MONETARY AND FISCAL POLICY COORDINATION

WITH A HIGH PUBLIC DEBT

Guido Tabellini*
University of California,
Los Angele

July 1987

UCLA Working Paper #449

Prepared for the conference "Surviving with a high public debt: lessons from the Italian experience," Castel Gandolfo, Rome.

* I am grateful to Alberto Alesina, Stanley Fischer, Vincenzo La Via, Patrick Minford, Mario Monti, Richard Portes, Riccardo Rovelli, Luigi Spaventa and several conference participants for very helpful comments on a preliminary version, and to the UCLA Academic Senate for financial support. Luca Molteni and Alessandro Prati provided able research assistance. This paper was completed while I was visiting Bocconi University. The usual disclaimer applies.

I. INTRODUCTION

Monetary policy in Italy has large repercussions on the size of the government budget. For instance, it can be calculated that at the end of 1985, because of the short duration of public debt, a 1% rise in the market real interest rate would have added to the fiscal deficit a flow of interest payments equal to .64% of GDP within one year. Moreover, the revenue collected through money seignorage in 1986 amounted to approximately 1.2% of GDP.[1]

Despite these repercussions, for the last several years the Italian monetary regime has evolved towards an increased decentralization between the monetary and the fiscal authorities. As a result of a series of institutional reforms that started in the early 1980s, the Bank of Italy has increased its autonomy from the Treasury and has pursued its monetary objectives with more determination than ever before.

At the same time that this process of decentralization was taking place, the Italian public debt was soaring at extremely high rates. Public debt is now over 100% of GDP (according to the unrevised national income accounts), and it is forecast to remain above this level for several years to come (see Cividini, Galli and Masera (1987)). According to several authoritative Italian economists, the growth of public debt in Italy cannot be arrested without a concerted effort on the part of both monetary and fiscal policies (this point of view is argued most forcefully in Spaventa (1984), (1985)).

These facts pose a natural question: is there any contradiction between the institutional reforms that increased the decentralization of the monetary and fiscal authorities, and the goal of stabilizing public debt?

This question is examined in the paper from two points of view. From a purely theoretical point of view, it is argued that there is no contradiction between the monetary reforms and the goal of stabilizing public debt. On the contrary, the monetary regime change and the resulting monetary restraint may facilitate the task of correcting the fiscal imbalances. The central point here is that the incentives of the fiscal authority, and hence its behavior, are not invariant to the features of the monetary regime. In a monetary regime in which the course of monetary policy is predetermined independently of the public debt outstanding, the fiscal authority internalizes the costs of deficit finance to a greater degree than in a regime where the debt is eventually monetized. Hence, a less accommodative monetary regime reinforces the fiscal authority incentives to pursue a more balanced fiscal policy.

Looking at the empirical evidence, however, suggests a more cautious conclusion. There is some indication in the data of a more balanced fiscal policy under the new monetary regime. However this evidence is not very robust. Moreover, the private sector did not seem to perceive a regime change. The overall picture that emerges here is that the new monetary regime has been shaped more by concrete monetary policy actions of the Bank of Italy than by binding external institutional reforms. In this new regime the link between fiscal deficits and future monetization has not been cut -- even though it now seems less automatic than before.

Combining these two points of view suggests the following tentative conclusion: the ambiguities of the new monetary regime force the Bank of Italy to pursue a restrictive monetary policy in order to maintain its credibility. At the same time, they weaken the fiscal authority incentives to

bear the whole burden of stabilizing public debt. As a result, these ambiguities could generate a non coordinated monetary and fiscal policy mix that would compromise the stabilization of public debt. If this conclusion is correct, it suggests that the remaining ambiguities of the new Italian monetary regime should be removed, and the process of monetary reform be completed as soon as possible.

The outline of the paper is as follows. Section 2 briefly summarizes the evolution of the Italian monetary regime from 1970 up to now. Section 3 describes a simple theoretical model in which the behavior of the fiscal authority is not invariant to the regime change. It is a game theoretic model with three players: the private sector, the fiscal authority and the central bank. The model predicts an inverse relationship between the size of fiscal deficits net of interest payments and the extent of debt monetization by the central bank. Section 4 looks at the empirical evidence, in order to determine whether the monetary regime change of the 1980s was indeed accompanied by a more disciplined fiscal policy. Finally, section 5 contains some concluding remarks.

2. MONETARY POLICY AND MONETARY INSTITUTIONS IN ITALY: 1970-86

This section summarizes the transformation of the Italian monetary regime in the period under consideration. The introductory chapter of this volume, by Luigi Spaventa, describes the evolution of public debt and of fiscal policy in this period. Here I focus on monetary policy and particularly on the interaction between the monetary and the fiscal authorities.

Institutional changes generally occur gradually over time, and any attempt of periodization involves some inescapable arbitrary judgment. In this case, three distinct subperiods can be identified. Even though it is not always possible to identify precisely the beginning and end of each period, important aspects of monetary policy and/or of monetary institutions differ sharply across these three subperiods. For clarity of exposition, this section proceeds as if the three subperiods are sharply identifiable. The empirical analysis of section 4 however performs some sensitivity analysis with respect to this periodization.

In the first subperiod, 1970-76, the Bank of Italy pursues the goals of stabilizing the interest rate and facilitating the monetary financing of fiscal deficits. The second subperiod, 1977-80, is a transition phase: the Bank of Italy begins to pay attention to monetary aggregates and gradually tries to gain independence from the fiscal authority. Monetary policy is less accommodative than in the previous subperiod. However the institutional position of the central bank is still relatively weak, and the instruments of monetary control remain inadequate to implement an independent monetary policy. Finally, in the third subperiod, 1981-86, the new monetary regime

takes a precise shape and important institutional reforms are implemented. As a result, the course of monetary policy becomes largely independent of the fiscal constraint.

This periodization is clearly reflected in the statistics reported in Table 1. The coefficient of monetary financing of the deficit is much higher in the first subperiod than in the other two. The same applies to the creation of monetary base against Treasury liabilities, as a fraction of GDP. The rate of growth of the total monetary base drops sharply in the third subperiod. The marginal real interest rate on public debt, which is negative on average in the first two subperiods, becomes positive and high in the third period.[2] Finally, as reported in Table 2, the share of public debt held by the Bank of Italy rises in the first subperiod, to reach 40% in 1976; and it steadily declines thereafter, to reach 16.5% at the end of 1986.

[Insert Tables 1 and 2 about here]

The remainder of this section describes the events of the three subperiods in more detail.[3]

2.1 Accommodative Monetary Policy: 1970-76

The attitude of the monetary authorities during this subperiod is adequately summarized in a well known official statement of Guido Carli, governor of the Bank of Italy until the summer of 1975: "We asked and we keep asking ourselves whether the Bank of Italy could have refused, or could refuse, to finance the budget deficit by refraining from the faculty, attributed by the law, of buying government debt. Such a refusal would leave the government in the impossibility of paying wages to public employees (...)

and pensions to all citizens. It would look like an action of monetary policy: in the substance it would be an act of rebellion. We cannot avoid the downfall only by means of the tools of monetary policy: we can try and make it less deep" (Report of the Bank of Italy, 1973, p. 426).[4] Faced by a budget deficit of unprecedented dimensions, with a market for Treasury bills still largely undeveloped, in the years 1970-73 the Bank of Italy completely subordinates its monetary policy to the goals of facilitating the deficit financing and stabilizing interest rates. The behavior of monetary aggregates is completely disregarded. The yearly report of the Bank of Italy does not even publish any ex post statistics concerning the quantity of money.[5] The quantity of money is mentioned for the first time in the 1975 report. But even then, a precise definition of the relevant aggregates is not provided, and the quantity of money is mentioned exclusively for its presumed correlation with the stock market -- see Tendenze Monetarie, December 1975.

In the summer of 1973 the inflationary consequences and the adverse external effects of this policy become evident. But the Bank of Italy cannot (or does not want to) reduce debt monetization.[6] Hence it cannot rely on monetary base control and interest rates to implement a more restrictive monetary policy. Instead, it introduces administrative controls on financial markets: first a portfolio constraint obliging commercial banks to invest a fraction of their deposits in long term bonds (and in Treasury bonds); and then a ceiling on the quantity of bank loans. This method of credit control is continued in subsequent years, and finds official recognition in the "letter of intent" signed with the IMF in 1974: the monetary policy target identified in this document is the quantity of total domestic credit, an

aggregate that can be controlled by the central bank mainly through administrative methods. This intermediate target will continue to guide monetary policy for several years and it is deemphasized by the Bank of Italy only in the 1980s.

The years of 1975 and 1976 are important and yet contradictory in the evolution of the Italian monetary system. Some institutional reforms are initiated, specifically designed to enhance the effectiveness of indirect methods of credit control. More importantly, the public debt auctions in the primary market are modified: they are made more competitive, but at the same time the Bank of Italy is required to act as the residual buyer of all the unsold public debt. The central bank is then free to resell the debt in the secondary market if it so wishes (however possibly incurring a capital loss).

