Capital Controls on Outflows: Theory, and Policy Implications*

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Abstract

We develop a theoretical framework for the study of capital controls on outflows (CCOs). In the theory, suitable CCOs can rule out coordination failures by foreign investors and prevent capital flight crises. CCOs can be optimal even if they entail deadweight losses. On the other hand, they may also be subject to time inconsistency and political opportunism. Our analysis yields several policy lessons, in particular that government credibility and reputation building are critical for the successful implementation of CCOs.

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1 Introduction

In the aftermath of the Global Financial Crisis, academics and policymakers started to reconsider controls on cross-border capital inflows as a potentially useful stabilization instrument. The International Monetary Fund, reversing years of skepticism, explicitly endorsed the use of capital flow management (CFM) policies on *inflows* in 2012, and, in the latest update of its Institutional View, considers it appropriate to preemptively use these tools when stock vulnerabilities are building up.[1] Macroeconomic models with pecuniary externalities as well as those with aggregate demand externalities provide the theoretical rationale for this newly favorable stance toward capital controls on inflows (CCIs). In both of these bodies of work, prudential inflow controls can help an economy curb excessive foreign borrowing and improve welfare.[2]

In contrast, explicit efforts to reconsider controls on capital *outflows* (CCOs) have been comparatively scarce. To some extent, this asymmetry reflects the inadequacy of theoretical models that motivate the use of controls on inflows (CCIs) to rationalize the use of CCOs.[3]

This is not surprising since controls on inflows are known by investors at the time of investment whereas outflow controls impact resources that have already been committed to an economy. Consequently, foreign investors do not value these policies equally (Sahay et al. 2023). Moreover, as discussed by Ghosh et al. (2020) and Ostry (2022), CCOs have a reputation *tantamount to expropriation*; they are often seen as being imposed by corrupt policy makers or are viewed as last gasp maneuvres of sinking governments.

Of course, the fact that CCOs are sometimes associated with corruption or financial despair

[1] See (IMF 2012) for the IMF's *The Institutional View on The Liberalization and Management of Capital Flows*, and IMF (2022) for its most recent update.

[2] 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. See Erten et al. (2021) for a general survey

[3] See Ostry (2022) for a discussion how the IMF's Integrated Policy Framework addresses capital inflow concerns but not capital outflows

does not rule out the possibility that, under other circumstances, CCOs can be socially useful and effective as stabilization tools. Both policymakers and investors seem to believe so. On the policy making front, Figure 1 shows that episodes of stringent CCO implementation coincide with a sharp decline in GDP growth and rising indicators of banking and currency crises. We interpret this correlation as suggestive evidence that policymakers are responding with CCOs to deteriorating macroeconomic and financial conditions.[4] On the investor side, a survey carried out by the IMF (Sahay et al. 2023) indicates that investors consider CFMs to be a valid part of a government's toolbox, in particular, to manage a capital flight-induced crisis.

Yet whether CCOs can be justified to forestall a financial panic remains an open question, due in part to their stigma. This has perhaps been best exemplified by the debate between Krugman's (1999) and Dornbusch (2001) regarding the desirability of Malaysia's CCOs during the Asian Financial Crisis. More recently, global developments - ranging from rising interest rates by central banks to heightened geopolitical tensions and financial fragmentation - have rekindled interest in better understanding CCOs as policy instruments.[5]

