An Analysis of Fiscal Rules in a Monetary Union at a Time of Crises

Maria Demertzis
DNB and University of Amsterdam

Nicola Viegi
University of Pretoria and ERSA

2010

Abstract

J.E.L. Classification: E62, H63

1 Introduction

The financial crisis gives some scope to analyse the robustness of EMU economic institutions and rule in the face of extreme events that were not predicted at the moment of their establishement. The main preoccupation of the drafters of the Maastricht Treaty was to limit the negative spillover from undisciplined behaviour of one of the members of the union. The main preoccupation was the possibility that EMU would produce an environment in which the fiscal policy is used more than possible, threatening the stability of the Union as a whole. In theoretical terms it means that Governments could find inside the union an incentive to violate their inter-temporal budget constraint, conducting a Ponzi game at the expense of their partners

Therefore in the Treaty the provisions regarding fiscal policy are designed to impose limits to its use and, in article 104b, to forbid any bail out operation among members countries and between Central Bank and fiscal authorities. The so called No-Bail Out rule plays the role of a bankruptcy law applied to sovereign states. Like any bankruptcy law (see Eichengreen and Portes,1995), the efficiency of a punitive rule should be evaluated not only on its ex-ante ability in reducing the probability of undisciplined behaviour, but also on its ex-post ability to reduce the overall cost of bankruptcy for all the parties involved. The two concepts are strictly linked: if the rule is too expensive ex-post (once the default has happened) than cannot be credible, and therefore efficient, ex-ante (when we have only the possibility of default). The objective of this paper is to analyse whether the No-Bail out rule represents an efficient (and sufficient) punitive mechanism.

Traditionally the need for institutional provisions to provide fiscal discipline has been contrasted with the ability of the Market to provide stability by itself (see for

example Buiter, Corsetti and Rubini, 1993). Confronted with an undisciplined Government, such *market-based fiscal discipline* would initially take the form of a rising risk premium on the debt of the country running excessive deficits; if these deficits persist, the default risk premium would increase at an increasing rate until the offending country will be denied additional credit. The increase of cost of borrowing, along with the possibility of credit rationing, would then provide the incentive to correct irresponsible fiscal behaviour. In this framework punitive rules are redundant. However, as pointed out by Goldstein and Woglom (1992), a market-based fiscal discipline can work only if certain conditions are satisfied, namely:

1. Capital must be able to move freely,
2. Full information on sovereign borrower must be available,
3. The market must be convinced both that there are no implicit or explicit outside guarantees on sovereign debt
4. The financial system must be strong enough to withstand the failure of the 'large' borrower.

These conditions are only partially satisfied within EMU. While capital mobility is already virtually free and information problems can be theoretically solved with increasing mutual control between member countries and financial institutions, it is doubtful whether the failure of a large borrower would not affect significantly the European financial system. Moreover, increasing market integration increases the external effects of fiscal crisis, increasing at the same time the benefits of a bail out operation, irrespective of the ability of the market to form correct expectations. If this is foreseen by the market, it would mean a looser government budget constraint and a risk premium imposed on the whole European debt and not on each single national debt.

If it is not possible to exclude, credibly, the possibility of bail-out of the countries in solvency crises, fiscal policy could automatically produce an (ex-ante) transfer of consumer wealth from the lower to the higher debt countries. In a world of forward looking agents the possibility of bail out will be immediately discounted by the private sector at the European level. An excessive fiscal impulse, a confidence crisis or a worsening of the credit position of one government will then spill over into the expected fiscal position of other member countries. Therefore, the government debt in one country could affect the future tax liabilities of consumers in other member countries, and the process could lead to a net transfer of wealth and consumption.

The objective of this paper is to analyse how increasing fiscal uncertainty changes the characteristics of the interdependence between countries forming a monetary union. We will use a well known macroeconomic model, as the Weil (1989) overlapping generation model, which will allow us to discuss some macroeconomic effects of increasing economic integration and fiscal uncertainty. The choice made here differs from previous studies on the issue of debt default (Calvo 1988, Alesina, Prati and Tabellini 1990). Our specification permits a closer evaluation of the nature of the economic spill-over of expansionary fiscal policies and the roots of a possible "Over-Expansionary Bias" in the EMU, though it sacrifices a careful study of strategic interaction among agents.