In 1975 Guido Carli is replaced by Paolo Baffi as governor of the Bank of Italy. The new governor publicly expresses some disagreement with the accommodating policy of his predecessor. However, the Bank of Italy continues to disregard the behavior of monetary aggregates. The monetary base and the quantity of money grow at extremely high rates throughout 1975. As a result, in January 1976 the Italian lira falls under speculative attack. The weakness of the lira continues throughout 1976. In the summer of 1976 the communist party scores a major victory in the political elections. This shakes the confidence of some Italian savers and possibly of foreign investors. In June and in September the lira falls again under speculative attacks and the Bank of Italy is forced to return to the old policy of debt monetization accompanied by strict administrative controls. Finally, in 1976 short term Treasury bills are offered for the first time to the non-banking public.

2.2 The Transition Phase: 1977-80

These can be called the years of "compensatory", or "ex-post", monetary policy.[7] The administrative credit controls begin to lose some effectiveness and impose increasing efficiency costs on the economy. The target for total domestic credit is systematically missed whenever the fiscal deficit turns out to be larger than forecast, which happens most of the time. As a result, the Bank of Italy gradually turns towards indirect methods of monetary control, that rely on controlling the quantity of monetary base. A secondary market for public debt is now in existence and operates quite smoothly. This enables the Bank of Italy to drain liquidity from the banking system through open market operations. The typical pattern of monetary policy during this period is as follows: the Treasury creates large amounts of monetary base through the overdraft account and in the primary market for public debt (recall that since 1975 the Bank of Italy is obliged to act as the residual buyer of public debt at the Treasury auctions). The central bank then destroys the monetary base created by the Treasury, through open market operations. To a large extent, the private sector holders of public debt are now the households rather then the banking system. Thus, the growth of a well organized market for public debt is accompanied by a large disintermediation of the financial system.

Throughout this period, the compensatory monetary policy of the Bank of Italy manages to limit the size of the overall creation of monetary base against Treasury liabilities (see Table 1). However, the Treasury is still responsible for large variations of liquidity during the course of each year. Moreover, the Treasury sometimes receives an implicit subsidy from the Bank of

Italy, since it forces the central bank to buy the debt in the primary market at a price which can occasionally exceed the price subsequently formed in the secondary market.

In 1979 Italy enters the EMS and Paolo Baffi is replaced by Carlo Azeglio Ciampi as governor of the Bank of Italy. However, none of these events substantially alters the course of monetary policy. During the first two years of its existence, the EMS does not place a binding constraint on Italian monetary policy, as indicated by the low level of real interest rates in Italy relative to other European countries (see Table 3), and by the frequent realignments of the Italian lira in the system.[8] And the new governor continues the "compensatory" monetary policy of its predecessor.

[Insert Table 3 about here]

2.3 The New Monetary Regime: 1981-86

The transformation of the monetary regime begins in the summer of 1981, when the Bank of Italy is freed from the obligation of buying the unsold public debt at the Treasury auctions. The "divorce" between the Bank of Italy and the Treasury, as the reform is called in the Italian press, has one main motivation (see Salvemini 1983): to block the mechanism described in the previous sub-section, whereby the Treasury creates monetary base and the Bank of Italy destroys it in the secondary market. This mechanism has several drawbacks. From a technical point of view, it adds variability to the monetary base and it forces the Bank of Italy to operate in the secondary market exclusively as a net seller of public debt. More importantly, from a political point of view, it places the responsibility for the level of

interest rates on the monetary rather than on the fiscal authorities. The divorce has the effect of increasing the visibility and hence the impopularity of deficit financing.[9] In this regard, it is worth noting that one of the most active and influential supporters of the divorce was the Secretary of the Treasury himself, Beniamino Andreatta. The Secretary of the Treasury and his advisers, perhaps even more than the Bank of Italy, were convinced that the divorce would have had positive repercussions on the incentives of the government and of the political authorities.

However, the reform is incomplete in two important respects: first of all, it still leaves the Treasury with the opportunity of creating liquidity through the overdraft account. Since the ceiling on this account is 14% of public expenditures in the current period, this is by no means a trivial channel of base creation. Indeed, as indicated in Table 1, the Treasury makes a heavy use of this account throughout this period of time. Secondly, the divorce gives the Treasury the ability to choose the minimum base price at the public debt auctions. Any offer below such a minimum price is not accepted. Hence, the Treasury can fix the maximum interest rate in the primary market. Since the debt traded in the primary market is a very good substitute of the debt traded in the secondary market, the Treasury can set a ceiling to a key interest rate in the Italian money market. In practice, this ceiling on the level of interest rates has very seldom been binding. The Treasury has regularly asked the Bank of Italy for "technical advice" about the appropriate base price. Generally this advice has been followed. It is not clear, however, whether this would continue to happen under a different Secretary of the Treasury. Nor is it clear whether the "technical adivce" offered by the

Bank of Italy has been conditioned by the perceived reaction of the Treasury to this advice.

Even in the presence of these constraints, however, the divorce has had relevant effects on the visibility of fiscal imbalances. This is well exemplified by events that took place in 1982. The Treasury had to raise a large amount of cash. It was unwilling to raise the interest rate in the primary market, and the size of the overdraft account was insufficient to cover its liquidity needs. The Bank of Italy chose not to monetize the debt in the primary market. And the Treasury was forced to ask Parliament to ratify by law the temporary overshooting of the legal limit on the overdraft account. We are clearly very far away from the logic of Guido Carli, that a refusal to monetize would amount to an "act of rebellion" (see subsection 2.1).

A second important institutional change that occurs in this period concerns the methods of monetary control. In 1983 administrative credit controls are abandoned, in favor of more indirect methods that rely on interest rates and monetary aggregates. There are several reasons for this change. Financial innovation is making the administrative controls less and less effective (see Cottarelli et al. (1986)). To the extent that the controls are not eluded, they impose increasing efficiency costs on the economy (see Bruni, Monti and Porta (1980)). Finally, the expansion of the public sector borrowing requirement is forcing the monetary authorities to deemphasize total domestic credit as a target of policy and to replace it with monetary targets. In 1974, when a target for total domestic credit was first announced, the public sector borrowing requirement amounted to less than 50% of total domestic credit. In 1983 it is over 70%. In such a situation, total

domestic credit is largely determined by fiscal policy, not by monetary policy. Suppose for instance that the fiscal deficit turns out to be larger than expected. The scope for offsetting the resulting increase in total domestic credit through a curtailment of credit to the private sector is severely diminished. Hence the shift towards monetary targets and indirect methods of control (see Ciampi (1986), Caranza and Fazio (1983)). As in the case of the divorce, much of the impetus in favor of the deregulation comes initially from the Treasury, and in particular from the influential report of the Treasury Commission chaired by Mario Monti (see Report (1983)). One of the points stressed in the report is that the regulatory constraints on financial markets confer a hidden subsidy to the Treasury. The removal of this subsidy, it is argued, restores new incentives towards a more disciplined fiscal policy.

Two interest rates now play a key role in the strategy of the Bank of Italy: the real interest rate on Treasury Bills, that is perceived as being systematically related to the demand for financial assets in general. And the differential between the rate on short term Treasury bills and the rate on bank deposits, that determines the demand for public debt on the part of households, and hence money demand (see Masera (1983), Caranza and Fazio (1983)). As documented in Tables 1 and 3, the real interest rate sharply increases during the 1980s both in absolute value and relative to other European countries.

The third and final milestone of the Italian monetary regime change is the increased willingness to accept the external constraint imposed by the EMS. This constraint was disregarded is the first couple of years of the EMS'

existence; but in more recent times it plays a major role in publicly justifying a severe monetary policy. As documented in Table 3, the real interest rate differential between Italy and West Germany rises sharply after 1981. The elimination of the controls on international capital flows, that is about to take place, will obviously consolidate the bite of this external constraint on Italian monetary policy.

2.4 What Next?

As stated in the previous pages, the monetary reform is yet to be completed. Among the industrial countries, Italy is still one of the few in which the Treasury has such large monetary powers through the overdraft account, and in which the central bank has access to the primary market for public debt. In most other countries the central bank operates exclusively in the secondary market; and the size of the Treasury overdraft account with the central bank is limited to a maximum of 2% or 3% of current expenditures. (In the case of Denmark, the U.K. and the U.S., the Treasury cannot receive any direct financing from the central bank -- see Bank of Italy (1983).) The reduction of the degree of monetary financing of the deficit that occurred in the 1980s is the result of discretionary choices of the Bank of Italy, not of binding external constraints. As such, the new course of monetary policy in Italy is easily reversible. Moreover, even the reforms described in the previous pages can be easily reversed, since they occurred through administrative decisions of the monetary and fiscal authorities and have not been ratified by a legislative act of Parliament.

In order to consolidate the process of monetary reforms, other important steps have to be taken. They are: (i) to curtail the monetary powers of the

Treasury, through a reduction in the size of the overdraft account; (ii) to tolerate more upwards flexibility of interest rates, by further reducing the participation of the Bank of Italy in the primary market for public debt, by making the public debt auctions more competitive and more generally by increasing the separation of responsibilities between the conduct of monetary policy (that should pertain to the Bank of Italy) and the management of public debt (that concerns the Treasury); (iii) to ratify these reforms by law, so as to transform them into external constraints on the policymakers, since right now the reforms rely for their survival exclusively on the goodwill and reputation of the policymakers themselves.

Should these additional steps be carried out in the near future? Or should they instead wait until the debt to GDP ratio has been stabilized by means of a coordinated monetary and fiscal policy strategy?

