Capital Controls on Outflows: Empirical Evidence, Theory, and Policy Implications*

Roberto Chang
Rutgers University

Andrés Fernández
International Monetary Fund

Humberto Martínez
Universidad de Chile

First draft: August, 2024
This draft: August, 2025

Abstract

We provide novel empirical evidence linking financial crises and declines in GDP growth to capital controls on outflows (CCOs). Accordingly, we develop a theoretical framework that is consistent with such evidence and yields policy and welfare lessons. In the theory, suitable CCOs can rule out coordination failures by foreign investors. CCOs can be an optimal policy response even if they entail deadweight losses. But CCO policy is also plagued by time inconsistency and political opportunism. Hence government credibility and reputation building emerge as critical for the successful implementation of CCOs.

*We thank Suman Basu, Javier Bianchi, Kristin Forbes, Chris Erceg, Jesper Linde, Caio Machado, Erlend Nier, Tjoervi Olafsson, Annamaria Kokenyne, Marco Rodriguez, Hernando Vargas and participants in seminars held at the IMF, Bank of England, Central Bank of Chile, PUC-Chile, and Banco de la República. Felipe Rojas provided outstanding research assistance. Humberto Martínez gratefully acknowledges research support to the Chilean Comisión Nacional de Investigación Científica y Tecnológica through project Fondecyt de Iniciación en Investigación 2024 No. 11241286. The views expressed in this paper are those of the authors and do not represent those of the IMF, IMF Management, or its Executive Board.

1 Introduction

In recent years, academics and policymakers have increasingly reconsidered controls on cross-border capital flows as a potentially useful stabilization device. This renewed interest largely reflects evolving views and research findings about capital inflows indicating that, under some circumstances, it may be socially beneficial to impose controls to curb excessive foreign borrowing. A theoretical rationale is provided by macroeconomic models with pecuniary and aggregate demand externalities, where prudential inflow controls can sometimes help correct these distortions and improve welfare.[1] On the policy front, the International Monetary Fund (IMF)'s Institutional View on the Liberalization and Management of Capital Flows (IV) explicitly endorsed the use of capital flow management (CFM) policies on *inflows* during surge episodes (IMF 2012a), and in a 2022 update, endorsed also the prudential use of inflow CFMs in the absence of inflow surges, as long as stock vulnerabilities are present.

In contrast, efforts to reconsider controls on capital *outflows* (CCOs) have been virtually absent. This striking asymmetry likely reflects the widespread belief that CCOs are either expropriatory measures imposed by corrupt policymakers or last gasp maneuvres of sinking governments (Ghosh et al. 2020). Such a belief is in fact taken as a given in the first theoretical study on the subject by Bartolini and Drazen (1997), who modeled CCOs as signals of future bad behavior by governments.

Of course, the fact that CCOs are sometimes associated with corruption or financial despair does not rule out the possibility that, under other circumstances, CCOs can be socially useful and effective as a stabilization tool. In that regard, the IMF's IV says that *"in crisis situations, or when a crisis may be imminent, there could be a temporary role for the introduction of CFMs on outflows"* (IMF 2012a) but also stresses that *"CFMs on outflows, (...) often entail greater costs (...) including through, for example, more adverse effects on investor confidence"* (IMF 2022).

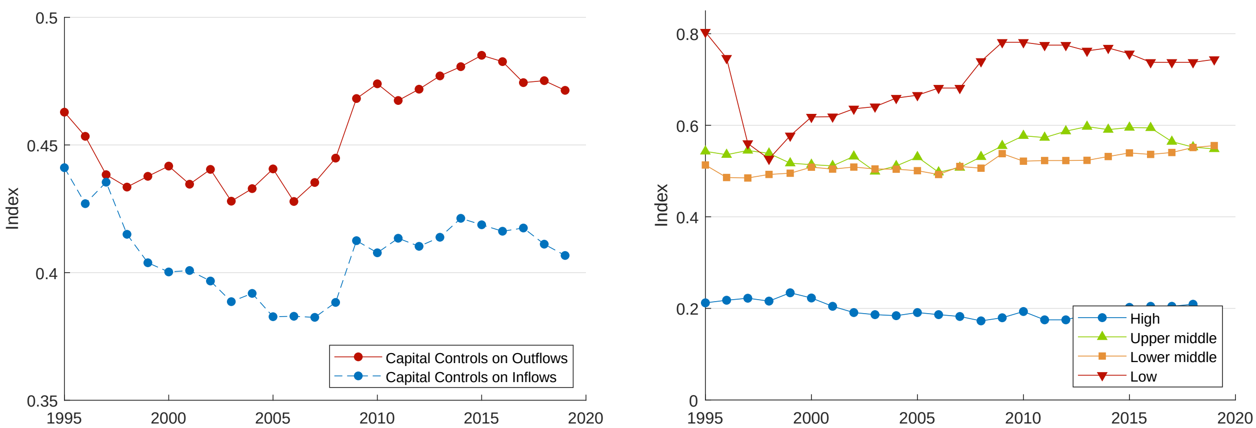
But whether CCOs can be justified to forestall a financial panic remains an open question. This has perhaps been best exemplified by the debate between Krugman's (1999) and Dornbusch (2001) about the desirability of Malaysia's CCOs in the middle of the Asian Financial Crisis. Moreover, to the best of our

[1] For early contributions on the use of controls linked to pecuniary externalities see Lorenzoni (2008), Korinek (2010), Jeanne and Korinek (2010), Bianchi (2011), Benigno et al. (2013). Models of controls motivated by aggregate demand externalities include the seminal work by Schmitt-Grohé and Uribe (2016), Farhi and Werning (2014), Farhi and Werning (2016). More recently, Basu et al. (2020) and Adrian et al. (2021) have modeled pecuniary and aggregate demand externalities within an integrated policy framework, when conventional and unconventional policies, including capital controls, are available.

knowledge, there is still no theoretical framework that explicitly incorporates both the potential benefits and the costs of CCOs. The debate therefore remains largely unsettled, complicating efforts to derive clear policy prescriptions.

The predominant focus in academic and policy debates on inflow measures contrasts with empirical *de jure* capital controls indices which show that outflow controls are not only widespread but in fact more prevalent than inflow controls, especially in low- and middle-income countries (Figure 1). This pattern suggests a disconnect between theoretical attention and policy practice. At the same time, recent global developments—including heightened geopolitical tensions, increased financial volatility, and growing pressures toward financial fragmentation—have rekindled interest in better understanding CCOs as policy instruments.[2] Against this backdrop, understanding when and how CCOs may serve as legitimate stabilization tools—and how their benefits compare with their costs—has become increasingly urgent.

Figure 1: Stance on Capital Controls



(a) On Outflows and Inflows **(b) On Outflows, by income**

Note: Panel (a) shows the simple yearly average of the capital control index on inflows and outflows from Fernandez et al. (2016), where 0 indicates a fully liberalized capital account and 1 indicates full controls. Panel (b) presents the yearly average of the capital control index on outflows, disaggregated by income group. EU countries are excluded due to a methodological change in 2005.

Several research questions thus emerge. Some are empirical: How are CCOs used in practice? Is there systematic evidence of their deployment during crises? Others are theoretical: What kind of model is most

[2]See for instance the Mar. 14, 2025, op ed in the Financial Times by G. Tett arguing that "Tariffs on goods may be a prelude to tariffs on money". A notable example of this trend is the Trump administration's recent push to activate Section 899 of the so-called "Big Beautiful Bill," aiming to expand the executive branch's authority to restrict capital outflows.

appropriate to think about the costs and benefits of CCOs? In particular, can CCOs be viewed as corrective tools addressing distortions or externalities and, if so, which ones? What normative implications can we draw? And, how are these implications related to the challenges associated with their implementation (i.e. time consistency, reputation and stigma)?

This paper addresses these questions using data and theory. On the empirical front, we assemble new evidence on the use of CCOs based on the largest available panel of countries. We identify episodes of strong CCO tightening, which we then relate to macroeconomic aggregates and measures of economic and financial stress. This exercise indicates that episodes of CCO implementation coincide with macroeconomic and financial distress–characterized by a sharp decline in GDP growth and rising indicators of banking and currency crises that begin to deteriorate prior to these episodes. Other macroeconomic symptoms reminiscent of crises, such as falling capital flows, current account reversals and large depreciations of the currency, also coincide with the deployment of CCOs.

Motivated by the empirical finding that CCOs are typically deployed amid crises and declining growth, we develop a three-period model of a small open economy in which CCOs can have *benefits* as well as *costs*. The model allows for the possibility of multiple equilibria and coordination failures among foreign investors, resulting in financial panics and capital flight episodes. Under such conditions, the benefits of CCOs derive from their ability to eliminate undesirable equilibria. In other words, CCOs work in our model not as expropriatory measures, but rather as tools for coordinating market expectations around a desirable, no-capital-flight equilibrium. For that reason, the anticipation that CCOs will be applied when circumstances warrant it can improve ex ante expected returns and attract more foreign investment. Our choice to model CCOs as coordination devices at times of financial stress can be seen as an open economy extension of the venerable tradition of models of banking and financial panics descending from Diamond and Dybvig (1983).

The costs of CCOs are modeled as deadweight losses associated with their use. These losses are intended to capture a broad range of potential adverse effects, including the distortions that CCOs may induce. The IMF's IV, for instance, associates capital controls with the risk of *"promoting rent-seeking behavior and corruption, facilitating repression of the financial sector, impeding financial development, and distorting the allocation of capital"* (IMF 2012a). These deadweight losses serve to encapsulate this panoply of costs in reduced form.

We highlight three key results from the model. First, by recognizing that CCOs may involve a variety of costs that must be weighed against their benefits, the model offers normative prescriptions. Large enough deadweight losses can render the use of CCOs unadvisable. Our analysis identifies what "large enough" means in precise terms. In particular, we find that CCOs can still be beneficial if the probability of a financial crisis would be high in their absence. Our analysis therefore calls for caution but, at the same time, identifies the relevant variables for evaluating CCOs in episodes of stress.

The second result that our model uncovers is that the optimal policy under commitment can be time inconsistent. This occurs because, as mentioned earlier, while appropriate CCOs can enhance ex ante returns to investment, the ex post incentives for a government to impose them can shift once initial investments are in place. The result that CCOs can be time inconsistent highlights the difficulties of appropriate CCO implementation. It implies that the welfare-enhancing properties of CCOs may be available only if a government enjoys sufficient credibility and commitment power. In fact, we show that CCO policy under discretion lowers initial investment and expected welfare not only relative to the optimal policy under commitment but also relative to laissez faire. Therefore a government that lacks commitment would like to eliminate the option to impose CCOs. This may explain why, in practice, many policymakers seem reluctant to even raise the possibility of CCOs.

Finally, we examine implications for our analysis of the view that CCOs are sometimes imposed by governments for reasons other than social benefit. For our discussion, we analyze the policy problem of an honest, benevolent government, where market participants may believe that the government is instead an opportunistic one that always imposes capital controls. In this context, we find that the benefits from CCO policy are increasing on the government's reputation, as given by the investors' prior belief that the government is benevolent. Further, in an extension that considers a repeated game that endogenizes investors beliefs, we show that the implementation of CCOs may have adverse effects on the honest government's reputation.

Therefore, that the government can be opportunistic considerably complicates the CCO policy problem of the honest government. Because capital controls result in a loss of reputation, the honest government is less inclined to impose capital controls even in circumstances where they would be called for in the model studied so far. And while CCOs can serve to eliminate financial panics, multiple equilibria reappear. The intuition is that the initial investment depends on expectations whether the government will impose CCOs in the fragile state. That decision will depend on the implied loss of reputation compared with the static gains from CCOs; but the latter increase with the initial investment.

Our findings carry important policy implications. Empirically, we document that episodes of capital controls on outflows (CCOs) tend to occur during periods of acute financial and currency distress—precisely when policymakers are under strong pressure to act. Our theoretical framework shows that, under such circumstances, CCOs can in principle prevent self-fulfilling capital flight and help stabilize expectations. However, the model also highlights important implementation challenges. Even when CCOs are desirable ex post, concerns about time inconsistency, credibility, and long-term reputation can hinder their effective use. These frictions imply that the success of CCOs depends not only on sound economic reasoning, but also on institutional capacity and the ability to build and sustain trust. For policymakers—especially in emerging markets—this underscores the need to approach CCOs with careful design, clear communication, and a long-term perspective. Tools that aim to coordinate expectations must themselves be credible over time to be effective.

Our paper is related to several strands of the literature. One strand includes open economy models that are prone to multiple equilibria, particularly those with collateral constraints. Mendoza (2005), Jeanne and Korinek (2010), and others present a heuristic analysis of the multiplicity problem, but do not offer a formal treatment of it. In an important contribution, Schmitt-Grohé and Uribe (2021) demonstrate that the kind of multiple equilibria and self-fulfilling crises that arise in these models resemble sudden stops and, crucially, can be appropriately addressed by the mere threat of capital control taxes in the event of capital flight.[3] Our work complements this body of work in at least two ways. First, we demonstrate how a similar conclusion –that CCOs may serve as coordination devices to stabilize expectations– can result from a very different analytical framework that extends ideas from the literature on banking and financial crises in from Diamond and Dybvig (1983) and Holmström and Tirole (2001). Second, and more importantly, the framework that we develop is rich enough to investigate the practical challenges involved in implementing CCOs–specifically, the obstacles posed by deadweight losses, imperfect credibility and lack of commitment. This allows us to show that even if CCOs can prevent a self-fulfilling crisis, they are not necessarily optimal in all cases.

In this paper we show that optimal CCOs can be time inconsistent and government credibility is needed for their effectiveness. This result belongs, of course, to the influential body of research on the time con-

[3]The use of capital outflow controls outside of financial crises has been studied in Farhi and Werning (2016) prescribing that taxes on outflows can mitigate periods of low economic activity. More recently, Bianchi and Coulibaly (2022) argue that whether taxes are set on inflows or on outflows depends on the relative magnitude of current and expected labor wedges. See also Li et al. (2023) for a model of optimal preemptive CCOs.

sistency of optimal policy pioneered by Kydland and Prescott (1977) and Calvo (1978). The contributions by Bianchi and Mendoza (2018) and Bocola and Lorenzoni (2020) address issues of time consistency and credibility in open economy models, though they do not consider the role of CCOs. While the former finds that macroprudential policy can be time-inconsistent when forward looking prices are part of a collateral constraint, the latter provides a rationale for the view that official foreign currency reserves support financial stability, by enhancing the credibility of authorities to intervene in financial panics. While the framework developed by Bianchi and Lorenzoni (2022) relying on pecuniary and aggregate demand externalities focuses mainly on prudential inflow controls, they do conjecture that outright prohibition on capital outflows may be welfare improving, but could impose reputation costs and raise inconsistency issues, which they leave for future research. We prove that this conjecture is correct—albeit within a different modeling framework. In an important contribution closer to our work, Fornaro (2022) shows how capital controls or fiscal transfers can eliminate bad equilibria characterized by inefficient capital flights in countries within a monetary union. Moreover, Fornaro (2022) is cautious against the practical use of CCOs due to the fact that relatively advanced economies –like the European ones that motivate his work– are more likely to feature complex financial systems that facilitate elusion of controls. Unlike in our work, he does not investigate further complication associated to time inconsistency in the use of these tools which, to the best of our knowledge, is new in the context of CCO policy analysis, nor he addresses the challenges that deadweight losses and reputation concerns have over the use of controls on outflows.

The central role that reputation has when determining effectiveness of capital account restrictions in our model is in line with other contributions. Bartolini and Drazen's (1997) developed the idea that CCOs can signal future "bad policies" to market participants, with the implication that "good" governments may choose capital market liberalization in order to avoid sending such a signal. Ghosh et al. (2020) model inflow controls as "damned by guilt of association" to CCOs, in turn "associated with autocratic and repressive regimes". In an important recent contribution, Clayton et al. (2025) construct a dynamic reputation model to rationalize the use of CCOs by China. In their model, it is assumed that the government builds credibility as an international currency issuer by *avoiding* the use CCOs, which aligns with China's broader strategy for internationalizing the Renminbi.

Our theoretical framework shares some similarities with these works but also key differences. As in those models, our treatment of reputation assumes the existence of different "types" of government. The key difference, however, is that in our model, CCOs can be socially beneficial under certain conditions, meaning a benevolent government would choose to implement them when warranted. This allows us to derive policy implications specifically for an "honest" government. For instance, our model implies that an honest government might refrain from imposing CCOs—even when desirable—if doing so would damage its reputation. This is clearly reminiscent of Bartolini and Drazen (1997), but with an important distinction: in our model, low reputation prevents the use of welfare-enhancing CCOs.[4] Likewise, in our setup, it is the perception of an *unwarranted* use of CCOs–not their use per se–that undermines reputation, unlike in Clayton et al. (2025). The latter offers a framework of analysis suitable for a country like China that aims to internationalize its currency, but is less appropriate for the small open economy that our model targets.

Lastly, our work makes two contributions to the empirical literature. First, it complements earlier work that found no systematic relationship between outflow controls and typical boom-bust cycles as in Fernández et al. (2015). A key difference is that our analysis examines macroeconomic dynamics *conditional* on strong CCO tightening episodes, while Fernández et al. (2015)' analysis is unconditional. Furthermore, we integrate narrative evidence and data on CCO recalibrations from Binici and Das (2021), whereas earlier studies focus only their extensive margin. Our finding that CCO episodes coincide with financial and currency crises echoes the result in Na et al. (2018), who document that sovereign defaults tend to be accompanied by capital controls. Second, while we do not evaluate the effectiveness of CCOs empirically, our model can help rationalize why previous studies have found mixed results in this dimension. These include findings that CCOs have rarely succeeded (Magud et al. 2018), may foster corruption (Johnson and Mitton 2003), reduce GDP growth (Forbes and Klein 2015), trigger sovereign credit rating downgrades (Bhargava et al. 2023), or fail as external shock-absorbers (Zeev 2017). Our emphasis on credibility, commitment, and coordination failures as prerequisites for effectiveness relates closely to the conclusion in Saborowski et al. (2014), who find that CCOs work only when backed by strong institutions.

The rest of the paper proceeds as follows. Section 2 presents the empirical evidence on the behavior of aggregate variables during episodes of CCO tightening. Section 3 describes our basic theoretical framework, introduces CCOs, and discusses their implications for equilibrium. Section 4 examines the time inconsistency problem of CCOs, and characterizes optimal policy under commitment and under discretion. Implications of political opportunism and dynamic reputation building for the analysis of CCO policy are stud-

[4] Concerns about reputation building in our model can also help rationalize the empirical findings in Acosta-Henao et al. (2025) that governments appear reluctant to actively use capital controls, hence their stickiness over time.

ied in section 5. Final comments and remarks are given in Section 6. Empirical and theoretical appendices expand on technical details.

2 Capital Controls on Outflows and Aggregate Variables: Evidence

This section presents fresh empirical evidence on the linkages between capital controls on outflows (CCOs) and the macroeconomy. We identify episodes of CCO tightening and document their systematic relationship with key macroeconomic variables. Our main finding is that such episodes are associated with macroeconomic and financial stress: they coincide with a steep fall in GDP growth and the occurrence of banking and currency crises. This stylized fact will be incorporated as a key building block of the model developed in later sections.

2.1 Methodology and Data

We identify episodes of forceful use of CCOs using information from three complementary sources. First, we include episodes characterized by the IMF as cases of "significant tightening of outflow controls" in both emerging and advanced economies between 1998 to 2009 (IMF 2012b). The additional two sources of information used are the CCO data in Fernandez et al. (2016) and the information on outflow CFMs in the IMF's Taxonomy of Capital Flow Management Measures, as captured in Binici and Das (2021). The former covers 100 countries from 1995 to 2019, and is built by coding the capital account regulation on the IMF's AREAER over 10 asset categories, distinguishing controls by direction of the flow and by residency. The latter covers the monthly changes for all episodes when CFMs have been officially identified by the IMF since 2012.[5]

The criterion we employ to identify forceful CCO episodes in the data is purely statistical and does not take into account any ex-ante or ex-post prudential behavior nor any interaction between CCOs and other macro-financial variables. More concretely, an episode is identified in these two dataset as a positive change

[5] This allows us to capture all publicly available measures of CCOs. The combination of the measures in IMF (2012b) and the IMF's Taxonomy allows us to capture all measures that have been officially identified by the IMF as macro-critical tightenings of CCOs. The granular information in Fernandez et al. (2016) complements this data by providing information on restrictions of a wider cross section of assets that may not be contained in the IMF Taxonomy. The Internet Empirical Appendix presents results focusing on each of these three sources of information. Other well known measures of capital controls such as those in Chinn and Ito (2006) and Quinn (1997) are not useful for our purpose because they do not differentiate between inflow and outflow controls.

in the index of CCOs (i.e. a tightening) that is greater than or equal to two and a half standard deviations, computed over the entire distribution of positive changes across countries and time. The information from the three sources yields a total of 31 separate CCO episodes over 26 countries.[6;7] They are somewhat uniformly spread out between 1998 and 2020. Furthermore, of the 31 episodes, 8 are from high income countries, 9 from upper-middle, 9 from lower-middle and 5 from low income. Lastly, using the work by Ilzetzki et al. (2021), we classify the CCO episodes by exchange rate regime: no legal tender, pegs and crawling pegs are the exchange rate regimes most prevalent, with 11, 8 and 6 of the CCO episodes displaying these regimes, respectively. The detailed list of episodes and their distributions across time, exchange rate regime and income level can be found in Table A.1 and Figs. A.5-A.7, respectively, of the Internet Empirical Appendix.

Having identified CCO episodes, we now document the comovement of these episodes with key macroeconomic variables via event study plots capturing averages across episodes. Our main focus of analysis is the systematic relationship between CCO episodes, real GDP, and macro-financial crises indicators. To isolate country-specific trends in real GDP, we calculate the average growth for each country and de-mean the series. We borrow the indices of banking and currency crises from Laeven and Valencia (2018) and real GDP data come from IMF's WEO (IMF 2022).[8]

2.2 Stylized Facts

Figure 2 depicts the dynamics of (de-meaned) GDP growth in the ten years around the 31 CCO episodes identified, in both simple means and medians ($t = 0$ is the year of the episode).[9] A first stylized fact readily emerges upon inspecting the figure: episodes of CCO tightening coincide with steep falls in GDP growth

[6]An important caveat to bear in mind with our methodology is that our proxy for CCO tightenings captures only the extensive margin of capital controls, not the intensive margin. Thus, our estimates might be underestimating the true extent of the tightening in this policy variable. Unfortunately, to the best of our knowledge, there are no publicly available systematic measures of the intensive margin of capital controls for a sufficiently large pool of countries. Acosta-Henao et al. (2025) study the intensive margin but only for a small subset of countries.

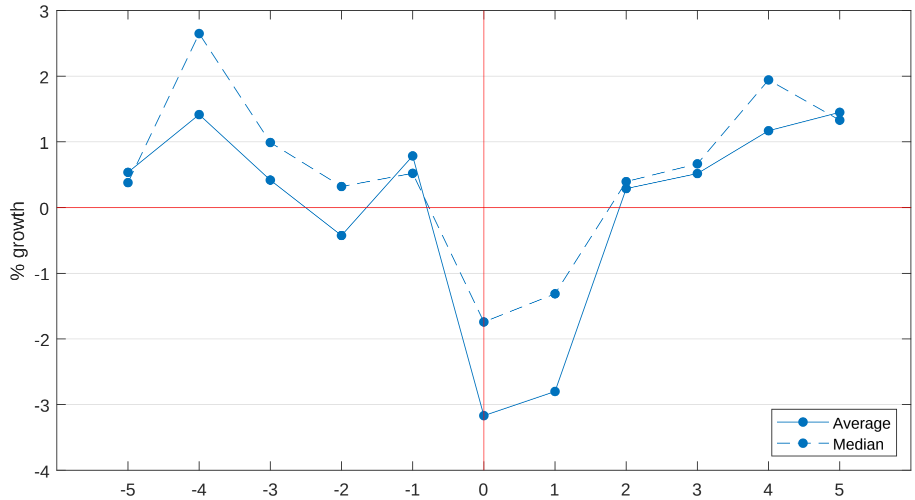
[7]We cannot separate all CCOs episodes by residency, i.e whether they have been applied to residents or non-residents. Robustness tests presented the Internet Empirical Appendix discuss the available information from a subset of episodes for which we can conduct such analysis. Results indicate that CCOs on non-residents are present in the majority of the cases (see Table A.6).

