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**Central Bank Independence,  
Bureaucratic Corruption and Fiscal  
Responses - Empirical Evidence**

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# Central bank independence, bureaucratic corruption and fiscal responses - Empirical Evidence

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## Abstract

This paper analyses the impact of bureaucratic corruption on fiscal policy outcomes for economies that have constituted to a greater or lesser extent independent central banks. The adverse implications of corruption on debt accumulation are verified using a cross-sectional setting of 77 developed and developing countries. Approximating central bank independence as that point in time that a major central bank reform took effect, we find that more corruption leads to higher debt accumulation. More importantly, complementing the analysis with a measure for the level of independence each reform gave strengthens the results; the impact of corruption is greater, the higher the independence that was granted. The findings are robust to different subsets of the sample and different sets of control variables. Suboptimal institutional quality poses difficulties on the achievement of a balanced debt process, which could obstacle price stability, despite the constitution of independent central banks.

*JEL Classification:* E58, E52, D73

*Keywords:* Central Bank Independence, Corruption

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# 1 Introduction

The aim of this paper is to explore empirically the impact of bureaucratic corruption on fiscal policy outcomes of countries with independent central banks. More precisely, our empirical analysis concentrates on the relationship between debt accumulation and corruption after full or partial central bank independence has been legislated.

There has been a general and intensively increasing trend towards Central Bank Independence (CBI) in the past couple of decades among both industrial and developing countries. During late 1980s and early 1990s many industrial countries have strengthened or established the independent legal status of their central banks, and developing countries followed their example soon afterwards. In the same context, many countries have opted for an inflation targeting framework, assigning inflation as the nominal anchor of the economy and announcing explicit quantitative inflation targets which can be easily verified *ex post*. However, the macroeconomic performances of the economies in question have been diverse, with special emphasis on the discrepancies among developed and developing countries.

There is widespread consensus on central bank independence being that monetary institutional design that eliminates the time-inconsistency problem and its subsequent inflationary bias (Barro and Gordon 1983). With the recognition that the inflation bias is, at least partially, determined by the taxation policy and hence the financing structure of government spending (Alesina and Tabellini 1987), the literature has also focused on the interactions among monetary and fiscal policy, by endogenising the latter. Huang and Wei (2006) is one of the first papers that allows for the quality of institutions to be examined.

Dimakou (2006) re-addresses the effectiveness of central bank independence in a dynamic framework in which bureaucratic corruption shapes and constrains fiscal decisions, which in turn affect monetary policymaking. She concludes that corruption intensity can undermine price stability through the strategic use of debt accumulation.<sup>1</sup> Even if an independent central bank is constituted, the government has the incentive to indirectly ‘force’ an expansionary monetary policy by increasing debt accumulation. The current work attempts to explore these findings empirically, by concentrating on the response of debt policies after the introduction of independent central banks in countries faced with different levels of bureaucratic corruption.

Our paper is related with two strands of the literature; central bank independence and corruption. The empirical literature on CBI is vast and mainly concentrates on the effect of independence on macroeconomic performance, namely inflation. Due to the lack of CBI evolution data, the approaches are mainly cross-sectional, and the results are mixed.<sup>2</sup> Furthermore, there appears to be no empirical work linking central bank independence and fiscal policy.<sup>3</sup> On the other hand, the corruption literature fo-

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<sup>1</sup>This incentive is prominent, unless a less conservative CB, regarding output considerations, is delegated and unless the economy is faced with severe levels of corruption.

<sup>2</sup>For a survey of the empirical literature on CBI see for instance Eijffinger and de Haan (1996) and Berger, Haan, and Eijffinger (2001). Recent empirical studies include both time series and panel data analyses.

<sup>3</sup>Masciandaro and Tabellini (1987) study the relationship between central bank independence and deficits. Neyapti (2003) examines the impact of budget deficits on inflation for different levels of central

cuses on the impact of corruption on economic growth, mainly through the investment transmission channel, and ignores other links with macroeconomic fiscal or monetary performance.<sup>4</sup>

We attempt to bring those two literatures together and assess the effect of corruption and independence on fiscal policy, and more precisely on total public debt. In a cross-sectional setting, CBI is approximated as a point in time, that is, as that central bank reform that gave a decisive step towards central bank autonomy. The impact of corruption is verified by comparing the level of debt before and after the reform date for a set of 77 countries. Reforms span during the 1990s and beginning of 2000s, including a set of developing countries that have not been assessed before. Our approach bears more resemblance with event studies, which have been quite limited, but recently growing, in the central bank independence literature. In addition, we complement our analysis with a newly compiled Grilli, Masciandaro, and Tabellini (1991) index for the level of independence each reform gave.

Our main results verify the importance of bureaucratic corruption in explaining debt accumulation given the introduction of central bank independence. The effect of corruption after an important central bank reform on debt-to-GDP ratio and on an approximate measure of deficit (first difference of debt-to-GDP) is significant, although quantitatively small. Nonetheless, the impact of different levels of corruption on debt-to-GDP growth is both significant and sizeable. Hence, we do find that more corruption leads to more debt accumulation. More importantly, we show that the effect of corruption is stronger, the higher the degree of independence the respective central bank was granted after the reform. The empirical results are robust to different specifications, control variables and sub-samples.

The rest of the paper is organised as follows. Section 2 discusses briefly central bank independence, both in terms of the way it has been measured and in terms of its evolution within and across geo-economic groups, motivating the empirical approach to be used here. In sections 3 we present the data and the methodology. Section 4 depicts estimation results, and Section 5 concludes.

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bank independence and financial development.

<sup>4</sup>Rose-Ackerman (1999), Aron (2000) and Aidt (2003) provide thorough surveys of the empirical literature on corruption

## 2 Central Bank Reforms and Central Bank Independence

Institutional reforms are promoted aiming at adjusting the incentives of the economic actors involved and improving economic outcomes. As regards to monetary institutions, it is widely accepted that delegation of monetary policy to an inflation-averse and independent central bank is that institutional design that overcomes the time-inconsistency problem, by ‘tying’ the hands of the government and eliminating the inflationary bias (Rogoff 1985, Walsh 1995, Svensson 1997).

A substantial empirical literature has concentrated at exploring the impact of central bank independence on macroeconomic performance, namely inflation. Conventionally, the independent status of a central bank has been measured as the degree of legal autonomy identified in the central bank act based on a set of common legal criteria, which are then scored and weighted accordingly. A list of the most widely known and frequently used CBI indexes is presented in Table 1.<sup>5</sup> Following the seminal works of Grilli, Masciandaro, and Tabellini (1991)<sup>6</sup> on 18 OECD countries and Cukierman, Webb, and Neyapti (1992)<sup>7</sup> on 72 countries, a vast empirical literature has flourished attempting to identify the effect of CBI on macroeconomic performance, testing the hypothesis that central bank independence promotes inflation stability.<sup>8</sup>

Table 1: Central Bank Independence Indexes

AL	Alesina (1988, 1989)
BP	Bade - Parkin (1988)
ES	Eijffinger - Schaling (1993)
GMT	GMT (1991)
LVAU	Un-weighted Legal Index of Cukierman (1992)
LVAW	Weighted Legal Index of CWN (1992)
SUMLV	CWN (1992) sum of 16 legal variables
TOR	Turnover rate Cukierman (1992) & CWN (1992)
VUL	Political Vulnerability Index Cukierman - Webb (1995)
NOR	Non-political turnover rate Cukierman - Webb (1995)

Results are mixed. The main findings suggest that independence does indeed relate to lower inflation in advanced economies, but for developing countries the negative relation is not robust to the time-period covered, the country samples and a set of control variables. Earlier empirical studies are mainly cross-sectional due to the lack of time-variation in independence and its measurement. As Cukierman (2006) ascertains, during the 40 years ending in 1989 there hardly had been reforms in central bank legislation, based on a number of legal indexes.

However, during the 1990s and beginning of 2000s the legal independence of most central banks has been updated. There has been a general trend -among both advanced and developing countries- towards enhanced CBI and numerous aspects of central bank legislations have been revised. Given this ongoing process, many different studies attempted to assess central bank independence developing different indexes or updating

<sup>5</sup>The last three indexes measure actual independence.

<sup>6</sup>Thereafter cited as GMT (1991)

<sup>7</sup>Thereafter cited as CWN (1992)

<sup>8</sup>For a survey of CBI indexes, comparisons and criticism, and empirical evidence see Arnone, Laurens, and Segalotto (2006), Berger, Haan, and Eijffinger (2001), Eijffinger and de Haan (1996).

the already existing ones for selected county groups (see Table 2).

Table 2: Updated CBI-Indexes

Cukierman, Miller, and Neyapti (2002)	Update CWN	26 Former Socialistic Economies
Maliszewski (2000)	Update and Extend GMT	20 Former Socialistic Economies
Lybek (1999)	Own Index	15 Former Soviet Union countries as of 1997
Jácome and Vázquez (2005)	Update GMT, CWN & Modified Cukierman Index	24 Latin American & Caribbean countries
Castens and Jácome (2005)	Modified Index	15 Latin American countries as of 2003
Arnone, Laurens and Segalotto (2006)	Update GMT	40 countries as of 2003
Mehran et al (1998)	Own Index	20 Sub-Saharan African countries as of 1996
Sturm & de Haan (2001)	Update TOR	90 countries for 1980s and 1990s
Ahsan et al (2006b)	Own Index	36 East Asian and Pacific countries
Gisolo (2007)	Own index	12 Mediterranean countries as of 2006

The updated CBI-indexes do verify the significance of this institutional design in the policy agenda of many countries and the move towards more independent monetary policymaking. At the same time, they raise compatibility issues both across countries and across time.

The timing of an institutional reform has been a widely neglected piece of information on how a commitment by the policymakers to a more independent central bank-materialised in the form of a legislation- can affect macroeconomic performance. This is the approach we follow. In our empirical investigation, central bank independence is primarily identified as that point in time that an important central bank reform took place providing a decisive step towards independence and observe the evolution of selected macroeconomic policies from that point onwards compared to before.

Event studies in this area of economic literature have been limited, although recently growing, concentrating mainly on time-series approaches and on inflation targeting adoption dates. Daunfeldt and de Luna (2003) investigate the effect of implementation dates of central bank reforms on the price stability process in 23 OECD countries. Using a non-parametric time-series method they first extract cyclical trends (medium run component) and irregular shocks (short run component) from the inflation series of each country, and then they compare the long run component of inflation with the reform dates in a descriptive manner.<sup>9</sup> Diana, Papadopoulos, and Sidiropoulos (2005) examine inflation dynamics in 7 transition economies, by applying an exogenous break point methodology on the inflation series to test the significance of the reform date. Clifton, Leon, and Wong (2001) examine the effect of inflation targeting (IT) on the unemployment-inflation trade-off for 7 OECD targeters 9 non-targeters in a time-series

<sup>9</sup>They extend their analysis to include more countries in Daunfeldt and de Luna (2008).

setting. Time is transformed with  $T$  being the quarter of IT adoption for each targeting country and then spans symmetrically in the interval of  $(T - 24, T + 24)$ . Ball and Sheridan (2003) compare the effect of inflation targeting in 20 OECD countries (7 targeters and 13 non-targeters) in a cross-sectional difference-in-difference approach. Most recently, Acemoglu, Johnson, Querubin, and Robinson (2008) use a panel data approach, with a 0-1 time dummy variable for the date of central bank reform for a set of 52 countries, attempting to assess the impact of political institutions on inflation, given the central bank reform. Daunfeldt, Granlund, Landström, and Rudholm (2010) study the effect of CBI reforms on inflation rates covering the event (or not) of central bank reforms in 132 countries during the period 1980-2005. They use a random effect panel model and examine the interaction between the level of democracy and political stability. Again, the reform is modeled in a 0-1 fashion. In general, event studies have mixed results, with many not finding evidence in support of the importance of the central bank reform or inflation targeting date.

The approach here bears some similarities with the aforementioned studies. As in Clifton, Leon, and Wong (2001), time is transformed such that  $\tau$  refers to the central bank Act reform date or the inflation targeting adoption for each country. As in Ball and Sheridan (2003), we perform a cross-sectional analysis, but do not use difference-in-difference estimation. The size and diversity of our country sample does not allow to test for differences between non-reform and reform countries. Furthermore, due to the use of such a large number of countries, the reform dates span from 1989 to 2002, and it would be very difficult to find a control group (of non-reform cases), as well as a reference date for the comparison.

The timing of a reform is undoubtedly a objective measure of a monetary policy shift, but the magnitude of the reform will inevitably differ from one country to another. Our empirical analysis is complemented with the level of independence each reform gave, using a newly compiled GMT-index. Before turning to our empirical investigation, we briefly present the evolution of central bank independence during the 1990s and beginning of 2000s for our country sample, organised by geo-economic group.

## Advanced Economies

The high volume of central bank reforms during 1990s within the advanced economies is mainly attributed to the Euro Area members. In accordance with the Maastricht Treaty provisions for the European Monetary Union (EMU), EU-members that opted for EMU-participation have gradually reorganised their central bank laws until the last stage of currency unification in 1999. In many cases, an intermediate reform took place around 1994, consistent with the guidelines of legislation harmonisation by the European Monetary Institute. Not only EMU-participants benefited from these reforms. Denmark,<sup>10</sup> UK and Sweden, also reformed their CB legislations on the same lines. As regards to other non-EU advanced economies, changes in CB legislations and in the degree of CBI were much less frequent and of smaller magnitude.

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<sup>10</sup>The case of Denmark is somewhat ambiguous; According to the CB official website and Lybek and Morris (2004) Denmark did not have a reform since 1969. This is also confirmed by However, Arnone, Laurens, and Segalotto (2006) report a 1998 amendment according to which the degree of CBI in Denmark improved substantially since the original GMT assessment of 1991.



Table 3: CBI (GMT-index) Evolution: Advanced Economies

	GMT (1991)			ALS (2003)			<i>Updated*</i>
	PA	EA	TA	PA	EA	TA	
Total Average	2.88	4.722	7.611	5.944	6.444	12.39	<i>12.29</i>
Euro-10 Average	3	4	7	8	5.9	13.9	<i>13.91</i>
Non-Euro Average	2.75	5.625	8.375	3.375	7.125	10.5	<i>10.66</i>

*Sources: Grilli, Masciandaro, and Tabellini (1991), Arnone, Laurens, and Segalotto (2006) and own-calculations*

The Euro Area includes: Austria, Belgium, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain; and the Non-Euro Area: Australia, Canada, Denmark, Japan, New Zealand, Switzerland, UK, and USA.

\*Includes Finland and Luxembourg for the Euro-Average and Iceland, Malta (2002), Norway and Sweden (1999) for the Non-Euro Average.

Arnone, Laurens, and Segalotto (2006) follow the evolution of central bank independence for the same 18 OECD countries that GMT (1991) studied and confirm that the magnitude of recent reforms among the non-Euro advanced economies is small. USA<sup>11</sup> retains the same degree of independence, though Australia and Japan show marginal increases. Only in Switzerland and New Zealand marked increases in their CBI are observed, although in the case of New Zealand the initial GMT (1991) assessment did not include the 1989 reform.

Table 3 presents a comparison of the GMT-index between 1991 and 2003, as assessed by Grilli, Masciandaro, and Tabellini (1991) and Arnone, Laurens, and Segalotto (2006). Overall, the high level of autonomy is mainly driven by the Euro Area economies and the increases are mainly attributable to political autonomy improvements. In 1991 the average level of CBI for the Advanced Economies was 7.611, with the non-Euro economies being above the average and the Euro economies below. The reverse is true for 2003. On average independence increased by around 60%, and for the Euro area is has almost doubled. In the spectrum of political autonomy, the Euro Area has attained the maximum score, and averages much higher than the non-Euro economies. Regarding economic autonomy, the non-euro area averages higher. This is so merely because Arnone, Laurens, and Segalotto (2006) penalises the Euro group for having the European Central Bank, rather than the national one, setting the discount rate.

There are no updated GMT-indexes for Luxembourg, Finland, Iceland, Malta, Norway and Sweden. Since, these are countries included in our empirical analysis, we construct the GMT-index using the Acts amended under the relevant central bank reform and integrate the results in the last column of Table 3. For more details regarding the GMT-assessment of these countries see Appendix A.2.

### Europe and Central Asia (ECA):

Within the process of transition from a planned to a market economy, central banking reforms were part of broader structural changes in the ECA region. During the 1990s, all former socialist economies (FSU) created new central bank laws and Central and East European (CEE) countries reformed pre-existing Charters. Despite cross-section variation, the reforms in central bank legislation were influenced by western

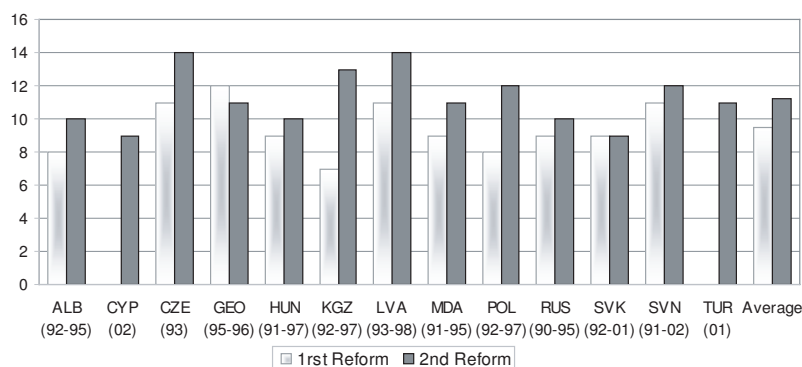
<sup>11</sup>USA had no central bank reform and thus not included in our sample.

institutional arrangements (e.g. Budensbank) and granted a high level of central bank independence.

