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February, 2003

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Abstract

This paper extends the game-theoretic model of Von Hagen and Harden (1995) that analyzes the impact of fiscal discipline on budgetary outcomes. It analyzes the effects on budgetary outcomes of both fiscal and monetary discipline, which are evaluated with respect to the relevant institutional rules. The model predicts that while both inflation and budget deficits are negatively associated with fiscal discipline, they may be positively associated with monetary discipline, proxied by central bank independence. This result obtains due to optimizing agents who internalize the burden of spending: inflation. Although not conclusive due to data limitations, the empirical findings of the paper support these predictions.

JEL Classification Numbers: D73, E58, H61, H72
Key Phrases: Budget Deficits; Central Bank Independence; Fiscal Discipline; Inflation.

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The Effects Of Fiscal And Monetary Discipline On Budgetary Outcomes

Abstract

This paper extends the game-theoretic model of Von Hagen and Harden (1995) that analyzes the impact of fiscal discipline on budgetary outcomes. We analyze the effects on budgetary outcomes of both fiscal and monetary discipline, which are evaluated with respect to relevant institutional rules. Our model predicts that while both inflation and budget deficits are negatively associated with fiscal discipline, they may be positively associated with monetary discipline, proxied by central bank independence. This result obtains due to optimizing agents who internalize the burden of spending: inflation. Although not conclusive, our empirical findings support these predictions.

1. Introduction

During the 1980s, and prior to the establishment of the ECB, macroeconomic performances and institutional settings have shown considerable variation in Europe (see Appendix I). The convergence criteria with respect to the level of inflation, budget deficits, government debt and the interest rates[1] that emerged during the process of establishing the European Monetary Union (EMU), however, heightened the importance of fiscal and monetary discipline in the member countries. Achieving convergence is considered to help obtain the potential benefits of integration while reducing or eliminating the possible transfers from well performing members towards those who lack fiscal stability. In this regard, the establishment of the European Central Bank (ECB) can be considered as a mechanism for establishing a common institutional structure to achieve monetary discipline in the member countries.

Though our reference point for the theoretical framework and the empirical study is the European Union (EU), this paper does not claim to provide a framework to study the economic performance in the EU where the details of institutional design for fiscal and monetary policies are still in the making. Rather, motivated with such an institutional design as that of the EU, this paper investigates, both theoretically and empirically, the effects on budgetary outcomes of fiscal and monetary discipline induced by institutional rules.

Von Hagen (1992) proposes an extensive criteria list to measure fiscal discipline and demonstrates a significant empirical linkage between fiscal discipline and the budgetary outcomes in 12 OECD economies. Furthermore, Von Hagen and Harden

(1995, H&H herein) provide a theoretical framework to analyze the effect of fiscal discipline on the level of *spending bias,* due to private utility gains from spending, in the European Community countries.[2] H&H's model suggests a positive relation between the spending bias and the relative strength of spending ministers' individual incentives against the collective interest of the government. *Fiscal illusion,* defined as the overestimation of the marginal benefit of a public activity, arises from the fact that while funding for a public spending usually comes from the general public, it benefits only a specific group within that public. Hence, while the constituency of each spending minister receives the entire fund allocated to a specific activity, they become only partially accountable for the burden generated on the aggregate budget.

H&H also provide empirical support for the limiting effect on fiscal illusion of the institutional rules that govern budgetary processes. Among a comprehensive set of the formal and informal rules of behavior and interaction that govern budgetary processes, H&H particularly consider four characteristics, namely, the structure of budget negotiations within the government, the rules of the parliamentary process, the flexibility of budget execution and the informativeness of the budget draft . To make an empirical assessment of the effectiveness of such rules in reducing fiscal illusion, Von Hagen

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[1] These criteria are: no more than the lowest three inflation rates in the Union plus 1.5%; 3% of GDP; 60% of GDP; and no more than the yield of the three best performers plus 2%, respectively.

