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CENTRAL BANK INDEPENDENCE
IN DEVELOPING COUNTRIES.
A SIGNALING MECHANISM?

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1. Introduction[*]

During the last two decades, the case of Central Bank Independence was a fashionable issue among academics of Political Economy as well as an important topic in politicians' agenda. A boom of reforms over the degree of monetary autonomy of these agencies took place at the beginning of the 1990s. In the case of industrialized countries, it was the time when Maastricht Treaty compelled European countries to fit they monetary institutions, making Central Banks more independent from the political power. On the other hand, in many developing countries, Central Banks adopted an independent status, either trying to exploit the functional properties of delegation or making use of its symbolic properties to reach better economic outcomes.

Whether functional or symbolic properties were the reason of delegation, it has been argued that Central Bank Independence should enhance the level of private investment in developing countries, due to it signals a strong commitment in fighting to inflation, as well as good governance. In this paper I put aside the *origins* issue of Central Banks and I focus in their *effects* on private investment. In this sense, I will asses the "signaling mechanism" improving some technical points, and overcoming some statistical shortcomings. I employ a more suitable measure of Central Bank Independence based on factual rather than legal autonomy; and I incorporate a key period (1990-1998) that use to be absent from many studies. Offering a competing explanation to signal investors –being under an IMF agreement–, and correcting potential endogeneity and sample selection bias, I perform a more appropriate model in order to explain the Central Bank Independence effect on private investment in developing countries. The results refute the idea of Central Banks as key actors in signaling creditworthiness.

The paper is organized as follows: in the next section a review an important piece of the literature on Central Banks; then I focus on the signaling mechanism: I review the rationales, empirical findings, and I state what are the main reasons to put it into question. In the fourth section I structure the research design: there, I bring out the hypothesis, explain the political-

economic model of private investment for developing countries, and describe the data. Finally I address the empirical results. The paper is closed with the conclusion.

2. Central Bank Independence, a literature review

The aim of this section will be to trace the path of the literature that has addressed the issue of Central Bank Independence (henceforth, CBI) both suggesting sound arguments about its adoption as well as putting forward empirical evidence about its effects. Firstly, I will bring in the classic explanation about the adoption of CB as an autonomy agency, that is, the theory of delegation; secondly, I will summarize the main findings on empirical grounds, that is, the effect of CBI on the level of inflation as well as other economic outcomes; and finally, I will close the review with an appropriate claim of the literature, namely, the source of the delegation rests on political concerns rather than on economic neutrality rationales.

2.1. Commitment through delegation: Ulysses and the expansionary claims of the Sirens

Before to tackle the issue of CBI effects one should have a word about where such independence came from. In this case we do not need to lag too much behind. The seminal articles by Kydland and Prescott (1977) and Barro and Gordon (1983) have guided the literature of CBI using the analytical framework posted by the time-inconsistency models of inflation. The basic idea emulates the dilemma that moves Ulysses to "ties his hands" in order to overcome the temptation of the Sirens. An unbounded government is not credible in its promises about fiscal and monetary policies due to its interests are time-inconsistent. Assuming that government can directly act on the level of inflation through the rate of monetary expansion (hence, on the level of employment), but also that politicians are interested in re-election, which means that they will be prone to boost the economy during pre-electoral periods, their pledge about their prudent policies will undergo an intrinsic lack of confidence.

Regarding such unbounded behavior, we can figure out that social actors, which bargain nominal wages, cannot assume a self-constrained behavior from the government, and, instead, they rationally anticipate that the government will have strong incentives to deviate from its pledge in the future. In other words, "government discretion is the sub-set of rules that provides no guarantees about its future behavior" (Barro and Gordon, 1983). In this sense, social actors adjust their inflationary expectations so as to maintain real wages without drops, making the effect of monetary expansion over employment a null one. That is what economists technically call "the neutrality of money". The consequence is a sub-optimal rate of inflation with the same level of employment, that is, a detrimental situation for the whole society.

This credibility problem could only be overcome by setting some kind of rules or institutional arrangements that pre-commit government to do not make use of monetary instruments in a partially way. An example of the former is the adoption of a *hard-peg* for exchange rates, and delegating the monetary policy to an independent agency is the case of the latter. Among others, Kenneth Rogoff (1985) proposed to delegate monetary policy to an independent and conservative CB to reduce the inflationary bias. His point was that central bankers will always place a greater weight in stability prices than the government, which means that they will be more averse to inflation than those politicians bewildered by the Sirens' chants. Or, in John Elster's words, "the Central Bank can be seen as the repository of reason against the short-term claim of passion" (1984).

Thus, as long as delegation to non-representative institutions is seen as the key way to enhance commitment (Alesina and Tabellini 1988), the entrustment of monetary policy to an independent CB has been argued as an accurate device to solve the time-inconsistency problem.

2.2. How strong are Ulysses knots? Empirical evidence

The impact of CBI on economic performance has been largely examined in a cross-country basis during the last decades. Clearly, the main association under study was the

relationship between independence and inflation. Key reference of this research are Grilli, Masciandaro and Tabellini (1991), Cukierman (1992), Cukierman, Webb and Neyapti (1992), Alesina and Summers (1993), Cukierman and Webb (1995), and Eijffinger and De Haan (1996), who found robust evidence in favor of a negative association between the two variables. But the strength of such results was consistently diminished by three sources of critiques.

Firstly, legal measures of CBI perform quite well explaining inflation in developed countries, while they do not in developing ones. Formal indicators of independence built from what is written in the charters (term office of governor; mechanism to resolve policy conflicts with the executive branch; objective assigned; lending limits to public sector; etc.) negatively correlate with the level of inflation in industrialized countries, meanwhile the most popular index of legal CBI is not correlated with inflation among developing nations (Cukierman et. al. 1993; Froyen and Waud 1995). Many authors have interpreted such mismatch in the sense that developing countries are less likely to comply with the written law and, in this sense, what they draw up on the paper could be in discrepancy on what is really happening in practice.

To succeed in this complication, an informal indicator of factual independence was introduced, computing the *turnover rate of central bank governors* (TOR). Such indicator is based in the presumption that, at least above some threshold, more rapid turnover presumably creates dependency from the political authorities (Cukierman et. al. 1992), and it has proved to affect the level of prize stability in developing countries through a positive association, that is, a higher turnover rate of governors leads to higher levels of inflation (Cukierman, 1992; Cukierman et. al. 1992; De Haan and Siermann 1994).

