

Volume 24, No. 4, Pages 717–848 December 2008 ISSN 0176-2680



# European Journal of POLITICAL ECONOMY

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## European Journal of Political Economy

journal homepage: [www.elsevier.com/locate/ejpe](http://www.elsevier.com/locate/ejpe)

# Central bank independence and monetary policymaking institutions – Past, present and future

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## ARTICLE INFO

### Article history:

Received 30 October 2007  
Received in revised form 22 July 2008  
Accepted 22 July 2008  
Available online 29 July 2008

### JEL classification:

E50  
E52  
E54  
E31

### Keywords:

Central bank independence  
Economic performance  
Nominal anchors  
Monetary institutions  
Future challenges

## ABSTRACT

This is an extensive survey of worldwide developments in the area of monetary policymaking institutions during the second half of the twentieth century and beyond. In addition the last section discusses current open issues and future challenges. Section 2 reviews the changes that have occurred in the area of central bank independence (CBI) during the last twenty years, discusses reasons for those developments and provides an overview of accumulated empirical evidence on the relation between CBI and the performance of the economy. Section 3 discusses lessons from stabilization of inflation, reviews the evidence and implications of asymmetric central bank objectives and considers the issue of CBI within the broader context of choosing a nominal anchor. Section 4 reviews the impact of independence on economic performance in the presence of labor unions. Section 5 considers future challenges facing modern central banks. The discussion presumes that CBI and price stability are here to stay and focuses on issues relating to the conduct of monetary policy by independent central banks in an era of price stability, like the risks associated with flexible inflation targeting and the impact of central bank capital and finances on its independence.

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## 1. Introduction

Twenty years ago and earlier, most central banks in the world functioned as departments of ministries of finance. They were expected, by law, custom or both, to utilize their policy instruments to achieve a myriad of objectives like high levels of growth and employment, provision of funds to government for the financing of public expenditures, and to address balance of payments problems.<sup>1</sup> They also were expected to maintain financial and price stability but the price stability objective was one among several other objectives in the charter of the bank and had no particular status. In some cases like Spain and Norway it did not even appear in the charter. Paralleling this state of affairs, economic theory did not attribute particular importance to central bank independence (CBI) and the concept of credibility of monetary policy was in early stages of development. Furthermore, a notable legacy of the Keynesian revolution was the belief that a certain amount of inflation is conducive to economic growth.

Although some banks had a reasonable amount of legal independence the level of actual independence, particularly in developing countries, was usually lower than the one indicated in the law. Except for a few cases central banks did not possess instrument independence and the responsibility for price stability was, at least implicitly, located in the ministry of finance and other economic branches of government. In a few developed economies (like the UK, Japan, the US and West Germany) with wide

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<sup>1</sup> In the case of many developing countries the central bank often functioned as a development bank that provided subsidized loans to various sectors of the economy.

capital markets price stability was maintained mainly through the actions of relatively conservative treasury departments or because of *de facto* independent central banks.<sup>2</sup>

Most other countries that enjoyed reasonable levels of price stability achieved this result by pegging their currencies to the currency of a country with sufficiently conservative aggregate nominal policies. Under the Bretton Woods system most currencies were automatically pegged to the US \$. Following the breakdown of this system in the seventies many countries adopted unilateral pegs and later on, bands. Countries without either of those three commitment devices endured prolonged episodes of high and variable inflation as exemplified by the cases of Argentina, Brazil, Israel, Mexico, Chile and other countries.

The contrast of this state of affairs with current practice and academic consensus with respect to CBI cannot be overemphasized. Most central banks in today's world enjoy substantially higher levels of both legal and actual independence than twenty years ago or earlier. CBI and accompanying institutional arrangements like inflation targeting have become widely accepted commitment devices. In spite of some contentious issues the following broad practical consensus backed by academic work has emerged. The primary responsibility of the central bank (CB) is to assure price stability and financial stability. Without prejudice to these objectives the CB should support the economic policies of government. To achieve its main objective the bank is given instrument independence.<sup>3</sup> Delegation of authority to a non-elected institution should be accompanied by accountability and transparency. It is noteworthy that those two buzz words of modern monetary institutions were hardly heard twenty years ago or earlier. In the absence of independence accountability was unnecessary and, as political entities, governments and ministries of finance had no incentives to raise questions about their own transparency in the conduct of monetary policy.<sup>4</sup>

This paper is a selective survey of the vast literature of the last twenty years on CBI.<sup>5</sup> Section 2 quickly reviews the institutional changes that have occurred in the area of central bank autonomy and related monetary policymaking institutions in the world during the last twenty years. It discusses some of the reasons for those developments and provides an overview of accumulated empirical evidence on the relation between CBI and the performance of the economy. Section 3 opens with a discussion of some of the lessons from stabilization of inflation and proceeds to consider the issue of CBI within the broader context of choice of nominal anchor. It also reviews recent evidence on asymmetric central bank objectives and its consequences. Section 4 briefly reviews recent literature which considers the impact of effective conservativeness or independence on economic performance in the presence of labor unions.<sup>6</sup> A main insight of this literature is that, in the presence of large wage setters, CBI affects real variables like the rate of unemployment, implying that conservativeness affects economic performance even in the long run.

Section 5 closes the paper by considering future challenges facing central banks. Price stability is now a permanent fixture of industrial economies and of many developing economies, and CBI is a well established feature of the contemporary monetary order. Starting from the presumption that those features are here to stay, the discussion in this part focuses on issues relating to the conduct of monetary policy by independent central banks in an era of price stability. In such times the bank is naturally expected to devote more attention to stabilization of the output gap. The section discusses the risks associated with such a flexible inflation targeting regime. In some instances a trade-off between democratic accountability and CBI may arise. This occurs, for example, when, due to its obligation to maintain financial stability, the CB engages in operations that lead to substantial losses. A closely related issue is the distribution of CB profits and losses between the CB and government and the optimal level of CB capital. The section reviews this hitherto relatively neglected issue.

## 2. The evolution of CBI over the last two decades: evidence, reasons and consequences

### 2.1. Evolution of CBI

The most widely available indices of CBI refer to the level of independence as specified in the law. It is well known that actual independence may often deviate, quite substantially, from legal independence. Such deviations are more important in developing than in industrial economies. This is probably due to better enforcement of the law in the first group of economies.<sup>7</sup> Other, more

<sup>2</sup> Partly because of the US wide capital markets, the *de facto* independence of the Federal Reserve was higher than its legal independence. At the time the German Bundesbank was unique in that it enjoyed both *de jure* as well as *de facto* independence and generally used its independence to promote public support for price stability. In spite of this long term position the Bundesbank's policy occasionally responded to the electoral cycle. Vaubel (1997) shows that monetary expansion accelerated at the beginning of pre-election periods when the German government had a political majority at the Bundesbank council and that it decelerated when the reverse was true.

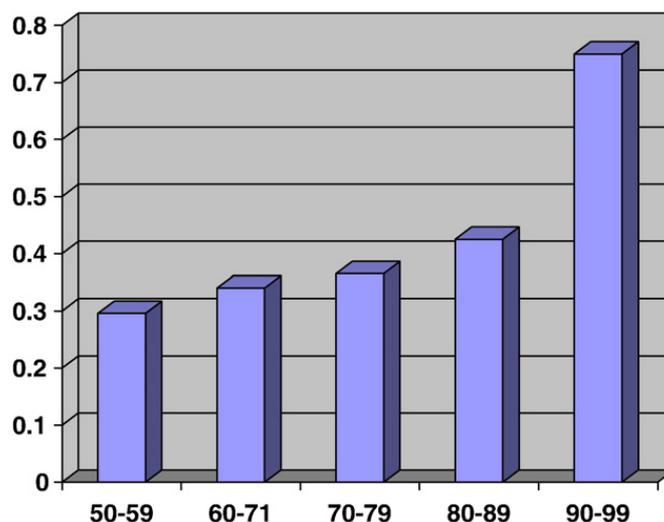
<sup>3</sup> In a few cases like the ECB and the Banco Central de Chile, the bank is even given some limited goal independence in the sense that it is free to determine its own inflation target.

<sup>4</sup> For reasons of space I do not discuss the fast expanding literature on those topics. The March 2007 issue of the *European Journal of Political Economy* is devoted to CB transparency and communications.

