MONETARY COMMITMENT, INSTITUTIONAL CONSTRAINTS AND INFLATION: EMPIRICAL EVIDENCE FOR OECD COUNTRIES SINCE THE 1970S

ANDREAS FREYTAG
FRIEDRICH SCHNEIDER

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Abstract

Central bank independence (CBI) is a very important precondition for price stability. However, the empirical evidence for a correlation between both is relatively weak. In this paper, this weakness is countered with a) an extended measure of monetary commitment, which includes well-known criteria for CBI and external criteria such as convertibility and exchange rate regimes and b) the argument that monetary commitment can grant price stability best if it is backed by an adequate assignment of economic policy. An empirical assessment with data from four decades confirms the crucial role of monetary commitment for price stability.

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Keywords: central bank independence, price stability, monetary commitment.

Andreas Freytag
Friedrich-Schiller-University Jena
Carl-Zeiß-Str. 3
07743 Jena
Germany
andreas.freytag@wiwi.uni-jena.de

Friedrich Schneider
Department of Economics
Johannes Kepler University Linz
Altenbergerstr. 69
4040 Linz-Auhof
Austria
friedrich.schneider@jku.at

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1. Introduction

In the past two decades, central bank independence (CBI) has been regarded as being the primary policy option to secure price (level) stability. Consequently, throughout the world, central banks have experienced an ever-increasing degree of CBI. Simultaneously, average world inflation has been decreased to a great extent. Despite these parallel developments, the direct statistical relationship between legal CBI and price stability is surprisingly weak, at least when calculated for both developing and developed countries (Arnone et al. 2006a). It is even more doubtful whether the observed correlation also reflects a causal relationship from high CBI to low inflation (e.g. Berger et al. 2001).

This disappointing empirical evidence has induced a number of explanations ranging from a fundamental criticism to the notion of common third determinants for both CBI and inflation (Posen 1993, Forder 2005). The question arises whether CBI is an appropriate instrument for granting stability. Alternative suggestions focus directly on the central bankers and their relations to the government. However, the literature has provided many convincing arguments for applying policy rules rather than trusting individuals and their promises (e.g. Brennan and Buchanan 1981). This paper departs from here and argues that rules such as central bank independence are effective only in the presence of enforcement mechanisms. In other words, there is a missing link between central bank independence based upon statute reading and its credibility. The price level and its developments cannot be exclusively traced back to monetary policy rules, but also to other relevant variables, both institutional and macroeconomic ones. The goal of our paper is to develop a procedure to overcome on the one hand the obvious theoretical weaknesses, in particular with respect to the link between commitment and credibility, and on the other hand the empirically weak correlation between commitment and inflation by using a pool to regression model to consider a country's development over time appropriately.

The remainder of this paper is organized as follows. In section 2, we present an overview about the literature. Section 3 presents the theoretical background of the paper and introduces our understanding of monetary commitment and credibility.

Two hypotheses are derived. In this section, the variables and data are introduced. The empirical assessment of the hypotheses for two samples of OECD countries over four decades is presented and discussed in section 5. Conclusions in section 6 round off the paper.

2. Monetary commitment in the literature

Monetary commitment has been discussed in the literature extensively for about 30 years. Although a widespread common belief that monetary policy should be rule bound and that central banks should be granted independence (CBI) has been developed over time, there is still controversy about details and about empirical evidence. This section is not meant to provide a survey, but to outline the basic contributions and to discuss the main theoretical and empirical problems and controversies as to indicate this paper's perspective. Basic contributions to the field have been made by different schools of thought. Brennan and Buchanan (1981) as well as Hetzel (1997) argue that monetary commitment is a constitutional decision which can be justified by principal-agent problems between the public as principal and the government as agent (McCallum 1997). This view is strengthened by the neoclassical approach as put forward among others by Kydland and Prescott (1997) as well as Barro and Gorden (1983).

As one practical policy option to remedy the principal agent problem, central bank independence can be granted. CBI is measured as the simple sum or as a weighted or unweighted average respectively of the various properties of central bank legislation (e.g. Parkin and Bade 1977, Grilli, Masciandaro and Tabellini 1991, Cukierman 1992 respectively). This procedure has been subject to severe criticism. Forder (1996) argues that the concept of statute reading is methodologically flawed, as it gives no credit to informal rules and to actual behaviour. For instance, the central bank's ability to conduct monetary policy may be limited despite a high degree of CBI due to exchange rate regimes set up by the government. He also claims that the statute of a central bank does not allow assessing the government's commitment to stability. One important conclusion of this reasoning is that CBI must not be confused with credibility (Freytag 2005). Credibility of a policy is only given if the public has trust in the respective

legislation. Less fundamentally and accepting the concept of CBI in general, Posen (1993) argues that the financial sector is able to influence both the degree of central bank independence and inflation; its dislike of inflation causes both. Similarly, Hayo (1998) as well as de Jong (2002) argue that cultural aspects can exert pressure on the government to grant CBI and to keep inflation low. In other words, as legal CBI is endogenous, it may be difficult to use it as an exogenous variable for policy outcome. A third line of reasoning argues that CBI does not reflect the role of transparency and accountability of central banks. This neglect may partly explain problems with the empirical analysis (de Haan, Eijffinger and Waller 2005, chapter 4).

One consequence of these criticisms would be to apply different commitment mechanisms (Hayo and Hefeker 2002) as a means to guarantee price stability. However, other mechanisms such as contracts for central bankers (Walsh 1995) or appointing a conservative central banker (Rogoff 1985) have even stronger flaws, as they do not provide a solution to the principal-agent problem. Theoretically, CBI or a similar commitment mechanism can be seen as the least problematic way to solve it.

According to the theoretical controversy, the empirical evidence is indeed less clear than the proponents of CBI would theoretically claim. At least, it seems to be exaggerated to identify an "…overwhelming empirical evidence…" supporting the claim that CBI and inflation are negatively correlated, as de Jong (2002, p. 675) does. In cross country studies[1], the empirical relation between legal indicators of CBI and price stability is positive, at least for a sample of industrialized countries and increasingly for transition economies. With respect to industrialized countries, all legal measures applied are negatively correlated with inflation. By contrast, for developing and transition countries, this relation is not that robust. Legal measures of CBI do not indicate a strong impact on inflation. The only significant negative correlation can be found between de-facto CBI measured as turnover rate of central banks' CEOs and inflation. This result is disappointing, as both the turnover rate and inflation may be caused by the same

[1] For an overview about the empirical literature concerning CBI and inflation see e.g. Berger et al. (2001, Table 1) as well as Eijffinger and de Haan (1996).

exogenous variable. The result again indicates that CBI does not imply credibility – it heavily depends on an enforcement mechanism.

