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IMF conditionalities, liquidity provision, and incentives for fiscal adjustment

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Abstract This paper proposes a model to study how conditional lending and immediate liquidity provision affect incentives for fiscal adjustment in a country facing the risk of sovereign default. Conditional lending provides explicit incentives for fiscal adjustment but immediate liquidity provision is more effective in reducing liquidation costs. For some parameters, immediate liquidity provision induces fiscal adjustment and debt repayment, while conditional lending does not (and vice-versa). Incentives for fiscal adjustment are concave in the fraction of lending provided under conditionalities. A large cost of tight fiscal policy shifts the balance toward immediate liquidity provision.

Keywords IMF · Conditionality · Fiscal adjustment · Liquidity provision · Sudden stop

JEL Classification F33 · F34 · H63

1 Introduction

One important characteristic of each credit line granted by the IMF during liquidity crises is the degree and the form of conditionality imposed on the borrower. For instance, Stand-by Arrangements require the debtor country to fulfill some pre-established conditions before resources are loaned. In contrast, a Flexible Credit Line do not require ex-post conditionalities, which means that resources are promptly available for a country in a liquidity crises, but this facility is only accessible to countries that

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match some ex-ante requirements. A Precautionary and Liquidity Line is an example of an IMF facility that combines both ex-ante and ex-post requirements.[1]

The IMF is subject of heated debates, and so are IMF conditionalities (see, e.g. Collier et al. (1997), Bird (2007) and Dreher (2009)). Among the several rationales for conditionalities proposed by the literature, moral hazard is an often mentioned justification and a prominent issue in the debate both in academic circles and in the popular press. In particular, it is often pointed out that IMF bailouts might affect incentives for debtors to carry out the necessary structural adjustments. Conditionalities would then ensure that appropriate policies are undertaken in order to make debt repayment more likely, if not certain.

The contribution of this paper to the debate is a simple model to study how conditional lending and immediate liquidity provision affect incentives for fiscal adjustment. On the one hand, conditional lending might increase incentives for debtors to undertake costly measures required for debt repayment by imposing those measures as a requirement for a country to receive IMF liquidity support. On the other hand, ex-post conditionalities imply that resources are only granted to the country after some time lag during which the country has to fulfill the requirements, and this delay in providing liquidity can be costly. This paper captures this trade-off in a simple model where liquidity needs and economic fundamentals are exogenous. The model is employed to understand how IMF lending and conditionalities affect the fiscal stance of a government facing a liquidity crisis.

The model portrays a small open economy that had borrowed from abroad and faces a sudden stop (as in Calvo (1998)), which means that it temporarily loses access to private capital flows. Projects that would need to be refinanced have to be terminated, leading to output losses. Owing to the fall in output, generating revenues for debt repayment would require a large tax rate, which might imply very low private consumption. However, the losses from liquidation of long-term projects can be reduced if an international lender-of-last-resort (the IMF) steps in and provides liquidity for the domestic economy. Lending can occur right after the liquidity crisis is observed or after a time lag which allows for conditional lending. Conditionalities are imposed in order to guarantee fiscal adjustment (as in Gonçalves and Guimaraes 2013). The international lender of last resort has to ensure that its loans will be fully repaid.

Conditional loans raise incentives for fiscal measures that improve the country's capacity of paying its sovereign debt because loans are only granted if the country carries out the stipulated fiscal adjustment. However, immediate liquidity provision is more effective in reducing inefficient liquidation costs. As a result, for some parameter values, immediate liquidity provision provides more incentives for debt repayment than conditional lending. That happens when the output losses resulting from a liquidity crisis are large, so that repaying debt would require low private consumption for the domestic agents. In those situations, paradoxically, immediate liquidity provision can provide more incentives for fiscal adjustment than conditional IMF lending, owing to the timing of assistance.

[1] A description of all types of credit lines granted by the IMF can be found at www.imf.org.

The results resonate with previous work that found an ambiguous effect of IMF support on incentives for reforms. In the models of Corsetti et al. (2006) and Morris and Shin (2006), liquidity support might actually incentivize a country to undertake costly reforms. However, the mechanism and implications here are different. Since conditional lending requires some time for its implementation, we show that it can actually be worse than unconditional lending in providing incentives for fiscal adjustment.

One implication of the model is that incentives for undertaking the fiscal adjustment required for debt repayment are concave in the fraction of lending provided under ex-post conditionalities. Hence, there are cases when it is optimal for the IMF to provide a facility with both immediate and conditional resources. Intuitively, the marginal benefits of avoiding liquidation costs are decreasing. Preventing a sharp output fall might be necessary for keeping the repayment option viable, but the incentives for adjustment provided by conditional lending are more important when the marginal utility of consumption is not so severely affected by the liquidation costs. While it remains possible that the best choice is to offer just conditional facilities or just immediate assistance, one implication of the model is that an international lender of last resort might also search for a balance between immediate liquidity support and conditional lending. Hence, the model is consistent with the often observed mix between immediate liquidity support and ex-post conditionalities. The Fund often lends resources to countries in distress when a liquidity crisis hits, but also provides further loan installments later as long as some conditionalities are met.

The model is then extended to a case where tight fiscal policy is costly to the economy. The objective is to understand how the cost of tight fiscal policy affects the optimal level of conditionalities. Interestingly, a larger cost of fiscal adjustment shifts the balance toward immediate liquidity support. When the cost of adjusting is large, repaying debt implies a large marginal utility of consumption, and immediate liquidity support is the best way to deal with the problem. A large cost of fiscal policy might also make debt repayment a dominated option even with support from the IMF, but then an increase in the level of conditionalities cannot solve this problem.