<sup>5</sup> Previous surveys appear in Eijffinger and de Haan (1996) and in Berger et al. (2001).

<sup>6</sup> Although related, independence and conservativeness are not quite the same. Independence refers to the ability of the bank to implement the policies it desires without political interferences. Conservativeness refers to the importance that the bank assigns to price stability in comparison to real objectives like high levels of economic activity and employment. Obviously, effective conservativeness, that determines policy choices, depends both on the bank's conservativeness, as well as on its independence. For the purposes of this survey there is no need to distinguish between those two concepts. I therefore use the terms conservativeness and independence interchangeably to mean "effective conservativeness." This is also the interpretation of conservativeness in Rogoff (1985) article in which this term was first introduced. However, there are contexts in which it is useful to keep conservativeness and independence apart (Eijffinger and Hoerberichts, 1998).

<sup>7</sup> Using data till the end of the eighties Cukierman (1992, ch. 19) documents a negative correlation between inflation and legal independence in developed economies but no significant relation between those two variables in developing countries. More recent evidence surveyed below suggests that the difference between actual and legal independence may also vary over time within a given country.



**Fig. 1. The average aggregate index of legal independence over time in nine Latin American economies.** Remarks: The figure combines data on the aggregate index of legal independence, LVAW, from Table A1 in Cukierman et al. (1992) for the forty years between 1950 and 1989 with data on the same index for the decade of the nineties from Appendix II in Jacome and Vazquez (2008-this issue) for nine Latin American countries. The countries are: Argentina, Bolivia, Colombia, Honduras, Mexico, Nicaragua, Peru, Uruguay and Venezuela. The index is defined over the zero to one interval, with zero corresponding to complete dependence and one to the maximum possible level of independence. Each column in the figure represents the average value of LVAW over these countries in the corresponding period. In the first two subperiods the number of countries is smaller than nine either because some of the central banks have not been created yet, or due to lack of data. For some of the countries Jacome and Vazquez provide a coding for the eighties as well. In those cases the figures used are averages between their codings and those of Cukierman, Webb and Neyapti for the eighties.

behaviorally oriented proxies have therefore been used. One, used only for developing countries, is the actual, as opposed to the legally mandated, turnover of CB governors and the other is a proxy for the political vulnerability of the CB governor. This index is defined as the frequency of cases in which the governor is replaced within a short period of time following a political transition.<sup>8</sup> None of those indices fully represents the actual independence of the CB. But, taken together, they provide a more complete picture of differences in CBI across countries and over time.

### 2.1.1. Legal independence

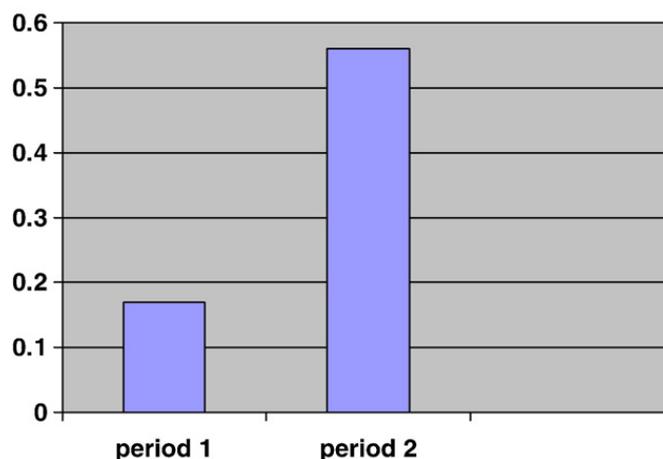
There is mounting evidence that the legal independence of most central banks in the world has increased during the nineties to an extent that appears to be a veritable revolution in central bank legislation. This is particularly remarkable in view of the fact that during the forty years ending in 1989 there had hardly been reforms in CB legislation. This statement is based on a number of legal indices, the most comprehensive of which are those in chapter 19 of Cukierman (1992) and in Cukierman et al. (1992), on updates and extensions of these indices for some subgroups of countries and on updates of the Grilli et al. (1991) index.<sup>9</sup> The Cukierman et al. (1992) index has been updated for twenty-six former socialist economies for the decade of the nineties by Cukierman et al. (2002). A somewhat broader index for twenty-four Latin American and Caribbean countries was recently developed by Jacome and Vazquez (2008-this issue).<sup>10</sup> The Grilli, Masciandro and Tabellini index has been reconstructed for a sample of over forty countries for two points in time; 1991 and the end of 2003 by Arnone et al. (2006).

In spite of some differences in coverage, definitions and the fact that not all indices have been updated for all countries, the broad picture that emerges is that legal independence took a quantum upward jump during the nineties. The most direct evidence for this appears in the Arnone et al. (2006) paper that provides data for both 1991 and 2003. In addition, comparison of legal independence of the CB in the former socialist economies with that of developed economies in the eighties by Cukierman et al. (2002) shows a substantially higher level of independence in the former group. Interestingly, Table 2 in that paper suggests that in about a third of the former socialist economies legal independence in the nineties was higher than the legal independence of the highly independent Bundesbank during the eighties. In line with the Maastricht Treaty the legal independence of the Bundesbank has also been upgraded since the eighties, along with that of all the countries that joined the Economic and Monetary Union (EMU).

<sup>8</sup> The turnover variable was originally introduced in chapter 19 of Cukierman (1992) and in Cukierman et al. (1992). de Haan and Kooi (2000) and Dreher et al. (2007) have updated this index and extended it to a wider sample of countries. The index of political vulnerability appears in Cukierman and Webb (1995).

<sup>9</sup> This index is based on a coding of sixteen different characteristics of CB charters that pertain to the allocation of authority over monetary policy, procedures for resolution of conflicts between the CB and government, the relative importance of price stability in CB objectives as stated in the law, the seriousness of limitations on lending by the CB to government, and procedures for the appointment and dismissal of the governor of the CB. Cukierman et al. (1992) present a weighted index of those sixteen characteristics (LVAW) and Cukierman (1992) presents an unweighted version of the same characteristics (LVAU). Both indices refer to a sample of over sixty countries. Other indices that appeared till the beginning of the nineties such as those used by Bade and Parkin (1988), Alesina (1988, 1989), Alesina and Summers (1993), Grilli et al. (1991) and Eijffinger and Schaling (1993) can, for the most part, be approximated by subsets of the components of the LVAW (or of the LVAU) index.

<sup>10</sup> The additional features included in the Jacome-Vazquez index involve procedures for appointment and dismissal of the entire CB board rather than just the governor, the extent to which the CB has a say with respect to exchange-rate policy, the obligations of the CB as a lender of last resort, the existence of provisions for the preservation of CB capital and the existence of legal provisions relating to the accountability and transparency of the CB.



**Fig. 2. The evolution of legal independence in six Former Socialist Economies.** Remarks: The figure shows the average value of the LVAW index (see remark to Fig. 1 for details) for six Former Socialist Economies which were not part of the Soviet empire and had, consequently, central bank laws prior to the downfall of the Soviet Union. The countries are Croatia, Hungary, Macedonia, Poland, Romania, and Slovenia. The figure for period 1 reflects the average level of legal independence in those countries prior to the central bank reforms of the nineties. The figure for period 2 reflects the average level of legal independence in those countries after the last central bank reform those countries had between the early nineties and 1997. Source: adapted from Table 1 of Cukierman et al. (2002).

To illustrate the revolution in the level of legal independence during the nineties, Fig. 1 shows the evolution of average legal independence in nine Latin American countries during the last fifty years of the twentieth century. The figure combines data from Cukierman et al. (1992) with updated data from Jacome and Vazquez (2008–this issue). The main lesson from the figure is that, after thirty to forty years of relative immobility in CB legislation, there was a quantum jump in the level of legal independence in those countries.

A similar picture emerges for the subset of former socialist economies that had separate central banks prior to the downfall of the Soviet Union (Fig. 2). The legal reforms they instituted, mainly in the early nineties, represent about a tripling of the LVAW index developed in Cukierman et al. (1992). Eight of the former socialist economies had two CB reforms during the nineties at intervals of about five years. Fig. 1 in that article shows that the levels of independence embedded in second CB laws are substantially higher than those of the first CB laws.

