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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 towards immediate liquidity provision.

JEL Codes: F33, F34, H63.

KEYWORDS: IMF, conditionality, fiscal adjustment, liquidity provision, sudden stop.

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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 resources are promptly available for a country in a liquidity crises, but this facility is only accessible to countries that 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 to 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 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 portraits a small open economy that had borrowed from abroad and faces a sudden stop (as in Calvo (1998)), which means it temporarily loses access to private capital flows. Projects that would need to be re-financed have to be terminated, leading to output

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

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 Goncalves and Guimaraes, 2013). The international lender of last resort has to ensure 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 liquiditation 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.

The results resonate with previous work that found an ambiguous effect of IMF support on incentives for reforms, implying that IMF lending does note necessarily generate moral hazard. 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 the incentive for undertaking afiscal adjustment required for debt repayment is concave in the fraction of lending provided under conditionality. 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 instalments 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 towards 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.

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. That allows for a simple model focused on the trade-off between immediate liquidity provision and conditional support,

[2] Exceptions include Cuadra et al (2010), who study cyclicality of fiscal policy in this framework, and Goncalves 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.

which is the contribution of this paper.

The paper is organized as follows. Next section describes the model and section 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 re-financed 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 consumption, u is a strictly increasing and strictly concave function ($u' > 0$, $u'' < 0$), g is 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 ($Z = D$), 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 is a simple way.[4]

Government spending is financed by a tax τ on the output y. The budget constraints for

[4] See Panizza, Sturzenegger and Zettelmeyer (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.

consumers and for the government imply that:

$$\begin{aligned} c &= (1-\tau)y \\ g &= \tau y - Z \end{aligned}$$

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:

- The domestic economy starts with debt D and investment I.
- 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]
- Interim output is given by $\varphi = R(I - (\ell_1 - x_1))$, where $R > 1$ is the return to investment.
- 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 y is given by $y = R(\varphi - (\ell_2 - x_2))$.
- The country decides on debt repayment Z and payoffs are realized.

[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 initial debt D and investment I, the return R, 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 model focuses on a situation of a "sudden stop" (as in Calvo (1998)) where the domestic economy cannot access private 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. There are two key distinction between periods 1 and 2: liquidation of projects in period 1 is more costly, representing the idea that immediate liquidity support can avert severe output slumps at times of crisis, but period 2 occurs after the fiscal decision has been undertaken, so lending in period 2 can be conditional on a certain τ.

Interest rate is normalized to 0.

Since the country cannot access external finance, without IMF lending, $x_1 = x_2 = 0$. Output of the economy is then given by

$$y_0 = IR^2 - \ell_1 R^2 - \ell_2 R$$

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 analyse 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).

The IMF can lend to the domestic country in both periods, but the total amount lent 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 one means the country will receive much of its liquidity support before being "inspected" by the IMF. Lending in the second period can be made contingent to conditionalities, in particular, to a tax rate $\bar{\tau}$ chosen by the IMF. A value of λ close to 0 implies most of IMF lending is conditional to a tax rate $\bar{\tau}$.

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

$$y_h = IR^2 - [\ell_1 - \lambda a] R^2 - [\ell_2 - (1-\lambda) a] R$$

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

$$y_l = IR^2 - [\ell_1 - \lambda a] R^2 - \ell_2 R$$

A large λ implies the country will face a smaller output loss (since λa is multiplied by R^2 and $(1-\lambda)a$ is multiplied by R). 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 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.[8]

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, that is the tax rate the government would choose (in case of repayment). Utility in case of repayment is now given by

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

Hence the government chooses to repay its debt if:[9]

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

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

[9] It is easy to show that if this condition holds, repayment is better than defaulting under the assumption $\Gamma \geq D$.

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.

3.2 Optimal IMF lending

The preferences of the IMF imply it will lend to the domestic country if and only if it expects to be fully repaid. That 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 this case is identical to the one in the previous section.

Now suppose 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

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

Alternalively, the domestic government can choose the tax rate that maximizes utility considering 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. That 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 I, 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 smaller liquidation costs, which is good for the domestic country. The effect of λ on f depends on which term dominates. Since

$$\begin{aligned} \frac{\partial y_h}{\partial \lambda} &= aR(R-1), \\ \frac{\partial y_l}{\partial \lambda} &= aR^2, \end{aligned} \tag{4}$$

we obtain

$$\frac{\partial f}{\partial \lambda} = u'\left(y_H - a - D\right)aR(R-1) - aR^2 \tag{5}$$

Since the constraint $g \geq 0$ binds, $u'(y_H - a - D) > 1$. 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.

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, 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:

$$\frac{\partial^2 f}{\partial \lambda^2} = (aR(R-1))^2 u''(y_h - a - D) < 0$$

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,

$$\frac{\partial^2 f}{\partial \lambda \partial \ell_1} = -u''\left(y_H - a - D\right) aR^3(R-1) > 0$$

Hence larger liquidity needs, corresponding to a larger value of ℓ_1, raise the marginal benefit from increasing λ. Since $\partial f/\partial \lambda < 0$, that implies that whenever the optimal λ is in $(0,1)$, an increase in ℓ_1 raises λ. Higher liquidity needs imply larger losses from a liquidity crisis, which reduce the level of private consistent with debt repayment. It is exactly in those cases that immediate liquidity support is most useful.