The empirical investigations do have a number of general problems. First, correlation does not necessarily imply causality (Berger et al. 2001). This can already be seen in the theoretical discussion. The degree of CBI is not exogenously given, but depends on historical experience. Granting CBI may also neglect accountability and leave too much room for central banks' discretion. In addition, central banks' behaviour can be directed at securing their high degree of independence (Forder 2005). Thus, a clear direction of causality is difficult to maintain. Second, cross section studies compare different countries at the same time and do not cover developments over time. In the literature, only a few pooled regressions have been run (ibid., Table 1). Third, it seems that heterogeneity with respect to the development level of countries plays a major role. In those countries where the rule of law is generally accepted, the legal status of the central bank is decisive for the success of its policy. In other countries, the correlation between the legal status and inflation is rather arbitrary.

Hence the goal of our paper is to develop a procedure to overcome these theoretical weaknesses and empirical problems in three ways: **First**, we use an alternative and in comparison to CBI more comprehensive legal measure of monetary commitment, namely one that focuses on independence, but at the same time also includes central banks obligation to guarantee transparency and accountability as well as external aspects of commitment (Freytag 2001). Thereby we hope to measure the government's commitment to price stability more comprehensively, because all actors' responsibilities are assessed, and to obtain more valid empirical evidence. Although there is a somewhat more convincing univariate relationship than with alternative measures (Freytag 2001), this evidence is far from satisfying.

Therefore, we **second** argue that granting CBI can raise credibility of monetary policy and guarantee price stability only if it is interpreted as part of the policy assignment. This implies for one that the number of policy objectives equals the number of policy instruments (Tinbergen 1952), next that the single components of economic policy are compatible with each other, in other words that a

consistent economic order exists (Eucken 1955). To ensure the adequate consideration of the policy assignment, not only formal economic policy rules are included, but also informal institutions, which exert influence on the outcome of monetary policy. Following this view, CBI is one of several important policy institutions necessary to secure price stability. The notion that institutional constraints are important for the effectiveness of policy rules has been increasingly considered in the literature in recent years (e.g. Keefer and Stasavage 2001, Freytag 2005[2]). In addition to this, the effects of a legal or constitutional policy rule are dependent on other macroeconomic factors. These have also to be taken into account.

Third, we try to tackle some methodical problems that other studies have. Thereby, we incorporate long term relationships rather than just looking at cross country evidence. This can be done by using a pooled regression model to consider a country's development over time appropriately. In addition, we concentrate on industrialized countries within the OECD to avoid problems with heterogeneity.

3. Theoretical background and hypotheses

The approach developed in this paper is theoretically based on the well-known rules versus discretion approach (basic: Kydland and Prescott 1977). Given that the government has several policy goals, it tries to maximize its utility function (U_G) consisting of arguments such as price stability (low inflation π), employment (N) and fiscal means (S): $U_G = U_G(\pi, N, S, ...)$. U_G is negatively dependent on inflation and positively dependent on N and S. In OECD countries, one can assume that the fiscal problems are minor in comparison with the problem of unemployment. Therefore, the government seeks to minimise the following loss function (L_G) with respect to inflation (π):

$L_G = 1/2\pi^2 + 1/2\beta_G(y_t - y^*)^2$, with $0 \leq \beta_G \leq 1$,

[2] The author shows for a sample of 29 countries, which pursued a monetary reform, that a high degree of monetary commitment is credible only jointly with an according policy assignment.

where β_G represents the weight the government assigns to the employment (output) objective. The current aggregate output y_t can be stimulated by a surprise inflation (Phillips relation):

$y_t = \pi_t - \pi_t^e + \varepsilon_t$, with ε representing a random shock.

Then, the minimisation process results in an optimal inflation rate π, which is positively dependent on β_G. It is positive, if the government assigns a positive weight to employment. This result is known as inflationary bias:

$$\pi = \beta_G y^* - \frac{\beta_G}{1+\beta_G}\varepsilon$$

Assuming rational expectations, the increase in inflation does not raise output to the desired level y^* in the long run. Instead, the individuals will acknowledge that the surprise inflation does not increase their real income, and employment – if it has risen in the short run – will decrease again and thus remain constant in the long run. From a political perspective, the government may be tempted to create an upswing in the business cycle e.g. prior to elections. The direct real effects of a political business cycle are zero. However, as the increase in inflation has negative consequences on growth (Barro 1995), this outcome presents a strong economic rationale for separating the objective of price stability from other policy objectives. By doing this, the government can use as many instruments to economic policy as it identifies policy objectives. Additionally, it makes sense to assigning monetary policy to an independent agency, called central bank, with an ncentive structure resulting in a simple loss function (L_{CB}):

$L_{CB} = \pi^2$.

Minimising this loss function leads to the optimal inflation rate $\pi = 0$.

Thus, the government's utility function can be analytically separated into individual utility functions of several governmental agencies, which have the task to implement special economic policies. The central bank's utility function contains price stability as only goal. Following a standard neoclassical policy assignment, the (narrowly defined) government's utility function contains economic growth, whereas the social partners seek to maximise employment.

Each optimisation process takes place under the constraint to consider the other policy objectives. The individual policymaker's decision-making process then is not disturbed by an alleged trade-off between policy objectives within the same loss function. This analysis confirms the economic case for the government to commit to price stability and grant central bank independence, as assigning monetary policy to an independent central bank obliged to meet the goal of price stability (instrument independence, Debelle and Fischer 1995) can be interpreted as a commitment device.

A crucial topic is the measurement of commitment. In general, it is measured as the weighted average of criteria assessing the relation between government and central bank with respect to monetary policy. The coding is restricted between 0 and 1 (Cukierman 1992). Throughout this paper, we use a comprehensive concept of monetary commitment (*MC*), which includes all components of conventional measures of CBI (in particular: Cukierman 1992, pp. 371-378), the central bank's accountability as well as external aspects of commitment, namely the exchange rate regime, convertibility restrictions, completive elements in monetary policy and the question of who decides on exchange rate policy (Freytag 2001).[3] By including accountability into *MC*, the central bank's responsibilities as part of the commitment to stability are considered. The reason for including external components is that our measure comprehensively captures the commitment of the government to stability.

However, as seen above commitment does not necessarily imply credibility of monetary policy. What the government announces to do is not under any circumstances what it really will do. This holds in particular if the assignment problem is not solved in a way that the different policy instruments are compatible. Assume that the government grants independence to the central bank and at the same time organises the labour market with a centralised wage negotiation scheme exclusively left to unions and employers associations. In the short run, the outcome of this negotiation process may be contradictory to price stability, if it raises nominal wages far beyond productivity growth. The central bank then has the choice to accommodate this nominal wage increase or to follow

[3] See *Annex 3* for details of the index of commitment.

a policy directed at price stability accepting increasing unemployment in the country.[4] The incompatibility of the labour market regime and the monetary regime causes tensions and leads to a situation of one objective inevitably missed. Private agents with rational expectations will not believe in inconsistent policy announcements. Their economic decisions (about wages and other long-term contracts) will make the monetary commitment incredible and will lead to time inconsistency, i.e. the government facing the incentive to deviate from the announced policy path.

