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EPEE

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Credibility, Irreversibility of Investment, and Liberalization Reforms in LDCs: A Note

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Credibility, Irreversibility of Investment, and Liberalization Reforms in LDCs: A Note*

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Abstract

Empirical evidence of the impact of policy uncertainty on aggregate investment is mixed. However, if the relationship between policy uncertainty and investment performance is non-linear, linear regression exercises might not capture the effect of policy uncertainty. In this short paper, I present a simple model with investment irreversibility which shows that, in the presence of legal constraints on investment in foreign assets, domestic real investment performance is poorer when trade reforms are only partially credible.

Journal of Economic Literature Classification Numbers: E22, F21, O1.

Keywords: Credibility, Trade Reforms, Investment Irreversibility, Capital Flight, Investment Performance.

1. Introduction

Reforms can actually be reversed. Hence private agents can legitimately wonder whether reforms will be maintained in the future. This fact introduces a distortion in the economic system: If agents believe that reforms will be reversed they might act against them [see e.g. Calvo (1987)]. As a consequence there may be a scope

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for introducing additional distortions to the extent that these either offset distortions generated by lack of credibility or improve government's credibility [see e.g. Engel and Kletzer (1991)]. Occasional poor domestic real investment performance after trade liberalization reforms [see e.g. Serven and Solimano (1993)] might be explained on this basis.

Furthermore, if real investment is partially irreversible the distortionary effect of incredible reforms is intuitively greater, since higher costs for private investors can be associated with reform reversal. Rodrik (1991) considers a model where investment irreversibility causes insufficient capital inflows (as well as insufficient reduction of capital outflows) to sustain trade reforms. van Wijnbergen (1985) considers a model where the option value attached to convertible (reversible) foreign assets produces an aggregate real investment slump (affecting all sectors) until doubts on credibility disappear. Expanding over Romer (1994), Aizenman (1997) emphasizes the additionally negative role of policy uncertainty for establishing new activities and transferring the technology associated to product innovation.

Empirical evidence of the impact of policy uncertainty on aggregate investment is mixed¹. Particularly Pindyck and Solimano (1993) found that the volatility of the marginal profitability of capital affects private investment in developing countries, but this volatility has little correlation with indexes of political instability used in recent studies of growth, as well as several indexes of economic instability: Only inflation turned out to be highly correlated with this volatility, and robust in explaining investment. Aizenman (1997) and Aizenman and Marion (1999) suggest possible explanations of the insufficiently satisfactory performance of empirical studies which are based on disappointment aversion and Knightian uncertainty as opposed to objective risk. In this short paper I try to suggest a simpler (albeit complementary) candidate explanation: If the relationship between policy uncertainty and private investment is non-linear, linear regression exercises might not capture the effect of policy uncertainty.

With liberalized capital markets, due to the option value associated to capital flight, after trade liberalization the latter is preferred to domestic investment if the perceived probability of reform reversal is high enough. Even with certainty of reversal, it is always possible to reap temporary higher revenues from capital flight, without endangering future revenues from domestic investment. Conversely,

¹see e.g. Aizenman and Marion (1993,1999), Alesina and Perotti (1996), Pindyck and Solimano (1993) and Serven (1997), about the impact of volatility and policy uncertainty on investment in LDCs. See also Pattillo (1998), on LDCs, and Guiso and Parigi (1999) for firm-level studies of the relationship between volatility, uncertainty and investment.

if there are barriers to capital flows, so that (possibly high) sunk costs have to be paid for each cross-border (illegal) operation², foreign assets lose their option value. With certainty of reversal, capital flight is no longer convenient. However, if the probability of reversal is not too high, capital flight might still be preferred to real domestic investment in any sector, because uncertainty lower expected returns to the latter (even though it might be too costly to repatriate capital, after uncertainty elimination). As a consequence, due to sunk costs in engaging in capital flight, the relationship between credibility of trade reforms and investment performance is U-shaped, so that the poorest performance is associated with reforms that are perceived as only partially incredible. As we increase the perceived probability of reform reversal, the incentive to domestic investment initially decreases and later increases. On the contrary, with liberalized capital markets, capital flight is preferred even in the case of certainty of reform reversal.