[8]Additional results in the Internet Empirical Appendix (Figure A.1) consider also sovereign debt crises as third indicator from Laeven and Valencia (2018). We also look at the behavior of other macro variables around CCO episodes such as aggregate consumption and investment; capital flows; current account balance; exchange rates, and inflation. The sources of these variables are standard (WEO and WDI). For the sake of space, results for these variables are reported in the Internet Empirical Appendix (see Figs. A.8-A.9). The Appendix also presents more systematic evidence on the joint movement between GDP and crises through regression analysis.

[9]While some of the episodes are identified at a higher frequency, i.e. those coming from the IMF Taxonomy, the analysis is done with annual data as the financial crises data is reported in this frequency.

of about 4 percentage points on average (3 percent in medians). In the year preceding a CCO episode, average (median) GDP growth is above trend growth by about (slightly below) 1 percentage, but falls steeply to -3 percent on average (-2 percent in medians) in the year of a CCO episode. The recovery is somewhat protracted, with average (median) growth rising above trend only two years after the CCO episode.

Figure 2: GDP Growth Around Episodes of CCO Tightening

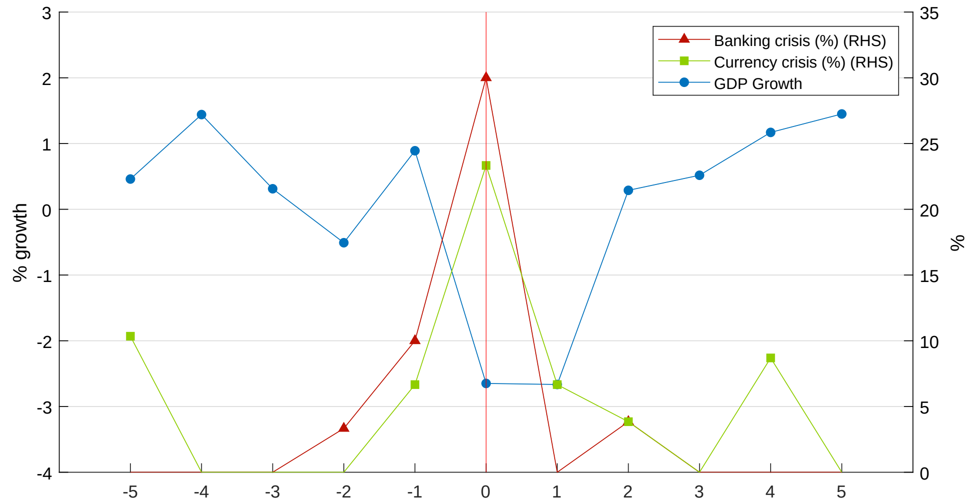


Note: The figure depicts in solid (dotted) line the average (median) dynamics of demeaned GDP growth in the ten years around the 31 episodes of forceful CCO tightening identified. $t = 0$ is the year of the episode. See main text for details of the methodology and sources used to identify the episodes. Further details, including the list of episodes, can be found in the Internet Empirical Appendix.

Figure 3 further illustrates the macro dynamics around the CCO episodes identified by documenting the behavior of crises indicators. In particular, the figure depicts the average banking and currency crises dummy indicators, as measured by Laeven and Valencia (2018). A second related stylized fact is apparent from this figure: CCO episodes coincide with spikes in both crises indicators. While the banking crisis indicator spikes at 30%, that of currency crisis peaks at 25%. Importantly, both crises indicators start increasing at least one year *before* the CCO episode materializes in $t = 0$. Figures A.2-A.4 in the Internet Empirical Appendix present results that document how the same patterns in Figures 2 and 3 are reproduced when we focus in each of the three separate sources that we use. Overall, this indicates that CCOs are implemented when crises have already began unfolding.

Further results in the Internet Empirical Appendix document the dynamics of other variables of interest around CCO episodes (see Figs. A.8-A.9). On average, CCO episodes also coincide with falling net and

Figure 3: CCO Episodes and Macro-Financial Crises



Note: The figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 30 episodes of forceful CCO tightening identified for which crisis indicators of banking and currency crisis exist in Laeven and Valencia (2018). $t = 0$ is the year of the episode. Averages of the dummy variables for these two crises indicators are plotted on the right scale. Out of the 31 episodes in CCO identified, only one does not have data from Laeven and Valencia (2018) which is why the GDP growth dynamics slightly differ between Figures 2 and 3. See main text for details of the methodology and sources used to identify the episodes. Further details, including the list of episodes, can be found in the Internet Empirical Appendix.

gross capital inflows, particularly in FDI. Gross outflows slow down, particularly in portfolio and FDI. They also coincide with large reversals in the current account balance, stagnant consumption and investment, depreciating currencies, and inflation spikes. In sum, these findings further corroborate the fact that large CCO tightenings are coincident with periods of macro-financial stress.

So far, our discussion has emphasized correlations, without taking a stance on causation. Figures 2 and 3 suggest, however, a natural timing of events: indicators of crises worsen first, and are followed by declines in GDP growth and CCO tightenings in response to worsening macroeconomic and financial conditions.[10] One might conjecture, however, that causality could run in a reverse direction, i.e. that a fall in GDP growth and a spike in crises indicators could be *caused* by the use of CCOs. While a formal analysis of causality is beyond the scope of this work, we nonetheless explore this alternative hypothesis in the Internet Empirical Appendix, by performing a counterfactual analysis using a 2-stage procedure (see Figure A.22). First, we recover CCO shocks by removing the systematic component in CCO indices that is associated to lagged macroeconomic activity. A second stage then uses these CCO shocks as regressors of contemporary GDP

[10] This timing is consistent with what Edwards (1999) refers to as curative capital controls on outflows.

growth. The counterfactual is obtained through the fitted GDP growth series assuming that only CCO shocks are turned on. The analysis shows that the simulated GDP growth barely moves in CCO episodes, indicating that the CCO shocks have negligible a impact on the deep fall in GDP growth documented in Figure 2.

The Internet Empirical Appendix contains further results as well as additional robustness tests. First, results with alternative less stringent thresholds for identifying CCO episodes are presented (see Figure A.20). In particular, we consider thresholds of 2 and 1.5 standard deviations, which deliver similar results in terms of the fall in GDP that is coincident with such episodes. Second, it documents the dynamics of CCO indices in the episodes identified, presenting evidence of a strong persistence in the use of these tools in the subsequent periods after the tightening episodes materialize (Figure A.21).[11] Third, we further explore the relationship between GDP dynamics and CCO episodes through linear regressions, controlling for time fixed effects and level of development (see Tables A.2-A.6). Lastly, we document the extent to which a subset of 21 CCO episodes identified are characterized by measures that restrict outflows from non-residents (see Table A.6).[12] Results indicate that 12 of the 21 cases CCOs are characterized by tightening of outflows from non-residents. In 16 episodes CCO episodes there is a tightening in CCO to residents.

Overall, the evidence examined here suggests that crises trigger both a fall in economic activity and the deployment of CCOs. We incorporate these facts as the main building blocks in our theoretical work, to which we turn next.

3 A Theoretical Framework

In this section we propose a basic framework for the analysis of capital controls on outflows. It is motivated by the empirical finding, documented in the previous section, that CCOs are often a response to deteriorating macroeconomic conditions and financial stress. Accordingly, our model features *coordination failures* that can be avoided by appropriate capital controls. It rationalizes the view that capital controls on outflows can be called for in certain circumstances, in particular self fulfilling creditor panics (IMF, 2012).

We begin by developing a setting in which, under laissez faire, capital flight can occur due to self fulfilling panics. Then we analyze how capital controls on outflows can prevent such crises. In contrast with most of

[11] The persistence in CCOs echoes the broader stickiness in capital controls in both extensive and intensive margins documented in Acosta-Henao et al. (2025)

[12] The analysis is done only on the subset of cases where an index from Fernandez et al. (2016) exists as this is the only source that can disaggregate controls by residency.

the literature, we allow capital controls to cause deadweight losses, which is realistic and adds interesting twists to the analysis. We show that CCOs can serve as coordination devices that eliminate unwanted equilibria. And, since CCOs are not binding in equilibrium, we discuss that there is some leeway in designing the specifics of CCO policy. Lastly, this section focuses on model equilibria and the role of CCOs in eliminating capital flight. The optimal choice of CCO policy is the subject of the next section.

3.1 A Basic Scenario

Consider a small open economy that lives for three periods, indexed by t = 0, 1, 2. In each period there is a single good which, for convenience, we refer to as *dollars*.

For now, we assume that the economy's population is represented by a benevolent government. At t = 0 the economy is endowed with an initial amount of dollars $A > 0$. In addition, the economy has the opportunity to invest in a project of variable size. We denote the project size at t by I_t.

The initial size of the project can be greater than A because the economy can borrow from foreign investors. Foreign investors are risk neutral. Without loss of generality, they have an alternative safe investment opportunity that yields a net interest rate equal to zero. We also assume that foreign investors are small and identical, and normalize their number to one. Denoting by i the average contribution of each investor to the project, the initial size of the project will then be $I_0 = A + i$.

At $t = 2$, the project returns RI_2 dollars, where $0 < R < 1$. We assume that the economy can credibly commit the whole of RI_2 to the repayment of outside investors. In the parlance of Holmstrom and Tirole (2011), RI_2 is the *pledgeable* income from the project. Note it depends on the final size of the project, I_2, which can be less than I_0, as we will see.

In addition to the pledgeable income, we assume that the project yields other, non-pledgeable benefits to the country. The total non-pledgeable benefits are BI_2, where $B > 0$. The existence of non-pledgeable benefits can be motivated in a number of ways, for example that foreign investment brings to the country positive externalities.[13]

In this setting, and in the absence of other considerations, it is easy to see that it is optimal for the economy to borrow as much as it can in order to maximize the size of the project. Indeed, the economy

[13] Alternatively, as in Holmstrom and Tirole (2011), non-pledgeability can emerge because of moral hazard, under which the domestic economy must be paid a minimum share of the project's total return to ensure incentive compatibility.

would be able to invest in a project of size $I_0 > A$ by offering investors a payoff RI_0 at *t*= 2 in exchange for an initial contribution of $i = I_0 - A$ from foreign investors at *t*=0. For foreign investors to participate, they must be paid the opportunity cost of their funds, which entails $RI_0 \geq i = I_0 - A$. This constraint with equality then gives the project size:

$$I_0 = \frac{1}{1-R}A \tag{1}$$

The size of the project would then be a multiple of the country's initial dollar endowment, where the *leverage ratio* $1/(1-R)$ is greater than one. The interpretation is simple. By our assumptions, the country benefits from building a project as large as possible. But a project of size I_0 can only attract RI_0 dollars from outside investors. Hence the difference, $I_0 - RI_0$, must be covered with the country's initial funds.

3.2 Financial Fragility and Capital Flight

Now we introduce a substantial complication. At *t* = 1 each foreign investor may be allowed to pull out from the project, obtaining a payoff that depends on the *state of nature* that is revealed at that time. This may reflect that, at *t* = 1, investors find alternative uses for their funds.

For concreteness, we assume that at *t* = 1 the economy can find itself in either a "normal" state or a "fragile" state, with probabilities $1-q$ and q respectively. In the fragile state, an investor that has contributed *i* dollars to the project at *t* = 0 can exit the project and obtain an alternative return of ωi, where ω is a positive constant. In the normal state, in contrast, investors do not have the option to exit the project. Equivalently, the alternative return is assumed to be zero in the normal state, so that foreign investors always choose not to exit the project.

In addition, in the fragile state the return of the project depends on the *collective* decisions of foreign investors to stay or exit. To model this aspect of the economy in the simplest fashion, we assume that the size of the project at the end of the last period, I_2, is equal to $g(\lambda)I_0$ where λ is the measure of investors that do not exit the project, and $g(\lambda)$ is a continuous and increasing function with $g(1) = 1$ and $g(0) = 0$.

It follows that an investor's payoff of not exiting is also a measure of what *other* investors choose. More precisely, at $t = 2$, each investor that stays can expect to be paid a rate of return equal to $f(\lambda)$ where

$$f(\lambda) \equiv \frac{g(\lambda)}{\lambda} R \frac{I_0}{i} \tag{2}$$

for $\lambda > 0$. We also define $f(0) = 0$ and assume that $g(\lambda)$ is such that $f(\lambda)$ is increasing and continuous on the unit interval.[14]

These assumptions capture that an individual investor's rate of return from staying is higher as more investors choose to stay. This requires $g(\lambda)/\lambda$ to be increasing in λ, and is more restrictive than the assumption that $g(\lambda)$ is increasing. This reflects that when more investors decide to stay the final size of the project is larger but, at the same time, the project's terminal payoff is divided between more people.[15]

More generally, our assumptions about the functions $g(\lambda)$ and $f(\lambda)$ are a short cut for strategic complementarities that may emerge in other setups.[16] For example, they are reminiscent of models of the Diamond-Dybvig type in which the return to a typical bank depositor is high in the absence of a bank run but falls to zero if there is a run (i.e. if all other depositors leave the bank).

Lastly, note that the assumption that the project's return *R* does not depend on the state at $t = 1$ is inessential. For instance, one could instead assume that the project return falls if the state turns out to be fragile. This modification could be accommodated easily and perhaps enhance realism somewhat, but would only make our notation more cumbersome with little impact on our analysis (as long as the fall in the project return were not too large).

3.3 Equilibrium Under Laissez Faire

Equilibria in our model are given by strategies for individual investors and an aggregate outcome such that, given the aggregate outcome, the strategies are optimal for each individual investor and, in turn, the aggregate outcome is induced by the strategies together with our maintained assumptions. For exposition and intuition, in this subsection we present and discuss only the key aspects of equilibria. Formal details and proofs are delayed to Technical Appendix A.1.

As we will see below, p denotes the exogenous probability of a capital flight during a fragile state at $t = 1$. With this definition, the main result in this subsection is then:

Proposition 1 (Equilibrium under Laissez Faire)

Assume $\omega < 1$. Then, under laissez faire, for any given p such that $0 \leq p \leq 1$ there is an equilibrium in

[14] For example, in models a la Diamond-Dybvig, there is some $0 < \lambda^* < 1$ such that $g(\lambda) = 0$ for $\lambda \leq \lambda^*$.

[15] Imposing convexity on g is a sufficient condition

[16] Fornaro (2022) refers to these strategic complementaries as investment complementarities while Farhi and Tirole (2012) find that costly and untargeted ex-post liquidity policies can generate such complementarity between agents decisions.

which all investors exit with probability pq.

For the intuition behind the proposition, we start by examining the continuation of the model from *t* = 1 on, and then go backwards. At *t* = 1, the initial size of the project I_0 and the initial contribution of investors $i = I_0 - A$ are given by previous decisions. At that point, if the state turns out to be normal, there are no further changes in the project, so that at *t*=2 the project has size I_0 and each foreign investor is paid RI_0.

On the other hand, if the state turns out to be fragile there are (at least) two possible continuation outcomes in equilibrium:

- If all investors believe that the others will exit ($\lambda = 0$), each expects the payoff from staying to be $f(0)i$ = 0 which is less than ωi. Hence it is individually optimal for all investors to exit the investment in the fragile state. We refer to this equilibrium continuation as a *run* or *capital flight*.

- If all investors believe that the others will stay ($\lambda = 1$), an individual investor that also stays with the project expects to receive as payoff $f(1)i$, so she will choose to stay as long as $f(1) > \omega$. The latter condition does hold, as we will check. Hence it is an equilibrium continuation for all investors to stay with the project in the fragile state.

Which outcome occurs in the fragile state depends on the beliefs of investors. This is a delicate problem that we bypass simply by assuming that capital flight occurs with probability *p*. In our analysis, and in line with much of the literature, we take *p* as exogenous, but we note that it may depend on history, institutions, or other aspects of the environment that we do not model here but can be significant in practice.[17]

We now turn to the determination of the initial investment size. Seen from $t = 0$, the expected payoff to an investor in the laissez-faire economy is

$$\Pi^{LF} = pq\omega i + (1 - pq)RI_0$$

To interpret this expression, recall that at $t = 1$ the state of the economy is fragile with probability q, and that in that state there is capital flight with probability p. Hence, from the viewpoint of $t = 0$, there is probability pq that the investment will end with capital flight and a corresponding payoff ωi. In all other cases, which occur with probability $1 - pq$, the project is carried to completion, and each investor receives RI_0.

[17] For instance, one can interpret part of p being determined by the effectiveness of other policies that can be used to address capital outflows and their destabilizing effects, such as regulatory forbearance, monetary policy, foreign exchange intervention, etc.

Now, for investors to initially join the project, their expected return must be at least as large as the opportunity cost of their funds, which is simply i. In fact, Π^{LF} must be exactly equal to i, because it is optimal for the country to choose the project size as large as possible. And using $i = I_0 - A$ we obtain the crucial condition:

$$pq\omega(I_0 - A) + (1 - pq)RI_0 = I_0 - A$$

i.e. $I_0 = LA$, where the leverage coefficient L is given by

$$L = \frac{1 - pq\omega}{1 - pq\omega - (1 - pq)R}$$

The leverage coefficient **L** is greater than one since pq and ω are between zero and one. More importantly, $L < 1/(1-R)$: the presence of capital flight reduces initial investment relative to the frictionless model of the previous subsection. Finally, the condition $f(1) = RI_0/i > \omega$, claimed earlier, is seen to hold.

The possibility of capital flight hence affects the economy's investment problem in an interesting and intuitive way. Investors realize that, if they participate in a project of size I_0, they will receive a payoff $\omega(I_0 - A)$ in the case of a capital flight episode, which occurs with probability pq. With probability $1 - pq$, there is no capital flight, and investors receive a payoff RI_0. Under these conditions, the most that the country can raise at $t = 0$ is $pq\omega(I_0 - A) + (1 - pq)RI_0$. This is less than I_0, the difference being covered with the country's initial equity A.

A key implication is that the initial investment size falls with the probability of capital flight *pq*. Effectively, the possibility of capital flight reduces the pledgeable income from the project, which in turn reduces the amount that the country can borrow initially and the size of the project.

Finally, the possibility of capital flight reduces the country's expected welfare. Recall that the country's payoff is the expected value of BI_2, where I_2 is the final size of the project. In equilibrium $I_2 = 0$ if there is capital flight and $I_2 = I_0$ otherwise. Hence the expected payoff to the country is

$$\begin{aligned} E(BI_2) &= B(1 - pq)I_0 \\ &= B(1 - pq)LA \qquad (3) \end{aligned}$$

The possibility of capital flight reduces the economy's payoff in two ways: the initial project size is smaller if the probability of capital flight is higher; and, with probability $pq,$ a capital flight episode wipes out the whole project and, hence, its benefits to the country.

3.4 Capital Controls on Outflows

As expectational runs and capital flight are welfare decreasing, government intervention may be called for. To study this issue, we endow the government with the power to enact capital controls on outflows (CCOs).

It will become apparent that, in our model, CCOs can serve as coordination devices, eliminating capital flight in the fragile state of nature. Because they can induce investors to decide not to exit in the fragile state, CCOs are not binding in equilibrium. This implies that capital controls would be unambiguously beneficial in the absence of other considerations. In practice, however, CCOs may entail several costs, from adverse effects on investor confidence (IMF 2022), to broader distortions induced by rent-seeking behavior and corruption, financial repression, and capital misallocation (IMF 2012a). Presumably, such costs can reduce or even offset the potential benefits of CCOs.

To explore the resulting trade-offs, we allow for CCOs to impose deadweight losses. As a result, the analysis of our model needs modification in interesting and illuminating ways. In this subsection we we take capital controls as given and examine the mechanics of how they work, especially in terms of ruling out bad run equilibria. Our discussion highlights the role of specific details of the economy, such as the ”technology” of controls. The cost-benefit analysis and optimal choice of CCOs is deferred to the next section.

To proceed, we assume that, in period $t = 1$ and if the state turns out to be fragile, the government can take some action that reduces the exit payoff from ωi to $(1 - \tau)\omega i$. At the same time, if that action is taken, the size of the project shrinks from I_0 to $(1 - \phi)I_0$. (Equivalently, the return falls from R to $R(1 - \phi)$.)

Parameter $\phi > 0$ is a measure of the deadweight losses associated with CCOs.[18] On the other hand, the parameter τ can be interpreted in different ways, depending on how controls are implemented. For instance, the policy can be a tax on exit, with τ the rate of the tax. Alternatively, one can regard τ as a cost to investors of increased bureaucratic obstacles to capital outflows. If $\tau = 1,$ the policy can be taken to be an outright prohibition on exit.

[18] We assume that deadweight losses reduce both the return of the project for investors and the domestic economy payoffs, despite that CCOs are only imposed on foreign investors. Thus, we make the implicit assumption that CCO distortions or capital flight incentives move across sectors. Forbes (2007) and Andreasen et al. (2024) provide empirical evidence of capital controls having a broader impact on the economy.

We assume that the government chooses to impose CCOs or not *after* the state of nature is realized at $t = 1$ but, if the state is fragile, *before* investors have chosen whether to stay with the project or exit. Therefore CCOs affect the individual investors' decision problem in the fragile state. By assumption, controls reduce the return to exit. But in the presence of deadweight losses, capital controls also reduce the return from staying with the project.

How they do so does depend on the specifics of capital controls. If controls are interpreted as a tax on exit, and with λ denoting the measure of staying investors, the revenue collected by the tax is $(1-\lambda)\tau\omega i$. In that case, one needs to make some assumption about the disposal of the revenue; for concreteness, assume that the revenue is shared among staying investors. Then each staying investor receives $(1-\lambda)\tau\omega i/\lambda$ in period *t* = 2, in addition to her share of the project payoff. Letting $\hat{f}(\lambda)$ denote the return to the individual investor from staying with the project under CCOs, it follows that

$$\hat{f}(\lambda) = (1-\phi)f(\lambda) + \frac{(1-\lambda)}{\lambda}\tau\omega \tag{4}$$

where $f(\lambda)$ is the same as in (2).

If instead the capital controls policy is a prohibition or the imposition of obstacles to exit, no revenue is collected, implying that

$$\hat{f}(\lambda) = (1-\phi)f(\lambda) \tag{5}$$

One can entertain other possibilities about how CCOs are implemented. But it will become apparent that such details, and the implications for $\hat{f}$, are not essential, as long as CCOs rule out run equilibria. This is because here the role of CCOs is to coordinate expectations, so their specifics matter only out of equilibrium.

In any case, under the above interpretations of $\hat{f}$, the following proposition says that sufficiently stringent capital controls rule out unwanted run equilibria.

Proposition 2 (Controls Can Eliminate Capital Flight)

For given τ, there is no equilibrium with capital flight if

$$(1-\tau)\omega \leq \hat{f}(0)$$

The proof is simple. If the state is fragile and λ investors stay with the project, an individual investor will also stay if $\hat{f}(\lambda) \geq \omega(1-\tau)$. Under the condition of the proposition, the preceding inequality holds if

$\lambda = 0,$ that is, even if all investors exit in the fragile state, and so it must hold for any λ. Then it is individually optimal for investors to stay with the project in the fragile state regardless of λ, and hence no capital flight can occur in equilibrium.

As mentioned, the proposition is valid $\hat{f}$ given by either (4) or (5). The choice of $\hat{f}$ only determines the minimum value of τ that rules out run equilibria. If $\hat{f}$ is given by (5), then $\hat{f}(0) = 0$, so the condition of the proposition requires $\tau = 1$. So in this case, a strict prohibition of capital flows is necessary to rule out capital flight equilibria. But less draconian policies may suffice. If $\hat{f}$ is given by (4) instead, and any strictly positive τ does the job.

These nuances may be of some interest, as they illustrate the role of policy technology and institutions, and suggest that there may be flexibility in designing controls appropriately. But as mentioned, the key assumption for our purposes is that the government can always find a sufficiently stringent policy that rules out capital flight equilibria. Therefore in the rest of the paper we will assume that the imposition of CCOs eliminate run equilibria.