The missing link between the inflation rate as the outcome of monetary policy and the de jure independence of the central bank is the public's behaviour with respect to long term contracts. This behaviour depends on how credible the monetary commitment is. Credibility itself depends on the compatibility of the components of economic order or institutional aspects respectively with the legal monetary regime. This compatibility has two dimensions, which are closely related. The first dimension is economic rationality, implying that the policy assignment is adequate to meet the policy objectives price stability, full employment and economic growth without interferences. To convince the public of its sincerity to strive for these objectives the government also has to consider the second dimension, namely political economy of the assignment. A strong signal to back monetary commitment with rules and/or behaviour in other policy areas certainly raises the credibility of monetary policy. Thus, statute reading indeed does make sense: to judge the credibility of a promise, it is important to relate it to de facto constraints, in this case the institutional setting.

Next, we need to identify those (formal and informal) components of economic order that contribute to the credibility of a monetary policy commitment and the discussion of the way, in which these components are connected to monetary policy. These institutions are well covered by the index of economic freedom (*EF*) (Gwartney et al. 2002). This index consists of 5 groups:

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[4] This scenario is not unlikely; it indeed reflects the case of Israel in the early 1980s, where the government was even part of the wage bargaining process. A monetary reform with strict monetary commitment failed due to the results of these tripartite and centralized wage negotiations, which did not consider the objective of price stability. Only after the monetary regime was made more flexible (via a crawling peg) and the disinflation program was made

(1) Size of government, including information about government consumption, subsidies and taxes.

(2) Legal system, consisting of information about property rights, judiciary independence, impartial courts, intellectual property rights, the role of military in politics and general acceptance of the law.

(3) Monetary soundness, not considered in this analysis (as we want measure the effect of economic freedom on monetary soundness, i.e. inflation).

(4) Freedom to trade with foreigners, including information about barriers to trade and capital restrictions.

(5) Regulation, including banking regulation, labour market regulation, business regulation and corruption.

The index covers almost all important institutional aspects and is grounded on de jure and de facto institutions. The value of the index is the higher, the smaller the government (including taxes), the better legally protected the citizens, the higher freedom to trade and the less regulated the labour market. To make it useful for our purpose, the index is adjusted by norming its values between 0 and 1 and by omitting monetary soundness; the expected correlation with inflation is negative. It is reasonable to argue that to be successful a strong monetary commitment requires a high degree of fiscal stability, a high degree of openness and a flexible labour market. High economic freedom exerts pressure on governments to stick to their policy announcements, as it leaves more options for the citizens. Costs of reneging are high.

In a final step, we combine *MC* and *EF* to construct a proxy for ex-ante credibility designed to analyse whether or not the public trusts an announcement in advance (*Cred1* and *Cred2*). Theoretically, the credibility of a monetary regime is the higher, the higher cost a deviation from a commitment causes for the government. Therefore, the interaction term of MC and EF is negatively correlated with inflation, as both variables are negatively correlated with inflation.

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less ambitious in 1985, inflation could be reduced sustainably in Israel (Freytag 2002, pp. 143f and 156).

In addition, there are control variables to estimate the determinants of inflation. Some new research has been devoted to cultural aspects (Hayo 1998). The argument goes as follows. The public attitude towards inflation is extremely important for both the monetary commitment and the resulting inflation rate. A high public regard of price stability raises political costs of inflation for the government. We take this into account with an attitude dummy for the 1990s (*ATT*) as well as with an EMU dummy for the 1990s (*EMU*). The amount of foreign trade (*TR*) can also have contradictory effects on inflation. On the one hand, foreign trade causes intensive competition and better allocation of resources and factors implying a lower inflation rate (Romer 1993). On the other hand, higher demand for domestic goods can increase their prices contributing to higher inflation.

Moreover, macroeconomic variables play a role in explaining inflation in a more traditional fashion: a high GDP growth (*dGDP*) may be positively correlated with inflation in less developed countries. However, in our sample of 20 developed OECD countries, GDP growth may also imply an efficient allocation of resources, efficient government activities and low distortions – there is no need for the government to abuse monetary policy. Put differently, in low growth countries, inflation may be higher (stagflation). We expect a negative correlation. By contrast, the actual wage development (*dW*), i.e. fast growing wages as well as price shocks (*Shock*) can increase the inflation rate. Wage pressure cannot be totally ignored by the central bank, and may lead to an increase in money growth, causing an increase in inflation. Finally, a price shock such as a sudden increase in the prices for natural resources, can also add to inflation.[5] The theoretical considerations suggest the following two hypotheses with respect to the correlation of central bank independence and inflation:

Hypothesis 1: In OECD countries inflation is the lower, the higher the degree of monetary commitment, the degree of fiscal stability, the degree of openness, the flexibility of labour markets and the inflation culture.

[5] It may be seen as appropriate to add the lagged endogneous variable. However, as we measure average inflation over a decade, we argue that the average CPI of the past decade has only a modest influence on the current decade's average CPI. Each decade is characterized by events, which have a bigger influence than past experience.

➔ $\pi = f(MC, EF, ATT(EMU), TR, dGDP, dW, Shock)$.

Hypothesis 1 refers to the economic rationality of economic policymaking. An adequate neo-classical policy assignment allows for price stability as other objectives are assigned own instruments.

Hypothesis 2: In OECD countries inflation is negatively correlated with the degree of credibility, defined as a fixed relation between institutional constraints and the index of monetary commitment.

➔ $\pi = f(credibility, ATT(EMU), TR, dGDP, dW, Shock)$;

➔ $credibility = f(MC, EF)$,

Hypothesis 2 is directed at the political rationality of economic policymaking. If the public – having rational expectations – is convinced about the adequacy of the assignment and the sincerity of the government's announcements, its plans will give reasons for time consistent policy.

4. Empirical results

The econometric analysis has the goal to empirically test our two hypotheses, hence it is directed at explaining the impact of monetary commitment and institutional factors on a decade's average consumer price inflation. The structure of the data strongly suggests applying a pooled regression fixed effects model for four periods and 20 OECD countries.[6] To control for international spillovers, we also test the model for a subsample of 14 small open economies (excluding the USA, the UK, France, Germany, Italy and japan). Fixed effects are necessary to take country specific factors appropriately into account.

For hypothesis 1 we obtain:

$$\pi_{it} = \beta_0 + \beta_1 MC_{it} + \beta_2 EF_{it} + \beta_3 ATT_{it} + \beta_4 TR_{it} + \beta_5 dGDP_{it} + \beta_6 dW_{it} + \beta_7 Shock_{it} + \varepsilon_{it}$$

with $i = 1,...,20$ (countries) and $t = 1,...,4$ (decades from 1960s through 1990s).

Hypothesis 2 is tested by:

[6] See *Annex 2* for a list of countries.

$$\pi_{it} = \beta_0 + \beta_1 Cred1(2)_{it} + \beta_2 ATT_{it} + \beta_3 TR_{it} + \beta_4 dGDP_{it} + \beta_5 dW_{it} + \beta_6 Shock_{it} + \varepsilon_{it}$$

with $i = 1,...,20$ and $t = 1,...,4$.