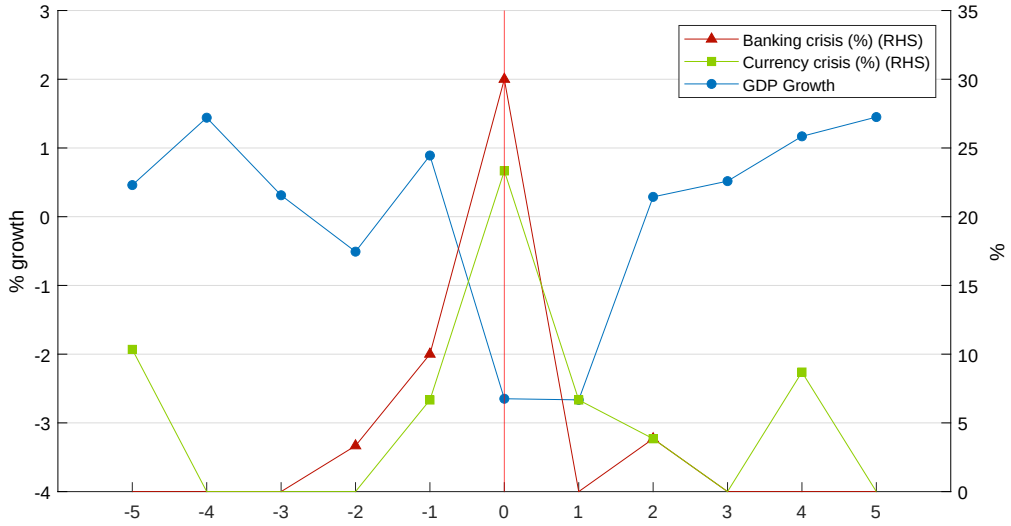
To the best of our knowledge, there is still no theoretical framework that explicitly incorporates both the potential benefits and the costs of CCOs. Importantly, any framework that is used to justify CCOs cannot shy away from, at least, the implementation hurdles imposed by their bad name. The debate, therefore, remains largely unsettled, complicating efforts to derive clear policy prescriptions.

The aim of this paper is to fill this gap. We present a theoretical framework that addresses three questions: What are the distortions or externalities that CCOs fix? What normative implications can be drawn? And how are these implications related to the challenges imposed by their bad reputation or stigma?

[4]See the working paper version for empirical exercises that support his interpretation (Chang et al. 2024)

[5]See Ostry (2022) and, also, 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 administrations recent push to activate Section 899 of the so-called "Big Beautiful Bill," aiming to expand the executive branchs authority to restrict capital outflows.

Figure 1: CCO Episodes and Macro-Financial Crises



Note: This figure depicts the average dynamics of GDP growth (demeaned) in the ten years around the 31 episodes of forceful CCO tightening identified, using Fernandez et al. (2016) and other datasets, 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. See the working paper version Chang et al. (2024) for details of the methodology, sources used to identify the episodes, and additional empirical exercises.

We consider a small open economy subject to multiple equilibria where expectations can drive to coordination failures among foreign investors, resulting in financial panics and capital flight episodes. Under such conditions, 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, not less, foreign investment.

To provide normative implications, we introduce deadweight losses associated with the use of CCOs. These losses serve to encapsulate a broad range of potential adverse effects due to CCOs in a reduced form.[6] Since well-tailored CCOs eliminate undesired outcomes in our model, the magnitude of deadweight losses turns out to be key parameter to obtain non-trivial policy prescriptions. We highlight three key results from the model.

First, a policy maker faces a trade-off when implementing CCOs between preventing a capital flight versus the deadweight losses it causes. Thus, large enough deadweight losses can render the use of CCOs unadvisable, even if capital flight is imminent. 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 deadweight losses, the probability of capital flight, and the return of foreign investors from fleeing as 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 differ from foreign investors incentives once initial investments are in place. The reason is that foreign investors obtain a greater payoff from a capital flight crisis than the domestic economy. Thus, for foreign

[6]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 2012)

investors, under some parameter values, crises are relatively not that bad.

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 can lower 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.

Additionally, from the perspective of foreign investors, a government that is time-inconsistent is one that, in the words of (Ostry 2022), "changes the rules of the game after the money has already entered the country". Accordingly, our framework proposes lack of government commitment as a potential source for CCOs bad reputation.

Finally, we examine the implications on CCOs optimal policy of foreign investors belief that CCOs are sometimes imposed by governments for reasons other than social benefit. That is, 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 distressprecisely 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 previous history, institutional capacity, and the ability to build and sustain trust. For policymakersespecially in emerging marketsthis 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.

Literature Review. 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.[7] 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

[7]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.

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 consistency 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 correctalbeit 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 CCOseven when desirableif 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.[8] 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 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

[8]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.

panics descending from Diamond and Dybvig (1983) and Chang and Velasco (2001). While this modeling choice is consistent with our interpretation of Figure 1 where discrete implementation of CCOs occur in response to deteriorating macroeconomic context, for the expert reader, CCOs is reminiscent of suspension of convertibility or deposit freeze policies. As in our framework, these policies coordinate agents towards the good equilibrium in the bank run literature. Moreover, Ennis and Keister (2009) show that these types of bank policies can also suffer from time-inconsistency.