The model is related to the vast literature on sovereign default. Much of the research in this field builds on the seminal contribution of Eaton and Gersovitz (1981). A small open economy can borrow from abroad but cannot commit to repay its debt, and default occurs when defaulting is the optimal choice. Most of this literature abstracts from fiscal policy.[2] An important feature of this literature is that foreign credit is always available as long as the domestic economy is willing to compensate lenders for the risk of defaulting.[3] This paper takes the opposite extreme view and considers a situation of a "sudden stop," where private foreign credit is not available. The model is thus suitable to study an economy going through a liquidity crisis that could be solvent if it had access to (actuarially fair priced) private funding.

[2] Exceptions include Cuadra et al. (2010), who study cyclicality of fiscal policy in this framework, and Gonçalves and Guimaraes (2013), who shows that fiscal policy is time inconsistent in this environment.

[3] In most of the literature, creditors are risk neutral, so the domestic economy can always borrow at the actuarially fair price. Lizarazo (2013) considers the case with risk averse lenders, which generates a risk premium in the model.

There is also a game-theoretical literature studying the strategic interactions between the IMF and private creditors. Examples include Rochet and Vives (2004), Corsetti et al. (2006) and Morris and Shin (2006). This paper takes the liquidity needs of the country as given, thus abstracting from the possible effects of the IMF on private lenders, which allows for a simple model focused on the trade-off between immediate liquidity provision and conditional support, which is the contribution of this paper.

The paper is organized as follows. Next section describes the model and Sect. 3 presents the results. Section 4 shows numerical examples that illustrate the workings of the model. Section 5 concludes with a discussion of the findings of the paper in the context of the literature on the IMF and the debate on conditionalities.

2 Model

A small open economy that had borrowed from abroad faces a liquidity crisis. Projects that would need to be refinanced have to be terminated, leading to output losses, unless the IMF lends resources to the domestic economy. Those output losses affect choices on fiscal policy and debt repayment, so the IMF intervention might avert a sovereign default episode.

2.1 The small open economy

A small open economy has debt D. The representative agent has utility given by

$$U = u(c) + g - P,$$

where c is the consumption, u is a strictly increasing and strictly concave function ($u' > 0, u'' < 0$), g is the government spending, and P is the penalty associated with default. Linearity in g is assumed for simplicity. Let $Z \leq D$ be the debt repayment. If the country pays all its debt ($Z = D$), then the penalty P is equal to 0. Otherwise, in case of total or partial default ($Z < D$), the country faces a penalty $P = \Gamma$. The penalty Γ represents the costs associated with sovereign default. There is a large literature on the costs of sovereign default, and while there is no consensus on the importance of each particular channel, it is widely accepted that sovereign default entails costs to the domestic country. Our model captures this cost which is a simple way.[4]

Government spending is financed by a tax τ on the output y. The budget constraints for consumers and for the government imply that

$$c = (1 - \tau)y$$
$$g = \tau y - Z.$$

[4] See Panizza et al. (2009) for a survey of this literature. The costs of sovereign default might stem from a reduction in international trade, perhaps owing to trade sanctions (see, e.g., Rose (2005) and Martinez and Sandleris (2011); reputational costs that affect access to finance or the country's position when negotiating with other nations (see, e.g., Tomz (2007) and Fuentes and Saravia (2010); domestic problems caused by the redistribution of wealth resulting from the sovereign default (see, e.g., Broner and Ventura (2011); among others.

For simplicity, taxes are not distortionary.[5] Debt must be repayed out of the government account.[6] Naturally, g and c have to be non-negative, and in case the government pays its debt in full, the constraint $g \geq 0$ can be written as

$$\tau y - D \geq 0. \tag{1}$$

In order to make the problem interesting, it is assumed that $D \leq \Gamma$. In case $D > \Gamma$, the domestic economy would never repay its debt: by not repaying debt, the government faces cost Γ instead of D and do not face the constraint in (1), so default is certainly better if $D > \Gamma$. Owing to the constraint, default might still be optimal in the case $D \leq \Gamma$.

Timing is as follows:

- In period 1, there are liquidity needs equal to ℓ_1. Let x_1 be the amount reinvested to cover liquidity needs, so $x_1 \leq \ell_1$. Then, $\ell_1 - x_1$ units of the investment are liquidated in the first period.[7]
- The government chooses the tax rate τ, which is observable.
- In period 2, there are further liquidity needs equal to ℓ_2. Let x_2 be the amount reinvested to cover liquidity needs, so $x_2 \leq \ell_2$. Then, $\ell_2 - x_2$ units of the interim output are liquidated in the period 2.
- Output is then given by

$$y = Y - \phi_1 (\ell_1 - x_1) - \phi_2 (\ell_2 - x_2),$$

  where $\phi_1 > \phi_2 > 1$.
- The country decides on debt repayment Z and payoffs are realized.

The initial debt D, the output parameter Y, the penalty Γ, and the liquidity needs ℓ_1 and ℓ_2 are exogenous in the model. They represent the economic outlook of the country. An economy might be illiquid but solvent, in the sense that its debt would be easily paid if it could borrow at actuarially fair rates to cover for its liquidity needs, but high values of ℓ_1 and ℓ_2 might make it very costly to repay its debt in the absence of foreign credit. The key endogenous variables are the tax rate τ and debt repayment Z, chosen by the government, and IMF lending that will be used to cover liquidity needs, x_1 and x_2. Interest rate is normalized to 0.