On the other hand, there is a more problematic critique in the field of measurement. Legal indices of CBI have a *subjectivity-bias* that does not allow us to show high levels of correlation between them, so the results of inflation variability depends upon the indicator employed (Eijffinger et. al. 1996; Mangano 1998). This means that the robustness of the empirical research could be easily put into question due such discretional decisions made in the creation of the indicators. In fact, it was found that running the analysis with a CBI-

country ranking measure –produced by six leading indicators– the relation between independence and inflation still being negative, but 87.5% of those coefficients were not statistically significant (Mangano 1998). The selection of the CBI index was also mistrusted due to what is called *inflation-biased judgment* (Walsh 1993; Forder 1995) that is, researchers use those indicators of CBI that show the closest relationship with inflation rather than those which are conceptually more appropriated. Regarding such caveats, many authors have endorsed the idea of tackling the issue of "independence" from a contract theory point of view (Walsh 1995; Persson & Tabellini 1994). Doing this, CBI would be understood as an endogenous by-product of the incentive structure faced by CB's governing body, thus, empirically, "it would call for a more specific –and arguably, less controversial– study of the determinants of incentives, rather than indulging in a subjective estimation of the individual components of independence" (Mangano 1998: 18).

Beyond measurement concerns, some argue that empirical results should be taken with a grain of salt. We can find some criticisms that agree in the point that a mere institution of an independent CB may not bring about its professed benefits, and in fact, when we focus on the right-hand-side of the equation and control for other key variables, CBI effect just vanishes. For example, Campillo and Miron (1997) propose a different specification in order to explain inflation. Controlling by political instability, level of debt, income, openness of the economy, exchange rate regime, and average past inflation, they found that CBI is not a significant variable for the whole sample (62 countries), as much as if developed countries are split from developing ones. Fuhrer (1997) also found that once control variable are introduced, the significance of many CBI coefficient disappears. In addition, Sturm and De Haan (2001) have broadened the sample for developing countries, also covering beyond the traditional limit of 1989, and they found that once several control variables are included, the CBI variable, using the TOR index, is often no significant. They realized that such measure is a significant factor only when high inflation countries are incorporate in the sample.

Fujiki's scrupulous OECD based work (1996) has found that the relationship between CBI and inflation depends on the sample period employed in the analyses, and that such relationship becomes much weaker once cross-national data is replaced by pooled cross sectional-time series information. A sub-period differentiated effect was also found by

Jonsson (1996) where CBI performed particularly well for the period 1972-1979, and by Walsh (1997) for the sub-period 1960-1972 where the relationship is not significant. Mas (1995) has also argued that cross-country econometrics is misleading because, more than once, instruments and factors that one would need to control for can be construed with both inflation and CB independence. This could be the case for government fiscal policy stance, deepness of financial sector, or political stability.

Along with these caveats, Eijffinger and Van Keulen (1995) did not find any significant relation between the two variables, though they did for countries where CB law has been in force for more than five years. And in the same line of arguments, but with the intention to dismantle the conventional causal link between CBI and inflation, Posen (1993) has found that, using Cukierman's formal index, CBI has no impact on prize stability if a measure of the effective financial opposition to inflation (FOI) in the society is included in the equation. Although his work was fairly criticized from a technical point of view,[1] his theoretical contention has been largely concern in the literature debate. His questions on the causality relationship between formal monetary institutions and prize stability was a sound argument that joint with other claims about the political source of CBI will be regarded in the last part of this section (*Cui bono?...*).

The research of the effect of CBI on economic outcomes did not only confine to the variation of inflation; the impact on other macro-economic variables was also broadly reported in the literature. Many studies have demonstrated that, among developed countries, higher levels of legal CBI does not systematically lead to higher level of economic growth, neither to greater variation in economic growth rates. Such findings were confirmed sampling several countries in different periods (Grilli, Masciandaro and Tabellini 1991; De Haan and Sturm 1992; Cukierman et al. 1993; Eijffinger and Schaling 1993; Eijffinger et. al. 1996; Fratianni and Huang 1994; Alesina and Summers 1993; Akhand 1998). Only De Long and

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[1] Key controls are absent from his analyses, and as Mas (1995) has pointed out, the endogeneity of FOI and inflation is not recognized. On the other hand, Franzese (1999) has shown that CBI affects inflation even after controlling by financial-sector strength. A critique of Posen's theory can also be found in De Haan and Van't Hag (1995).

Summers (1992) has found a positive relation between CBI and GDP per worker in industrialized countries, although controlling for unconventional factors.

On the other hand, the increase of credibility due to the adoption of higher levels of independence from the CB seems to reduce the costs of disinflation in terms of long-term economic growth (Posen 1994; Debelle and Fisher 1995; Gärtner 1995; Walsh 1995 Eijffinger and De Haan 1996). Surprisingly, in developing countries it was found that an informal measure of CBI (Cukierman's TOR index) was positively related with economic growth and it does in a statistically significant way (Cukierman et al. 1993).

Regarding the variation of the interest rate levels, it has been reported a significant negative relation with CBI variable (Eijffinger et. al. 1996); likewise it was found a significant inverse association between interest rates and political vulnerability of CB (Cukierman and Webb 1995). On the contrary, CBI has shown low (Alesina and Summers 1993) or no relation (Eijffinger et. al1996) with interest rates variance. Budget deficit of governments could not be robustly confirmed as a variable associated with CBI (De Haan and Sturn 1992; Pollard 1993), meanwhile the turnover rate of central bankers (TOR) has shown a clear and significant association with CB credits to public sector and government for both, developed and developing countries (Cukierman 1992; Cukierman, Webb and Neyapti 1992; Sikken and De Haan 1998). Finally, as it was the case for economic growth, the level of unemployment was not confirmed to be affected by the level of CBI (Alesina and Summers 1993; Bleaney 1996).

Although the huge amount of studies has robustly stated a many key associations between the independence of monetary institutions and economic variables, there are still some ones that have not been carefully investigated. That is the case of CBI effects on private investment. I will review this relationship with some more details in the next section (*A signaling mechanism…*), but first we must close this review with an echoed claim: *it's politics, stupid!*

2.3. *Cui bono?* **Politics and CBI**

An interesting subfield of study is that in which researchers endogenize the degree of CBI in order to find political-economic rationales behind the adoption of certain characteristics in monetary institutions. As I pointed out above, the work of Posen (1993, 1995) triggered off one of the structural critiques toward the causality linkage between CBI and inflation. He argues that those scatter-plots depicting a clear relationship between both variables only shows an apparent association that straightly relies on political concerns. The relative power of an interest coalition against inflation in the society, and not the monetary institutional structure by itself, should explain the variation of inflation across countries. Due to inflation has redistributive consequence, monetary policy will always be in the ongoing market of politics and its institutions. In this sense, prize stability reflects the political power of those interests that oppose to inflation. And, since financial intermediaries are harmed by inflation, the Financial Opposition to Inflation (FOI) is what really matters in order to give sense to the illusory link between CBI and prize stability. As early as the beginning of the 1990s, Maxfield suggested that Banker's alliances, defined as interests coalitions of public and private financiers, could play an important role in shaping economic policy (1991: 419). In other words, the argument goes like "*interests* rather *institutions* matter".