For completeness, though, we need to check that CCOs which eliminate run equilibria also preserve a no-run equilibrium. This is a consequence of the next proposition.

Proposition 3 (Equilibrium without Capital Flight)

For given τ, an equilibrium without capital flight exists as long as

$$(1-\tau)\omega \leq \hat{f}(1) = \frac{1-\phi}{1-q\phi}$$

Propositions 2 and 3 now imply that CCOs that eliminate run equilibria are not too severe so that the no-run equilibrium survives. CCOs that prevent runs satisfy$(1-\tau)\omega \leq \hat{f}(0)$ by Proposition 2. If $\hat{f}$ is given by (5), the case of exit taxes, the condition of Proposition 3 clearly holds, and the no-run equilibrium survives. Note that nobody pays the exit tax in that no-run equilibrium. Alternatively, if $\hat{f}$ is given by (4), Proposition 2 requires τ to be one, i.e. there must be an exit prohibition, as already noted. But again, the prohibition is not binding in the remaining, no-run equilibrium: no investor would want to exit anyway if all others are staying.

This discussion reveals that capital controls can serve as a coordination device. They work if they convince individual investors that the other investors will not leave. Hence their role is only to eliminate unwanted equilibrium runs in the fragile state. That capital controls are effective only through stabilizing expectations is underscored by the fact that, if runs are eliminated, the controls are not binding for investors.

Summarizing, we have set up a model of an economy with an investment project financed partly by foreign investors. Under laissez faire, there can be a self fulfilling crisis and capital flight. The imposition of CCOs can eliminate run equilibria. CCOs can serve as coordination devices and are not binding in equilibrium. For that reason, there is some flexibility in designing the details of CCO policy.

One caveat to our discussion is that the way we model capital controls and deadweight losses does not capture all operational challenges that governments might face when implementing CCOs. For instance, our model assumes that there is complete information ϕ while, in practice, governments make policy decisions based on estimates;[19] it ignores potential constraints and challenges imposed by *"sequential"* flight, that is, a scenario where investors decide to leave, or stay, in some order;[20] and we capture abstract any heterogeneous multi-sectorial impact of CCOs and capital flight incentives through a single parameter ϕ. These issues are relevant in practice, but their analysis is somewhat peripheral to our discussion and better left for future research.

A second caveat is that, while CCOs can eliminate run equilibria, it is not obvious that they raise welfare because they themselves cause deadweight losses. We turn to this issue and the question of optimal CCO policy.

4 Optimal Versus Time Consistent CCO Policy

While CCOs can eliminate self-fulfilling investor panics, as seen in the previous section, their impact on welfare is not obvious if CCOs cause deadweight losses. One reason is that, perhaps not unexpectedly, the cost-benefit analysis of CCO policy depends on an economy's parameters. But there is a second reason, which is more surprising and novel in this context: the analysis of CCOs depends on whether the government can *commit* in advance to impose (or not) capital controls under certain circumstances. In other words, the optimal capital controls policy may not be *time consistent* .

[19] As shown by Bennett et al. (2023), potential misspecification by policymakers reduces welfare benefits from policy. Our setup highlights that, additionally, misspecification can lead a government to poor policy design of CCOs as coordination devices.

[20] See Wallace (1988) for policy challenges emanating from a sequential service constraint in a Diamond and Dybvig framework. In a mutual funds context, Cipriani et al. (2014) and Li et al. (2021) show that the possibility of *"gates"*, policy akin to CCOs, can drive investors to run preemptively.

4.1 Costs and Benefits in Equilibrium

In the preceding section we showed that CCO policies can serve as coordination devices and prevent capital flight. On the other hand, we assumed that they involve a direct cost: if CCOs are enacted in the fragile state, the final size of the project falls to $I_2 = (1-\phi)I_0$, reducing terminal payoffs in that state.

There is an additional, more subtle cost: the anticipation of CCOs affects, in turn, the initial size of the project. Assuming that controls rule out capital flight in the fragile state, the expected payoff to investors is given by

$$\Pi^{CC} = [q(1-\phi) + (1-q)]RI_0$$

since the imposition of capital controls, which occurs with probability q, reduces the final payoff by the factor ϕ. Using again the fact that $\Pi^{CC} = i = I_0 - A$ now gives the initial project size under capital controls:

$$I_0 = \frac{1}{1-(1-q\phi)R}A \tag{6}$$

Comparing with (1), we see that CCOs eliminates runs but does not bring initial investment to its frictionless level. The intuition is that, assuming $\phi > 0$, the imposition of CCOs reduce expected pledgeable income from RI_0 to $(1-q\phi)RI_0$: the controls are applied in the fragile state, which has probability q, and cause a proportional loss ϕ of pledgeable income from the project. For that reason, the leverage ratio and the initial size of the project decrease with the product $q\phi$.

In turn, the country's expected welfare is

$$\begin{aligned} BE(I_2) &= B[(1-q) + q(1-\phi)]I_0 \\ &= B(1-q\phi)\left[\frac{1}{1-(1-q\phi)R}\right]A \end{aligned} \tag{7}$$

An increase in $q\phi$ reduces expected welfare in two ways: it directly increases the expected loss, given the initial size of the project I_0; and it also reduces the project size.

While CCOs imply lower welfare than the frictionless scenario, they may or may not improve welfare relative to the laissez faire case. The resulting policy problem is thus nontrivial, and its resolution turns out to depend on parameter values and, less obviously, on the government's commitment power.

4.2 Optimal Policy with Commitment

Suppose that at $t = 0$ the government chooses whether to impose CCOs in the fragile state *and* that the choice is credible, i.e the government enjoys sufficient commitment power.[21] The country's expected payoff under laissez faire is given by (3). On the other hand, if CCOs are to be optimal, they must rule out capital flight, implying an expected payoff given by (7). Hence imposing CCOs in the fragile state will be optimal under commitment if

$$(1 - q\phi)\left[\frac{1}{1-(1-q\phi)R}\right] > (1-pq)\frac{1-pq\omega}{1-pq\omega-(1-pq)R} \tag{8}$$

and suboptimal if the inequality is reversed.

The inequality characterizes relative values of parameters for which CCOs are optimal under commitment. The interpretation is straightforward. Consider the role of the cost parameter ϕ. The inequality is necessarily satisfied if $\phi = 0$, i.e. if CCOs impose no deadweight losses. In such a case, CCOs are unambiguously welfare improving, as they rule out capital flight at zero cost.

By continuity, the inequality must hold if $\phi > 0$ but small. On the other hand, the inequality ceases to hold if ϕ is large enough. This says that if the deadweight costs of CCOs can be too big relative to the gains from eliminating capital flight.

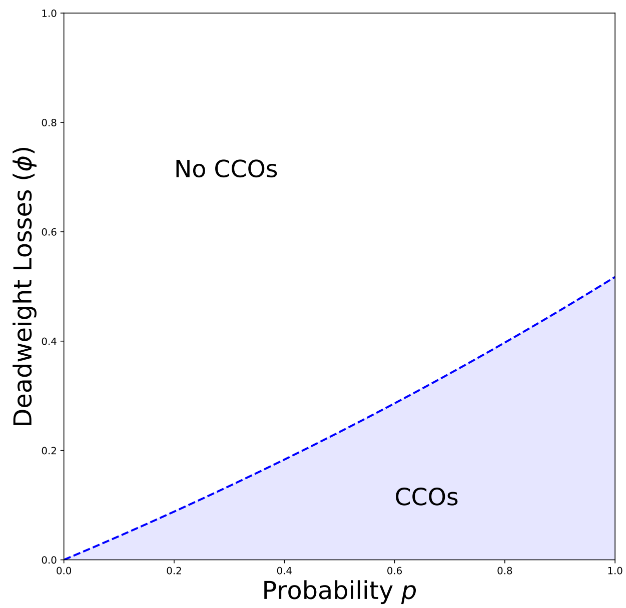
The gains from CCOs are due to the elimination of capital flight, so they increase with p. This is expressed by the fact that the right hand side of the inequality is decreasing in p, which does not appear in the left hand side. Hence the higher p the more likely the inequality is satisfied, rendering CCOs optimal.

To illustrate further, the dashed blue line in Figure 4 presents the combinations of $\{\phi, p\}$ such that (8) holds with equality. If ϕ is small relative to p for $\{\phi, p\}$ (i.e. to the right of the dashed blue line), CCOs are imposed in the fragile state. Hence the shaded (blue) region is the set of pairs $\{\phi, p\}$ for which CCOs are optimal under commitment.

Summarizing, the optimal policy choice of a government under commitment depends on parameter values. The government will impose CCOs in the fragile state if p is relatively large and ϕ relatively small. These results reflect that CCOs eliminate run equilibria, whose probability increases with p, but impose deadweight losses that increase with ϕ.

[21] See Appendix A.2 for the formal introduction of a committed government in the anonymous sequential game.

Figure 4: Optimal CCOs Policy: Commitment Case



Note: numerical example with the following parametrization $\{R = 0.8, A = 0.2, B = 1, q = 0.2, \omega = 0.72\}$

4.3 Policy Under Discretion

As seen in previous sections, the initial investment I_0 and the expected benefits $BE(I_2)$ both depend on the expectations at $t = 0$ that capital controls will or will not be imposed in the fragile state. This indicates that the optimal policy under commitment may not be *time consistent.*

To examine the time consistency problem, consider the situation at $t = 1$, if the fragile state has occurred. At that time, the initial size of the project I_0 is already fixed by previous decisions. Suppose that the government has the opportunity to reconsider its stance on capital controls. Will capital controls be beneficial at that juncture?

To answer this question, with the obvious notation, we say that the government chooses a *laissez faire policy* $\pi = LF$ or a *capital controls policy* $\pi = CCO$. (As noted before, we can restrict attention to CCO policies that rule out capital flight.) A *discretionary equilibrium* is then defined by a policy π, a set of investor strategies, and an aggregate outcome λ such that, in addition to the conditions stated in Section 5.2, policy π is optimal for the government in the fragile state at $t = 1$. (See Appendix A.3 for more details.)

Proposition 4 (CCO Policy Under Discretion)

In any discretionary equilibrium, the government chooses $\pi = CCO$ only when the probability of a capital flight is greater than deadweight losses, i.e. if

$$p > \phi \tag{9}$$

The proof is simple. Consider the government's decision at $t = 1$ if the state is fragile. At that point, I_0 is given. Not imposing CCOs then means that capital flight occurs with probability p, so that the expected payoff from the project becomes $EBI_2 = (1-p)BI_0$. By imposing CCOs, on the other hand, the possibility of capital flight is eliminated, but the final size of the project falls to $I_2 = (1-\phi)I_0$, so the expected payoff is $(1-\phi)BI_0$. The proposition then follows.

Comparing (8) and (9) it becomes obvious that, in general, the government will have an incentive to deviate at $t = 1,$ if the fragile state has occurred, from the optimal policy under commitment. In other words,

Corollary The optimal commitment policy can be time inconsistent.

For the intuition, fix $\phi > 0$, and let $\bar{p}$ denote the value of p such that the LHS and the RHS of (8) are equal. Suppose that $\phi < p < \bar{p}$. Then (8) fails, so laissez faire is optimal under commitment. However, in the absence of commitment, (9) holds, so that the government will impose CCOs in the fragile state.

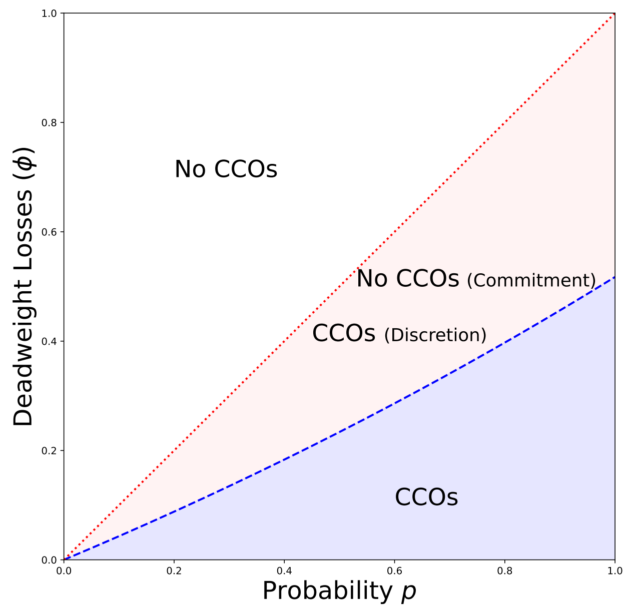
The source of inconsistency is clear. At $t = 0$, the government wants to maximize the initial investment size I_0. To do that, it must promise to refrain from imposing CCOs in the fragile state, even at the risk of self fulfilling capital flight. But if the state is fragile at $t = 1$ the considerations change. I_0 is then fixed, and then the government's key comparison is between the deadweight losses from CCOs against the expected losses from capital flight. [22]

In the absence of commitment, investors will anticipate that policy announcements at $t = 0$ are not credible. The outcome of the model will then be given by its discretionary equilibria, which is easy to characterize: in the fragile state, capital controls are imposed if $p > \phi$ and they are not imposed in the opposite case. If controls are imposed the initial size of the project I_0 and the expected payoff to the country $BE(I_2)$ are as in subsection (3.4); in the opposite case, they are as in subsection (3.3).

Figure 5 illustrates. As in Figure 4, the shaded blue area shows combinations $\{\phi, p\}$ for which CCOs are imposed under commitment. The dotted red line is the 45 degree line, along which $p = \phi$. So under

[22] As in Fornaro (2022), an additional assumption underlying time inconsistency in our model is that the government is concerned only about domestic welfare and not about foreign investors.

Figure 5: Optimal and Time Consistent CCOs Policy



Note: numerical example with the following parametrization $\{R = 0.8, A = 0.2, B = 1, q = 0.2, \omega = 0.72\}$

discretion CCOs are imposed for pairs $\{\phi, p\}$ to the right of the dotted red line, i.e. pairs not only in the blue region but also in the shaded red region. This is to say, CCOs are imposed for a larger set of pairs $\{\phi, p\}$ than under commitment. If the pair $\{\phi, p\}$ is between the red and blue lines the government will want to announce at $t = 0$ that CCOs will not be imposed in the fragile state but, under discretion, renege on that promise if the state at $t = 1$ turns out to be indeed fragile.

Finally, consider the implications of time inconsistency for welfare. In terms of the figure, if $\{\phi, p\}$ is in the red region the discretionary outcome results in lower investment and welfare than under commitment. This is the case in spite of the fact that CCOs would be applied under discretion but not under commitment.

In fact, it may be more striking to note that, in the presence of time inconsistency, the ability of the government to impose CCOs in the fragile state lowers initial investment and expected welfare relative to laissez faire. This follows directly from the fact that when $\{\phi, p\}$ is in the time inconsistency region, the government would choose not to enact CCOs in the commitment case, leading to the same equilibrium outcome as in laissez faire. In this case, a government under discretion would prefer not to have the option to impose CCOs.

4.4 Discussion

Although our model is admittedly rather simple, our analysis reveals that the time inconsistency problem will often be present in models of CCO policy. This is because, as stressed in our discussion, anticipated CCO policy will in general affect ex ante expected returns on investment. As initial investments are sunk, ex post gains from CCO policy will differ from ex ante incentives. This means, in turn, that policy makers will be tempted to break initial promises, at least under some circumstances. This is what occurs in our model, as shown in the preceding subsection, and is a variant of the time inconsistency issue of Kydland and Prescott (1977) and Calvo (1978).

In the context of the debate about CCOs, the analysis and results in this section can be seen as an important difficulty to the position, expressed by Stiglitz and Ostry (2022) and others, that CCOs can be beneficial provided that "the rules of the game are clear and known ahead of time". In particular, Ostry and Stiglitz's claim that "a *pre-announced* policy to tax short-term capital outflows (...) and to impose more extensive controls in the event of the crisis, could ultimately enhance macroeconomic stability and, in that respect, make foreign investment more attractive" may be valid but only under the additional assumption that the pre-announced policy is indeed time consistent.

Further, dealing with time inconsistency becomes a first-order concern in the analysis of CCOs since it implies lower investment and welfare not only relative to the optimal commitment outcome but also relative to laissez faire. Governments that lack commitment would then prefer to eliminate the option of imposing CCOs and, as important, to convince foreign investors that CCOs are not even being considered as a plausible policy instrument. This may be a reason why some government officials are swift to deny any thought of CCOs and, more generally, why CCOs have a bad name.[23]

Naturally, the question then arises of whether and how a government can commit to an optimal CCO policy. Here we can, of course, adapt ideas from an enormous literature on how to solve time inconsistency in general (see, for example, Persson and Tabellini (2002)). This is a general issue that deserves a separate treatment, but three observations seem particularly pertinent in our context. First, one of the usual proposals to gain credibility in policy is to establish rules or institutions that take away discretion from the policy maker.

[23]Examples abound. For one, the assistant governor Adnan Zaylani Mohamad Zahid of the Central Bank of Malaysia (Bank Negara) said in November of 2016 "The situation and conditions are vastly different [from 1998 Asian financial crisis](...). So definitely no capital controls. There is no discussion of moving in that direction" (See here)

In this regard, one interesting possibility is that some aspects of international agreements, as well as the IMF's IV, can be seen as "rules" in that direction. In particular, the IV's statement quoted in the introduction, that CCOs may be justified in crisis situations, could be interpreted as a rule to boost the credibility of CCO policy. Second, the model in this section suggests that the main incentive to depart from an optimal CCO policy may be for a government to impose CCOs when they would not be called for under the optimal policy. In this sense, the most important part of a rule might be to specify the circumstances under which CCOs should *not* be used. Third, it should be noted that the temptation to renege on previously announced CCO policy may emerge in the absence of "bad" government motives, such as corruption or opportunism. In fact, in our analysis we have assumed that the government is benevolent and maximizes social welfare. The benefits from imposing CCOs, if any, arise solely from the elimination of bad equilibria, and not from any form of expropriation.

5 Capital Controls and Political Opportunism

Theoretical analysis of capital controls are often received with skepticism and criticized for lacking realism. One reason for that kind of reaction may be, as we pointed out in the previous section, is that promises of optimal CCOs policy may not be credible in the absence of commitment. But another reason is that, in practice, capital controls have often been imposed by *opportunist* governments, effectively attempting to expropriate foreign investors, as a relatively easy way to obtain resources to deal with a financial emergency, or just for self serving reasons. [24]

It must be observed that the fact that CCOs can be misused by "bad" governments does not, in principle, eliminate the possibility that CCOs can be beneficial if an *honest* government is in place. If so, it is important to figure out how the possibility of political opportunism alters the policy problem of the honest government and, more generally, how it affects the overall analysis of CCOs.

In this section we pursue exactly that avenue, modifying the model of the previous section to allow for political opportunism. We show that the existence of political opportunism reduces the welfare benefits of

[24] Indeed, the possibility of such political opportunism lies behind the claim by Bartolini and Drazen (1997) that capital account liberalization can be seen as a signal of government honesty. Likewise, the claim of Ghosh et al. (2020) that capital controls on inflows have the problem of "guilt by association" with capital controls on outflows presupposes that the latter are not set in a benevolent manner but, rather, by opportunist or incompetent governments. One more reason to be hesitant about imposing CCOs may be that, for a variety of reasons, they are difficult to remove once their welfare benefits disappear. This would explain the strong persistence in CCOs documented in the Empirical Appendix.

CCOs but does not eliminate them completely. We also show that, if the government's "type" is observed only through its policy choices, the honest government may try to signal its type via the imposition (or not) of CCOs, a result that has the same flavor as Bartolini and Drazen's.

5.1 Modeling Political Opportunism

In order to introduce political opportunism in the simplest way, we modify our basic model with the assumption that the government can be either *honest* or *opportunist*. The investors' initial belief that the government is honest is denoted by $\beta \in (0, 1)$, and is a measure of the government's *reputation*. We assume that β is also the probability that the government is honest. The model then becomes an anonymous sequential game played by the honest government, the opportunist government, and the investors. The game is analyzed formally in Appendix A.4 . Below we highlight the relevant aspects for our analysis.

The honest government chooses policy to maximize the country's welfare, which is given by the expectation of $BI_2,$ as in the previous section. The opportunist government, in contrast, always imposes capital controls. This may reflect political aims, corruption, etc. One way to formalize this idea in our model is to interpret ϕI_0 not as a deadweight loss from imposing capital controls, as we did in the previous section, but as an expropriation amount appropriated by the opportunist policymaker. What exactly lies behind the opportunist government is peripheral, however, for our analysis. What is crucial is that the opportunist government always imposes capital controls. We then focus of the implications for the policy problem of the honest government.

A precise definition of equilibrium in this case is given in Appendix A.4. Intuitively, an equilibrium with political opportunism (or *politico economic equilibrium*) consists of a government policy strategy π (either laissez faire, *LF*, or capital controls, *CCO*), a set of investors' strategies, and an aggregate outcome such that the investors' strategies are individually optimal for each investor given the aggregate outcome, the government policy, and initial belief β; the aggregate outcome is induced by the investors' strategies and government policy; and the government policy is optimal for the honest government in the fragile state at $t = 1$, given the aggregate outcome.

Note that the opportunistic government does not solve a decision problem, while the honest government chooses to impose CCOs or not only if the state is fragile at $t = 1$. For brevity, if we say that "the government chooses CCO" or "chooses LF" it is to be understood that the choice is made at the mentioned node, i.e.

after the state is revealed to be fragile at $t = 1$. Also, note that we have imposed sequential optimality in equilibrium, so the government cannot commit at $t = 0$ about its policy choice.

Our first proposition states conditions for an equilibrium in which the honest government does impose CCOs.

Proposition 5 (CCOs under political opportunism)

A politico economic equilibrium with $\pi = CCO$ and no capital flight exists if the following two conditions are satisfied:

$$p > \phi \quad \textit{and} \quad \omega < \frac{1}{(1-\beta)(1-\phi)+\beta(1-q\phi)}$$

The proof is in Appendix A.4. The condition $p > \phi$ is clearly necessary for the honest government to choose CCOs. On the other hand, not imposing CCOs would imply two equilibrium continuations, with and without capital flight. As before, multiplicity requires $0 < \omega i < RI_0$. The second condition of the proposition is required for these inequalities to hold.

In the equilibrium of the proposition, no capital controls are imposed by the honest government if the state is normal, and the final project size is $I_2 = I_0$; while in the fragile state capital controls are imposed and the size of the project falls to $I_2 = (1-\phi)I_0$. (For future reference, note that we do not need to assume that investors observe directly the government type at $t = 1$: if no capital controls are imposed, investors learn that the government is honest, while investors have effectively no decisions to make if capital controls are imposed.)

The equilibrium determines the initial size of the project. The foreign investors' expected payoff from participating in the project if the government is honest is $\Pi^{CC} = [q(1-\phi)+(1-q)]RI_0$, and $R(1-\phi)I_0$ if not. Recalling now that investors have zero opportunity cost of funds, the expected payoff from participating in the project must equal the size of their initial investment $i = I_0 - A$, and hence $I_0 - A = \beta\Pi^{CC} + (1-\beta)R(1-\phi)I_0$, which yields $I_0 = L(\beta)A$, where the leverage coefficient is

$$L(\beta) = \frac{1}{1-[1-(\beta q+(1-\beta))]\phi]R}$$

This expression summarizes how the possibility of political opportunism reduces investment. A comparison with (6) reveals that the initial project size is smaller than in the absence of opportunism. In this sense, investor beliefs that the government is opportunist and will impose unjustified capital controls hurts the economy. In addition, it is easily seen that $L(\beta)$ is increasing in β: initial investment falls if the government's reputation worsens.

The preceding expressions can be interpreted once again in terms of the impact of political opportunism on pledgeable income. As in the previous section, pledgeable income falls because of the anticipation of capital controls; the difference in the current setting is that an opportunist government always imposes capital controls. In this case, with probability β the honest government imposes controls in the fragile state only, with probability q. With probability $1-\beta$ there is an opportunist government that always imposes controls. Capital controls, which reduce pledgeable income by ϕ, then occur with probability $\beta q + (1-\beta)$.