The model captures the importance of immediate liquidity support in a simple way by assuming that the losses from a liquidity shortage in the first period are larger than the losses from a similar liquidity shortage in the second period ($\phi_1 > \phi_2$). The underlying idea is that by the second period, a financial meltdown might have already spread and taken its toll. Liquidity crises are often linked with banking crises, and as put forth by Fischer (1999), a lender of last resort that is able to act quickly can stop a financial panic from spreading. Mishkin (1999) corroborates this view and states that "the faster liquidity is provided in an international lender-of-last-resort operation,

[5] Section 3.3 considers the case where taxes have a negative effect on output.

[6] That is as in Cuadra et al. (2010) and Gonçalves and Guimaraes (2013).

[7] Caballero and Krishnamurthy (2001) model liquidity needs in a similar way.

the better".[8] The need to act quickly to avoid a banking meltdown was defended in stark terms by Chairman Bernanke, when justifying the bailout following the Lehman crisis: "if we don't do this, we may not have an economy on Monday."

The timing of the model implies that lending in period 2 occurs after the fiscal decision has been undertaken, which reflects an important advantage of providing lending some time after a crisis has erupted: it can be conditional on a certain τ. This is the central trade-off between conditional lending and immediate liquidity support explored in this paper.

The model focuses on a situation of a "sudden stop" (as in Calvo (1998)) where the domestic economy cannot access private credit. Since the country cannot access external finance, without IMF lending, $x_1 = x_2 = 0$. Output of the economy is then given by

$$y_0 = Y - \phi_1 \ell_1 - \phi_2 \ell_2.$$

By assuming a sudden stop, the model does not explain why capital flows suddenly dry and basically assumes a role for the IMF. The model is then used to analyze the trade-off between conditionalities and immediate liquidity support faced by this international lender of last resort.

2.2 The IMF

There is an international lender of last resort, the IMF, endowed with an amount A of resources that can be lent to be country. Its preferences are simple: as in Rochet and Vives (2004) and Corsetti et al. (2006), the IMF gets benefit B if it succeeds in avoiding a liquidity crisis (perhaps because the IMF internalizes the externalities on other countries) but faces a cost C if the country default on its debt (net of any benefit).[9]

When a country is hit by a crisis, the IMF can provide liquidity immediately, or it can promise liquidity support once the country has fulfilled some conditions. Countries need to meet some ex-ante conditionalities in order to quality for immediate liquidity support. The difference between ex-ante conditionalities and ex-post conditionalities is in the timing of loans and conditions: in case of ex-ante conditionalities, a country has access to IMF loans as soon as it is hit by a sudden stop; in case of ex-post conditionalities, there is a time lag between the beginning of a crisis and the IMF loan.

In the model, The IMF can lend to the domestic country in period 1 and in period 2, but the sum of those IMF loans cannot exceed A. Let $a \leq A$ be the total amount lent and let λ be the proportion lent in the first period. The trade-off between conditionality and immediate liquidity support is captured by the value λ, the key endogenous variable in the IMF problem. A value of λ close to 0 implies that most of IMF lending is

[8] Mishkin (1999) adds that "an important historical feature of successful lender-of-last-resort operations, is that the faster the lending is done, the lower is the amount that actually has to be lent."

[9] There is no uncertainty in the model, so more detailed IMF preferences would not affect the results. In equilibrium, the IMF knows whether the country will choose to repay its debts or not (conditional on the IMF's own choices). We thus assume that the IMF wants to avoid a debt default, and then study whether immediate liquidity provision or conditional lending are more effective in providing incentives for fiscal adjustment and repayment.

conditional on a tax rate chosen by the IMF ($\bar{\tau}$), so it corresponds to IMF facilities with ex-post conditionalities. Since the IMF will only choose a high value of λ in case a country meets certain conditions, we can interpret the choice of $\lambda = 1$ as a line of credit with ex-ante conditionalities only.

A flexible credit line (FCL) is an example of an IMF facility with $\lambda = 1$. Countries that meet some ex-ante conditions can request an FCL and access the funds whenever they want. Most countries treat an FCL as a precautionary instrument; readily available in case the country is hit by a sudden stop in capital flows. In the model, that corresponds to IMF lending in period 1. Colombia, Mexico, and Poland are examples of countries that have requested a Flexible Credit Line in the last few years.

In order to allow λ to vary between 0 and 1, we assume $A \leq \ell_1$ and $A \leq \ell_2$. Then $x_1 = \lambda a$ and $x_2 = (1 - \lambda)a$. Output y now depends on whether the country complies with the conditionalities imposed by the Fund. In case the domestic government choose its tax rate equal to $\bar{\tau}$, its output y is given by

$$y_h = Y - \phi_1 \left[\ell_1 - \lambda a\right] - \phi_2 \left[\ell_2 - (1 - \lambda)\, a\right].$$

However, if the domestic government chooses a different tax rate, then it does not receive an installment from the IMF in period 2, and output y is then given by

$$y_l = Y - \phi_1 \left[\ell_1 - \lambda a\right] - \phi_2 \ell_2.$$

A large λ implies the country will face a smaller output loss (since λa is multiplied by ϕ_1 and $(1 - \lambda)a$ is multiplied by ϕ_2). That captures the benefits of prompt liquidity support. However, a large λ also imply a small difference between y_h and y_l, which will play an important role in the model.

The model captures the role of IMF lending stated in Article I of the Fund's Articles of Agreement: "to give confidence to members by making the general resources of the Fund temporarily available to them under adequate safeguards, thus providing them with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity." The liquidation costs capture the destructive measures mentioned in the statement.