[2] They measure fiscal discipline based on the types of budgetary procedures. They distinguish between essentially two budgetary procedures. In the first approach, called as "procedure-oriented", the budget process vests ministers without portfolio with special strategic powers . The second approach to budgeting, the "target-oriented" approach involves the government's collective negotiation of a set of binding numerical rules for the budget.

(1992) constructs an index that characterises institutional provisions in the national budget processes for 12 OECD countries.[3]

This paper argues that in addition to the institutional rules that exert fiscal discipline, rules that exert monetary discipline have potentially important effects on budgetary outcomes. To that end, we extend the model of H&H by incorporating a measure of monetary discipline in order to investigate the effect of institutional rules on budgetary outcomes. We argue that central bank independence, as a mechanism of credible commitment to price stability, proxies monetary discipline and may also contribute to fiscal discipline by constraining the spending decision of the government.

Rogoff (1985) and Cukierman (1992), among others, provide theoretical discussion on the positive relationship between central bank independence and price stability. Empirical studies also support this literature [see, for example, Parkin (1986), Grilli, Masciandro and Tabellini (1991), Alesina and Summers (1993), Cukierman, Webb and Neyapti (1992), Eiffenger S. and De Haan (1996)], and on the inflationary effects of budget deficits [see Neyapti (1998)].

In contrast with this literature, both Beetsma and Uhlig (1998) and Cukierman and Lippi (1999), however, build models that suggest a possible negative linkage between CBI and price stability. The dominant feature of these models is that a low degree of central bank independence may perform the function of a fiscal disciplining device when economic agents internalize the costs of inflation. It is therefore possible for a central bank to be "too independent".

[3] As we extensively use this index in the empirical part of this analysis, Appendix II provides details of construction of this index.

Based on a model of a strategic interaction between central bank and workers' unions, Cukierman and Lippi (1999) demonstrate that CBI may be positively associated with inflation in the case of a high degree of inflation aversion by unions. This result obtains because unions internalize the inflation cost to a greater extent and thus demand lower real wage increases the lower the degree of CBI. Beetsma and Uhlig (1998), on the other hand, demonstrate the negative effect of an independent European Central Bank (ECB) on fiscal discipline. They argue that in the case of the ECB[4], the union governments may tend to generate higher levels of debt than before since they do not fully internalize the resulting burden, which is potentially higher rate of future inflation. Average debt burden can thus rise as an unintended consequence of an independent ECB.

To investigate the relative effects of fiscal and monetary discipline on fiscal outcomes, we keep the basic features of the H&H model in that we assess fiscal discipline through budgetary processes distinguished on the basis of the strategic dominance of the government over the spending ministers. In addition, however, we modify H&H's model by incorporating a budget constraint and by assuming that, as an institution to exert monetary discipline, central bank independence is negatively related with the monetization of the budget.[5]

The current model yields explicit solutions for the level of budget deficits and inflation that are both in negative relation with the degree of centralization of the budget decision, or with the degree of fiscal discipline. The interesting implication of the model,

[4] ECB is generally considered to be an independent institution. Indeed, based on the set of criteria proposed in Cukierman, Webb and Neyapti (1992), its legal independence exceeds that of individual member countries' central banks, including that of Germany.

[5] An independent central bank may also represent a constituency that has an interest in reducing the inflation burden of spending [see, for example, Goodman (1991) and Posen (1994)].

however, is that spending bias is positively related with central bank independence. This apparent anomaly obtains since the burden of extra spending, inflation, is internalized by both the government and the spending ministers. A significant contribution of this paper is that, notwithstanding the Sargent and Wallace (1981) results of the positive relationship between inflation and the lack of monetary discipline, it shows that high degree of central bank independence, as a institutional manifestation of monetary discipline, may in fact lead to moral hazard among the agents who decide on the budget. Moreover, the impact of monetary discipline on the economy is not linear and depends on the fiscal rules.

As an empirical test of the model's predictions, we investigate the relative roles of fiscal and monetary discipline in 12 OECD countries during the 1980s. Even though constrained with small sample problems, our empirical investigation supports the model's main propositions.

