\dot{\theta}_1^E-\dot{\theta}_2^E)-\hat{Y}^E[-\theta_1 h\hat{Y}_\kappa-\theta_2(\hat{R}_\kappa-h\hat{Y}_\kappa)]\}$

Manipulating a bit and collecting common terms in the above expression for $J_{\hat{Y}^E,\kappa}$, we get:

$$J_{\hat{Y}^E,\kappa}=\Gamma\left(\left\{\theta_2(\hat{R}_\kappa-h\hat{Y}_\kappa)(\hat{Y}^E-\hat{R})-\hat{R}_\kappa\dot{\theta}_{2SS}-\hat{Y}_\kappa\theta_1(hf\hat{Z}-h\hat{Y}^E)-\hat{Y}_\kappa^E(\dot{\theta}_1^E-\dot{\theta}_2^E)\right\}\right) \quad \text{(a.1)}$$

With $\Gamma=\frac{1}{[h-(1-\theta_1+\theta_2)]}$. The partial derivative $J_{\hat{Y}^E,\kappa}$ is the result of several counter-acting forces and gauging its final sign is not simple. However, our analysis is somehow facilitated by the fact that we can already attribute a clear sign to some of its components. More specifically:

(i) $\theta_1 f\hat{Z}h\hat{Y}_\kappa<0$

(ii) $\theta_2\hat{R}(\hat{R}_\kappa-h\hat{Y}_\kappa)>0$ since that $\hat{R}_\kappa>0$ and $\hat{Y}_\kappa<0$

(iii) $\hat{Y}_\kappa^E(\dot{\theta}_1^E-\dot{\theta}_2^E)<0$ since that $\hat{Y}_\kappa^E<0$ and $(\dot{\theta}_1^E-\dot{\theta}_2^E)>0$

(iv) $\theta_1 h\hat{Y}_\kappa<0$ since that $\hat{Y}_\kappa<0$

(v) $\theta_2(\hat{R}_\kappa-h\hat{Y}_\kappa)>0$ since that $\hat{R}_\kappa>0$ and $\hat{Y}_\kappa<0$

We can now make some conjectures based on what stated above as to the sign of some elements of equation (a.1) for $J_{\hat{Y}^E,\kappa}$:

(vi) When the perceived macro-financial risk of the periphery is (perceived as) low at correspondingly low values of the current account deficit-to-GDP ratio κ, we can reasonably assume that $\hat{Y}^E>\hat{R}$. The BoP-constrained growth rate is higher than the growth rate of debt payments to foreign lenders. If so, $\theta_2(\hat{R}_\kappa-h\hat{Y}_\kappa)(\hat{Y}^E-\hat{R})>0$. Things may change at higher levels of κ. The increase in the current account deficit-to-GDP ratio first induces $\hat{Y}^E$ to decrease given that the periphery has to take care of a heavier debt service. Second, the debt service itself may rise fast given increasingly pessimistic foreign lenders about the sustainability of periphery's external debt. More likely, $(\hat{Y}^E-\hat{R})$ turns negative and so $\theta_2(\hat{R}_\kappa-h\hat{Y}_\kappa)(\hat{Y}^E-\hat{R})$ does.

(vii) In a debtor economy burdened by external debt service payments, overall macroeconomic stability requires that the growth rate of exports exceeds that of imports. In mathematical terms, long-run stability implies $(f\hat{Z}-h\hat{Y}^E)>0$. If so, also $(hf\hat{Z}-h\hat{Y}^E)$ is positive. In fact, one can easily verify that $(hf\hat{Z}-h\hat{Y}^E)>(f\hat{Z}-h\hat{Y}^E)>0$ if $(h-1)f\hat{Z}>0$, which is normally the case in peripheral countries with $h>1$. In the end, $[-\hat{Y}_\kappa\theta_1(hf\hat{Z}-h\hat{Y}^E)]$ turns out to be positive in equation (a.1) given that $\hat{Y}_\kappa<0$.

(viii) $\hat{R}_{\kappa}\dot{\theta}_2^E$ is a negative entry in the equation (a.1) – after considering the negative sign in front of it – unless $\dot{\theta}_2^E < 0$. It is reasonable to think that $\dot{\theta}_2^E$ is positive and bigger at higher levels of κ. This element is relatively small when also the current account deficit-to-GDP ratio κ is low.