Another work that has deeply marked the two sides between, let's say, *institutionalists* and *structuralists*, was that of John B. Goodman (1991) who, first in a brief article (1991) and, later, in a book (1992), argues, through an historical and comparative reasoning, that CBs are a by-product of societal coalition preferences on economic policies, and political leaders' expectations about their tenure in office. Politicians act either as "representatives and brokers" of these coalitions, but at the same time, they design monetary policy depending on their probabilities to remain in power. The lower the risk of being fire by votes ("the paper stones"), the more discretion on monetary issues.[2]

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[2] Goodman (1991) also mentions the contrary situation, where "the more these leaders fear that their grip on government is vulnerable, the grater their incentive to increase the independence of central bank and thereby institutionalize a bias toward monetary restriction" (p. 334). In other words, the government ties the successor's hands with the cost of controlling his expansionary ambitions too. Notwithstanding, this arguments do not seem convincing, because such reasoning could be apply to conservative governments afraid of future "spending beasts" from the labor representation, but *why a prone-inflation government would proceed in this way?* Such question is not fully answered.

In the same line of reasoning, McNamara (2002) argues that analyzing the choice of monetary institutions through the lenses Principal-Agent theory begs some critical questions. Quoting Joseph E. Stiglitz she remains that "the decisions of central bankers are not just technical decisions: they involve trade-offs, judgments whether the risk of inflation are worth the benefits of lower unemployment" (p. 53). So, delegation does not occur in a political vacuum, and to what extend monetary policy could be accountable through democratic mechanism is not at all a minor question (McNamara 1999, 2002; Blinder 1999). In favor of her argument, we can bring in the work by Boylan (1998) who argued that where authoritarian elites fear a populist –democratic–future, and they know that the nation will pass to a transition stage in the short term, they are likely to insulate monetary policy through the creation of an autonomous CB in order to tie successors' hands in policy-making. Such reasoning is befitting to the Chilean and Mexican experiences. Maxfield (1994) also calls to look at financial incentives of key actors such as government, private banks, and industrialists in order to explain the cross-national variation in the inflation-fighting success of CBs in developing countries.

Following these arguments, and reformulating their claims in equilibrium terms, it can be said that the adoption CBI is not a self-enforcing equilibrium, because if it relays on political support, then, once such support changes, the independence of the institution could blow up.

Using one of Tsebellis' classification of institutions (1990), I would said that, those who argue in favor of an independent CB adoption on political neutrality basis think in such institution as an *efficient institution*; meanwhile those who, like Posen, see a political nexus between such raising and its redistributive consequence, they clearly understand CB as a *redistributive institution*. The difference is far from being trivial. The former assumes that with a more institutional conservative monetary policy everybody become well off, and such equilibrium should be accepted due to it is Pareto efficient, that is, it improves the conditions for everyone, and any change would worsen the conditions of ones in favor of others. On the other hand, the latter rejects the neutrality of institutions in the sense that they are always a matter of political choice and coalition building. Indeed, redistributive institutions could be understand as a way of preserve the interests of the dominant coalition (*consolidating*

institutions), or to create a new majority composed of the previous losers and some of the previous winners (*new deal institutions*) (Tsebellis 1990).

Along with this argument, although without a conspiracy aura, the popular book of who was Vice-Chairman of the Federal Reserve Board –Alan S. Blinder– raises the question about the independence of central banks from financial markets. Assuming that such independence is both unattainable and undesirable because monetary policy works through the markets (that is, expectation and actual reactions from the markets should be relevant for formulating monetary policy), what could be sometimes detrimental in timing monetary policy is "follow the market", that is, to deliver the interest rate path that the markets have embedded in asset prices (Blinder 1998: 60). "Follow the markets" may produce poor monetary policy due herds, fads and speculative bubbles that do not use to be based on the fundamentals of the economy. All Blinder's caveats in this way point to the fear that CB could lose a proper long time horizons in formulating the monetary policy.

How politics influences in shaping CBI –or its effectiveness– has not only been addressed focusing on political interests from social actors or social coalitions; in fact, there is a large part of the literature that endogenizes the degree of CBI through several political institutions.[3]

Moser (1999) and Keefer and Stasavage (1998, 2003) has found that CBI is higher, and performs a larger negative relationship with inflation, in those countries with extended checks and balances, as it is the case of bicameral systems or any others institutional arrangement in the political system that incorporates veto players in the decision-making process. This is the case stressed by Lohmann (1994) when she explains the relationship between Federalism and the autonomy of CB in Germany.

Alesina (1989) and Alesina and Sachs (1988) have explored the association between government partisanship and CBI, and Franzese (1999) and Hicks (2003) have demonstrated

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[3] One could carry the argument forward saying that political institutions are endogenous too. So CBI should be explaining by those factors that shape institutions. In this sense, one must be aware that in these works institutions are taken as given, that is to say, they are exogenous.

that CBI has a stronger impact on inflation when government is leftist. Another factor largely examined was the intermediation of the wage-bargaining structure in the relationship between CBI and prize stability. Though some authors give all the merits to the wage-bargaining institutions (Hall 1994), many others attribute a complementary role between the two variables (Iversen 1999; Cukierman and Lippi 1999). Keefer and Stasavage (1998, 2003) also found that in those countries with moderate political instability and high level of polarization, the credibility of CBI is larger because the cost of reverse the level of independence established by the former government are higher under those conditions. Cukierman (1994: 69) supports, in one way or another, such an argument when he shows that higher levels of political instability in democratic countries are likely to lead to more delegation of authority to semi-independent institutions. And last, but not least, a very thoughtful argument was put it by William Benhard, first in a paper (1998) but, later, in a book (2002), where he noticed that the incentive structure of politicians in their choice of central bank institutions is also shaped by potential conflicts due to informational asymmetries of monetary policy, particularly between government ministers, legislators, and coalition partners.

Just to recap, let me state what the main points of this review are: firstly, governments delegate monetary policy to independent CBs due to a time inconsistency problem, which remains in government lack of confidence. Such mistrust is explained by a mismatch between government short term interests (politicians are vote-seeking, so they could manipulate the economy in pre-electoral periods), and long-term interests (prize stability); secondly, it has been largely proved that there is a negative association between CBI and inflation, though the former variable has not robustly demonstrated an impact on other economic outcomes, such as growth or unemployment. Thirstily, those findings could be put in doubt through two broad critics. Many methodological concerns have been raised on measurement issues and equation specifications. On one hand, results often vary depending on which indicator is used, as well as how the impacts of other variables are controlled for. On the other hand, some scholars have called the attention about the misunderstanding on the causal relationship between CBI and inflation. Roughly speaking, they argue that the bulk of the literature have been searching the causal link in the wrong place. Instead of explaining cross-national variation of prizes through the level of CBI, they should remain that... *it's politics, stupid!*

Finally, many other researches have successfully introduced political institutions as intermediate factors so as to explain the origins and the effects of CBI on inflation.