2. The Model

Von Hagen and Harden (1995) investigate the linkage between fiscal performance and fiscal discipline, based on von Hagen (1992) who evaluates fiscal discipline based on the various features of the budgetary processes. In a game-theoretic approach, they distinguish between different budgetary processes as: *i.* the government's collective optimization; *ii.* individual spending ministers' optimization; and *iii.* Nash bargaining between spending ministers over their budgetary allocations. Of the latter two budgetary processes, the first one results from the aggregation of each of the spending ministers'

bid; and the second one results from the spending ministers' negotiation over their budgetary allocations.

The current model extends the model of H&H to incorporate the possible effects on the budgetary decisions of monetary discipline. To this end, the current model modifies H&H's model first by introducing a budget constraint for the government's optimization problem. Second, it explicitly defines the burden of additional spending in terms of deviation from an inflation target, rather than in terms of the total spending by the spending ministers (SMs), as we argue that social excess burden is the part of that spending that is inflationary. The model assumes that the part of the government's financing requirement that is monetized is negatively related with the degree of monetary discipline. We hypothesize that the latter can be proxied by the degree of central bank independence; while various factors may change the degree of monetization from one period to the other, degree of central bank independence can be considered as a stable indicator of the degree of monetary discipline. In the following, we present the model incorporating these features into all three types of the budgeting decisions as postulated by H&H. The optimization problems pertain to a government and to n - SMs. Each SM chooses a spending level x_i that may deviate from an exogenously given target level of public activity, X_i^*, where i = 1…n.

2.1. Government's Collective Optimization

The government's collective interest is to minimize both the deviations of all spending levels from their respective targets and the social excess burden generated by the aggregate of such deviations. The government's joint utility function thus involves

deviations of both the spending by the SMs and inflation from their respective targets. Hence, the government maximizes the following joint utility function (U) with respect to the X_i's:

$$U = -\sum_{i=1}^{n} \frac{a}{2}(X_i - X_i^*)^2 - \frac{b}{2}(\Pi - \Pi^*)^2 \qquad (1)$$

subject to the budget constraint:

$$D = \sum_{i=1}^{n} X_i - \sum_{i=1}^{n} T_i + rB_{t-1} \leq dM + dB \qquad (2)$$

where *a* and *b* in Equation (1) are the parameters that represent the government's loss for each unit of the quadratic disutility received for the deviations of spending and inflation (Ð) from their respective targets. In Equation (2), D is the government's financing requirement, or deficits; T_i is the tax revenue obtained from the constituency of spending minister i; rB_{-1} is the total interest payments for the outstanding debt B_{-1}; dM is the part of deficits that is financed through money issue, where M is the money stock; and dB is the part that is financed through new bond issue.

We assume that the part of deficits that is financed through money issue is inversely related with the degree of central bank independence:

$$dM = \gamma D \qquad (3)$$

where γ is the degree of – the lack -- of central bank independence.[6] Hence, the lower the γ the higher the central bank independence. In addition, we assume that all monetary

[6] Equation (2), the budget constraint, becomes an equality in case one writes: $dB = (1-\gamma) D$.

expansion is inflationary and, thus, dM = ΠM holds in a steady-state, where ΠM is the inflation tax.[7] Hence the relationship between inflation and deficits becomes:

$$\Pi = \gamma D/M \qquad (4)$$

We further assume that since the degree of CBI is known with certainty, the degree of monetization, and thus the inflation burden, of spending is also known both by the government and by the ministers prior to their spending decision. As optimizing agents, they thus adjust their spending, given their degree of aversion to inflation. The collective optimization (by the government) with respect to the level of spending thus yields the following expression:

$$(X_i - X_i^*) = -\frac{bg}{aM}(\Pi - \Pi^*) \quad \text{for each i} \qquad (5)$$

This solution implies that if γ is zero, that is if the central bank is totally independent, all the SMs' spending are on target and inflation is zero (due to Equation 4).[8] Otherwise, there is a negative relationship between the deviations of spending and inflation from their respective targets. This can be interpreted as follows: the government may allow spending to exceed its target level if the overall burden of spending, that is the inflation rate, is below its target. The trade-off is such that, for given spending and inflation targets, the total deviation of all spending from its targets can be higher the lower is the deviation of inflation from its target. The higher is the degree of central bank independence, the smaller is this trade-off.