In the end, it is reasonable to think that $J_{\hat{Y}^E,\kappa} > 0$ when κ is rather low. Insofar as international investors trust peripheral countries to be macro-financially "sound", an increase in the current account deficit (mirroring larger net capital inflows) is associated with faster growth. Imports can rise relatively faster with respect to $\hat{R}$ in comparison to what happens in riskier macro environment featuring higher values of κ and $\hat{R}$. In this latter case, when international investors more likely developed pessimistic feelings and $\hat{R}$ may jump up, $J_{\hat{Y}^E,\kappa}$ easily turns into negative.

We are now in the condition to study the stability properties of the system based on the different signs the partial derivatives included in the Jacobian matrix (J) can take. We have two distinct scenarios, let's call them A and B and, hence, two different matrices J_A and J_B, corresponding to the two equilibria portrayed in Figures 2 and 3 in the main text. More specifically:

$$J_A = \begin{array}{c} \dot{\kappa} \\ \dot{\hat{Y}}^E \end{array} \begin{bmatrix} \overbrace{J^A_{\kappa,\kappa}}^{-} & \overbrace{J_{k,\hat{Y}^E}}^{-} \\ \underbrace{J^A_{\hat{Y}^E,\kappa}}_{+} & \underbrace{J_{\hat{Y}^E,\hat{Y}^E}}_{-} \end{bmatrix} \qquad \text{(a.2)}$$

$$J_B = \begin{array}{c} \dot{\kappa} \\ \dot{\hat{Y}}^E \end{array} \begin{bmatrix} \overbrace{J^B_{\kappa,\kappa}}^{+} & \overbrace{J_{k,\hat{Y}^E}}^{-} \\ \underbrace{J^B_{\hat{Y}^E,\kappa}}_{-} & \underbrace{J_{\hat{Y}^E,\hat{Y}^E}}_{-} \end{bmatrix} \qquad \text{(a.3)}$$

Matrix J_A corresponds to the "virtuous" equilibrium in Figures 1 – 3 featuring a low level of the current account deficit-to-GDP ratio κ_A and a high BoP-constrained growth rate $\hat{Y}_A^E$. In order to capture the stability properties in the neighborhood of point A, we have to consider the determinant and the trace of matrix J_A. We have:

$$\det.(J_A) = J^A_{\kappa,\kappa} J_{\hat{Y}^E,\hat{Y}^E} - J^A_{\hat{Y}^E,\kappa} J_{k,\hat{Y}^E}$$

$$Tr.(J_A) = J^A_{\kappa,\kappa} + J_{\hat{Y}^E,\hat{Y}^E}$$

Based on the study carried out above, it is easy to see that $\det.(J_A) > 0$ and $Tr.(J_A) < 0$. This means that point A is a stable node. The economy, if shocked away from point A, will progressively converge back to it.

When we move the attention to matrix J_B, it is associated to the "bad" equilibrium B portrayed in Figure 2, in which a high current account deficit-to-GDP ratio κ_B is associated to a low BoP-constrained growth rate $\hat{Y}_B^E$. In this case, the determinant of this matrix is:

$$\det.(J_B) = J^B_{\kappa,\kappa} J_{\hat{Y}^E,\hat{Y}^E} - J^B_{\hat{Y}^E,\kappa} J_{k,\hat{Y}^E} < 0$$

One can immediately verify that $\det.(J_B) < 0$ since that $J^B_{\kappa,\kappa}$ is now positive, whilst $J^B_{\hat{Y}^E,\kappa}$ becomes negative. Because of this, in Figure 2, the equilibrium point B is characterized by saddle-path

instability. Outside the equilibrium, the economy will depart away from it unless it gets located on the specific and unique trajectory (the saddle path) guiding it back to equilibrium.