Because $\beta q + (1-\beta) = q + (1-\beta)(1-q) > q$, the probability of capital controls is higher than in the absence of political opportunism, and the more so the smaller β. The country's expected payoff is then

$$B[1 - q\phi]I_0(\beta) = B[1 - q\phi]L(\beta)A$$

A fall in β hurts the country in two ways: it reduces initial investment, as discussed; and it raises the probability that costly CCOs will be imposed when they are not justified. [25]

5.2 Capital Controls and Reputation Building

In the model of the preceding subsection, investment and welfare were found to be increasing functions of β, the investors' prior belief that the government is honest. In a dynamic setting, the honest government will then presumably try to convince investors that it is indeed honest, inducing investors to update their beliefs. This suggests interesting links between capital controls and reputation building, in the spirit of Bartolini and Drazen (1997), since CCOs can lead to a loss of reputation.

To how CCOs can affect reputation, suppose that investors do not observe the government's type directly. To make the analysis interesting, suppose also that they do not observe if the economy falls into the normal state or the fragile state at $t = 1$.[26] On the other hand, they do observe whether capital controls were

[25] It may be worth mentioning that the two different effects reflect that we take β to be both the subjective belief and the probability that the honest government is "chosen in an initial move by Nature" at the beginning of the model. This assumption of common priors is usual to convert a game of incomplete information to one with imperfect information which can be analyzed with standard techniques. See Fudenberg and Tirole (1991), pages 209-210 for further discussion.

[26] A weaker assumption is that, if the government imposes capital controls, investors do not observe whether the state is normal or fragile at $t = 1$. This may be more realistic, under the interpretation that the imposition of capital controls effectively takes away the option to exit from investors.

imposed or not. Investors update their beliefs based on this observation.

Indeed, if capital controls are not imposed at $t = 1$, investors can conclude that the government is honest for sure, since the opportunistic government always imposes controls. If capital controls are observed instead, the calculation is a little more involved, but it still straightforward using Bayes' Rule. Recall that, in the case under focus, the honest government imposes controls at $t = 1$ only in the fragile state, while the opportunistic government imposes controls in both the normal state and the fragile state. Bayes Rule then implies that the (posterior) probability that the government is honest after capital controls are observed is[27]

$$1 - \frac{1-\beta}{(1-\beta)+\beta q} = \beta \frac{q}{q+(1-\beta)(1-q)}$$

The posterior probability is strictly less than β, which is intuitive. Upon observing CCOs investors raise their subjective probability that controls were imposed for opportunism rather than for "benevolent" reasons, i.e. to prevent coordination failure.

Because capital controls result in a loss of reputation, the honest government may be more reluctant to impose capital controls even in circumstances where they would be called for in the model studied so far. This would be the case if the government cared about its future reputation, for example because of future interactions between the government and investors.

In order to shed light on this issue, we turn to a *two stage* version of our model, The previous (static) model is repeated twice; each repetition is called a "stage". The only difference between the first stage and the second stage will then be that first stage outcomes affect second stage investors' beliefs about the government's type.

Recalling that each stage has three periods indexed by $t = 0, 1, 2$, we use a "(s)" superscript to denote the stage $s = 1, 2$. For example, $I_0^{(2)}$ denotes the project size at the beginning of the second stage (i.e. at $t = 0$ of $s = 2$).

Since the second stage is just the model of previous sections, its outcomes have already been discussed. In particular, assuming that the conditions of Proposition 5 are satisfied, the initial project size in the second stage, $I_0^{(2)}$, is given by $I_0^{(2)} = L(\beta^{(2)})A$, where $\beta^{(2)}$ denotes the investors' belief probability *at the start of the*

[27] To be sure: let A be the event that the government is opportunistic and B the event that the government imposes capital controls. Hence $P(B|A) = 1$ and $P(B|A^c) = q$. Also, $P(A) = 1 - \beta$, $P(A^c) = \beta$. Then Bayes Rule says that $P(A|B) = P(A \cap B)/P(B) = 1 - \beta/[\beta q + (1-\beta)]$. (We use $P(A \cap B) = P(B|A)P(A) = 1 - \beta$ and $P(B) = P(B|A)P(A) + P(B|A^c)P(A^c)$ =$(1-\beta) + q\beta$.) The probability of honest government after capital controls are observed is then simply $P(A^c|B) = 1 - P(A|B)$.

second stage that the government is benevolent, and $L(.)$ is the leverage ratio function (5.1). An additional implication is that the honest government's expected payoff in the second stage is

$$\Pi^{(2)}(\beta^{(2)}) = B(1 - q\phi)I_0^{(2)} = B(1 - q\phi)L(\beta^{(2)})A$$

and hence is increasing in its reputation $\beta^{(2)}$.

Summarizing, leverage, investment, and expected payoffs in the second stage increase with $\beta^{(2)}$. The crucial fact now is that $\beta^{(2)}$ may depend on what has happened in the first stage, and in particular on whether capital controls have been imposed in the first stage.

To see how, consider the honest government's decision in the first stage, if the state of the economy is fragile at $t = 1$. From our previous analysis we know that, at that point, imposing capital controls rules out the capital flight equilibrium but imposes a deadweight loss of ϕ, implying an expected payoff $B(1 - \phi)I_0^{(1)}$ for the first stage (where $I_0^{(1)}$ denotes the initial project size in the first stage). Because $p > \phi$, we also know that capital controls yields a higher payoff in the first stage than laissez faire. The new and critical aspect of the model in this section is that imposing capital controls will affect the government's reputation, which matters for second stage outcomes and payoffs.

The honest government's evaluation of its options depends on the resulting payoffs for the two stages. For concreteness, we assume that the government's total payoff is the sum of the payoffs in the two stages (i.e. there is no discounting between stages)). Let $\beta_{CC}^{(2)}$ denote the (posterior) beliefs about β at the end of the first stage if capital controls are observed. Then the honest government's total (two-stage) payoff from imposing capital controls in the first stage if the state is fragile is

$$B(1 - \phi)I_0^{(1)} + \Pi^{(2)}(\beta_{CC}^{(2)})$$

In contrast, if the government does not impose capital controls in the fragile state, there is a run equilibrium with probability p, implying that the first stage payoff is $B(1-p)I_0^{(1)}$. In addition, if capital controls are not implemented in the first stage, investors learn that the government is honest, i.e. that $\beta = 1$ with probability one. Hence the continuation payoff for the honest government if it does not impose capital controls is

$$B(1 - p)I_0^{(1)} + \Pi^{(2)}(1)$$

It follows that the honest government imposes capital controls in the fragile state of the first stage if

$$p - \phi > \frac{1}{BI_0^{(1)}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC}^{(2)})] \tag{10}$$

and does not impose capital controls in the opposite case.

The preceding condition reveals the key link between capital controls and reputation building. In the static model previously analyzed the benevolent government imposed capital controls in the fragile state if $p > \phi$. In the repeated stage model of this subsection, the condition $p > \phi$ still implies that CCOs yields a higher first stage payoff than laissez faire. However, capital controls imply a loss of reputation: upon observing capital controls in the first stage, investors increase their subjective belief that the government is opportunistic; in contrast, the absence of controls allows them to conclude that the government is benevolent. This effect means that the imposition of capital controls in the first stage reduces the second stage expected payoff by $\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC}^{(2)})$. Condition (16) then says that, for controls to be optimal for the honest government in the first stage, the short term gain (in terms of the first stage payoff) must exceed long term cost associated with reputation loss.

Note that the preceding inequality is more stringent than $p > \phi$, which was the condition under which the honest government would choose CCOs in the absence of reputational considerations. Hence our discussion suggests that, in the presence of political concerns and reputation building, the honest government's policy problem becomes more delicate.

Indeed, one may conjecture the existence of politico-economic equilibria in which $p > \phi$ holds but the honest government chooses LF in the first stage. This conjecture turns out to be correct, but the argument requires a full characterization of equilibrium. To see why, note that (16) depends on $I_0^{(1)}$, the initial size of the project in the first stage, which presumably depends on the probability of capital controls and, therefore, whether (16) holds or not. Likewise, (16) depends on the posterior probability $\beta_{CC}^{(2)}$, which presumably depends on the honest government policy decision.

5.3 Dynamic Politico-Economic Equilibria

For purposes of exposition, here we discuss equilibria of the two stage model in terms of the initial project size $I_0^{(1)}$, the policy choice $\pi^{(1)}$ for the honest government, and the posterior investor beliefs $\beta_{CC}^{(2)}$ if CCOs are observed in the first stage (obviously, if LF is observed, $\beta^{(2)} = 1$.) Some technical details and proofs are delayed to Appendix A.5, which casts the model formally as an anonymous sequential game and describes its full solution.

Equilibrium requires that (i) given $\pi^{(1)}$, $I_0^{(1)}$ be optimal for investors at $t = 0$ in the first stage; (ii) given $I_0^{(1)}$ and $\beta_{CC}^{(2)}$, capital controls be imposed in the fragile state of the first stage if (16) holds, and they not be imposed in the opposite case; and (iii) given the capital controls decision, $\beta_{CC}^{(2)}$ be derived using Bayes Rule.

Intuitively, there may be two kinds of equilibria in the two stage model:

1. Partially Revealing Equilibrium: In the fragile state of the first stage, the benevolent government imposes capital controls. Since the opportunistic government always imposes controls, if capital controls are indeed observed, at the end of the first stage investors cannot tell for sure if the government is honest or opportunistic (although they update their beliefs).

Bayes' Rule implies that, after observing controls, the investors' probability belief that the government is benevolent falls to

$$\beta_{CC}^{(2)} = \beta^{(1)} \frac{q}{q + (1 - \beta^{(1)})(1 - q)} \tag{11}$$

where $\beta^{(1)}$ is the investors' belief at the start of the first stage that the government is benevolent.

Also, in the first stage, the honest government imposes capital controls with probability q, and the opportunistic government does so with probability one. An easy adaptation of our previous analysis then yields the initial project size:

$$I_0^{(1)} = \frac{1}{1 - [\beta^{(1)}(1 - \phi q) + (1 - \beta^{(1)})(1 - \phi)]R} A \tag{12}$$

Finally, for equilibrium, (16) must hold with $I_0^{(1)}$ and $\beta_{CC}^{(2)}$ given by the two preceding expressions. If capital controls are observed at the end of the first stage, $\beta^{(2)} = \beta_{CC}^{(2)}$; if they are not, $\beta^{(2)} = 1$.

2. Fully Revealing Equilibrium: In the fragile state of the first stage, the benevolent government does not impose capital controls. As a consequence, if capital controls are indeed observed, investors conclude that the government is opportunistic, i.e. $\beta_{CC}^{(2)} = 0$. The initial project size in the first stage is

$$I_0^{(1)} = \frac{1}{1 - [\beta^{(1)}(1 - pq) + (1 - \beta^{(1)})(1 - \phi)]R} A \tag{13}$$

Finally, for equilibrium, the inequality in (16) must be reversed at the preceding value of $I_0^{(1)}$ together with $\beta_{CC}^{(2)} = 0.$

The following proposition confirms the above intuition.

Proposition 6 (Equilibrium Existence and Multiplicity)
At least one equilibrium must exist in the two stage game. Which kind of equilibrium exists depends on parameter values. For some values, there are equilibria of both kinds.

A proof is given in Appendix A.5, which also describes the parameter combinations for the existence of equilibria of each kind.

Our results highlight an interesting resolution of the dynamic trade-offs faced by the honest government in the first stage. In a partially revealing equilibrium, the honest government imposes capital controls, as in the static game, but, since $\beta_{CC}^{(2)} < \beta^{(1)}$, it does so at the cost of losing reputation, which reduces investment and payoffs in the second stage. In a fully revealing equilibrium, the government refrains from imposing capital controls in the first stage when the state is fragile, in spite of the fact that capital controls raise the first stage payoff relative to laissez faire. By doing so, the government gains in reputation and, therefore, increases second stage payoffs by more than what it loses in the first stage.

Importantly, the honest government's policy problem depends on the expectations of foreign investors, which determines the initial investment ($I_0^{(1)}$) . This is most patently expressed by the possibility of multiple equilibria. If investors expect the honest government to impose capital controls in the fragile state only, they raise their initial investment because the cost of controls is less than the loss of a run. But a higher $I_0^{(1)}$ raises the first stage payoffs relative to the second stage payoff. The reputational cost of capital controls then becomes relatively less important than the current benefit of controls, which makes the government more inclined to use controls. In contrast, if investors expect the honest government not to impose capital controls when they are called for, they reduce their initial investment. But by doing so they strengthen the reputational incentives against capital controls.

It may be striking to realize that CCOs can serve to eliminate investor panics in the fragile state, but cannot eliminate equilibrium multiplicity in the two stage model. One could say that, in the presence of political distortions, economic policies can only do so much.

6 Conclusion

We have presented fresh empirical evidence on the links between capital controls on outflows and macroeconomic variables. A main finding is that CCOs are typically implemented after the onset of crisis conditions, and concurrently with declines in output growth. These empirical features are incorporated in a theoretical model of the costs and benefits of CCOs. In addition to embedding the empirical facts alluded to, the model proposed here formalizes the idea that CCOs may be beneficial to deal with capital flight amid macroeconomic and financial stress. The model is therefore developed so that multiple equilibria and coordination failures may appear when the economy is in a fragile state. In such a situation, CCOs can serve as devices to coordinate expectations, reassuring investors and preventing capital flight. While the model emphasizes that CCOs can be socially beneficial under some circumstances, we have also made an effort to allow for some potential shortcomings of CCOs. The most direct way is just to assume that CCOs entail deadweight costs. An alternative issue, which is novel in the literature, is that optimal CCO policy can be time inconsistent. Finally, in view of a widespread belief that CCOs can be taken advantage of by corrupt or politically opportunistic governments, we have examined the implications of the possible existence of governments of that kind. In particular, we identify how CCO policy may depend on a government's reputation, which in turn may evolve as the public observes the presence or absence of CCOs.

We have kept the model as simple as possible in order to highlight basic ideas and lessons. Having said this, we see our theoretical framework as a useful start to studying the pertinence of controls on outflows, suggesting extensions and elaborations in many directions.

First, as mentioned previously, we abstract from several operational challenges of implementing CCOs which could be addressed in a more specialized version of the model. For example, in a multi-sectoral version of the model one could explicitly account for how investors leaving one sector affect other sectors of the economy, both in terms of capital flight incentives as well as potential distortions. Another operational challenge lies on whether to restrict CCOs to non-residents or extend them to residents. While the model focuses on CCOs to non-residents, consistent with the empirical evidence in the Appendix, such evidence also points to CCOs to residents being widespread, warranting a more formal analysis on the trade-offs to each of the two kinds of restrictions.

Second, an obvious extension is to develop our arguments in stochastic infinite horizon settings. This is a nontrivial task insofar as models of the Diamond-Dyvbig variety are not easy to extend to infinite horizons. However, some infinite horizon open economy models with pecuniary externalities often admit multiple equilibria, as emphasized by Schmitt-Grohé and Uribe (2021). Such models could be amenable for studying CCOs as coordination devices, as we have done in this paper.

Third, another avenue for future research is to extend our framework to a multi-country version to study international coordination of capital control policies. Despite that by their very nature capital *flows* between countries, international coordination is yet to be fully understood. A potential reason for this omission is that capital controls on outflows are viewed as welfare reducing policies for non-residents. However, we have seen that CCOs can be optimal even for foreign investors under some circumstances. Thus, we believe that a multi-country extension of our framework is well-suited to study this issue.

Lastly, in light of the state of the current literature on capital controls, a crucial extension is to investigate the prudential use of CCOs and, more generally, the relative impact of CCOs and other macroprudential policies. In this regard, note that in our model controls on initial capital inflows and other macroprudential policies would be undesirable since they would negatively impact investment without bringing any gains in terms of the likelihood of capital flight. In contrast, we have seen that CCOs can be welfare improving even if they entail deadweight losses. This suggests that CCOs can be justified in situations where macroprudential policies cannot, namely when coordination failures represent the dominant macroeconomic danger. How to identify when this is the case in actual economies remain a fundamental issue for research.

References

Acosta-Henao, M., Alfaro, L., and Fernández, A. (2025). Sticky capital controls. *Journal of International Economics*. Forthcoming.

Adrian, T., Erceg, C. J., Kolasa, M., Linde, J., and Zabczyk, P. (2021). A quantitative microfounded model for the integrated policy framework. *IMF Working Paper*, (2021/292).

Andreasen, E., Bauducco, S., and Dardati, E. (2024). Capital controls and firm performance. *Journal of International Economics*, page 103897.

Bartolini, L. and Drazen, A. (1997). Capital-account liberalization as a signal. *The American Economic Review*, pages 138–154.

Basu, S., Boz, E., Gopinath, G., Roch, F., and Unsal, F. (2020). A conceptual model for the integrated policy framework. *IMF Working Paper*, (2020/121).

Benigno, G., Chen, H., Otrok, C., Rebucci, A., and Young, E. R. (2013). Financial crises and macroprudential policies. *Journal of International Economics*, 89(2):453–470.

Bennett, F., Montamat, G., and Roch, F. (2023). Robust optimal macroprudential policy. *Journal of International Economics*, 141:103714.

Bhargava, A., Bouis, R., Kokenyne, A., Perez-Archila, M., Rawat, U., and Sahay, M. R. (2023). *Capital Controls in Times of Crisis–Do They Work?* International Monetary Fund.

Bianchi, J. (2011). Overborrowing and systemic externalities in the business cycle. *American Economic Review*, 101(7):3400–3426.

Bianchi, J. and Coulibaly, L. (2022). Liquidity traps, prudential policies, and international spillovers. Technical report, National Bureau of Economic Research.

Bianchi, J. and Lorenzoni, G. (2022). The prudential use of capital controls and foreign currency reserves. In Gopinath, G., Helpman, E., and Rogoff, K., editors, *Handbook of International Economics: International Macroeconomics*, chapter 6.

Bianchi, J. and Mendoza, E. G. (2018). Optimal time-consistent macroprudential policy. *Journal of Political Economy*, 126(2):588–634.

Binici, M. and Das, M. (2021). Recalibration of capital controls: Evidence from the IMF taxonomy. *Journal of International Money and Finance*, 110:102252.

Bocola, L. and Lorenzoni, G. (2020). Financial crises, dollarization, and lending of last resort in open economies. *American Economic Review*, 110(8):2524–2557.

Calvo, G. A. (1978). On the time consistency of optimal policy in a monetary economy. *Econometrica: Journal of the Econometric Society*, pages 1411–1428.

Chinn, M. D. and Ito, H. (2006). What Matters for Financial Development? Capital Controls, Institutions, and Interactions. *Journal of Development Economics*, Volume 81, Issue 1:163–192.

Cipriani, M., Martin, A., McCabe, P. E., and Parigi, B. M. (2014). Gates, fees, and preemptive runs. *FRB of New York Staff Report*, (670).

Clayton, C., Dos Santos, A., Maggiori, M., and Schreger, J. (2025). Internationalizing like china. *American Economic Review*, 115(3):864–902.

Diamond, D. W. and Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of political economy*, 91(3):401–419.

Dornbusch, R. (2001). Malaysia: Was it different? Technical Report 8325, National Bureau of Economic Research.

Driscoll, J. and Kraay, A. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, 80:549–560.

Edwards, S. (1999). How effective are capital controls? *Journal of Economic Perspectives*, 13(4):65–84.

Farhi, E. and Tirole, J. (2012). Collective moral hazard, maturity mismatch, and systemic bailouts. *American Economic Review*, 102(1):60–93.

Farhi, E. and Werning, I. (2014). Dilemma not trilemma? capital controls and exchange rates with volatile capital flows. *IMF Economic Review*, 62(4):569–605.

Farhi, E. and Werning, I. (2016). A theory of macroprudential policies in the presence of nominal rigidities. *Econometrica*, 84(5):1645–1704.

Fernandez, A., Klein, M., Rebucci, A., Schindler, M., and Uribe, M. (2016). Capital Control Measures: A New Dataset. *IMF Economic Review*, Volume 64:548–574.

Fernández, A., Rebucci, A., and Uribe, M. (2015). Are capital controls countercyclical? *Journal of Monetary Economics*, 76:1–14.

Forbes, K. J. (2007). One cost of the chilean capital controls: Increased financial constraints for smaller traded firms. *Journal of International Economics*, 71(2):294–323.

Forbes, K. J. and Klein, M. W. (2015). Pick your poison: The choices and consequences of policy responses to crises. *IMF Economic Review*, 63(1):197–237.

Fornaro, L. (2022). A theory of monetary union and financial integration. *The Review of Economic Studies*, 89(4):1911–1947.

Fudenberg, D. and Tirole, J. (1991). *Game theory*. MIT press.

Ghosh, A. R., Kim, J. I., and Qureshi, M. S. (2020). What's in a name? that which we call capital controls. *Economic Policy*, 35(101):147–208.

Holmström, B. and Tirole, J. (2001). Lapm: A liquidity-based asset pricing model. *The Journal of Finance*, 56(5):1837–1867.

Holmstrom, B. and Tirole, J. (2011). *Inside and Outside Liquidity*. MIT Press, Cambridge, MA.

Ilzetzki, E., Reinhart, C., and Rogoff, K. (2021). Rethinking exchange rate regimes. In Gopinath, G., Helpman, E., and Rogoff, K., editors, *Handbook of International Economics*.

IMF (2012a). *The Liberalization and Management of Capital Flows - An Institutional View*. Policy Papers.

IMF (2012b). *Liberalizing Capital Flows and Managing Outflows*.

IMF (2022). Review of the institutional view on the liberalization and management of capital flows. *Policy Paper*, 2022/008:97.

IMF (2022). World Economic Outlook Database October, 2022.

Jeanne, O. and Korinek, A. (2010). Excessive volatility in capital flows: A pigouvian taxation approach.

American Economic Review, 100(2):403–407.

Johnson, S. and Mitton, T. (2003). Cronyism and capital controls: Evidence from malaysia. *Journal of Financial Economics*, 67:351–382.

Korinek, A. (2010). Excessive dollar borrowing in emerging markets: Balance sheet effects and macroeconomic externalities. Available at SSRN 967524.

Krugman, P. (1999). Capital control freaks. how malaysia got away with economic heresy. *The Dismal Science*.

Kydland, F. E. and Prescott, E. C. (1977). Rules rather than discretion: The inconsistency of optimal plans. *Journal of Political Economy*, 85(3):473–491.

Laeven, L. and Valencia, F. (2018). Systemic Banking Crises Revisited. *IMF Working Paper*, 18/206.

Li, B., A, R., and Tong, H. (2023). Looting and preemptive capital outflow controls. Technical Report Mimeo, International Monetary Fund.

Li, L., Li, Y., Macchiavelli, M., and Zhou, X. (2021). Liquidity restrictions, runs, and central bank interventions: Evidence from money market funds. *The Review of Financial Studies*, 34(11):5402–5437.

Lorenzoni, G. (2008). Inefficient credit booms. *The Review of Economic Studies*, 75(3):809–833.

Magud, N. E., Reinhart, C. M., and Rogoff, K. S. (2018). Capital controls: Myth and reality. *Annals of Economics and Finance*, 19(1):1–47.

Na, S., Schmitt-Grohé, S., Uribe, M., and Yue, V. (2018). The Twin Ds: Optimal Default and Devaluation. *American Economic Review*, 108(7):1773–1819.

Persson, T. and Tabellini, G. (2002). *Political economics: explaining economic policy*. MIT press.

Quinn, D. (1997). The Correlates of Change in International Financial Regulation. *American Political Science Review*, Volumne 91, Issue 3:531–551.

Saborowski, C., Sanya, S., Weisfeld, H., and Yepez, J. (2014). Effectiveness of capital outflow restrictions. Technical Report 14/8, International Monetary Fund.

Schmitt-Grohé, S. and Uribe, M. (2016). Downward nominal wage rigidity, currency pegs, and involuntary unemployment. *Journal of Political Economy*, 124(5):1466–1514.

Schmitt-Grohé, S. and Uribe, M. (2021). Multiple equilibria in open economies with collateral constraints. *The Review of Economic Studies*, 88(2):969–1001.