However, a key difference in our framework relative to the bank run literature is that the welfare of a relevant type of agent, foreign investors, is not part of the government's objective function. This is precisely what makes CCOs a policy that faces additional hurdles in its implementation. For example, time-inconsistency in Ennis and Keister (2009) occurs because the government cannot promise to be tough enough ex-post since it values the welfare of impatient depositors. In contrast, in our model, the government lacks the commitment to be lenient ex-post with foreign investors. Reputation building and concerns are relevant in our framework because a government cannot back up its promises to investors with its objective function, but rather it must build it through its policy decisions.

The rest of the paper proceeds as follows. Section 2 describes our basic theoretical framework, introduces CCOs, and discusses their implications for equilibrium. Section 3 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 studied in section 4. Final comments and remarks are given in Section 5. The theoretical appendix expand on technical details.

2 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 that CCOs are often a response to deteriorating macroeconomic conditions and financial stress (Figure 1). Accordingly, our model features *coordination failures* by

foreign investors 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.

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 the literature, we allow capital controls to cause deadweight losses, which is realistic and adds interesting twists to the analysis.

Lastly, this section discusses model equilibria and the implications of given CCOs, leaving the optimal choice of CCO policy for later sections. We show that CCOs can serve as coordination devices that eliminate unwanted equilibria. We find some leeway in designing the specifics of CCO policy, since CCOs are not binding in equilibrium.

2.1 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. It depends on the final size of the project, I_2, which equals I_0 under the assumptions of this subsection.

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 $B > 1 - R > 0$. 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.[9]

We assume that the government maximizes the country's expected final benefits from the project. It is then easy to see that, in the absence of other frictions, it would be optimal for the economy to invest all of its initial endowment A and borrow as much as it can in order to maximize the size of the project. Indeed, the economy would be able to invest in a project of size $I_0 > A$ by offering investors the pledgeable income $RI_2 = RI_0$ 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 would give 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 A.

[9] 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.

2.2 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 $g(\lambda)I_1$ 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 $g(0) = 0$. As mentioned, I_1 is the size of the project in period 1, which equals I_0 under laissez faire.

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.[10]

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

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

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.[11]

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.[12] 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).

2.3 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 the Appendix A.

As we will see below, p denotes the exogenous probability of 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 which all investors exit with probability pq.

[11] Imposing convexity on g is a sufficient condition

[12] 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.

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.[13]

We now turn to the determination of the initial investment size. Seen from $t = 0$, the expected

[13]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. See, for example, Schmitt-Grohé and Uribe (2021) Section 6 for a similar treatment of multiplicity where equilibrium selection depends on an exogenous probability.

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.

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 subsection 2.1. 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 $\omega(I_0 - A)$ if there is capital flight, 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. Indeed, 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 the nonpledgeable benefits 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

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

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.

2.4 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 2012). 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 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.[14] 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.

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. To be precise, let $\hat{f}(\lambda)$ denote the return to the individual investor from staying with the project if CCOs are imposed. If CCOs

[14] 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.

take the form of a prohibition or the imposition of obstacles to exit, it is natural to assume that

$$\hat{f}(\lambda) = (1-\phi)f(\lambda) \tag{4}$$

Alternatively, suppose controls are interpreted as taxes on exit. With λ denoting the measure of staying investors, such taxes collect $(1-\lambda)\tau\omega i$ in revenue, and one needs to make some assumption about the disposal of the revenue. For concreteness, assume that the revenue is shared among staying investors. Then, as long as $\lambda > 0$, 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, if $\lambda > 0$,

$$\hat{f}(\lambda) = (1-\phi)f(\lambda) + \frac{(1-\lambda)}{\lambda}\tau\omega \tag{5}$$

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

If $\lambda = 0$, the previous expression reduces to $\hat{f}(0) = \infty$. The interpretation is that, if all other investors are to exit, an individual investor is offered an arbitrarily large amount if she stays.[15]

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 either of the two above interpretations of $\hat{f}$, the following proposition says that sufficiently stringent capital controls rule out run equilibria.

Proposition 2 (Controls Can Eliminate Capital Flight)

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

[15] Although imprecise, this statement is hopefully intuitive. A more precise statement is obtained with a slight modification of the redistribution scheme. Fix some $\epsilon>0$, and let staying investors receive $(1-\lambda)\tau\omega i/\lambda$ as long as $\lambda \geq \epsilon$. For $\lambda < \epsilon$, let a staying investor receive $(1-\lambda)\tau\omega i/\epsilon$. Obviously this redistribution scheme is feasible and, by making ϵ arbitrarily small, implies that staying investors receive an arbitrarily large return.