A second wave of reforms -from the second half of 1990s and onwards- was motivated by EU participation and future EMU aspiration. These include: Czech, Hungary, Latvia, Poland, Slovak Republic, Slovenia, Cyprus, Estonia, Lithuania as well as Turkey.<sup>12</sup> Together with the CB reforms, the majority of the countries moved away from the fixed pegs to either more flexible exchange rate regimes, e.g. managed floats, as in Czech Republic (1997), Slovak Republic (1998), and Poland (1998) or to hard pegs, as Lithuania and Estonia did. The rest of the countries in our sample, Albania, Georgia, Kyrgyz Republic, Moldova and Russia, which apart from the first were all FSU economies, also underwent major central bank reforms.

The transition economies have received considerable attention for updating central bank independence measurements. Overall, during the past couple of decades there have been intensive reforms which improved substantially the degree of independence, as observed by the Cukierman-index for 26 Former Socialist Economics in Cukierman, Miller, and Neyapti (2002) and by a specific index in Lybek (1999) for 15. Maliszewski (2000) develops an Extended-GMT-index for the transition economies and compares his findings with the above mentioned studies. Figure 1 presents the GMT-index for the ECA countries included in our empirical analysis, using the data of Maliszewski (2000) and, when missing, complementing them with our calculations.<sup>13</sup>

Figure 1: CBI Evolution in ECA



Source: Maliszewski (2000) and author's calculations.

It becomes obvious that the reforms in this area were very ambitious giving a decisive step towards the legal autonomy of monetary policy. Note that Figure 1 shows CBI evolution comparing two reforms during the 1990s. If further we consider that before the first reform (and especially for the FSU countries) central bank independence was very close to zero, then the gravity of the reforms is even stronger. Overall, the average for the group increased from 9.45 for the first set of reforms in the beginning of 1990s to 11.23 for the most recent ones. One interesting aspect of this region's reforms is that in most cases political autonomy has being higher than economic autonomy,

<sup>12</sup>Turkey and Cyprus are not transition economies, but are classified as ECA from a geographical perspective. Estonia and Lithuania have adopted currency board arrangements, which leave no scope for monetary policy, hence they are excluded from our empirical study.

<sup>13</sup>Czech Republic (1998), Latvia (1998), Slovak (2001), Slovenia (2002), as well as Cyprus (2002) and Turkey (2001) are reforms in which we update the GMT-index.

especially with respect to the first reform. This observation is not a very common one since it is more costly and more difficult to legally isolate the central bank from political influences, rather than allow for economic autonomy. More information about central bank independence in the region is provided in Appendix A.3.

### **Latin American and the Caribbean (LAC):**

During the 1990s central bank reforms became an important component of the economic agenda in most Latin American countries. Many of these countries experienced incidents of hyperinflation and economic recessions during 1980s, which were partly attributable to the use of monetary policy for short-term political purposes, either financing expansionary fiscal policies or stimulating economic activity.

In an attempt to bring inflation down and restore the credibility of monetary policy, policymakers implemented institutional changes by reforming the central bank's legislation, and in many cases, the constitution, with explicit provision for the central bank, its functions and its degree of autonomy.<sup>14</sup> Following the financial crises of 1990s many Latin American countries opted for more flexible exchange rate regimes, and some shifted monetary policy towards inflation targeting. Another motivation for the shift of attention towards legal CBI in Latin America suggested by Maxfield (1997) refers to governments' drive to compete for international creditworthiness. In contrast to Latin America, changes to CB legislations were largely absent in the Caribbean.

There is no single comprehensive study that covers all the reforms that took place in the region, hence CBI data will be based on different sources and own calculations. Jácome (2001), Jácome and Vázquez (2005), Carstens and Jácome (2005) follow the evolution of central bank independence in LAC during the 1990s and its effect on macroeconomic performance. Their data are complemented by the most recent updates of Arnone, Laurens, and Segalotto (2006) for Brasil (1999), El Salvador (1996) and Peru (2002) and by Lybek and Morris (2004) for some Caribbean countries. Finally, for Chile (1999), Mexico (1999), Nicaragua (1999), and Venezuela (2001) we calculate the GMT-index.

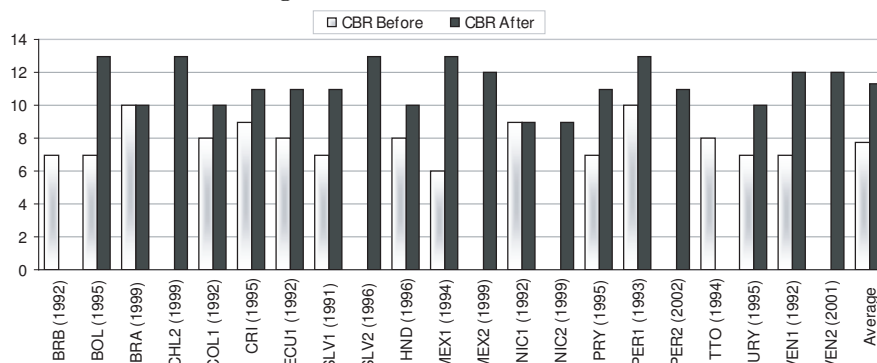
Figure 2 uses all available data on the GMT-index to graphically illustrate the increases in central bank independence from the reforms that took place in the region during 1990s.

Despite the methodological and comparability issues that arise from combining many different studies, central bank reforms did take place in the region and the average independence level as measured by the GMT-index increased from around 7.7 to 11.2 after the reforms of the 1990s and beginning of 2000s. There was much more movement in the Latin America compared to the Caribbean, in terms of both frequency and size of reforms. Overall, economic autonomy is higher, and there is still space for improvements in terms of political autonomy. Apart from legally strengthening the autonomy status of their central banks many Latin American countries shifted towards fully-fledged inflation targeting regimes; Chile (1999), Colombia (2000), Brazil (2000) and Peru (2002). For more information about central bank independence in LAC see Appendix A.4.

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<sup>14</sup>Gutierrez (2003) concentrates on the constitutional provisions for CBI to construct an index based on this information and assesses its importance in lowering inflation in LAC.

Figure 2: CBI Evolution in LAC



Source: *Jácome and Vázquez (2005)*, *Carstens and Jácome (2005)*, *Arnone, Laurens, and Segalotto (2006)*, and author's calculations

### East Asia and the Pacific (EAP):

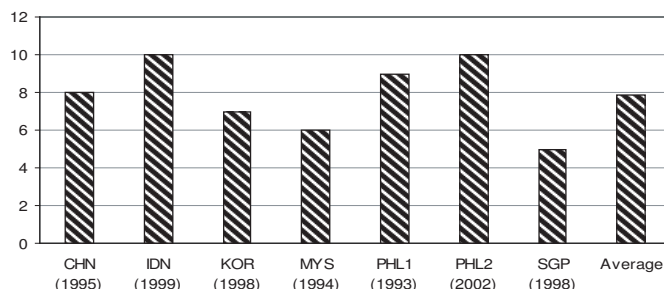
The average level of central bank independence in East Asia and the Pacific (EAP) has been relatively low (Maxfield 1997), however, in the wake of the 1997 Asian economic crisis the issue of CBI gained in importance. The financial crisis raised the need for a redetermination of the institutional frameworks of monetary and exchange rate policies. This generally triggered more flexible exchange rate regimes and more independent and transparent central banking. Among the crisis-hit countries, Malaysia fixed its currency to the USD in 1998, though Indonesia (1999), Korea (1998), Philippines (2002) and Thailand (2000) officially proclaimed to float their exchange rate while adopting an inflation-targeting monetary policy framework, implicitly or explicitly. Most of the Asian countries proceeded to central bank reforms soon after the crisis (except for Malaysia, China and Philippines).

The literature on measuring and assessing the impact of central bank independence in East Asia and the Pacific has been limited.<sup>15</sup> A recent paper by Ahsan, Skully, and Wickramanayake (2006b) develops a Central Bank Independence and Governance (CBIG) index for 36 Asian Pacific countries, providing valuable information about the level and evolution of independence in the region, but not allowing for comparisons with other regions. We, therefore, construct the GMT-index for the EAP countries to be included in our empirical work, namely for China (1995), Indonesia (1999), South Korea (1998), Malaysia (1994), Philippines (1993), Singapore (1998) and Thailand (2000).

Overall, economic autonomy is higher than political, and the average score of the region is 7.7. Political autonomy is limited in EAP, especially in terms of the appointment structure, the terms in office and conflict resolutions. Moreover, apart from Indonesia and Korea, in all other cases government representatives are allowed in the Board. Economic autonomy scores better. In the aftermath of the crisis, the regulatory and supervisory structure of the banking systems has improved in the region and the importance of financial stability is also verified within the Bank's objectives. For more details on central bank independence in EAP region and a comparison of our GMT-index findings with the CBIG-index of Ahsan, Skully, and Wickramanayake (2006b) refer to Appendix A.5.

<sup>15</sup>Fry (1996) is an exception. Also JP-Morgan (2000) analyses central banking for selected countries in the EAP region.

Figure 3: CBI in EAP



Source: Author's calculations.

### Subsaharan Africa (SSA)

SSA consists of a set of fairly new central banks, established after the grant of independence in the 1960s, and coinciding with the introduction of national currencies. Colonial independence led to a number of different institutional arrangements and post-colonial Africa exhibits one of the richest landscapes of monetary policy and exchange regimes. Two broad patterns can be identified depending on the sphere of influence, the British and the Franc zones (Honohan and O'Connell 1997, Masson and Pattillo 2005).<sup>16</sup>

The use of monetary policy for economic development and fiscal deficit financing, the underdeveloped debt and financial markets, the high external, and recently domestic, debt burdens, and a series of aid flows generate a different set of challenges for SSA central banks since they do not always hold the necessary monetary policy instruments to affect the market. In that sense, and despite some countries recent attempts to modernise their monetary policy frameworks and strengthen the autonomy of central banks, SSA countries face a set of different structural and political problems, in which legal provisions may only poorly capture real practice. The Heavily Indebted Poor Countries (HIPC) initiative reflects the extent of these challenges for some countries. Further, Christensen (2005) points caution to the reliance on domestic debt, especially among non-HIPC.

Mehran, Ugolini, Briffaut, Iden, Lybek, Swaray, and Hayward (1998) provide a thorough study of the financial sector development for 32 SSA countries and they also construct their own CBI-index for 20 of these. However, this index does not allow for comparisons with the rest of the country groups, and does not refer to the most updated central bank Acts, since at the time of the study many laws were under review. For that reason and based on data availability, we construct the GMT-index for 9 SSA-countries included in our regression analysis.<sup>17</sup>

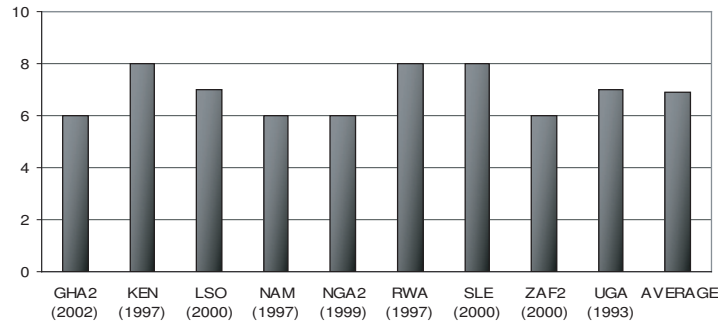
On average, the level of central bank independence in the region, calculated at 6.88, is limited, both in terms of political and economic autonomy. For the former, the lowest scores come from the provisions regarding the appointment procedure and

<sup>16</sup>Since the CFA Franc zone does not leave much space for independent monetary policymaking, we will not concentrate on the African countries of the corresponding currency unions.

<sup>17</sup>We did not manage to find English translations of the CB Acts for Ethiopia (1994) and Burundi (1993), countries also included in our regressions. We use information from Mehran et al (1998) to extract the GMT scores.

term in office of the Governor and Board. On the economic autonomy side, central laws lack in terms of a formal prohibition of direct credit to the government and direct participation in the primary debt market, activities that have been prohibited among the IND, ECA and LAC groups.

Figure 4: CBI in SSA



Source: Author's calculations.

Another common aspect in the region refers to banking system supervision. Supervision was a late arrival, since the banking system has been dominated by foreign banks and subsequently by government owned ones. Recent changes with the emergence of new banks and the increase in competition have lead to notable progress in modernising the banking laws and putting the basis for supervision. Nonetheless, in almost all SSA countries, banking supervision is vested within the central bank's functions. Overall, economic autonomy is higher compared to political autonomy, except for South Africa. Kenya (KEN-1997), Rwanda (RWA-1997) and Sierra Leone (SLE-2000) rank on the top, with scores almost equally distributed between the two aspects of independence. South Africa moved to an inflation targeting framework in 2000. Appendix A.6 provides more information and an analytical assessment of the CMT-index for the region.

### Middle-East & North Africa (MENA):

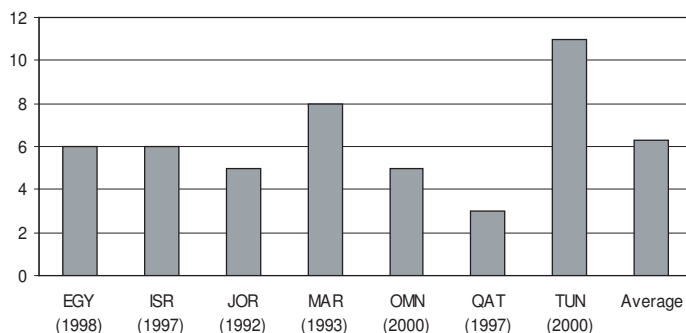
The push for central bank independence in the MENA region has been limited compared to other regions. Starting in about 1985, Arab governments shifted at varying rates toward policies aiming at achieving macroeconomic stability, a higher degree of integration with the world economy and an expanded role for the private sector. During the 1990s most countries have also made cautious progress with structural reforms, including trade liberalisation and privatisation (Page 2003).

In the first half of the 1990s, partial central bank reforms took place in Algeria (1991)<sup>18</sup>, Egypt (1992), Qatar (1993), Jordan (1992), Morocco (1993) and Tunisia (1994). For more details about some of those early reforms see Maxfield (1997). Central bank independence in the region has been largely ignored both in policy and academic cycles. Hence, assessment of the level of independence in the Middle East and North Africa has been very limited. Based merely on data availability 7 MENA countries are included in our empirical analysis. A GMT-index is available from Arnone, Laurens, and Segalotto (2006) for four of them, and an own assessment has been performed for the last three. A recent paper by Gisolo (2007) constructs a specific measure for 12

<sup>18</sup>Due to data unavailability, Algeria is not included in our empirical study.

Mediterranean central banks, including some from the MENA region.

Figure 5: CBI in MENA



Source: *Arnone, Laurens, and Segalotto (2006) and author's calculations.*

As depicted in Figure 5, central bank independence in the region is very low, scoring around 6.28. Overall, monetary policy in the region is either subject to requirements of maintaining a pegged or highly managed exchange rate, and /or focused on credit and its allocation across sectors. To date, many MENA countries, such as Jordan, Morocco, and Tunisia, have strengthened banking supervision and regulation, and have taken steps to conform to international Basel standards. Despite the on-going process towards more market-based structures, the banking and financial sectors remain underdeveloped, relative to other regions with similar economic development. The region is also characterised by inefficient debt markets.

Countries that seem to be deviating from this norm are Israel, Tunisia and Morocco. It is suggested by many that actual independence is higher than legal in Israel.<sup>19</sup> The only major amendment to the status of the central bank was made in 1985 with the passing of the “No Printing Law”, which prohibited the Bank from granting loans to the government. Israel moved in inflation targeting in June 1997. Both Gisolo (2007) and Arnone, Laurens, and Segalotto (2006) ascertain that Tunisia enjoys the higher level of independence in the MENA region. Arnone, Laurens, and Segalotto’s (2006) GMT-index shows that although economic autonomy is high, Bank Al-Maghrib is politically dominated. Both Tunisia and Morocco have been preparing towards inflation targeting. More details regarding the level of CBI in the region are provided in Appendix A.7.

## Summary

Institutional changes within the monetary policy framework did take place during the 1990s and the majority of them improved the degree of independence and modernised central banking activities. Overall, the Advanced economies region attains the highest level of central bank independence, followed closely by ECA and LAC. Those two groups rank higher than the non-Euro Advanced economies. Contrary to conventional wisdom, this verifies that high legal CBI is not only a concern of the advanced economies. It should also be noted that actual independence could be different. The last three geo-economic groups have substantially lower levels of independence, though

<sup>19</sup>See Gisolo (2007).

that should be viewed in the overall economic-political history and environment of those regions that differ from the others. EAP ranks first, followed by SSA and finally by MENA.