In the remainder of the paper I argue that the completion of the monetary reforms should not be delayed. Not only there is no contradiction between the completion of the reforms and the goal of arresting the growth of public debt. On the contrary, the monetary reform can be regarded almost as a prerequisite for achieving that goal. As stated in the introductory section, the argument is that reforming the monetary regime changes the incentives of the fiscal authority, in the direction of making the fiscal stabilization more desirable to achieve. This argument will be presented in two steps. The next section analyzes some theoretical results supporting this point of view. Section 4 then considers the empirical evidence in the light of these theoretical results.

3. A THEORETICAL INTERPRETATION OF THE MONETARY REFORMS

The monetary reforms described in the previous section grew out of an intellectual climate that stressed the positive incentive effects of adding visibility and transparency to forms of taxation that had hitherto been hidden and implicit (see for instance Monti (1983a, 1983b), Masera (1986), Bruni and Giavazzi (1987), Salvemini (1983)). This line of thought can be traced back to the research of Buchanan and his associates (see Brennan and Buchanan (1980) and Mueller (1979)), and before them to the work of Italian economists such as Puviani (1903). Fiscal policy decisions are viewed as reflecting political considerations about the redistributive effects of the policy. The political gains associated with the redistributions (in cash or in kind) in favor of certain groups of the population are weighted against the political costs of effecting these transfers. This weighting process however is highly imperfect. Because of irrationality on the part of political agents, or because of the existence of information gathering costs, some forms of taxation have smaller political (but not necessarily economic) costs than others. Typically, deficit financing, money seignorage and regulatory constraints are implicit taxes bearing smaller political costs than more explicit forms of taxation. According to this point of view, therefore, the desirable incentive effects of the reforms on the behavior of the fiscal authority operate by increasing the visibility and the transparency of the taxes implicit in the process of deficit financing.

In this section I analyze a second incentive effect of the monetary reforms that can facilitate the correction of the fiscal imbalance. This

effect operates by improving the strategic position of the central bank, in the context of a dynamic game between the monetary and fiscal authorities.

The key idea is as follows. Suppose that, because of the same reasons considered by the school of Public Choice (information gathering costs, logrolling and vote trading, budget maximizing bureaucrats, and so on), the fiscal authority desires a large amount of public expenditures or of transfers. Suppose further that the central bank is shielded from the political pressures that direct the incentives of the fiscal authority towards large public expenditures. Hence, assume that the central bank assigns a smaller weight to public expenditures. We then have two decentralized taxing authorities with different objectives.

In this situation, the Treasury finds it optimal to run a deficit. For by doing so, it forces the central bank partially to increase the future rate of money seignorage. Moreover, the incentive to run a deficit for the fiscal authority is stronger the larger is the extent of debt monetization. Hence, a monetary reform that reduces the extent of future debt monetization has the effect of reducing the equilibrium size of the budget deficit. Naturally, the desirability of the reforms depends on a judgment concerning the optimal size of the inflation tax. If the inflation tax that would be chosen by the Treasury exceeds the optimum, then the monetary reforms can be welfare improving, since they lead to less inflation and smaller deficits.

Note that this strategic effect of the reforms operates independently of any visibility effect. However, it is clearly complementary to it. The reason for focusing on this particular aspect of the monetary reforms is mainly one of division of labor, given that it has been neglected so far in the Italian public policy debate.[10]

3.1 The Model

The model is the simplest possible to analyze the idea summarized in the previous pages. The nature of the results should extend to much more general settings even though the analysis would be more complex.

The economy is open to the rest of the world and is a price taker in international capital markets. The only tool of monetary policy is the domestic component of the monetary base. Thus, exchange rates are perfectly flexible. Moreover, purchasing power parity is assumed, so that there is no need to distinguish between the price level and the nominal exchange rate. The time horizon lasts two periods. At the end of the second period all debt (private or public) has to be repaid.

The private sector consists of a representative consumer that lives two periods and maximizes:

$$(1) \quad V = \text{Max}\{\ln C_1 + \beta \ln C_2 + \ln m_1 + \beta \ln m_2\} \qquad 1 > \beta > 0$$

where: $C_i \equiv$ consumption in period i; $m_i \equiv M_i/P_i \equiv$ real money balances held at the end of period i, M_i and P_i being respectively nominal money balances and the price level in period i. Real money balances enter the utility function because of the liquidity services that they provide.

The consumer is endowed with a positive quantity E of real output in each period; this endowment is taxed at the rate τ_i in period i. Moreover, at the beginning of the first period of his life, the consumer also owns a positive quantity of nominal money balances, M_0, and of real government debt, B_0.[11] Finally, he faces a given real interest rate in international capital markets, r, that coincides with his subjective rate of intertemporal

preference: $1/(1+r) = \beta$. Under all these assumptions, and denoting the inverse of the expected inflation rate in period 2 by $\pi_2^e \equiv P_1/P_2^e$, the consumer's intertemporal budget constraint can be written as:

$$(2) \quad W \equiv E(1-\tau_1) + \beta E(1-\tau_2) + B_0 + M_0/P_1 = C_1 + m_1(1-\beta\pi_2^e) + \beta C_2 + \beta m_2$$

where W denotes his lifetime real wealth.

The first order conditions of this simple optimization problem yield the consumer's demand for private consumption and for real money balances in the two periods of his life:

$$(3) \quad C_1 = C_2 = m_2 = \frac{W}{2(1+\beta)}$$

$$m_1 = \frac{W}{2(1+\beta)(1+\beta\pi_2^e)}$$

The conflict of interest between the two policy makers is modelled in the simplest possible way. The fiscal authority behaves like Buchanan's Leviathan: it only cares about public expenditures, G, and maximizes:

$$(4) \quad U = \text{Max} \{\ln G_1 + \beta \ln G_2\}$$

The central bank, by contrast, only cares about the private sector and totally disregards public consumption. Making a less extreme hypothesis about the divergence of preferences between the two policymakers would complicate the notation and the algebra but would not alter the nature of the results in any respect. The only essential feature of the model is that the inflation tax desired by the fiscal authority is larger than that desired by the central bank. Even though this feature does not have universal validity, it seems to

capture an important aspect of the interaction between the monetary and fiscal authorities in Italy from 1970 up to now.

The action of the two policymakers is constrained by the intertemporal government budget constraint:

$$
\begin{aligned}
& G_1 + B_0 \leqq \tau_1 E + \beta B + M_1/P_1 - M_0/P_1 \\
& G_2 + B \leqq \tau_2 E + M_2/P_2 - M_1/P_2
\end{aligned}
\tag{5}
$$

where B is the (real) public debt issued by the government in period 1 that has to be repaid in full at the end of period 2.

It is clear that the fiscal authority always sets taxes at 100%. Hence, to simplify the notation, I will denote the excess of public expenditures over tax revenues by $g_i = G_i - E$. Thus, g_i is the fiscal deficit net of interest payments in period i. The fiscal authority chooses g_i. and the central bank chooses M_i, i = 1, 2.

The imposition of the government budget constraint implies the loss of one degree of freedom in setting monetary and fiscal policies. Who is going to bear the residual burden of satisfying this constraint? Obviously, there is no general answer: it depends on the institutional set-up.[12] Here this feature of the institutional setting is parameterized as follows. It is assumed that a fraction $(1-\theta)$ of the burden of satisfying the budget constraint falls on the fiscal authority, and that the remaining fraction θ falls on the central bank. Thus, in the second period of the game, g_2 and M_2 are constrained by:

$$
\begin{aligned}
& g_2 \leqq -(1-\theta)B \\
& M_2/P_2 - M_1/P_2 \leqq \theta B
\end{aligned}
\tag{6}
$$

If $\theta = 1$, we have a regime where fiscal policy is dominant and the burden of repaying the debt falls entirely on monetary policy. This regime resembles the one analyzed by Bryant and Wallace (1980); it corresponds to a situation in which the fiscal authority acts as the Stackelberg leader and has the first move in each period of the game. If $\theta = 0$ we have the opposite extreme: a regime where monetary policy is dominant and the burden of repaying the debt falls exclusively on fiscal policy. This regime would arise if the central bank could act as the Stackelberg leader and could precommit to a course of action for the current period before fiscal policy has been chosen. Intermediate regimes correspond to values of θ between 0 and 1. Throughout the paper I will refer to θ as the "degree of fiscal dominance".

The monetary regime prevailing in Italy in the first half of the 1970s clearly resembles the case of a dominant fiscal policy, with a θ very close to 1: a non-accommodating monetary policy would have been an "act of rebellion" -- see section 2.1 above. The reforms of the 1980s can be interpreted as having had the effect of reducing the value of θ: the divorce between the Bank of Italy and the Treasury officially recognizes that monetary policy should not automatically bear the burden of financing the fiscal deficit; the increased importance of the Italian participation in the EMS limits the autonomy of domestic monetary policy; and more generally the reforms denote the emergence of a political and intellectual climate in which monetary policy is partially shielded from fiscal pressures. Even though Italy is still far away from the extreme regime of a dominant monetary policy, nonetheless the interpretation of the reforms of the 1980s as an event that has reduced the value of θ seems plausible.