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[7] By totally differentiating m = M/P and assuming that there is no change in real money balances, we obtain dM/M = dP/P which then yields dM = ΠM.

[8] Given an inflation target Π*, the spending targets X^*_i could be chosen such that both targets are met; that is, Π= Π* and $X^*_i = X_i$ emerges as a solution for all i.

2.2. Spending Ministers' Individual Optimization

Similar to the government, each spending minister gets a quadratic disutility from the deviations of both its level of spending and inflation from their respective targets. However, each spending minister also benefits from the level of its spending: c. Hence, the spending minister optimizes the following problem with respect to the level of its spending:

$$V_i = cX_i - \frac{d}{2}(X_i - X_i^*)^2 - \frac{e_i}{2}(\Pi - \Pi^*)^2 \qquad (6)$$

The solution becomes:

$$(X_i - X_i^*) = \frac{c}{d} - \frac{e_i g}{Md}(\Pi - \Pi^*) \qquad (7)$$

Assuming that both the government and the SMs give equal weights to the deviations of spending and inflation from their respective targets, that is if a = d and (b/n) = e_i , then the spending bias arising from the collection of each SM's optimum choice vis a vis the government's solution becomes: c/a – [γ(n-1)/ nd] (Π-Π*). For γ = 0, the case of full central bank independence, the bias, c/a, is positive. The sign of the bias is positive as long as γ (the inverse of the degree of central bank independence) follows the following condition: [γ (Π - Π^*) < c] (assuming that [(n-1)/n] is close to one, or n is large).

2.3. Nash Bargaining Among the Spending Ministers

Alternatively, total spending may be decided upon by negotiations among spending ministers over their budgetary allocations, the total of which is then allocated equally. This is tantamount to the Nash bargaining solution of H&H, which obtains from

the optimization of $\mathbf{SV_i}$ with respect to X_i, assuming that e_i's are the same for all i = 1…n. Equation (8) shows the result of this optimization:

$$(X_i - X_i^*) = \frac{c}{d} - \frac{egn}{Md}(\Pi - \Pi^*) \qquad (8)$$

Hence, for $\gamma = 0$, the Nash bargaining solution yields the same spending bias as in the case of the aggregation of individual optimal spending decisions by the SMs. For $\gamma \neq 0$, that is when central bank is not completely independent, however, this solution leads to a lower spending bias (due to the addition of term *n* to the second part of the expression) than in the case of individual optimization by the spending ministers.

3. A Comparative Analysis of the Outcomes of Different Budgetary Processes

For analytical convenience, we assume that inflation tax is the only form of tax and thus $T_i = 0$ for all i in Equation (2). If, without loss of generality, we can assume that the inflation target is zero, *b* becomes the cost of inflation. If b is equal to M, the money stock, the burden can be interpreted as the amount of inflation tax, $M\Pi$.[9] Analogously, the parameter that identifies the cost of inflation burden for each spending minister, e_i, now defines the SM's share of the inflation tax. More specifically, we assume that the constituencies of spending ministers hold equal amounts of money balances and thus suffer from the inflation tax by $e_i = (M/n)$. We further assume that a =

[9] Here, the implicit assumption is that b might not be a constant degree of inflation aversion, but it might change as the amount of money stock changes.

d.[10] These assumptions help simplify the expressions in Equations (5), (7) and (8) for comparative purposes.

Table 1 summarizes the outcomes in terms of the deviation of deficits from its target, $(D\text{-}D^{*})$, when Equations (5), (7) and (8) are aggregated for n spending ministers. Propositions 1 to 5 summarize the findings based on the above solutions.