The independent variables for the institutional set ups and for the credibility are specified as follows:

1. MC is generally measured by assessing the central bank law with respect to the ability of the central bankers to pursue a stability oriented monetary policy free of political influence. Thus ten criteria (see *Annex 3*)[7] are introduced and given numerical values, which are averaged either weighted or unweighted. The data is available from the 1960s to the 1990s. The information for *MC* for the 1990s is taken from Cukierman (1992), Freytag (2001), central bank's websites (IWP 2003) and IMFb.

2. To measure the institutional setting, we use a comprehensive measure, namely the index of economic freedom by Gwartney et al. (2002) resolved for section 3 (access to sound money). It is also restricted between 0 and 1. A higher value implies a higher degree of economic freedom. The variable *EF* is available for the years 1970, 1975, 1980, 1985, 1990, 1995 and 2000. As the index in the very year reflects developments of the past, we argue that the 1970 value represents the institutional setting of the 1960s, that the average of the values for 1975 and 1980 represents the 1970s and so forth. Thus, we obtain four observations per country.

3. In hypothesis 2, we argue that the public is able to assess the economic order. The compatibility of the monetary regime with other policy areas is important for its credibility. This hypothesis demands for an ex-ante proxy of credibility. Otherwise, we would be unable to test the hypothesis. The compatibility of the monetary commitment with the institutional setting is calculated by the sum of *MC* and *EF*, the index of economic freedom: $Cred1 = (MC + EF)$. The higher the sum of *MC* and *EF*, the higher the credibility of the monetary regime and the higher the variable *Cred1*. Therefore, the expected influence on inflation is negative. A strong alternative version of the credibility variable is the product

of MC and EF: $Cred2 = MC * EF$. If both monetary commitment and economic freedom are high (close to one), credibility also is high (close to one). If both indicators are low (close to zero), credibility is also low (close to zero). The expected impact of *Cred2* is negative.

4. A dummy called *ATT* is taking the value 1 for the 1990s, as in this period all countries changed their central bank law. It is a proxy for an increased public preference for stability. We alternatively use *EMU*, which takes the value 1 for the EMU members in the 1990s.

5. *TR* as a measure for foreign trade is calculated from the sum of exports and imports divided by GDP and multiplied with 2: $OP = (X + M) / GDP * 2$; it is available from the 1960s through the 1990s. The data is from Heston, Summers and Aten (2002).

6. We also assess the influence of real GDP growth (*dGDP*) on inflation, assuming a negative impact on inflation. Again, the data is from Heston, Summers and Aten (2002).

7. The variable *dW* displays the increase in average wages in a country per decade. The data is from IMFa.

8. A shock variable (dummy) for the 1970s (two oil price shocks) is applied.

9. Finally, for the subsample "small open economies" we use the CPI in the US for the same period as control variable.

The endogenous (dependent) variable is average consumer price inflation (*CPI*) for the very decade. Consumer price inflation is calculated on the basis of IFS statistics (IMFa). The data is calculated annually, and averages are taken. The following statistical relations between CPI and exogenuous variables are expected:

Exo-genous	*MC*	*EF*	*Cred1*	*Cred2*	*ATT/ EU*	*TR*	*dGDP*	*dW*	*Shock*	*US CPI*
Expected sign	-	-	-	-	-	+/-	-	+	+	+

[7] See also the studies by Grilli, Masciandaro and Tabellini (1991), Parkin and Bade (1977),

The results of the pooled regression using the White cross-section correction method in the basic model for the entire sample are shown in tables 1 through 5. The regressions are done using two samples. The first sample covers the period from the 1970s through the 1990s, as the world-wide economic policy setting concerning exchange rates and capital restriction changed in the early 1970s (tables 1 and 3). The dependent variable in all cases is consumer price inflation, measured as the average annual change in consumer prices of the respective decade (*CPI)*. Equation 1 deals with hypothesis 1, whereas equations 2 and 3 assess hypothesis 2. In tables 2, 4 and 5, we show the results of estimating the second sample including the 1960s to see whether or not the structural break after 1971 is a problem for the relationship between CPI and our independent variables.

In general, the empirical evidence of our econometric analysis is encouraging and confirms our two major hypotheses to a considerable degree. Monetary commitment in conjunction with the institutional setting can explain the development of inflation (*CPI*) very well. Following our hypotheses 1, inflation is indeed decreasing the higher the degree of monetary commitment and the higher the degree of economic freedom. The empirical results of table 1 also make evident that a comprehensive measure of monetary commitment is well suited to catch the relation between commitment and inflation. Also our hypotheses 2 is confirmed, which means that a monetary commitment can gain credibility and facilitate price stability, if it is compatible with the economic order.

a) The full sample

In table 1, the first regression clearly shows that with the exception of the influence of wage increase (variable *dW*) the coefficient of *MC* has the quantitative largest influence and is with a t-value of -12 highly statistically significant. Then follows the independent variable foreign trade (measured as the doubled sum of exports and imports in per cent of GDP) with a positive sign, meaning the more open a country is the higher is a risk of inflation. The independent variable economic freedom (*EF*) is just statistically significant and

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Cukierman (1992) and Cukierman et al. (2002).

the negative statistically significant coefficient of the dummy variable *ATT* shows that there is an increase public preference for price stability. Obviously, the oil price shock variable has the expected positive statistically significant influence and also the real growth rate of GDP has the expected negative influence on inflation.

Table 1: Credibility and inflation: Pooled regression 1970s to 1990s

Variable	1	2	3
C	**14.983*** (7.66)**	**16.489*** (16.15)**	**11.507*** (50.37)**
MC	**-8.767*** (-12.19)**		
EF	**-5.579* (-1.92)**		
Cred1		**-8.453*** (-9.05)**	
Cred2			**-14.477*** (-10.33)**
ATT	**-2.54*** (-10.5)**	**-2.273*** (-32.95)**	**-2.114*** (-42.4)**
TR	**8.312*** (4.64)**	**7.854*** (5.64)**	**8.418*** (7.23)**
dGDP	**-1.586*** (-10.68)**	**-1.544*** (-11.04)**	**-1.505*** (-13.1)**
dW	**10.674*** (15.39)**	**10.923*** (18.71)**	**10.844*** (27.25)**
Shock	**2.652*** (12.43)**	**2.475*** (13.72)**	**2.484*** (14.58)**
N	**55**	**55**	**55**
adjR^2	**0.988**	**0.997**	**0.998**
F-Statistics	**169.9**	**699.9**	**1,094.4**

t-statistics in parenthesis.
Source: own calculations

If we turn to equations 2 and 3 where we test our major hypotheses 2 (inflation in the OECD countries now is negatively correlated with a degree of credibility defined as a fixed relation within an institutional constraint and the index of monetary commitment), we see that the two independent variables *Cred1* and *Cred2* are highly statistically significant and have the expected negative sign and are quantitatively quite important. In equation 3 the independent variable *Cred2* has the quantitatively largest influence. If we summarize these results we see that all independent variables have the theoretically expected signs. If we start with

the monetary commitment (*MC*) it is highly significantly negatively correlated with the average consumer price inflation in every decade. The institutional setting, expressed as the degree of economic freedom (*EF*), has also a negative impact on the CPI, however less significant. All control variables are contributing to the explanation of the rate of CPI in all three decades. The change in public attitude toward inflation in the 1990s (*ATT*) as well as high GDP growth (*dGDP*) or reducing inflation, high trade, wage growth as well as the dummy variable for the oil price shock, increased the rate of *CPI*. When following our hypotheses 2, *MC* and *EF* are merged to the credibility variable. The other variables remain robust and are similarly important. Adding *MC* and *EF* (*Cred1*) is the less convincing alternative, whereas the product of both increases the better value and thereby the relevance of credibility. So from the results in table 1 we assume equation 3 being the most important regression.