The remainder of this section analyzes the impact that a change in θ has on the equilibrium of the game, and in particular on the rate of inflation and on the size of the fiscal deficit in the first period.

3.2 The Macroeconomic Equilibrium

The demand for real money balances in period 1, and hence the price level in that same period, depend on expected future inflation. Under rational expectations, expected future inflation is determined by the equilibrium condition of the money market in period 2. From equations (6) and (3):

$$(7) \quad m_2 = \theta B + m_1\pi_2 = \theta B + m_2\pi_2/(1-\beta\pi_2^e)$$

Equating π_2 and π_2^e, and using (3) again, equation (7) can be solved for the actual and expected inverse of the inflation rate:

$$(8) \quad \pi_2 = \pi_2^e = \frac{W - 2\theta(1+\beta)B}{[W - 2\theta\beta B](1+\beta)}$$

By taking partial derivatives of (8), it can be shown that π_2 is increasing in W and decreasing in θ and (if $\theta > 0$) in B. Thus a higher debt to be repaid, B, or a higher proportion of debt to be monetized in the second period, θ, tend to raise the inflation rate. Whereas a higher private real wealth, W, by increasing the demand for real balances in period 2, has the opposite effect of reducing the inflation rate.

The price level in period 1, P_1, is also determined by the equilibrium condition in the money market:

$$(9) \quad 1/P_1 = \frac{m_1}{M_1} = \frac{W}{2(1+\beta)(1-\beta\pi_2^e)M_1}$$

Defining $\mu = M_1/M_0$ as the gross rate of growth of money supply in period 1, recalling from (2) that $W = B_0 + M_0/P_1$, and using (8) to form π_2^e, we can

solve (9) for the inverse of the price level:

$$(10)\quad \frac{1}{P_1} = \frac{2B_0 - \theta\beta B}{2(2\mu-1)M_0}$$

Equation (10) implies:

Proposition 1:

P_1 is increasing in μ and B. The effect of B on P_1 is proportional to θ.

That is, an expansionary monetary policy (a larger μ) increases prices in the current period. And issuing more public debt, B, is also inflationary in the current period, since the private sector realizes that issuing debt leads to future inflation and hence reduces its real money demand today. Moreover, the larger is the degree of fiscal dominance (the larger is θ), the more inflationary are the consequences of issuing public debt. In the limit, if monetary policy is dominant (that is if $\theta = 0$), issuing debt has no effect on prices, since the debt will not be monetized at all in the future.

This result suggests an empirical conjecture. Namely, the Italian monetary regime change should be reflected in a diminished response of the rate of inflation to the time path of public debt in the 1980s relative to the earlier period. This conjecture is tested in subsection 4.3 below.

3.3 Fiscal Deficit and Monetary Reforms

It is now possible to evaluate the effect of changing θ on the behavior of the fiscal authority and on the players welfare in a feedback-Nash equilibrium. In such an equilibrium, the two policymakers move simultaneously

in each period and take into account the effect of the state variable on the outcome of the game in the second period, i.e., they take into account equations (6) and (8). This is the appropriate solution concept, given that neither player can precommit to a course of action forever.[13]

The government budget constraint in period 1 is:

$$B = \frac{1}{\beta}[g_1 + \frac{M_0}{P_1}(1-\mu) + B_0]$$

or, using equation (10):

$$(11)\quad B = g_1\Phi(\mu,\theta) + \Omega(\mu,\theta)$$

Where

$$\Phi(\mu,\theta) = \frac{4\mu - 2}{\beta[(4-\theta)\mu + \theta - 2]}$$

$$(12)$$

$$\Omega(\mu,\theta) = \frac{2B_0}{\beta[(4-\theta)\mu + \theta - 2]}$$

The fiscal authority maximizes (4) with respect to g_1 and B, subject to (6), (11) and (12), and taking current monetary policy, μ, as given. Its first order conditions imply:

$$(13)\quad 1/G_1 \gtreqless \beta(1-\theta)\Phi(\mu,\theta)/G_2$$

with an equal sign in an interior optimum. The left hand side of (13) is the marginal utility of public expenditures in the current period. The right hand side is the marginal cost of financing it by issuing public debt. This cost is given by the marginal disutility of the future reduction in expenditures that is necessary to repay the debt, under the existing monetary regime, as parameterized by θ.

Monetary policy is chosen by the central bank so as to maximize the private sector welfare, subject to the private sector first order conditions (equation (3)), the equilibrium condition in the money market (equations (8) and (10)), the government budget constraints (equations (5) and (6)), and for a given value of the fiscal policy variable, g_1. Section 1 of the appendix characterizes more precisely the central bank optimization problem and applies the envelope theorem to prove that under plausible conditions the central bank welfare (and hence the private sector welfare under the hypothesis of this model) is a monotonically decreasing function of θ. That is, the more dominant is monetary policy, the better off is the central bank. Not surprisingly, given the assumptions of the model, the optimal monetary arrangement for the private sector's welfare has the central bank completely shielded from fiscal pressures (that is, the optimal value of θ is 0). This result would survive several generalizations of the underlying model, as long as one retains the assumption that the rate of inflation desired by the central bank is closer to the social optimum than the inflation rate that would be chosen by the Treasury.

Finally, applying the implicit function theorem to (13) and to the central bank first order conditions, it is possible to prove that, for large values of B_0 and for θ not too close to 1:

Proposition 2

The fiscal deficit net of interest payments in period 1, g_1, is an increasing function of θ.

That is, a monetary reform that decreases the degree of fiscal dominance, θ, forces the fiscal authority to reduce the size of the budget deficit in period 1. The intuition is straightforward. The cost of issuing

public debt here is mitigated by its future partial monetization. A monetary reform that cuts the link between public debt and subsequent money creation thereby tends to raise the marginal cost of running a fiscal deficit. In the limit, if monetary policy is dominant and money creation is absolutely independent of the stock of public debt in circulation (that is, if $\theta = 0$), equation (13) reduces to $G_1 = G_2$, in which case the fiscal authority finds it optimal to balance the budget in both periods.

3.4 Further Remarks

The results presented in the previous pages seem in strident contrast with two related common sense considerations that recur in public policy discussions of the Italian financial problems: namely, that fiscal deficits are de facto determined independently of the stance of monetary policy; and that their size is purely the macroscopic consequence of several myopic political decisions, rather than being the deliberate and strategic choice of a rational agency.

The first consideration, however, reflects a confusion between monetary policy actions and monetary institutions. In the model of the previous pages too, it is true that fiscal policy is not affected by current monetary policy. The crucial determinant of fiscal policy is the monetary regime: that is, the link between current deficits and future monetization. This link does not depend on the goodwill (or bad will) of the Bank of Italy. It is determined exclusively by factors that the monetary authority controls only indirectly and in the very long run, such as institutions, political constraints, intellectual climate. The analytical results of this section therefore should

not beinterpreted as an argument in favor of more restrictive monetary policies within the current institutional set up. Such a policy choice would merely substitute less monetization today for even more monetization in the future, as in the model of Sargent and Wallace (1981). The results do however argue in favor of a continuation of the monetary regime change initiated in the 1980s. To the extent that such a monetary regime change would credibly reduce future debt monetization, it would also decrease the incentives of the fiscal authority to run a deficit.

The second objection to the approach taken in this section is more damaging and more difficult to handle. But even if fiscal policy decisions are not taken by a rational player, the fact that changing the monetary regime may increase the cost of running a fiscal deficit remains valid. All that is necessary for the argument to go through then is that, at some stage of the political decision process, these costs be taken into account.[14]

4. MONETARY REFORMS AND FISCAL POLICY: THE EVIDENCE

This section tests the conjecture formulated in the previous pages, namely that the Italian monetary reforms brought about a fiscal policy more disciplined by the intertemporal budget constraint. Two kinds of evidence are considered: direct indicators of fiscal policy; and indirect evidence reflecting private sector expectations of future debt monetization. The evidence is mixed. The fiscal policy indicators give ambiguous results, depending on the particular indicator that is chosen and on the specification of the econometric regressions. And the indirect evidence suggests that the private sector expects the currently outstanding debt to be repaid by future monetization rather than by future fiscal surpluses.

4.1 Simple Fiscal Policy Indicators

A commonly used indicator of intertemporal fiscal policy decisions in Italy is the public sector borrowing requirement (PSBR) scaled to nominal GDP. This variable has steadily grown throughout the period under consideration. However, its growth exclusively reflects the increasing flow of interest payments on government debt.

Table 4 reports the PSBR net of (net) interest payments, scaled to GDP:[15] it is roughly constant throughout the period. Its yearly average is 7.59% for the period 1970-76, 6.68% for 1977-81, and 7.32% for 1982-1986. Hence, this indicator suggests that no change in fiscal policy occurred as a result of the monetary reforms.[16]

The PSBR net of interest payments however is not a good indicator of fiscal policy, since it reflects both discretionary decisions and the

automatic impact of the business cycle on tax revenue and on some components of public expenditures. In order to isolate those discretionary decisions, Table 4 also reports the PSBR net of interest payments and cyclically adjusted.[17] This variable suggests a fiscal policy change: its yearly average is 4.53% for the period 1970-76, 2.74% for the period 1977-81 and 0.63% for the period 1982-1986.[18]

[Insert Table 4 about here]

The computation of the cyclical adjustment, however, is subject to serious errors of measurement.[19] Moreover, a simple comparison of cyclically adjusted PSBR conceals the effects of other factors (political and economic) besides the monetary regime change that may have influenced the course of fiscal policy throughout the period under consideration. The next subsection therefore estimates a reaction function of the fiscal authority, using two different methods.