In Figure 1, we portray the case of a straight downward-sloped isocline for $(\dot{\kappa} = 0)$. This scenario materializes whenever $|\hat{Y}_\kappa| > |\hat{Y}_\kappa^E|$ for $\forall\kappa$, so that $J_{\kappa,\kappa}$ is always negative. Two distinct equilibria may exist and, once again, saddle-path instability characterizes equilibrium B. The mathematical demonstration of this result is less straightforward than what done before. Indeed, the sign of $\det.(J_B)$ is now apparently uncertain, as both $J^B_{\kappa,\kappa}J_{\hat{Y}^E,\hat{Y}^E}$ and $J^B_{\hat{Y}^E,\kappa}J_{k,\hat{Y}^E}$ are positive, and it is unclear which one prevails. Saddle-path instability emerges if $J^B_{\hat{Y}^E,\kappa}J_{k,\hat{Y}^E} > J^B_{\kappa,\kappa}J_{\hat{Y}^E,\hat{Y}^E}$. We can prove this condition is fulfilled in point B in Figure 1 by studying the relative slope of the two isoclines for $(\dot{\kappa} = 0)$ and $(\dot{\hat{Y}}^E = 0)$. Take the isocline for $(\dot{\kappa} = 0)$ first, and totally differentiate it with respect to κ and $\hat{Y}^E$:

$\Psi = \dot{\kappa} = \xi\big(\hat{Y}(\kappa) - \hat{Y}^E(\kappa)\big) = 0$ so that:

$$\frac{\partial\Psi}{\partial\kappa}\bigg|^E d\kappa + \frac{\partial\Psi}{\partial\hat{Y}^E}\bigg|^E d\hat{Y}^E = 0 \rightarrow \frac{d\hat{Y}^E}{d\kappa}\bigg|_{\Psi=0} = -\frac{(\partial\Psi/\partial\kappa)|^E}{(\partial\Psi/\partial\hat{Y}^E)|^E} = -\frac{J^B_{\kappa,\kappa}}{J_{k,\hat{Y}^E}} < 0$$

When we move the attention to the isocline for $(\dot{\hat{Y}}^E = 0)$ and, once again, we totally differentiate it, we obtain:

$\Phi = \dot{\hat{Y}}^E\big(\kappa, \hat{Y}^E(\kappa)\big) = 0$ so that:

$$\frac{\partial\Phi}{\partial\kappa}\bigg|^E d\kappa + \frac{\partial\Phi}{\partial\hat{Y}^E}\bigg|^E d\hat{Y}^E = 0 \rightarrow \frac{d\hat{Y}^E}{d\kappa}\bigg|_{\Phi=0} = -\frac{(\partial\Phi/\partial\kappa)|^E}{(\partial\Phi/\partial\hat{Y}^E)|^E} = -\frac{J^B_{\hat{Y}^E,\kappa}}{J_{\hat{Y}^E,\hat{Y}^E}} < 0$$

The determinant $\det.(J_B)$ reads:

$$\det.(J_B) = J^B_{\kappa,\kappa}J_{\hat{Y}^E,\hat{Y}^E} - J^B_{\hat{Y}^E,\kappa}J_{k,\hat{Y}^E} = (\partial\Psi/\partial\kappa)|^E * \big(\partial\Phi/\partial\hat{Y}^E\big)\big|^E - (\partial\Phi/\partial\kappa)|^E * \big(\partial\Psi/\partial\hat{Y}^E\big)\big|^E.$$

It is easy to see that $\det.(J_B) < 0$ requires $-\frac{(\partial\Psi/\partial\kappa)|^E}{(\partial\Psi/\partial\hat{Y}^E)|^E} > -\frac{(\partial\Phi/\partial\kappa)|^E}{(\partial\Phi/\partial\hat{Y}^E)|^E}$. Saddle-path instability at equilibrium B in Figure 1 emerges if the (negatively sloped) locus for $(\dot{\kappa} = 0)$ is flatter than the (negatively sloped) locus for $(\dot{\hat{Y}}^E = 0)$. This is exactly what we have in Figure 1 in the main text.

Appendix A.2

The formal discussion of the effects of episodes of financial bonanza over peripheral countries' macro dynamics hinges upon the study of the implications a positive financial shock (d_K) may have on the position of the two isoclines for $(\dot{\kappa} = 0)$ and $(\dot{\hat{Y}}^E = 0)$.