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

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 for $\hat{f}$ 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 (4), 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 (5) instead, and any strictly positive τ can do the job.[16]

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

[16] With the redistribution scheme of the preceding footnote, it is sufficient to choose ϵ small enough.

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 ϕ is perfectly known while, in practice, governments make policy decisions based on estimates;[17] it ignores potential constraints and challenges imposed by *"sequential"* flight, that is, a scenario where investors decide to leave, or stay, in some order;[18] 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.

[17] 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.

[18] 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.

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.

3 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*.

3.1 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 eliminate 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.

3.2 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.[19] 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 (15). Hence imposing CCOs

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

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.

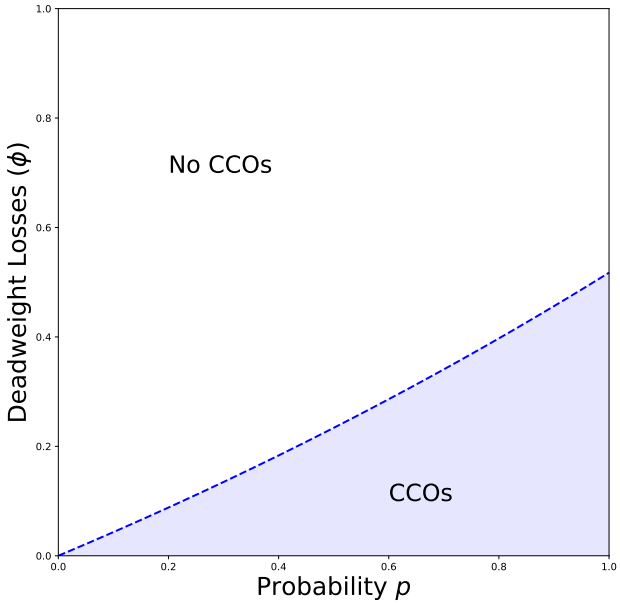
By continuity, the inequality must hold if $\phi > 0$ but small. On the other hand, the inequality ceases to hold if ϕ is large enough. This says that if the deadweight costs of CCOs can be too big relative to the gains from eliminating capital flight.

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 2 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.

Figure 2: Optimal CCOs Policy: Commitment Case



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

3.3 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 subsection 2.3, policy π is optimal for the government in the fragile state

at $t = 1$. (See the Appendix 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 $E(BI_2) = (1 - p)BI_0$. 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. [20]

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 equilibrium, which is easy to characterize: in the fragile state, capital controls are imposed if $p > \phi$; then the initial size of the project I_0 and the expected payoff to the country $BE(I_2)$ are as in subsection (2.4). If $p < \phi$ instead, the government refrains from imposing CCOs, and the outcomes are the same as under laissez faire.

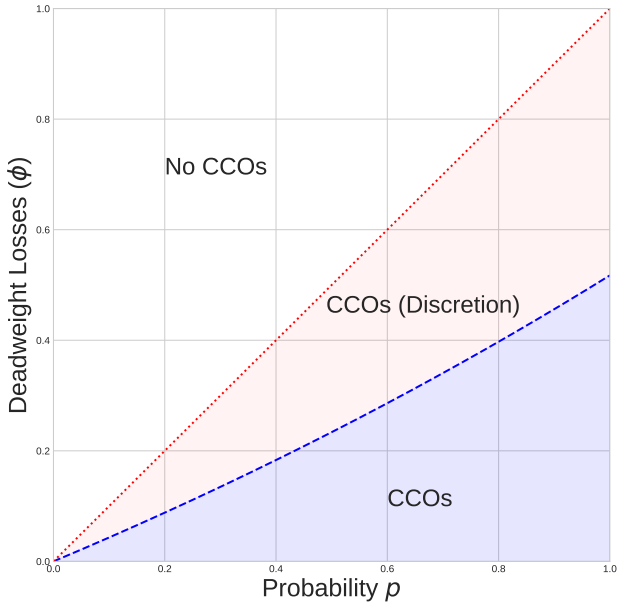
Figure 3 illustrates, as in Figure 2, the shaded blue area shows combinations $\{\phi, p\}$ for which CCOs are imposed under commitment. The dotted red line is the 45 degree line, along which $p = \phi$. So under discretion CCOs are imposed for pairs $\{\phi, p\}$ to the right of the dotted red line, 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.