4.2. The Treasury Reaction Function

This subsection exploits the following simple idea: if fiscal policy is conditioned by the goal of stabilizing public debt, then the size of the cyclically adjusted PSBR net of interest payments should be inversely related to the stock of debt outstanding at the beginning of each period (and possibly in previous periods).[20] Moreover, this inverse relation should be stronger in the periods in which this goal is pursued more actively. This result follows for instance from a model in which the Treasury loss function includes a quadratic term in public debt, or equivalently in the deviations of public debt from its desired time path. Tabellini (1986) analyses a dynamic game

theoretic model exhibiting this feature. Tabellini and La Via (1987) estimate the reduced form of such a model on US data.

This simple insight suggests the following research strategy: to estimate a Treasury reaction function, including lagged values of public debt as explanatory variables; and then to test whether the coefficients on the lagged debt variables have become more negative under the new monetary regime.

This strategy faces a number of difficulties: there are only 17 annual observations (before 1970 there was no serious fiscal imbalance). Despite the fact that these are relatively few observations, the period is sufficiently long that the assumption of stability of the coefficients may fail. Finally, there is no theory to guide us on the specification of the reaction function.

Of these, the third difficulty is really the fundamental one: even with a large data set, in any non-experimental setting and in the absence of sharp theoretical priors, there always is a "degrees-of-freedom-deficit" (see Leamer (1983)). For this reason, in the following pages particular attention is paid to the robustness of the results with respect to alternative specifications.

To save on the degrees of freedom, I follow two alternative approaches: first I estimate a reaction function with sharp prior constraints on the lag structure and loose priors on the set of explanatory variables to be included. Then I do the opposite: I impose no prior constraints on the lag structure but I restrict more severely the set of included explanatory variables.

4.2.1 Sharp Priors on the Lag Structure

The general form of the reaction function estimated in this sub-section is:

$$(1)\quad f_t = \beta_0 + \beta_1 f_{t-1} + \beta_2 d_{t-1} + \beta_3 D d_{t-1} + \sum_{i=1}^{i} \delta_i x_{it} + u_t$$

where:

$f_t \equiv$ PSBR, cyclically adjusted and net of interest payments, scaled to nominal GDP.

$d_t \equiv$ stock of public debt held by the private sector at the end of year t, scaled to nominal GDP.

$D \equiv$ dummy variable taking a value of 0 up through 1981 and a value of 1 thereafter.

$x_{it} \equiv$ some exogenous economic variable that can influence the size of f_t, either because the Treasury responds to it, or because it has some automatic effect on either tax revenues or public expenditures.

$u_t \equiv$ unobservable error term.

The β coefficients correspond to variables for which I assume no specification uncertainty. Thus, the corresponding variables are included in all the regressions. The δ coefficients instead correspond to variables to which I assign loose prior beliefs, in the sense that I ignore whether or not they should be included as explanatory variables, and how. This second set of variables will be the object of some formal specification search. The focus coefficient is β_3: I want to find out whether fiscal policy has responded more vigorously to the goal of stabilizing public debt after 1981 than before. The conjecture is that β_3 is negative.

The variables x_{it} are the CPI inflation rate, x_{1t} (that may affect f_t automatically through the fiscal drag, or it may induce a discretionary

response); and the real interest rate on Treasury bills, x_{2t} (that alters the Treasury intertemporal tradeoffs). The expected sign on the coefficient of both variables is negative. In order to avoid simultaneous equation bias, the predicted rather than the actual values of these variable are used in estimating equation (1). These predicted values were generated by means of on OLS regression of the variable in question on itself lagged twice and on lagged values of: f, d, a measure of cyclical output fluctuations, and the creation of the Treasury component of the monetary base scaled to nominal GDP. The hypothesis of no first order autocorrelation in the residuals of these OLS regressions could not be rejected. These predicted values of x_1 and x_2 can thus be regarded as instrumental variables for either the actual values of x_1 and x_2, or for the Treasury expectations about these variables if the Treasury responds with a lag and tries to forecast the future (see McCallum (1976)). The results are not sensitive to the way in which these predicted values of x are generated. In particular, the result of a negative estimated β_3 coefficient referred to in the following paragraph is reinforced if the variable Dd_{t-1} is added to the OLS regressions generating the values of x.

Table 5 reports the estimates of the coefficients in (1), when no constraint is imposed and all the variables are included.[21] None of the coefficients on public debt is significantly different from zero. However, whereas β_2 is positive, β_3 is negative as expected. Moreover, when either δ_1 or δ_2 or both are constrained to be equal to zero, β_2 remains positive and insignificant, whereas β_3 remains negative, but rises in absolute value and becomes significant. Table 6 reports the estimates when δ_2, the coefficient on the real interest rate, is constrained to be zero. Not only does β_3 become significant, but the overall regression improves.

[Insert Tables 5 and 6 about here]

In order to verify further that the negative sign of β_3 is robust to alternative specifications of (1), section 2 of the Appendix reports the results of some sensitivity analysis done with the help of "SEARCH", a Bayesian statistical package designed by Leamer and Leonard (1983). This analysis confirms that uncertainty about the prior constraints on the δ coefficients does not invalidate the inference that β_3 is negative. Finally, the same inference remains valid if a different, more gradual periodization of the monetary regime change is chosen, and if the relevant variables are scaled to a log linear trend of nominal GDP (rather than to its actual value).

The results however are sensitive to the specification of the lag structure. If the variables d_{t-2}, Dd_{t-2} and f_{t-2} are added to the right hand side of (1), an F test cannot always reject the hypothesis that the coefficients of Dd_{t-1} and Dd_{t-2} are both equal to zero. These two coefficients turn out to be of opposite sign, and their algebraic sum is negative, but for some specifications it is very small. Only when δ_2 is constrained to be equal to 0 can one reject the hypothesis that the sum of the coefficients on Dd_{t-1} and Dd_{t-2} is zero.

Summarizing, the evidence reported in this subsection suggests that the monetary regime change forced the fiscal authority to pay more attention to the goal of stabilizing public debt. This evidence is robust to alternative specifications of the Treasury reaction function, as long as one is willing to maintain the prior hypothesis about the lag structure explicit in equation (1): namely, that the PSBR is influenced by f_{t-1} and d_{t-1}, but not by the

same variables in earlier periods. When this prior hypothesis is relaxed, some of the results change.

The next subsection asks the same question, but with no prior constraints on the lag structure.

4.2.2 Unrestricted Lag Structure

The equation estimated in this subsection is:

$$(2)\quad f_t = \alpha_0 + \beta_1(L)\, f_{t-1} + \beta_2(L)d_{t-1} + \beta_3(L)Dd_{t-1} + \delta_2(L)x_{2t-1} + u_t$$

where the variables are defined as in equation (1) above. Unlike in the previous subsection, lagged actual values rather than predicted values of the real interest rate, x_2, are used, since now there is no simultaneous equation bias problem.[23] $\beta(L)$ and $\delta(L)$ are second degree polynomials in the lag operator. The focus coefficients are again those of $\beta_3(L)$. The conjecture is that the sum of these two coefficients is negative.

Table 7 reports the estimates for $\beta_{3(L)}$ unconstrained. The two β_3 coefficients are of opposite sign and of similar magnitude. An F test cannot reject the hypothesis that they are both insignificantly different from zero.

[Insert Table 7 about here]

Thus, here the evidence points in the opposite direction relative to that considered in the previous subsection: with a relatively unrestricted lag structure, there is no indication that the monetary regime change had an impact on the attitude of the Treasury towards the goal of stabilizing public debt. Since there is no theoretical ground on which to choose between the

specification of this and of the previous subsection, it seems impossible to draw any reliable inference: the evidence concerning the Treasury reaction function is not sufficiently robust to assess whether the regime change had an impact on fiscal policy.

4.3 Indirect Evidence: The Inflationary Consequences of Budget Deficits

According to Proposition 1 in section 3, the inflationary consequences of budget deficits depend, through the expectations of the private sector, on a feature of the institutional setting: namely, the degree of fiscal dominance (the parameter θ of subsection 3.3). This result is more general than the model from which it was derived. Sargent and Wallace (1981), for instance, analyzing an overlapping generations model, note that the growth of public debt is not inflationary if it occurs in a regime where monetary policy is dominant (in the sense that its future time path is independent of the stock of public debt outstanding). But it is inflationary if instead fiscal policy is dominant, since the debt will then be repaid through future money seignorage (see also Aiyagari and Gertler (1985)). Moreover, in a regime where fiscal policy is dominant, the inflationary consequences of the deficit are larger with a more restrictive monetary policy, since such a policy further increases future money creation.

This suggests an indirect test of whether the monetary reforms of the 1980s reduced the degree of fiscal dominance in Italy. If they did, then we should find that fiscal deficits had more capacity to predict inflation before the monetary reforms than afterwards. If instead the degree of fiscal dominance was unchanged, then the opposite should be true: monetary policy has

been more restrictive in the 1980s than in the earlier period. If fiscal policy is dominant, then, this tends to increase the inflationary consequences of budget deficits, as noted by Sargent and Wallace. Naturally, this is a joint test of the nature of the institutional setting, of the hypothesis of rational expectations and of the hypothesis that the monetary reforms were unexpected.