Table 1: Deviation of Budget Deficits from Target and Fiscal Discipline
(Assumptions: $\Sigma e_i = b = M$; $e_i = M/n$; and $a = d$)

Government's Collective Optimization (G)	$(D - D^{*}) = -\frac{ng}{a}(\Pi - \Pi^{*})$
Spending Ministers' Individual Optimization (SM)	$(D - D^{*}) = \frac{cn}{a} - \frac{g}{a}(\Pi - \Pi^{*})$
Spending Ministers' Nash Bargaining (NB)	$(D - D^{*}) = \frac{cn}{a} - \frac{gn}{a}(\Pi - \Pi^{*})$

Proposition 1. Under the forgoing assumptions, deviations of both deficits and inflation from their respective targets can be ranked with respect to the three budgeting procedures as: $G \leq NB \leq SM$.

Hence, the government's collective solution yields lower budget deficits, and thus lower inflation rates, than the spending ministers' (SMs') either individual optimization or Nash bargaining solutions. This shows that the extent of centralization of budgetary processes has a restrictive role on the spending bias. This is consistent with the main result of H&H in that when dominated by individual interests of spending ministers budgetary processes yield a higher burden than otherwise.

[10] The latter two assumptions indicate that the weights given to the deviations of spending and inflation

After substituting Equation (4) in all the expressions reported in Table 1, and solving for D in terms of the model parameters, M, and the target values, we obtain ambiguous results for the partial derivative of D with respect to ã (or CBI). Under the following conditions, obtained for each of the above models, however, both deficits and inflation (D and Ð) have a negative relationship with CBI:

G: $$g < \left(\frac{\Pi^* Ma}{n\Pi^* g + 2aD^*} \right)$$

SM: $$g < \left(\frac{\Pi^* Ma}{\Pi^* g^2 + 2aD^* + 2cn} \right)$$

NB: $$g < \left(\frac{\Pi^* Ma}{n\Pi^* g + 2aD^* + 2cn} \right)$$

Otherwise, D (and Ð) are positively related with CBI (or negatively related with ã). These conditions imply that, the minimum degree of CBI (the maximum ã) needed to obtain the negative relationship between CBI and deficit (or inflation) is the largest for the case of spending ministers' Nash bargaining. If [ãÐ* (n-ã) >2cn] holds, then it is also larger for spending minister's individual optimization, than for the government's collective optimization.[11] This outcome provides a new perspective for the expected impact of the monetary institutions on the economy in view of different fiscal rules.

Proposition 2. The range of values of CBI that leads to result of positive association between CBI and deficits (or inflation) is wider for NB than from SM and G. If [ãÐ* (n-ã) >2cn], then it is also wider for SM than for G. Interpreting the above conditions

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from their respective targets are the same for both the government and spending ministers.

conversely, the degree of CBI below which a positive relationship between deficits (or inflation) and CBI obtains is the smallest in the case of G than both NB and SM.

The intuition behind this seemingly perverse result is as follows. The spending ministers, especially in case of Nash bargaining, internalize the burden of inflation because the constituency of each spending minister holds some amount of money balances (e_i) whose value deteriorates with inflation. Hence, the lower the degree of independence of the central bank, the more the spending ministers become averse to spending that leads to inflation. That is, the lack of monetary discipline, measured in terms of the lack of central bank independence, increases fiscal discipline on the part of the spending ministers who internalize the burden of inflation.[12]

The above outcomes also indicate that the impact of CBI not only depends on the existing fiscal rules, but also is non-linear. This proposition is certainly subject to the criticism and further empirical testing that spending ministers or their constituents may also benefit from the inflation tax, which could render the effect of inflation ambiguous.

Proposition 3. Keeping everything else constant, an increase in the number of SMs (n) increases deficit in the case of either individual optimization or Nash bargaining by the SMs.[13] This effect, however, is negative in the case of the government's collective optimization.

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[11] Note that ($n\tilde{a}Ð^*$) is greater than ($\tilde{a}^2Ð^*$).

[12] Though one may argue that inflation also reduces the debt burden and may thus be desirable, it should be noted that the debt burden is not the responsibility of individual spending ministers, but of the central government, and thus does not neutralise the aforementioned anti-inflationary incentives for the spending ministers.