### 3 Data and Methodology

Our empirical analysis concentrates on the impact of corruption on fiscal policies given that full or partial central bank independence has been legislated. Dimakou (2006) develops a two period model in which monetary and fiscal policies interact under different levels of bureaucratic corruption. The main findings suggest that, in the presence of corruption, central bank independence might not be the optimal institutional design. Even if an independent central bank is constituted, the government has the incentive to strategically accumulate debt in an attempt to indirectly ‘force’ the central bank to pursue an expansionary monetary policy. The channel of transmission lies on the central bank’s output considerations. Consequently, economies faced with higher bureaucratic corruption that set independent central banks should observe rising levels of debt and higher levels of inflation *vis a vis* others with higher institutional quality. This result provides an explanation for the poorer inflation performance of especially developing and emerging economies that moved towards central bank autonomy.

The testable hypothesis to be analysed here is whether central bank independence ‘ties’ the hands of the government, by looking at the debt responses of economies that moved towards a more independent monetary institutional design.

#### 3.1 Method

The methodology adopted bears similarities with the cross-sectional growth models where initial GDP levels are used to examine the existence of “ $\beta$ -convergence”, as for example in Barro (1991). The empirical investigation of our argument involves estimating the effect of bureaucratic corruption on debt after an important central bank reform in a cross-sectional setting. This is conducted as follows. Suppose a country had a decisive CB reform at some point in time, say  $\tau$ . We then calculate the average debt-to-GDP of 3 years before the reform (including the year  $\tau$ ) and the average debt-to-GDP level corresponding to 3 years after the reform. Hence, for each country we have,

$$DB = \frac{d_{\tau-2} + d_{\tau-1} + d_{\tau}}{3}$$

$$DA = \frac{d_{\tau+1} + d_{\tau+2} + d_{\tau+3}}{3}$$

where  $d_t = D_t/GDP_t$  corresponds to the debt-to-GDP ratio and  $DB$  and  $DA$  correspond to averages of 3 years before and after respectively.

The starting point of the empirical analysis of the regime shift is captured by model (1).

$$DA_i = \alpha + \beta QUAL_i + \gamma X_i + \delta DB_i + \epsilon_i \quad (1)$$

Despite being a snapshot analysis, there is a time-dimensional element generated by  $DB_i$  and essentially by the timing of the reform. This specification allows for an implicit long-run effect of corruption and control variables on debt, given that  $\delta < 1$ .

Driven by the empirical results, discussed in section 4, we also investigate the following specification, in which we impose the restriction that the coefficient of the 3-years before the reform average debt-to-GDP ratio is unity ( $\delta = 1$ ). Hence, we do not allow for the existence of long-run effects.

$$DD_i = \alpha + \beta QUAL_i + \gamma X_i + u_i \quad (2)$$

where  $DD_i = DA_i - DB_i$  and can be viewed as a gross measure of deficit as a share of GDP.<sup>20</sup>

Our last specification investigates the impact of corruption in the growth rate of debt, after the monetary policy regime shift takes place. This specification scales for the ‘initial’ (3-year average before the reform) debt-to-GDP level, and hence acknowledges the impact of  $DB_i$  on all variables, including the variance of the error term.

$$GD_i = \alpha + \beta QUAL_i + \gamma X_i + \varepsilon_i \quad (3)$$

where  $GD$  is the percentage change in the average 3 years before and after debt-to-GDP ratio, calculated as  $GD = \frac{DA-DB}{DB} \times 100$ .

$QUAL$  reflects the level of corruption (quality) of each country and  $X$  consists of a set of control variables. Subscript  $i$  refers to each observation (country and reform) in our sample, thus countries with two central bank reforms are treated as different observations. The choice of 3 years averaging was merely driven by debt data availability. Although not presented here, using 4 and 5 years averages does not qualitatively affect our results, but increases the cases with missing data.<sup>21</sup>

### 3.2 Data

Our country sample consists of 77 countries, 23 advanced and 54 developing. Central bank reform dates span from 1989 to 2002. 29 countries had two reforms during the examined period which raises the number of observations in the model to  $i = 106$ . Developing countries come from all geo-economic regions and provide for a very diverse sample, as analysed in the previous section. Countries are classified into geo-economic and income groups according to Jaimovich and Panizza (2006). Appendix B presents the country sample and the reform dates.

#### Debt

Collecting public debt data for a big set of countries over a balanced time period is a cumbersome task. Most available debt data sets are incomplete (e.g. International Financial Statistics (IFS), World Bank Indicators), both in terms of cross-sectional and time series coverage. A more extensive data set on external debt is available. However, as we are interested in total, domestic and external, public debt and the evolution of external debt might not be a good indicator for overall debt we cannot use this data set. To our knowledge, the most complete publicly available data set, which we use in this study, is provided by Jaimovich and Panizza (2006) (hereafter JP). Their debt data set refers to central government debt (both external and domestic) as a share of GDP. A separate GDP column is available, measured in current billion USD. JP data refer to gross central government debt. For more information regarding JP data and their methodology see Jaimovich and Panizza (2006).

<sup>20</sup>Following Campos, Jaimovich, and Panizza (2006), we also estimate a different deficit specification, in which GDP changes are isolated. The results remain the same as in (2).

<sup>21</sup>Even with 3 years averages, we have missing debt data for the pre-reform period for Albania (1996), Chile (1989), Czech (1993), Georgia (1996), Hungary (1991), Kenya (1997), Latvia (1992), Moldova (1995), Poland (1992), Slovak Republic (1993) and Slovenia (1991).

## Bureaucratic Corruption

As a proxy for bureaucratic corruption (*QUAL*), we use the most widely known index, the Corruption Perception Index (CPI) of Transparency International (TI) as of 2005. This is the only year that we have data for the whole country sample. Notwithstanding, since corruption is a feature that changes very sluggishly over time this is not a major drawback. In this index, corruption is defined as the abuse of public office for private gain and it does not distinguish between administrative and political corruption. CPI-TI assesses and ranks countries in terms of the degree to which corruption is perceived to exist among public officials and politicians, drawing on different polls and different surveys among business people, academics and risk analysts. The index is computed as the simple average of the number of different surveys. It ranges from 0 (absolute corruption) to 10 (perfect institutional quality). More information regarding the methodology of CPI-TI is provided by Lambsdorff (1998) or [www.transparency.org](http://www.transparency.org).

## Central Bank Independence

In our model CBI is primarily proxied as a point in time. Data on central bank reform dates have been collected from official Central Bank websites, legal databases and a set of reference papers. Inflation Targeting (IT) adoption dates are treated as central bank reforms as well. Appendix B provides a list with the reforms, the amended acts and the relevant sources.

Despite the fact that a central bank reform is undisputable, each reform gave a different level of independence, and it is in high levels of CBI that the government has a higher incentive to strategically accumulate more debt. We accommodate for this feature with the introduction of a dummy variable that categorises the reformed countries according to the level of independence given by the new Act, as measured by the GMT-index. We use a dummy, instead of the actual level of CBI, to ameliorate the subjectivity biases created by combining many different sources, as well as own calculations. We then interact this dummy with the level of corruption (quality) of each country, allowing us to investigate the effect of corruption on debt at different stages of central bank independence. Our CBI dummy is grouped in 4 categories for high, upper medium, lower medium and low independence ( $IHIGH_i, IUMED_i, ILMED_i, ILOW_i$ ). The GMT-index is measured in a 0 (no CBI) to 16 (full CBI) scale, by adding up its two components (political and economic autonomy). The categorisation of the countries into the 4 classes was mainly based on deriving somehow equal size groups, while keeping the level of CBI as coherent as possible. The majority of the countries fall into the middle category, which triggered a further split into upper medium ( $IUMED$ ) and lower medium ( $ILMED$ ). There is no country with a 0 score (the least independent is Qatar with a score of 3) nor with 16. More precisely,

$$\begin{aligned} IHIGH &= \begin{cases} 1 & \text{if CBI} \geq 13 \\ 0 & \text{otherwise} \end{cases} & IUMED &= \begin{cases} 1 & \text{if } 11 \leq \text{CBI} \leq 12 \\ 0 & \text{otherwise} \end{cases} \\ ILMED &= \begin{cases} 1 & \text{if } 8 \leq \text{CBI} \leq 10 \\ 0 & \text{otherwise} \end{cases} & ILOW &= \begin{cases} 1 & \text{if CBI} \leq 7 \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

## Control Variables

The vector  $X$  includes a set of control variables that could be affecting the evolution of the debt-to-GDP ratio, other than corruption.

Since our dependent variable refer to debt as a share of GDP, variations in GDP could be affecting  $DA_i$ ,  $DD_i$  and  $GD_i$  negatively. Hence, we construct a control variable,  $GRGDP_i$ , as the percentage change of annual average real GDP between 3 years before and after the CB reform for each country, following the same process as with  $GD_i$ . Constant price GDP data are obtained from the IFS series of the IMF and the World Development Indicators of the WB.<sup>22</sup> Following the same reasoning, inflation could be impacting our dependent variable. However, the effect of inflation in different countries' debt to GDP ratio, difference or growth rate is unclear. Some countries have indexed debt, so inflation is already accounted for, though for others with non-indexed debt, we would expect variations in the rate of inflation to be affecting the different measures of debt (as a share of GDP) negatively.  $INF_i$  is constructed the same way as  $GGDP_i$ , using CPI data (IFS, IMF), thus,

$$INF_i = \frac{PA_i - PB_i}{PB_i} \times 100, \quad PA = \sum_{t=\tau+1}^{\tau+3} P_t/3 \quad \text{and} \quad PB = \sum_{t=\tau-2}^{\tau} P_t/3$$

Furthermore, we control for the exchange rate regime of each country, since the more rigid the regime, the less scope for discretionary monetary policy. In this case, a strategic manipulation of debt by the government will not affect monetary policy, i.e. it will not induce the CB to respond. The government being aware of that, will not necessarily use debt policy in such a way. The exchange rate regime of each country was drawn by the de facto classification of Bubula and Ötoker Robe (2002). Firstly, we include an exchange rate dummy ( $EX_j, j = 1, 2, 3, 4, 5$ ) identifying 5 different exchange rate regimes that were in place or were introduced at the time of the CB reform; Namely,  $EX1$  for fixed pegs,  $EX2$  for horizontal bands,  $EX3$  for crawling pegs and crawling bands,  $EX4$  for tightly managed floats, and  $EX5$  for managed and independent floats. In cases where a central bank reform was accompanied by an exchange rate regime shift, we categorise the country according to the new regime. The majority of countries fall into the last category, with some of the intermediate cases having a small number of countries. Hence, we also include a broader categorisation of regimes,  $EXFIXED$ ,  $EXINTER$ ,  $EXFLOAT$ , for fixed, intermediate and floating ones.

Financial or currency crises are also accounted for, since they have sizeable effects on the debt accumulation of the affected countries. For instance, the Asian financial crisis of 1997 caused Indonesia's debt-to-GDP to increase by 235% between 1997-1998. The crisis dummy ( $CRISIS_i$ ) gives a value of 1 to those countries which experienced a financial or currency crisis during the years of interest, that is, around the time of the central bank reform, and a value of 0 otherwise. This dummy variable is capturing all the major crises that occurred during the 1990s and beginning of 2000, since, in the majority of the cases, the aftermath of the crisis initiated the introduction of a new monetary policy framework, usually accompanied by an exchange rate regime shift. The monetary design change was verified with a new or amended Central Bank Act, or with a move to an inflation targeting regime. We would expect the effect of this variable on  $GD_i$  to be positive. In addition note that since both public debt and GDP are measured in current USD, if a country's overall debt has a large part of foreign currency denominated debt, a sizeable currency devaluation would over-state the size of the debt-to-GDP ratio.

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<sup>22</sup>GDP deflator data from the WDI were taken for Russia, Moldova, Ghana and Rwanda.

Furthermore, we also control for the initial debt level of each country. For (1) this is captured by  $DB_i$ , the 3 years before the reform average of debt-to-GDP ratio. For (2) and (3) we introduce a dummy for countries that are highly indebted.  $HIGHDB_i$  takes the value 1 if the country's 3 years before the reform average debt-to-GDP ratio exceeds 80%. Countries with excessive debt-to-GDP ratios are facing a set of different challenges; due to credit or other constraints, they might not be able to issue more debt, but at the same time it could be difficult to implement a drastic debt disaccumulation policy. Overall, countries with high starting debt/GDP levels experienced small decreases after the reforms. A similar control variable accounts for the Heavily Indebted Poor Countries initiatives, initiated in 1996 and further enhanced in 1999. This is a scheme of debt relief launched by the IMF and World Bank, to ensure sustainability of external debt for Heavily Indebted Poor Countries (HIPC). After eligibility for this scheme (decision point) is granted to a country, usually it takes some time until the creditors start providing the full size of the decided debt relief (completion point).<sup>23</sup> We introduce the  $HIPC_i$  dummy for countries that have their decision or completion points under the two HIPC-initiatives included in the period examined. This dummy variable, although an almost perfect subset of  $HIGHDB_i$ , reflects a very different feature that impacts debt levels and growth rates.

Finally, we also include separate country dummies to exclude the possibility of outliers or exceptional cases affecting the results, and to assess the impact of individual countries on debt. The countries included in these dummies and the motivation for this is further explained in the following sections. Appendix C provides detailed information of the countries included in each control variable and sources documentation.

## Summary Statistics

Table 4 presents summary statistics for the whole country sample, as well as for the sub-groups of countries under the *CRISIS*, *HIPC* and *HIGHDB* clusters, and for each geo-economic region. Table 5 shows pair-wise correlations across the main variables and 6 depicts scatter plots.

The two measures of debt evolution,  $DD$ ,  $GD$  are significantly positively correlated.  $GD$  is scaled by the initial debt-to-GDP-ratio ( $DB$ ), therefore, it is relatively greater compared to  $DD$  when  $DB$  is low and vice versa. The selection of  $GD$  can, therefore, be considered more preferable, since it allows for a better cross-country comparison, given the great variation of the initial debt/GDP levels in our sample. As an illustration, let us consider the cases of UK (1992) and Hungary (1991). The difference in the debt-to-GDP ratio before and after their reform is around 10% for both countries ( $DD_{UK} = DD_{HUN} \simeq 10\%$ ). Since the initial (3-year before) debt over GDP for the UK is 33%,  $GD_{UK} = 30.8\%$ , whereas for Hungary  $DB$  is substantially higher at 73%. Thus, the growth rate of debt-to-GDP for Hungary is much different and equal to  $GD_{HUN} = 13.8\%$ .

The mean rate of growth of average debt-to-GDP for 3 years before and after the reform ( $GD$ ) is 5.8%, though the maximum is 87% and corresponds to Kyrgyz Republic (1997) which is included in the *CRISIS* dummy and the minimum is -62% for

<sup>23</sup>After the decision point is met, interim relief may start on the debt service falling due. Debt relief refers to either debt cancelation or debt restructuring. For more information of on the HIPC initiative see [www.worldbank.org/hipc](http://www.worldbank.org/hipc) and IMF and WB (2005).

Sierra Leone which revised its CB Act soon after the civil war ended and is part of the *HIPC* cluster. Average *DD* is slightly negative. The 3 years-average Debt/GDP after the reform (*DA*) is 60% for the whole country sample, with Nicaragua (NIC1 1992) having the highest value.<sup>24</sup> Countries that experienced a crisis during the examined period have a much higher average debt evolution (both *GD* and *DD*) compared to the overall sample, although average *GD* and *DD* for countries under the *HIPC* initiative is considerably lower.

The average quality of institutions, as measured by the corruption perception index, for the whole sample is 5.2, ranging from severe corruption (1.9 for Nigeria) to almost no corruption (9.7 for Iceland). The overall average level of central bank independence is 10 (in a 0 (no CBI) - 16 (full CBI) scale). Average corruption for the group of countries hit by a currency/ financial crisis is relatively lower to the overall average, though much lower for the heavily indebted poor countries. In terms of independence the *CRISIS* group scores a bit higher than the overall one, but the *HIPC* one scores the lowest.

Turning to the geo-economic classification, the *IND* group, which consists of 36 observations (23 advanced countries) has the highest average quality and central bank independence levels. *MENA* (7 countries) is the second group in terms of quality levels, but ranks last regarding central banks' independent status. The Eastern European and Central Asia (*ECA*) and Latin America and Caribbean (*LAC*) regions, despite being characterised by fairly low average institutional quality, proceeded to noticeable central bank reforms in the 1990s giving decisive steps towards independence. East Asia and Pacific (*EAP*) has a higher level of institutional quality compared to *ECA* and *LAC*, but much smaller central bank independence. Finally, Sub-Saharan countries (*SSA*) have the lowest *QUAL* and the second lowest *CBI*. The crisis incidents are evenly allocated among the *IND* (*ERM* crisis), *ECA* (Russian/ Asian crisis spillovers), *EAP* (Asian crisis) and *LAC* (individual banking/ currency crises). *HIPC* is equally split between *SSA* (Ghana, Rwanda, Sierra Leone) and *LAC* (Bolivia, Honduras, Nicaragua). Thus, the *MENA* region entails no crisis-hit nor *HIPC* cases.