Examination of more detailed information in these and other sources suggests that the trends illustrated by those figures reflect a worldwide trend toward substantially higher levels of CB independence. Moreover, the fact that the second CB law in Former Socialist Economies that had two CB reforms reflects a uniformly higher level of independence than the first law, supports the view that the trend toward legal independence intensified during the nineties. Those conclusion are corroborated by recent updates of the Grilli et al. (1991) index of CBI produced by Arnone et al. (2006). They update this 1991 index for 18 developed economies, 9 emerging economies and 4 developing countries for legislation outstanding as of the end of 2003. Their index is standardized, as in the Cukierman et al. (1992) index to the zero–one range. They find that the mean levels of legal independence in those three groups of countries rose, respectively, from 0.476, 0.313 and 0.341 in 1991 to 0.774, 0.646 and 0.636 in 2003 (Table 10).

### 2.1.2. Actual independence and some illustrations of discrepancies between actual and legal independence

Have there also been meaningful changes in the actual level of CBI as proxied by the actual turnover of CB governors and by the index of political vulnerability of the CB during the nineties? Dreher et al. (2007) update and extend the turnover data set to 137 countries. Comparison of this data set with the earlier data from Cukierman (1992) and Cukierman et al. (1992) should, in principle, make it possible to examine whether high turnover rates in developing countries are lower today than in the past.<sup>11</sup> Although such a comparison has not been done explicitly, casual evidence for Latin American countries – in which turnover and the political vulnerability of the CB were among the highest in the world till the end of the eighties – points to a substantial increase in independence as proxied by both of those indices.

In addition to legal status, actual independence depends on various formal and informal institutional arrangements such as the type of exchange–rate regime, the ability of the bank to engage effectively in open market operations, the stance of fiscal policy and the existence of explicit institutional arrangements beyond the law that make the price stability objective a recognized (mainly by the political establishment) objective of the CB. A prominent example of the latter is the various inflation targeting methods adopted by about twenty countries since this innovation was pioneered at the end of the eighties in New Zealand and Canada.

Cukierman (2007a) constructs a judgmental index of actual CBI for the Bank of Israel since its creation in 1954 which takes the factors above and several others into consideration. Comparison of this index of actual independence with its legal counterpart suggests that, in spite of relatively limited changes in legal independence, there have been substantial changes in the actual independence of the Bank following the stabilization of high inflation in 1985. In particular, while actual independence was

<sup>11</sup> Dreher et al. (2007) focus on the impact of political instability, elections and inflation on the probability that a CB governor is replaced rather than on the evolution of turnover over time.

substantially lower prior to, and several years following the 1985 stabilization, the relation between those two types of independence has been permanently reversed since the mid-nineties.

Till the 1985 inflation stabilization one of the main tasks of the Bank of Israel was to channel and extend credits to various sectors of the economy. This was done through an elaborate system of directed credits to various sectors of the economy. The Bank had relatively little influence on the size, the composition and the terms of those credits. Moreover, due to other institutional restrictions, the Bank's ability to conduct effective open market operations was severely limited. In addition the capital market was highly segmented and dominated by non-competitive elements. The combination of those factors seriously impeded the actual ability of the Bank to focus on the price stability objective.

The main factors responsible for increases in the actual independence of the Bank of Israel in the post-1985 stabilization period (in spite of a relatively immobile charter) were: a gradual reduction, mostly through attrition, of directed credits; a gradual lifting (until their complete elimination at the end of 2001) of restrictions limiting the Bank's ability to issue short-term securities for monetary policy purposes; a gradual process of desegmentation of credit markets; a gradual process of lifting various controls on capital flows; a gradual flexibilization of the exchange rate and its gradual replacement by inflation targets since December 1991. Starting in the mid-nineties substantial increases in the short-term interest rate set by the Bank (in spite of public criticisms by the Treasury and exporters) point to an increase in the relative effective emphasis on price stability. The Israeli experience suggests that substantial changes in the actual independence of the Bank may occur without much change in legal independence.

A similar, but less dramatic, process occurred during the first half of the nineties at the Bank of England. Due to changes in monetary policymaking institutions at the end of 1992 the actual independence of the Bank of England rose without any change in CB legislation. Underlying this trend was the disappointing performance of monetary targets during the eighties and, in the early nineties, the low credibility of Britain's commitment to the Exchange Rate Mechanism (ERM) which led, in September 1992, to the depreciation of the Pound Sterling (Bowen, 1995). The poor performance of those two alternative anchors – monetary stocks and the exchange rate – convinced Chancellor Lamont to introduce an anchor based on a final rather than an intermediate target leading to the introduction of inflation targets in the UK.

Although the final decision regarding the setting of short-term rates and of the inflation target remained in the hands of the Chancellor, the new policy framework increased the involvement of the Bank of England in monetary policymaking. The Bank was invited to participate at joint meetings with the Treasury in order to formulate and tender advice on interest rates to the Chancellor. The prompt publication of those minutes made it possible for the Bank to quickly transmit its point of view to the public. To effectively operate the new framework, the Bank was asked to produce forecasts of inflation under the assumption of unchanged interest rates and to produce inflation reports that would explain the reasons for missed targets and convey the uncertainty about the inflation forecast to the public.<sup>12</sup> In addition, since November 1993, the Bank had some limited discretion about the timing of implementation of the interest-rate decision made by the Chancellor. As a consequence of those institutional changes the actual independence of the Bank of England increased already in the early nineties in spite of the fact that legal independence followed only during the second half of the nineties.<sup>13</sup>

## 2.2. Why did CBI increase so much during the nineties?

The evidence surveyed in the previous section supports the conclusion that during the nineties there has been a worldwide sustained increase in the levels of both legal and actual independence. This trend is due to a combination of global as well as of regional factors. This subsection briefly reviews the main factors.<sup>14</sup> Two main global factors underlie the trend toward higher CBI. One is an increased worldwide quest for price stability triggered by the stagflation of the seventies and the dismal economic performance of some high inflation countries, in Latin America and elsewhere. Contrary to the sixties and the seventies, the accepted view during the eighties and the nineties became that inflation and the associated uncertainties retard growth. The relatively good real performance of some low inflation countries like Germany and Japan till the eighties supported this view.

The second factor is globalization, the gradual dismantling of controls on capital flows and the associated widening of international capital markets. Those processes reinforced the quest for price stability and raised the importance of CBI as a signal of macroeconomic nominal responsibility to domestic and international investors. As argued by Maxfield (1998), this factor was particularly important in developing countries whose political establishments were anxious to establish smooth access to international capital markets. Relatedly, the IMF embraced the view that a high level of independence is a desirable institutional feature and actively promoted CB reform in many developing economies through conditionality and other means. In addition the intellectual revolution triggered by the KPBG inflation bias story helped cement a consensus that trying to use money to raise output beyond its full information, flexible price, value is ineffective and only leads to socially harmful inflation.<sup>15</sup> By offering a relatively simple theory of the prisoner's dilemma aspects of the interaction between monetary policymakers and individuals in

<sup>12</sup> Compared to a money stock target that may be only loosely related to inflation, an inflation target has the advantage that it focuses on the final objective of policy. But, unlike sufficiently narrow monetary targets, inflation is less controllable. Some of the consequences of this tradeoff for monetary policy are discussed in Cukierman (1995).

<sup>13</sup> By contrast inflation targets in New Zealand were introduced, concurrently with a substantial upgrading of legal independence, in 1989. But they have not been embedded in the Reserve Bank of New-Zealand law. The 1989 law only requires that the Governor and the Minister of Finance agree (in a Policy Target Agreement) on some target or targets for monetary policy. This was done expressly because no one knew at the time whether the inflation targeting framework would succeed in delivering price stability.

<sup>14</sup> A more extensive but older discussion appears in Cukierman (1998).

<sup>15</sup> KPBG stands for Kydland and Prescott (1977) and Barro and Gordon (1983).

the economy, the inflation bias model provided academic credence for the claim that monetary policy should be delegated to a sufficiently independent CB and helped spread this notion internationally.