[13] The partial derivatives of deficits with respect to the number of spending ministers for SM and NB are: $cMa / (a^2M + \gamma^2)$ and $cMa / (a^2M + \gamma^2 n)$, respectively.

A possible explanation for this asymmetry is that, unlike spending ministers, the government takes into account the full cost of the increase in spending. Thus, as n increases, the expectation that both the level of total spending and inflation would increase may lead the government to cut back on total spending and thus deficits.

Proposition 4. Keeping everything else constant, the spending bias that arises from spending ministers' Nash bargaining solution for X_i's, as compared to that of the government's collective solution, increases with the number of spending ministers. This impact, however, is smaller in the case of Nash bargaining between the SMs.

Proposition 5. Keeping everything else constant, the higher the utility received from individual SM's spending (c), the higher are the spending biases and budget deficits. This positive relationship is stronger in the case of individual optimization by the SMs than in the case of their Nash bargaining.

4. Some Empirical Evidence

To test for the findings of the foregoing model, we use yearly inflation rates and the ratio of budget deficits to GDP in averages over the period from 1981 to 1990 (source: International Financial Statistics of the IMF). Data covers the 12 OECD countries, studied in Von Hagen (1992), for which the IFD index is available. Though the data is limited to claim sound evidence in favor or disfavor of the model predictions, we nevertheless provide the results of this preliminary analysis.

To measure fiscal discipline, we employ the broad structural index (SI1) constructed in Von Hagen (1992).[14] As measures of the degree of central bank independence, we use the aggregate weighted index of legal independence developed by Cukierman, Webb and Neyapti (1992), and a subset of it (as defined in Cukierman, Miller and Neyapti, 1997). We call these latter indices with their original abbreviations: LVAW and LVESX, respectively.[15] Appendix II reports the list of criteria for the construction of both the indices of fiscal discipline (IFD) and legal central bank independence (CBI).

Our empirical analysis is cross sectional since neither IFD nor CBI changes in the sample countries over the period analyzed here. Data is therefore rather limited to perform a multiple regression analysis to investigate the respective roles of CBI and IFD on both deficits and inflation. Thus, in a preliminary attempt, we look at the averages of inflation rates and budget deficits corresponding to the high and low (with respect to a mean value) values of both IFD and CBI indices. Table 2 summarizes the findings.

According to Table 2, both inflation rates and budget deficits are substantially lower for high values of IFD indices than for their lower values. This finding is consistent with both that of H&H and with Proposition I above. When we view the sample across the high and low classification of CBI, however, an interesting picture arises; both budget deficits and inflation take their highest average values in the cases of low IFD, but high CBI (see the shaded areas in Table 2). This observation is in support

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[14] Narrow definition of the structural index, SI3, yield virtually the same results, and are therefore are not reported here.

[15] Following Eiffinger and Schaling (1993) and Eiffinger and van Keulen (1995), we employ a subset of the legal CBI index to account for those characteristics that are suggested to have greater relevance than some other aspects of central bank independence. LVESX is one such narrow index that consists only of the criteria on the allocation of authority for monetary policy, conflict resolution, objectives of the central bank and the limitations on lending to the government.

of Proposition 2 in suggesting the possibility of positive association of these variables with CBI.

Appendix III investigates possible interactions between fiscal and monetary discipline by looking at the correspondences between high and low values of IFD and CBI. Those tables reveal that the CBI indices are substantially higher for higher values of the IFD indices, and vice versa. Hence, the results call for some care in designing an empirical analysis of the relative roles of IFD and CBI on fiscal perfo rmance.

Table 2: Averages of the inflation rate and budget deficits grouped by the high and low levels of fiscal discipline and central bank independence

Central Bank Independence Indices		**Average Deficits to GDP Ratio**		**Average Inflation Rates**	
		Fiscal Discipline Index (SI1)			
		High[a]	Low[b]	High	Low
LVAW	High	2.7 (3)[d]	9.7 (3)	3.72 (3)	14.73 (3)
	Low	2.2 (2)	6.0 (4)	6.48 (2)	7.03 (4)
LVESX	High	1.8 (3)	9.9 (2)	4.98 (3)	13.45 (2)
	Low	3.5 (2)	6.6 (5)	4.59 (2)	9.09 (5)

Notes:

[a] High : Referring to those values of indices that are greater than the mean of the whole sample.
[b] Low: Referring to those values of indices that are smaller than the mean of the whole sample.
[c] The average of 1981-1990.
[d] The size of the sample.