Stiglitz, J. E. and Ostry, J. D. (2022). The imf is still behind the times on capital controls. *Project Syndicate*.

Wallace, N. (1988). Another attempt to explain an Illiquid banking system: With sequential service taken seriously. *Federal Reserve Bank Minneapolis Quarterly Review*, pages 3–15.

Zeev, N. B. (2017). Capital controls as shock absorbers. *Journal of International Economics*, 109:43–67.

A Theoretical Appendix

In the spirit of game theory, this appendix discusses our basic model in terms players, decision nodes, moves to each player at the nodes, and payoffs. To define the equilibrium concept, one slight complication is that there is a continuum of players (investors). It is then helpful to add aggregate outcomes to the list of objects to be specified in an equilibrium.[28]

A.1 Basic Model With Given CCO Policy

In section 3 we assume that a capital controls policy (either $\pi = LF$ or $\pi = CCO$) is set at the start of the game. The policy is applied at $t = 1$ only if the state turns out to be fragile.

Players. The government (G) and a continuum of (foreign) investors.

Nodes and Information. An initial time $t = 0,$ with π given.

At $t = 1,$ there are two possible states, *normal* and *fragile,* with probabilities q and $1 - q$. If the state is fragile an exogenous variable is then realized, "sunspots" with probability p and "no sunspots" with probability $(1 - p)$.

Hence there are three nodes at $t = 2$: normal (with probability $1 - q$), fragile with sunspot (probability pq, referred to as sunspots, for brevity), and fragile without sunspot (probability $q(1 - p),$ referred to as no sunspots).

Moves and Strategies. At $t = 0$ the government proposes an initial contribution i from the typical investor. The investor then accepts or rejects it. To simplify exposition, we will just assume that i is the maximal contribution that is accepted, i.e. i must equal the expected payoff to investors.

The only other nontrivial decision is made by the typical investor in period $t = 1$, if the state is fragile and after observing the sunspots realization. We describe the investor 's *strategy* by two indicator functions: χ_s ($= 1$ if investor leaves if sunspots, $\chi_s = 0$ if not); χ_{ns} ($= 1$ or 0 if investor leaves or stays) if no sunspots. An investor strategy will be denoted by $\chi = (\chi_s, \chi_{ns})$

Aggregate Outcomes and Payoffs. The *aggregate run outcome* $\lambda = (\lambda_s, \lambda_{ns})$ is the number of investors λ_s (λ_{ns}) that stay if sunspots (no sunspots) at $t = 1$. Without loss of generality, we restrict attention to outcomes where λ_s and λ_{ns} are either 0 or 1.

Given the initial project size i and an aggregate run outcome, other aggregate outcomes and payoffs are defined in the natural way. For instance, the project size evolves according to $I_0 = A + i$; if state is normal at $t = 1$, $I_2 = I_1 = I_0$; in the sunspots state, $I_2 = g(\lambda_s)(1 - \phi)I_0 \equiv I_{2s}$; in the no sunspots state, $I_2 = g(\lambda_{ns})(1-\phi)I_0 \equiv I_{2ns}$. The expected final size of the project is then $E(I_2) = (1-q)I_0 + q\left[pI_{2s} + (1 - p)I_{2ns}\right].$

The government's expected payoff is then $BE(I_2),$ and the expected payoff to an investor is $(1-q)RI_0 + qp[\chi_s\omega(1 - \tau)i + (1 - \chi_s)RI_{2s}] + q(1 - p)[\chi_{ns}\omega(1 - \tau)i + (1 - \chi_{ns})RI_{2ns}] - i.$

Equilibrium. An initial proposal $i,$ an investor strategy $\chi,$ and aggregate run outcome λ are an (anonymous, symmetric, sequentially perfect) equilibrium if:

1. The aggregate run outcome is consistent with the investor's strategy (i.e. $\lambda_s = 1-\chi_s$ and $\lambda_{ns} = 1-\chi_{ns}$)
2. The initial proposal i is greater than zero and gives investors a zero expected payoff, given the aggregate outcome
3. The strategy χ is optimal for the typical individual investor, given the aggregate run outcome λ.

Proposition. Assuming that

$$(1 - \tau)\omega < \frac{1 - \phi}{1 - q\phi}$$

[28] In game theoretical terms, our model should be seen as an *anonymous* game.

there is an equilibrium **with** capital flight given by:

$$\begin{aligned}\chi_s &= 1,\ \lambda_s = 0\\ \chi_{ns} &= 0, \lambda_{ns} = 1\\ I_{2s} &= 0,\ I_{2ns} = (1-\phi)I_0\end{aligned}$$

and

$$I_0 = A + i = LA$$

where the leverage coefficient is

$$L = \frac{1 - qp(1-\tau)\omega}{(1-qp(1-\tau)\omega) - [q(1-p)(1-\phi) + (1-q)]R}$$

Remarks. In this equilibrium, there is capital flight at $t = 1$ with probability pq. Also, note that in laissez faire the leverage coefficient becomes

$$I_0 = \frac{1 - pq\omega}{1 - pq\omega - (1-pq)R}A$$

which is consistent with the text.

Proof. Equilibrium condition 1 holds by construction. Let $\hat{f}(\lambda)$ denote the return to the individual investor from staying with the project under CCOs, as in the main text. For condition 3, it is necessary in the sunspots state that

$$(1-\tau)\omega i > \hat{f}(0)i = 0$$

which holds if $i > 0$. In the no sunspots state, it is necessary that

$$(1-\tau)\omega i < \hat{f}(1)i = (1-\phi)RI_0$$

Now, the expected payoff to investors is:

$$q[p(1-\tau)\omega i + (1-p)(1-\phi)RI_0] + (1-q)RI_0 - i = 0$$

which, after simplification and rearranging, gives

$$(1-\phi)RI_0/i = \frac{[1 - qp(1-\tau)\omega]\,(1-\phi)}{q(1-p)(1-\phi) + (1-q)}$$

The necessary condition $(1-\tau)\omega i < (1-\phi)RI_0$ is then satisfied under the condition of the proposition. Finally, since $i = I_0 - A$ we get L and I_0 from

$$q[p(1-\tau)\omega(I_0 - A) + (1-p)(1-\phi)RI_0] + (1-q)RI_0 = I_0 - A$$

This construction ensures that equilibrium condition 2 holds.■

Corollary. If

$$(1-\tau)\omega < \hat{f}(0)$$

there cannot be an equilibrium with capital flight.

Proof. From the previous discussion, capital flight in the sunspots state requires $(1-\tau)\omega i > \hat{f}(0)i$, which is ruled out by the preceding inequality.■

One consequence is that a policy with $\tau = 1$ can always rule out capital flight.

Proposition. Assuming the same condition as in the previous proposition, there is an equilibrium **without** capital flight given by

$$\begin{aligned}\chi_s &= 0,\ \lambda_s = 1\\ \chi_{ns} &= 0, \lambda_{ns} = 1\\ I_{2s} &= I_{2ns} = (1-\phi)I_0\end{aligned}$$

and

$$I_0 = A + i = \frac{1}{1-(1-q\phi)R}A$$

Proof. Again the proof requires just to check conditions 1-3. For condition 3, with or without sunspots, we need

$$(1-\tau)\omega i < \hat{f}(1)i = (1-\phi)RI_0$$

In this case the payoff to investors is given by

$$(1-q\phi)RI_0 - i = 0$$

and hence the preceding inequality becomes

$$(1-\tau)\omega(1-q\phi) < (1-\phi)$$

which is the condition of the proposition.■

A.2 Optimal Policy With Commitment

In subsection 4.2 it is assumed that G *chooses* a policy π at $t = 0$, together with the proposal i. An *optimal policy with commitment* is then a choice (i, π) such that there is no other (i, π) that results in an equilibrium with a higher $E(I_2)$.

The analysis of the preceding section is modified in the obvious way. Assuming that the conditions of the Propositions of the previous section hold, capital controls are optimal if

$$(1-q\phi)\left[\frac{1}{1-(1-q\phi)R}\right] > (1-pq)\frac{1-pq\omega}{1-pq\omega-(1-pq)R}$$

and laissez faire is optimal if the inequality is the opposite. This is just the main result of subsection 4.2 where the proof is given.

A.3 Discretionary Case

Assume instead, as in subsection 4.3, that G chooses a policy π at $t = 1$ if the state is fragile, but before the sunspot variable is realized. The original formulation of the model and the definition of equilibrium need to be modified accordingly. In particular, the investor strategy χ as well as the aggregate run outcome can depend on the policy choice π. The investors' strategy is now denoted by $\chi = (\chi_s^\pi, \chi_{ns}^\pi)$, with $\pi = LF, CCO$, and the aggregate run outcome by $\lambda = (\lambda_s^\pi, \lambda_{ns}^\pi)$. In this notation, λ_s is the number of investors that stay in the fragile state under policy π if sunspots are observed, etc.

Equilibrium. A project size i, policy π, investor strategy χ, and aggregate run outcome λ is a *discretionary equilibrium* if:

1. The aggregate run outcome is consistent with the strategy pair
2. The initial proposal i is greater than zero and gives investors a zero expected payoff, given the aggregate outcome λ and policy π.
3. The policy π is optimal for the government at $t = 1$, given $I_0 = A + i$ and the aggregate run outcome λ.
4. The strategy χ is optimal for the typical individual investor, given the aggregate run outcome λ and policy π.

Proposition. There is a discretionary equilibrium with $\pi = CCO$ if

$$p > \phi$$

If the inequality is the opposite, there is a discretionary equilibrium with $\pi = LF$.

Proof. Once more, the proof involves checking 1-4 and left to the reader. In particular, the proof of condition 3 follows subsection 6.2 in the text.■

A.4 Political Opportunism (Single Stage)

Now consider the case with political opportunism described in subsection 5.1.

Players. The government G and the continuum of investors.

Nodes, Information, and Moves. At $t = 0$, "nature" chooses the government's *type*: honest or opportunistic. Investors have an initial **belief** $\beta \in [0, 1]$ that the government is honest.

At $t = 1$, if G is opportunistic, the state of the economy is assumed to be fragile (this simplifies the exposition). In that node, the CCO policy $\pi = CCO$ is imposed by the opportunistic G, and $I_1 = (1 - \phi)I_0$.

If G is honest, at $t = 1$ the state can be normal with probability $1 - q$ or fragile with probability q. In the normal state investors do not have the opportunity to run, so we assume that the LF policy $\pi = LF$ is imposed, and $I_0 = I_1 = I_2$.

If the state is fragile and G is honest, G can choose either $\pi = LF$ or $\pi = CCO$. (This is the only point in $t = 1$ at which the honest government makes a nontrivial decision).

In the fragile state, investors decide whether to stay or leave after observing the policy π and the realization of the sunspots variable.

The size of the project is adjusted according to whether the state is normal or fragile, the policy π, and the aggregate investment decision. At $t = 2$, investors are then paid and model ends.

Strategies, Aggregate Outcomes, Beliefs. At $t = 0$ both kinds of government propose an initial project size I_0 and contribution $i = I_0 - A$ to the typical investor. To shorten exposition, we impose that the proposal leave investors indifferent between accepting or not. (This is clearly optimal for the honest government, while the opportunistic government must imitate the honest one so as not to reveal its type.)

At $t = 1$, as noted above, the only nontrivial decision for the honest government is to choose a policy $\pi = LF$ or $\pi = CCO$ if the state is fragile.

The investor 's *strategy* χ is given by her choice of staying or leaving in the fragile state, conditional on the observed policy π and sunspots realization. It is again denoted by $\chi = (\chi_s^\pi, \chi_{ns}^\pi)$.

The *aggregate run outcome* $\lambda = (\lambda_s^\pi, \lambda_{ns}^\pi)$ is the number of investors that stay if policy π is observed and sunspots occur (λ_s^π) or not (λ_{ns}^π).

Clearly, given i, the government's strategy π and the aggregate run outcome χ determine project size at all nodes in the natural manner. Payoffs depend on I_2 as in the basic model.

Equilibrium. An equilibrium in the model with political opportunism is an initial proposal i and project size $I_0 = A + i$, an investors' strategy χ, a government strategy π, and an aggregate run outcome λ, such that:

1. The aggregate run outcome λ is consistent with χ
2. The initial proposal i gives investors an expected zero payoff, given the policy π, the aggregate run outcome, and the initial government reputation β.
3. The strategy χ is optimal for the individual investor at $t = 1$, given I_0, π, and the aggregate run outcome λ.
4. Policy π is optimal for the honest G if the state is fragile in $t = 1$, given I_0 and the aggregate run outcome λ.

Proposition. There is an equilibrium in which $\pi = CCO, (\lambda_s^{CCO}, \lambda_{ns}^{CCO}) = (1,1), (\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1), \chi = 1 - \lambda, i = I_0 - A$ with

$$I_0 = \frac{1}{1 - [\beta(1-\phi q) + (1-\beta)(1-\phi)]R} A$$

provided that

$$\omega < \frac{1}{(1-\beta)(1-\phi) + \beta(1-q\phi)}$$

and

$$p > \phi$$

Proof. Equilibrium condition 1 is true by construction. For condition 2, note that the expected initial payoff for investors in equilibrium satisfies

$$(1-\beta)(1-\phi)RI_0 + \beta\left[(1-q)RI_0 + q(1-\phi)RI_0\right] = i = I_0 - A$$

which yields the equilibrium value of I_0.

At $t = 1$, if $\pi = CCO$ is observed investors stay, by the assumption that $CCOs$ bind. If $\pi = LF$ is observed and the state is fragile (which occurs with probability zero), the equilibrium continuation $(\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1)$ says that probability p and stay with probability $1-p$. This is individually optimal if $0 < \omega i < RI_0$, which holds because $i > 0$ and $\omega < R(I_0/(I_0 - A)))$ under the conditions of the proposition.

Finally, condition 4 is satisfied if $p > \phi$, as discussed in the text. ■

A.5 Two Stage Model

We turn to the two stage model of subsection 5.2 . To simplify matters, here we only expand on the analysis of the first stage, taking advantage of the special assumptions we have imposed, and especially that the payoff to the honest government in the second stage, $\Pi^{(2)}(\beta^{(2)})$, is completely determined its *reputation* $\beta^{(2)}$ entering that stage.

The formal description of the first stage is the same as that of the one stage model, except that one needs to describe the evolution of reputation, and that the honest government cares about two stage payoffs. Hence we omit stage superscripts unless strictly needed.

Players. The government G and the continuum of investors.

Nodes, Information, and Moves. An initial time $t = 0$, "nature" chooses the government's *type*: honest or opportunistic. Investors have an initial **belief** $\beta^{(1)}$ that the government is honest.

At $t=1,$ if G is opportunistic, the state of the economy is assumed to be fragile, the CCO policy $\pi = CCO$ is imposed, and $I_1 = (1-\phi)I_0$.

If G is honest, at $t=1$ the state is normal with probability $1-q$ or fragile with probability q. In the normal state the LF policy $\pi = LF$ is imposed, and $I_0 = I_1 = I_2$.

If the state is fragile and G is honest, G chooses between $\pi = LF$ or $\pi = CCO$.Investors decide whether to stay or leave after observing the policy π and the realization of the sunspots variable.

The size of the project is adjusted according to whether the state is normal or fragile, the policy π, and the aggregate investment decision. At $t=2,$ investors are then paid and the first stage ends.

Strategies, Aggregate Outcomes, Beliefs. At $t=0$ both kinds of government propose an initial project size I_0 and contribution $i = I_0 - A$ to the typical investor. The proposal leave investors indifferent between accepting or not.

The honest G's strategy is a choice $\pi = LF$ or CCO. The investor 's *strategy* $\chi = (\chi_s^\pi, \chi_{ns}^\pi)$ is given by her choice of staying or leaving in the fragile state at $t=1$, having observed the policy π and sunspots realization.

The *aggregate run outcome* is again denoted by $\lambda = (\lambda_s^\pi, \lambda_{ns}^\pi)$ and has the same meaning as in the previous section.

Given i, the government's strategy π and the aggregate run outcome χ determine the evolution of project size. First stage payoffs depend on $I_2 = I_2^{(1)}$ as in the basic model.

Finally, as mentioned, the second stage payoff to the government is $\Pi(\beta^{(2)})$, where $\beta^{(2)}$ depends on first stage outcomes. Let β_{CCO} denote the posterior investors' belief that G is honest if $\pi = CCO$ has been observed. Of course, if $\pi = LF$ has been observed, investors learn that G is honest for sure. So $\beta^{(2)} = \beta^{CCO}$ if the state is fragile and $\pi = CCO$ is observed, and $\beta^{(2)} = 1$ in all other cases.

Dynamic equilibrium. A dynamic equilibrium is an initial proposal i and project size $I_0 = A + i$, an investors' strategy $\chi,$ a government strategy $\pi,$ an aggregate run outcome $\lambda,$ and a posterior belief β_{CCO} such that:

1. The aggregate run outcome λ is consistent with χ
2. The initial proposal i gives investors an expected zero payoff, given the policy π, the aggregate run outcome, and the initial government reputation $\beta^{(1)}$.
3. The strategy χ is optimal for the individual investor at $t=1,$ given I_0, π, and the aggregate run outcome λ.
4. Policy π is optimal for the honest G if the state is fragile in $t=1$, given $I_0,$ $\beta_{CCO},$ and the aggregate run outcome λ.
5. β_{CCO} is derived from π using Bayes' Rule.

Remark. As mentioned earlier, in condition 4 optimality for the honest G refers to its two stage payoff.

The following propositions describe the two classes of equilibria mentioned in subsection 5.3 of the text.

Proposition (Partially Revealing Equilibrium). There is an equilibrium in which $\pi = CCO, (\lambda_s^{CCO}, \lambda_{ns}^{CCO}) = (1,1), (\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1), \chi = 1-\lambda, i = I_0 - A$ with

$$I_0 = \frac{1}{1 - [\beta^{(1)}(1-\phi q) + (1-\beta^{(1)})(1-\phi)]R} A \tag{14}$$

and

$$\beta^{CCO} = \beta^{(1)} \frac{q}{q + (1-\beta^{(1)})(1-q)} \tag{15}$$

provided that

$$\omega < R(I_0/(I_0 - A)))$$

and

$$p - \phi > \frac{1}{BI_0}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta^{CCO})] \tag{16}$$

Proof. Equilibrium condition 1 holds by construction.

Note that there is no capital flight in this equilibrium, but CCOs are imposed in the fragile state. So the zero expected payoff condition is:

$$i = RI_0[1 - \phi(\beta^{(1)}q + (1 - \beta^{(1)}))]$$

Using $I_0 = A + i$ gives the equilibrium I_0. Condition 2 is then satisfied.

If CCOs are imposed, they are binding by assumption, so $(\lambda_s^{CCO}, \lambda_{ns}^{CCO})$ must equal $(1,1)$. If the state is fragile but CCOs are not imposed (which can only happen out of equilibrium), the condition $(\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1)$ means that there is capital flight with probability p. Following previous discussion, this is seen to be optimal for individual investors provided $0 < \omega i < RI_0$, which is guaranteed by $\omega < R(I_0/(I_0 - A)))$.

Finally, conditions 4 and 5 are proven with the same arguments as in the main text.■

Proposition (Fully Revealing Equilibrium). There is an equilibrium in which $\pi = LF$, $(\lambda_s^{CCO}, \lambda_{ns}^{CCO}) = (1,1), (\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1), \chi = 1 - \lambda$, $i = I_0 - A$ with

$$I_0 = \frac{1}{1 - [\beta^{(1)}(1 - pq) + (1 - \beta^{(1)})(1 - \phi)]R}A \tag{17}$$

and

$$\beta^{CCO} = 0$$

provided that

$$\omega < R(I_0/(I_0 - A)))$$

and

$$0 < p - \phi < \frac{1}{BI_0}[\Pi^{(2)}(1) - \Pi^{(2)}(0)]$$

The proof is a simple adaptation of previous arguments and the discussion in the text, and left to the interested reader.■

Finally, we turn to the existence of equilibrium. The two results below imply the proposition in subsection 5.3

Existence of equilibrium. Suppose that a partially revealing equilibrium does not exist. Then 16 must fail at $I_0^{(1)} = I_{CC}$ where I_{CC} is the right hand side of (14).

Let I_{LF} be the value of $I_0^{(1)}$ in a perfectly revealing equilibrium, that is, the RHS of (17). Because $p > \phi$, $I_{CC} > I_{LF}$. Hence

$$\begin{aligned} p - \phi &\leq \frac{1}{BI_{CC}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC})] \\ &< \frac{1}{BI_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC})] \\ &< \frac{1}{BI_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] \end{aligned}$$

where the third inequality follows from $\Pi^{(2)}(\beta_{CC}) > \Pi^{(2)}(0)$.

Hence, if 16 fails with $I_0^{(1)} = I_{CC}$, it fails with $I_0^{(1)} = I_{LF}$ and $\beta_{CC}^{(2)} = 0$ as well. But this means that there is a perfectly revealing equilibrium (with $I_0^{(1)} = I_{LF}$ and $\beta_{CC}^{(2)} = 0$).

We have shown that a perfectly revealing equilibrium exists if an imperfectly revealing equilibrium does not. Hence at least one equilibrium exists.

Multiplicity of equilibria. From the analysis above we infer that equilibria of both kinds coexist if

$$\frac{1}{BI_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] > p - \phi > \frac{1}{BI_{CC}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC})] \tag{18}$$

We claim that

$$\frac{1}{BI_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] > \frac{1}{BI_{CC}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC})]$$

and hence the multiplicity condition can be satisfied (for $p - \phi$ in the obvious range).

Consider:

$$\begin{aligned}
& \frac{1}{I_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] - \frac{1}{I_{cc}}[\Pi^{(2)}(1) - \Pi^{(2)}(\beta_{CC})] \\
= \quad & \frac{1}{I_{LF}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] - \frac{1}{I_{cc}}[\Pi^{(2)}(1) - \Pi^{(2)}(0)] + \Pi^{(2)}(0) - \Pi^{(2)}(\beta_{CC})] \\
= \quad & (\frac{1}{I_{LF}} - \frac{1}{I_{CC}})[\Pi^{(2)}(1) - \Pi^{(2)}(0)] + \frac{1}{I_{CC}}[\Pi^{(2)}(\beta_{CC}) - \Pi^{(2)}(0)]
\end{aligned}$$

Since $I_{CC} > I_{LF}$, and $\Pi^{(2)}(\beta^{(2)})$ is increasing in $\beta^{(2)}$, all the terms are positive, proving the claim. We conclude that (18) can hold, and therefore there can be equilibria of the two types.

Internet Appendix

This Empirical Appendix gathers additional results. It is structured as follows. Table A.1 lists the 31 episodes of CCO tightening from each of the three sources used, and the related crises indicators from Laeven and Valencia (2018). The subsequent four figures (A.1-A.4) expand Figure 3 from the main text documenting the three crises indicators (A.1) and the robustness if each of the three sources is used independently (A.2-A.4). Figures A.5 through A.7 document the 31 CCO episodes across time, exchange rate regime and income level.

Figures A.8 - A.19 document the dynamics around the CCO episodes of the control macro variables used in the analysis: Capital Flows (Gross Capital Inflows, Gross Capital Outflows, Gross Portfolio Inflows, Gross Portfolio Outflows, Gross FDI Inflows, Gross FDI Outflows and Net Capital Inflows), Current Account Balance, Consumption and Investment growth, Exchange Rate, and Inflation.

Figure A.20 presents robustness results when the threshold used to identify CCO episodes is relaxed. Figure A.21 further documents the persistence of CCO indices around the episodes identified.