In this note I build a simple model to analyze an economy where alternative assets (say: capital flight) are illegal - as is usually the case in developing countries undertaking trade reforms - and thus there are sunk costs associated to them. Actually, when trade liberalization reforms are only partially incredible, any type of real investment (both in sectors favored and in sectors put at disadvantage by the reforms) becomes riskier (future policy uncertainty is maximum). Expected returns to any particular sector are higher, the higher the perceived probability of a future policy environment which favors that sector (even with risk-neutrality). Conversely, returns to capital flight are unaffected by real sector reforms. Therefore, an intermediate level of policy incredibility might reduce returns to all type of investment well below expected returns to capital flight, thereby inducing an upsurge of the latter. The crucial factor that makes U-shaped the relationship between credibility and returns to domestic investment is not liquidity of foreign assets (that are basically illiquid in the model presented below). On the contrary what matters is the fact that policy uncertainty affects expected returns to any type of domestic investment but not to foreign assets.

²Effective black markets let cross-border capital flows occur in countries where the capital account has not been liberalized. This implies, however, that intermediation costs as well as other costs associated to rent-seeking activities have to be paid. See e.g. Vos (1992) on methods for estimating capital flight in countries where capital outflows are illegal.

2. The Model

Let us start with two real sectors (say: import-substituting - or IS - and export, the latter favored by reforms) and call them 0 and 1. I focus on entrepreneurs' investment decisions³. In every period gross revenue per unit of capital invested in 0 and 1 is r_0 and r_1 respectively. After reforms, gross revenue per period changes to r_0^* and r_1^* , with $r_0^* < r_0$ and $r_1^* > r_1$. It is assumed that there is no obsolescence, and that by the time investment projects start to produce a revenue (viz. in the second period) uncertainty about policy reversal has been eliminated. Furthermore we assume that there are entry costs (per unit of invested capital) ϵ_0 and ϵ_1 (in 0 and 1 respectively) and exit costs θ_0 and θ_1 . Denoting the (constant) discount rate with ρ , and with V_0 and V_1 the present value of net revenue to investment in 0 and 1 respectively, we have:

$$V_1 = (1 - \pi) \frac{r_1^*}{\rho} + \pi \max \left\{ \frac{r_1}{\rho}, \frac{1}{1 + \rho} \left(r_1 + \frac{r_0}{\rho} - \theta_1 - \epsilon_0 \right) \right\} - \epsilon_1 - 1,$$

$$V_0 = \pi \frac{r_0}{\rho} + (1 - \pi) \max \left\{ \frac{r_0^*}{\rho}, \frac{1}{1 + \rho} \left(r_0^* + \frac{r_1^*}{\rho} - \theta_0 - \epsilon_1 \right) \right\} - \epsilon_0 - 1.$$

where π is the perceived probability of reversal (as is standard in the aforementioned literature, we assume risk-neutrality). We assume that sunk costs are large:

$$\frac{r_1}{\rho} > \frac{r_0}{\rho} - \theta_1 - \epsilon_0,$$

$$\frac{r_0^*}{\rho} > \frac{r_1^*}{\rho} - \theta_0 - \epsilon_1.$$

Hence, real investment is *de facto* completely irreversible (resources can be shifted to other sectors only by means of new investment projects, but existing projects are never shut down by selling the existing capital stock). The present value of net revenue from investment is reduced to:

$$V_i = \frac{1}{\rho} [r_i^* - \pi (r_i^* - r_i)] - \epsilon_i - 1, \quad i = 0, 1.$$

³Variables' values need not to be the same for every agent.