[20] 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 3: Optimal and Time Consistent CCOs Policy



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

3.4 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.[21]

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. 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

[21]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)

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.

4 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 pointed out in the previous section, that promises of optimal CCOs policy may not be credible. But another reason is that, in practice, capital controls have often been imposed by *opportunistic* governments, effectively attempting to expropriate foreign investors as a relatively easy way to obtain resources, to deal with a financial emergency for self serving reasons. [22]

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 may be 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 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.

[22] 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.

4.1 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 *opportunistic*. 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 actual 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 . 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 previous sections. The opportunist government, in contrast, always imposes capital controls. This may reflect political aims, corruption, etc. One way to formalize this idea 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. 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 in the fragile state.

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:

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

The proof is in Appendix A. The condition $p > \phi$ is clearly necessary for the honest government to choose CCOs in the fragile state. 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 $I_2 = I_1 = I_0$; while in the fragile state capital controls are imposed and the size of the project falls to $I_2 = I_1 = (1-\phi)I_0$. (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 $I_0 - A = \beta\Pi^{CC} + (1-\beta)R(1-\phi)I_0$. The implication is that $I_0 = L(\beta)A$, 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 opportunistic 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 opportunistic 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 the government reputation 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. [23]

[23]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.

4.2 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 the influential work of Bartolini and Drazen (1997).

To see how CCOs can affect reputation, assume that investors do not observe the government's type directly. On the other hand, they do observe whether capital controls were imposed or not. Investors update their beliefs based on this observation. Indeed, if capital controls are not imposed at $t = 1$, investors 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. To make the analysis interesting but keeping it simple, we suppose that, if the government is in fact opportunistic, the state at $t = 1$ is fragile (in the sense that investors observe that they could leave in principle, but they stay because the opportunistic government imposes binding CCOs). [24] Then, if the honest government imposes controls at $t = 1$ in the fragile state (which occurs with probability q when the government is honest), Bayes Rule then implies that the (posterior) probability that the government is honest after capital controls are observed is[25]

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

The posterior probability is strictly less than β, which is intuitive. Upon observing CCOs

[24] 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.

[25] 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 $P(A^c|B) = 1 - P(A|B)$.

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 two stages will then be that first stage outcomes affect investors' beliefs at the start of the second stage.

To discuss the two stage model we need additional notation. 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, we assume that the conditions of Proposition 5 are satisfied. Then 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 second stage* that the government is benevolent, and $L(.)$ is the leverage ratio function (4.1). An additional implication is that the honest government's expected payoff in the second stage is

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

which increases in $\beta^{(2)}$, the government's reputation at the beginning of the second stage.

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 yield 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 of previous sections 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 reveals how, in the presence of political concerns, the honest government may be less inclined to impose CCOs in the fragile state, because of the associated loss of reputation.

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 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 depends on the honest government policy decision.

4.3 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, 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. But 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 that the initial project size $I_0^{(1)}$ must equal :

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

Finally, for equilibrium, (16) must hold with $I_0^{(1)} = I_{CC}$ and $\beta_{CC}^{(2)}$ given by the preceding expression. 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 $I_0^{(1)} = I_{LF}$ with

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

Finally, for equilibrium, the inequality in (16) must be reversed at $I_0^{(1)} = I_{LF}$ and $\beta_{CC}^{(2)} = 0$.

The following proposition establishes conditions for existence of equilibria of the aforementioned kinds.

Proposition 6 (Equilibrium Existence and Multiplicity)
Assume that

$$\omega < R(I_{CC}/(I_{CC} - A))$$

and

$$\omega \left[p((1 - \phi) + \beta\phi(1 - q))\right] < p - \phi$$

Then 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.

The last condition is a mild strengthening of the assumption that $p > \phi$. Both conditions are satisfied if ω is small enough. A more precise statement and a proof are given in Appendix A.

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.

Crucially, the honest government's policy problem depends on the expectations of foreign investors, which determines the initial investment ($I_0^{(1)}$), but investors choose initial investment based on anticipations about CCO policy . This interaction 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.