In table 2, we widen the data sample and include the 1960s to see how robust the results are. At the end of the 1960s this decade was marked with the end of the Bretton Woods system and can be regarded as the period within which significant structural breaks in the world economy took place. If we first make an overall comparison, we immediately see, realized, that the results remain very stable when the 60s are added to the sample, with the exception, that the institutional setting (*EF*) has a wrong sign and is not statistically significant. This may be due to the fact that the 1960s are not covered by the data, the earliest documentation is from 1970. We use these data as a proxy for the 1960s. If we include the 1960s, as we have done in table 2, the weight and importance of some control variables increase, like the variable *dW* (wage increase), which has a coefficient of 10 without the 1960s and increases to 15 including the 1960s. On the other hand, the influence of real growth decreases without the 1960s, the coefficient was 1.6 and including the 1960s the coefficient shrinks to 0.9. The most remarkable influence is the openness of an economy, measured with the independent variable (*TR*) (sum of exports and imports in % of GDP), here the coefficient had a value of 8.3 without the 1960s and has now an increase of 19.7 including the 1960s. The influence of this estimated coefficient more then doubled.

Table 2: Credibility and inflation: Pooled regression 1960s to 1990s

Variable	4	5	6
C	**5.632 (1.68)**	**9.485*** (5.08)**	**6.219*** (.3.56)**
MC	**-6.375*** (-12.42)**		
EF	**0.032 (0.01)**		
Cred1		**-5.936*** (-9.72)**	
Cred2			**-10.205*** (-11.51)**
ATT	**-2.815*** (-8.13)**	**-2.383*** (-10.56)**	**-2,3*** (-14-6)**
TR	**19.699*** (5.114)**	**16.877*** (3.6)**	**16.843*** (3.46)**
dGDP	**-0.851*** (-5.37)**	**-0.78*** (-4.65)**	**0.806*** (-4.61)**
dW	**15.71*** (61.96)**	**15.15*** (23.06)**	**15.389*** (16.21)**
Shock	**2.733*** (18.77)**	**2.601*** (43.07)**	**2.67*** (39.51)**
N	**65**	**65**	**65**
adjR^2	**0.994**	**0.997**	**0.998**
F-Statistics	**386.6**	**782.5**	**1,624.7**

t-statistics in parenthesis.
Source: see above

In general, when we include the 1960s the control variables gain importance. One explanation for this may be, that in the 1960s the link between monetary commitment and inflation was weaker due to the problems related to the Bretton Woods system. With this we mean, that central banks more or less follow the U.S. monetary policy and that capital flows were restricted, both resulting in less commitment and less economic freedom. Summarizing our results, we can clearly confirm our two major hypotheses, which are: inflation in OECD countries is the lower the higher the degree of monetary commitment and the degree of economic freedom. In addition, inflation in OECD countries is negatively correlated with the degree of credibility, defined as a fixed relation between institutional constraints then the index of monetary commitment. Our results are quite robust to different specification and changing of the investigated time period.

b) The subsample "small open economies"

In addition, we test our hypotheses for a subsample which contains the set of small open economie within the OECD. The motivation for dealing with this group is to estimate whether or not the results are driven by the major economies. In general, as shown in tables 1 and 2 the results are robust when the subsample of small open economies is used. Some interesting differences show up (Table 3).

Table 3: Credibility and inflation in small open economies:[1)]
Pooled regression 1970s to 1990s

Variable	7	8	8
C	18.573*** (14.64)	15.969*** (5.21)	12.102*** (3.97)
MC	-6.116*** (-3.46)		
EF	-10.027 (-1.60)		
Cred1		-6.366*** (-5.29)	
Cred2			-10.351*** (-3.14)
ATT	-2.888*** (-7.33)	-3.137*** (-10.04)	-3.151*** (-6.12)
TR	2.211 (0.33)	3.330 (0.45)	4.086 (0.51)
dGDP	-1.686*** (-14.85)	-1.738*** (-11.75)	-1.754*** (-11.20)
dW	11.391*** (6.50)	11.380*** (5.43)	11.410*** (4.23)
Shock	1.844*** (44.10)	2.084*** (7.60)	2.180*** (7.14)
N	38	38	38
adjR^2	0.911	0.915	0.912
F-Statistics	19.968	22.032	21.070

t-statistics in parenthesis.
[1)] Countries in this sample are the following ones: Australia, Austria, Belgium, Canada, Denmark, Finnland, Greece, Ireland, Netherland, New Zealand, Norway, Sweden and Switzerland.
Source: own calculations.

To start with the differences (in comparison with the entire sample) for hypothesis 1, the institutional constraint (*EF*) is no longer significant, and the estimated coefficient is much smaller. The same holds for the trade variable. Monetary commitment (*MC*) only looses a bit of its explanatory power, but remains strong

and statistically significant. The other variables have had an even stronger impact on CPI since the 1970s. As for hypothesis 2, both forms of credibility (*Cred1* and *Cred2*) remain highly statistically significant, although they lose a bit of their explanatory power; both coefficient ant t-statistics are smaller than in table 1. The other variables are stronger than for the entire sample. An explanation for the weaker performance can be that small countries face higher competition from the world markets than bigger ones. Therefore, the increasing demand for domestic goods seems to have smaller impact on the price level.

Table 4: Credibility and inflation in small open economies:[1)]
Pooled regression 1960s to 1990s

Variable	10	11	12
C	15.703*** (5.65)	14.398*** (5.22)	11.017*** (4.24)
MC	-5.940*** (-3.92)		
EF	-7.707** (-2.76)		
Cred1		-6.008*** (-6.25)	
Cred2			-9.947*** (-3.59)
ATT	-2.860*** (-7.92)	-2.990*** (-10.70)	-2.985*** (-6.50)
TR	5.737 (0.97)	5.824 (1.11)	5.923 (1.11)
dGDP	-1.758*** (-21.18)	-1.766*** (-24.83)	-1.764*** (-24.16)
dW	13.934*** (3.23)	13.929*** (3.31)	13.932*** (3.07)
Shock	2.110*** (9.68)	2.210*** (9.85)	2.257*** (10.98)
N	43	43	43
adjR^2	0.870	0.875	0.873
F-Statistics	15.009	16.494	16.191

t-statistics in parenthesis.
1) Countries in this sample are the following ones: Australia, Austria, Belgium, Canada, Denmark, Finnland, Greece, Ireland, Netherland, New Zealand, Norway, Sweden and Switzerland.
Source: Own calculations.