3 Equilibrium

We first discuss the choice of the domestic economy with respect to fiscal adjustment τ and debt payment Z in a situation without the IMF. We then include the IMF in the model, analyze how government policy and IMF lending interact and study the optimal value of λ.

The assumptions on default cost immediately imply that either debt is fully repaid ($Z = D$) or is not at all repaid ($Z = 0$). So, the problem of the domestic economy is reduced to a binary choice (default or not) and the choice of τ.

3.1 Benchmark case with no IMF

The first-order condition with respect to τ yields

$$u'\left(\left[1-\hat{\tau}\right]y_0\right)=1,$$

where $\hat{\tau}$ is the optimal tax rate if there are no binding restrictions to the choice of τ. The marginal utility of consuming one extra unit equals the marginal benefit of public spending (equal to 1 in the model). However, the constraint $g \geq 0$ in (1) will be binding if $\hat{\tau}y_0 < D$ and the government wants to repay its debt, since in this case, the domestic government will not have enough resources to honor its obligations with a tax rate equal to $\hat{\tau}$.

There are then two cases to consider: suppose first the constraint $g \geq 0$ does not bind. Then, utility in case of repayment and default are given by

$$\begin{aligned} U_{P0} &= u(\left[1-\hat{\tau}\right]y_0)+\hat{\tau}y_0-D \\ U_{D0} &= u(\left[1-\hat{\tau}\right]y_0)+\hat{\tau}y_0-\Gamma, \end{aligned} \tag{2}$$

where U_{P0} is utility in the case of repayment and U_{D0} is utility in case of default. Owing to the assumption $D \leq \Gamma$, the country chooses to repay its debt.[10]

Now suppose the constraint $g \geq 0$ binds if the country decides to repay its debt. In case of default, the utility of the representative agent is still given by (2), since in that case $g = \hat{\tau}y_0 > 0$. In case of repayment, the constraint in (1) implies $\tau \geq D/y_0$, and owing to the concavity in u, the government chooses $\tau = D/y_0$ and $g = 0$. Utility in case of repayment is then given by

$$U_{P0} = u(y_0 - D).$$

The government chooses to repay its debt if $u(y_0 - D) > U_{D0}$, which leads to

$$u(y_0 - D) - u(\left[1-\hat{\tau}\right]y_0) - \hat{\tau}y_0 + \Gamma \geq 0.$$

In case the constraint $g \geq 0$ is slack, that is, if debt repayment does not require some extra fiscal adjustment, repaying the debt entails a benefit given by the difference $\Gamma - D$. This benefit is also present in case the constraint $g \geq 0$ binds, but now there is also a cost: the tax rate will have to be larger than the government would like, which reduces the marginal utility of consumption. In this case, repaying debt entails some fiscal adjustment which hurts the consumer in the present period. The result is then ambiguous. The cost of fiscal adjustment (very low consumption) might make default the optimal choice for the domestic government. IMF lending can affect that decision.

[10] If D happened to be larger than Γ, then the government would choose to default, and there is nothing that the IMF could do about it. This is a case where it is never optimal to repay the contracted amount of debt.

3.2 Optimal IMF lending

The preferences of the IMF imply that it will lend to the domestic country if and only if it expects to be fully repaid, which puts an endogenous limit to a since debt will never be repaid if $a + D > \Gamma$. Hence, $a \leq \Gamma - D$ and it will be shown that as long as this condition is satisfied, incentives for repayment are increasing in a. Hence, the IMF can avoid default if and only if the country chooses to repay its debt when $a = \max\{A, \Gamma - D\}$.

Now the constraint $g \geq 0$ in (1) becomes

$$\tau \geq \frac{a + D}{y}.$$

If this constraint does not bind, the first-order condition with respect to τ yields

$$u'\left(\left[1 - \hat{\tau}_P\right] y_h\right) = 1,$$

and as long as $a \leq \Gamma - D$, the country finds it optimal to repay—the intuition in this case is identical to the one in the previous section.

When default risk is not an issue, the country internalizes all effects of a change in τ. Hence, there is no reason for the IMF to intervene in the country's choice of fiscal policy. IMF loans can still reduce liquidation costs, and since immediate liquidity provision is more effective in avoiding the costs of a liquidity crisis (by assumption), immediate liquidity support ($\lambda = 1$) is the best choice in this case, which is consistent with the prescription in Mishkin (1999) of prompt liquidity support in order to avoid the spreading of a crisis.

However, when tight fiscal policy is required for debt repayment, the country's choice of τ may be different from the first best. Suppose now the constraint $g \geq 0$ binds. In this case, the domestic government chooses between fiscal adjustment and repayment. Repayment requires $\tau y = a + D$ but output is given by y_h, so

$$U_{PI} = u(y_h - a - D).$$

Alternatively, the domestic government can choose the tax rate that maximizes utility considering that debt will not be repayed, taking into account that it will not receive the IMF loan in the second period, so output will be given by y_l. Thus

$$U_{DI} = u(\left[1 - \hat{\tau}_D\right] y_l) + \hat{\tau}_D y_l - \Gamma,$$

where $\hat{\tau}_D$ is given by

$$u'\left(\left[1 - \hat{\tau}_D\right] y_l\right) = 1. \tag{3}$$

Repaying is the best option if $U_{PI} > U_{DI}$, which implies

$$f = u(y_h - a - D) - u(\left[1 - \hat{\tau}_D\right] y_l) - \hat{\tau}_D y_l + \Gamma > 0.$$

The f function measures the relative incentives to repay debt. Repayment occurs if $f > 0$.