Among the regional motives for increasing independence are: First, the breakdown of other institutions designed to safeguard nominal stability like the European Monetary System (EMS) and the Bretton Wood System, intensified the search for alternative institutions. Second, the good track record of the highly independent Bundesbank demonstrated that CBI can function as an effective device for assuring nominal stability. Third, the acceptance of the Maastricht Treaty by the European Union and Community implied that in order to conform with the Treaty many countries in the Union had to upgrade the independence of their CB as a precondition for membership in EMU. The fact that such a stipulation was introduced in the Treaty in the first place is related to the good record of the Bundesbank and to the central position of Germany within the Union. Fourth, after recent successful stabilization of inflation, particularly in Latin America, policymakers were looking for institutional arrangements capable of reducing the likelihood of high and persistent inflation in the future. In view of the experience available at the time, raising CBI was a natural way to achieve this objective. Fifth, the upgrading of CBI and the creation of best practice Western-type central banks in the former socialist countries were part of a more general attempt by these countries to create the institutional framework needed for the orderly functioning of a market economy. The fact that many of these new central banks were granted substantial *de jure* independence was no doubt motivated by evidence from the industrial economies suggesting that inflation and legal independence are negatively related and that independence and growth are either positively related or unrelated (see next subsection).

The discussion above still leaves open the question as to why did many countries choose to raise their commitment to price stability by upgrading CBI rather than through other means such as unilateral pegs? This question is discussed in Subsection 3.4 within the context of choice of nominal anchor.

### 2.3. CBI and economic performance

This subsection briefly surveys existing evidence on the relation between CBI and economic performance in the areas of inflation, growth, investment and the distributions of real and nominal rates of interest.

#### 2.3.1. Inflation

The early evidence in [Alesina and Summers \(1993\)](#), [Grilli et al. \(1991\)](#), [Cukierman \(1992, ch. 19\)](#) and [Cukierman et al. \(1992\)](#), suggests that, for the industrial economies, inflation and legal independence are negatively related. By contrast, in the group of developing countries neither inflation nor growth is related to legal independence. This is most likely due to the fact that at least till the early nineties there was hardly any link between actual and legal independence within this group of countries. When behaviorally oriented proxies of independence such as the actual turnover of CB governors and the index of political vulnerability are used, a negative relation between inflation and independence emerges within the group of developing countries as well ([Cukierman, 1992, ch. 19](#); [Cukierman et al., 1992](#); [Cukierman and Webb, 1995](#)).

Using data on the legal independence of freshly created central banks in former socialist economies (FSE) during the nineties, and controlling for cumulative liberalization, price decontrols and wars, [Cukierman et al. \(2002\)](#) find no relation between inflation and legal independence during the initial stages of liberalization. However, once the process of privatization and liberalization of domestic prices and of foreign trade becomes sufficiently large and sustained, a negative relation between inflation and legal independence does emerge. A possible reason is that legal independence is enforced in practice only when the shift to a market economy has become sufficiently important to induce the authorities to seriously engage in law enforcement.

For the Latin American and Caribbean countries during the nineties, and controlling for international inflation, banking crises and the exchange-rate regime, [Jacome and Vazquez \(2008-this issue\)](#) find a negative relation between inflation and legal independence. For a similar group of countries and time period [Gutierrez \(2003\)](#) finds that countries that entrench the legal independence of the CB in the constitution have lower inflation than those that do not.

Is there a general lesson from these different empirical investigations? The evidence is consistent with the conclusion that inflation and actual CBI are negatively related in both developed and developing countries. But the extent to which this basic relation is also reflected as a negative relation between inflation and legal independence depends on several other factors such as regard for the law and the degree of commitment to CBI as proxied, *inter alia*, by whether or not the CB charter is entrenched in the constitution.

One may argue that the negative relation between independence and inflation arises because of reverse causality from inflation to independence rather than from independence to inflation. It is hard to resolve this important question on the basis of existing evidence. Using data on legal independence for the Latin American and Caribbean countries during the nineties [Jacome and Vazquez \(2008-this issue\)](#) do not find evidence to support causality from legal independence to inflation. Closer examination of their data suggests that in some cases, the stabilization of high inflation preceded the upgrading of legal CBI. This was the case in Argentina, Peru and Nicaragua in the early nineties and in Brazil at the end of the nineties. In such cases inflation was initially quite high and the stabilization was of the “cold turkey” type. In other Latin American countries like Columbia, Paraguay and El Salvador legal CBI was granted during the disinflation process which then continued in a gradual fashion. In one case (Venezuela) inflation actually accelerated after legal independence was upgraded in the early nineties.

Data from [Cukierman et al. \(2002\)](#) show that acceleration of inflation following the upgrading of legal CBI was quite common during the early and mid-nineties in the Former Socialist Economies (FSE). This was the case following the first CB reform in Kazakhstan, Lithuania and Mongolia, and in Croatia, Belarus, Turkmenistan, Ukraine, Tajikistan, Latvia, and the Kyrgyz Republic.

Kazakhstan, Lithuania and Mongolia had a second-round of CB reform from the mid-nineties on, after high inflation had been largely stabilized. From that point on, low inflation persisted. More generally Cukierman et al. (2002) find that legal independence in the FSE is associated with lower inflation only after the process of liberalization has gathered sufficient momentum. A possible explanation for this finding is that law enforcement was relatively poor during the early stages of liberalization and as a consequence legal independence did not translate into actual independence. This and other evidence support the view that CBI functions reasonably well as an inflation prevention device. However, once high inflation has been allowed to develop CBI alone does not always suffice for the restoration of price stability.<sup>16</sup>

What can be said about the direction of causality between behavioral proxies of CBI and inflation? Using governors' turnover as a proxy for actual (lack of) independence Cukierman (1992, ch. 20, Section 7) finds evidence in favor of two-way causality between turnover and inflation during the forty years ending in 1989. Dreher et al. (2007) produce more recent evidence suggesting that causality runs from inflation to turnover.<sup>17</sup>

### 2.3.2. Growth, investment and the distribution of nominal and real rates of interest

For developed economies Grilli et al. (1991) found that real growth and CBI are unrelated. This led them to label CBI a “free lunch”. Those results are corroborated in studies by Alesina and Summers (1993) and Cukierman et al. (1993).

For developing economies the last paper finds that, although there is no association between legal independence and the rate of growth of per capita income, the association between growth and actual independence as proxied by the political vulnerability of the CB and related measures of turnover has a positive impact on the rate of growth. More precisely, using data from the sixties to the eighties and controlling, *inter alia*, for initial GDP, the change in terms of trade, initial primary and secondary enrollment ratios, it is found that higher political vulnerability of the CB governor and related measures of turnover are negatively associated with per capita growth.

For a subset of developing countries Cukierman et al. (1993) also find, in some cases, a similar negative impact of turnover on the share of investment in GDP. A possible joint interpretation of the last two results is that, under weak central bankers, private investments are lower reducing the long-run rate of growth.

Alesina and Summers (1993) and Cukierman et al. (1993) find that in developed economies the variability of both nominal and real rates of interest is negatively associated with legal independence. The second paper also finds, for the decade of the eighties, that the average real return to depositors was higher in developed economies with higher levels of legal independence.

For developing countries Cukierman et al. (1993) find that the variability of both nominal and real deposit rates of interest is positively associated with the turnover of CB governors.

The broad conclusion from those findings is that the variabilities of both real and nominal rates of interest are lower, and that the average real return to depositors is higher, in countries with higher levels of actual independence.

## 3. Remarks on disinflation and the changing structure of nominal anchors

### 3.1. “Cold turkey” versus gradual stabilizations and the role of the CB

During the last two decades many high inflation countries, the world over, stabilized inflation. Some of those stabilizations were of the “shock” or “cold turkey” type and others were gradual. Some involved the ministry of finance and even the entire government while others were implemented mainly by the CB. Two regularities appear to emerge from those experiences. First, by and large, very high inflations at rates over one hundred percent were stabilized by using the first method whereas stabilizations of inflation in the two-digit range were implemented gradually. Second, government involvement in the stabilization of high inflation was usually larger when high inflations were stabilized whereas low inflations were stabilized mainly, or solely, by the CB.

Thus, the stabilization of low inflation by industrial countries following the oil shocks of the seventies was done gradually and usually with relatively little involvement of the government. Similarly, the stabilization of low inflation in Chile since the beginning of the nineties was done gradually mainly by the CB. By contrast the stabilization of high inflation in Bolivia, Argentina and Israel during the eighties was of the cold turkey type and featured a substantial involvement of government. Interestingly, Israel went through both types of stabilizations at different times. The cold turkey 1985 stabilization that permanently reduced inflation from the three digit range to between ten and twenty percent per annum was led by government to the point that the minister of finance and the prime minister were personally involved. On the other hand the next phase of stabilization, that took place over the decade of the nineties and reduced inflation to the zero to two percent range, was done mainly by the CB in spite of occasional criticisms of the bank's restrictive policy by the minister of finance.