From my point of view, two interesting question have not been fully addressed by this literature. First, taking into account that once the degree of independence of CB is established, it hardly moves in a short period of time, which means that, in one way or another, it is supported by the main political forces, which place CBI in an consent equilibrium. But, *what prevents current or future governments from untying the institutional knots that limit their discretion?* This is what Persson and Svensson (1989) call *time-inconsistency preferences* problem, which only was stressed by Keefer and Stasavage (1998). On the other hand, it is at least curious *why fiscal policy is not a target of political delegation?* (Mas 1995; Blinder 1997)

3. A signaling mechanism for private investment in developing countries

In this section I briefly account for one hypothesis that have been quite accepted without too much criticism and empirical refutation, namely, that CBI works as a signaling mechanism from investment in developing countries. I put forward its rationales; its short observational evidence; and finally, I argue why we should put it into question.

3.1. The rationales

The sudden increase in the number of countries that enhanced CBs levels of autonomy during the last decade (see Figure 1) has lead some scholars to argue that fostering independent monetary institutions was a way of signaling good governance as well as a policy-reforms paths.

Figure 1. Number of Legally Independent CB (Source: McNamara 2002)
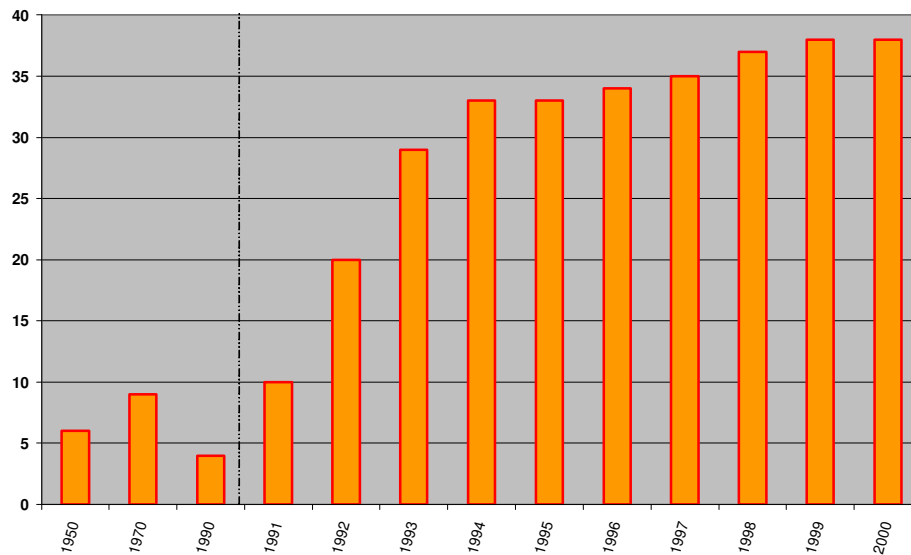
Particularly, this was the case of developing countries that, in a new international framework with a highly integrated economy –especially financial markets–, were quite interested in attracting foreign capital investment. The argument was brought in mainly by Sylvia Maxfield in his celebrated book *"Gatekeepers of Growth: The International Political Economy of Central Banking in Developing Countries"* (1997), where she states that CBs are most likely to be independent when politicians desire international creditworthiness.

This hypothesis is very suggestive, because it involves two questions in one. Firstly, it asks whether or not the need of international creditworthiness is the *cause* of the adoption of independent agencies to regulate monetary policy; but, secondly, it throws a question about the *effects* of CBI over private investment.

Regarding the latter –the causation query– it was largely argued that the political and economic environment during the 1990s was one the main reasons to explain the diffusion of CBs. Within a neo-liberal height at national and international level, the argument of CBs as a way of generate credibility was broadly defended, but, from two different points of view. On one hand, many economists suggested that delegation of monetary policy was the best way to show a strong commitment in the fighting to inflation and in the implementation of several

structural economic reforms. That is to say, the *functions* of CB is what really matter in order to generate good expectation among economic actors and, hence, to promote private investment. In this sense, adoption becomes the best strategy for governments in order to signaling to investors that they are truly "modern", ready to carry out extensive reforms to provide a setting conducive to business (Maxfield 1997).

On the other hand, many sociologists have claimed that the argument of creditworthiness as a source of CBI is very close to a *symbolic imitation* mechanism (Gilardi 2005). The key point here is that adoptions are independent of actual functional properties of the organization at stake, because symbolic CB properties by themselves are more important than their actual performance. The signal is understood as such, even if the statistical relationship between CBI and private investment does no exist. In this case, delegation is thus a very instrumentally rational adaptation to a specific cultural environment which rewards certain organizational forms over others (McNamara 2002: 60). This reasoning was also posted with the concept of *"institutional isomorphism"*, where common political and economic pressures, the search of legitimacy, and shared expectations about how things work, have created a pattern of convergence around the adoption of independent CBs (DiMaggio and Powell 1991; Bell 2002; McNamara 2002).

Regarding the causation issue on empirical terms, I only know Meseguer's works (2002, 2003) where she finds that *learning*, between countries, do not play a role as a mechanism of policy choice.

Whether functional or symbolic properties are the reason of delegation, what must be answer first *is whether or not CBI affects the level of private investments*. This is what really matters for the signaling mechanism, and it is what this paper is about.[4] So focusing our attention in the impact of CBI on private investment, and following Rogoff (1985), we can consider two competing effects. On one hand, if CBI increases monetary stability, the lower inflation shall generate good expectation for investment and hence, generates a positive relationship. On the other hand, it is also true that an autonomous agency will be less

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[4] Whether or not we are able to respond to the causation query with the empirical results of the second question is out of the extent of this research.

sensitive to political pressures, so it could be expected that it will less reluctant at the time of rising interest rates, thus CBI could lower investment generating a negative association. In the face of such ambivalent impact, we could control for the overall macro-economy in a multivariate regression, and we can still assume that CBI would have a positive effect, primarily because investors might view CBI as a "signal" that national economic policy will be stable and consistent (Maxfield and Pastor 1999: 300). But, *how such hypothesis has been empirically tested?*

3.2. Empirical evidence

The CBI-investment relationship in developing countries has been more defended with words rather than facts. And those who have empirically tested such association, they did it within many shortcomings. The empirical evidence comes mainly from the work of Maxfield (1997) and Maxfield and Pastor (1999). In order to test the signaling hypothesis they run a multivariate regression controlling for those economic variables that have proved to play an important role in the right-hand-side of the private investment equation in developing countries, and a political variable, using a well-know index of democracy (Gurr 1990). Moving from a pure economic model of private investment to other with the CBI variable (Cukierman's index) proves that a signaling mechanism takes place (the coefficient of CBI is positive and significantly different from zero). In fact, once the level of democracy is introduced, it is also proved that CBI matters particularly within democratic settings. According to Maxfield (1997) the likelihood that governments will use CBI to try to signal creditworthiness is greater i) the greater the expected effectiveness of signaling; ii) the larger the country's financial needs; iii) the more secure politicians' tenure is; and iv) the fewer restrictions the country has on international financial transactions (Berger et al. 2000).