The IMF can affect the decision on default in two ways. First, by reducing the liquidation costs, the IMF increases the amount of private consumption compatible with debt repayment, which reduces the marginal utility of private consumption (at the margin) and, hence, makes repayment less costly. Second, by lending funds conditional on a value of τ that leads to debt repayment, the IMF can increase the difference between output in case of repayment (y_h) and output in case of default (y_l). Crucially, a large value of τ makes it possible *and optimal* for a country to repay.

Taking derivatives shows that f is increasing in a and Γ, and decreasing in liquidity needs ℓ_1 and ℓ_2. So a policy that increases f for given parameters is also a policy that makes repayment possible for lower default costs, smaller IMF loans, or larger liquidity needs.

The main questions of this paper are about the effects of λ on f. Taking the derivative of f with respect to λ and using (3) yields

$$\frac{\partial f}{\partial \lambda} = u'\left(y_h - a - D\right)\frac{\partial y_h}{\partial \lambda} - \frac{\partial y_l}{\partial \lambda}.$$

An increase in λ raises the marginal utility in case of repayment (the first term), but also increases the marginal utility in case of default: a larger λ implies the smaller liquidation costs, which is good for the domestic country. The effect of λ on f depends on which term dominates. Since

$$\begin{aligned}\frac{\partial y_h}{\partial \lambda} &= a(\phi_1 - \phi_2),\\ \frac{\partial y_l}{\partial \lambda} &= a\phi_1,\end{aligned} \tag{4}$$

we obtain

$$\frac{\partial f}{\partial \lambda} = u'\left(y_h - a - D\right)a(\phi_1 - \phi_2) - a\phi_1. \tag{5}$$

Since the constraint $g \geq 0$ binds, $u'\left(y_h - a - D\right) > 1$. The expression in (5) thus highlights a trade-off involved in the choice between conditionalities and immediate liquidity support. There are two countervailing effects, and the overall impact of λ on f is ambiguous.

The first effect is the disciplining role of conditionalities: conditional lending (low λ) spurs fiscal adjustment by rewarding a larger τ. A lower level of λ represents a larger fraction of loans conditional on fiscal adjustment, which means relatively more liquidity support for the country if fiscal adjustment is undertaken. A reduction in λ has a negative impact on the resources lent to the domestic economy in the first period regardless of the decision about repayment, but has a positive impact on second period lending only if the government chooses a value of τ that enables debt repayment.

The countervailing effect is the damage-reducing role of immediate liquidity provision: a larger λ might increase incentives for repayment by reducing the damage caused by a liquidity crisis. Without IMF support, the output fall could be excessively large, and repayment could end up requiring very high tax rates, implying very low

private consumption and very high marginal utility. Consequently, debt repayment could become very costly. This effect hinges on the assumption that $\phi_1 > \phi_2$ (in case $\phi_1 = \phi_2$, the first term in (5) vanishes), and its importance depends on how costly the delay in providing liquidity ($\phi_1 - \phi_2$) is.

Therefore, immediate liquidity provision might provide *more* incentives for fiscal adjustment than conditional lending. This seemingly paradoxical possibility result stems from liquidity provision having larger effects earlier in the process. If a sudden stop can inflict serious damage on a country's economy, then the resulting output fall might have very negative effects on incentives for fiscal adjustment owing to the resulting large drop in private consumption. Clearly, conditional on repayment being certain, liquidity provision earlier is better than later, as that would bring a larger reduction on liquidation costs.

One important implication of the model is that

$$\frac{\partial^2 f}{\partial \lambda^2} = (a(\phi_1 - \phi_2))^2 u''(y_h - a - D) < 0.$$

Thus, f is concave in λ. Marginal incentives for fiscal adjustment and debt repayment are decreasing in λ. The intuition is that a little bit of immediate liquidity support might be very important for preventing severe damages from a sudden stop, but since marginal utility from consumption is decreasing, the marginal benefit or large liquidity support is not so large. On the other hand, conditional lending always has a positive effect on incentives for fiscal adjustment for increasing the difference between y_h and y_l.

The effect of other parameters of the model on λ can be seen by the respective cross derivatives. For example,

$$\frac{\partial^2 f}{\partial \lambda \partial \ell_1} = -u''(y_h - a - D)\, a(\phi_1 - \phi_2)\phi_1 > 0.$$

Hence, larger liquidity needs, corresponding to a larger value of ℓ_1, raise the marginal benefit from increasing λ. Since $\partial f/\partial \lambda < 0$, which implies that whenever the optimal λ is in $(0, 1)$, an increase in ℓ_1 raises λ. This result might appear counter intuitive: conditionalities are less effective for a country in a worse situation. Higher liquidity needs imply larger losses from a liquidity crisis, which reduce the level of debt consistent with repayment. It is exactly in those cases that immediate liquidity support is most useful.

Moreover,

$$\frac{\partial^2 f}{\partial \lambda \partial D} = -u''(y_h - a - D)\, a(\phi_1 - \phi_2) > 0.$$

Hence, a larger debt also raise the marginal benefit from increasing λ. When the debt D is very large, reducing the liquidation costs that lead to an output fall is particularly important because the marginal utility of consumption is very high. Note, however, that the total size of IMF loans a is limited by $\Gamma - D$; hence, a larger level of debt reduces the amount that can be borrowed from the IMF. A large debt thus reduces

the scope for immediate liquidity provision but does not provide support for fiscal conditionalities.[11]

The results in this section are summarized in the following proposition:

Proposition 1 *The proportion lent in the first period (λ) affects incentives for repayment (f) in the following way:*

(1) In case the unrestricted choice of τ implies $g \geq 0$, default is not a concern and the optimal $\lambda = 1$.
(2) In case the unrestricted choice of τ would imply $g < 0$,
  (a) The effect of λ on f is given by (5), and is ambiguous.
  (b) f is concave in λ.
  (c) Higher liquidity needs and a higher level of debt shift the balance toward a larger λ, but may make debt repayment unfeasible.