In what follows I argue that those regularities are not accidental for two reasons. First, under high and persistent inflation the public's belief in the seriousness of policymakers' commitment to price stability is likely to be substantially lower than under low inflations, or using terminology borrowed from Barro (1986) and Cukierman and Liviatan (1991), the initial “reputation” of policymakers is lower in the second case. Reputation is defined formally in those papers as the probability,  $\beta$ , that the public attributes to the event that the policymaker in office intends to deliver the inflation target that he preannounces. When  $\beta$  equals

<sup>16</sup> Using cross-sectional data from 11 EMU countries Vaubel shows that when a measure of the public's sensitivity to inflation is added to a regression of inflation on legal independence, the first variable is negative and significant whereas legal independence is not significant.

<sup>17</sup> Relatedly, de Haan and Kooi (2000) present evidence supporting the view that the relation between inflation and turnover is driven mainly by data from high inflation countries.

one, reputation is perfect, and when it is zero reputation is non-existent. In most real-life situations  $\beta$  is strictly between zero and one. That is, policymakers have some reputation but it is not perfect.

The model captures imperfect reputation by assuming that the policymaker in office can be one of the following two *exogenously given* types: a dependable one who takes the inflation target as a commitment to set the policy instrument in a way that will make inflation as near to the target as possible, and a weak type who mimics the announcement of his dependable counterpart, but is not really committed, and is therefore subject to the classical KPBG inflation bias problem. Both types share an identical objective function which increases in unexpected inflation and decreases in inflation. One can think of the dependable type as a policymaker who feels that reputation is an important electoral asset whereas the weak (or opportunistic) policymaker believes that reputation is a minor factor in his reelection prospects.

Cukierman (2000a,b) extends those frameworks to allow for imperfect control of inflation by policymakers. An important consequence of imperfect control is that the opportunistic policymaker can engage in short-term discretionary policies without being revealed as weak with probability one. In such an environment the public adjusts  $\beta$  gradually using Bayes rule. However, when sufficiently extreme rates of inflation occur reputation takes a jump. In particular, following the realization of a sufficiently high rate of inflation the policymaker loses all reputation, and following the realization of a sufficiently low rate of inflation he establishes his credentials as being dependable with probability one. Both policymaker types aspire toward higher reputation since the impact of the preannounced inflation target is higher when reputation is higher and this raises the value of their objectives.

When in office, the dependable policymaker attempts to raise his reputation by announcing and implementing a sufficiently low inflation target in order to increase the probability that his dependability will be subsequently revealed with probability one. When in office, the weak policymaker attempts to preserve his existing reputation by mimicking his dependable counterpart in the preannouncement of the target and by scaling down his planned inflation to a level below the one period discretionary rate. Thus, the two policymakers have opposite incentives with respect to revelation of their identities. The dependable CB aspires to reveal his type with probability one while the opportunistic policymaker tries to minimize the chances that his type will be revealed. Even if he mimics his dependable counterpart in deeds, as well as in words for some time, the opportunistic type will ultimately inflate at the high discretionary rate. As a consequence permanent stabilization of inflation is achieved only when a dependable policymaker is in office.

Stabilization of inflation brings with it long-term benefits at the cost of abandoning short-term advantages associated with the creation of unanticipated inflation under discretion. One can therefore think of the onset of a drive for stabilization as an increase in the concern of policymakers for the future, relative to current objectives and model it as an increase in the (common to both types) discount factor,  $\delta$ . The framework above implies that when a dependable policymaker is in office and  $\delta$  goes up, raising the incentive to implement a stabilization, the type of stabilization chosen by the dependable type will depend on the initial level of reputation. In particular, a shock treatment is more likely when initial reputation is sufficiently low and gradual stabilization is more likely when it is sufficiently high (proposition 6 in Cukierman, 2000b).

The intuition underlying this result is the following. An increase in the discount factor makes the future more important and induces *both* types, when in office, to inflate at lower rates. When reputation is sufficiently low the reduction in planned inflation by the dependable type (D) is larger than the reduction in planned inflation by the weak type (W) because, at a low reputation, D stands to gain relatively more from full separation than W stands to lose from it at the margin. As a consequence the probability of a shock treatment after which D is clearly separated from his weak counterpart is higher than that of gradual stabilization. When initial reputation is sufficiently high, W stands to lose relatively more than the reputation D stands to gain from full separation. Hence, when the future becomes more important, W makes a relatively stronger effort to prevent full separation than the effort made by D to establish his identity beyond any doubt. As a consequence, the probability of gradual stabilization is higher than that of a shock treatment.

A second factor that affects the relative desirability of shock versus gradual stabilization under moderate versus high inflation is related to the existence of nominal wage contracts and other temporary nominal rigidities. In particular, when initial inflation is sufficiently high the structure of overlapping sticky wages and prices is very compressed. As a consequence the relative price distortions associated with a shock treatment are relatively small. By contrast, when initial inflation is moderate the structure of overlapping wage contracts and prices is spread out, making the relative price distortions associated with a shock treatment higher and more persistent. Hence gradual stabilizations are relatively more attractive in this case.

Why do governments tend to be more heavily involved in the stabilization of high inflations whereas low inflations are frequently stabilized mainly by the CB? There are several reasons. First, the root cause of high inflation is usually due to government's fiscal imbalances and the need to finance them through seigniorage. In the presence of limited government access to credit markets such needs often create high inflations (Bolivia in the first half of the eighties is an example). Since the root cause of the problem resides in government's fiscal needs the solution must involve government.

Second, even when the root cause resides elsewhere, once high inflation has been allowed to develop, it is quite likely that the CB alone will not be able to do the job for several reasons. In such cases, without a clear-cut demonstration of fiscal responsibility by government, the low reputation of policymakers makes it extremely hard for the CB to convince the public that a change in regime is around the corner. This is reinforced by the fact that during high inflation the independence of the CB is low. In addition if, as was the case in countries like Chile and Israel, indexation is widespread at the outset and a shock stabilization is implemented, some or all of the indexation arrangements have to be temporarily suspended. Clearly, actions of this type are not within the arsenal of instruments of the CB. They require, instead, the involvement of government and other groups like labor unions.

### 3.2. Changes in the transmission process in the aftermath of successful stabilizations

Although they are desirable, successful stabilizations temporarily complicate the conduct of monetary policy. The reason is that such stabilizations induce changes in the transmission process of monetary policy through a variety of channels. Wages and prices become more sticky, the degrees of informal and formal indexation go down and the pass-through coefficient and dollarization go down as well. All those phenomena have taken place in Israel following the success of inflation targeting in reducing inflation to the current standards of Europe and the US. Schmidt-Hebbel (2004) documents similar trends for Chile.

Those changes lead to a lengthening of the transmission of monetary impulses to inflation and the real effects of monetary policy become more persistent. Since they raise the ability of monetary policy to affect output and employment, those are desirable developments. On the other hand, those structural changes make pre-disinflation knowledge about the precise magnitudes of the coefficients of the transmission mechanism somewhat obsolete and raise the CB uncertainty concerning the structure of the economy. As a consequence, during several years following successful stabilizations, monetary policymakers are forced to rely more heavily on various judgmental procedures and on a larger amount of relatively partial signals about the impact of monetary policy.

### 3.3. The inflation target, asymmetric CB objectives and non-linear reaction functions

During the last decade much of the academic research dealing with CB reaction functions has been cast in terms of Taylor rules. For the most part these rules assume that the CB loss function is quadratic in the output gap and in the deviation of inflation from its target.<sup>18</sup> This formulation leads to nice linear reaction functions and implies that the CB treats losses from being above and being below target with respect to both inflation and output in a symmetric manner. In the absence of uncertainty about future shocks possible asymmetries in losses do not matter. However, when it is recognized that real-life central banks are uncertain about future shocks when they pick their policy instruments, the shape of the objective function over the entire possible range of losses becomes important.