In both analyses, the authors recognize the limitations of the results: they recall measurement difficulties on CBI; the time constrain on the data because Cukierman's index goes until 1989; and the impossibility to differentiate between domestic and foreign investors' responses to CBI (although the signaling mechanism could apply to both). However, their

political-economic model provides a basic quantitative support to argue that CBI is a good signal to encourage private investment in developing countries.[5]

3.3. Why should we doubt?

Offering two technical reasons and one theoretical concern –with statistical implications– I will argue that the main findings described above –that CBI generates confidence for investors– must be put into question.

3.3.1. Measurement and Specification

Some of the weak points of the empirical evidence have been already posted above. First of all, the index that they use to measure CBI is not the most suitable for developing countries. As we saw in the literature review, many researches have demonstrated that legal index of independence correlates with inflation for industrialized countries but no for developing nations. In this sense, if what it is written in the CBs charts is not enough to expect low rates of inflation, then we could not think about legal measures, such as the Cukierman's one, as a way of enhance private investment. Secondly, such index puts a critical time constrain to the analyses. Cukierman's index goes from 1972 to 1989. And regarding that the sudden increase of autonomous agencies spring at the beginning of the 1990s, then it is clear that a key period (1990-2000) is absent from those analyses. Indeed, I would argue, then, that assessing CBI-investment association without such period will be, at least for developing countries, a futile exercise.

Another source of doubts is that private investment –as a GDP ratio– does not seem to have risen together with CBI adoptions. As Figure 2 shows, the trends of private investment in developing countries have not been sharply changed if we take a long-time perspective (1970-2000).

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[5] Berger et al. (2000) also quoted some studies that report some evidence that "partially support this view". I do not bring them in because, from my point of view, they tangentially address the issue at stake.

Figure 2. Trends on Private Investment in Developing Countries 1970-2000
(Data Source: IFC 2001)
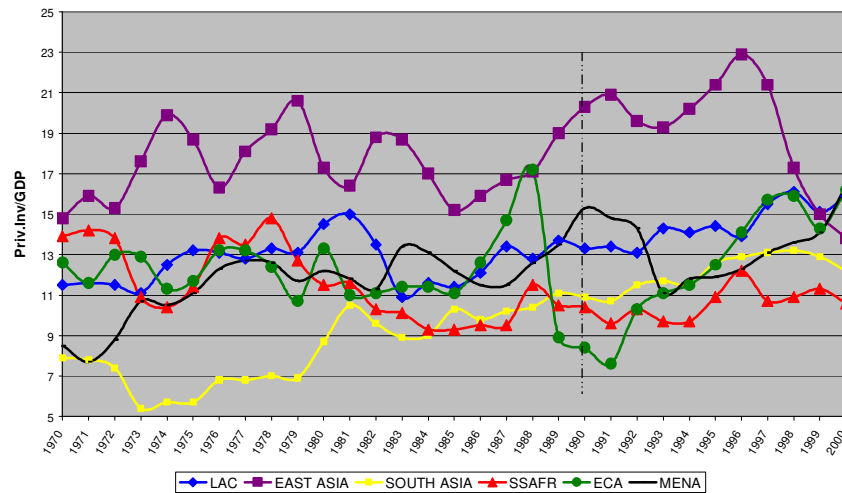
Of course investment not only depends on the presence of CBI; but as empirical tests have demonstrated, once key macro-economic factors are controlled for, CBI stills being an important variable. So, *can we think in a competing explanation? What would be another source of international creditworthiness?* I will argue that investors, especially foreign investors, sometimes use short-cuts so as to asses how risky an enterprise is. International financial institutions like the International Monetary Found (henceforth IMF), or the information provided by private companies of risk-evaluation, such us Standard and Poor's or the EMBI+ index of JP Morgan, are useful informational sources to capture business climate, specially in developing countries.

From my point of view, the case of IMF agreements is the most relevant, because governments can use them as a credible signal of an ongoing economic discipline. This is possible due to loans are attached with a set of conditional policies such as fiscal austerity, tight monetary policy, or markets liberalization that foster investors' confidence. Vreeland (2003: ch.3) has found that failing to comply with IMF programs has other costs in addition to not receiving the loan installment since creditors and investors follow signals from the IMF. So, in one way or another, IMF agreements work for governments as a commitment device to put forward certain unpopular policies, and to reach economic targets that make the

country an attractive place to make business. Then, stability and economic discipline should be guaranteed for private investment.[6]

3.3.2. Endogeneity and Selection Bias

If we want to asses how a new specification would be affect the impact of CBI on private investment we shall confront two statistical shortcomings: *endogeneity* and *sample selection bias*. Both statistical phenomenon generate a bias that makes OLS estimations not consistent. Endogeneity and sample selection bias refer to two distinct concepts, both entailing distinct solutions.[7] Endogeneity means that an independent variable in the model is a *choice variable* which is correlated with some other unobserved variables relegated to the error term. In our case of study, due to being or not being under an IMF agreement could only be tested as a binary situation –with a dummy variable–, we can suspect of an endogenous *binary treatment* depending on those conditions under which some countries are more likely to enter in an agreement with the Found. Thus, using a dummy variable to capture such effect in a *pooled* sample –with countries *under* and *not under* IMF arrangements– would be inappropriate, since those countries that have turn to the Found may self-select and, hence, they will be nonrandom.[8]

On the other hand, sample selection problems appear when the dependent variable is observed only for an exclusive, nonrandom sample. For example, Przeworski et. al. (2000) explains how democracy in poor countries is less likely to survive due to adverse economic conditions, leading to fewer observation of democratic government in poor nations. In our case, we can think that those economic and political conditions that make some countries more likely to being under an IMF settings, could lead us to observe more IMF agreement in

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[6] In addition to these arguments, it has also been argued that for developing countries, entering in an IMF arrangement could mean a straight incorporation –and acceptance– in the international (financial) community (Martínez Pérez 2004).

[7] See STATA 2001.

[8] Note that there is not a sample selection problem here, because the dependent variable is observed for all observations in the data.

developing countries. And if there exists a causal link between IMF agreements and private investment, then our selection will be bias. This will not happen if we can assume that being under IMF arrangements is random. But, certainly, it is unlikely to be true.

If we believe that the dummy variable would has merely an intercept effect on private investment, we should estimate and *endogenous model*; but if we believe that it has not only an intercept-effect, but also a slope-effect, then a *Heckman-corrected model* would be more suitable. The difference between both would be that in the latter the *betas* would differ depending on the country status according to the IMF agreements. Both models assume that there exist an underlying regression relationship where,

$$y_j = \beta.x_j + \delta.z_j + \varepsilon_j$$

at the time that

$$z_j^* = w_j + u_j,$$

and the observed decision is

$$z_j = 1, \text{ if } z_j^* > 0$$
$$\quad = 0, \text{otherwise,}$$

where,

$$\varepsilon_j \sim N(0,\sigma\ )$$
$$u_j \sim N(0,\sigma\ )$$
$$corr(\varepsilon_j, u_j) = \rho$$

The next section will state how all these doubts could be tackle; and doing this I will try to offer, then, a better empirical finding about the CBI-investment association.