5 Conclusion

We have presented a theoretical model of the costs and benefits of capital controls on outflows. 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, evidence in Chang et al. (2024) 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.

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A Theoretical Appendix

This appendix discusses technical details underlying our analysis. We map our framework into an associated game, specifying players, decision nodes, moves to each player at the nodes, and payoffs. We also define an applicable equilibrium concept. [26] These formalities may seem excessive at first, but they become essential in analyzing settings with incomplete information, as in the political opportunism versions of our model.

B Basic Model: Laissez Faire

We develop the model of subsection 2.3. as an anonymous game and define equilibrium.

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

Nodes. The first node is the initial time $t = 0$. 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 realized: "sunspots" with probability p and "no sunspots" with probability $(1 - p)$.Hence there are three nodes at $t = 1$: normal (with probability $1 - q$), fragile with sunspot (probability pq, referred to as the sunspots state, for brevity), and fragile without sunspot (probability $q(1 - p)$, referred to as no sunspots state).

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 realization of sunspots. We describe the investor 's *strategy* by two indicator functions: χ_s (= 1 if investor leaves in sunspots state, = 0 if she stays in that state), and χ_{ns} (= 1 or 0 if investor leaves or stays in no sunspots state). 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 occur (resp. if there are no sunspots) at $t = 1$. Without significant 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 the state is normal at $t = 1$, the project size stays the same, so $I_2 = I_1 = I_0$. If the state at $t = 1$ is fragile, the size of the project becomes $I_2 = g(\lambda_s)I_0 \equiv I_{2s}$ in the sunspots state, and $I_2 = g(\lambda_{ns})I_0 \equiv I_{2ns}$ in the no sunspots state. The government's expected payoff is then $BE(I_2) = B\{(1 - q)I_0 + q\,[pI_{2s} + (1 - p)I_{2ns}]\}$, while the expected (net) payoff to an individual investor is $(1 - q)RI_0 + q[p(\chi_s\omega i + (1 - \chi_s)RI_{2s}) + (1 - p)(\chi_{ns}\omega i + (1 - \chi_{ns})RI_{2ns})] - i$.

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

[26] 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. In game theoretical terms, our framework becomes an *anonymous* game.

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.

Proof of Proposition 1: The following defines an equilibrium:

$$i = I_0 - A$$

with

$$I_0 = LA = \frac{1 - qp\omega}{1 - [qp\omega + (1 - pq)R]}A$$

$$\begin{aligned} \chi_s &= 1,\ \lambda_s = 0 \\ \chi_{ns} &= 0, \lambda_{ns} = 1 \end{aligned}$$

Checking that the equilibrium conditions 1-3 listed above are satisfied is straightforward and left to the reader.

C Basic Model: CCOs

We modify the anonymous game with the assumption that CCOs are enacted if the state is fragile, as in subsection 2.4. There are two implications to take into account. First, deadweight losses affect project size: $I_1 = (1-\phi)I_0$. Hence, $I_2 = g(\lambda_s)I_1 = g(\lambda_s)(1-\phi)I_0 \equiv I_{2s}$ in the sunspots state, while $I_2 = g(\lambda_{ns})(1-\phi)I_0 \equiv I_{2ns}$ in the no sunspots state. Second, payoffs to foreign investors that leave are reduced by CCOs. The expected payoff to a foreign investor is now $(1-q)RI_0 + q\{p[\chi_s\omega(1-\tau)i + (1-\chi_s)\hat{f}(\lambda_s)i] + (1-p)[\chi_{ns}\omega(1-\tau)i + (1-\chi_{ns})\hat{f}(\lambda_{ns})i]\} - i$.

Proof of Proposition 2. Suppose that there is an equilibrium where investors leave in the sunspots state, i.e. with $\chi_s = 1$. Then $\lambda_s = 1 - \chi_s = 0$. Individual optimality then requires

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

But this is ruled out by the condition of the Proposition and $i > 0$.

Proof of Proposition 3. Under the condition of the Proposition, an equilibrium **without** capital flight is 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

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

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.■

D Optimal Policy With Commitment

In subsection 3.2 it is assumed that G *chooses* a policy π (either laissez faire, $\pi = LF$, pr CCOs, $\pi = CCO$) 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 laissez faire case is modified in the obvious way. Assuming that the conditions of the Propositions of the previous section hold, $\pi = CCO$ is optimal if (8) is true, and $\pi = LF$ is optimal in the opposite case. This is just the main result of subsection 3.2, where the proof is given.