In order to perform this test, I estimate an equation of the following general form (all variables are expressed in deviations from their mean):

$$(3) \quad P_t = \alpha(L)P_{t-1} + \beta(L)m_{t-1} + \sigma(L)y_{t-1} + \delta(L)d_{t-1} + u_t$$

where: P ≡ CPI inflation rate; m ≡ first difference of the log of base money; y ≡ first difference of the log of real output; d ≡ first difference of the log of total public debt. The null hypothesis is that $\delta(L) = 0$ for the period 1981:3 - 1986:4.

The data are quarterly. Table 8 reports the summary statistics of the whole sample and of the two subperiods. The hypothesis of no pairwise cointegration for the whole sample between the CPI and the stock of base money, the CPI and the stock of public debt, and the stock of base money and the stock of public debt could not be rejected at the 5% confidence level. The unconstrained estimates are reported in Table 9, for the whole period and for the two subperiods. The log polynomial is chosen to be of order 3 for the period 1981:3 - 1986:4, in order to preserve degrees of freedom. The two longer subperiods instead have a distributed lag of order 4 for all the variables. The results are not sensitive at all to the choice of the lag length. The LM statistics cannot reject the hypothesis of no autocorrelation of the residuals for any of the equations.

[Insert Tables 8, 9 about here]

Table 10 reports the F statistics for testing the null hypothesis that all the coefficients of $\delta(L)$ are zero, given that the maximum length of $\delta(L)$ is assumed to be n, for n = 1, 2, 3, 4. The hypothesis is strongly rejected for the period 1981:3 - 1986:4. It is also rejected, though a bit more weakly, for the period 1970:1 - 1981:2. Also note that the coefficients of $\delta(L)$ in Table 9 tend to be larger in the period 1981:3 - 1986:4 than in the preceding period.

[Insert Table 10 about here]

If the total stock of public debt is replaced by the public debt held by the private sector, the hypothesis is still rejected for 1981:3-1986:4, but not for the period 1970:1-1981:2. Similarly, the same pattern (a strong rejection for 1981:3-86:4 and a weaker and more sensitive rejection for 1970:1-81:2) is maintained if $\sigma(L)$ in (3) is constrained to be zero, if the lag length for some of the variables is altered, or if base money is replaced by M1. If lagged import prices of consumption goods are added to the regressions and the lag lengths of all variables are shortened so as to save degrees of freedom, the results remain unaffected and the coefficients on the import prices are generally insignificant.

Finally, if the subperiods are redefined as 1970:1-1976:4 and 1977:1-1986:4, the null hypothesis is again strongly rejected in the second subperiod, whereas the first subperiod gives more ambiguous results.

This result is quite striking. Not only are deficits inflationary under the new monetary regime, but they seem to be more inflationary than under the

old one! This finding strongly contradicts the conjecture that the monetary reforms were perceived to have reduced the degree of fiscal dominance.

Three interpretations are possible. The first one is simply that the regression is mispecified, either because of omitted variables or because of the choice of the lag length. This is of course always possible, in any atheoretical test of this kind. However it does not seem very likely, given the robustness of the results to the different specifications reported above.

The second interpretation is that a reduction in the degree of fiscal dominance did take place. But it did not show up in the data for two reasons: first of all, the institutional reforms were implemented gradually throughout the 1980s. And secondly, the private sector expectation may have reacted slowly to the reforms, maybe through some kind of learning process.

The third possible interpretation is that the process of monetary reform is still largely incomplete, and as such it lacks credibility.[24] It is incomplete in two respects. First of all because, as discussed in section 2, a few important reforms are still to be implemented (reducing the size of the Treasury overdraft account, further limiting the participation of the Bank of Italy in the primary market for public debt and increasing the upwards flexibility of interest rates in the primary market). Secondly, and perhaps more importantly, because it is not clear yet that the reforms already implemented will not be reversed in the future. Many of these reforms were the result of purely technical and administrative decisions. These decisions are very easily reversible if the Minister of the Treasury or if the leadership of the Bank of Italy find it expedient to do so. More generally, the new monetary regime contains several ambiguities; its general features

have been shaped more by the actual behavior of the policymakers themselves than by the imposition of external constraints. As a result, a promise of no future debt monetization may lack credibility. And in this case, as shown by Sargent and Wallace, a restrictive monetary policy enhances the inflationary consequences of fiscal deficits.

5. CONCLUSIONS

The paper started with a question: is there contradiction between the institutional reforms of the 1980s that increased the decentralization of the Bank of Italy and the Treasury, and the goal of coordinating monetary and fiscal policies so as to stabilize public debt?

The theoretical analysis of section 3 suggests a negative answer. This answer relies crucially on a distinction between monetary regime and monetary policy actions. According to this distinction, the institutional reforms of the 1980s can be interpreted as creating a regime in which monetary policy is dominant, in the sense that there is no automatic link between fiscal deficits and money creation. Such a regime gives credibility to a refusal to increase future debt monetization, and consequently strengthens the Treasury incentives to pursue a more balanced fiscal policy. Within this regime, the Bank of Italy can choose to coordinate with the Treasury an adjustment path of public debt. Moreover, such a coordinated action would not undermine the credibility of the monetary authority. Its credibility is gauranteed by the external rules of the game, that is, by the institutional features that define the regime.

The historical and empirical analysis of sections 2 and 4 convey the impression that the distinction between the Italian monetary regime and the policy actions of the Bank of Italy is in practice much more blurred. The reforms are still incomplete. The evidence of a more disciplined fiscal policy is mixed. There is no indication in the data that the private sector perceived a reduction in the degree of fiscal dominance. It seems plausible

to infer from all this that the new monetary regime contains several ambiguities. It is not precisely defined independently of the concrete monetary policy actions. In this situation a contradiction between the need of stabilizing public debt and the goal of reducing the degree of fiscal dominance could emerge: a coordinated accommodative monetary policy could damage the credibility of the Bank of Italy, and this in turn could have deleterious effects on the incentives of the fiscal authority, thereby nullifying the purpose of the reforms. But on the other hand, a restrictive monetary policy could lack the credibility to induce the fiscal authority to bear the whole burden of stabilizing public debt.

If this formulation of the problem is correct, it seems possible to draw an important normative implication from the foregoing analysis: Namely, that the current ambiguity of the Italian monetary regime should be removed. If the ambiguity persists, the combination of future monetary and fiscal policies in Italy might resemble the equilibrium outcome of a game of chicken: a tight monetary policy motivated by the goal of establishing some credibility; accompanied by large fiscal deficits based on the expectation of future debt monetization.[25]

Some of the legislative and administrative steps that are necessary to give a more precise shape to the new Italian monetary regime have been outlined in section 2. These steps would have the byproduct of enhancing the central bank independence from the Treasury. As such, however, they would also increase the independence of the central bank from the political authorities. And this would create another, perhaps even more dangerous, confusion of responsibilities. Monetary policy, like explicit forms of

taxation and any other major economic policy decision, involves the choice between conflicting goals and opposed political interests. Only democratically elected representatives have the political legitimacy to make such choices. As noted by Poincaré: "Money is too important to be left to central bankers;"[26] "and to Treasury officials," one is tempted to add.

A corollary of the arguments developed in this paper, therefore, is that the additional reforms outlined in subsection 2.4, some of which have been advocated on several occasions by the Bank of Italy, should be accompanied by reforms that explicitly limit the independence of the central bank from the legislative authority. Not in the sense of creating direct Parliamentary control over the appointment and terms of office of the leadership of the Bank of Italy.[27] But rather in the sense of limiting the range of actions that the Bank of Italy can take without explicit parliamentary approval. For instance, along the lines suggested in Monti (1985), p. 39: "...the ideal regime would be that in which the monetary authorities, on the basis of the inflationary targets expressed by the government and by Parliament, propose to Parliament a plan for the growth of monetary aggregates. Once the plan has received Parliamentary ratification, during its implementation, the central bank can discretionally deviate from its planned course of action, if it can prove that the behavioral parameters of the economy have unexpectedly changed. If instead the deviation implies the acceptance of a higher rate of inflation, the central bank should obtain the authorization-imposition of Parliament. Not technocracy, therefore, in which the monetary authorities choose the final goals, but a strengthening of the monetary authorities by depriving them of some discretionary powers that should belong to the legislative authority."

APPENDIX 1

Proposition 3

If in equilibrium $\mu \geq 1$, then the central bank welfare is a strictly decreasing function of θ.