In order to have higher incentive to invest in 1 rather than in 0, it is necessary that $V_1 - V_0 > 0$. This requires:

$$V_1 - V_0 = \frac{1}{\rho} [(r_1^* - \rho\epsilon_1) - (r_0^* - \rho\epsilon_0) - \pi(r_1^* - r_1 + r_0 - r_0^*)] > 0. \quad (2.1)$$

(2.1) implies that the desired resource shift is obstructed by the lack of credibility, which acts as a tax on investment.

Let us introduce foreign assets, assuming that they give gross revenue per period r_f . Moreover we assume that domestic and foreign capital markets are segmented: This may be achieved by introducing fixed costs of engaging in rent-seeking activities to export and import capital (respectively ψ and ξ) when capital movements are officially prohibited. The latter assumption justifies a pre-reform capital account equilibrium with no capital shift, if we additionally assume:

$$\frac{r_0}{\rho} - (\xi + \epsilon_0) \leq \frac{r_f}{\rho} \quad \text{and} \quad \frac{r_f}{\rho} - \psi \leq \frac{r_0}{\rho} - \epsilon_0. \quad (2.2)$$

Moreover, in the pre-reform period we have

$$\epsilon_0 - \epsilon_1 \leq \frac{r_0 - r_1}{\rho}, \quad (2.3)$$

otherwise 1 would be preferred also in the pre-reform period.

As previously assumed, if policy reversal occurs, it will occur just before time 2. If agents choose to engage in capital flight, they have to do it in period 1, with an option to reverse it in period 2. Hence, if agents engaged in capital flight their undiscounted gross revenue would be r_f in period 1 and either r_f or r_i^* , $i = 0, 1$, or r_0 , depending on occurrence of policy reversal and decisions on capital repatriation, afterwards. However, from (2.2), we know that if policy reversal occurs they do not repatriate capital - therefore, the case of return equal to r_0 (and, thus, r_0^*) can be excluded. The present value of net revenues from the capital flight option is:

$$V_f = \frac{1}{1+\rho} r_f + \frac{\pi}{\rho(1+\rho)} r_f + \frac{1-\pi}{\rho(1+\rho)} \max \{r_f, r_1^* - \rho\xi - \rho\epsilon_1\} - \psi - 1. \quad (2.4)$$

Let us analyze the case when $r_1^* - \rho\xi - \rho\epsilon_1 \leq r_f$ - no capital repatriation. Eq. (2.4) is reduced to $V_f = \frac{r_f}{\rho} - \psi - 1$. Hence for $i = 0, 1$:

$$V_f - V_i = \frac{1}{\rho} \left[r_f - \rho(\psi - \epsilon_i) - r_i^* - \pi(r_i - r_i^*) \right].$$

The preference for capital flight with respect to physical investment in 0 is negatively dependent on the probability of reversal, while the opposite holds for capital flight vs. investment in 1. Notice that here patterns of preferences do not depend on any option value attached to reversibility of capital flight (*de facto* it does imply precommitment), but on the fact that returns to capital flight are not affected by policy uncertainty. As shown below, reversibility is neither necessary nor sufficient to induce higher expected returns to domestic investment than to capital flight when the perceived probability of reversal is very high⁴.

To induce capital flight it is necessary that $V_f > \max_{i=0,1} \{V_i\}$. Notice that $V_j - V_i$, $i, j = 0, 1, f$, are linear in π . Moreover:

$$V_f - V_0 > 0 \Leftrightarrow \pi < \frac{r_f - \rho(\psi - \epsilon_0) - r_0^*}{r_0 - r_0^*} = \alpha, \quad (2.5)$$

$$V_1 - V_0 > 0 \Leftrightarrow \pi < \frac{(r_1^* - r_0^*) - \rho(\epsilon_1 - \epsilon_0)}{(r_1^* - r_0^*) + (r_0 - r_1)} = \beta,$$

$$V_f - V_1 > 0 \Leftrightarrow \pi > \frac{r_1^* + \rho(\psi - \epsilon_1) - r_f}{r_1^* - r_1} = \gamma. \quad (2.6)$$