4. Research Design

This section will be organized as follows: firstly, I state the main hypothesis stemmed from the previous sections; then, I fix the econometric models of the research; and, finally, I described the data employed.

4.1. Hypothesis

The key point of this research is that previous tests of the CBI-private investment relationship are plenty of doubts. In order to test the signaling mechanism all alternative explanations should be control for. My intuition is that to be or not to be under an IMF agreement is a critical factor that both should lessen the impact of CBI, and perform a positive association with private investment. Such evaluation must take into account the endogenous and selection bias potentiality of such relationship.

4.2. A political-economic model of private investment for developing countries

The first step –*Model 1*– will be to reproduce the traditional private investment equation previously tested in other researches (Serven and Solimano 1992) although incorporating some suggestion made by Rama (1993) for developing countries.[9] The subsequent models –*Models 2 to 4*– will incorporate respectively, the CBI variable; a key political factor –level of democracy–; and the dummy variable indicating if the country is under an IMF agreement. *Model 5 and 6*, will correct the potential bias generated by endogeneity or sample selection. To proceed in this way, the latter variable –which I call *"Under"*– will be instrumented by a set of economic and political factors that have been

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[9] In his article about *"Empirical Investment Equations for Developing countries"*, Rama suggests that financial repression from either, credit rationing or weakness of the capital markets, restrain the access of firms to addition equity capital, thus affecting the level of private investment. In order to control for such impact, I use a (lagged) World Bank measure of domestic credit provided by banking sector as a share of GDP. The rationale is to capture the credit available for the private sector.

proved as key components to explain the likelihood of living with the Found. Formally, the first set of models will be:

$$\Pr iv = f[Publin^{+/-}, Expgro^{+}, Debtex^{-}, Log\inf^{-}, Sq\inf^{-}, Dcrebk^{+}, CBI^{+}, Demo^{+}, Under^{+}], \varepsilon$$

where *Prinv* and *Publinv* are the private and public investment as a share of GDP (%); *Expogro* is the expected level of growth (GDP%); *Debtexp* is the expected debt burden calculated as the ratio of total external debt to exports of goods and services (current US$); *Loginf* is the natural logarithm of inflation; *Sqinf* is the square of inflation; *Dcrebk* is the domestic credit provided by banking sector (% of GDP); *CBI* is our measure of central bank independence; *Demo* is an index of democracy; and *Under* is a dummy variable indicating whether or not the country is under an IMF agreement. All economic variables are lagged one year, and the sign of the first derivative indicates the expected direction of their effects on private investment according to the basic econometric models of the literature.[10]

In order to test either an endogenous model as well as a Heckman-corrected model, I will estimate countries likelihood to enter in agreement with the Found. Following the conventional modeling structure of the literature (Vreeland 2003; Martínez Pérez 2004), I model such probability on political and economic conditions that explain the necessity to turn to the IMF loans. The function is that in which:

$$Under = f[\operatorname{Re} serves^{-}, CA\_Balan^{-}, Debt\_S^{+}, BudgetDef^{+}, System^{+}, ExeCRL^{+/-}], u$$

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[10] After review the main piece of the *crowding-in/out* literature (Blejer and Khan 1984, Aschauer 1989, Rama 1993, Ghura and Goodwin 2000, Erden and Holcombe 2005, Atukeren 2006) we can only state an ambiguous impact of Public Investment on Private Investment in developing countries. One hand, it is argued that public investment generates negative effect on private investment, because the former use to be less efficient for short and long economic growth than the latter. In addition, public investment can indirectly *crowds-out* private investment: when government expenditure rises, prices and interest rates increase, thus making business environment less attractive. On the other hand, it is also argued that public investment is beneficial for private sector, that is, it could impose a positive externality (*crowding-in*) where the provision of public services is weak and the need of infrastructure is patent. Government can also act in an anti-cyclical way to reduce fluctuations and uncertainty in the economy. In doing so, public investment could increase the aggregated demand, creating market for goods and services produced in the private sector, augmenting its profits and improving economic expectation that would lead to a rise in private investment.

where *Reserves* is the total reserves in months of imports; *CA_Balan* is the current account balance; *BudgetDef* is the country budget deficit; *System* is whether or not the political system is presidentialism; and *ExeCRL* is the chief executive ideology. All economic variables are also lagged one year and sign of the first derivative indicates the expected direction of their effects.

Unfortunately, CBI indexes use to be period averages, so the usual "over time" regressions used in cross-sectional time-series analysis ("fixed effects") would be of limited utility in this case (Maxfield and Pastor 1999). The point is that, due to the CBI effect is almost time-invariant, an OLS *with dummy variables model* would capture the specific CBI impact for each country through the country dummy variable. Performing a model with "random effects" –where a common intercept is calculated and the country-difference from such intercept is relegated to the error term–, will allow us to test CBI effect on the dependent variable. All models report White heteroskedasticity-corrected standard errors.

4.3. Data

The data on private and public investment is from the traditional report on *"Trends in Private Investment in Developing Countries"* that the *International Finance Corporation* makes yearly (IFC 2001)[11]; the remainder economic data is from the World Bank's *World Development Indicators* (2000, 2005). Regarding political variables, the Gurr eleven-point scale index of democracy was taken from the *Polity IV* dataset. *James R. Vreeland* shared with me his dataset on *"IMF and Economic Development"* (2003) where the *Under* variable is coded 1 for the years there was an IMF agreement in force, and 0 otherwise.[12] From the

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[11] The authors of this work (Everhart and Sumlinski) note in the appendix a critical point to understand the source of our dependent variable: "National accounts normally do not break down gross domestic investment into its private and public sector components. When they do, "private" investment often includes investment by state-owned enterprises such as state steel mills and so on. In this publication, we attempt to determine total public investment, inclusive of public investment undertaken by any state-owned enterprises. Private investment is then defined as the difference between total gross domestic investment (from national accounts) and consolidated public investment." (IFC 2001: p. 29)

[12] The types of IMF agreements in force considered by Vreeland are: *Stand-by; Extended Fund Facility; Structural Adjustment Facility; and Enhanced Structural Adjustment Facility.*

Database of Political Institutions (2000) I took the system and government ideology variables, although I changed the range of the former from 4 to 2 categories.[13] Now, let me spend a few words on our key variable, namely, CBI.