After a period as vice-chairman of the Fed, Blinder (1998, pp. 19, 20) suggests that "... in most situations the CB will take far more political heat when it tightens preemptively to avoid higher inflation than when it eases preemptively to avoid higher unemployment." Although the Fed enjoys a fair amount of actual independence, it is not totally insensitive to the reactions of the political establishment and the public. It is therefore likely that, in making policy decisions, the Fed may weight losses from negative output gaps more heavily than losses (if any) from positive output gaps. Cukierman (2000a) formalizes this asymmetry by postulating that the CB is concerned with losses arising from negative output gaps but is indifferent to the size of the gap as long as it is positive and shows that, in such a case, there will be an inflation bias even if the bank aims at achieving potential output on average. Using cross-sectional data from industrial economies Cukierman and Gerlach (2003) find support for this theory. Using a more general specification of asymmetric output gap objectives, Ruge-Murcia (2003) finds that such a specification fits the behavior of US inflation better than the traditional Barro and Gordon (1983) model which relies on quadratic objectives.

It might appear, at first blush, that there should be no reason for asymmetries in losses from the discrepancies between inflation and the inflation target (briefly – "the inflation gap"). However in periods of gradual disinflation, in which the CB is anxious to establish a reputation for being committed to the target, it may be more apprehensive of positive than of negative inflation gaps. Hence during such periods the bank may follow policies which make it more likely that the inflation target will be missed from below than from above. Interestingly, during the gradual Israeli disinflation at the end of the nineties and the beginning of the twenty-first century, the Bank of Israel missed the target many more times from below than from above.<sup>19</sup> A similar phenomenon occurred in the UK during the inflation targeting period.

Essentially, asymmetries in losses from inflation and output gaps reflect inflation avoidance and recession avoidance on the part of the CB with respect to those gaps. Such motives generally lead to non-linear Taylor rules. Cukierman and Muscatelli (2008) investigate the consequences of asymmetric preferences within a New-Keynesian framework of the type suggested by Clarida et al. (2000) and test for the existence of non-linearities in the interest-rate reaction functions of the US and the UK.

In times of stable inflation, as is the case in the US since the mid-eighties, recession avoidance preferences may dominate. In times of inflation stabilization, due to reputational considerations, inflation avoidance preferences may dominate. In the presence of both avoidance motives the reaction function may still be linear because the two motives affect the conventional linear Taylor rule in opposite directions. Recession avoidance alone tends to make the Taylor rule concave in both gaps, and inflation avoidance alone tends to make it convex in both gaps. Hence, in the presence of both motives, the Taylor rule is non-linear if one of those motives dominates the other.

Cukierman and Muscatelli (2008) develop a criterion for finding the dominant avoidance motive and apply it to the UK and the US. They find evidence supporting the existence of asymmetric CB objectives in most periods as well as substantial over-time variations in the identity of the dominant avoidance motive in both countries. In particular, the period between the end of the seventies and 1990 in the UK is characterized by a dominant recession avoidance motive. By contrast, since the introduction of inflation targets in 1992, the UK reaction function is characterized by a dominant inflation avoidance motive. In the US there is evidence of a dominant inflation avoidance motive during the (Vietnam war) inflationary buildup under McChesney–Martin. But

<sup>18</sup> See, for example, Taylor (1999) and, for Latin America, Loayza and Schmidt-Hebbel (2002).

<sup>19</sup> This even led some critics of the Bank to claim that the Bank was aiming at an inflation target that was lower than the one assigned to it by government (Sussman, 2007).

during the (stable price level) Greenspan era, and to a lesser extent during the Burns/Miller period, there is evidence of a dominant recession avoidance motive.

The more general lesson from those findings is that the objective functions of central banks are likely to adapt over time in order to address the most pressing economic problem of the day.<sup>20</sup>

### 3.4. CBI cum inflation targets versus exchange-rate anchors

Price stability can be achieved through a variety of anchors. Delegation of authority to an independent and sufficiently conservative CB (with or without explicit targeting of inflation) is one type of anchor, and some level of commitment to a unilateral peg is another one.<sup>21</sup> Different countries have utilized, or still are utilizing, one or the other, or some combination or variation of those anchors. The last fifteen years have witnessed a substantial reshuffling of nominal anchors.<sup>22</sup> Some countries in Latin America and elsewhere have gradually shifted from an exchange-rate anchor to effective CBI augmented by explicit inflation targeting.<sup>23</sup> Other countries like those joining the Euro area substantially raised their commitment to permanently fixed exchange rates by eliminating separate currencies through the creation of the EMU. China continues to maintain an implicit fixed peg, and so do some countries in the far East.

An argument often advanced in favor of replacing exchange-rate based anchors by CBI with explicit or implicit inflation targeting is that this makes it possible to utilize monetary policy for domestic stabilization purposes. However, the flexibility required for stabilization policy can also be achieved by exchange-rate bands at the cost of occasional abandonment of the band. For a given level of reputation Cukierman et al. (2004) discuss some of the factors that determine the choice of band width and the associated point along the trade-off between flexibility and credibility. An analogous, although not quite identical, trade-off arises under an independent CB with inflation targets. Here this trade-off is determined by the degree of targeting flexibility of the bank which depends on its conservativeness. By allowing larger and more sustained deviations of inflation from its target a less conservative CB leaves more flexibility for stabilization policy which is analogous to a wider exchange-rate band.

A second argument against exchange-rate anchors is that, in the current era of free capital mobility, the level of foreign exchange reserves needed to defend a fixed peg is likely to be prohibitive more often than before. This was vividly illustrated by the 1998 currency crisis. Again, if one wishes to maintain flexibility this can be achieved by widening the band. In spite of this, many developing economies still peg their currencies to some key currency (Calvo and Reinhart, 2002). Those remarks are consistent with the view that different anchors are appropriate for different countries, as well as for the same country in different time periods.

Interestingly, independently of whether they use an exchange-rate anchor, a dirty float, a band, a diagonal peg or a freely floating exchange rate, most countries have upgraded the legal independence of their central banks during the nineties. Thus, it appears that legal independence of the CB has come to be considered desirable even if some type of exchange-rate anchor is being used. But the likelihood that this legal independence translates into actual independence is higher when the exchange rate is more flexible.

## 4. The role of central bank independence in unionized economies

The literature on credibility and endogenous monetary policy that followed the lead of Kydland and Prescott (1977) and Barro and Gordon (1983) (hereinafter KPBG) implicitly assumes that all markets, and in particular the labor market, are competitive. A basic consequence of this assumption is that the conservativeness, or effective independence, of the CB affects inflation and the extent of countercyclical policy, but not the long run, or potential level of output and employment. In other words, in the absence of cyclical shocks, the level of CB independence is neutral with respect to the real economy in the same sense that money is neutral in classical monetary discussions like that of Patinkin (1965). The last ten years have witnessed the emergence of a new literature that considers the impact of monetary and labor market institutions on the economy in the presence of large wage setters like labor unions. This section reviews very briefly some of its main ideas.<sup>24</sup>

An important general message of this recent literature is that when wage settlements are centralized within a small or moderate number of unions, CBI affects inflation as well as real variables like employment, output and real wages. The basic reason for this dramatic difference in outcomes is that, when setting nominal wages, labor unions act strategically by taking the policy response of the CB into consideration.<sup>25</sup> Since the expected response of the CB depends on its independence, the actions of unions and the level of economic activity come to depend on CBI. This insight and the analytical frameworks that underlie it are particularly relevant for European economies in which the fraction of the labor force covered by collective agreements is large, and in which wage-bargaining institutions are often rather centralized.

<sup>20</sup> Alternatively one can think of those objective functions as being time invariant but dependent on the long run state in which the economy happens to be. To my knowledge, existing literature has not attempted to model or estimate such dependence explicitly.

<sup>21</sup> In some isolated cases price stability has been achieved without either of those anchors by having sufficiently conservative treasuries conduct monetary policy. This was the case in Japan during the second half of the twentieth century.

<sup>22</sup> The two way changes that have occurred worldwide in the use of exchange rate based anchors during the nineties are discussed in Fischer (2001).

<sup>23</sup> Corbo (2002) discusses the reasons for these changes in Latin American countries.

<sup>24</sup> Some of the earlier work in this area was carried out by political scientists. Hall (1994) and Hall and Franzese (1998) are examples. A recent survey that focuses mainly on the subsequent economic literature appears in Cukierman (2004).

<sup>25</sup> In more technical terms they act as Stackelberg leaders vis-a-vis the CB.