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<sup>24</sup>Nicaragua, Kyrgyz Republic and Sierra Leone are some of the countries we account for as outliers in our regressions.

Table 4: Summary Statistics

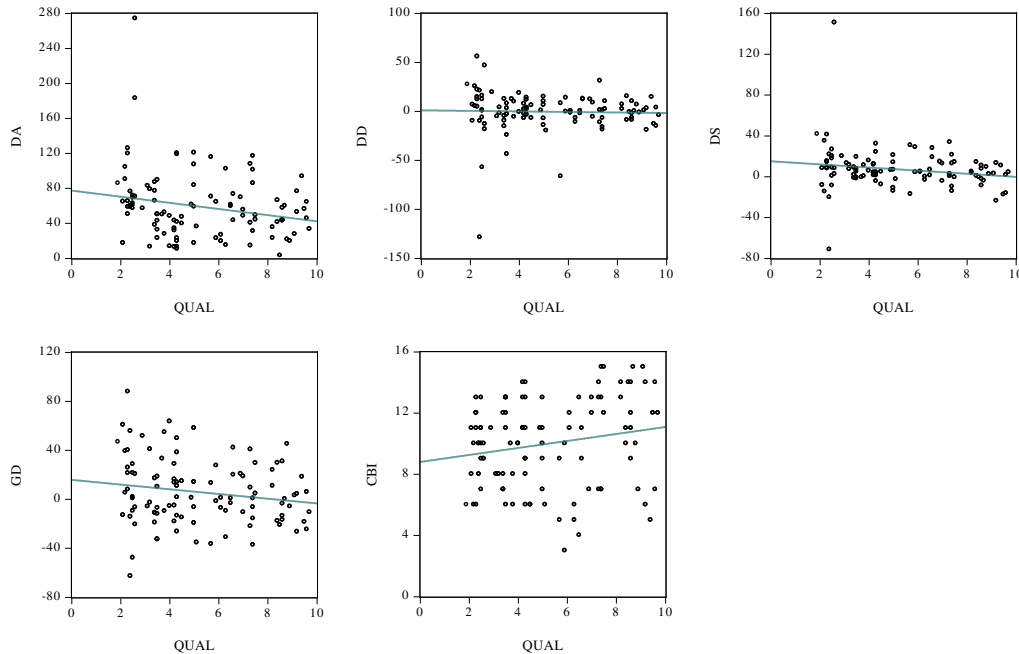
	<i>TOTAL</i>	<i>CRISIS</i>	<i>HIPC</i>	<i>IND</i>	<i>ECA</i>	<i>LAC</i>	<i>EAP</i>	<i>SSA</i>	<i>MENA</i>
Quality	Average	5.215	4.228	2.783	7.753	3.813	4.213	3.058	5.100
	Max	9.700	8.600	3.500	9.700	7.300	9.400	4.500	6.300
	Min	1.900	2.100	2.400	4.300	2.300	2.200	1.900	3.200
	St. Dev.	2.368	2.178	0.426	1.458	1.230	2.373	0.969	1.318
DA	Average	59.197	52.826	93.694	59.951	46.206	59.624	74.032	73.538
	Max	273.93	120.617	182.767	120.617	119.495	273.933	125.801	115.765
	Min	3.100	13.233	60.600	3.100	10.798	13.667	22.862	15.063
	St. Dev.	38.209	31.697	44.764	31.377	28.811	56.602	28.543	32.388
DD	Average	-0.335	12.771	-35.944	0.504	5.411	1.999	-14.646	-11.633
	Max	55.846	55.846	-5.327	31.095	55.846	46.633	25.467	13.896
	Min	-128.68	-9.967	-128.683	-19.046	-15.386	-24.333	-19.792	-128.683
	St. Dev.	20.404	13.546	47.541	10.684	15.891	14.307	13.105	43.512
GRGDP	Average	10.82135	7.497501	20.91861	8.624458	7.917304	9.925094	14.48826	17.81358
	Max	43.90129	33.36041	43.90129	28.02121	17.43486	23.88261	43.90129	41.42411
	Min	-13.9941	-10.1233	8.155366	-1.93189	-10.1233	-5.2845	4.427485	-13.9941
	St. Dev.	9.014027	9.277203	13.46326	5.532199	7.720782	7.104782	10.17074	14.65154
INF	Average	34.878	65.661	39.279	8.400	54.354	75.683	17.999	8.171
	Max	309.71	276.266	74.174	30.582	276.266	309.714	48.158	71.627
	Min	-7.0073	3.843	11.235	-0.038	6.979	6.148	1.748	11.235
	St. Dev.	53.642	85.657	27.203	4.943	64.404	78.196	15.477	18.131
CBI	Average	10.000	10.444	9.000	11.194	10.789	11.083	6.667	6.429
	Max	15.000	13.000	13.000	15.000	14.000	14.000	10.000	11.000
	Min	3.000	6.000	6.000	4.000	8.000	7.000	5.000	3.000
	St. Dev.	2.875	1.977	2.366	2.974	1.686	1.792	1.923	0.888
CRISIS	Average	0.1698	1.000	0.000	0.351	0.263	0.167	0.500	0.000
	No. of countries	18.000	18.000	0.000	5.000	5.000	4.000	4.000	0.000
	Out of total	106.000	18.000	6.000	36.000	19.000	24.000	8.000	12.000
HIPC	Average	0.0566	0.000	1.000	0.000	0.000	0.125	0.250	0.000
	No. of countries	6.000	0.000	6.000	0.000	0.000	3.000	3.000	0.000
	Out of total	106.000	18.000	6.000	36.000	19.000	24.000	8.000	7.000
HIGHDB	Average	0.1981	0.056	0.833	0.194	0.053	0.125	0.000	0.571
	No. of countries	21.000	1.000	5.000	7.000	1.000	3.000	0.000	4.000
	Out of total	106.000	18.000	6.000	36.000	19.000	24.000	8.000	12.000

Among the three different dependent variables, *DD* has the smallest (and insignificant) direct correlation with Quality. All others are negatively correlated with Quality, albeit quantitatively small. As expected, *DB* and *DA* are strongly positively correlated, a figure that will also be verified in our estimation results. There is a weak positive correlation between institutional quality and central bank independence. This reflects recent developments, by which quite a few countries with relatively high corruption put forward ambitious central bank reforms. This is especially the case among Latin America and former socialist economies. The positive correlation between institutional quality and independence could explain the negative correlation of CBI with all dependent variables (except for *DD*).

Table 5: Pair-wise correlations among main variables

Corr. (Prob.)	QUAL	DA	DB	DD	GD	CBI
QUAL	1					
DA	-0.217 (0.025)	1				
DB	-0.187 (0.054)	0.869 (0.000)	1			
DD	-0.032 (0.748)	0.131 (0.182)	-0.377 (0.000)	1		
GD	-0.171 (0.079)	0.034 (0.727)	-0.354 (0.000)	0.774 (0.000)	1	
CBI	0.188 (0.053)	-0.251 (0.009)	-0.268 (0.006)	0.066 (0.502)	-0.028 (0.774)	1

Figure 6: Scatter Plots among main variables



Outlier countries are easily depicted from the scatter plots. These are predominantly, Nicaragua, Sierra Leone, Kyrgyz Republic, Uganda and Qatar.



## 4 Estimation Results

Equations (1), (2) and (3) are estimated via OLS with White Heteroskedasticity-Consistent Standard Errors and Covariance. In most cases, our model exhibits heteroskedasticity problems as identified by the White Test, which could indicate evidence of non-linearities.

### *Results for DA and DD*

As can be seen from Table's 6 first three columns, regressions using the original equation,  $DA_i = \alpha + \beta QUAL_i + \gamma X_i + \delta DB_i + \epsilon_i$ , indicate that  $DB_i$  is capturing almost all of the explanatory power and in all cases the coefficient of  $DB_i$  is not statistically significantly different from unity. This motivates the use of the first differences in the debt-to-GDP ratio which is obtained by equation  $DD_i = a + bQUAL_i + cX_i + u_i$ . The next three columns of Table 6 show the results using (2).

In all cases, the coefficient of  $QUAL$  is negative, significant in the 5% or 1% level and in the vicinity of 1.5-2%. The real GDP growth rate does seem to be significant, although quantitatively small. The impact of  $INF$  is even smaller. The  $CRISIS$  dummy proves significant under all equations and specifications and accrues positively on debt-to-GDP. On average, we observe that countries hit by a financial crisis have higher debt-to-GDP ratio or debt-to-GDP differences in the range of 6-10 percentage points. On the other hand, the  $HIPC$  dummy seems to be of smaller statistical significance, albeit of a greater magnitude.  $HIPC$  turns insignificant, when we control for specific countries. The dummy variable accounting for a high initial debt level ( $HIGHDB$ ) is included in equation (2), indicating a significantly negative effect. Exchange rate regimes are also never significant, using both ways of dummy categorisation. Selected results are depicted in columns (2) and (5) respectively. Finally, columns (3) and (6) present results after controlling for selected exceptional cases and the effect of  $QUAL$  still remains. The separate country dummies will be further explained in the next section.

The first difference in the debt-to-GDP average ratio is not capturing the effect of the initial debt level, a measure that varies significantly in our sample.  $DD$  is unscaled in this respect, measuring the absolute difference (as a share of GDP) between the debt before and after the corresponding reform, but does not account for the size of this difference based on the initial level. This is avoided with the use of  $GD$ . Hence, Table 7 presents our results using the rate of growth of debt (average 3 years before and after the CB reform) as the dependent variable.

Table 6: Estimation Results for Equations (1) and (2) (No. of Observations 106)

	Equation (1): DA			Equation (2): DD		
	(1)	(2)	(3)	(4)	(5)	(6)
CONST	25.276 (3.253)***	25.425 (2.753)***	22.840 (3.689)***	22.764 (4.124)***	21.141 (4.736)***	18.951 (4.054)***
QUAL	-1.602 (-2.575)**	-1.612 (-2.048)**	-1.543 (-2.924)***	-1.834 (-2.991)***	-1.690 (0.675)**	-1.763 (-3.270)***
DB	0.890 (9.206)***	0.890 (9.188)***	0.876 (12.665)***			
GRGDP	-0.861 (-2.815)***	-0.856 (-2.848)***	-0.569 (-2.748)***	-0.876 (-2.732)***	-0.867 (0.319)***	-0.553 (-2.683)***
INF	-0.041 (-1.410)	-0.076 (-2.138)**	-0.057 (-2.154)**	-0.056 (-1.742)*	-0.069 (0.035)*	-0.069 (-2.432)**
CRISIS	7.803 (1.915)*	9.743 (2.303)**	6.565 (2.615)**	8.608 (2.353)**	9.409 (3.574)***	7.849 (3.596)***
HIPC	-22.888 (-1.709)*	-25.247 (-1.826)*	-9.804 (-1.200)	-23.698 (-1.719)*	-24.462 (13.814)*	-11.219 (-1.553)
HIGHDB				-11.266 (-2.000)**	-11.030 (5.613)*	-9.964 (-2.154)**
EX1		-0.420 (-0.085)				
EX2		-2.308 (-0.718)				
EX3		6.961 (1.189)				
EX4		-1.473 (-0.267)				
EXINTER					4.028 (4.283)	
EXFLOAT					0.262 (3.549)	
NIC1			64.695 (5.401)***			52.256 (11.166)***
SLE			-87.095 (-7.082)***			-97.159 (-10.452)***
KGZ			51.543 (13.699)***			47.484 (17.435)***
UGA			-48.110 (-7.663)***			-48.390 (-8.847)***
<i>R-square</i>	0.832	0.835	0.926	0.411	0.332	0.734
<i>Adj. R-square</i>	0.822	0.818	0.918	0.376	0.261	0.706
<i>SER</i>	16.139	16.308	10.931	16.123	17.535	11.067
<i>F-stat</i>	81.582	48.141	118.800	11.528	4.718	26.194
<i>Prob(F-stat)</i>	0.000	0.000	0.000	0.000	0.000	0.000

Note: t-ratios in parenthesis

\* = 10%, \*\* = 5%, and \*\*\* = 1% levels of significance

### *Results for the growth rate of debt-to-GDP, GD*

Overall, the effect of *QUAL* is significant at the 1% level and ranges between 3.3 and 3.6%. This implies that a decrease in institutional quality (more corruption) by 1 unit will increase the rate of growth of (3-years average) debt-to-GDP ratio by approximately 3 percentage points. Given that average *GD* in our sample is 5.8%, the impact of corruption on debt accumulation is sizeable.

*GRGDP* and *INF* have a negative impact on *GD*, but they are quantitatively small. The dummies for *HIGHDB*, *CRISIS* and *HIPC* are always significant both statistically and quantitatively. As expected, *HIGHDB* and *HIPC* reduce *GD* considerably, though *CRISIS* increases it. Their sizeable effects are attributable to the fact that they include countries with very different debt processes compared to the average. In most countries hit by a crisis, there were marked increases in their debt-to-GDP ratios, in others where *GD* was not largely affected the impact of the crisis is noticed in either their real GDP growth or inflation. Sometimes, the effect of the currency crisis is smoothed with the use of averages, as in the case of Indonesia, where debt/GDP grew by 234% between 1997-98, though *GD* = 39%. Highly indebted countries are experiencing debt decreases after the reforms, a feature observed even more strongly among the Heavily Indebt Poor Countries (*HIPC*).

Columns (2) and (3) of Table 7 include two different types of exchange rate regime dummies, but they all turn to be insignificant. A number of reasons could explain this result. Firstly, we have excluded all currency board arrangements or currency unions (apart from the EMU and some countries in the Rand zone), in which cases there is no scope for discretionary monetary policy.<sup>25</sup> Secondly, regarding the first classification of exchange rates, each regime dummy includes a very different sample both in terms of individual countries and in terms of size. For instance, *EX2* refers to horizontal bands and accounts only for 10 countries, the majority of which were in the ERM system, however, *EX5* includes 52 much more diverged observations. Nonetheless, a more general categorisation of regimes, where  $EXFIXED = EX1 + EX2$ ,  $EXINTER = EX3 + EX4$  and  $EXFLOAT = EX5$ , is not alleviating the results.

In column (4) of Table 7 we follow the growth Barro-type specification more closely by regressing the ‘growth rate’ of debt-to-GDP for a given period using the ‘initial’ debt-to-GDP ratio as one of the regressors. The impact of the before the reform debt-to-GDP is significant and the importance of institutional quality prevails. In columns (5) and (6) we control for some outlier countries, as a means of confirming that the results are not driven by exceptional cases. The first reform of Nicaragua (1992) is a peculiar case that is not included in any of the dummy variables. Despite a huge 3 years-average debt-to-GDP ratio for before 1992 (227%), Nicaragua’s debt/GDP increased further after the reform. Sierra Leone (2000) which apart from becoming a *HIPC*, it went out of a civil war on that year, and both effects contributed to a sizeable debt/GDP decrease, and Kyrgyz Republic (1997), which experienced the highest increase in *GD* due to the negative spill-over of the Russian financial crisis. Despite the exclusion of those countries, the results remain robust with the impact of *QUAL* in the same range as before, however the significance of *HIPC* control disappears in (6).

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<sup>25</sup>Countries of the Euro Area are considered as independent floaters. Alternative specifications were they are classified as a separate group, does not alter the empirical findings.

Table 7: Estimation Results for Equation (3): *GD* (No. of observations 106)

	(1)	(2)	(3)	(4)	(5)	(6)
Const.	35.852 (4.620)***	35.955 (3.540)***	34.068 (4.270)***	38.776 (4.776)***	35.593 (4.538)***	34.007 (4.267)***
QUAL	-3.543 (-3.603)***	-3.416 (-2.903)***	-3.537 (-3.395)***	-3.216 (-3.395)***	-3.496 (-3.527)***	-3.300 (-3.344)***
GRGDP	-0.752 (-2.670)***	-0.766 (-2.721)***	-0.756 (-2.558)**	-0.730 (-2.650)***	-0.737 (-2.613)**	-0.702 (-2.399)**
INF	-0.138 (-2.714)***	-0.160 (-2.500)**	-0.144 (-2.586)**	-0.118 (-2.461)**	-0.146 (-2.787)***	-0.147 (-2.802)***
HIGHDB	-15.228 (-3.452)***	-14.676 (-3.031)***	-14.800 (-3.214)***		-16.959 (-3.984)***	-16.153 (-3.755)***
CRISIS	31.257 (5.624)***	33.315 (5.795)***	31.389 (5.682)***	30.328 (5.210)***	31.828 (5.709)***	29.313 (5.814)***
HIPC	-15.263 (-2.025)**	-16.723 (-2.088)**	-16.282 (-2.089)**	-14.621 (-1.773)*	-13.693 (-1.814)*	-8.738 (-1.303)
DB				-0.142 (-2.157)**		
EX1		0.412 (0.062)				
EX2		-7.841 (-1.631)				
EX3		3.364 (0.537)				
EX4		-2.564 (-0.294)				
EXINTER			3.042 (0.531)			
EXFLOAT			2.516 (0.494)			
NIC1					30.475 (5.247)***	30.780 (5.241)***
SLE						-31.554 (-3.120)***
KGZ						55.204 (10.344)***
<i>R-square</i>	0.455	0.464	0.457	0.450	0.467	0.516
<i>Adj. R-square</i>	0.422	0.408	0.412	0.417	0.429	0.471
<i>SER</i>	20.242	20.493	20.415	20.333	20.131	19.377
<i>F-stat</i>	13.790	8.230	10.207	13.518	12.248	11.368
<i>Prob(F-stat)</i>	0.000	0.000	0.000	0.000	0.000	0.000

Note: t-ratios in parenthesis

\* = 10%, \*\* = 5%, and \*\*\* = 1% levels of significance

### *Results for different levels of Central Bank Independence*

In general, our results are in line with the theoretical implications of the model in Dimakou (2006); more corruption can explain a part of the higher debt-to-GDP accumulation of different countries after more CBI is granted. However, up to now our empirical investigation does not account for the level of independence. The individual Act reforms, although being viewed as reforms in the direction of improved autonomy, gave different degrees of independence to their central banks. Following the hypothesis outlined at the beginning of the section, we would expect the effect of institutional quality to be stronger when high levels of CBI are legislated, rather than when a monetary policy regime shift is only partial. From an empirical point of view, we account for this feature of the model by interacting the quality of institutions with a dummy variable reflecting the level of independence the central bank reform in question gave.<sup>26</sup> This way we can establish the impact of quality on *GD* for 4 levels of CBI. Results are presented in Table 8.