Given assumptions (2.2) and (2.3) we have that $\beta \leq 1$ and $\alpha \leq 1$. By transitivity of preferences we can conclude that if $\beta < \alpha$ then $\gamma < \beta$, while when $\beta > \alpha$ then $\gamma > \beta$. It is convenient to engage in capital flight when $\gamma < \pi < \alpha \leq 1$, that corresponds to the situations: f is better than 1 which in turn is better than 0 ($\pi < \beta$) and f is better than 0 which in turn is better than 1 ($\pi > \beta$). These situations are depicted in Figure 2.1. It is easy to show that $V_f - V_1$ is a linear increasing function of π ; $V_f - V_0$ and $V_1 - V_0$ are linear decreasing functions of π . The solid lines F1, F0 and 10 represent $V_i - V_j$ for $i, j = f, 1$, $i, j = f, 0$, and $i, j = 1, 0$, respectively. $V_f - \max_{i=0,1} \{V_i\}$ is represented in bold; it is an increasing function of π , for $\pi < \beta$, but it is a decreasing function for $\pi > \beta$, as we can see from the figure. Conversely, when $\beta > \alpha$ it is easy to show that capital flight is never convenient.

⁴In the model of van Wijnbergen (1985) foreign assets are assumed to be fully convertible, therefore, even with certainty of reversal, returns to capital flight are higher than to domestic investment.

Similar patterns can be obtained in the case when agents repatriate capital if policy reversal does not occur. These results can be summarized by the following proposition⁵:

Proposition 2.1. *If there are sunk costs of engaging in capital flight, a necessary condition for after-reform capital flight upsurge (and investment slump) to occur is that the probability of policy reversal is neither too small nor too large.*

This result may sound paradoxical. However to understand the intuition more easily take the case when repatriation of capital flight is never convenient: If agents are almost sure that reforms will be reversed, uncertainty is almost eliminated and it is not convenient to resort to foreign assets given that they are *de facto* equally irreversible. Engaging in capital flight is more convenient, the stronger the uncertainty about future policy actions⁶. This fact is reinforced if capital flight repatriation is convenient if policy reversal does not occur, due to the additional option value associated to capital flight.

Furthermore, consider the case of a simultaneous capital account liberalization and denote the present value of net revenues from foreign assets in this case with V_f^* . We have:

$$V_f^* = \frac{1}{1+\rho} r_f + \frac{\pi}{\rho(1+\rho)} \max \{r_f, r_0 - \rho\epsilon_0\} + \frac{1-\pi}{\rho(1+\rho)} \max \{r_f, r_1^* - \rho\epsilon_1\} - 1,$$

that is, from (2.4), $V_f^* - V_f \geq \psi > 0$. In this case, the range of probability of policy reversal that produces a capital flight upsurge is even larger. This occurs because capital flight is less costly and the additional option value attached to capital flight is greater if the capital account is simultaneously liberalized⁷. We can show however that, even at $\pi = 1$, $V_f^* - V_0 > 0$. In other words, even with certainty of reversal, capital flight is preferred to domestic investment in the IS sector. This is due to the temporary lower returns to investing in the IS sector

⁵Likewise in Rodrik (1991), aggregate investment per sector can be obtained, in a rigorous way, by integrating with respect to the distribution of entry costs among agents (assuming that all other variables are the same for every agent).

⁶There is some evidence, although preliminary, from Turkey's reforms in the early '80s of the occurrence of a similar pattern of investment performance and capital flight vs. level of credibility [Bassanini (1997)].

⁷Notice that the latter remark implies that, if opening up the capital account does not increase the credibility of reforms, real investment performance may be poorer after simultaneous liberalization of current and capital account.

than to capital flight (combined with the full reversibility of the latter, which let the investor reap the temporary gain without jeopardizing future returns).