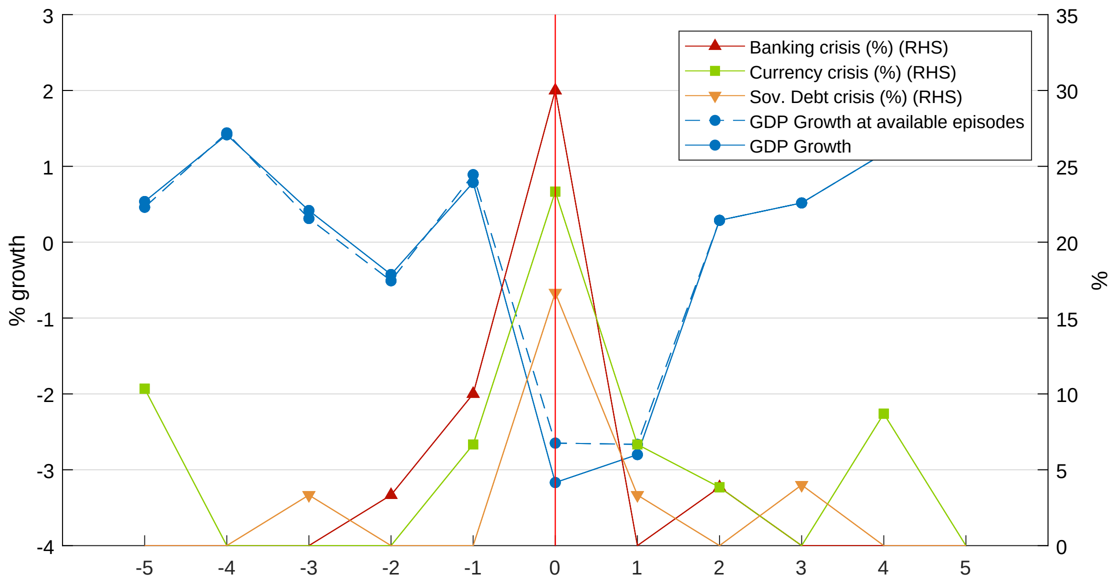
The last figure A.22 describes the methodology and results of the counterfactual analysis that explores causality, where CCO shocks are used to account for growth dynamics in the episodes identified.

The remaining set of tables report OLS regressions and companion Probit regressions aimed at systematically pinning down the relationship between CCOs, GDP growth and crises. Tables A.2, A.3 and their companion Probit regression (A.4) are the baseline model estimated. The next two tables A.5 and A.6 report robustness results when controlling for the level of GDP per capita. Table A.7 reports the CCO episodes where residency can be identified. Table A.8 reports the OLS results correcting cross-sectional dependence through Driscoll and Kraay (1998) standard errors. The last two tables A.9 and A.10 use year fixed effects in the regressions instead of time trend.

Country	Year	Banking crisis	Currency crisis	Sov. debt crisis
Bangladesh∓	1996	0	0	0
Cyprus∓	1996	0	0	0
Uzbekistan∓	1996	0	0	0
Bulgaria∓	1997	0	0	0
Vietnam∓	1997	1	0	0
Malaysia △	1998	0	1	0
Russia △	1998	1	1	1
Ethiopia∓	2000	0	0	0
Argentina △	2001/2002	1	0	1
Turkey △	2001	0	1	0
Uruguay △	2002	1	1	1
Lebanon ∓	2005	0	0	0
Sweden∓	2006	0	0	0
Bolivia ∓	2007	0	0	0
Ecuador ∓	2008	0	0	1
Iceland ∓ ⋆ △	2008/2009	1	1	0
Latvia △	2008/2009	1	0	0
Myanmar ∓	2008/2009	0	0	0
Russia △	2008	1	0	0
Ukraine △	2008	1	0	0
Argentina ⋆	2011	0	0	0
Cyprus ⋆	2013	0	0	1
Czech Republic ∓	2013	0	0	0
Ghana ⋆	2014	0	1	0
Ukraine ⋆	2014/2015	1	1	0
Greece ∓ ⋆	2015	0	0	0
China ⋆	2016	0	0	0
Finland ∓	2016	0	0	0
Sweden ∓	2016	0	0	0
Zimbabwe ⋆	2016	0	0	0
Fiji ⋆	2020	no data	no data	no data
Total		9	7	5

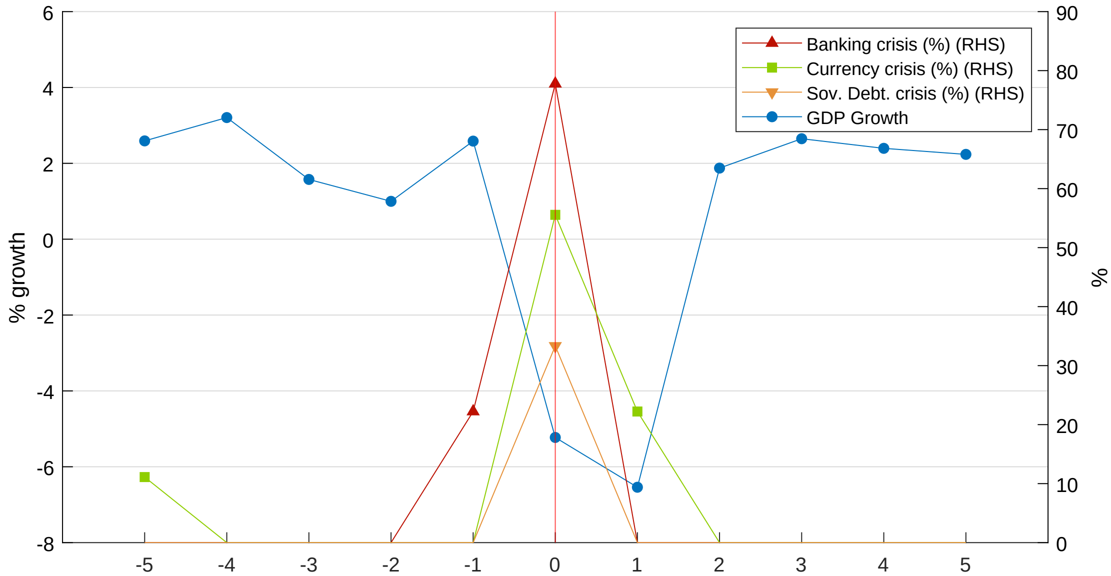
Note: Table reports the 31 CCOs episodes: △ are those coming from IMF (2012b), ⋆ those from the IMF's Taxonomy (Binici and Das 2021) and ∓ those from Fernandez et al. (2016) index. The table also reports crisis indicators of banking, currency and sov. debt crises from Laeven and Valencia (2018) for the CCO episodes.

Table A.1: CCO Episodes and Macro-Financial Crises



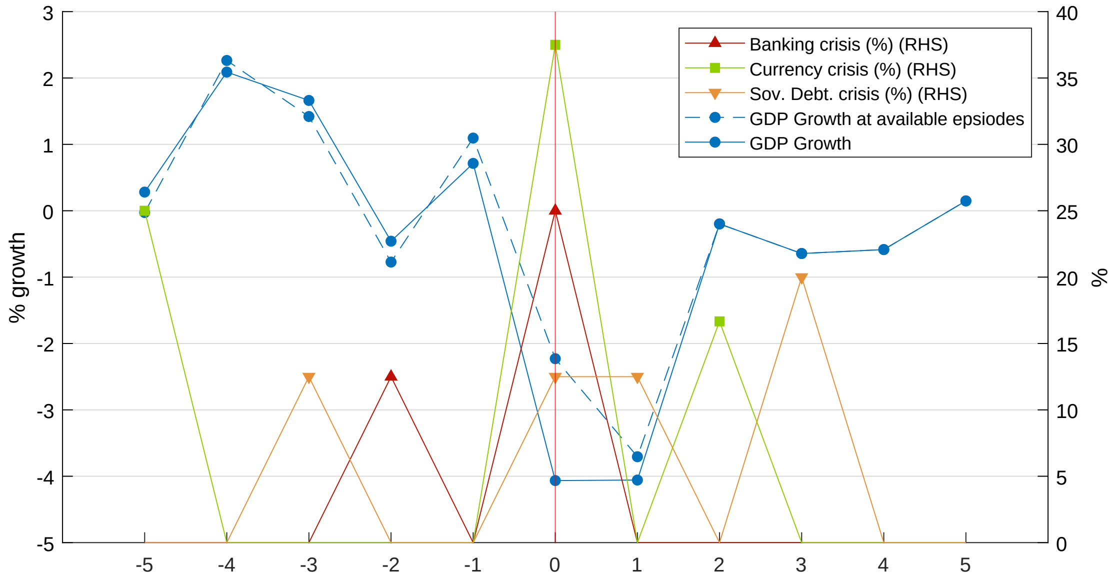
Note: The figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 30 episodes of forceful CCO tightening identified for which crisis indicators of banking, currency and sov. debt crises exist in Laeven and Valencia (2018). $t = 0$ is the year of the episode. Averages of the dummy variables for these three crises indicators are plotted on the right scale. Out of the 31 episodes in CCO identified, only one does not have data from Laeven and Valencia (2018). GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.1: GDP Growth and Crises around full set of episodes



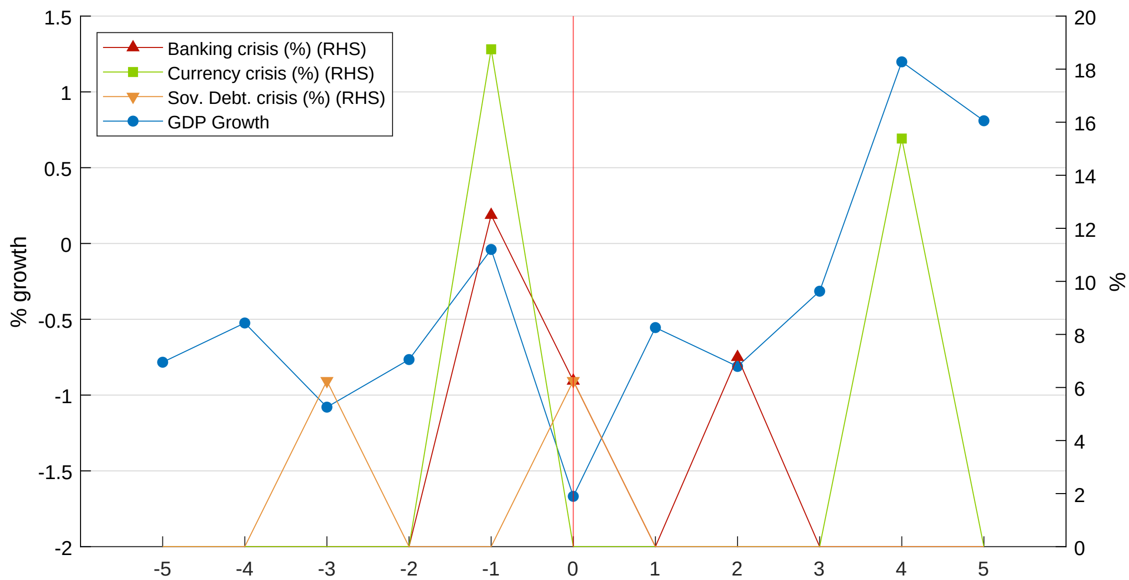
Note: The figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 9 episodes of forceful CCO tightening identified in IMF (2012b), for which crisis indicators of banking, currency and sov. debt crises exist in Laeven and Valencia (2018). $t = 0$ is the year of the episode. Averages of the dummy variables for these three crises indicators are plotted on the right scale.

Figure A.2: GDP Growth and Crises around Episodes in IMF (2012b)



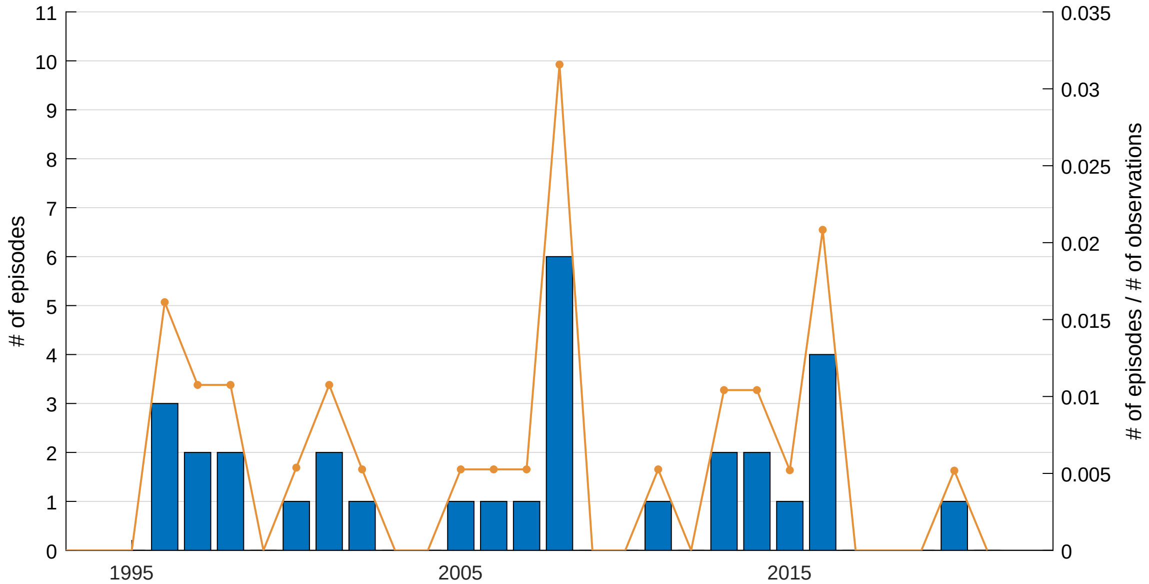
Note: The figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 9 episodes of forceful CCO tightening identified in the Taxonomy (Binici and Das 2021), for which crisis indicators of banking, currency and sov. debt crises exist in Laeven and Valencia (2018). $t = 0$ is the year of the episode. Averages of the dummy variables for these three crises indicators are plotted on the right scale. Out of the 9 episodes in CCO identified, only one does not have data from Laeven and Valencia (2018). GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.3: GDP Growth and Crises around the IMF Taxonomy episodes



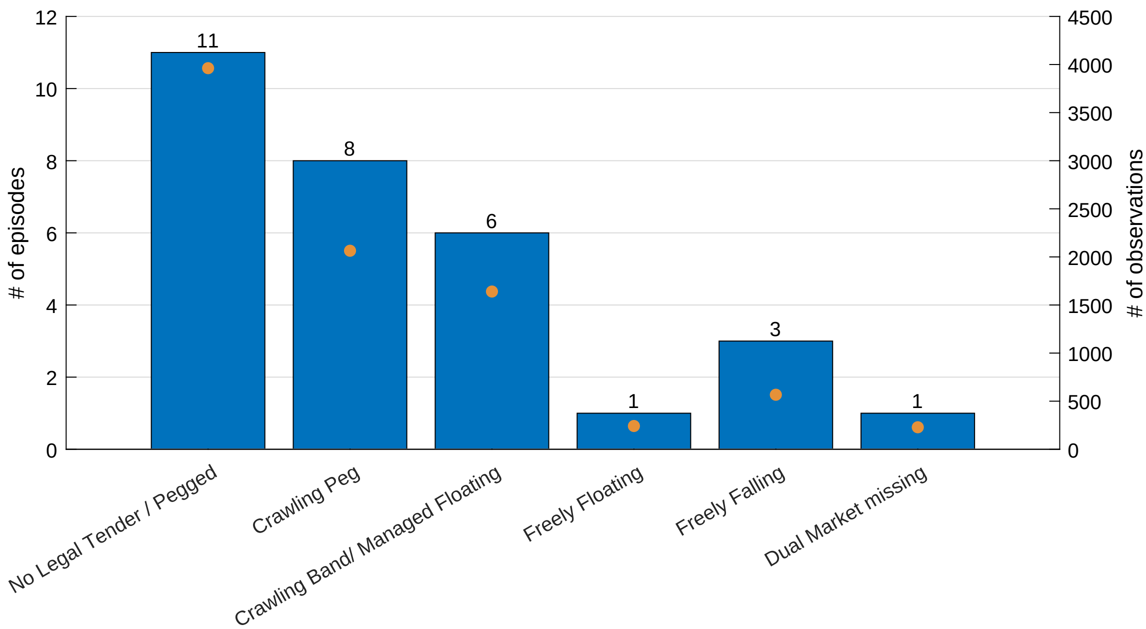
Note: The figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 16 episodes of forceful CCO tightening identified using the Fernandez et al. (2016) index, for which crisis indicators of banking, currency and sov. crises debt exist in Laeven and Valencia (2018). $t = 0$ is the year of the episode. Averages of the dummy variables for these three crises indicators are plotted on the right scale.

Figure A.4: GDP Growth and Crises around Fernandez et al. (2016) episodes



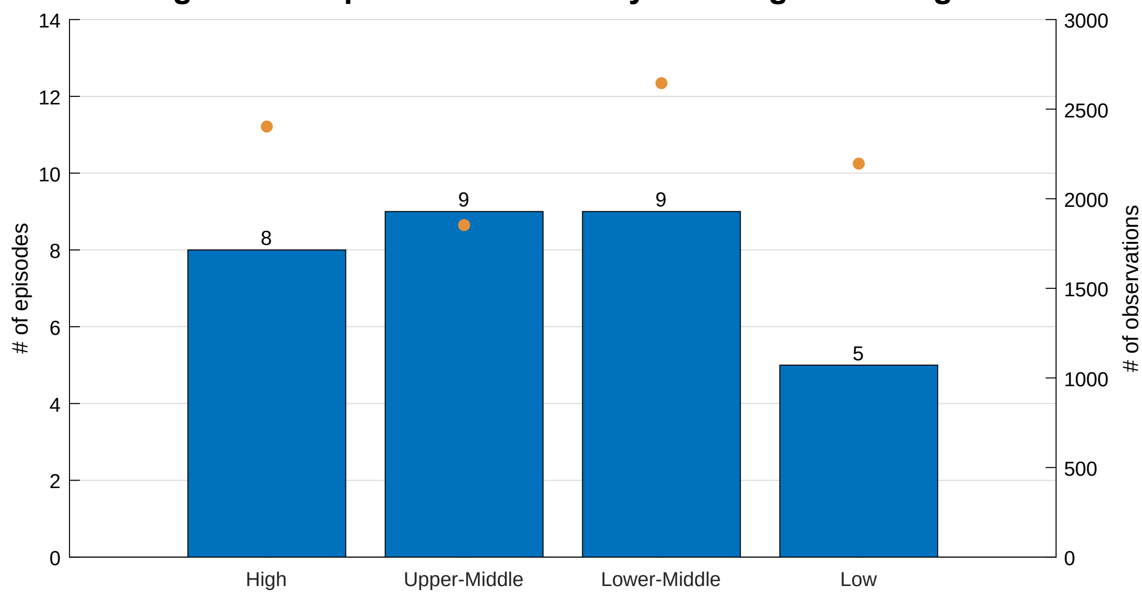
Note: The figure depicts the number of episodes by year. Right scale shows the number of episodes over number of observations, by year, for reference.

Figure A.5: Episodes of CCOs by Year



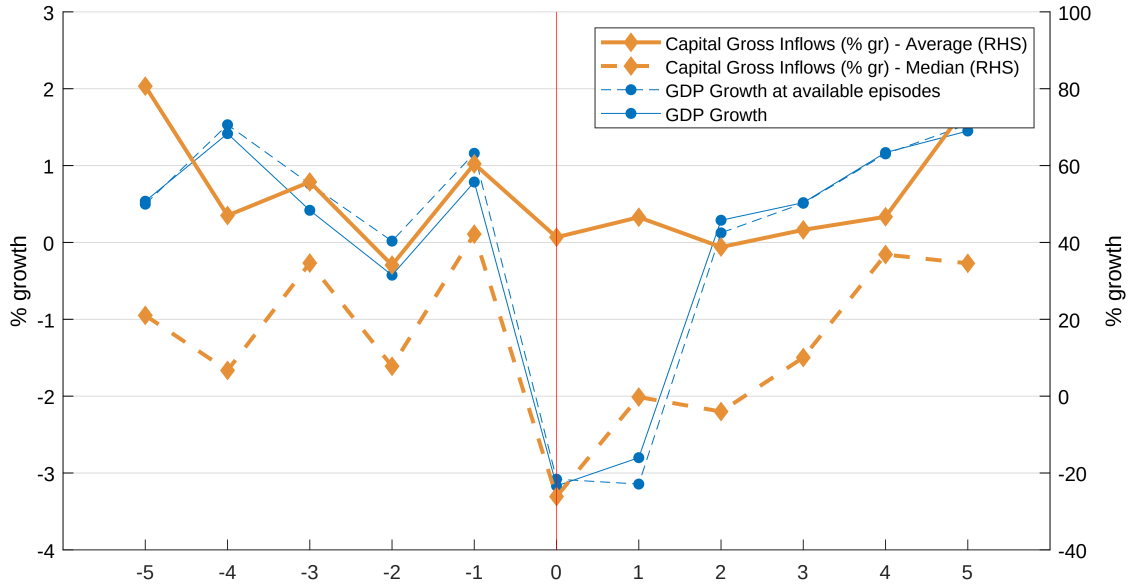
Note: The figure depicts the number of episodes by the exchange rate regime in Ilzetzki et al. (2021). Right scale shows the number of observations, by regime, for reference. 30 episodes can be matched with exchange rate regime data.

Figure A.6: Episodes of CCOs by Exchange Rate Regime



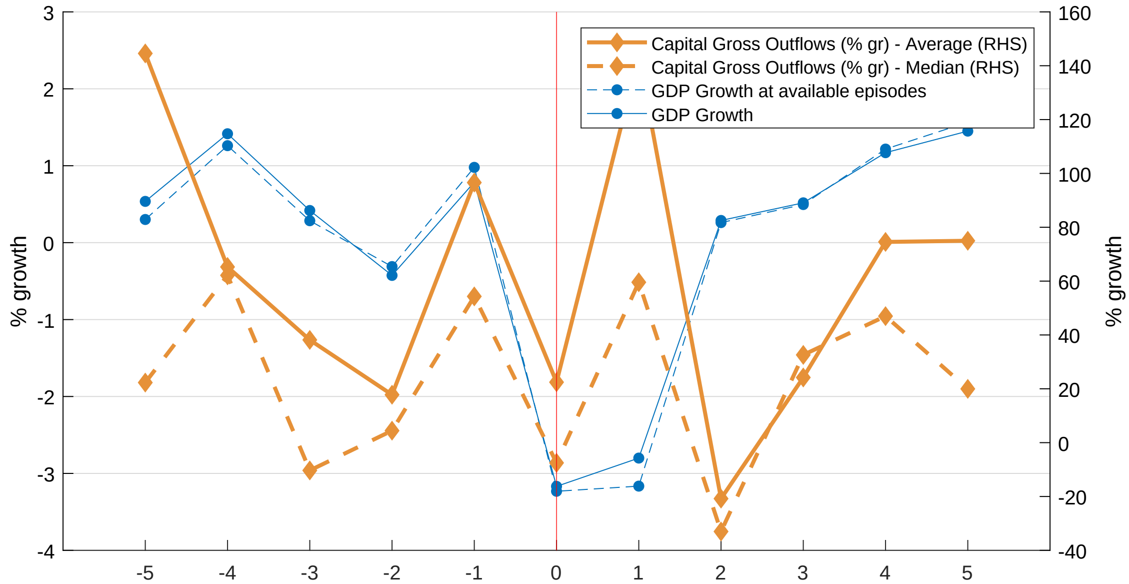
Note: The figure depicts the number of episodes by income level. Right scale shows the number of episodes over number of observations, by year, for reference.