3.3 Extension: costs of fiscal adjustment

We now extend the model to capture the idea that a stringent fiscal adjustment imposes costs on the economy. These costs might result from the deleterious effects of distortionary taxation, or from the lack of public investment on infrastructure, or from the political struggle that often takes place whenever tax increases or spending cuts are planned. For the sake of simplicity, we suppose that a choice of $\tau = \hat{\tau}_D$ yields no cost to the economy, but output is decreased by $\chi(\tau - \hat{\tau}_D)^2$ whenever $\tau > \hat{\tau}_D$. This is a simple way to capture the costs of tight fiscal policy, and the question is about the effect of the cost of fiscal adjustment χ on λ.

As before, if the constraint $g \geq 0$ does not bind, the domestic country finds it optimal to repay its debt as long as $a \leq \Gamma - D$. In this case, conditionalities are unnecessary. We focus on the case where the constraint $g \geq 0$ binds.

The expression for utility in case of default is not affected by this modification in the model. In case of repayment, output is reduced by $\chi(\tau - \hat{\tau}_D)^2$; hence, the f function is now given by

$$f = u(y_h - a - D - \chi(\tau - \hat{\tau}_D)^2) - u\left(\left[1 - \hat{\tau}_D\right] y_l\right) - \hat{\tau}_D y_l + \Gamma > 0,$$

where y_h is as before. Thus

$$\frac{\partial f}{\partial \lambda} = u'\left(y_h - a - D - \chi(\tau - \hat{\tau}_D)^2\right)\left[\frac{\partial y_h}{\partial \lambda} - 2\chi(\tau - \hat{\tau}_D)\frac{\partial \tau}{\partial \lambda}\right] - \frac{\partial y_l}{\partial \lambda}. \tag{6}$$

Now a change in λ affects the utility in case of repayment in two ways: it directly affects y_h (as before) but it also affect the cost of fiscal adjustment, since a larger λ reduces

[11] Fafchamps (1996) analyzes conditionalities that increase the cost of defaulting (Γ in this model). For example, trade openness might increase the potential costs from trade sanctions. In that kind of model, ex-post conditionalities might be an optimal response to larger debt, but fiscal conditionalities play a different role.

the tax required for debt repayment. Since the constraint $g \geq 0$ binds, $\tau y_h = a + D$ is not affected by λ; hence,

$$y_h \frac{\partial \tau}{\partial \lambda} = -\tau \frac{\partial y_h}{\partial \lambda}.$$

Using that and (4) into (6) yields

$$\frac{\partial f}{\partial \lambda} = u'\left(y_h - a - D - \chi(\tau - \hat{\tau}_D)^2\right) a(\phi_1 - \phi_2)\left[1 + \frac{\tau}{y_h} 2\chi(\tau - \hat{\tau}_D)\right] - a\phi_1.$$

Hence,

$$\begin{aligned}\frac{\partial^2 f}{\partial \lambda \partial \chi} = &-u''\left(y_h - a - D - \chi(\tau - \hat{\tau}_D)^2\right)(\tau - \hat{\tau}_D)^2 a(\phi_1 - \phi_2) \\ &\times \left[1 + \frac{\tau}{y_h} 2\chi(\tau - \hat{\tau}_D)\right] + u'\left(y_h - a - D - \chi(\tau - \hat{\tau}_D)^2\right) \\ &\times a(\phi_1 - \phi_2)\frac{\tau}{y_h} 2(\tau - \hat{\tau}_D), \end{aligned} \tag{7}$$

which is positive for $\tau > \hat{\tau}_D$. Hence, a larger cost of fiscal adjustment χ favors a larger λ, and thus it increases the marginal benefit of immediate liquidity support. An increase in λ raises y_h, which reduces the marginal utility of private consumption in case of repayment, and that is particularly important when fiscal adjustment has a strong negative effect on output (i.e., when χ is large), which is the first term in (7). A larger λ also requires a smaller fiscal adjustment, and the benefit of a smaller tax rise is proportional to χ, which is the second term in (7). Since τy_h is pinned down by the constraint imposed by debt repayment, χ does not affect the choice of τ.

Interestingly, a large cost of fiscal adjustment shifts the balance toward immediate liquidity support. Common sense might suggest that conditional assistance is needed when tight fiscal policy is costly as a way to provide incentives for adjustment, but the rewards from conditional lending do not increase with a larger χ. In contrast, marginal utility from consumption is affected by χ, and when tight fiscal policy is more costly, reducing liquidation costs becomes more important. Immediate liquidity support can reduce the impact of the fiscal adjustment on agents' marginal utility of consumption.

A large χ might also imply that debt repayment is not feasible. An increase in χ shifts down the f function and might make it negative for any value of λ. In any case, an increase in conditionalities does not help.