When considering at the extended period from the 1960s through the 1990s (Table 4), the outcome also does not dramatically change. There are two major

changes. Trade (*TR*) is no longer significant, however EF is. In addititon the weight of the wage changes (*dW*) increases. Both credibility variables (*Cred1* and *Cred2*) remain significant and the size of the estimated coefficients is roughly the same.

Table 5: Credibility and inflation in small open economies:[1)]
Pooled regression 1960s to 1990s

Variable	13	14	15
C	15.628*** (10.36)	13.176*** (5.18)	9.656*** (3.89)
MC	-6.009*** (-4.45)		
EF	-10.010*** (-3.18)		
Cred1		-6.178*** (-7.13)	
Cred2			-9.80*** (-3.69)
ATT	-1.281* (-1.94)	-1.708** (-2.24)	-1.814* (-1.93)
TR	-2.665 (-0.32)	-1.783 (-0.21)	-1.129 (-0.12)
dGDP	-1.460*** (-5.70)	-1.499*** (-6.03)	-1.507*** (-5.93)
dW	13.866*** (3.36)	13.914*** (3.32)	13.962*** (3.01)
Shock	-0.631 (-0.51)	-0.217 (-0.16)	-0.027 (-0.02)
US CPI	0.784** (2.49)	0.713* (2.05)	0.674* (1.81)
N	43	43	43
adjR²	0.875	0.879	0.935
F-Statistics	14.954	16.211	15.760

t-statistics in parenthesis.
1) Countries in this sample are the following ones: Australia, Austria, Belgium, Canada, Denmark, Finnland, Greece, Ireland, Netherland, New Zealand, Norway, Sweden and Switzerland.
Source: Own calculations.

The estimation results do not change when the independent variable, US American consumer price inflation (*US CPI*) is added and has a statistically significant influence. Monetary commitment (*MC*), economic freedom (*EF*) and credibility (*Cred1* and *Cred2*) remain significant and have a major impact on the dependent variable; changes in wage and GDP also keep their explanatory power.

Interestingly, the shock variable (*Shock*), the attitude variable (Att) and the trade variable (*TR*) become insignificant. Obviously, there is a substitutive effect between the dummy variables and trade on the one hand and the US inflation rate on the other hand.

c) Somefurther robustness tests

In general, the results show a high robustness and extremely high R^2adj, even if we drop some variables and incorporate the 1960s as an additional period. The results are robust, all variables remain significant and the signs are also stable. We also test whether or not the results are driven by the fact that we estimate fixed effects. The Hausman test for the institutional variables (*MC*, *EF*, *Cred1*, *Cred2*) reveals that the estimators are consistent. As can be expected for the period 1970s through 1990s, the test has a higher significance level than for the longer period including the 1960s. This seems plausible. The three decades since 1970 are indeed characterized by a rather constant monetary policy.

In addition, we test the entire sample without the US for three decades and four decades (tables A1 and A2 respectively). The results remain robust, except for the puzzling result that EF is insignificant for the period 1970s through 1990s (table A1) and becomes significant for the longer time span (table A2). Even for two short subperiods – the 1960s and 1970s in table A4 as well as the 1980s and 1990s in table A3) the robustness is high. In the latter estimations we do not rely on fixed effects. In sum, the interpretation of the results is rather straightforward.

5. Summary and policy conclusions

The paper aims at giving an explanation for the "missing link" between de-jure monetary commitment and the inflation performance of OECD countries since the 1950s. For this purpose, we use a comprehensive measure for monetary commitment, which includes internal aspects of CBI as well as external components such as convertibility restrictions and the exchange rate regime. We formulated two hypotheses, (1) in OECD countries inflation is the lower, the higher the degree of monetary commitment, the degree of fiscal stability, etc. and

(2) inflation is negatively correlated with the degree of credibility, defined as a fixed relation between institutional constraints and the index of monetary commitment. Both hypotheses are strongly confirmed by our pooled regressions. We also test the long run relationship between inflation and commitment by using again a pooled regression over three (respectively four) decades.

Indeed, these extensions of the analysis help understanding the role of monetary commitment within the economic policy assignment. The obvious and expected outcome is that monetary commitment is important for the success of monetary policy. This has already been shown in the theoretical and partly in the empirical literature. However, our contribution reveals that commitment is at best a necessary condition; the sufficient condition seems to be an appropriate enforcement mechanism, however this mechanism cannot be modelled explicitly. Instead, institutional constraints are chosen. The higher the degree of economic freedom for the citizens, the less incentives politicians face to weaken stability oriented monetary policy. Our results become stronger when controls such as wage pressure, GDP growth, trade intensity and shock dummies are introduced. These results suggest that the public very well perceives the credibility of policy rules by relating the degree of monetary commitment with other policy areas. This relation can be (and obviously is) used as a concept to assess credibility of policy rules ex-ante. In the long run, the credibility of policy rules has an impact on the behaviour of the public with respect to contracts. This behaviour has implications for monetary policy.

The policy lessons to be drawn are first that governments can increase overall welfare by committing to stability oriented monetary policy, e.g. by granting central bank independence. Second, such a commitment by governments is dependent on the quality of an enforcement mechanism. Third, other policy outcomes are relevant for the success of monetary policy. Higher growth, moderate wage pressure and global stability also contribute to lower inflation.

Annexes

Annex 1: List of variables, basic statistics

	ATT	CPI	Cred1	Cred2	EF	GDP	MC	TR	SHOCK	WAGE
Mean	0.246	6.051	1.11	0.32	0.63	2.42	0.5	0.23	0.29	0.07
Median	0.0	5.1	1.13	0.31	0.64	2.12	0.47	0.21	0.0	0.05
Maximum	1.0	18.8	1.54	0.58	0.82	9.36	0.8	0.61	1.0	0.33
Minimum	0.0	0.4	0.36	0.09	0.49	0.13	0.18	0.04	0.0	-0.07
Std. Dev.	0.43	4.08	0.28	0.13	0.07	1.33	0.18	0.12	0.46	0.07
Skewness	1.179	0.83	-0.51	0.17	0.18	2.27	0.12	1.37	0.91	1.14
Kurtosis	2.39	3.13	2.91	1.78	2.99	12.8	1.87	4.87	1.83	5.15
Jarque-Bera	16.06	7.56	2.83	4.32	0.37	315.85	3.61	29.69	12.72	26.54
Probability	0.0003	0.023	0.24	0.12	0.83	0.0	0.16	0.0	0.0017	0.000002
Sum	16.0	393.3	71.97	20.97	41.23	157.43	32.42	14.79	19.0	4.35
Sum Sq. Dev.	12.06	1065.7	4.88	1.16	0.36	113.14	2.08	0.91	13.45	0.35
Observations	65	65	65	65	65	65	65	65	65	65
Cross sections	20	20	20	20	20	20	20	20	20	20

Source: See section 4.