#### 4.1. Main ideas and analytical frameworks

Most of the literature on the strategic interaction between the CB and unions shares two basic presumptions. First, nominal wages are contractually fixed for a certain period of time to which I refer as the 'contract period.' Second, monetary policy and prices can be adjusted during the contract period. Casual observation supports both presumptions. Union nominal wages are normally fixed for at least one year, while prices and the money supply are usually adjusted at frequencies that are higher than one year. Those presumptions lead to the formulation of simple game theoretic models in which unions move first and set nominal wages while the CB moves second and chooses the rate of inflation or the money supply depending on the model. Third, union management likes higher real wages for its members but dislikes unemployment among them. Some of the recent literature also assumes that unions are averse to inflation. This is motivated by the observation that in many cases the pensions of union workers are not indexed and that union members, like other individuals, generally dislike inflation.

For the sake of simplicity a good part of the recent literature investigates the strategic interaction between the labor market and the CB for the extreme case of a single, all encompassing, monopoly union. The more recent literature generally considers the case of several unions. Following the lead of the KPBG-type models much of the literature on unions and the CB assumes that the CB directly controls the rate of inflation. More recent literature recognizes that prices are set by firms and that the policy instrument of the monetary authority is the money supply.<sup>26</sup> A basic consequence of this difference in modeling choices is that in the first group of models monetary policy affects the economy only via supply side channels, whereas in the second group it affects it mainly through demand side channels.

This difference in modeling strategy leads to diametrically opposed conclusions about the real effects of CBI on the economy. In particular papers which assume that the CB directly controls inflation and that unions are averse to inflation, conclude that by alleviating the inflationary fears of unions, more conservative central banks induce higher real wage demands and higher levels of unemployment (Skott, 1997; Cukierman and Lippi, 1999; Lawler, 2000; Lippi, 2003).<sup>27</sup> On the other hand, work by Soskice and Iversen (1998, 2000) which abstracts from unions' inflation aversion and postulates that the monetary authority controls the money supply concludes that less accommodating central banks moderate unions' wage demands by raising the fear of unemployment among their members. This view implies that both inflation and unemployment are lower under less accommodative central banks.<sup>28</sup>

Coricelli et al. (2006) propose a framework that integrates those different mechanisms into a unified framework, making it possible to identify the conditions under which either of the above effects dominates. The framework features both supply side and demand side transmission channels of monetary policy. They find that, for realistic values of the relative aversion of unions to inflation and to unemployment, higher CBI reduces the bargaining power of unions and leads to lower values of unemployment, real wages and inflation. The main features of this framework are as follows: prices and wages are set, respectively, by monopolistically competitive firms and by labor unions. Prices are fully flexible and wages are contractually fixed. The CB affects the price level and employment indirectly via its choice of money supply. The game now has a third stage in which firms set prices so as to maximize their real profits. This is preceded by the choice of money supply in the second stage and by the choice of nominal wages in the first stage.<sup>29</sup>

#### 5. Future challenges for an era of price stability

In sharp contrast to the decade of the eighties, large parts of the world currently enjoy price stability and central banks have become the guardians of this stability. This, I believe, is a good arrangement since reasonably independent central banks have a comparative advantage in maintaining price stability in comparison to bringing high rates of inflation down.<sup>30</sup>

There are several reasons to believe that this era of price stability is here to stay. First, even moderately independent CBs today find it easier than in the past to insist on delivering price stability because so much of each country's trade is with countries that are also characterized by price stability. This is reinforced by substantially higher freedom in the movement of capital and the associated wider international capital markets. In this new era, nominal (and financial instability) within a single country is much more costly than in the past in terms of limitations on the access to capital markets. Ministries of finance and governments, anxious to maintain unhindered access to borrowing in case of need, understand that letting inflation persistently deviate from the world norm will raise the risk premium on their borrowings and generally limit their ability to borrow. They are consequently more willing than in the past to allow central banks to focus on price stability. Similar considerations apply to the maintenance of financial stability. Thus, free and wide capital markets reinforce the incentives of governments to appoint relatively conservative central bankers and to give them enough latitude to maintain a strong focus on the attainment of price stability.

<sup>26</sup> By using money equilibrium the analysis in those models can be recast, equivalently, in terms of an interest rate instrument instead of a money market stock instrument.

<sup>27</sup> In the extreme case of a monopoly union, this view implies that (abstracting from stabilization policy) a populist or ultra-liberal CB that cares only about unemployment is best for a society that dislikes both inflation and unemployment.

<sup>28</sup> Accommodation and conservativeness are distinct concepts. However, empirical evidence presented in Cukierman et al. (1998) suggests that more conservative central banks are less accommodative. Such an association is also implied by theory.

<sup>29</sup> An extension of this framework, designed to capture strategic interactions between fiscal and monetary policies in the presence of unionized labor markets appears in Cukierman and Dalmazzo (2006).

<sup>30</sup> Cukierman et al. (2002) show that high levels of legal CBI in the newly created central banks of the former socialist economies did not stop the substantial inflationary impact of price decontrols during the nineties.

### 5.1. Monetary policy in an era of price stability and flexible inflation targeting

At the same time, once inflation has been conquered, there is a natural tendency to expect that, when choosing its policy instruments, the central bank will pay more attention to the state of the real economy than during the period of inflation stabilization. Using Svensson's (1997) terminology, they expect the bank to become a flexible inflation targeter, or if the bank had already been flexible during stabilization, they expect it will become even more flexible once inflation has been conquered.<sup>31</sup> Such expectation arises first because politicians and the public generally expect policymaking institutions to deal with the current main problem. Once inflation has been eradicated from the system, they take this fact for granted and expect the bank will pay more attention to other pressing problems of the day.

But there is also a deeper, welfare-based, reason to justify more flexibility (or less conservativeness) on the part of the CB. It is related to the fact, discussed in Subsection 3.3, that the policy trade-off between inflation and economic activity changes after the permanent stabilization of inflation. In particular, a unit change in the policy instrument, such as the interest rate for example, has a relatively stronger and more sustained impact on economic activity in comparison to inflation than prior to the stabilization of inflation. It can be shown that under such circumstances, a higher degree of flexibility in monetary policy is indicated. The intuition is that since the policy trade-off between economic activity and inflation is now "better", it pays on welfare grounds to let monetary policy focus, relatively more than during disinflation, on stabilization of the output gap.<sup>32</sup>

Obviously flexible inflation targeting requires an operational measure of the output gap. Since the output gap is defined as the deviation of actual output from potential output, implementation of flexible inflation targeting requires an operational measure of the output gap. Although central banks have been using various smooth versions of actual output to proxy for potential output for quite a while, this procedure may at times cause serious policy mistakes. In addition it is not grounded in theory. The next subsection briefly reviews the origins of those problems.

### 5.2. The perils of output gap stabilization

Nobody knows with certainty what is the time path of potential output. Although part of this uncertainty is resolved with the benefit of hindsight, there is normally substantial uncertainty about the current and near future expected level of this variable at the time monetary policy choices are made. A major implication of this observation for the choice of monetary policy procedures is that, due to poor real-time knowledge about the output gap, flexible inflation targeters condition their policy on a variable that is measured with a substantial amount of error.

In an important paper Orphanides (2001) shows that during the second part of the seventies and part of the eighties the Fed systematically overestimated potential output, leading to substantial overestimation of the magnitude of the recession at that times. Since the Fed behaved as a flexible inflation targeter, those forecast errors induced a monetary policy stance which came to be considered with the benefit of hindsight as excessively loose, thus contributing to the inflationary bulge of the second half of the seventies in the US. The fact that there was a substantial decrease in output during the second half of the seventies is well known and is not under dispute. What is at issue here is how much of this decrease was due to cyclical elements over which monetary policy has some temporary impact versus how much was due to changes in potential output over which monetary policy has little or no impact.

Since errors of forecast are sometimes positive, at other times negative, and normally not persistent, one may think at first blush that policy errors induced by poor measurement of the output gap should not inject persistent errors into the choice of monetary policy. Unfortunately, this is not the case with the output gap. Cukierman and Lippi (2005) show that errors in forecasting potential output and the output gap are generally serially correlated. The intuitive reason is that, unlike forecasts of many variables whose true values become known with a lag of one period, the true values of potential output and of the output gap are not revealed with certainty, even after the fact. As a consequence monetary policy errors of flexible inflation targeters become serially correlated as well. In periods in which potential output does not deviate much from its trend, the measured persistence in policy is small and may not constitute a serious problem for flexible targeting. But in periods with large deviations of potential output from its trend, policy errors may be quite persistent over time. Thus, in the presence of flexible inflation targeting, the inherent unobservability of the output gap is particularly dangerous for nominal stability around and following turning points in the path of potential output.