Figure A.7: Episodes of CCOs by Income Level



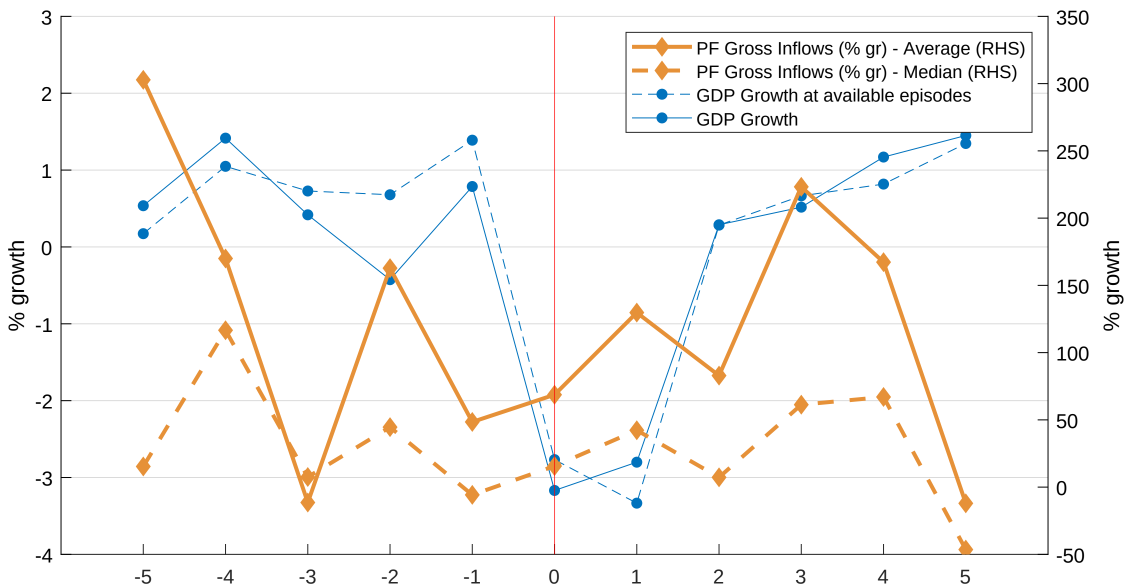
Note: The figure depicts the average and median dynamics of Gross Total Capital Inflows (growth) at the right scale in the ten years around 30 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since one episode does not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.8: Gross Total Capital Inflows growth around Episodes



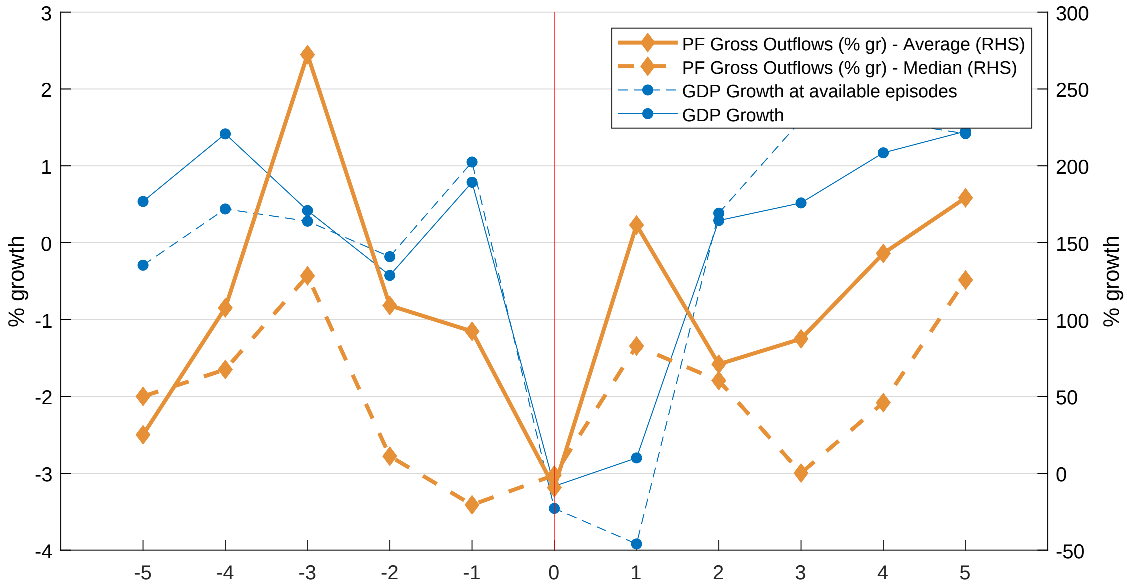
Note: The figure depicts the average and median dynamics of Gross Total Capital Outflows (growth) at the right scale in the ten years around 28 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since three episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.9: Gross Total Capital Outflows growth around Episodes



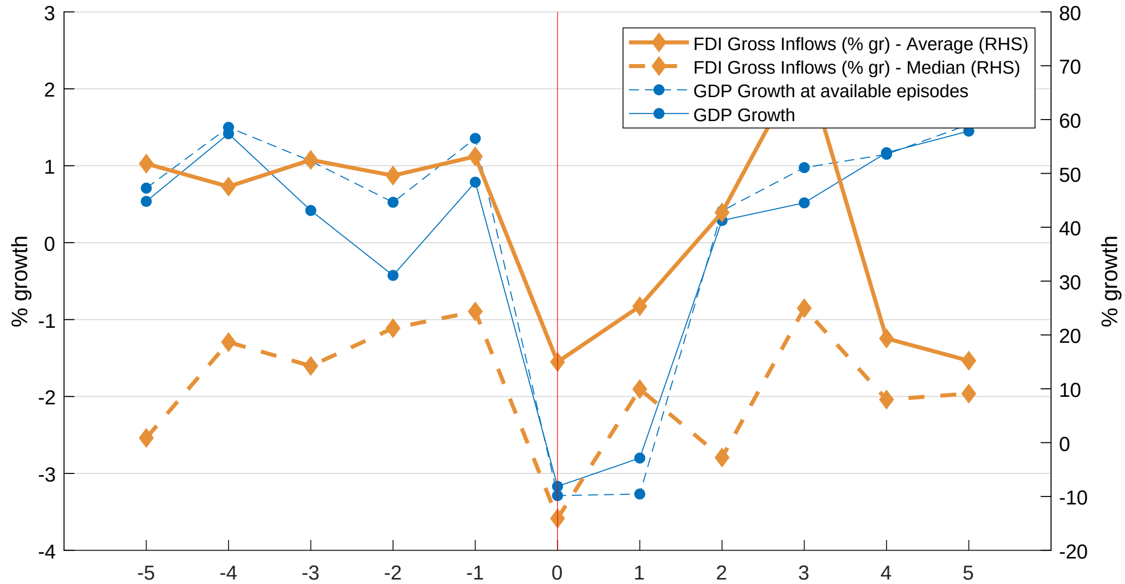
Note: The figure depicts the average and median dynamics of Gross Portfolio Inflows (growth) at the right scale in the ten years around 22 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since nine episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.10: Gross Portfolio Inflows growth around Episodes



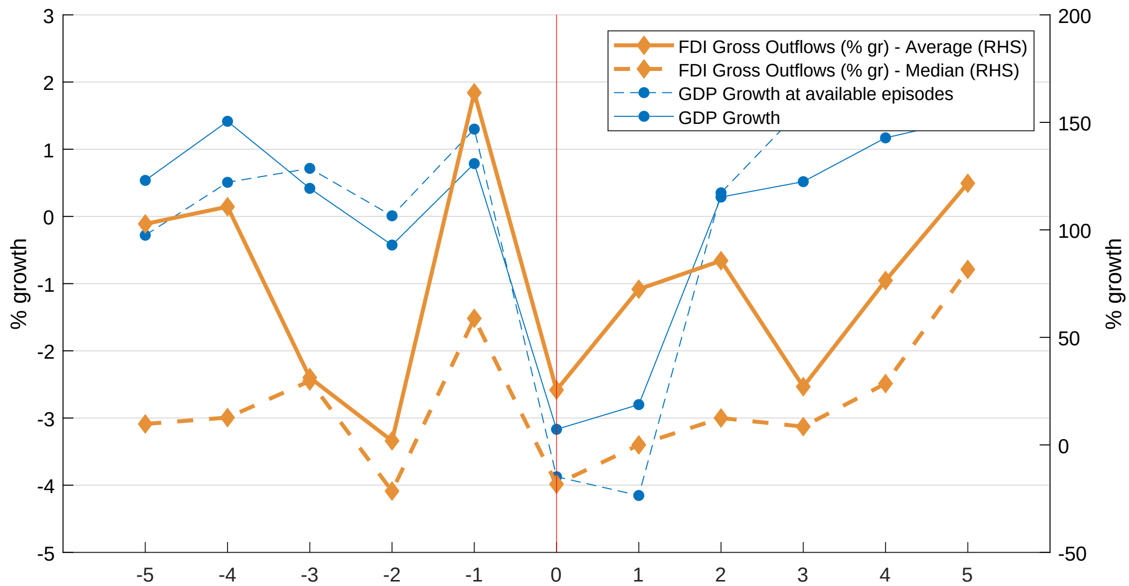
Note: The figure depicts the average and median dynamics of Gross Portfolio Outflows (growth) at the right scale in the ten years around 23 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since eight episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.11: Gross Portfolio Outflows growth around Episodes



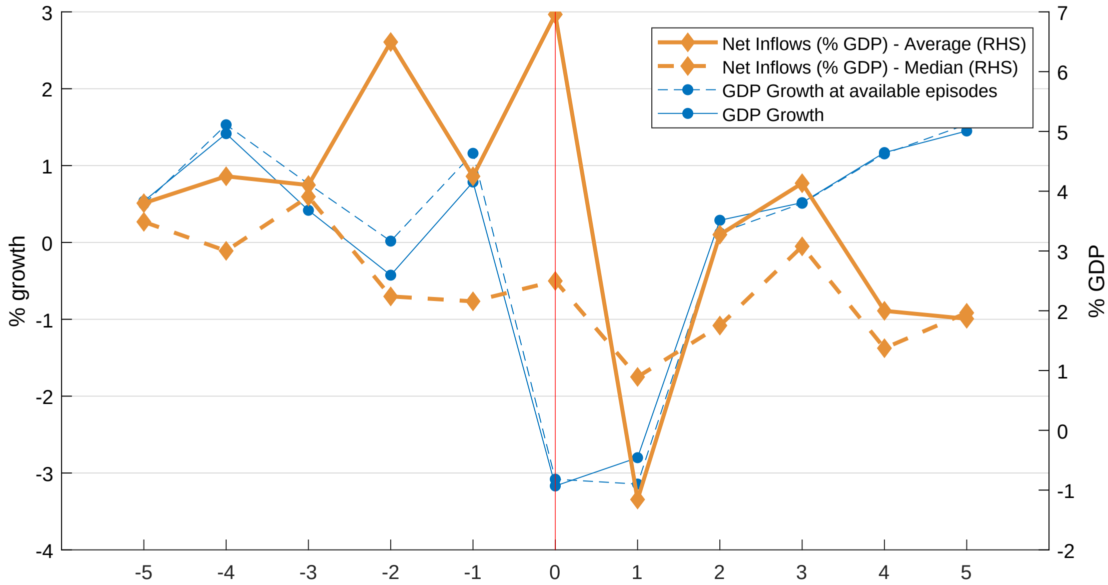
Note: The figure depicts the average and median dynamics of Gross FDI Inflows (growth) at the right scale in the ten years around 28 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since three episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.12: Gross FDI Inflows growth around Episodes



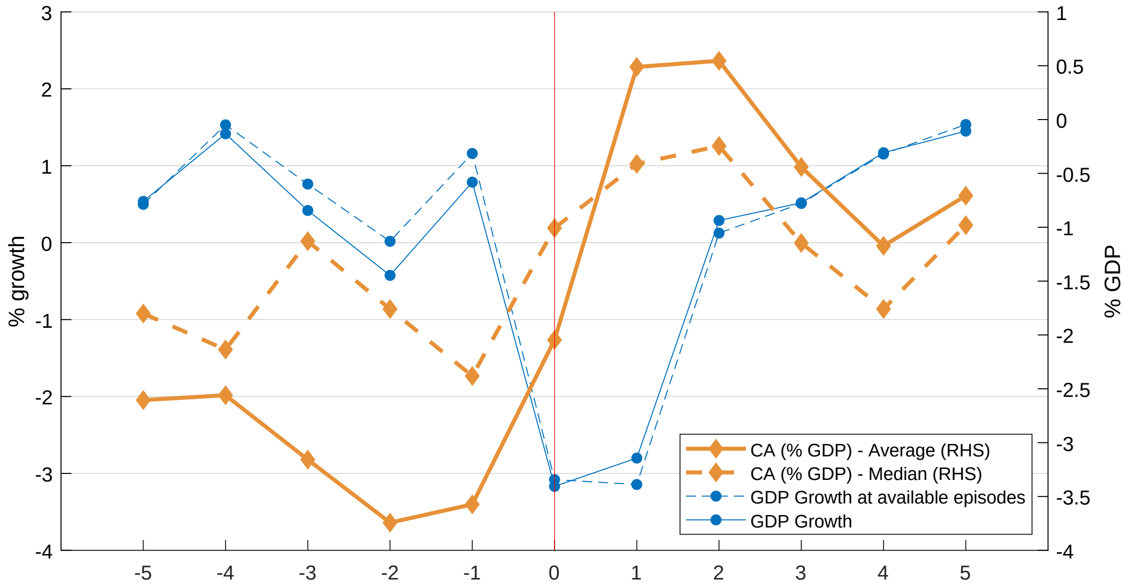
Note: The figure depicts the average and median dynamics of Gross FDI Outflows (growth) at the right scale in the ten years around 22 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since nine episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.13: Gross FDI Outflows growth around Episodes



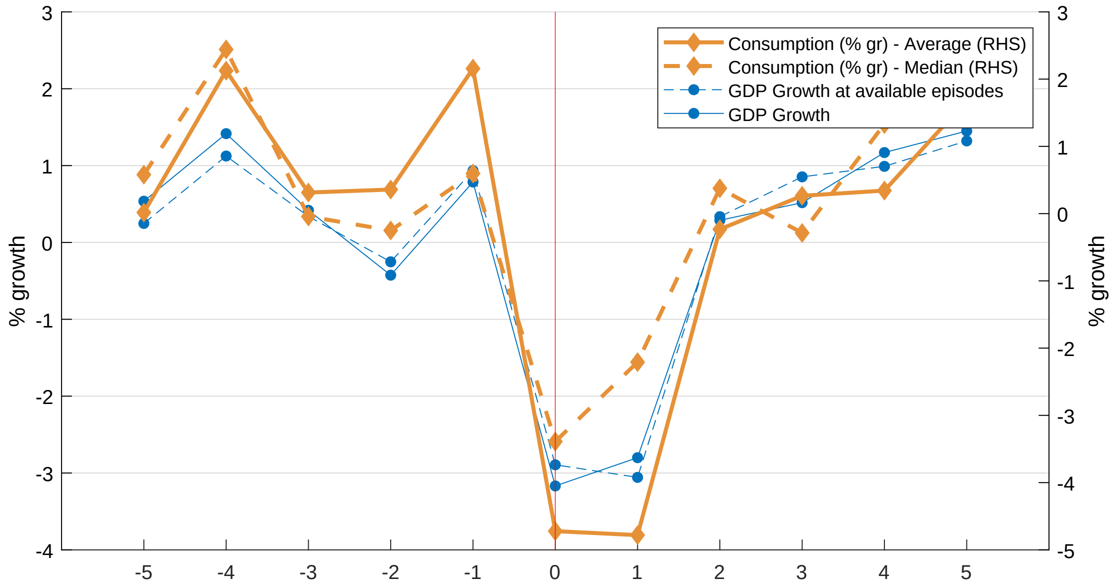
Note: The figure depicts the average and median dynamics of Net Inflows (as % of GDP) at the right scale in the ten years around 30 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since one episode does not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.14: Net Total Capital Inflows (as share of GDP) around Episodes



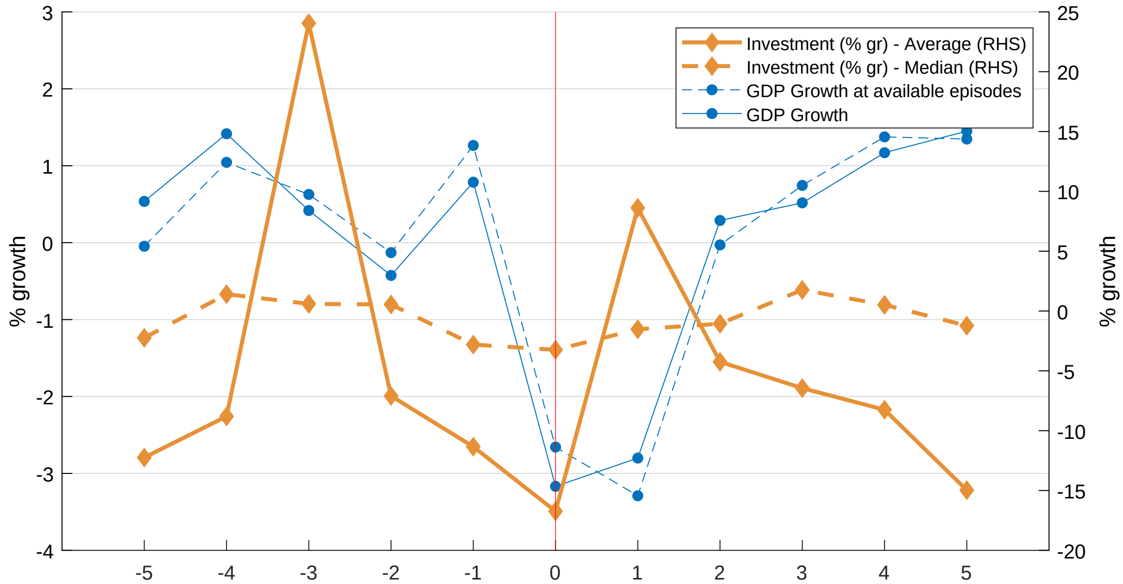
Note: The figure depicts the average and median dynamics of the Current Account Balance (as % of GDP) at the right scale in the ten years around 30 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since one episode does not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.15: Current Account Balance around Episodes



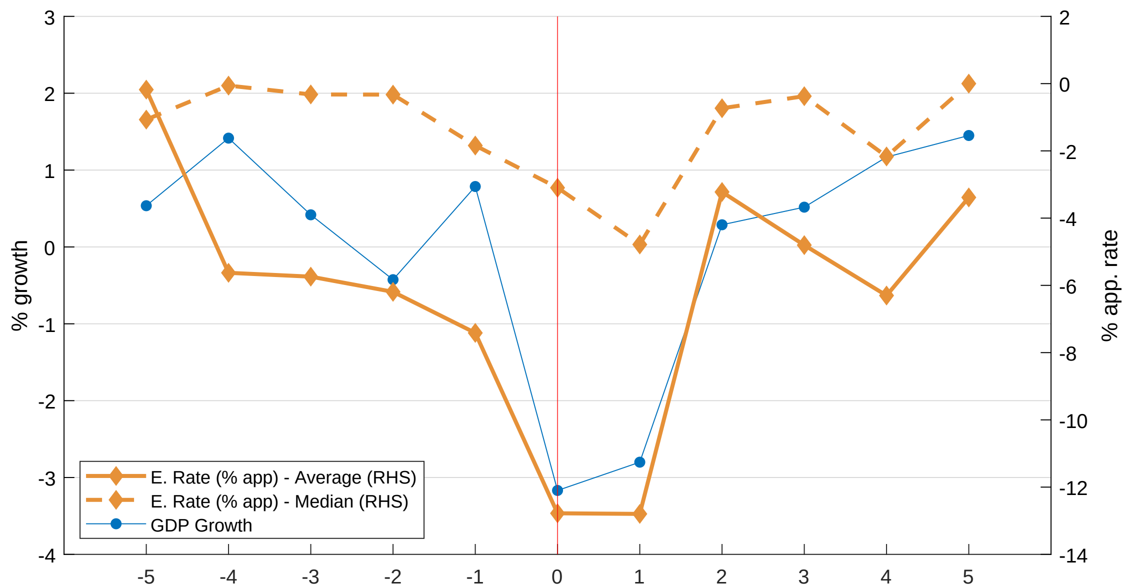
Note: The figure depicts the average and median dynamics of the Consumption growth (demeaned) at the right scale in the ten years around 28 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since three episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.16: Consumption growth around Episodes



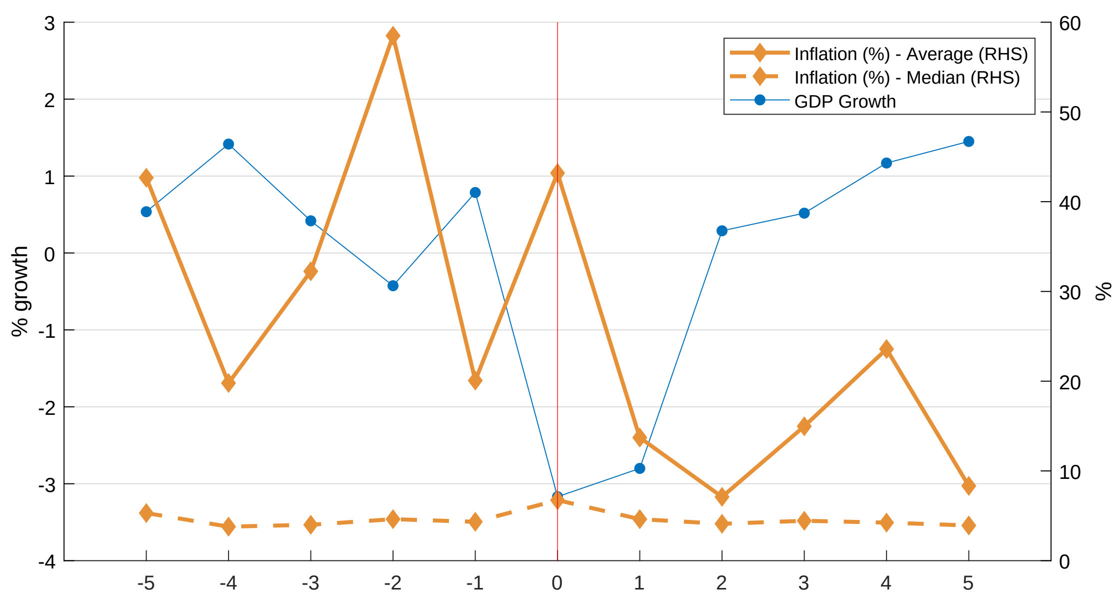
Note: The figure depicts the average and median dynamics of the Investment growth (demeaned) at the right scale in the ten years around 28 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. Since three episodes do not have data for this variable, the GDP Growth and GDP Growth at available episodes are shown for comparison.

Figure A.17: Investment growth around Episodes



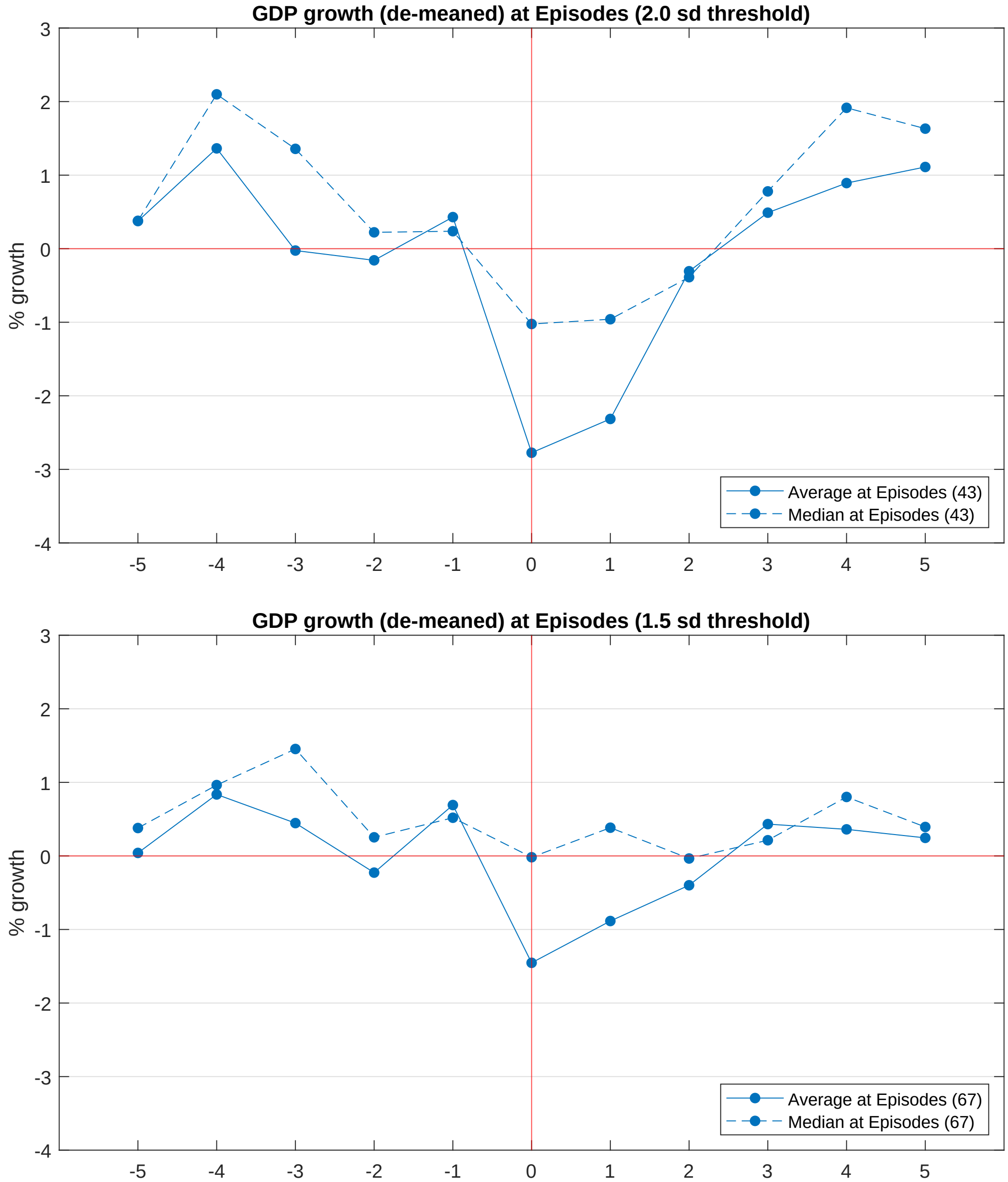
Note: The figure depicts the average and median dynamics of the Exchange Rate appreciation rate at the right scale in the ten years around 31 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. The GDP Growth is shown for comparison.