Annex 2: List of countries

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, UK, USA.

Annex 3: Index of monetary commitment

Criterion	Com-ponent	Explanation	Numerical codings
Stated objectives of monetary policy	*obj*	1. Price stability only goal	1.00
		2. Other objectives mentioned	0.66
		3. Other objectives equally important	0.33
		4. No goals for monetary policy	0.00
Locus of legal commitment	*const*	1. Constitution	1.00
		2. Central bank law	0.66
		3. Decree	0.33
		4. Not fixed at all	0.00
Discretionary power belonging to the government	*gov*	1. No power left to the government	1.00
		2. Exchange rate only issue to be consulted between government and monetary authority	0.66
		3. Exchange rate regime completely left to government	0.33
		4. Government may override central bank as regards monetary policy	0.00
Conditions of appoint-ment and dismissal of monetary CEO	*ceo*	1. CEO must be a reputed expert	1.00
		2. No expertise demanded	0.00
	diss	1. Appointment with fixed term and dismissal only after criminal offences and bad performance	1.00
		2. No rules for dismissal	0.50
		3. Dismissal unconditioned or linked to resignation of governments and ministers	0.00
Conditions of lending to the government	*limcred*	1. No central bank credit allowed	1.00
		2. Central bank credit allowed conditionally	0.50
		3. Central bank credit allowed unconditionally	0.00
	limprim	1. Central bank is not allowed to purchase public bonds on the primary market	1.00
		2. Central bank is allowed to purchase public bonds in hard currency on the primary market	0.66
		3. Central bank is allowed to purchase public bonds in any cur rency on the primary market	0.33
		4. No limitations on credit activities	0.00

Annex 3 (cont.)

Supervision and regulation of the financial system by the central bank	*reg*	1. Supervision and regulation is assigned to a separated body 2. Supervision and regulation is assigned to central bank 3. No supervision and regulation	1.00 0.50 0.00
Accountability of the central bank	*acc*	1. Obligation to inform the public 2. Obligation to inform the parliament in public hearings 3 Obligation to inform the government without publicity 4. No accountability	1.00 0.66 0.33 0.00
External pledges of the government	*extern*	1. Exchange rate fixed to a hard currency and money base fully backed with foreign reserves 2. Exchange rate fixed 3. Crawling peg 4. Managed floating 5. Free floating	1.00 0.75 0.50 0.25 0.00
Convertibility restrictions	*conv*	1. Full convertibility 2. Partial convertibility 3. Convertibility for current account transactions only 4. Convertibility for capital account transactions only 5. No convertibility	1.00 0.75 0.50 0.25 0.00
	mult	1. One exchange rate 2. Multiple exchange rate	1.00 0.00
Interactions with other currencies	*comp*	1. A hard currency can be used for all transactions 2. A hard currency can be used for some transactions, others excluded 3. A hard currency may be held 4. No holdings or transactions in hard currencies allowed	1.00 0.66 0.33 0.00

Source: Freytag (2001, p. 198-199), own changes.

Annex 4 Robustness Tests

Table A1: Credibility and inflation without the US:
Pooled regression 1970s to 1990s

Variable	A1	A2	A3
C	12.819*** (4.12)	14.372*** (35.01)	10.487*** (10.32)
MC	-7.394*** (-3.95)		
EF	-3.097 (-0.42)		
Cred1		-6.812*** (-5.20)	
Cred2			-11.667*** (-3.98)
ATT	-3.049*** (-4.96)	-2.795*** (-5.97)	-2.701*** (-4.78)
TR	9.850** (2.06)	10.590*** (2.91)	10.892** (2.58)
dGDP	-1.825*** (-10.62)	-1.770*** (-10.57)	-1.783*** (-12.22)
dW	10.429*** (3.40)	10.568*** (5.08)	10.666*** (4.16)
Shock	2.945*** (9.11)	2.884*** (26.88)	2.913*** (37.01)
N	52	52	52
adjR^2	0.903	0.906	0.905
F-Statistics	19.943	21.520	21.275

t-statistics in parenthesis.
Source: see above

Table A2: Credibility and inflation without the US:
Pooled regression 1960s to 1990s

Variable	A4	A5	A6
C	5.289 (0.742)	6.496 (1.05)	4.177 (0.80)
MC	-5.114*** (-2.60)		
EF	-1.652*** (-0.22)		
Cred1		-4.571** (-2.10)	
Cred2			-8.386** (-2.15)
ATT	-3.001*** (-3.51)	-2.826*** (-5.23)	-2.676*** (-4.95)
TR	20.423 (1.64)	20.798* (1.70)	20.755* (1.74)
dGDP	-0.644 (-1.40)	-0.597 (-1.40)	-0.623 (-1.46)
dW	15.775** (2.19)	15.853*** (2.26)	15.890** (2.24)
Shock	2.722*** (7.95)	2.670*** (8.19)	2.669*** (8.73)
N	61	61	61
adjR^2	0.794	0.799	0.800
F-Statistics	10.259	10.940	11.012

t-statistics in parenthesis.
Source: see above

Table A3: Credibility and inflation: Pooled regression 1980s to 1990s

Variable	A7	A8	A9
C	11.340 (1.48)	6.798*** (3.06)	5.908*** (2.14)
MC	-3.206** (-1.89)		
EF	-8.380 (-1.14)		
Cred1		-2.864* (-2.44)	
Cred2			-6.077 (-1.48)
ATT	-2.308*** (-5.26)	-2.555*** (-18.06)	-2.473*** (-6.83)
TR	4.527*** (9.98)	5.530*** (3.18)	5.127*** (5.13)
dGDP	-0.518 (-0.55)	-0.338 (-0.53)	-0.446 (-0.58)
dW	39.420*** (4.32)	44.362*** (21.22)	43.849*** (10.51)
Shock			
N	36	36	36
adjR^2	0.643	0.645	0.647
F-Statistics	11.488	13.701	13.846

t-statistics in parenthesis.
Source: see above

Table A4: Credibility and inflation: Pooled regression 1960s to 1970s

Variable	A10	A11	A12
C	6.918 (1.39)	5.276* (1.73)	5.876** (2.38)
MC	-6.591*** (-5.38)		
EF	-1.520 (-0.30)		
Cred1		-2.990 (-1.49)	
Cred2			-9.985*** (-2.66)
ATT			
TR	-0.838 (-0.68)	-0.518 (-0.53)	-0.956 (-0.72)
dGDP	-0.179 (-0.77)	0.023 (0.11)	-0.162 (-0.56)
dW	16.420*** (34.00)	15.641*** (198.96)	15.774*** (54.88)
Shock	5.403*** (9.55)	5.818*** (16.96)	5.355*** (10.19)
N	29	29	29
adjR^2	0.790	0.754	0.801
F-Statistics	18.566	18.189	23.594

t-statistics in parenthesis.
Source: see above

References

Arnone, Marco, Bernard J. Laurens and Jean-Francois Segalotto (2006a), *The Measurement of Central Bank Autonomy: Survey of Models, Indicators, and Empirical Evidence*, IMF Working Paper 06/227, Washington D.C.