We have established a necessary condition for after-reform capital flight upsurge, with the appealing implication that the relationship between credibility and domestic investment turns out to be U-shaped subject to it. Can we however establish sufficient conditions? In other words, how likely is the case $\gamma < \beta < \alpha$ as opposed to $\alpha < \beta < \gamma$? Again, I illustrate this point starting by the non-repatriation case.

After simple manipulations, from (2.5) and (2.6), taking into account assumptions (2.2) and (2.3), we have that $\gamma < \alpha$ if and only if:

$$\frac{r_f - \rho(\psi - \epsilon_1) - r_1}{r_0 - \rho(\psi - \epsilon_0) - r_f} > \frac{r_1^* - r_1}{r_0 - r_0^*}. \quad (2.7)$$

The left-hand side of (2.7) can be read in terms of after-reversal returns to IS and export and after-reform (but pre-reversal) returns to capital flight. We can easily generalize (2.7) to the repatriation case and have the following proposition:

Proposition 2.2. *Assume that there are sunk costs of engaging in capital flight. After-reform capital flight upsurge (and investment slump) occurs if and only if both the following conditions hold:*

- *the probability of policy reversal is neither too small nor too large.*
- *the following inequality is satisfied:*

$$\frac{A}{B} > \frac{C}{D},$$

where A is the difference between after-reform (but pre-reversal) returns to capital flight and after-reversal returns to export, B is the difference between after-reversal returns to IS and after-reform (but pre-reversal) returns to capital flight, C and D are the pre-reversal change in gross revenue from export and gross revenue from IS, respectively.

In spite of the cumbersome way the foregoing proposition need to be expressed, the conditions it requires are actually quite intuitive. Notice that the right-hand side of (2.7) is non-negative by assumption; the left-hand side can be positive or negative. (2.7) holds only if after-reversal returns to export are smaller than returns to capital flight. In fact in this case A would be positive. Furthermore, (2.7) holds whenever the pre-reform difference between returns is large (A is large)

or, alternatively, when the costs imposed to the IS sector by the reforms are sufficiently larger than the benefits awarded to the export sector (C/D is small).

All that matters is the comparison between short-run and long-run gains. Capital flight can never be attractive if the loss investors would incur in the case of reversal is small. In this latter case, for any expected probability of reversal there is always a type of investment that offer higher returns than capital flight either in the short or the long -run. This case is represented in Figure 2.2. The solid lines F0, F1 and 10 have the same interpretation as for Figure 2.1. Similarly, $V_f - \max_{i=0,1} \{V_i\}$ is represented in bold. The comparison between the figures makes clear that in Figure 2.2 all the lines are shifted down enough, in such a way that they cross at negative values of $V_i - V_j$.

In other words, (2.7) does not hold only if pre-reform (or after-reversal) returns to export are sufficiently high that the expected costs imposed by reform reversal at an intermediate credibility level are not sufficient to discourage a risk-neutral agent from investing in export⁸.

3. Concluding Remarks

In this short paper, I have presented a simple model with investment irreversibility which shows that, in the presence of legal constraints on investment in foreign assets, domestic real investment performance is poorer when trade reforms are only partially incredible. In other words, I have shown that the relationship between credibility and real domestic investment is U-shaped. I have argued that this brings about a possible explanation of the inconclusiveness of empirical tests on the relationship between policy uncertainty and private investment in LDCs. As we have seen that this relationship can be non-monotone, linear regressions may fail to detect a significant relationship⁹.

⁸In this case risk or disappointment aversion can play a major role.

⁹Actually many samples used to perform empirical tests of the negative relationship between policy uncertainty and investment have included countries with restrictions on capital flows. Pyndick and Solimano (1993), when they confined the analysis to OECD countries only, found a correctly signed (albeit not significant) relationship between private investment and political instability. Obviously capital account restrictions, even in historical perspective, have loomed much larger in LDCs than in OECD countries.