5. Summary and Conclusions

This paper incorporates central bank behaviour into the model of von Hagen and Harden (H&H, 1995) to investigate the relative effects of fiscal and monetary discipline

on budgetary outcomes. We argue that degree of central bank independence provides a measure of monetary discipline. Following the original model, this paper also distinguishes between budgetary procedures based on the government's collective choice of the level of budgetary spending; the Nash bargaining among the spending ministers; and the aggregate of the spending levels determined by individual spending ministers.

As in the original model, the current model predicts that fiscal illusion is limited by fiscal discipline. However, it also suggests the possibility of a positive relationship between fiscal illusion and the degree of central bank independence. The rationale for this is that provided that monetary accommodation of inflation is higher the lower is the degree of central bank independence, spending ministers, whose constituencies are harmed by inflation, choose to spend less than otherwise. As the number of spending ministers increase, both budget deficits and inflation also increase in the case of optimizing spending ministers since the resulting burden on the constituency of each spending minister gets smaller. In case of Nash bargaining, however, this effect is smaller than in the case of individually optimizing spending ministers.

The current model indicates that greater degrees of central bank independence that symbolises the institutionalisation of monetary discipline, may lead to moral hazard on behalf of the agents who decide on the budget. Thus, it is possible to observe higher levels of deficits and inflation associated with institutions established with the purpose of achieving monetary discipline.

Using the indices of fiscal discipline (IFD) developed by H&H and the indices of central bank independence (CBI) developed by Cukierman, Webb and Neyapti (1992), we make a preliminary empirical investigation to test the predictions of this model.

Although not entirely conclusive, the evidence support model predictions. Data on 12 European countries also exhibit substantial interaction between IFD and CBI.

The varying degrees of independence that the central banks of the European Community members have had during the 1980s (see Cukierman et al, 1992) may, in view of the establishment of the ECB, help to predict deviations among the European Community members with regards to their future fiscal performance. The implications of the current analysis are, nevertheless, not limited with the countries studied here.

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Appendix I. Macroeconomic and Institutional indicators in the EU, 1980s.

Table A.1.a: Macroeconomic Indicators in the European Union, 1980-90

COUNRTY	Deficit/GDP	Inflation Rate	Gross Public Debt/GDP
Belgium	9.68	4.71	116.76
Denmark	1.46	6.30	66.13
France	2.55	6.70	32.31
Germany	1.48	2.63	41.99
Greece	10.68	18.90	61.82
Ireland	9.18	8.35	102.51
Italy	12.23	10.08	83.72
Luxembourg	-3.52	4.54	12.35
Netherlands	5.20	2.46	68.50
Portugal	9.21	17.75	63.60
Spain	5.41	9.66	40.82
United Kingdom	1.78	6.27	54.26
Mean	5.45	8.20	62.06
Standard Deviation	4.80	5.31	29.28
Coefficient of Variation	0.88	0.65	0.47

Notes: Deficit and Inflation figures are in averages for 1980-1989; debt figures Are in averages for 1980-90.

Source: OECD

Table A.I.b. Indices Of Fiscal And Monetary Discipline

COUNRTY	SI1 [1]	SI3 [1]	LVAW [2]	LVESX [2]
Belgium	0.34	0.18	0.20	0.08
Denmark	0.60	0.68	0.53	0.87
France	0.86	0.94	0.27	0.51
Germany	0.65	0.44	0.73	0.87
Greece	0.32	0.03	0.59	0.53
Ireland	0.34	0.31	0.48	0.80
Italy	0.25	0.38	0.29	0.20
Luxembourg	0.23	0.19	0.37	0.42
Netherlands	0.62	0.74	0.45	0.37
Portugal	0.40	0.30	0.44	0.37
Spain	0.31	0.28	0.27	0.25
United Kingdom	0.73	0.86	0.30	0.04
Mean	0.47	0.44	0.41	0.44
Standard Deviation	0.21	0.29	0.16	0.29
Coefficient of Variation	0.45	0.66	0.38	0.65