The result of this section is summarized in the following proposition:

Proposition 2 *A higher cost of fiscal adjustment (χ) shifts the balance toward a larger proportion of lending in the first period (λ), but reduces the maximum level of debt consistent with debt repayment.*

4 Numerical examples

This section presents numerical examples in order to illustrate the workings of the model. The numerical examples are not intended to be taken as calibration exercises,

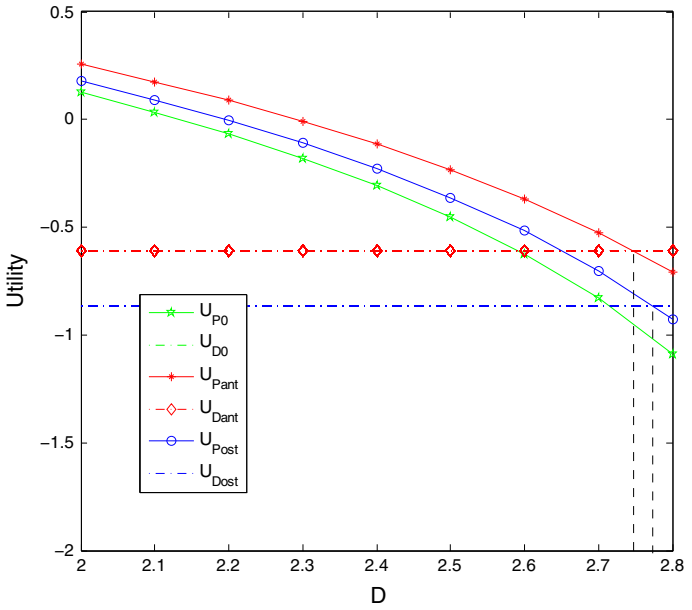

Fig. 1 Conditional lending provides more incentives for adjustment

and the objective is only to explain the economic intuition behind the results. The numerical examples assume $u(c) = \log(c)$ and abstract from the costs of fiscal adjustment ($\chi = 0$).

Figure 1 compares the cases $\lambda = 0$ and $\lambda = 1$ when liquidity needs in the first period are given by $\ell_1 = 0.9$. All other parameters, including the size of IMF loans ($a = A = 0.1$), are fixed.[12] In this example, incentives for fiscal adjustment are larger when $\lambda = 0$. The bottom curve with stars shows the utility of the country in case of repayment with no IMF lending, and the botton dotted line shows the utility in case of default. Larger debt D reduces utility in case of repayment, but not in case of default. IMF conditional lending raises the utility conditional on repayment (the curve with circles) but keeps unchanged utility in case of default. IMF immediate liquidity support raises utility conditional on repayment even more (curve with asterisks), because it is more effective in saving liquidation costs. However, it also raises the utility conditional on defaulting (top horizontal line). So in principle, it is not clear which option provides more incentives for fiscal adjustment and rebt repayment.

In the example depicted in Fig. 1, conditional lending provides more incentives for adjustment. For D small enough, the country finds it optimal to repay debt even with no IMF assistance. Then, there is an interval for D in which the country finds it optimal to repay debt when the IMF provides funding, regardless of the value of λ. In all those cases, $\lambda = 1$ is the best option: it leads to larger output and is consistent with debt repayment. But then, there is an interval for D, where immediate liquidity provision would lead to default, and some ex-post conditionalities are needed to pro-

[12] The remaining parameters are: $Y = 7.68$, $\ell_2 = 1.4$, $\phi_1 = 2.56$, $\phi_2 = 1.6$ and $\Gamma = 3$.

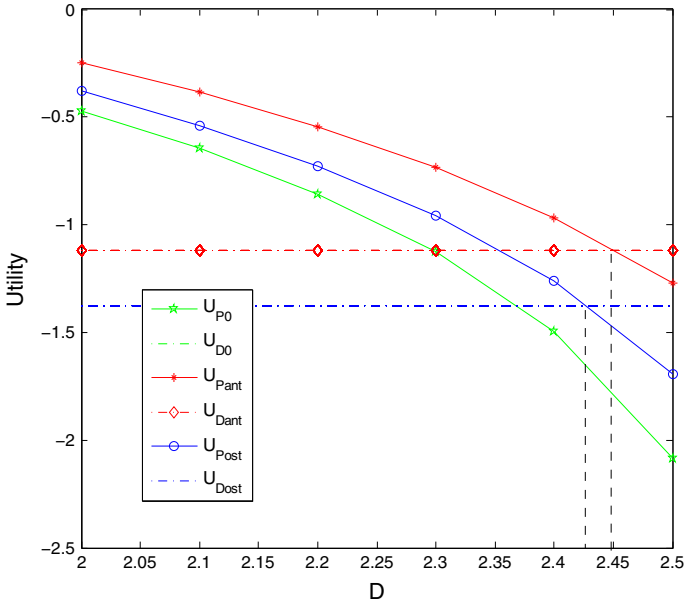

Fig. 2 Immediate liquidity provision is optimal

vide incentives for fiscal adjustment that allows for debt repayment. Finally, when D is large enough, there is nothing the IMF can do to ensure that debt will be paid.

As liquidity needs increase, the maximum amount of debt that can be paid in equilibrium goes down, which is intuitive: larger liquidity needs imply larger liquidation costs and, consequently, lower output, which makes repaying debt more costly in terms of utility from consumption. Interestingly, there is another effect: larger liquidity needs also make immediate liquidity provision relatively more effective.

Figure 2 provides another comparison of the effectiveness of lending with $\lambda = 0$ and $\lambda = 1$ with the same parameters but $\ell_1 = 1.1$. In this case, incentives for fiscal adjustment are larger when $\lambda = 1$. Ex-ante IMF lending increases both utility conditional on repayment and utility in case of default. However, in this case, the effect on utility in case of default (top horizontal line in Fig. 2) is not large enough to offset the increase in utility in case of repayment (curve with asterisks). For this economy, when debt D is low enough (below 2.45), immediate liquidity support is optimal. For larger values of D, default is unavoidable.