Proof

Substituting (8) and (10) in (3) and then in (1), we obtain the central bank (and private sector) objective function as a function of μ, B and θ:

$$(A.1) \qquad V = \text{Max}\{(1+2\beta)\ln W + \ln [\frac{W}{2} - \theta\beta B]\}$$

where W is the private sector real wealth defined by (2). The central bank maximizes [A.1] with respect to μ and B, subject to (11). Its Lagrangian is accordingly:

$$(A.2) \qquad L = V + \lambda[B - g_1\Phi(\mu,\theta) - \Omega(\mu,\theta)]$$

Applying the envelope theorem to (A.2), we have that

$$(A.3) \qquad \frac{\partial V}{\partial \theta} = \frac{\partial L}{\partial \theta} = \frac{1+2\beta}{W}\frac{\partial W}{\partial \theta} + \frac{1}{m_1}\frac{\partial m_1}{\partial \theta} + \lambda[-g_1\frac{\partial \Phi}{\partial \theta} - \frac{\partial \Omega}{\partial \theta} - \frac{\partial g_1}{\partial \theta}]$$

Where all the partial derivatives are computed for given values of the control variables, μ and B. Specifically:

$$\frac{\partial W}{\partial \theta} = \frac{-\beta B}{4\mu - 2} < 0$$

$$\frac{\partial m_1}{\partial \theta} = \frac{1}{2}\frac{\partial W}{\partial \theta} - \beta B < 0$$

$$\frac{\partial \Phi(\mu,\theta)}{\partial \theta} = \frac{(4\mu-2)(\mu-1)}{\beta[(4-\theta)\mu - 2 + \theta]^2} \geq 0 \qquad \text{iff } \mu \geq 1$$

$$\frac{\partial \Omega(\mu,\theta)}{\partial \theta} = \frac{2B_0(\mu-1)}{\beta[(4-\theta)\mu-2+\theta]^2} \geq 0 \qquad \text{iff } \mu \geq 1$$

$$\frac{\partial g_1}{\partial \theta} > 0, \text{ as remarked in the text.}$$

Hence, $\frac{\partial L}{\partial \theta} < 0$, if $\mu \geq 1$

Q.E.D.

Remark

The condition that in equilibrium $\mu \geq 1$ (i.e. that in equilibrium the central bank does not decrease the stock of nominal money balances in period 1) is very plausible and should be satisfied for most parameter values.

APPENDIX 2

Sensitivity Analysis for the specification of Equation (1)

This section reports on the results of some sensitivity analysis performed using "SEARCH", a program elaborated by Leamer and Leonard (1983).

The program combines prior and sample information in several ways. The goal is to characterize the mapping from priors into posteriors, for alternative specifications of prior beliefs. I want to find out how the estimate of β_3 in equation (1) is affected by the imposition of alternative linear constraints on δ_1 and δ_2, the coefficients of the "doubtful" variables, x_1 and x_2. "SEARCH" computes the answer for all possible combinations of linear constraints on δ_1 and δ_2, as long as one is willing to specify a prior location for the remaining β coefficients. For lack of better information, the chosen prior location for the β's corresponds to the OLS estimate of the constrained model,(i.e. $\delta_1 = \delta_2 = 0$). Given this prior location for the β's, the posterior estimate of β_3 is bound to lie in the interval:

$$-.056 < \beta_3 < -.006$$

This interval also includes as special cases the constrained OLS estimates corresponding to $\delta_1 = 0$ and/or $\delta_2 = 0$.

The range of this interval (.05) exceeds in absolute value the estimated standard error of β_3 reported in Table 5 (.035). However, the interval lies on the negative axis and is bounded away from zero. Hence, we can conclude that the specification uncertainty about the variables x_1 and x_2, though numerically relevant for the absolute value of β_3, and large relative to the

sampling uncertainty as summarized by the estimated standard error, does not affect the validity of the inference that β_3 is negative. This inference is robust to alternative specifications of constraints on δ_1 and δ_2.

Footnotes

1. This number is obtained by multiplying the rate of growth of the monetary base (about 7%) by the stock of monetary base as a fraction of GDP (about 18%).

2. The surge in the ex post real interest rate begins in 1981. However the ex ante real interest rate (computed according to survey data) begins to rise earlier, in mid 1980. The differential between the Italian ex post real interest rate and other European rates also rises in 1981 (see Table 3).

3. Masciandaro (1986) contains a more detailed analysis of these years, focusing on the same question of monetary and fiscal policy coordination.

4. This well known statement by Carli is almost identical to a remark that Rudolf Havenstein, the head of the German central bank in the 1920s, presented in defense of the monetary policy that it pursued during the German hyperinflation: "The Reichbank has done all it could do with any chance of success. For years...it has continually called attention to these [fiscal] conditions and demanded a remedy in the most serious and urgent way, but it was not in a position to stop the discounting of Treasury bills as long as the Reich had no other available means to cover its deficit, and as long as all groups in the legislature were not fully convinced that such means absolutely have to be found. For the Reich must live, and real renunciation of discounting in the face of the tasks set by the budget...would have led to chaos. The threat of a general refusal to discount Treasury bills would have been nothing but a futile gesture" (Rudolf Havenstein,"Defending the Policy of the Reichsbank" (Address to the Executive Committee of the Reichsbank, 25

August 1923), in Fritz K. Ringer (1969), pp. 93-96. I am grateful to Marcello De Cecco for this reference.

5. The behavior of M_1 and M_2 is described for the first time in 1973 by "Tendenze Monetarie," a private publication of Banca Commerciale Italiana directed by Mario Monti.

6. A large portion of the public debt outstanding becomes due in 1973.

7. See also Masciandaro (1986).

8. The Lira was realigned 4 times in the period March 1979 - October 1981.

9. Tabellini (1987) argues that the divorce may have had a second important effect on the incentives of the policy makers: by raising some uncertainty about the future behavior of the monetary authorities, it created new reputational incentives that gave the Bank of Italy some credibility in pursuing a less accommodative monetary policy.

10. However, see Tabellini (1986, 1987) for a related analysis.

11. The assumption that public debt is indexed to the price level simplifies the analysis but does not affect the results in any respect.

12. Note that this issue is not an artifact of having a finite horizon. If would also arise in an infinite horizon model, as long as the time path of public debt is bounded from above. Specifically, the question that would arise in are infinite horizon version of this same model is: who will bear the burden of satisfying the budget constraint when the upper bound of public debt is reached? The answer to this question will determine the strategic interaction among the monetary and fiscal authorities throughout the rest of the game, just as in the two periods model analyzed in the text.

13. Because of the feedback nature of the strategies chosen by both players,

the equilibrium is subgame perfect and hence a fortiori time consistent.

14. Monti (1986) contains similar considerations.

15. Interest payments are net of interest received. They are computed as follows: it is assumed that the average interest rate is the same on passive and active interest rates. The flow of gross (passive) interest payments is then multiplied by the ratio of net to gross general government debt (source, OECD).

16. The GDP data on which all the ratios reported in this section have been computed do not incorporate the recent revision of April 1987. According to this revision, nominal GDP should be revised upwards during the 1980s by as much as 15% in some years. Hence, the revised data would make it much easier to argue that there indeed was a fiscal policy correction in the 1980s. The reasons for using the old data are that these were the data available to the policymakers at the time at which policy decisions were taken and that the revisions do not go up to the early 1970s yet.

17. The cyclical adjustment reported in table 4 is done by the OECD, according to the following method (see also European Economy, November 1984). The interpolation of output peaks gives a measure of "full employment" output. The cycle is computed as the difference between actual and "full employment" output. This measure of the cycle is then used to compute the cyclical component of tax revenues and of a small fraction of public expenditures. See OECD (1983) for more details.

18. Because of the method according to which it is computed (interpolation of output peaks), the level of the cyclical adjusted PSBR is not particularly meaningful, since it reflects an overly optimistic assumption about the

natural rate of output. However, a fiscal policy change in the 1980s relative to the earlier period is apparent even if one considers the first difference of the cyclically adjusted PSBR, rather than its level.

19. Ceriani and Di Mauro (1986) report three different estimates of the Italian cyclically adjusted PSBR net of interest payment, for the period 1970-84. Two of these are based on log-linear trends of the natural level of real output. The third one is based on middle reference points of the business cycle, along the same lines of De Leeuw and Holloway (1983) for the U.S. The three estimates differ markedly. Only one of them suggests a smaller cyclically adjusted PSBR in the years 1982-84 relative to the previous period.

20. The cyclical adjustment and the subtraction of interest payments help to isolate the policy component from the automatic components of the PSBR.

21. The hypothesis of no first order serial correlation of the residuals cannot be rejected.

22. Specifically, a second dummy was added to the debt variable. This dummy took a value of 1 in the years 1977-81, of gradual monetary regime change, and 0 elsewhere. Its estimated coefficient is negative and significant, but the same applies to β_3. Hence, the inclusion of this second dummy strengthens the inference that the first period, 1970-76, was different from the other two. The results are also invariant to redefining the dummy variable D as being 0 up through 1982 rather than 1981.

23. When x_1 rather than x_2 is used in (2), the results are virtually unchanged, but the hypothesis of white noise residuals is strongly rejected.

24. Further support in favor of this interpretation is provided by the

difficulties that the Treasury has had (with the possible exception of 1985) in issuing fixed interest public debt.

25. Blinder (1982), Loewy (1976) and Sargent (1985) suggest a similar interpretation of the current U.S. monetary-fiscal policy mix.

26. Quoted by Friedman (1962).

27. Kane (1980) contains some convincing criticism of such a form of legislative control over monetary policy.

DATA SOURCES

Bank of Italy for the following variables: PSBR, Interest payments, stock of public debt, CPI inflation rate, Monetary base, Overdraft account.