Regarding the caveat raised above about which CBI measures should be more proper to test developing countries, I will use an informal measure of independence based in the turnover rates of central bankers between 1980 and 1998. The dataset was provided by *Jan-Egbert Sturm* and *Jakob De Haan*, and it was also used in Sturm and De Haan (2001)[14] This index correlates with inflation better than the Cukierman's formal measure (see Table 1), and shows a significant variation between and *within* countries.

Table 1. Correlations between inflation and CBI index in the sample

	cuk	tor	tor80	tor90
cuk	1	***		
tor	-0.1674	1	***	***
tor80	0.1013	0.7422	1	***
tor90	-0.2096	0.6834	0.4351	1
inflation	**-0.0307**	**0.1753**	**0.1414**	**0.1876**

In order to make easy the understanding of the further analyses, I inverted the sign of the index, thus when the CBI increases employs that such bank is more independent than before.[15]

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[13] Doing this I stressed the powerful discretion of presidentialism compared with other political systems (within democracies).

[14] The authors make me known that, at the moment, they are in the process of updating this dataset to include more countries and additional years. These data will in due time be made available via http://www.kof.ethz.ch.

[15] As we will see, in this way we should find a positive relationship between CBI and private investment.

Although they made an excellent work coding the changes in the seat of CBs, I was compelled to restrict the sample only to Latin American and Caribbean countries –LAC– due to many other developing countries that are in their dataset are cases where data on private investment and other variables are missing or incomplete. In the face to decide whether or not introduce a few more countries (someone from Asia and Africa) I chose to focus in a more homogeneous set of nations that, indeed, have experienced a similar path on economic-policy making during the last two decades. So, LAC countries are going to be our proxy of what I have been calling "developing countries". Thus, the dataset is composed by pooled cross-sectional time-series data with nineteen countries[16] from 1980 to 1998. The *NxT* matrix results in 361 observations.

As benchmark cases, it could be useful to remind that the average turnover rate for industrialized countries from 1950 to1989 is around 0.2 (or an average tenure for five years) (Cukierman, Webb and Neyapti 1992). Figure 3 shows the turnover rates of the two last decades for those countries in the sample.

Figure 3. Turnover rates of central bankers in LAC countries 1980-1990

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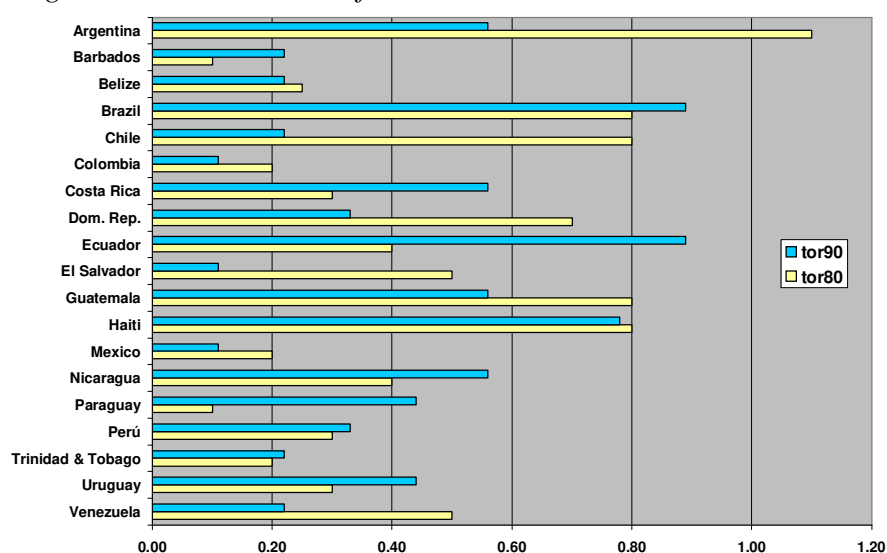
[16] These countries are: Argentina, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Paraguay, Peru, Trinidad & Tobago, Uruguay and Venezuela.

5. Results

Table 2 shows the results for the basic models (1 to 4). Departing from a rough model – *Model 1*–, we can see which the basic-economic determinants of private investment in developing countries are. The expected sign of the variables are correct, with the exception of those related with inflation. Only two factors seem to be quite clear. On one hand, there is a positive relationship between the expected level of growth and private investment. One point increase of expected growth (%GDP) means 0.3 boost of private investment as a share of GDP. On the other hand, the expected debt burden performs a negative association with investment. The magnitude of the impact is similar of expected growth, although it is a negative one, and the standard error is a bit higher. Although statistically insignificant, the level of public investment seems to weakly support the crowding-out effect, because a one point increase (%GDP) of such public enterprise employs an almost 0.1 increase of the private one. The other three variables do not play a significant role in the model, and they will not in the following ones.

Once the *CBI* variable is introduced –*Model 2*–, the model does not change in its basis. Notwithstanding, this variable shows a considerable effect. The impact of "independence" is positive and significant on private investment, and its magnitude exhibit almost two points increase for a marginal increment of the *CBI* variable. This is a first rough test that points in favor of the signaling mechanism hypothesis, and it is quite close to previous findings in the literature. When we turn to *Model 3* and *4*, two competing explanations are incorporated. Firstly, in contrast to previous works, the democratic level of the country does not exert a significant, although positive, relationship with the level of investment. Secondly, once the IMF dummy variable is added to the model, it is curiously visible that living under IMF settings does not help to increase investors' confidence. Indeed, the effect is contrary to what was expected. Anyway, in both models the magnitude of *CBI* basically remains, only with small changes.

Table 2. Basic models (1-4)

	Model 1	Model 2	Model 3	Model 4
	β *coeff*	β *coeff*	β *coeff*	β *coeff*
pbinv	-0.086	-0.093	-0.021	-0.086
	(0.071)	(0.073)	(0.087)	(0.083)
expgro	0.299***	0.290***	0.290***	0.275***
	(0.039)	(0.038)	(0.046)	(0.045)
debtexp	-0.265***	-0.257***	-0.289***	-0.296***
	(0.071)	(0.072)	(0.072)	(0.076)
loginf	0.044	0.082	-0.299*	-0.159
	(0.175)	(0.174)	(0.174)	(0.061)
sqinf	0.000	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
dcrebk	0.005	0.006	0.010	0.014
	(0.008)	(0.008)	(0.008)	(0.008)
cbi		1.958***	1.640*	1.863**
		(0.896)	(0.918)	(0.914)
demo			0.084	0.055
			(0.071)	(0.070)
under				-0.534
				(0.361)
intercept	13.059***	11.885***	12.187***	12.244***
	(0.992)	(1.097)	(1.438)	(1.360)
Wald χ^2	83.26***	87.86***	89.04***	92.27***
freedom	(6)	(7)	(8)	(9)
Number of obs.	296	296	239	227

Dependent Variable: *private investment (%GDP)*
Coefficients Significance at: *p< 0.1 **p< 0.05 *** p< 0.01
Robust Standard Error in brackets

If we accept these results, the picture will be something like *"central bank independence matters to attract investors"* but *"living with the Found not"*. Indeed –although with a smaller level of confidence– it could be argue that being under IMF umbrella exerts a crowding-out effect of private investment. In this sense, CBI functions as a signaling mechanism of creditworthiness, meanwhile, being under an IMF agreement, also signals, but with a poster of *"high risks country"*.