Figure A.18: Exchange Rate appreciation around Episodes



Note: The figure depicts the average and median dynamics of the Inflation at the right scale in the ten years around 31 episodes of forceful CCO tightening. $t = 0$ is the year of the episode. The GDP Growth is shown for comparison.

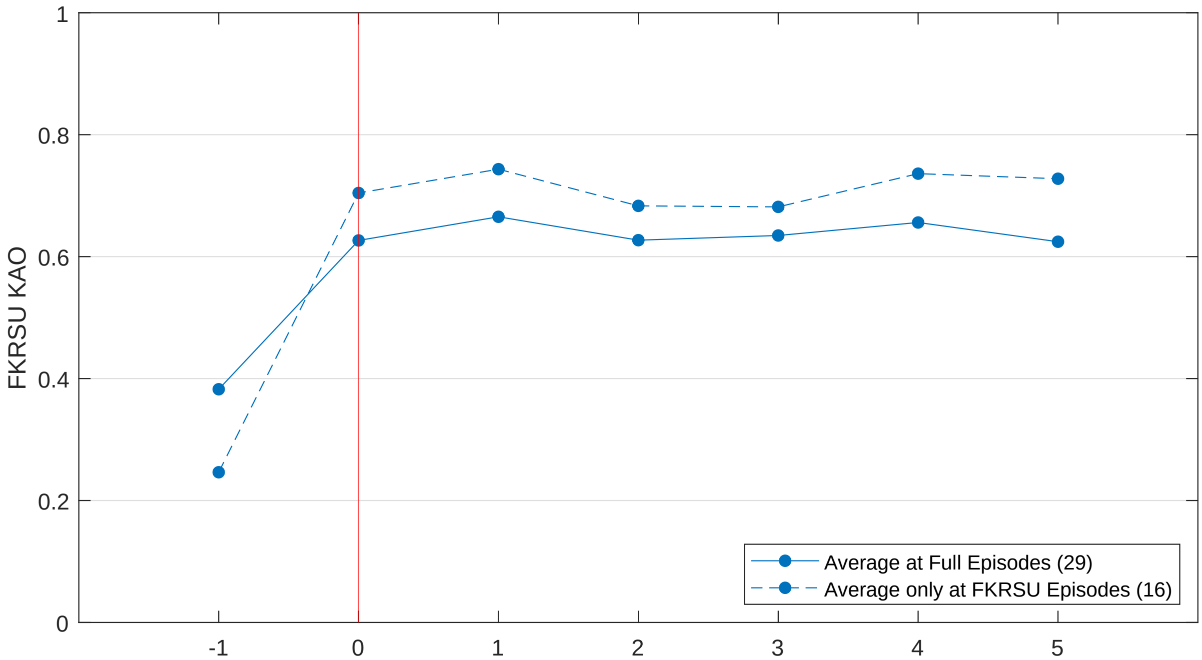
Figure A.19: Inflation around Episodes



No. Episodes	IV	Taxonomy	FKRSU	*Repeated*	**Total**
2.5 sd threshold	9	9	16	3	31
2.0 sd threshold	9	18	23	7	43
1.5 sd threshold	9	18	47	7	67

Note: Both panels depict the average (median) dynamics of GDP growth (demeaned) in the ten years around the episodes of forceful CCO tightening identified using two different thresholds: 2.0 sd and 1.5 sd. $t = 0$ is the year of the episode. The bottom table lists the number of episodes identified from each of the three complementary sources: IV (significant tightening of outflow controls in IMF (2012b)), Taxonomy (IMF's Taxonomy of CFM, in Binici and Das (2021)) and FKRSU (index by Fernandez et al. (2016)).

Figure A.20: Robustness: GDP Growth Around Episodes of CCO Tightening



Note: The figure depicts the persistence of Fernandez et al. (2016) KAO index (0-1 index, where 1 is a fully restricted capital account) the following 5 years after the episodes are identified. The solid line shows the average for the full list of episodes, except two of them (Zimbabwe 2016 and Fiji 2020) that do not have data on KAO index. The dashed line shows the average only for the episodes identified using Fernandez et al. (2016) KAO index.

Figure A.21: Persistence of Capital Controls

To further explore the relationship between GDP dynamics and CCO episodes, we estimate linear regressions of the form

$$Y_{i,t} = \beta GDPgr_{i,t} + \alpha X_{i,t-1} + \epsilon_{it},$$

where $Y_{i,t}$ takes the value of 1 if country i experienced a CCO episode in year t and 0 otherwise, $GDPgr_{i,t}$ is the de-meaned real growth rate of income, and $X_{i,t-1}$ is an array of (lagged) macro country-specific controls. The latter include country fixed effects and time trends, as well as the exchange rate regime, inflation, the CA balance, gross and net capital flows, consumption and investment growth. In one specification, the Laeven and Valencia (2018) crisis indicators are also added as controls (not lagged).

Results are summarized in Table A.2. The first row depicts the estimated β coefficients associated to GDP growth across 5 alternative specifications that gradually enrich the set of controls used, albeit at the cost of fewer observations/countries available. While column 1 has no controls, columns 2 through 4 sequentially add country fixed effects, time trends (linear and quadratic), and the aforementioned lagged macro controls, respectively. The last column, additionally controls for the two crisis indicators. Table A.3 presents the full set of estimated coefficients.

Table A.2: CCO Episodes and the Macroeconomy: Regression Analysis

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP growth	-0.000621***	-0.000636***	-0.000690***	-0.00223***	-0.00172***
Banking Crisis					0.140***
Currency Crisis					0.120***
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	5014	5014	2877	2494
Countries	193	193	193	143	143
Episodes	31	31	31	22	22
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017
Adjusted R^2	0.002	0.008	0.008	0.020	0.097

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports OLS results from the regression analysis of the occurrence of CCO episodes on GDP growth. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth. See the Internet Empirical Appendix for the full table of estimated coefficients.

The key takeaway from the table is that GDP growth systematically correlates negatively with CCO episodes, which is consistent with Figure 1 in the main text, and the estimated negative β coefficient is statistically significant at 1%, even after controlling for several other macro variables. In fact, adding macro controls increases the absolute value of the estimated β. Importantly, the negative link between growth and CCO episodes remains even after controlling for banking and currency crises (column 5) which, in turn, are positively correlated with CCO episodes, in line with Figure 2.

Estimated marginal effects from a probit analysis presented below help gain additional intuition (see Table A.4). They imply that a 1% decrease in GDP growth would coincide with an increase in the probability of having a CCO episode by 1.1%. This is not only statistically significant but also economically relevant, for the unconditional probability of such an episode is 6.7%, therefore implying an increase of around 16.4% (1.1/6.7). Tables A.5 and A.6 present further robustness results.

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.000621***	-0.000636***	-0.000690***	-0.00223***	-0.00172***
t			0.00201	0.00684*	0.00180
t^2			-0.0000190	-0.0000614*	-0.0000118
L.ER Regime				-0.00391	-0.00371
L.ER (app. rate)				-0.000128	-0.000213
L.Inflation (%)				-0.00000969	-0.0000106
L.CA Balance (%GDP)				-0.000591	-0.000291
L.Net Inflows (%GDP)				-0.0000303	-0.000250
L.Gross Inflows (% gr)				0.00000928	0.0000139
L.Gross Outflows (% gr)				-0.000000245	-0.000000817
L.Consumption (% gr)				0.00102***	0.00118***
L.Investment (% gr)				-0.0000328	-0.0000156
Banking Crisis					0.140***
Currency Crisis					0.120***
Constant	0.00630***	-0.000116	-0.0514	-0.174	-0.0548
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	5014	5014	2877	2494
Countries	193/195	193/195	193/195	143/195	143/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017
Adjusted R^2	0.002	0.008	0.008	0.020	0.097

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports OLS results from the regression analysis of the occurrence of CCO episodes on GDP growth. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth.

Table A.3: CCO Episodes and the Macroeconomy: Regression Analysis, OLS

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.0342***	-0.0657***	-0.0754***	-0.162***	-0.150***
t			0.320	0.901**	0.547
t^2			-0.00291	-0.00795**	-0.00448
L.ER Regime				0.0690	0.106
L.ER (app. rate)				-0.0594***	-0.0837***
L.Inflation (%)				-0.0578**	-0.0737**
L.CA Balance (%GDP)				-0.0560	-0.000243
L.Net Inflows (%GDP)				-0.0223	-0.0444
L.Gross Inflows (% gr)				0.00157*	0.00168
L.Gross Outflows (% gr)				-0.000569	-0.000802
L.Consumption (% gr)				0.163***	0.214***
L.Investment (% gr)				-0.000423	0.00130
Banking Crisis					2.514***
Currency Crisis					1.714**
Constant	-2.541***	-1.900***	-10.57*	-27.74**	-19.14
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	692	692	373	329
Countries	193/195	26/195	26/195	17/195	17/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports Probit results from the regression analysis of the occurrence of CCO episodes on GDP growth. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth. The marginal effect at the most comprehensive specification implies that if GDP growth would fall a further 1% then the probability of having a CCO episode increases by 1.1%, relative to an unconditional probability of 6.7%, i.e. an increase around 16.4% (1.1/6.7).

Table A.4: CCO Episodes and the Macroeconomy: Regression Analysis, Probit

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.000668***	-0.000682***	-0.000746***	-0.00225***	-0.00172***
GDP per capita (thousand US$)	0.00000117	-0.0000371	0.000241	0.000623	-0.0000232
t			0.00189	0.00647	0.00181
t^2			-0.0000185	-0.0000593*	-0.0000119
L.ER Regime				-0.00393	-0.00371
L.ER (app. rate)				-0.000127	-0.000213
L.Inflation (%)				-0.0000105	-0.0000106
L.CA Balance (%GDP)				-0.000606	-0.000290
L.Net Inflows (%GDP)				-0.0000344	-0.000250
L.Gross Inflows (% gr)				0.00000940	0.0000139
L.Gross Outflows (% gr)				-0.000000219	-0.000000816
L.Consumption (% gr)				0.00101***	0.00118***
L.Investment (% gr)				-0.0000337	-0.0000156
Banking Crisis					0.140***
Currency Crisis					0.120***
Constant	0.00647***	0.00183	-0.0593	-0.192	-0.0543
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	5014	5014	2877	2494
Countries	193/195	193/195	193/195	143/195	143/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017
Adjusted R^2	0.002	0.008	0.008	0.020	0.097

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports OLS results from the regression analysis of the occurrence of CCO episodes on GDP growth. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth.

Table A.5: Robustness: CCO Episodes and the Macroeconomy: GDP per capita, OLS

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.0369***	-0.0658***	-0.0776***	-0.168***	-0.145**
GDP per capita (thousand US$)	0.000791	0.00383	0.0542	0.0562	-0.0401
t			0.283	0.811*	0.631
t^2			-0.00268	-0.00735*	-0.00509
L.ER Regime				0.0575	0.114
L.ER (app. rate)				-0.0618***	-0.0824***
L.Inflation (%)				-0.0612**	-0.0720**
L.CA Balance (%GDP)				-0.0499	-0.00430
L.Net Inflows (%GDP)				-0.0228	-0.0451
L.Gross Inflows (% gr)				0.00167*	0.00163
L.Gross Outflows (% gr)				-0.000577	-0.000793
L.Consumption (% gr)				0.160***	0.218***
L.Investment (% gr)				-0.000329	0.00129
Banking Crisis					2.565***
Currency Crisis					1.771**
Constant	-2.544***	-1.944***	-9.787	-25.08*	-21.60
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	692	692	373	329
Countries	193/195	26/195	26/195	17/195	17/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports Probit results from the regression analysis of the occurrence of CCO episodes on GDP growth. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth. The marginal effect at the most comprehensive specification implies that if GDP growth would fall a further 1% then the probability of having a CCO episode increases by 4.9%, relative to an unconditional probability of 6.7%, i.e. an increase around 73.1% (4.9/6.7).

Table A.6: Robustness: CCO Episodes and the Macroeconomy: GDP per capita, Probit

Country	Year	△ KAO	△ KAO NonResident	△ KAO Resident	△ KAO Undet.
Greece	2015	0.70	0.25 36%	0.15 21%	0.30 43%
Ecuador	2008	0.70	0.30 43%	0.30 43%	0.10 14%
Vietnam	1997	0.51	0.29 56%	0.29 56%	-0.06 -11%
Cyprus	1996	0.50	0.15 31%	-0.10 -19%	0.44 89%
Myanmar	2008	0.47	0.23 50%	0.23 50%	0.00 0%
Czech Republic	2013	0.45	0.05 11%	0.30 67%	0.10 22%
Uzbekistan	1996	0.44	0.28 63%	0.22 50%	-0.06 -13%
Finland	2016	0.40	0.00 0%	0.30 75%	0.10 25%
Sweden	2016	0.40	0.00 0%	0.30 75%	0.10 25%
Bolivia	2007	0.40	0.20 50%	0.20 50%	0.00 0%
Sweden	2006	0.40	0.00 0%	0.30 75%	0.10 25%
Bulgaria	1997	0.36	0.04 12%	0.24 69%	0.07 19%
Lebanon	2005	0.35	0.15 43%	0.00 0%	0.20 57%
Ethiopia	2000	0.33	-0.01 -2%	0.04 14%	0.29 88%
Bangladesh	1996	0.32	0.09 28%	0.16 50%	0.07 22%
Cyprus	2013	0.25	-0.05 -20%	0.20 80%	0.10 40%
China	2016	0.10	0.00 0%	0.00 0%	0.10 100%
Russia	1998	0.05	0.05 100%	0.00 0%	0.00 0%
Latvia	2008	0.05	0.00 0%	0.05 100%	0.00 0%
Argentina	2001	0.05	0.00 0%	0.05 100%	0.00 0%
Mean △		**0.36**	**0.10**	**0.16**	**0.10**
Median △		**0.40**	**0.05**	**0.20**	**0.10**
Mean %		**-**	**25%**	**48%**	**27%**
Median %		**-**	**20%**	**50%**	**22%**

Note: The Table desegregates the △ KAO (0-1 index, from Fernandez et al. (2016), where 1 is a fully restricted capital account) among three different components: those measures directed to outflows by non-resident (△ *KAO NonResident*), by residents (△ *KAO Resident*), and those that cannot be determined (△ *KAO Undet.*). Only episodes with positive △ KAO are analyzed. Each row shows both the absolute variation and the share of each component compared to △ KAO. Bottom rows provide summary measures.

Table A.7: CCO Episodes: Residency Components

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.000621***	-0.000636***	-0.000690***	-0.00223**	-0.00172*
t			0.00201	0.00684	0.00180
t^2			-0.0000190	-0.0000614	-0.0000118
L.ER Regime				-0.00391	-0.00371
L.ER (app. rate)				-0.000128	-0.000213
L.Inflation (%)				-0.00000969	-0.0000106
L.CA Balance (%GDP)				-0.000591***	-0.000291
L.Net Inflows (%GDP)				-0.0000303	-0.000250
L.Gross Inflows (% gr)				0.00000928	0.0000139
L.Gross Outflows (% gr)				-0.000000245	-0.000000817
L.Consumption (% gr)				0.00102**	0.00118**
L.Investment (% gr)				-0.0000328	-0.0000156
Banking Crisis					0.140***
Currency Crisis					0.120***
Constant	0.00630***	-0.000116	-0.0514	-0.174	-0.0548
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✓	✓	✓
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	5014	5014	2877	2494
Countries	193/195	193/195	193/195	143/195	143/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: Table reports OLS results from the regression analysis of the occurrence of CCO episodes on GDP growth, with cross-sectional dependence adjusted standard errors (Driscoll and Kraay 1998). Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth.

Table A.8: Robustness: Regression Analysis, OLS with Driscoll-Kraay Standard Errors

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.000719***	-0.000739***	-0.000739***	-0.00295***	-0.00215***
L.ER Regime				-0.00366	-0.00352
L.ER (app. rate)				0.00000960	-0.000104
L.Inflation (%)				-0.00000498	-0.00000312
L.CA Balance (%GDP)				-0.000509	-0.000323
L.Net Inflows (%GDP)				0.0000360	-0.000176
L.Gross Inflows (% gr)				0.00000809	0.0000135
L.Gross Outflows (% gr)				-0.00000150	-0.00000131
L.Consumption (% gr)				0.000955**	0.00113***
L.Investment (% gr)				-0.0000383	-0.0000195
Banking Crisis					0.137***
Currency Crisis					0.121***
Constant	0.000193	-0.00618	-0.00618	0.0128	0.00143
Year F.E.	✓	✓	✓	✓	✓
Country F.E.	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✗	✗	✗
Macro Controls	✗	✗	✗	✓	✓
Observations	5014	5014	5014	2877	2494
Countries	193/195	193/195	193/195	143/195	143/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017
Adjusted R^2	0.006	0.012	0.012	0.028	0.097

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: Table reports OLS results from the regression analysis of the occurrence of CCO episodes on GDP growth, with year fixed-effects. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth.

Table A.9: Robustness: Regression Analysis, OLS with year fixed effects

	(1) episode	(2) episode	(3) episode	(4) episode	(5) episode
GDP (% gr)	-0.0479***	-0.130***	-0.130***	-0.397***	-0.368***
L.ER Regime				0.0427	0.223
L.ER (app. rate)				-0.0673*	-0.101**
L.Inflation (%)				-0.0438	-0.0803
L.CA Balance (%GDP)				-0.0323	-0.0481
L.Net Inflows (%GDP)				-0.0136	-0.0935
L.Gross Inflows (% gr)				0.00225	0.00331*
L.Gross Outflows (% gr)				-0.00213	-0.00317
L.Consumption (% gr)				0.286***	0.325***
L.Investment (% gr)				-0.00116	0.000340
Banking Crisis					2.190**
Currency Crisis					2.447**
Constant	-3.132***	-3.507***	-3.507***	-3.070**	-3.972**
Year F.E.	✓	✓	✓	✓	✓
Country F.E	✗	✓	✓	✓	✓
Trend (linear and Quad.)	✗	✗	✗	✗	✗
Macro Controls	✗	✗	✗	✓	✓
Observations	2963	410	410	176	176
Countries	193/195	26/195	26/195	17/195	17/195
Episodes	31/31	31/31	31/31	22/31	22/31
Years	1995-2021	1995-2021	1995-2021	1995-2020	1995-2017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Table reports Probit results from the regression analysis of the occurrence of CCO episodes on GDP growth, with year fixed-effects. Macro controls (all lagged): degree of exchange rate flexibility from Ilzetzki et al. (2021); nominal exchange rate growth; inflation; CA balance; Capital Flows (net and gross); consumption and investment growth. The marginal effect at the most comprehensive specification implies that if GDP growth would fall a further 1% then the probability of having a CCO episode increases by 2.7%, relative to an unconditional probability of 12.5%, i.e. an increase around 21.6% (2.7/12.5).

Table A.10: Robustness: Regression Analysis, Probit with year fixed effects

The counterfactual analysis is made in two stages. In the 1st stage, we have the Fernandez et al. (2016) CCO index as the dependent variable ($CCO_{i,t}$):

$$CCO_{i,t} = \beta_1 CCO_{i,t-1} + \beta_2 GDPgr_{i,t-1} + \alpha_1 X_{i,t-1} + \epsilon_{i,t}$$

Where $X_{i,t-1}$ are lagged covariates (ER regime, ER appreciation rate, inflation, CA Balance, Capital Flows and Banking and Currency crises) and also country F.E. and time trends. Then we get a series of CCO shocks, that can be calculated as:

$$\widetilde{CCO}_{i,t} = CCO_{i,t} - \widehat{CCO}_{i,t}$$

In the 2nd stage we use the CCO shocks as a variable to explain the GDP growth path. To evaluate the effect of a large CCO shock, we will regress only on episodes and their neighborhood (between t-5 and t+5).

$$GDPgr_{i,t} = \gamma \widetilde{CCO}_{i,t} + \varepsilon_{i,t}$$

Finally, we get a fitted series for GDP growth, as explained only by the CCO shocks.

$$\widehat{GDPgr}_{i,t} = \widehat{\gamma} \widetilde{CCO}_{i,t}$$

The estimator of γ is not significant, with a magnitude of -0.165. The next figure shows the fitted GDP growth path $\widehat{GDPgr}_{i,t}$ for the 31 episodes:

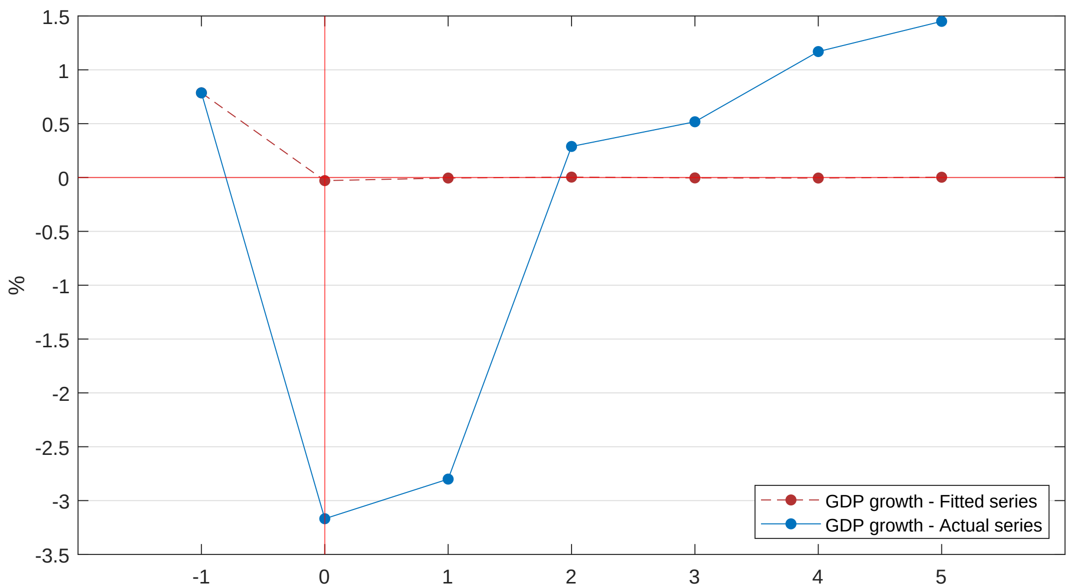


Figure A.22: GDP Growth - Counterfactual Simulation