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

Proposition 1 *Effects of the proportion lent in the first period (λ) on incentives for repayment (f):*

1. *The effect of λ on f is ambiguous.*
2. *f is concave in λ.*
3. *Higher liquidity needs shift the balance towards a larger λ.*

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

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

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 direcly affects y_h (as before) but it also affect the cost of fiscal adjustment, since a larger λ reduces 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

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

Hence

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

which is positive for $\tau > \hat{\tau}_D$. Hence a larger cost of fiscal adjustment χ favours a larger λ, 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). That 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. That 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 towards 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 towards a larger proportion of lending in the first period (λ).*

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, 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 ($\chi = 0$).

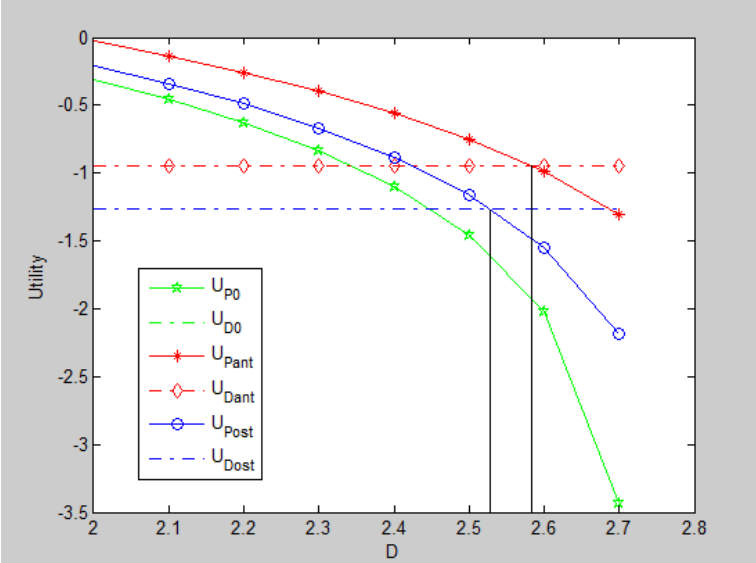

Figure 1: Immediate liquidity provision is optimal

Figure 1 compares only the cases $\lambda = 0$ and $\lambda = 1$ and shows a case where immediate liquidity provision is optimal, in the sense that incentives for fiscal adjustment are larger when $\lambda = 1$.[10] The bottom curve with stars shows the utility of the country in case of repayment with

[10] Parameters are: $I = 2.88$, $R = 2$, $a = 0.08$, $\ell_1 = 1.4563$, $\ell_2 = 1.4813$ and $\Gamma = 3$.

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 Figure 1, immediate liquidity provision is the best option.

Figure 2 provides another comparison of the effectiveness of lending with $\lambda = 0$ and $\lambda = 1$ with different parameters.[11] In this case, incentives for fiscal adjustment are larger when $\lambda = 0$. 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 Figure 2) more than offsets the increase in utility in case of repayment (curve with asterisks). In terms of welfare, the optimal IMF intervention depends on the level of the debt D: if D is small enough, then the debtor country has enough incentives to repay debt in any case, so immediate liquidity support is the best option for it is more effective in reducing output losses. However, there is a range of values for D in which conditional lending can induce fiscal adjustment and debt repayment, but unconditional ex-ante lending cannot.

If the example depicted in Figure 2 is modified so that $\ell_1 = 0.997$ (instead of 0.9), 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. 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 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.

[11] Parameters are: $I = 3$, $R = 1.6$, $a = 0.1$, $\ell_1 = 0.9$, $\ell_2 = 1.4$ and $\Gamma = 3$.

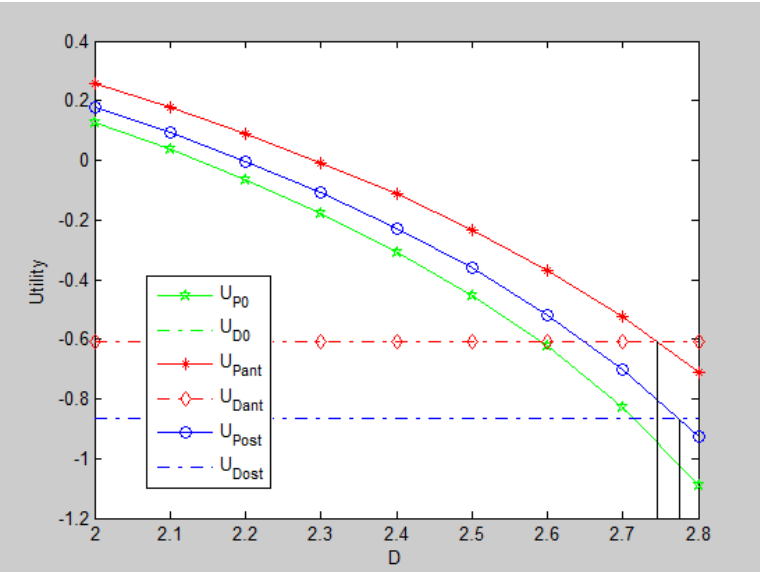

Figure 2: Conditional lending provides more incentives for adjustment

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; (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.[12]

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

[12] See also the discussion in Fisher (2004) and Conway (2006).

the country in the sense of reducing the costs from a liquidity crisis.