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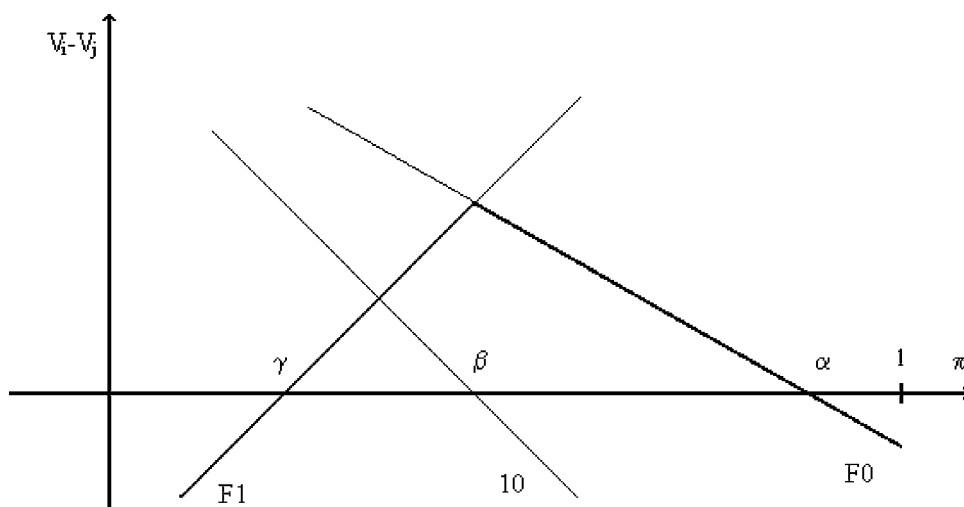


Figure 2.1:

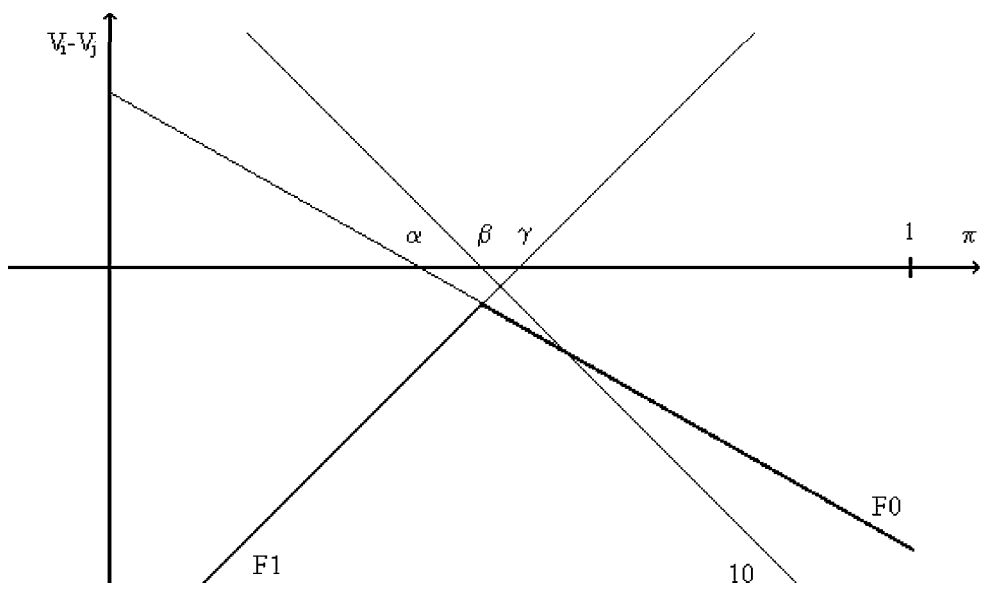


Figure 2.2:

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