Our empirical results verify this conjecture. The impact of quality on debt-to-GDP accumulation is the highest for the countries that shifted to very high levels of CBI, and gradually decreases as the level of CBI introduced by the central bank reform lessens. The interaction variables of quality with high, upper medium and low CBI are significant under all specifications. According to our results, within the reforms that gave high degree of independence, a unit rise in corruption (lower *QUAL*), increases the change of the debt/GDP ratio by 4 percentage points. Within the group of upper medium CBI, the impact of corruption on debt-to-GDP is around 3.6 points and among the countries that their reforms gave very little independence, the impact of corruption is lower and equal to 2.5. However, the interaction variable *QUAL\*ILMED* turns out to be insignificant and of lower magnitude than expected.

The two clusters that incorporate the smallest reforms, include economies from all geo-economic regions, as well as the majority of low-income countries. The diversity of cases is also reflected on the timing of the reforms. The *ILMED* group includes 5 *IND* countries, which apart from Canada refer to prior to 1995 Act amendments. Reformed central banks from *LAC* and *ECA* are scattered throughout the 1990s, and most of these countries exhibit high corruption levels. The last four countries in the group come from *SSA* and *MENA*. The *ILOW* group is dominated by *SSA*, *MENA* and *EAP* countries. The few *IND* countries refer to either older reforms or to more recent Nordic cases. All the Asian crisis hit and *HIPC* countries are distributed in those two groups.<sup>27</sup>

Concentrating on the level of independence given to the reformed central banks, the *ILMED* group is characterised overall by low political autonomy and its main improvements compared to *ILOW* come from economic autonomy aspects. In that sense, and considering that a certain level of political autonomy is also required for economic autonomy to be more relevant, those two groups that exhibit lower levels of CBI do not differ so much. For this reason, in column (2) of Table 8 we add the last two groups of CBI and the lack of significance is no longer observed. With three categorisations for the level of CBI, all interaction variables are significant and the impact of worsening

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<sup>26</sup>Ideally, we would be interested in the change in CBI, rather than the absolute degree the new law gave. However, unavailability of information regarding the level of independence before the reform does not allow us to explore this issue.

<sup>27</sup>Bolivia is classified as *HIPC* and is incorporated in the *IHIGH* group.

Table 8: Estimation Results for Equation (3): *GD* using CBI levels (No. of observations 106)

	(1)	(2)	(3)	(4)	(5)	(6)
Const.	33.612 (4.215)***	34.150 (4.407)***	36.802 (4.809)***	36.673 (4.757)***	34.569 (4.421)***	38.883 (4.807)***
QUAL						
GRGDP	-0.776 (-2.808)***	-0.773 (-2.860)***	-0.821 (-2.932)***	-0.805 (-2.881)***	-0.772 (-2.662)***	-0.792 (-2.891)***
INF	-0.135 (-2.480)**	-0.133 (-2.497)**	-0.137 (-2.555)**	-0.144 (-2.634)***	-0.146 (-2.665)***	-0.116 (-2.299)**
HIGHDB	-16.415 (-3.574)***	-16.882 (-3.633)***	-15.849 (-3.359)***	-17.645 (-3.847)***	-16.713 (-3.616)***	
CRISIS	31.226 (5.569)***	31.455 (5.782)***	32.141 (5.746)***	32.757 (5.849)***	29.922 (6.088)***	31.329 (5.286)***
HIPC	-15.277 (-2.116)**	-14.610 (-1.963)*	-14.227 (-1.886)*	-12.530 (-1.658)	-8.030 (-1.174)	-14.247 (-1.680)*
QUAL*IHIGH	-3.988 (-4.026)***	-4.071 (-4.266)***	-4.384 (-4.641)***	-4.358 (-4.582)***	-4.216 (-4.429)***	-4.032 (-4.421)***
QUAL*IUMED	-3.616 (-3.301)***	-3.723 (-3.556)***	-4.098 (-3.910)***	-4.065 (-3.853)***	-3.659 (-3.573)***	-3.637 (-3.644)***
QUAL*ILMED	-1.733 (-1.027)		-3.568 (-2.710)***	-3.651 (-2.774)***	-3.121 (-2.420)**	-3.130 (-2.411)**
QUAL*ILOW	-2.549 (-2.275)**		-2.999 (-2.760)***	-2.926 (-2.695)***	-2.686 (-2.514)**	-2.592 (-2.277)**
QUAL*ILMED+ QUAL*ILOW		-2.326 (-2.015)**				
DB						-0.138 (-2.008)**
EXFIXED						
EXFLOAT						
AUS			50.810 (6.497)***	51.527 (6.601)***	48.570 (6.190)***	46.409 (5.617)***
MLT1			45.097 (7.679)***	45.576 (7.773)***	43.608 (7.202)***	43.567 (7.320)***
NIC1				30.603 (4.865)***	30.477 (4.844)***	
SLE					-29.644 (-2.863)***	
KGZ					57.156 (10.062)***	
<i>R-square</i>	0.487	0.484	0.533	0.545	0.595	0.523
<i>Adj. R-square</i>	0.438	0.441	0.479	0.486	0.535	0.467
<i>SER</i>	19.955	19.911	19.224	19.091	18.208	19.449
<i>No of Observ.</i>	106	106	106	106	106	106
<i>F-stat</i>	10.110	11.353	9.770	9.275	9.542	9.351
<i>Prob(F-stat)</i>	0.000	0.000	0.000	0.000	0.000	0.000

Note: t-ratios in parenthesis

\* = 10%, \*\* = 5%, and \*\*\* = 1% levels of significance

quality as the level of CBI is higher on the rate of debt accumulation increases.

In order to identify the underlying reasons for the insignificance of the ILMED

dummy, we examine closely the composition of countries in this group. Firstly, it is the group with the lowest standard deviation in quality levels, a feature driven by the lack of high quality countries relative to the other groups. Australia (AUS 1993) and Malta (MLT1) have the highest and *fourth* highest quality in the *ILMED* group, though they rank 9th and 23rd in the overall sample respectively. At the same time, both countries experienced sizeable increases in their debt-to-GDP-ratio after their central bank reforms, which are not accounted for in the *CRISIS* dummy. They both suffered from severe recessions around the time of their reforms which caused substantial debt increases.<sup>28</sup> In column (3) of Table 8 we control for those two countries with the use of separate country dummies and we do observe that the effect of quality within the lower medium levels of CBI gets significant both statistically and quantitatively.

Nicaragua (NIC1 1992) and Sierra Leone (SLE), countries we have been controlling for in all previous regressions, are in the *ILMED* group. We control for those (as well as Kyrgyz) and conclude that the effect of quality in all levels of independence remains significant. The effect and significance of all other control variables does not change from the regressions of Table 7. Exchange rate regime dummies, although not presented here, are again insignificant without altering the main findings. On the other hand, *GRGDP* and *INF* are significant, albeit of small size. The rest three dummies, *HIGHDB*, *CRISIS* and *HIPC*, are in all specifications significant quantitatively and statistically.<sup>29</sup>

The results of Table 8 suggest the presence of non-linearities in the impact of bureaucratic corruption on debt at different levels of CBI. In testing the significance of these non-linearities we perform a set of coefficient restriction tests (Wald test) and factor breakpoint tests. The results are mixed. In all specifications, the significant difference among the coefficient of *IHIGH* and *ILOW* is confirmed. Further, when Nicaragua, Sierra Leone and Kyrgyz are excluded, the factor breakpoint test suggests that the breaks, as identified by the four independence clusters, are significant.

We perform different robustness checks and the results remain unchanged. Firstly, we perform the analysis for different measures of debt, as shown in equations (1), (2) and (3), and quality constitutes a significant factor. Secondly, as depicted in Appendix D, we exclude all the countries that were hit by a currency crisis (*CRISIS*) and the ones that were accepted in the Heavily Indebted Poor Countries initiatives (*HIPC*), and we find similar results. Furthermore, regressions are run for all of the three specifications, excluding the observations where residuals were above (below) 1.5 and 2 standard deviations from the regression line. This way we isolate the effect of outliers or extraordinary individual cases. Again, as it can be seen from Appendix D, the results remain robust.

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<sup>28</sup>In the case of Australia, the reform date, although widely accepted as the IT date, refers to the unilateral decision of the Reserve Bank to follow an inflation targeting regime. Another widely accepted view is that the recession was responsible for the drop of inflation and hence for the success of the IT regime, which followed the recession. See for instance Macfarlane (1998)

<sup>29</sup>Again, *HIPC* becomes insignificant when all separate country dummies are included.

## 5 Conclusion

Central bank independence has become a common formula for the elimination of inflationary boosts and fiscal dominance phenomena in the past couple of decades in both the developed and developing world. An analysis of the changes in the legal status of central banks, as envisaged in the central bank acts, demonstrates the extent of frequency and gravity of such reforms that took place during 1990s and beginning of 2000s. We investigate the evolution of central bank reforms during that period for a set of 77 countries, 23 advanced and 54 developing per geo-economic group.

Advanced economies attain the highest levels of central bank independence, followed by ECA (Europe and Central Asia) and LAC (Latin America and Caribbean). Increased independence in the advanced group is merely attributed to the Euro Area economies and the legal requirements for integration into the European Monetary Union which proclaimed for specific amendments to ensure both economic and political autonomy of central banks. Moreover, and perhaps contrary to conventional wisdom, ECA and LAC rank higher than the non-Euro advanced economies. Those two regions, although driven by different political and/or economic considerations achieved marked increases in the legal independence of their monetary policy making. The last three geo-economic groups studied, namely MENA (Middle East and North Africa), EAP (East Asia and Pacific) and SSA (Sub Saharan Africa), have substantially lower levels of independence, despite recent attempts for improved autonomy and modernisation of central banking.

However, despite the uniformity of such a process towards increased independence, monetary and fiscal performance has been very diverse. We ascertain that corruption can interact with fiscal policy by shifting the financing of government spending and can be responsible for expanding debt processes of economies that constitute independent central banks. In a cross-sectional setting, central bank independence is primarily approximated as that point in time that a decisive reform took place. We then explore the impact of bureaucratic corruption in the evolution of debt, gross deficit and debt accumulation before and after that point.

Consistent with the theoretical underpinnings of Dimakou (2006), quality of institutions is an important factor in explaining cross-country debt-to-GDP growth. After an important central bank reform and controlling for a set of other factors, we find that more corruption leads to higher debt accumulation. More importantly, complementing the analysis with a measure for the level of independence each reform gave strengthens the results; the impact of corruption is greater, the higher the independence that was granted. Thus, we provide evidence that the impact of corruption on debt exhibits non-linearities. The results are robust to a set of control variables and different specifications and sub-samples.

Our empirical findings on the impact that bureaucratic corruption has on fiscal responses, given a monetary policy reform, can explain the lack of a consistent relationship between central bank independence and inflation. This is further strengthened by the findings of Al-Marhubi (2000) that confirms the adverse impact of corruption on inflation for a set of 41 countries. Thus, improving the quality of institutions is vital in order to avoid sharp increases of debt after monetary policy reforms, and any adverse



implications such a fiscal policy stance may have on the actual autonomy of monetary policy making or price stability. Quality of monetary and fiscal institutions can be considered as complements, rather than substitutes, hence attention should be directed to improving the quality of both the monetary and the governmental institutions and not the one or the other alone.

## A Appendix

### Central Bank Independence, Methodology and Evolution

#### A.1 Appendix GMT-index

Table A.1: GMT Criteria

	<i>Political Autonomy (PA)</i>
(1)	Governor appointed without government involvement
(2)	Governor appointed for more than 5 years
(3)	Board appointed without government involvement
(4)	Board appointed for more than 5 years
(5)	No mandatory participation of government representatives in the Board
(6)	No governmental approval is required for formulating MP
(7)	Requirements forcing CB to pursue monetary stability among its primary objectives
(8)	Legal protections strengthening CB's position in case of conflict with government
	<i>Economic Autonomy (EA)</i>
(1)	No automatic procedure for government to obtain direct credit facilities from CB
(2)	Direct credit facilities extended at market rates
(3)	Credit on a temporary basis
(4)	Credit of limited amount
(5)	CB does not participate in primary market for public debt
(6)	CB is responsible for setting the Discount Rate
(7a)	CB has no responsibility for overseeing the banking sector
(7b)	CB shares responsibility with other institutional entities

#### A.2 Advanced Economies

The following graphs depict the evolution of CBI per country using available data from Grilli, Masciandaro, and Tabellini (1991), Tavelli, Tullio, and Spinelli (1998) and Arnone, Laurens, and Segalotto (2006).

We measure the level of central bank independence using the GMT-index for the following countries: Luxembourg, Finland, Iceland, Malta Norway and Sweden. We abstract from assessing the level of independence for the two EMU-members, since due to harmonisation, their score would be very close to the one obtained by the rest EMU-participants (in the proximity of 14).

The core of the CB Act of Iceland dated back to 1986, when the discussions for a reform started in 2001. As analysed in Petursson (2000) Iceland (and Norway) scored among the lowest in many aspects of CBI, as examined by Fry, Julius, Mahadeva,

Figure A.1: CBI Evolution in Euro Area (10) economies

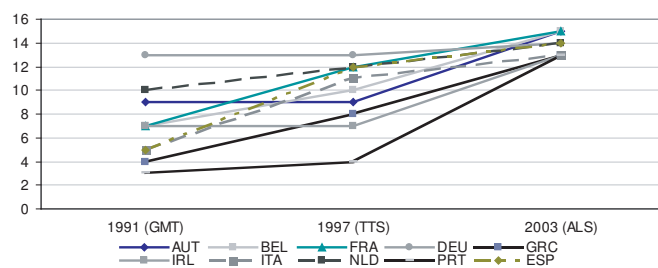
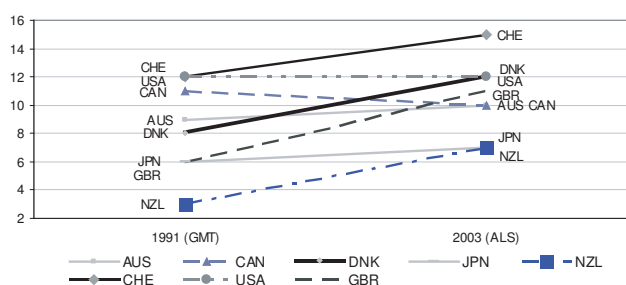


Figure A.2: CBI Evolution in non-Euro Advanced Economies



Roger, and Sterne (2000) as of 1998. The new Act that came in force in May 2001 upgraded the level of both political and economic autonomy substantially. Price stability became the main objective of monetary policy and an IT regime was adopted; the term in office of the Board was extended and the composition of the main governing bodies changed. Also, in the area of economic autonomy, instrument independence was formulated, together with a de facto ban on CB credit to the public sector. The CB Reform ended in an increase in the level of CBI of Iceland, comparable with the ones of the rest of advanced economies. Norway has also been characterised by limited CBI, especially in terms of political autonomy, as suggested by both JP-Morgan (2000) and Lybek and Morris (2004) with political appointment of governors, no clear mandate of objectives, need of governmental approval and no prohibition of monetary financing. Since 2001, Norwegian government has defined an inflation target of 2.5% (Government Regulation, March 2001), however, the amendment of December 1999 (in effect from April 2000) did not provide for a decisive step towards legal CBI.<sup>30</sup> Sweden, though it opted out of the EMU it amended the CB Act in January 1999 attaining a level of CBI similar to the EMU-members. CBI evolution can also be captured by comparing the Tavelli, Tullio, and Spinelli (1998) GMT-score as of 1997 and the one constructed by us. The level of CBI in Sweden increased from 6 in 1997 to 14 in 1999. Malta has had two important amendments to the CB status, in 1994 and 2002, with the latter being driven by the aspiration of EU-participation. The 2002 CB reform prohibited monetary financing and gave to Malta the maximum score in

<sup>30</sup>Even the 2003 CB Act Amendment does not improve the legal status of the Norges Bank in the political autonomy aspect. Still important monetary policy decisions have to be submitted to the Ministry, and there is no clear mandate of price stability, rather the CB shall conduct its operations in accordance with the economic policy guidelines of the government. The most relevant amendment of this reform refers to the prohibition of CB direct credit to the government, a provision that came in force from 1 January of 2005. However, due to the lack of data for the rest of variables, the 2003 reform is not included in our empirical analysis.

terms of economic autonomy. Less advances were achieved in the sphere of political autonomy, while price stability became the primary objective. Note, however, that the criteria required by EU for EMU participation differ from the ones of the GMT-index; for instance, the GMT-index is giving a score only if the term in office of the Governor or the Board is (strictly) more than 5 years, though the EU treaty does not prescribe such a condition.