### 5.3. A new conception of the output gap

An intriguing recent innovation of New-Keynesian economics is to conceptualize potential output as the level of output that would have been produced in the economy under flexible wages and prices and perfect competition in all markets. Woodford (2003, ch. 6) shows that, provided those conditions are satisfied, economic welfare is maximized when output is equal to this concept of potential output.<sup>33</sup> On this basis he suggests that monetary policy should be directed at minimizing the gap between actual output and this New-Keynesian potential output concept.

<sup>31</sup> A CB is a flexible inflation targeter if its loss function penalizes the output as well as the inflation gaps. By contrast a bank is a strict inflation targeter if it cares only about the inflation gap. Obviously there can be only one kind of strict targeter but many types of flexible targeters, depending on the weight of the output gap in comparison to that of the inflation gap in the bank's loss function. The higher this weight, the more flexible, or less conservative, is the bank.

<sup>32</sup> This point is developed more fully in Cukierman (2007b).

<sup>33</sup> An early formulation of this principle appears in Goodfriend and King (1997) and Rotemberg and Woodford (1997).

This notion of potential output has two attractive features: First, it is welfare based. Second it is particularly suited as a target for monetary policy since it directs attention to the distortion that monetary policy can handle relatively more efficiently (temporary distortions of relative prices). But its practical applicability is limited by the fact that there currently are no empirical measures of the flexible price and wage equilibrium.<sup>34</sup> In addition most real world markets are imperfectly competitive. Once this is recognized the level of output that maximizes welfare no longer necessarily equals the flexible wage and price equilibrium (Benigno and Woodford, 2005; Cukierman, 2005). Moreover, the flexible price/wage equilibrium is often more volatile than the sticky price/wage equilibrium implying that policymakers should aim at making the level of output more, rather than less, volatile. My reality judgement is that even if reliable measures of the flexible price/wage equilibrium had been available, most central bankers would resist such a policy. Cukierman (2005) provides a partial rationalization for such resistance by showing that, in the presence of monopolistic competition on product markets the sticky price/wage equilibrium may welfare dominate its flexible counterpart.

#### 5.4. Capital market inflationary expectations as a guide to monetary policy

Since prices are determined by the decentralized decisions of many sellers the rate of inflation is ultimately determined by the aggregation of their decisions. An important insight of New-Keynesian economics is that, due to temporary price and wage stickiness, the aggregate rate of inflation depends on inflationary expectations. The central bank can therefore affect the rate of inflation by influencing inflationary expectations. Importantly, this implies that a current credible change in CB policy may affect the rate of inflation immediately and not only with a lag, as is the case in backward looking models.<sup>35</sup>

Countries like Israel and Chile in which the joint availability of nominal and indexed bonds makes it possible to obtain up-to-date information on inflationary expectations can therefore use this information as a leading indicator of inflation and partially base monetary policy on it. The Bank of Israel has actually done that to various extents during the last decade with reasonable success. One advantage of inflationary expectations from the capital market as an indicator of monetary policy is that when, due to unanticipated adverse shocks credibility declines, the Bank can act quickly to restore credibility before the decline has had a serious impact on inflation. During periods following the successful stabilization of inflation in which the uncertainty about structural economic parameters is high the availability of such an indicator is particularly attractive.

Bernanke and Woodford (1997) point out that if conventionally defined rational inflationary expectations are used as the sole indicator for policy, the price level may become indeterminate and the rate of inflation may diverge. This is sometimes referred to figuratively as the problem of “the monkey in the mirror.” However in spite of occasional substantial reliance on inflationary expectations from the capital market, no such instability has been recorded in Israel. Possible reasons for this divergence between theory and outcomes are that the Bank of Israel has relied on other indicators as well and generally deviated from precise adherence to the mechanical rule postulated in Bernanke and Woodford. My gut feeling is that, although the problem of the monkey in the mirror may become a real possibility under high inflation, it is very unlikely in the current generally very low inflation environment.

#### 5.5. Central bank capital, distribution of profits and independence

The issue of CB capital and of rules for the distribution of profits and their impact on the bank's independence is a relatively neglected institutional aspect of central banking. It appears, at first blush, to bear strong similarities to such questions for private corporations. Formally central banks and private firms are incorporated within a similar legal structure and utilize similar accounting principles. However, this resemblance in formal procedures hides several important differences. Unlike private corporations, CBs are set up to achieve aggregate policy objective(s) rather than to maximize profits. Unlike a private corporation, a negative net worth (or capital) at the CB does not imply that the bank will go bankrupt and cease to operate. Finally, the main owner of the CB is the government rather than private individuals, implying that any distribution of profits increases the spending power of government and that CB losses ultimately translate into revenue losses or additional expenditures for the central government.

When the level of CB capital becomes negative and drops below some threshold there is a danger that the political establishment might be successful in preventing the bank from following policies that lead to additional losses, limiting the independence of the bank through its balance-sheet position. In such cases, the more capital a CB possesses, the better its ability to conduct policy independently from fiscal authorities. This consideration is particularly important when the public interest requires the CB to adopt policies that create further losses for the bank. Such situations may arise for a variety of reasons such as when achievement of an inflation target necessitates contractionary policies, when financial stability considerations require the bank to assume the losses of failed financial institutions in order to reduce the risk of a systemic crisis or due to a costly defense of a peg or band.

The point is not that negative capital always limits the policy options of the bank. Thus, the Banco Central de Chile managed to stabilize inflation in spite of negative capital on its balance sheet. In the Chilean case the negative capital was not a constraint because government was committed to maintain a budgetary surplus. But there obviously are other cases in which the negative capital of the bank seriously limited independence. Examples are provided in Stella (2005).

<sup>34</sup> To a first approximation there is no connection between traditional measures of potential output based on various smoothers of output and the flexible wage and price equilibrium under perfect competition.

<sup>35</sup> A survey appears in Clarida et al. (1999).

Does that imply that in order to assure CBI, government should always cover all CB losses? The answer is not clear-cut since such an arrangement allows a non-elected institution (the CB) to make fiscal policy decisions. This is obviously questionable on grounds of democratic accountability. Consequently, there is a trade-off between democratic accountability and CBI. This trade-off may become particularly important when the occurrence of large economic or political shocks force the CB to engage in policies that have substantial adverse fiscal implications. When endowed with sufficient legal independence and positive levels of capital it is quite likely that, most Western CBs will be able to engage in loss-creating policies when such policies are required. However, if at the time those policies are needed the bank already has a substantial amount of negative capital, it is likely that the political establishment will have the ability, and often the incentive, to stop, delay or severely limit them.

This risk is important mainly in developing countries in which the association between actual and legal independence is loose. In such cases the relation between independence and the level of CB capital is likely to be discontinuous in the sense that below a certain threshold of negative capital the CB will be seriously limited by political authorities even if it enjoys a high level of legal independence. But above this threshold the ability of the bank to conduct policy independently will not depend, to a first approximation, on the level of CB capital. It follows that maintenance of a sufficiently high level of capital is basically a (partial) insurance against states of nature in which the bank's ability to resist the pressures of political authorities is weakened.<sup>36</sup>

Similar considerations apply to rules and regulations for the allocation of CB profits to government. Such rules are often not very transparent and biased toward larger distributions to government opening the door for evasion of deficit limits. Clear and transparent rules about the distribution of profits as well as about procedures for rebuilding negative levels of central bank capital enhance the bank's independence and its credibility as a guardian of price stability. An enlightening discussion of those issues appears in Stella (2005).

## Acknowledgements

I would like to thank an anonymous referee, Jakob de Haan, Roland Vaubel and David Archer for useful comments on previous drafts. Earlier versions of the paper were presented as a distinguished lecture at the September 2005 meeting of the Chilean Economic Association in Vina del Mar Chile, at the November 2006 Second Economic History Panel on the Evolution of Central Banks (Bank of England), at the September 2007 Bocconi University conference on Central Bank Independence and at the November 2007 joint Bundesbank/Bank of Finland conference on Designing Central Banks in Eltville, Germany.

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<sup>36</sup> A fuller discussion appears in Cukierman (in press).

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