Arnone, Marco, Bernard J. Laurens and Jean-Francois Segalotto (2006b), *Measures of Central Bank Autonomy: Empirical Evidence for OECD, Developing, and Emerging Market Economies*, IMF Working Paper 06/228, Washington D.C.

Barro, Robert J. (1995), 'Inflation and Economic Growth', Bank of England, *Quarterly Bulletin*, Vol. 35, pp. 166-175.

Barro, Robert J. and David B. Gordon (1983), 'Rules, Discretion and Reputation in a Model of Monetary Policy', *Journal of Monetary Economics,* Vol. 12, pp. 101-121.

Berger, Helge, Jacob de Haan and Sylvester C.W. Eijffinger (2001), 'Central Bank Independence: An Update of Theory and Evidence' *Journal of Economic Surveys*, pp. 3-40.

Brennan, Geoffrey H. and James M. Buchanan (1981), *Monopoly in Money and Inflation: The Case for a Constitution to Discipline Government*, Institute for Economic Affairs, Hobart Paper 88, London 1981.

Cukierman, Alex S. (1992), *Central Bank Strategy, Credibility and Independence. Theory and Evidence*, The MIT Press, Cambridge/Mass. and London.

Cukierman, Alex, Geoffrey P. Miller and Bilin Neyapti (2002), 'Central Bank Reform, Liberalization and Inflation in Transition Economies – An International Perspective', *Journal of Monetary Economics*, Vol. 49, pp. 237-264.

Debelle, Guy and Stanley Fischer (1995), 'How Independent Should a Central Bank Be?', in: Jeffrey C. Fuhrer (ed.) *Goals, Guidelines, and Constraints, Facing Monetary Policymakers*, The Federal Reserve Bank of Boston, Boston, pp. 195-221.

De Haan, Jakob, Sylvester C.W. Eijffinger and Sandra Waller (2005), *The European Central Bank. Credibility, Transparency and Centralization*, The MIT Press, Cambridge/Mass. and London.

De Jong, Elke (2002), 'Why Are Price Stability and Statutory Independence of Central Banks Negatively Correlated? The Role of Culture?', *European Journal of Political Economy*, Vol. 18, pp. 675-694.

Eijffinger, Sylvester C.W. and Jakob de Haan (1996), *The Political Economy of Central-Bank Independence*, Special Papers in International Economics, No. 19, International Finance Section, Department of Economics, Princeton University, Princeton.

Eucken, Walter (1955), *Grundsätze der Wirtschaftspolitik*, Mohr (Siebeck), Tübingen and Polygraphischer Verlag, Zürich.

Forder, James (1996), 'On the Assessment and Implementation of 'Institutional' Remedies, *Oxford Economic Papers*, Vol. 50, pp. 39-51.

Forder, James (2005), 'The Limits of 'Independene' and the Policy of the ECB, *Public Choice*, Vol. 125, pp. 431-444.

Freytag, Andreas (2001), 'Does Central Bank Independence Reflect Monetary Commitment Properly – Methodical Considerations', *BNL Quarterly Review*, No. 217, June 2001, pp. 181-208.

Freytag, Andreas (2002), *Success and Failure in Monetary Reform. Monetary Commitment and the Role of Institutions*, Edward Elgar, Cheltenham, Northhampton.

Freytag, Andreas (2005), 'The Credibility of Monetary Reform: New Evidence', *Public Choice*, Vol. 124, pp. 391-409.

Grilli, Vittorio, Donato Masciandaro and Guido Tabellini (1991), 'Political and Monetary Institutions and Public Financial Policies in the Industrial Countries', *Economic Policy*, No. 13, pp. 342-392.

Gwartney, James and Robert Lawson with Walter Park, Smita Wagh, Chris Edwards, and Veronique de Rugy (2002), *Economic Freedom of the World: 2002 Annual Report*. Vancouver: The Fraser Institute, 2002. Data retrieved from www.freetheworld.com, quoted as Gwartney et al. (2002).

Hayo, Bernd (1998), 'Inflation Culture, Central Bank Independence and Price Stability', *European Journal of Political Economy*, Vol. 14, pp. 241-263.

Hayo, Bernd and Carsten Hefeker (2002), 'An Alternative View of Central Bank Independence', *European Journal of Political Economy*, Vol pp. .

Heston, Alan, Robert Summers and Bettina Aten (2002), Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002

Hetzel, Robert L. (1997), 'The Case for a Monetary Rule in a Constitutional Democracy', Federal Bank of Richmond, *Economic Quarterly*, Vol. 83/2, pp. 45-65.

Institute for Economic Policy (2003), *Central Bank Addresses*, http://www.uni-koeln.de/wiso-fak/iwp/, quoted as IWP 2003.

International Monetary Fund (a), International Financial Statistics Yearbook, Washington D.C., quoted as IMFa.

International Monetary Fund (b), *Annual Report on Exchange Arrangements and Exchange Restrictions*, current issue, Washington D.C., quoted as IMFb.

Keefer, Philip and David Stasavage (2001), 'Checks and Balances, Private Information and the Credibility of Monetary Commitments', *World Bank Working Paper* No. 2542.

Kydland, Finn E. and Edward C. Prescott (1977), 'Rules Rather Than Discretion: The Inconsistency of Optimal Plans', *Journal of Political Economy*, Vol. 85, pp. 473-491.

McCallum, Bennett T. (1997), 'Crucial Issues Concerning Central Bank Independence', *Journal of Monetary Economics*, Vol. 39, pp. 99-112.

OECD (1999), *OECD Employment Outlook*, Paris.

Parkin, Michael and Robin Bade (1977), *Central Bank Laws and Monetary Policies: A Preliminary Investigation*, University of Western Ontario, London, Ontario, mimeo.

Posen, Adam S. (1993), 'Why Central Bank Independence Does Not Cause Low Inflation: There Is No Institutional Fix For Politics', in: Richard O'Brian (ed.) *Finance and the International Economy*, Vol. 7, Oxford, Oxford University Press, pp. 41-65.

Rogoff, Kenneth (1985), 'The Optimal Degree of Commitment of an Intermediate Monetary Target', *Quarterly Journal of Economic*, Vol. 100, pp. 1169-1190.

Romer, David (1993), 'Openness and Inflation: Theory and Evidence' *Quarterly Journal of Economics*, Vol. 108, pp. 869-903.

Tinbergen, Jan (1952), *On the Theory of Economic Policy*, North-Holland, Amsterdam.

Walsh, Carl E. (1995), 'Optimal Contracts for Central Bankers', *The American Economic Review*, Vol. 85, pp. 151-167.

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