Let's consider $(\dot{\kappa} = 0)$ first by taking its total differential with respect to κ and d_K. We get:

$\Psi = \dot{\kappa} = \xi\big(\hat{Y}(\kappa, d_K) - \hat{Y}^E(\kappa, d_K)\big) = 0$ so that:

$$\frac{\partial\Psi}{\partial\kappa}\bigg|^E d\kappa + \frac{\partial\Psi}{\partial d_K}\bigg|^E dd_K = 0 \rightarrow \frac{d\kappa}{dd_K} = -\frac{(\partial\Psi/\partial d_K)|^E}{(\partial\Psi/\partial\kappa)|^E} \lesseqgtr 0$$

With $\hat{Y}_{d_K} > 0$; $\hat{Y}^E_{d_K} = \frac{\theta_1 f_{d_K}\hat{Z} - h_{d_K}\hat{Y}^E}{[h-(1-\theta_1+\theta_2)]} < 0$ since that $f_{d_K} < 0$ and $h_{d_K} > 0$.

Based on the signs of the derivates reported above, we certainly have $\left.\frac{\partial\Psi}{\partial d_K}\right|^E = \kappa^E\xi\left(\hat{Y}_{d_K} - \hat{Y}^E_{d_K}\right) > 0$. Episodes of financial bonanza induce increases in the current account deficit-to-GDP ratio. Hence, we will have $\frac{d\kappa}{dd_K} = -\frac{(\partial\Psi/\partial d_K)|^E}{(\partial\Psi/\partial\kappa)|^E} > 0$ whenever $(\partial\Psi/\partial\kappa)|^E < 0$. This happens at equilibrium A in Figures 1 and 3, as well as at equilibrium B in Figure 1. On the contrary, $\frac{d\kappa}{dd_K} = -\frac{(\partial\Psi/\partial d_K)|^E}{(\partial\Psi/\partial\kappa)|^E} < 0$ if $(\partial\Psi/\partial\kappa)|^E > 0$. This is the case of equilibrium B in Figures 2 and 3 with the U-shaped isocline for $(\dot{\kappa} = 0)$. In the end, our analysis suggests that, because of the financial shock d_K, the locus for $(\dot{\kappa} = 0)$ will move upward in Figures 3 and 4.

If we now look at the isocline for $(\dot{\hat{Y}}^E = 0)$, we get:

$$\Phi = \dot{\hat{Y}}^E\left(\kappa, \hat{Y}^E, d_K\right) = 0$$

Take the total differential of $\Phi(.)$ with respect to $\hat{Y}^E$ and d_K:

$$\left.\frac{\partial\Phi}{\partial\hat{Y}^E}\right|^E d\hat{Y}^E + \left.\frac{\partial\Phi}{\partial d_K}\right|^E dd_K = 0 \rightarrow \left.\frac{d\hat{Y}^E}{dd_K}\right|_{\Phi=0} = -\frac{(\partial\Phi/\partial\hat{Y}^E)|^E}{(\partial\Phi/\partial d_K)|^E}$$

Whilst we already know that the sign of $\left(\partial\Phi/\partial\hat{Y}^E\right)|^E$ is negative, the sign of $(\partial\Phi/\partial d_K)|^E$ is less clear-cut. Taking equation (17) and its first derivative with respect to d_K, after some manipulations we get expression (a.4) below:

$$\left.\frac{\partial\Phi}{\partial d_K}\right|^E = \frac{\left(h_{d_K}\hat{Y} + h\hat{Y}_{d_K}\right)\left[\theta_2\left(\hat{R} - \hat{Y}^E\right) - \theta_1\left(f\hat{Z} - \hat{Y}^E\right)\right] + f_{d_K}\hat{Z}\theta_1\left[\left(f\hat{Z} - h\hat{Y}\right) + \left(f\hat{Z} - \hat{Y}^E\right)\right] - \hat{Y}^E{}_{d_K}\left(\dot{\theta}_1^E - \dot{\theta}_2^E\right)}{h - (1 - \theta_1 + \theta_2)} \qquad \text{(a.4)}$$

Given the presence of several elements that may compensate each other, let's make some conjectures:

(i) If we look at the first element in the right-hand side of equation (a.4), $\left(h_{d_K}\hat{Y} + h\hat{Y}_{d_K}\right) > 0$ since that $h_{d_K} > 0$ and $\hat{Y}_{d_K} > 0$.