As we noted above, such results should be put into question due to endogeneity and selection bias problems. Table 3 shows a Durbin-Wu-Hausman test so as to examine the endogeneity shortcoming. This is an augmented regression test which includes the residuals of the endogenous right-hand-side variable (z-residuals) as a function of all exogenous variables in a regression of the original model. If the beta coefficient of the *z-res* variable is significantly different from zero –as it is our case–, then OLS estimation is not consistent.

Table 3. Durbin-Wu-Hausman test

	beta	**std.err**	**p**
pbinvlag	-0.400	0.117	0.001
expgro	0.398	0.063	0.000
debtexp	0.176	0.219	0.423
loginf	0.090	0.241	0.707
sqinf	0.000	0.000	0.078
dcrebk	-0.004	0.014	0.791
cbi	0.758	0.984	0.441
democ	-0.142	0.075	0.059
under	1.005	0.951	0.291
z_res	**-1.167**	**0.290**	**0.000**
_cons	13.499	1.688	0.000

In the Table 4 I, first, compare the last standard OLS model –*Model 4*– with the endogenous model –*Model 5*–. The result is very different picture. Firstly, three changes are reported in the economic basis of the model. Now, the crowding-out effect of public investment becomes stronger. Indeed, one point increase of public money invested (as a share of GDP) would lead to a reduction of half point of private investment. This is in line with those researches that have found empirical support for the *crowding-out* hypothesis in developing countries (Balassa 1988, Pradha et al. 1990, Rocha and Teixeira 1996, Nazmi and Ramirez 1997, Lächler and Aschauer 1998). On the other hand, the expected levels of growth strengthen its positive association with the dependent variable. Now, 1% increase of growth

involves more than 0.3 points. Then, the level of expected debt stops to affect negatively to the dependent variable. Now, being in debt exerts some kind of attraction for investment, although the association is not significant.

Secondly, our key variables experiment considerable modifications. Both variables change the sign of the impact, and *CBI* loses the significance in favor of its competing variable, namely, *Under*. Now, signaling independence of monetary authorities do not seem to be crucial in attracting investors; but being under an IMF agreement seems to be an efficient device so as to signal economic discipline and commitment in the fight to inflation. Indeed, the difference between *to count or not to count* with IMF guarantee is around 3% of private investment as a share of GDP. This is a large gap between both clusters, and it means that IMF agreements look like a better and successful device for domestic and international creditworthiness in developing countries, rather than CBI as is usually argued. Undoubtedly, this finding confirms one of the suspicions raised in the hypothesis of the research.

The last empirical exercise in order to correctly model the determinants of private investment –and particularly to assess the CBI signaling hypothesis– will be to examine the potential selection effects of being under an IMF agreement on private investment. The two last columns of Table 4 allow us to compare such impact. The results of the selection model should be interpreted exactly as though we observed IMF agreement for all countries in the sample. Thus, Heckman-corrected model –*Model 6*–shows consistent coefficients in contrast to the standard OLS regression –*Model 2*–.

It also exhibits considerable differences on the economic foundations of the model. It confirms that public investment and expected growth are the most economic factors so as to explain the level of private investment in developing countries. As in de endogenous model, the expected debt is not statistically relevant to explain investment. But what is more important for this research, the *CBI* effect loses its statistical and magnitude strength, leading us to refute the signaling mechanism that have been largely argued for private investment in developing countries.

Table 4. Correcting endogeneity and sample selection bias

	Model 4 *Standard OLS*	**Model 5** *Endogenous*	Model 3 *Standard OLS*	**Model 6** *Selection*
	β *coeff*	β *coeff*	β *coeff*	β *coeff*
pbinv	-0.086	-0.542***	-0.021	-0.499**
	(0.083)	(0.099)	(0.087)	(0.211)
expgro	0.275***	0.317***	0.290***	0.245***
	(0.045)	(0.054)	(0.046)	(0.061)
debtexp	-0.296***	0.297	-0.289***	0.060
	(0.076)	(0.245)	(0.072)	(0.322)
loginf	-0.159	0.099	-0.299*	0.202
	(0.061)	(0.233)	(0.174)	(0.259)
sqinf	0.000	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
dcrebk	0.014	0.008	0.010	0.023
	(0.008)	(0.012)	(0.008)	(0.015)
cbi	1.863**	**-0.204**	1.640*	**0.364**
	(0.914)	(0.985)	(0.918)	(0.947)
demo	0.055	-0.091	0.084	0.219**
	(0.070)	(0.073)	(0.071)	(0.092)
under	-0.534	**3.208***		
	(0.361)	(1.107)		
intercept	12.244***	12.743***	12.187***	14.094***
	(1.360)	(1.724)	(1.438)	(2.049)
Wald χ² freedom	92.27*** (9)	107.42*** (9)	89.04*** (8)	55.35*** (8)
Wald test of indep. eqns. (rho = 0): chi2 (1)		19.82***		3.72*
Number of obs.	227	168	239	206

Dependent Variable: *private investment (%GDP)*

Coefficients Significance at: *p< 0.1 **p< 0.05 *** p< 0.01

Robust Standard Error in brackets

6. Conclusion

During the last two decades, the case of Central Bank Independence was a fashionable research issue in Political Economy as well as an important topic from politicians around the world. In developing countries, Central Banks adopted an independent status, either trying to exploit the functional properties of delegation or making use of its symbolic properties to reach higher levels of economic performance.

Whether functional or symbolic properties were the reason of delegation, it has been argued that Central Bank Independence should enhance the flow of private investment, due to it signals a strong commitment in fighting to inflation, good governance, as well as a structural economic reform path. Such institutions became crucial for those countries due to, in a new international framework with a highly integrated economy –especially financial markets–; they were quite interested in attracting foreign capital.

Actually, many scholars have argued a positive relationship between "independence" and "private investment" for developing countries. But such association has been more defended with words rather than facts. Two empirical works have provided a basic quantitative support to argue that CBI is a good signal to encourage private investment, though they did it within many shortcomings.

In this paper, I assessed the "signaling mechanism" improving some technical points, and overcoming some statistical shortcomings. I employ a more suitable measure of Central Bank Independence based on factual rather than legal autonomy; and I brought in the key time-period for these analyses, that is, the 1990s.

Offering a competing explanation to signal investors –being under an IMF agreement–, and correcting potential endogeneity and sample selection bias, I reached more appropriate results of Central Bank Independence effect on private investment in developing countries. They refute the idea of Central Banks as key actors in signaling creditworthiness, and find that being under an IMF agreement seems to be an efficient device for attracting investors.

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