Table A.2: GMT-index recent CB Reforms - IND

<i>Political Autonomy</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
ISL	2001		1		1	1	1	1		<b>5</b>
MLT1	1994					1	1	1		<b>3</b>
MLT2	2002					1	1	1		<b>3</b>
NOR	2000		1			1		1		<b>3</b>
SWE2	1999		1	1	1	1	1	1		<b>6</b>
<i>Economic Autonomy</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
ISL	2001	1	1	1	1		1	1	1	<b>7</b>
MLT1	1994	1		1	1		1	1	1	<b>6</b>
MLT2	2002	1	1	1	1	1	1	1	1	<b>8</b>
NOR	2000	1					1	1	1	<b>4</b>
SWE2	1999	1	1	1	1	1	1	1	1	<b>8</b>

GMT-index constructed using the CB Acts as reported in Table B.1, except for Sweden (Act amended as of 2006) and Norway (available Act No.43 of 2005, but used the provisions as amended in 2000 (for EA(1)-(5)) after communication with the Norges Bank.)

### A.3 Europe and Central Asia (ECA)

#### A.3.1 Updated GMT-index for selected ECA countries

Maliszewski (2000) does not report recent GMT-index data for Czech Republic (1998), Latvia (1998), Slovak (2001), Slovenia (2002), as well as Cyprus (2002) and Turkey (2001). The CB reforms in Czech Republic, Latvia, Slovenia and Slovakia follow the initial major reforms in the beginning of 1990s which focused at the transition from plan to market. The new reforms aim at further improving the level of CBI in line with recent practices worldwide. For Czech we use the Arnone, Laurens, and Segalotto's (2006) GMT-index, which shows that the CBI increase is attributable exclusively to improvements in economic autonomy. At the same time (January 1998) the Czech National Bank signaled a new monetary policy framework and started explicit inflation targeting. For Latvia, the 1998 CB Act amendment explicitly prevents the Minister of Finance from temporarily postponing decisions of the Board (Art 25), and prohibits direct credit to the government (Art 30). In Slovenia, the 2002 amendments improved EA and specifically prohibited government deficits monetisation; PA was already at a very high level, though responsibility for banking supervision still remains within the CB.

In Slovak, Act No. 149/2001 took effect as of 1 May 2001 and ensured the full implementation of the *acquis* in terms of independence of the central bank. Apart from that this amendment introduced the prohibition of monetary financing of the public sector. Art. 25 of the Act prohibits overdraft facilities by not allowing a debit balance in the Treasury's accounts with the CB. Nonetheless, there is no provision for CB's

direct participation in the primary debt market. Furthermore, PA in Slovak is still limited. Note, however, that there is a difference between the GMT political criteria and the EU *acquis* requirements with the latter not specifying the years in office for the Board of the CB, just require the political cycle to be bigger. Cyprus's 2002 CB legislation amendment was mainly triggered by EU participation aspiration, and ended in primarily EA improvements. On the other hand, Cyprus CB Act still lags behind especially in terms of political autonomy and ranks among the lowest ones in the region (together with Slovakia). Slovenia and Cyprus (and Malta) joined the EMU in January 2007 and 2008 respectively. The CB reforms of 2007 though are too recent to be included in our empirical analysis and thus we do not assess their improvement in terms of CBI. The Turkish financial crisis of 2000-2001 lead, among other things, to a CB reform which generated a set of amendments, including the primacy of price stability, reorganisation of the CB's Board with the creation of the Monetary Policy Committee (MPC) and prohibition of CB's direct credit to the government.

Table A.3: GMT-index recent CB Reforms - ECA (own calculations)

<i>Political Autonomy</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
CYP	2002					1	1	1		<b>3</b>
LVA2	1998	1	1	1	1	1	1	1		<b>7</b>
SVK2	2001	1				1	1	1		<b>4</b>
SVN2	2002		1	1	1	1	1	1		<b>6</b>
TUR	2001					1	1	1		<b>3</b>
<i>Economic Autonomy</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
CYP	2002	1	1	1	1	1	1			<b>6</b>
LVA2	1998	1	1	1	1	1	1		1	<b>7</b>
SVK2	2001	1	1	1	1		1			<b>5</b>
SVN2	2002	1	1	1	1	1	1			<b>6</b>
TUR	2001	1	1	1	1	1	1	1	1	<b>8</b>

Own calculations assessing the amended Acts as reported in Table B.1 expect for Latvia. In this case, due to unavailability of the 1998 Act, we used the most recent one (last amendment June 2005).

## A.4 Latin America and the Caribbean (LAC)

### Updated GMT-index for selected LAC countries

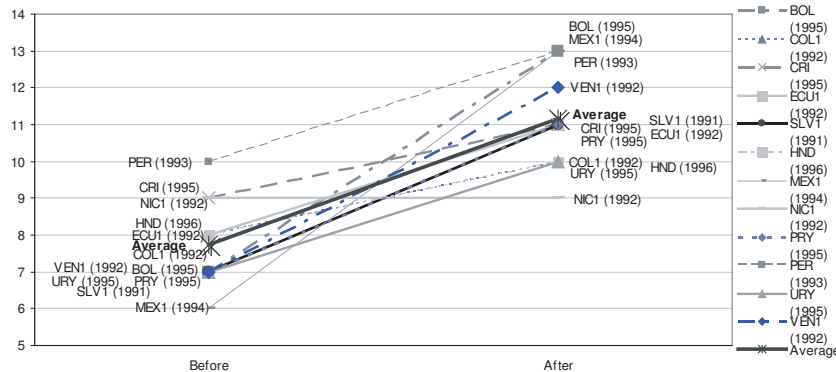
CBI evolution in the region requires the combination of many different sources which results in a few shortcomings the main one being the incompatibility generated due to different authors' subjectivity bias. Each author's interpretation will tend to differ and hence combining the results will create a bias. This seems to be considerably apparent in the case of the LAC countries. We observed many different and contrasting GMT scoring in the cases where laws' assessments of different sources overlapped. The following table presents the own GMT-index calculations. Jácome and Vázquez (2005) give a GMT score for Chile, referred to as the post-1989 reform index, which differs from the own calculated by us. The same applies for Mexico, when comparing ours with the one reported by Arnone, Laurens, and Segalotto (2006). Note that in the case of Mexico, even the one reported by Jácome and Vázquez (2005) for the after 1994 reform is different. If we move further to the disaggregate scores, the situation becomes even more problematic.

In both cases we chose ours GMT-index.

The case of Mexico				
Source	CBR	PA	EA	TA
JV	post-1994	8	5	13
Own	1999	6	6	12
ALS	as of 2003	5	6	11

Figure A.4 uses Jácome and Vázquez's (2005) data to show individual changes in the level of CBI in the region during the first wave of CB reforms of 1990s.

Figure A.3: Changes in the level of CBI in LAC, for the first CB Reform of 1990s



Source: Jácome and Vázquez (2005)

Table A.4 shows the own GMT-index assessment that refers to some recent reforms taking place in the region, namely Chile (1999), Mexico (1999), Nicaragua (1999) and Venezuela (2001). The recent reforms of Nicaragua (NIC2 - 1999) and Venezuela (VEN2 - 2001) gave a GMT-index which does not differ from the one attained by the previous reforms. This could hold either because amendments referred to provisions the GMT-index does not account for (e.g. accountability, transparency) or amendments that did not affect the score or the assessments come from different sources. Finally, in the empirical work, we also take into account the reforms of 1998 and 2000 for Ecuador and Colombia respectively, for which we have no information for the level of central bank independence. Colombia moved to an inflation targeting regime in 2000 without a formal change to the CB status. Actually, an inflation target has been being announced since 1991, however the CB followed a gradual move towards fully-fledged inflation targeting and it was only when the currency was let to float in September 1999 that such a regime became formal.<sup>31</sup>

## A.5 East Asian and Pacific (EAP)

### Updated GMT-index for selected EAP countries

All the reforms in this region are assessed by us. Bank of Indonesia has been formally independent since the passage of the new Act in May 1999 which granted both instrument and goal independence. Apart from being responsible for banking supervision, CB fulfills all other economic autonomy criteria, though political autonomy could be further enhanced. Without having a fully-fledged inflation targeting regime, monetary policy is directed towards keeping headline inflation down, with the adoption of a ceiling inflation target of 5%. China lacks severely in almost all aspects of political

<sup>31</sup>For more details on the implementation of inflation targeting in Colombia see Gómez, Uribe, and Vargas (2002).

Table A.4: GMT-index recent CB Reforms - LAC (own calculations)

<i>Political Autonomy (PA)</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
CHL2	1999		1	1	1	1	1	1		6
MEX2	1999		1	1	1	1	1	1		6
NIC2	1999						1	1		2
VEN2	2001		1		1		1	1		4
<i>Economic Autonomy (EA)</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
CHL2	1999	1	1	1	1		1	1	1	7
MEX2	1999	1	1		1	1	1		1	6
NIC2	1999	1	1	1	1		1	1	1	7
VEN2	2001	1	1	1	1	1	1	1	1	8

GMT-indexes refer to the CB Acts as depicted in Table B.1, except for Chile for which the only available Act is the only last amended in January 2006.

autonomy; monetary policy is set by the CB with advice from the Monetary Policy Committee (which consists of many government representatives) and under the approval of the State Council (Cabinet). The 1995 CB Act establishes the MPC, which started operating from July 1997. Economic autonomy is much higher with China (together with Indonesia) attaining the maximum score in the region. There is formal prohibition of direct credit to government and participation in the primary debt market. Moreover, though not included in our empirical analysis, China further amended its CB Status in 2003 without affecting the already limited level of political autonomy. The 2003 Act provides for the China Banking Regulatory Commission to take over banking supervision and for the State Council to establish a coordinating mechanism for financial supervision and regulation. Also, in practice independence is very low (JP-Morgan 2000). The CB of Philippines was established as an independent central monetary authority pursuant to the Constitution and the New CB Act of 1993 (as the successor of the old CB, originally established in 1949). Under the new act, primacy of price stability is explicit, the CB no longer undertakes quasi-fiscal activities, and lending to the government is contained. Moreover, Philippines moved to explicit inflation targeting in 2002. Despite the revised Act of 1994, CBI in Malaysia is limited. CB's role is viewed as complementary to government development aims and fiscal policy, hence there is little scope for actual CBI. Government participants (Secretary-General of the Treasury) in the Board, need for government approval in many of its operations restrain political autonomy.

Singapore is the country with the lowest GMT-index. The Monetary Authority of Singapore is not formally independent from the government; the Board is dominated by government participants with short terms in office and multiplicity of objectives. Economic Autonomy is also restricted with vague provisions for the terms of lending to the government and responsibility over banking supervision. In the wake of the crisis, the Bank of Thailand came under pressure to reorganise. Moreover, Thailand shifted to an inflation targeting regime in 2000. However, despite a Draft Bill Law of 2000 we have not been able to obtain the new CB Act. However, given that Thailand scores the lowest among our studied group, using the data of Ahsan, Skully, and Wickramanayake (2006b), we could say that CBI is limited.

Until the currency crisis of 1997, the Bank of Korea was under the jurisdiction of the Ministry of Finance and its policies were heavily influenced by governmental

goals. The 1998 CB Act improves upon the previous status and strengthens the CBI of the Bank of Korea. Price stability becomes the primary objective and there are no government officials in the Board, however terms in office are 4 years or less and appointments are politically driven. Furthermore, direct credit to the government is allowed and terms and conditions for such advances are vague. Banking supervision is in the sphere of the Financial Supervisory Commission.

Table A.5: GMT-index recent CB Reforms - EAP (own calculations)

<i>Political Autonomy</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
CHN	1995	1						1		2
IDN	1999			1		1	1	1		4
KOR	1998					1	1	1		3
MYS	1994						1	1		2
PHL1	1993		1		1		1	1		4
SGP	1998						1	1		2
<i>Economic Autonomy</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
CHN	1995	1	1	1	1	1	1			6
IDN	1999	1	1	1	1	1	1			6
KOR	1998				1		1	1	1	4
MYS	1994	1		1	1		1			4
PHL1	1993	1		1	1	1	1			5
SGP	1998	1				1	1			3

Own calculations assessing the amended Acts as reported in Table B.1 expect for Malaysia, Singapore and Korea. We used the most recent available acts (2006, 2007 and 2003 respectively).

The Table below describes the level of CBI as measured by CBIG-index of Ahsan, Skully, and Wickramanayake (2006b) and provides a comparison with our GMT-index.<sup>32</sup>

We observe that EAP as a whole is lacking in the legal aspect of the CBIG-index. This sub-index corresponds to the procedures of appointment/dismissal of the governor, the term in office and the responsibility of the CB as a regulatory body for the banking sector. This draws in line with our findings in terms of political autonomy.

<sup>32</sup>We exclude 2 of the CBIG sub-indexes in order to improve comparability with the GMT. Nonetheless, the remaining sub-indexes include different criteria and hence in some cases comparisons may be misleading. Unfortunately, we do not have more disaggregated data for CBIG-index.

Table A.6: CBIG-index: EAP

	CBIG					GMT
	Total	1) Legal	2) Political	3) Price St.	5) MP	TA
PHL	0.7429	0.3600	1.0000	0.8900	0.7217	9
KOR	0.7082	0.6000	1.0000	0.8444	0.3883	7
MYS	0.7070	0.3200	0.9778	0.8900	0.6400	6
CHN	0.6898	0.2024	0.6667	0.8900	1.0000	7
IND	0.5852	0.3992	0.5344	0.7636	0.6436	10
THA	0.4833	0.1000	0.8678	0.6220	0.3433	na
SGP	na	na	na	na	na	5

Source: CBIG - Ahsan, Skully, and Wickramanayake (2006b)  
GMT - own calculations

The political aspect, which assesses the turnover rate of the governor, and the participation of government officials in the board, is high on average, except for China and Indonesia. Regarding the sub-index of monetary policy and monetary financing of the budget, China score the highest, followed by Philippines, though Korea and Thailand score the lowest.

## **A.6 Sub-Saharan Africa (SSA)**

### **Updated GMT-index for selected SSA countries**

Most African countries inherited rule-based monetary frameworks and fixed exchange rate regimes, mainly currency boards, at independence. Though their evolution varies significantly after independence, we can distinguish two main patterns depending on the sphere of influence. Regarding the British zone, the West and East African currency boards were abandoned soon after independence and various new regimes were adopted. On the other hand, in the CFA Franc zone, the greater involvement of France in the post-independence period ensured that only a few countries of CFA broke away (Honohan and O’Connell (1997), Masson and Pattillo (2005)). No CFA Franc zone country is examined here.

Heavy reliance on monetary financing of government deficits and subsequent bouts of inflation were observed in many African countries. The fiscal stance and the financing of fiscal deficits has been both a problem and a driving force in the monetary regime evolution. Despite the set of economic and financial reforms from mid-1980s onwards, financial systems in SSA are still underdeveloped. Nonetheless, the financial system is still small. Nowadays, apart from Kenya, South Africa and Ghana, countries with small populations (e.g. Lesotho, Namibia, Rwanda) and countries recovering from monobank systems (e.g. Ethiopia) have a small number of banks. At the same time, domestic debt markets are also underdeveloped in the SSA region, partly due to shallow financial sectors and to more favourable terms on foreign borrowing from international aid agencies or on grant terms. High external debt is a prominent feature in the region, which, among other things, did not facilitate the evolution of the domestic debt markets and government securities markets. There is, however, a marked difference between Heavily Indebted Poor Countries (HIPC) and non-HIPC countries, with the former ones having much less developed debt markets and less reliance on domestic debt compared to the latter ones. Ethiopia, Kenya, Mauritius, Nigeria, South Africa have been relying on domestic debt since 1980s, in contrast to others such as Ghana and Namibia that either have small debt markets or have recently increased their reliance on domestic debt.<sup>33</sup>

Overall, the level of independence in the region is low and mainly attributed to economic autonomy criteria. Kenya (KEN-1997), Rwanda (RWA-1997) and Sierra Leone (SLE-2000) rank on the top, with scores almost equally distributed between the two aspects of independence. The Reserve Bank of South Africa is one of the few joint-stock companies<sup>34</sup> CBs and, as expected in these cases, a portion of the Board members is appointed by the shareholders. Note also that South Africa switched to a fully-fledged inflation targeting regime in February 2000. However, the 2000 CB Act amendment only refers to changes in the minimum reserves requirements provisions; even the primary objective of the CB still reads “...to protect the value of the currency of the

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<sup>33</sup>See Christensen (2005) for more details on the evolution of domestic debt in SSA.