There are many aspects of IMF conditionalities that this paper does not address. First, a large literature studies the political determinants of IMF conditionalities.[13] This paper provides a normative benchmark that could be extended to include political considerations and other economic links among countries. Moreover, some critics of conditionality claim 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.

This paper has implications for empirical work concerned with the effects of IMF conditionalities (see Dreher (2009) for a review of this literature and references therein). In particular, whether conditional lending is the best strategy to deal with a country depends on its economic outlook, and there are cases where a mix of immediate liquidity support and ex-post conditionalities is the only way to provide incentives for fiscal adjustment and debt repayment. Moreover, immediate liquidity provision is particularly good when tight fiscal policy is very costly.

References

[1] Bird, G. (2007). The IMF: a Bird's eye view of its role and operation. *Journal of Economic Surveys* 21, 683-745.

[2] Broner, F.; Ventura, J. (2011). Globalization and Risk Sharing. *Review of Economic Studies* 78, 49-82.

[3] Caballero, R.; Krishnamurthy, A. (2001). International and domestic collateral constraints in a model of emerging market crises. *Journal of Monetary Economics* 48, 513-548.

[4] Calvo, G. (1998). Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops. *Journal of Applied Economics* 1, 35-54.

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

[5] Collier, P.; Guillaumont, P; Guillaumont, S.; Gunning, J.W. (1997). Redesigning conditionality? *World Development* 25, 1399-1407.

[6] Conway, P. (2006). The International Monetary Fund in a time of crisis: A review of Stanley Fischer's IMF Essays from a Time of Crisis. *Journal of Economic Literature* 44, 115-144.

[7] Corsetti, G; Guimaraes, B; Roubini, N. (2006). International lending of last resort and moral hazard: A model of IMF's catalytic finance. *Journal of Monetary Economics* 53, 441-471.

[8] Cuadra, G; Sanchez, J.M.; Sapriza, H. (2010). Fiscal policy and default risk in emerging markets. *Review of Economic Dynamics* 13, 452-469.

[9] Dreher, A. (2009). IMF conditionality: theory and evidence. *Public Choice* 141, 233-267.

[10] Dreher, A.; Jensen, N. (2007). Independent Actor or Agent? An Empirical Analysis of the Impact of U.S. Interests on International Monetary Fund Conditions, *Journal of Law and Economics* 50, 105-124.

[11] Easterly, W. (2005). What did structural adjustment adjust? The association of policies and growth with repeated IMF and World Bank adjustment loans, *Journal of Development Economics* 76, 1-22.

[12] Eaton, J.; Gersovitz, M. (1981). "Debt with potential repudiation: theoretical and empirical analysis", *Review of Economic Studies* 48, 289-309.

[13] Fischer, S. (2004). IMF Essays from a Time of Crisis: The International Financial System, Stabilization and Development. Cambridge, MA: MIT Press.

[14] Fuentes, M.; Saravia, D. (2010). Sovereign defaulters: Do international capital markets punish them? *Journal of Development Economics* 91, 336-347.

[15] Gonçalves, C. E.; Guimaraes, B. (2013). Sovereign default risk and commitment for fiscal adjustment, working paper.

[16] Lizarazo, S. (2013). Default risk and risk averse international investors. *Journal of International Economics* 89, 317-330.

[17] Martinez, J.; Sandleris, G. (2011). Is it punishment? Sovereign defaults and the decline in trade. *Journal of International Money and Finance* 30, 909-930.

[18] Morris, S.; Shin, H. (2006). Catalytic finance: When does it work? *Journal of International Economics* 70, 161-177.

[19] Nooruddin, I.; Simmons, J.W. (2006). The politics of hard choices: IMF programs and government spending. *International Organization* 60, 1001-1033.

[20] Panizza, U.; Sturzenegger, F.; Zettelmeyer, J. (2009). The Economics and Law of Sovereign Debt and Default, *Journal of Economic Literature* 47, 651-98.

[21] Rochet, J.-C.; Vives, X. (2004). Coordination failures and the lender of last resort: was Bagehot right after all? *Journal of the European Economic Association* 2, 1116-1147.

[22] Rose, A. (2005). One reason countries pay their debts: renegotiation and international trade. *Journal of Development Economics* 77, 189–206.

[23] Stone, R. (2008). The Scope of IMF conditionality. *International Organization* 62, 589-620.

[24] Tomz, M. (2007). Reputation and international cooperation. Princeton University Press.