Notes: 1. SI1 and SI3 are indices of fiscal discipline derived from the broad and narrow indices defined by von Hagen and Harden (1995).
2.LVAW and LVESX are the broad and narrow indices of central bank independence defined in Cukierman, Webb, Neyapti (1992) and Cukierman, Miller and Neyapti (1998), respectively.

Appendix II. Criteria to Evaluate Fiscal and Monetary Disicipline

Table A.IIa. List of Criteria for Constructing the Index of Fiscal Discipline (IFD) – Von Hagen (1992).

1. *Structure of Negotiations within Government:*
   a. General constraint: The rule for designing overall budget.
   b. Agenda setting for budget negotiations.
   c. Scope of budget norms in the setting of agenda.
   d. Structure of negotiations.

2. *Structure of Parliamentary Process:*
   a. Amendments.
   b. Required to be offsetting.
   c. Can cause fall of government.
   d. All expenditures passed in one vote.
   e. Global vote on total budget size.

3. *Informativeness of the Budget Draft:*
   a. Special funds included.
   b. Budget submitted in one document.
   c. Assessment of budget transparency by respondents.
   d. Link to national accounts.
   e. Government loans to non-government entities included in budget draft.

4. *Flexibility of Budget Execution:*
   a. Minister of Finance block expenditures.
   b. Spending ministries subject to cash limits.
   c. Disbursement approval required from Minister of Finance or controller.
   d. Transfers of expenditures between chapters.
   e. Changes in budget law during execution.
   f. Carry-over of unused funds to next year.

Each of the sub-items under the 4 main headings is enumerated between 0 and 4 for each country. SI1 is the sum resulting from the numbers from 1 to 4 including all sub-items. Von Hagen also enumerate SI2 as the sum of items 1, 2 and 4, and SI3 as the sum of items 1 and 2.

Table A. II.b. List of Criteria for Constructing the Index of Central Bank Independence -- Cukierman, Webb and Neyapti (CWN, 1992).

1. *Chief Executive Officer:*
   a. Term of office,
   b. Who appoints CEO?
   c. Dismissals,
   d. May CEO hold other offices in government?
2. *Policy Formulation:*
   a. Who formulates monetary policy?
   b. Who has final word in resolution of conflict?
   c. Role in government's budgetary process
3. *Objectives:*
4. *Limitations on lending to the government:*
   a. Advances,
   b. Securitized lending,
   c. Terms of lending,
   d. Potential borrowers from the bank,
   e. Limits on central bank lending,
   f. Maturity of loans,
   g. Interest rates on loans,
   h. Central bank prohibited from buying or selling government securities in the primary market?

The construction details of the indices of CBI, LVAW and LVESX, are available in CWN (1992) and Cukierman, Miller and Neyapti (1998), respectively.

Appendix III. Interaction between IFD and CBI:

Table A.III.a: Average Values of CBI by Groups of IFD

Indices of Central Bank Independence	Fiscal Discipline Indices		Total Sample Average
	SI1	**SI3**	
	High	**Low**	
LVAW	0.456 (5)	0.377 (7)	0.410 (12)
LVESX	0.532 (5)	0.247 (7)	0.443 (12)
	SI3	**SI3**	
	High	**Low**	
LVAW	0.456 (5)	0.377 (7)	0.410 (12)
LVESX	0.716 (5)	0.379 (7)	0.443 (12)

Table A.III.b: Average Values of IFD by Groups of CBI

Fiscal Discip. Index	Central Bank Independence Indices		Total Sample Average
	LVAW	**LVAW**	
	High	**Low**	
SI1	0.692 (5)	0.313 (7)	0.471 (12)
	LVESX	**LVESX**	
	High	**Low**	
SI1	0.532 (5)	0.379 (7)	0.471 (12)