<sup>34</sup>Joint-stock companies CBs are Austria, Belgium, Greece, Italy, Japan, Pakistan, Switzerland and USA; 9 CBs out of 101 (Lybek and Morris 2004).



Republic in the interest of balanced and sustainable economic growth...”. Hence, the GMT score remains the same under both amendments. Contrary to the results of Mehran et al (1998) we find that South Africa enjoys a level of independence that ranks among the lowest ones in the region.

Table A.7: GMT-index recent CB Reforms - SSA (own calculations)

<i>Political Autonomy (PA)</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
GHA	2002						1	1		<b>2</b>
KEN	1997					1	1	1		<b>3</b>
LSO	2000					1	1	1		<b>3</b>
NAM	1997						1	1	1	<b>3</b>
NGA	1999						1	1		<b>2</b>
RWA	1997		1			1	1	1		<b>4</b>
SLE	2000			1		1	1	1		<b>4</b>
ZAF1	1996			1		1	1	1		<b>4</b>
ZAF2	2000			1		1	1	1		<b>4</b>
UGA	1993						1	1		<b>2</b>
<i>Economic Autonomy (EA)</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
GHA	2002	1		1	1		1			<b>4</b>
KEN	1997	1	1	1	1		1			<b>5</b>
LSO	2000	1		1	1		1			<b>4</b>
NAM	1997			1	1		1			<b>3</b>
NGA	1999	1		1	1		1			<b>4</b>
RWA	1997		1	1	1		1			<b>4</b>
SLE	2000	1		1	1		1			<b>4</b>
ZAF1	1996		1				1			<b>2</b>
ZAF2	2000		1				1			<b>2</b>
UGA	1993	1	1	1	1		1			<b>5</b>

GMT-indexes refer to the CB Acts as depicted in Table B.1.

Our empirical analysis also includes the CB reforms of Burundi (BDI- 1993), and Ethiopia (ETH - 1993), for which we did not manage to retrieve the CB Acts. Hence, we draw conclusions regarding their CBI levels based on the information of Mehran et al (1998) and their CB websites.

## A.7 MENA

Central bank independence in the Middle East is very low and reforms are infrequent. Qatar Monetary Authority (QMA) was established in 1973 (Law No. 7 of May 1973), soon after the discontinuation of the Qatar - Dubai currency board arrangement. This coincided with the introduction of a new currency, the Qatari Riyal. QMA was responsible for maintaining the stability of the QR exchange rate. In 1993 (Law No.15) the Qatar Central Bank was established, inheriting the exchange rate targeting of QMA and the same parity with the USD. Even when incorporating the 1997 (Law No.19) amendments, CBI is almost non-existent. The 1997 amendments focus on the reserve requirements provisions, offshore banking and on provisions related to regulation and supervision of banks. It was on the same year that the Doha Stock Exchange began operations in 1997. The two monetary authorities that preceded the establishment of the Central Bank of Oman, namely the Muscat Currency Authority in 1970 and the Oman Currency Board in 1972, were not vested with full banking status, but,

they had well prepared the ground for the emergence of the Central Bank of Oman. However the major event heralding the eminent creation of the Central Bank of Oman was the launching of the Banking Law in 1974 (which was amended vide Royal Decree No. 114/2000). Nonetheless, CBI is limited, with virtually nonexistent political autonomy. Since 1989 Jordan has made considerable stabilisation and adjustment efforts. The amendments to the CB Act brought in 1992 set the objectives of the CB and the powers to fulfil them. Despite that, both political and economic autonomy is limited. Governmental involvement in the appointment and dismissal of the Board, as well as unclear conditions regarding CB's credit to the government contribute to this direction.

Bank of Israel was established by Law 5714-1954 and became effective in December 1954. The sole major amendment to the status of the CB came in 1985 with the passing of the "No Printing Law", which prohibited the Bank from granting loans to the government. In the late 1990s discussions started regarding the modernisation of the CB Act, which resulted in the Levin Committee recommendations. However, as of January 2008 a new Bank of Israel Law has not yet passed. Nonetheless, Israel started implicit inflation targeting in 1992 which was further strengthened in 1997 with the exchange rate band gradually widening. The GMT-index of Arnone, Laurens, and Segalotto (2006) suggests that the level of CBI is low, especially in terms of political autonomy.

In 1983-84 both Tunisia and Morocco embarked in Structural Adjustment Policies aimed at boosting the development of the private sector and removing the distortions due to a very large public sector. Central Bank of Tunisia was created by Act No. 58-90 in 1958, when Tunisia withdrew from the Franc-zone. In 1994 the banking legislation was modified reinforcing CB's powers in banking regulation and supervision. A further amendment took place in 2000 which mainly expanded and modernised the CB activities. Both Gisolo (2007) and Arnone, Laurens, and Segalotto (2006), though using different indexes, find that Tunisia enjoys the higher level of CBI in the MENA region. Preparing the grounds for a potential inflation targeting shift, Tunisia amended the organic law of the CB in May 2006, assigning price stability as the primary objective, enhancing transparency and strengthening CB's independence. However, this reform is too recent to assess its impact. Bank Al-Maghrib was established in 1959 and a new currency was adopted at the same time. In July 1993 a new banking act was adopted establishing a unified regulatory framework for all credit institutions. This act extended the sphere of consultation between monetary authorities and credit institutions and reinforced the power of the central bank in regulating and supervising the activities of credit institutions. Soon afterwards (October 1993), amendments were brought to the Bank's statutes aiming at specifying more accurately its attributions, in particular, those related to monetary policy, and granting more autonomy to its administration and management bodies. 1993 is the date we chose as the CB reform date for Morocco. Arnone, Laurens, and Segalotto's (2006) GMT-index shows that although economic autonomy is high, Bank Al-Maghrib is politically dominated. Creating the preparatory work for a move towards an inflation targeting regime, a new amendment bill was under way in 2006, which according to Gisolo (2007) it has not yet been enacted. The new statutes of the CB (2006) state the primacy of price stability and the independence of the CB. CB becomes responsible for devising and conducting monetary policy and government influence is diminished by having only one seat of government representation in the Board without voting right.

Despite structural reforms, MENA region's focus on improving the level of CBI

Table A.8: GMT-index recent CB Reforms - MENA (own calculations)

<i>Political Autonomy (PA)</i>										
Country	CBR	PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)	PA(7)	PA(8)	<b>PA</b>
EGY	1998							1		1
ISR	1997							1		1
JOR	1992					1	1	1		3
MAR	1993						1	1		2
OMN	2000						1			1
QAT	1997						1	1		2
TUN	2000		1			1	1	1	1	5
<i>Economic Autonomy (EA)</i>										
Country	CBR	EA(1)	EA(2)	EA(3)	EA(4)	EA(5)	EA(6)	EA(7a)	EA(7b)	<b>EA</b>
EGY	1998	1		1	1	1	1		1	6
ISR	1997	1		1	1	1	1			5
JOR	1992				1		1			2
MAR	1993	1		1	1	1	1			5
OMN	2000	1		1	1		1			4
QAT1	1997						1			1
TUN	2000	1		1	1	1	1		1	6

Egypt, Israel, Morocco and Tunisia were assessed by Arnone, Laurens, and Segalotto (2006). GMT-indexes for Jordan, Oman and Qatar refer to the CB Acts as depicted in Table B.1.

has been neglected. Partially due to fixed exchange rates (that leave no much space for independent monetary policy), partially due to lack of interest CB's legal framework was mainly transformed towards modernising monetary policy instruments and practices, rather than isolating these practices from governmental influences.

## B Appendix Central Bank Reforms

Table B.1: Central Bank Reforms: Dates and Acts

<i>Name</i>	<i>Year</i>	<i>Central Bank Act</i>
Albania	1996	Law No.8076 of February 1996 “On the Bank of Albania” (Maliszewski 2000)
Australia	1993	IT - April 1993 (Carare & Stone 2003, Roger & Stone 2005)
Austria <sup>a</sup>	1998	Federal Act as amended by No. 60/1998, April 1998 - ESCB
Barbados	1992	Chapter 323C. Central bank of Barbados 1992 (Lybek & Morris 2004)
Belgium 1	1993	Organic Law of the National Bank of Belgium of March 1993 (EMI 1993, 1995)
Belgium 2 <sup>a</sup>	1998	Organic Act DD. February 1998 of the National Bank of Belgium - ESBC (EMI, 1998)
Bolivia	1995	Law on the Central Bank of Bolivia, Law 1670 of October 1995 (Lybek & Morris 2004, Jacome & Vazquez 2005)
Brazil	1999	IT-June 1999 (Carare & Stone 2003, Roger & Stone 2005)
Burundi	1993	Status de la Banque de la Republic du Burundi, July 1993 (in French)
Canada 1 <sup>b</sup>	1991	IT - February 1991 (Carare & Stone 2003, Roger & Stone 2005)
Canada 2	2001	Bank of Canada Act, R.S., 1985 with amendments in October 2001 (Lybek & Morris 2004)
Chile 1	1989	Law 18,840, Basic Constitutional Act of the Central Bank of Chile, October 1989 (Jacome & Vazquez 2005)
Chile 2 <sup>1</sup>	1999	IT-September 1999 (Carare & Stone 2003, Roger & Stone 2005). Law 18,840 as amended by Law 19,653 of December 1999 (reference)
China, P.R.	1995	Law of the People’s Republic of China on the People’s Bank of China, promulgated by Order No. 46 of the President of the People’s Republic of China in March 1995
Colombia 1 <sup>1</sup>	1992	Law No. 31 of December 1992 on the Bank of the Republic of Colombia (Lybek & Morris 2004, Jacome & Vazquez 2005)
Colombia 2	2000	IT-2000 (Carare & Stone 2003), IT - Sept 1999 (Roger & Stone 2005)
Costa Rica	1995	Organic Law of the Central Bank of Costa Rica, No. 7558 of November 1995 (Jacome & Vazquez 2005)
Cyprus	2002	The Central Bank of Cyprus Act of 2002 (in force from July 2002)
Czech Republic 1 <sup>h</sup>	1993	National Council Act No. 6/1993 Coll., of December 1992 on the Czech National Bank (in effect from January 1993) (Maliszewski 2000)
Czech Republic 2	1998	IT-January 1998 (Roger & Stone 2005). Act No. 6/1993, as amended by Act No. 15/1998 Coll., of 1998
Denmark	1998	Act No. 116 of 7th April 1936 as amended (Arnone, Laurens & Segalotto 2006)
Ecuador 1	1992	Ley de Regimen Monetario y Banco del Estado, May 1992 (Jacome & Vazquez 2005)
Ecuador 2	1998	Amendment Law of 1998 (Jacome & Vazquez 2005)
Egypt	1998	Statutes of the Central Bank of Egypt of 1975, last amended in 1998 (Arnone, Laurens & Segalotto 2006)
El Salvador 1	1991	Ley Organica del Banco Central de Reserva de El Salvador, Decreto No. 746, April 1991 (Jacome & Vazquez 2005)
El Salvador 2	1996	Charter of the Central Reserve Bank of El Salvador, Reforms of May 1996 (Lybek & Morris 2004)
Ethiopia	1994	Mehran <i>et al</i> 1998
Finland <sup>a</sup>	1998	Act on the Bank of Finland, No. 214/1998 of March 1998 - ESCB (Lybek & Morris 2004)

Table B.1 – Continued

<i>Name</i>	<i>Year</i>	<i>Central Bank Act</i>
France 1 <sup>h</sup>	1994	Statute of the Banque de France, amended by Act 93-980 of August 1993 and Act 93-1444 of December 1993 (in effect from January 1994) (EMI 1995)
France 2 <sup>a</sup>	1998	Statute of the Banque de France - Act 98-357 of May 1998 - ESCB (in effect from 1 Jan 1999)
Georgia	1996	Organic Law of Georgia on the National Bank 1995 as amended in May 1996 (Maliszewski 2000)
Germany 1	1994	Bundesbank Act as amended in 1992
Germany 2 <sup>a</sup>	1997	Sixth Act Amending the Bundesbank Act in December 1997 (apart from some provisions of Art.1, all other parts shall enter into force on the date from which Germany participates in the Monetary Union pursuant to Art. 109j of EU)
Ghana 2	2002	Bank of Ghana Act, January 2002 Act 612
Greece 1	1994	Statute of the Bank of Greece, amended by the General Meeting of Shareholders November 1994, ratified by law 2275/1994
Greece 2 <sup>h</sup>	1998	Statute of the Bank of Greece, amended by the General Meeting of Shareholders December 1997, ratified by law 2609/1998
Honduras <sup>l</sup>	1996	Ley del Banco Central del Honduras Decreto No. 53 de Feb 1950, reformada por lo decreto No. 228-96 de Diciembre de 1996 (in Spanish)
Hungary 1	1991	Act LX of October 1991 on the Magyar Nemzeti Bank (Maliszewski 2000, CMN 2002)
Hungary 2 <sup>h</sup>	1997	Act CXXIX of 1996 on the Amendment of Act LX of 1991 on the Magyar Nemzeti Bank (in effect from 1997) (Maliszewski 2000)
Iceland	2001	IT-March 2001 (Roger & Stone 2005). Act No. 36/2001 on the Central Bank of Iceland, May 2001 (Lybek & Morris 2004)
Indonesia	1999	Act of the Republic of Indonesia, No. 23 of May 1999 concerning Bank Indonesia
Ireland 1	1989	Central Bank Act 1989, No. 16 of July 1989
Ireland 2 <sup>a</sup>	1998	Central Bank of Ireland Act 1998, No. 2 of March 1998 (effective from May 1998, apart from sections 13,14,15,16)
Israel <sup>c</sup>	1997	IT - June 1997 (Carare & Stone 2003, Roger & Stone 2005)
Italy 1	1993	Statute of the Bank of Italy of 1936, as amended by Presidential Decrees of 6 March and 18 July 1992 by Law No. 82 of February 1992, Law No. 483 of November 1993 and Decree No. 385 of September 1993 (EMI, 1993, 1995, 1996)
Italy 2 <sup>a</sup>	1998	Statute of the Bank of Italy of 1936, as amended by Presidential Decree on Apr 1998 (Lybek & Morris 2004)
Japan <sup>h</sup>	1998	The Bank of Japan Law of June 1997 (in effect from April 1998)
Jordan	1992	Central Bank Of Jordan Law No.23 of 1971 as amended by Laws No. 10 and 16 of March and April 1992 (Lybek & Morris 2004)
Kenya <sup>h</sup>	1997	The Central Bank of Kenya Act CAP 491 as amended by No. 9 of 1996 (in effect from April 1997) (Mehran et al 1998)
Korea <sup>dh</sup>	1998	The Bank of Korea Act of 1950, wholly amended by Law No. 5491 of December 1997 (effective from April 1998) (Lybek & Morris 2004)
Kyrgyz Republic	1997	Law of the Kyrgyz Republic on the National Bank of the Kyrgyz Republic No. 59, July 1997 (Maliszewski 2000, Lybek & Morris 2004)
Latvia 1 <sup>e</sup>	1994	Law “On the Bank of Latvia” of May 1992 (Maliszewski 2000, CMN 2002)
Latvia 2	1998	Law “On the Bank of Latvia” of 1992, with amendments passed by the Saeima of the Republic of Latvia in November 1998 (Lybek 1999)
Lesotho	2000	Central Bank of Lesotho Act, August 2000