If we consider $\ell_1 = 1$ (instead of 0.9 or 1.1), then an intermediate value of λ maximizes incentives for fiscal adjustment.[13] Intuitively, larger liquidation costs increase the marginal benefit of some immediate liquidity provision, making it more attractive. Since incentives for fiscal adjustment and debt repayment are concave in λ, a combination of immediate liquidity support and conditional lending in this case increases the range of values of debt D compatible with debt repayment. So for some values

[13] For $\ell_1 = 0.997$, incentives for repayment with $\lambda = 0$ and $\lambda = 1$ are exactly the same, in the sense that the respective thresholds for the level of debt D consistent with repayment coincide.

of D, default is only avoidable if the IMF chooses intermediate values of λ, thus providing some immediate liquidity but also lending resources later conditional on fiscal adjustment.

5 Discussion

The literature offers several distinct reasons for IMF conditionalities. They can be (i) a way for international organizations to impose their will on debtors; (ii) a mechanism through which countries can signal their type to markets; (iii) a result of the political game; and (iv) commitment devices (See Dreher (2009)). Conditionalities here fall in the fourth category: conditional lending provides incentives for fiscal adjustment. In the model, an international lender of last resort can induce the domestic country to repay its debt by lending resources conditional on fiscal adjustment.[14]

Dreher (2009) argues for the need to rethink structural conditionalities, highlighting the importance of ex-ante conditionalities. In the model, ex-ante conditionalities are tantamount to immediate liquidity provision, since in this case, there is no delay between a crisis and liquidity support. Ex-post conditionalities are indeed a poor choice whenever sovereign default is not an issue and also when liquidation costs lead to large output losses that make repayment very costly. However, in some cases, conditional lending might be the only way to make sure the country repays its debts. Nevertheless, the model is consistent with the idea that satisfying the conditions for immediate liquidity support (call those ex-ante conditionalities) works best for the country in the sense of reducing the costs from a liquidity crisis.

Proposition 1 shows that ex-ante conditionalities are optimal when sovereign default is not a concern or when liquidity needs are very high. That description fits the case of relatively advanced emerging economies: their fundamentals are relatively strong, and their capital account position is dominated by private flows, which means that a sudden stop in private capital flows, caused perhaps by a crisis in faraway countries, might lead to very high liquidity needs.[15] Indeed, Flexible Credit Lines are only granted to some of the (relatively) more advanced countries that borrow from the IMF. For example, in 2013, Polish authorities renewed for the second time a two-year US$33.8 billion FCL. The country treats it as precautionary credit line, though Poland has the full amount available upfront, with no ongoing conditions.

Proposition 1 also states that in some cases, intermediate values of λ are optimal, and we do observe those in reality. Gambia needed IMF financial assistance in 2012 due to a major crop failure and a heavy debt burden. IMF enabled an immediate disbursement of US$14.2 million through an Extended Credit Facility. One year later, after the first IMF review and a year of tight fiscal policy, the Fund approved another disbursement of US$2.3 million. The case of Gambia illustrates a blend of immediate assistance and ex-post conditionality.

[14] See also the discussion in Fischer (2004) and Conway (2006).

[15] In fact, a capital account position dominated by private flows is one of the criteria mentioned by the IMF for access to a flexible credit line: http://www.imf.org/external/np/exr/faq/facfaqs.htm#q6.

Bosnia and Herzegovina provides a recent example of IMF loans with ex-post conditionalities. The country reached an agreement with the IMF on a Stand-by Arrangement in July 2012. The aim of the assistance was to mitigate the effects of the Euro zone crisis. The first disbursement of a 24-month US$500 million Facility was conditional to the implementation of a number of measures (including fiscal conditionalities). The IMF Board released financial assistance in September 2012. The short period between the agreement and the first disbursement of the loan suggests that Bosnia and Herzegovina was facing a (relatively) low cost of fiscal adjustment in that time.

While the above examples might illustrate the potential of the model to explain observed conditionalities, serious empirical work is needed to understand whether IMF conditionalities match the prescription from the model. In addition, the model is not suitable for quantitative analysis, which is left for future research. Moreover, there are many aspects of IMF conditionalities that this paper does not address. First, a large literature studies the political determinants of IMF conditionalities.[16] This paper provides a normative benchmark that could be extended to include political considerations and other economic links among countries. Second, some critics of conditionality claim that it simply does not work: Bird (2007) points to empirical evidence supporting the view that part of the problem with conditionality is the inability of countries to implement them properly (see also Easterly (2005) and Dreher (2009)). This paper has nothing to add to this discussion. Last, part of the debate surrounding conditionalities relates to policies aiming at fostering growth, which are also not dealt with in this paper.

Notwithstanding those caveats, the model in this paper provides a useful framework to think about IMF lending and its conditionalities. Incentives for fiscal adjustment by an indebted country depend on the difference between welfare in case the country chooses to adjust and repay and welfare in case of default. IMF conditional lending reduces the costs of a liquidity crisis only if the country chooses to undertake the required fiscal adjustment; immediate liquidity support is more effective in reducing the costs of a liquidity shortage, but it also helps a country that ends up choosing a low fiscal stance and defaults on its debt. The optimal strategy needs to take all those effects into consideration.

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[16] Recent contributions include Nooruddin and Simmons (2006), Dreher and Jensen (2007) and Stone (2008).

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