OECD for the cyclically adjusted PSBR and for the computation of net interest payments.

Masera (1986) for nominal GDP.

Ceriani and Di Mauro (1986) for a measure of cyclical output fluctuations.

Macchiati and Prati (1986) for the nominal interest rate (period 74-86: average rate on return on 6 months Treasury Bills at the biweekly auctions; period 68-73: rate on commercial bank loans).

ISTAT for real output.

All quarterly data are seasonally unadjusted.

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Table 1
MONETARY POLICY IN ITALY

	Coefficient of Deficit Monetization[1]	Real Interest Rate[2]	Monetary Base Creation Against Liabilities of the Treasury[3]		Rate of growth of monetary base
			Total	Overdraft a/c	
1970-76	47.73	- 1.27	4.72	2.73	17.7
1977-81	14.10	- 1.47	1.32	4.25	16.9
1982-86	12.83	3.84	1.97	6.38	13.6

All data are yearly averages.

1. Creation of monetary base against Treasury liabilities, as a fraction of the public sector borrowing requirement.

2. 1974-86: Nominal interest rate on 6 months Treasury Bills (weighted average of returns based on biweekly auctions) less CPI inflation rate.

1970-73: Average nominal rate of return on total public debt less CPI inflation.

3. Scaled to nominal GDP.

SOURCE: Bank of Italy

Table 2

SHARE OF PUBLIC DEBT HELD BY THE BANK OF ITALY

1970	25.62
1971	24.40
1972	23.36
1973	28.01
1974	31.67
1975	37.07
1976	40.32
1977	30.74
1978	27.40
1979	23.58
1980	23.36
1981	23.67
1982	21.90
1983	17.56
1984	16.57
1985	17.64
1986	16.56

The debt aggregate refers to the public sector.

SOURCE: Bank of Italy

Table 3

REAL INTEREST RATE DIFFERENTIALS BETWEEN ITALY AND WEST GERMANY

1974	-6.4
1975	-4.9
1976	- .7
1977	-3.4
1978	-1.3
1979	-4.7
1980	-7.7
1981	-3.2
1982	.3
1983	1.7
1984	3.4
1985	3

The real interest rate is computed as the difference between the nominal interest rate and the actual CPI rate of inflation. The nominal interest rate is the monthly average of all money rates.

SOURCE: Tables 43 and 31 in Ungerer et al. (1986).
DATE: IMF, International Financial Statistics.

Table 4

PSBR WITH AND WITHOUT INTEREST PAYMENTS AND CYCLICAL ADJUSTMENTS

Year	Fy	Fay
1970	4.57	3.18
1971	6.93	4.16
1972	8.02	5.71
1973	8.85	5.99
1974	7.05	5.21
1975	10.82	4.30
1976	6.91	3.14
1977	5.47	1.52
1978	9.78	2.56
1979	6.51	3.50
1980	5.24	2.21
1981	6.39	3.93
1982	8.02	1.92
1983	8.14	0.79
1984	7.24	0.29
1985	8.22	1.62
1986	5.00	0.12

FY is the PSBR net of (net) interest payments -- see footnote 15. Fay is the PSBR net of (net) interest payments and cyclically adjusted -- see footnote 17. All variables are scaled to nominal GDP -- see footnote 16.

SOURCE: Bank of Italy and OECD.

Table 5

UNCONSTRAINED ESTIMATES OF EQUATION (1)

β_0	β_1	β_2	β_3	δ_1	δ_2
4.963	.260	.007	-.028	-.193	-3.09
(5.326)	(.526)	(.069)	(.035)	(.137)	(.487)

$\bar{R}^2$ = .617

F = 6.159

S.E. = 1.210
MLM = 1.211
LM = 1.715

Standard errors are in parentheses. LM is the Lagrange Multiplier test for the hypothesis of no first order serial correlation of the residuals. MLM is the LM test modified for small samples (Kiviet (1981)). The regression S.E. is corrected for degrees of freedom.

Table 6

ESTIMATES OF EQUATION (1) WHEN THE CONSTRAINT $\delta_2 = 0$ IS IMPOSED

β_0	β_1	β_2	β_3	δ_1
1.889	.562	.036	-0.046	-.120
(2.156)	(.218)	(.050)	(.021)	(.071)

$\bar{R}^2$ = .636

F = 7.997

S.E. = 1.179
MLM = .9132
LM = 1.29

Standard errors are in parentheses. LM is the Lagrange Multiplier test for the hypothesis of no first order serial correlation of the residuals. MLM is the LM test modified for small samples (Kiviet (1981)). The regression S.E. is corrected for degrees of freedom.

Table 7

ESTIMATES OF EQUATION (2)

α_0	β_{11}	β_{12}	β_{21}	β_{22}	β_{31}	β_{32}	δ_{21}	δ_{22}
4.854	.826	-.589	.009	-0.063	.200	-.235	-.198	.153
(4.032)	(.420)	(.492)	(.102)	(.117)	(.440)	(.473)	(.257)	(.147)

$\bar{R}^2$ = .611

F = 4.136

S.E. = 1.220
MLM = 2.702
LM = 5.74

Standard errors are in parentheses. LM is the Lagrange Multiplier test for the hypothesis of no first order serial correlation of the residuals. MLM is the LM test modified for small samples (Kiviet (1981)). The regression S.E. is corrected for degrees of freedom.

Table 8

SUMMARY STATISTICS

Variables	Mean	Std. Dev.	Autocorrelation r1	r2	r3	r4	r5	r6
Period 1970:1 - 1986:4								
p	3.09	1.56	.66	.57	.52	.41	.37	.35
y	.6	5.83	-.53	.15	-.57	.95	-.53	.12
m	3.62	3.85	-.33	-.19	-.22	.61	-.15	-.20
d	5.04	1.66	.17	.08	.25	.44	.09	.23
Period 1970:1 - 1981:2								
p	3.35	1.66	.65	.57	.51	.38	.33	.41
y	.69	6.22	-.50	.09	-.54	.94	-.50	.03
m	3.76	4.05	-.38	-.14	-.20	.54	-.11	-.16
d	4.87	1.81	.14	.12	.23	.40	.11	.30
Period 1981:3 - 1986:4								
p	2.55	1.17	.63	.52	.65	.70	.73	.48
y	.52	5.05	-.62	.35	-.68	.98	-.64	.37
m	3.34	3.44	-.21	-.39	-.31	.82	-.28	-.35
d	5.38	1.27	.21	-.27	.15	.48	-.22	-.19

Table 9

UNCONSTRAINED ESTIMATES OF EQUATION (3)

Period 1970:1 - 1986:4

α_1	α_1	α_3	α_4	β_1	β_2	β_3	β_4
.280	.290	.298	-.139	.026	-.021	.022	.072
(.137)	(.135)	(.141)	(.138)	(.056)	(.058)	(.059)	(.054)
σ_1	σ_2	σ_3	σ_4	δ_1	δ_2	δ_3	δ_4
.190	.216	.166	.152	.304	.089	.040	-.120
(.059)	(.052)	(.061)	(.067)	(.102)	(.100)	(.095)	(.093)

$\bar{R}^2$ = .59 S.E. = .999 LM = .204
F = 7.032 MLM = .153

Period 1981:3 - 1986:4

α_1	α_2	α_3	β_1	β_2	β_3
-.220	.424	.460	.051	-.282	-.165
(.383)	(.256)	(.297)	(.107)	(.116)	(.178)
σ_1	σ_2	σ_3	δ_1	δ_2	δ_3
-.186	-.059	.048	.407	.159	.008
(.106)	(.137)	(.085)	(.218)	(.207)	(.187)

$\bar{R}2$ = .71 S.E. = .631 LM = 1.54
F = 5.277 MLM = .63

Table 9, Continued

Period 1970:1 - 1981:2

α_1	α_2	α_3	α_4	β_1	β_2	β_3	β_4
.238	.250	.250	-.099	-.020	-.040	.008	.069
(.184)	(.179)	(.198)	(.192)	(.083)	(.086)	(.082)	(.073)
σ_1	σ_2	σ_3	σ_4	δ_1	δ_2	δ_3	δ_4
.207	.216	.189	.149	.304	.144	.061	-.089
(.080)	(.080)	(.082)	(.090)	(.152)	(.145)	(.142)	(.149)

$\bar{R}^2$ = .504 S.E. = 1.17 LM = .22
F = 3.866 MLM = .14

Standard Errors are in Parenthesis. LM is the statistic for the Lagrange Multiplier test on first order serial correlation. MLM is the LM test modified for the degrees of freedom, as in Kiviet (1981). The regression S.E. is corrected for degrees of freedom.

Table 10

F TESTS ON THE HYPOTHESIS THAT $\delta(L) = 0$

Period 1981:3 - 1986:4		
	F	t
When:		
$\delta(L)$ of order 3 :	1.91	
$\delta(L)$ of order 2 :	3.18*	
$\delta(L)$ of order 1 :		2.43*
Period 1970:1 - 1981:2		
	F	t
When:		
$\delta(L)$ of order 4 :	1.42	
$\delta(L)$ of order 3 :	1.81	
$\delta(L)$ of order 2 :	2.74*	
$\delta(L)$ of order 1 :		2.14*

The (*) indicates that the F or t value is significant at the 5% level.