Table B.1 – Continued

<i>Name</i>	<i>Year</i>	<i>Central Bank Act</i>
Luxembourg <sup>a</sup>	1998	Organic Law of the Banque Central du Luxembourg, Law of December 1998 - ESCB (in effect from January 1999)
Malaysia	1994	Central Bank of Malaysia Act 1958 - revised March 1994 (Lybek & Morris 2004)
Malta 1	1994	CAP 204 as amended by Acts XIV and XXVI of 1994 (in effect from November 1994)
Malta 2	2002	CAP 204 as amended by Act XVII of 2002 (in effect from September 2002)
Mexico 1 <sup>h</sup>	1994	Banco de Mexico Law of December 1993 (in effect from April 1994)
Mexico 2	1999	Banco de Mexico Law as amended in January 1999 (ALS 2006)
Moldova	1995	Law No. 548-XIII on the National Bank of Moldova of July 1995 (CMN 2002, Maliszewski 2000, Lybek & Morris 2004)
Morocco	1993	Statutes of Bank Al-maghrib - Morocco of 1959, amended as of October 1993 (Lybek & Morris 2004)
Namibia <sup>i</sup>	1997	Bank of Namibia Act No 15 of December 1997
Netherlands 1 <sup>i</sup>	1993	Nederlandsche Bank Act of December 1993 (EMI 1993, 1995)
Netherlands 2 <sup>a</sup>	1998	Bank Act of 1998 of April 1998, Stb. 200 - ESBC
New Zealand <sup>h</sup>	1990	The Reserve Bank of New Zealand Act of 1989 (into force in February 1990) (St. Dawe Reserve Bank Bulletin Vol. 53, No. 1, 1990)
Nicaragua 1	1992	Decreto No. 42-92 Ley Orgnica del Banco Central de Nicaragua of July 1992
Nicaragua 2	1999	Organic Law of the Central Bank of Nicaragua, Law No. 317 of September 1999
Nigeria	1999	Central Bank of Nigeria Decree No 24 of 1991 as amended by Decree No 41 of 1999
Norway <sup>h</sup>	2000	Norges Bank Act amended by Act No. 95 of December 1999 (in force April 2000)
Oman <sup>i</sup>	2000	Banking Law of 1974 as amended by Royal Decree No. 114/2000 of December 2000 (Lybek & Morris 2004)
Paraguay	1995	Law No. 489 Organic Law of the Central Bank of Paraguay, August 1995 (Jacome & Vazquez 2005)
Peru 1	1993	Central Reserve Bank of Peru Organic Law, Decree-Law No. 26123, January 1993 (Lybek & Morris 2004, Jacome & Vazquez 2005)
Peru 2	2002	IT - January 2002 (Carare & Stone 2003, Roger & Stone 2005)
Philippines 1	1993	Republic Act No. 7653, The New Central Bank Act of the Republic of Philippines of 1992, passed by the House of Representatives and the Senate in June 1993 (Lybek & Morris 2004)
Philippines 2	2002	IT - January 2002 (Carare & Stone 2003, Roger & Stone 2005)
Poland 1	1992	The Act on the National Bank of Poland of 1992, 72/1999, item 360 (Maliszewski 2000)
Poland 2 <sup>h</sup>	1998	The Act on the National Bank of Poland of August 1997, No. 140, item 938 (in effect from Jan 1998)(Maliszewsk 2000, CMN 2002). IT - October 1998 (Roger & Stone 2005)
Portugal 1	1995	Bank de Portugal Organic Law, as amended by Law 231/95 of September 1995 (EMI, 1993, 1995)
Portugal 2 <sup>a</sup>	1998	Organic Law No. 5/98 of January 1998 - ESCB
Qatar	1997	Decree Law No. 15 of August 1993
Russia	1995	Federal Law No. 65-FZ, of April 1995, "On Amending the RSFSR Law On the Central Bank of the RSFSR (Bank of Russia)" (CMN 2002, Maliszewski 2000)
Rwanda	1997	Law No 11/97 of July 1997 regarding Statutes of the National Bank of Rwanda
Sierra Leone	2000	The Bank of Sierra Leone Act, February 2000

Table B.1 – Continued

<i>Name</i>	<i>Year</i>	<i>Central Bank Act</i>
Singapore	1998	Act 28 of July 1998 Monetary Authority of Singapore (Amendment) Act of July 1998
Slovak Republic 1 <sup>h</sup>	1993	Act of the National Council of the Slovak Republic No. 566/1992 Coll. of November 1992 on the National Bank of Slovakia (in effect from January 1993) (CMN 2002, Maliszewski 2000)
Slovak Republic 2	2001	Act of the National Council of the Slovak Republic No. 149/2001 of May 2001
Slovenia 1 <sup>f</sup>	1993	Law on the National Bank of Slovenia, June 1991
Slovenia 2	2002	Bank of Slovenia Act, Official Gazette of the Republic of Slovenia No. 58/02, July 2002
South Africa 1	1996	South African Reserve Bank Act 90 of 1989 as amended by Act 2 of March 1996 (Mehran et al 1998)
South Africa 2	2000	IT - February 2000 (Roger & Stone 2005) South African Reserve Bank Act 90 of 1989 as amended by Act 57 of November 2000
Spain 1	1994	Law of Autonomy of the Banco de Espana, Law 13/1994, June 1994 (EMI, 1995)
Spain 2 <sup>a</sup>	1998	Law of Autonomy of the Banco de Espana, as amended by Law 12/1998, April 1998 - ESCB (Lybek & Morris 2004)
Sweden 1 <sup>s</sup>	1995	IT - (Jan 1993 Carare & Stone 2003, Roger & Stone 2005), IT -1995 (JP Morgan Guide to Central Banking Watching, 2000)
Sweden 2	1999	The Sveriges Riksbank Act, January 1999
Switzerland	2000	National Bank Law of 1953, as of May 2000 (Lybek & Morris 2004, ALS 2006)
Thailand	2000	IT-May 2000 (Carare & Stone 2003, Roger & Stone 2005)
Trinidad & Tobago	1994	Central Bank Act- Chapter 79:02, amended by Act No. 23 of 1994 (Lybek & Morris 2004)
Tunisia	2000	Law 58-90 of 1958, amended as of April 2000 (Lybek & Morris 2004)
Turkey	2001	The Law on the Central Bank of the Republic of Turkey No 1211 amended as of Law No. 4651 of April 2001
Uganda	1993	The Bank of Uganda Statute, May 1993, Statute No 5 (Mehran et al 1998)
United Kingdom 1	1992	IT- October 1992 (Carare & Stone 2003, Roger & Stone 2005)
United Kingdom 2	1998	Bank of England Act, June 1998 (ALS 2006)
Uruguay	1995	Banco Central del Uruguay Charter, Law No. 1666 of March 1995 (Jacome & Vazquez 2005)
Venezuela, R. B. 1 <sup>t</sup>	1992	Law of the Central Bank of Venezuela of December 1992 (Jacome & Vazquez 2005)
Venezuela, R. B. 2	2001	Law on the Central Bank of Venezuela, amended as of September 2001 (Lybek & Morris 2004)

**Sources:** Unless otherwise specified, details of dates and reforms were collected from central bank websites, annual reports and various working papers. EMI refers to the Reports of the European Monetary Institute. Inflation Targeting (IT) Dates are taken from Carare & Stone (2003), Roger & Stone (2005), and JP Morgan Guide to Central Bank Watching (2000). IT does not always correspond to a new CB Act, rather it could either be signaled by a CB Directive/Regulation or by an internal decision of the CB Board.

## Notes

<sup>a</sup>These are the countries that joined the EMU in January 1999. The final amendments to the Acts of the member states in order to accord with the European Treaty requirements took place during 1998, but the enactment date for most cases was January 1999. Hence, the CB reform date is set to 1999.

<sup>b</sup>In 1991, Bank of Canada, jointly with the government adopted inflation targeting, without a modification in the Bank's Act. Despite the fact that in practice price stability is being given priority, according to the preamble of the Act it is one among other objectives until today.

<sup>c</sup>Since 1992 Israel has set an inflation target, together with other intermediate targets. However, we pick the date (1997) where a pure inflation target was adopted. Since the establishment, the Bank of Israel Law, 5714-1954 has only been amended in 1985.

<sup>d</sup>Korea started inflation targeting from January 2001, according to Roger & Stone (2005).

<sup>e</sup>Latvia's first Law after the collapse of USSR was passed in 1992. However, the removal of the ruble and the introduction of the lets took place in 1993. Our debt data start from 1994, which is the date we choose here. Furthermore, the Law amendment of (June) 1997 was further amended on October 1998 to prevent Minister of Finance from temporarily postponing decisions by the Board and explicitly preventing direct credit to the government.

<sup>f</sup>Debt data on Slovenia start from 1993.

<sup>g</sup>We chosen 1995 as the inflation targeting date, avoiding this way the adverse effects of the ERM crisis on Sweden's economy.

<sup>h</sup>These are the countries in which the approval (or promulgation) date differs from the enforcement one. We always use the latter one for the Central Bank Reform date.

<sup>i</sup>For these countries the enactment and/or enforcement date refers to an end of year date (December). In order to allow for the amended law to influence the monetary and/or fiscal policy practice, we set the Central Bank Reform date to the next year.



## C Control Variables

Table C.1: Countries in each control dummy

HIPC	HIGH DB
Ghana (2002)	Belgium (1993)
Rwanda (1997)	Belgium (1999)
Honduras (1997)	Ireland (1989)
Nicaragua (1999)	Israel (1997)
Bolivia (1995)	Jordan (1992)
Sierra Leone (2000)	Italy (1993)
<i>Source: IMF and WB (2005)</i>	Italy (1999)
	Greece (1994)
CRISIS	Greece (1998)
	Ghana (2002)
UNITED KINGDOM (1992)	Egypt (1998)
GERMANY (1994)	Poland (1992)
FRANCE (1994)	Morocco (1993)
SPAIN (1994)	Rwanda (1997)
ITALY (1993)	Honduras (1997)
KOREA (1998)	Nicaragua (1992)
COLOMBIA (2000)	Nicaragua (1999)
THAILAND (2000)	Uganda (1993)
MEXICO (1994)	Sierra Leone (2000)
TURKEY (2001)	Burundi (1993)
CHINA,P.R. (1995)	Ethiopia (1994)
MOLDOVA (1995)	Comment: $DB > 80\%$
ECUADOR (1998)	
ALBANIA (1996)	
RUSSIA (1995)	
KYRGYZ R. (1997)	
INDONESIA (1999)	
PARAGUAY (1995)	
<i>Source: Jácome and Vázquez (2005), Kaminsky and Reinhart (2001), Mouratidis and Spagnolo (2004), Reinhart and Rogoff (2008)</i>	

Table C.2: Classification of countries-reforms according their GMT-index

<i>ihigh</i>		<i>iumed</i>		<i>ilmed</i>		<i>ilow</i>	
COUNTRY - YEAR		COUNTRY - YEAR		COUNTRY - YEAR		COUNTRY - YEAR	
Finland	1999	Iceland	2001	Australia	1993	New Zealand	1990
Sweden	1999	Denmark	1998	UK	1992	Singapore	1998
Switzerland	2000	Netherlands	1994	Canada	2001	Sweden	1995
Austria	1999	UK	1998	Malta	1994	Norway	2000
Netherlands	1999	Canada	1991	Uruguay	1995	Belgium	1993
Luxembourg	1999	France	1994	Cyprus	2002	Ireland	1989
Germany	1994	Spain	1994	Hungary	1991	Japan	1998
Germany	1999	Malta	2002	Hungary	1997	Barbados	1992
France	1999	Slovenia	1993	Greece	1994	Portugal	1995
Belgium	1999	Slovenia	2002	Slovak R.	1993	Israel	1997
Ireland	1999	Italy	1993	Slovak R.	2001	Oman	2001
Chile	1989	Tunisia	2000	Colombia	1993	Qatar	1997
Chile	2000	Czech R.	1993	Colombia	2000	Jordan	1992
Spain	1999	Costa Rica	1995	Trinidad & Tob.	1994	Malaysia	1994
Portugal	1999	El Salvador	1991	Brazil	1999	S. Korea	1998
Italy	1999	Latvia	1994	Poland	1992	S. Africa	1996
Czech R.	1998	Mexico	1999	China,P.R.	1995	S. Africa	2000
Greece	1998	Turkey	2001	Morocco	1993	Namibia	1998
El Salvador	1996	Poland	1998	Rwanda	1997	Thailand	2000
Latvia	1998	Moldova	1995	Honduras	1997	Ghana	2002
Mexico	1994	Ecuador	1992	Nicaragua	1992	Egypt	1998
Peru	1993	Ecuador	1998	Nicaragua	1999	Lesotho	2000
Peru	2002	Georgia	1996	Philippines	1993	Uganda	1993
Bolivia	1995	Venezuela, R. B.	1993	Philippines	2002	Burundi	1993
Kyrgyz R.	1997	Venezuela, R. B.	2001	Albania	1996	Ethiopia	1994
		Paraguay	1995	Russia	1995	Nigeria	1999
				Sierra Leone	2000		
				Indonesia	1999		
				Kenya	1997		

## D Additional Estimation Results

With the exclusion of the CRISIS and HIPC countries we have 82 observations remaining. Table D.1 displays the results for equation (3) when the CRISIS and HIPC countries are excluded. In columns (1)-(3), where quality is treated as a separate variable, the effect of quality on debt accumulation is still significant, but of smaller size. Inflation and exchange rate regimes fail to explain the debt process of different countries. When quality of institutions is interacted with the independence level of each central bank, we see from column (4) that only for the countries that gave a high degree of CBI the effect of quality is significantly negative. Controlling for Nicaragua (NIC1-1992), Australia (AUS-1993) and Malta (MLT1-1994) turns the IUMED and ILOW groups significant, although the ILMED is still unimportant.

Table D.1: Estimation Results for Equation (3) excluding CRISIS and HIPC countries

	(1)	(2)	(3)	(4)	(5)
CONST	21.471 (2.798)***	20.898 (3.186)***	23.376 (2.872)***	20.137 (2.838)***	23.257 (6.773)***
QUAL	-2.432 (-2.280)**	-2.366 (-2.441)**	-2.298 (-2.094)**		
GGDP	-0.230 (-1.924)*	-0.233 (-2.026)**	-0.247 (-1.845)*	-0.400 (-3.629)***	-0.386 (0.116)***
INF	-0.009 (-0.216)		-0.010 (-0.199)	0.000 (0.000)***	0.000 (0.000)***
HIGHDB	-11.833 (-2.223)**	-11.743 (-2.299)**	-12.541 (-2.266)**	-14.739 (-3.098)***	-14.548 (4.933)***
QUAL*IHIGH				-3.275 (-3.240)***	-3.713 (0.970)***
QUAL*IUMED				-1.749 (-1.385)	-2.272 (1.216)*
QUAL*ILMED				0.397 (0.208)	-1.743 (1.750)
QUAL*ILOW				-1.323 (-1.320)	-1.831 (0.958)*
NIC1				47.937 (5.675)***	49.014 (9.308)***
AUS					45.242 (11.849)***
MLT1					40.045 (8.491)***
EXINTER			-1.331 (-0.184)		
EXFLOAT			-3.941 (-0.647)		
<i>R-square</i>	0.119	0.119	0.125	0.269	0.336
<i>Adj. R-square</i>	0.074	0.085	0.055	0.199	0.253
<i>SER</i>	20.752	20.621	20.960	19.293	18.641
<i>No of Observ.</i>	82	82	82	82	82
<i>F-stat</i>	2.611	3.518	1.786	3.880	4.041
<i>Prob(F-stat)</i>	0.042	0.019	0.113	0.001	0.000

Note: t-ratios in parenthesis

\* = 10%, \*\* = 5%, and \*\*\* = 1% levels of significance

Table D.2: Estimation Results for Equation (3) with different samples

	Exclude residuals with $ SE  > 2$			Exclude residuals with $ SE  > 1.5$	
	(1)	(2)	(3)	(4)	(5)
Const.	28.801 (4.506)***	27.955 (4.284)***	26.074 (3.918)***	30.934 (5.748)***	30.726 (5.662)***
QUAL	-3.470 (-4.036)***			-3.739 (-5.103)***	
GGDP	-0.341 (-3.872)***	-0.393 (-4.317)***	-0.405 (-4.529)***	-0.291 (-3.828)***	-0.328 (-4.087)***
INF	-0.066 (-1.916)*	-0.060 (-1.772)*	-0.070 (-1.705)*	-0.063 (-2.130)**	-0.060 (-1.997)**
HIGHDB	-14.204 (-3.431)***	-15.623 (-3.669)***	-15.765 (-3.704)***	-13.773 (-3.677)***	-15.643 (-4.135)***
CRISIS	30.480 (7.009)***	29.388 (6.824)***	30.077 (7.027)***	31.275 (8.312)***	30.651 (8.397)***
HIPC	-8.711 (-1.831)*	-7.203 (-1.665)*	-7.230 (-1.375)	-12.158 (-2.757)***	-10.608 (-2.475)**
QUAL*IHIGH		-4.384 (-4.892)***	-4.177 (-4.739)***		-4.449 (-5.804)***
QUAL*IUMED		-2.928 (-2.843)***	-2.865 (-2.824)***		-3.604 (-4.091)***
QUAL*ILMED		-2.569 (-2.086)**	-2.475 (-2.037)**		-3.283 (-3.100)***
QUAL*ILOW		-2.267 (-2.525)**	-2.130 (-2.386)**		-2.600 (-3.666)***
EXFIXED			2.198 (0.541)		
EXINTER			4.127 (0.768)		
<i>R-square</i>	0.525	0.566	0.570	0.619	0.651
<i>Adj. R-square</i>	0.494	0.522	0.515	0.591	0.612
<i>SER</i>	17.234	16.740	16.862	14.391	14.017
<i>No of Observ.</i>	99	99	99	90	90
<i>F-stat</i>	16.918	12.900	10.469	22.427	16.593
<i>Prob(F-stat)</i>	0.000	0.000	0.000	0.000	0.000

Note: t-ratios in parenthesis

\* = 10%, \*\* = 5%, and \*\*\* = 1% levels of significance

In the first three columns of Table D.2 we exclude observations for which residuals are higher/lower than 2 standard deviations from the line, and the sample size is reduced to 99 reforms. All explanatory variables remain significant, apart from the exchange rate regimes. The impact of corruption (QUAL) is of the same magnitude both on its own and when interacted with the level of independence the respective reform gave. Columns (4) and (5) include observations within 1.5 standard deviations from the regression line and the results remain robust.

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