E Discretionary Case

Assume instead, as in subsection 3.3, that G chooses a policy $\pi = LF$ or $\pi = CCO$ 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^π 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 are 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 if the state is fragile 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.

The proof of Proposition 4 now involves just verifying conditions 1-4 and left to the reader. In particular, condition 3 is checked following subsection 3.3 in the text.

F Political Opportunism (Single Stage)

Now consider the case with political opportunism described in subsection 4.1.

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 (in the sense that investors have, in principle, the opportunity to leave, but are prevented from doing so because CCOs are imposed before they can; 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 chooses 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. (Note however that the imposition of CCOs effectively takes away that choice, so the investors' decision to stay or leave is only nontrivial if in the fragile state and $\pi = LF$).

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 G 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 $\chi = (\chi^{\pi}_{s}, \chi^{\pi}_{ns})$.

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

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. Given the government's reputation β, 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.

Proof of Proposition 5. Under the conditions of the 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

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

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 must stay, by the assumption that $CCOs$ bind. If $\pi = LF$ is observed but the state is fragile (a node that is reached with probability zero in equilibrium), the equilibrium continuation $(\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0, 1)$ says that investors leave with 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. ■

G Two Stage Model

We turn to the two stage model of subsection 4.2. 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 $I_2 = I_1 = (1 - \phi)I_0$.

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 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, to implement if state is fragile. 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 χ, a government strategy π, an aggregate run outcome λ, 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, β_{CCO}, and the aggregate run outcome λ.
5. β_{CCO} is derived from π using Bayes' Rule.

Remarks. As mentioned earlier, in condition 4 optimality for the honest G refers to its two stage payoff. Also as mentioned, in any equilibrium $(\lambda_s^{CCO}, \lambda_{ns}^{CCO}) = (1, 1)$, which will not be repeated.

The following claims describe the two classes of equilibria mentioned in subsection 4.3 of the text.

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

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

and

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

provided that $p > \phi$,

$$\omega < R(I_{CC}/(I_{CC}-A)))$$

and

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

Proof of Claim 1. Equilibrium condition 1 holds by construction.

Note that there is no capital flight in this equilibrium, but the honest government imposes CCOs 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 $I_0 = I_{CC}$. Equilibrium 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 $\pi = LF$ (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 $\omega < R(I_{CC}/(I_{CC}-A)))$.

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

Claim 2 (Fully Revealing Equilibrium). There is an equilibrium in which $\pi = LF$, $(\lambda_s^{LF}, \lambda_{ns}^{LF}) = (0,1), \chi = 1-\lambda$, $i = I_0 - A$ with

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

and

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

provided that $p > \phi$,

$$\omega < R(I_{LF}/(I_{LF}-A)))$$

and

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

The proof of Claim 2 is a simple adaptation of previous arguments and the discussion in the text, and left to the interested reader.■

For our analysis of existence and multiplicity of equilibrium, we assume ω is small enough in the sense that

$$\omega < R(I_{CC}/(I_{CC} - A))$$

and

$$\omega \left[p((1-\phi) + \beta\phi(1-q))\right] < p - \phi$$

The last condition can be seen as a mild strenghtening of the assumption that $p > \phi$. We note that it implies that $I_{CC} > I_{LF}$, as the reader can check using (14) and (17).

The two results below, which imply Proposition 6 in subsection 4.3, can now be proven.

Existence of equilibrium.

Suppose that a partially revealing equilibrium does not exist. Then

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

where the first inequality follows from the failure of (16) at $I_0^{(1)} = I_{CC}$, the second inequality from $I_{CC} > I_{LF}$, and the third inequality from $\Pi^{(2)}(\beta_{CC}) > \Pi^{(2)}(0)$.

Finally, $I_{CC} > I_{LF}$ implies $R(I_{LF}/(I_{LF} - A))) > R(I_{CC}/(I_{CC} - A))) > \omega$. We have then shown that the conditions for a fully revealing equilibrium in Claim 2 are satisfied.

Multiplicity of equilibria. From the analysis above we infer that equilibria of both kinds coexist if $\omega < R(I_{CC}/(I_{CC} - A)))$ and

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

We claim that

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

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

Consider:

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

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