(ii) The sign square brackets term $\left[\theta_2\left(\hat{R} - \hat{Y}^E\right) - \theta_1\left(f\hat{Z} - \hat{Y}^E\right)\right]$ is apparently uncertain. Note, however, that $\theta_2\left(\hat{R} - \hat{Y}^E\right)$ and $\theta_1\left(f\hat{Z} - \hat{Y}^E\right)$ closely resemble $\theta_2\left(\hat{R} - h\hat{Y}^E\right) = \dot{\theta}_2^E$ and $\theta_1\left(f\hat{Z} - h\hat{Y}^E\right) = \dot{\theta}_1^E$, respectively. We also know that $\theta_2\left(\hat{R} - \hat{Y}^E\right) > \dot{\theta}_2^E$ and $\theta_1\left(f\hat{Z} - \hat{Y}^E\right) > \dot{\theta}_1^E$. insofar as $h > 1$. As discussed above, in a growing economy, the long-run stability of κ requires $\dot{\theta}_1^E > \dot{\theta}_2^E$. Hence:

$$\theta_1\left(f\hat{Z} - h\hat{Y}^E\right) - \theta_2\left(\hat{R} - h\hat{Y}^E\right) > 0 \rightarrow \left(\theta_1 f\hat{Z} - \theta_2\hat{R}\right) - (\theta_1 - \theta_2)h\hat{Y}^E > 0.$$

We can thus write: $\left(\theta_1 f\hat{Z} - \theta_2\hat{R}\right) > (\theta_1 - \theta_2)h\hat{Y}^E > (\theta_1 - \theta_2)\hat{Y}^E$.
Given the above sequence of inequalities, we can safely say that $\left[\theta_2\left(\hat{R} - \hat{Y}^E\right) - \theta_1\left(f\hat{Z} - \hat{Y}^E\right)\right] = -\left[\left(\theta_1 f\hat{Z} - \theta_2\hat{R}\right) - (\theta_1 - \theta_2)\hat{Y}^E\right] < 0$ has a negative sign as the overall term $(h_{d_K}\hat{Y} + h\hat{Y}_{d_K})\left[\theta_2\left(\hat{R} - \hat{Y}^E\right) - \theta_1\left(f\hat{Z} - \hat{Y}^E\right)\right]$ does.

(iii) $f_{d_K}\hat{Z}\theta_1\left[\left(f\hat{Z} - h\hat{Y}\right) + \left(f\hat{Z} - \hat{Y}^E\right)\right] < 0$. In fact, given that long-run stability requires $\left(f\hat{Z} - h\hat{Y}^E\right) > 0$, the term in the square brackets is certainly positive. Since that $f_{d_K} < 0$ by assumption, the above term is overall negative.

(iv) Finally, ${\hat{Y}^E}_{d_F}\left(\dot{\theta}_1^E - \dot{\theta}_2^E\right) < 0$ since that $\left(\dot{\theta}_1^E - \dot{\theta}_2^E\right)$ must be positive and ${\hat{Y}^E}_{d_K}$ is negative by assumption. Overall, this term, given the minus sign in front of it, is a positive entry in the equation (a.4) for $\left.\frac{\partial \Phi}{\partial d_K}\right|^E$.

It is not possible to determine which element in equation (a.4) eventually prevails. However, if we reasonably assume that its multiple negative components dominate the last unique positive one, we most likely have $(\partial\Phi/\partial d_K)|^E < 0$. Given the self-stabilizing negative effect that $\hat{Y}^E$ displays over its own dynamics, we eventually obtain:

$$\left.\frac{d\hat{Y}^E}{dd_K}\right|_{\Phi=0} = -\frac{\overbrace{(\partial\Phi/\partial\hat{Y}^E)|^E}^{-}}{\underbrace{(\partial\Phi/\partial d_K)|^E}_{-}} < 0$$

When an episode of financial "bonanza" occurs and $d_K > 0$, $\hat{Y}^E$ must decrease to keep $(\dot{\hat{Y}}^E = 0)$. From a graphical point of view, the isocline for $(\dot{\hat{Y}}^E = 0)$ moves downward in Figures 3 and 4.