2 The Model

Consider a monetary union composed of two symmetric countries called (by pure coincidence) Italy and Germany. In this monetary union two fiscal authorities (the German and Italian Governments) provide services and levy income taxes over two different national groups. The supply side of the economy is represented by an exogenous stream of income.

2.1 The Private Sector

The private sector in the two countries is modelled following the Overlapping Generation framework developed by Weil (1987, 1989). Therefore, the two economies are populated by infinitely living agents, but their aggregate population grows at the constant rate (n). Taking the interest rate as exogenous[1], the individual of generation v at time t maximises the following logarithmic utility function,

$$U_t^v = E_t \left\{ \sum_{s=t}^{\infty} \beta^{s-t} \log c_s^v \right\} \tag{1}$$

subject to the budget constraint at time t,

$$E_t \left\{ \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} c_s^v \right\} = (1+r)\, b_t^v + E_t \left\{ \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} \left[(1-\tau_s)\, y_s^v \right] \right\} \tag{2}$$

where $b_t^v$is the beginning of the period stock of assets of vintage v, and τ_s is the income tax rate imposed by the Government. Maximisation of equation (1) subject to (2) gives the individual consumption function for Italy,

$$c_s^v = (1-\beta) \left\{ (1+r)\, b_t^v + E_t \sum_{s=t}^{\infty} \left(\tfrac{1}{1+r} \right)^{s-t} \left[(1-\tau_s)\, y_s^v \right] \right\} \tag{3}^2$$

The model at the individual level is a straightforward infinitely lived agent model. On the other hand at the aggregate level the population in the two countries (N_t and N_t*) grows at a rate n assumed to be strictly lower than the real interest rate, i.e. $n<r$, in order to avoid any dynamic inefficiency[3]. Therefore $N_t = (1+n)N_{t-1}$and at time t=0 the population N_0 is normalised to one in both countries. This assumption together with the assumption that a new born generation has no assets ($b_v^v = 0$),

[1]- Taking the interest rate as an exogenous quantity is generally justified with the "small country" argument. I will not even try to use such an excuse for an assumption that substantially simplifies the analysis. On the other hand, because the dynamic and steady state properties of this class of models are well known, it is easy to control for the effect on the results of introducing endogenous interest rate determination and then to verify the generality of the results themselves.

[2]- This result comes from the substitution of the Euler equation for adjacent periods, $c_{t+1}^v = \beta\,(1+r)\, c_t^v$in the budget constraint, and using the property of an infinite sum of an integer strictly lower than one.

[3]- Dynamic efficiency is particularly important in our analysis because without it there would not be a debt problem in the first place (see the following Government Budget Constraints 9 and 9') . See Blanchard and Fisher (1988) for a discussion.

allows us an easy derivation of the aggregate variables[4].

$$C_t = (1-\beta)\left\{(1+r)\,B_t + E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s)\,Y_s\right]\right\} \tag{3}$$

The same relations govern the behaviour of the German private sector where each individual maximises a function like (1) subject to a budget constraint like (2). The results is an aggregate consumption relation equal to:

$$C_t^g = (1-\beta)\left\{(1+r)\,B_t^g + E_t \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s^g)\,Y_s^g\right]\right\} \tag{4}$$

In order to capture financial integration in stylised fashion, we assume that at time (t) a portfolio of public debt issued by the two Governments represents the total financial assets of the private sector in the two countries. Suppose only a fraction α ($0< \alpha <1$) of Italian public debt is held by the Italian public, 1-α being the part of Italian debt held by the German public. Similarly German debt is distributed between the two private sectors, with ϕ being the proportion held domestically, giving the following definition of non-human capital in period (t) in the two countries as:

$$B_t = \alpha D_t + (1-\phi) D_t^g \tag{5}$$

$$B_t^g = (1-\alpha) D_t + \phi D_t^g \tag{6}$$

Although they will play an important part in the following analysis, condition (5) and (6) are only a crude simplification of a much more complex process of financial integration. Nevertheless there is growing evidence that cross border holding of public debt is becoming an important source of interdependence between economies (IMF World Economic Outlook , 1995).

Moreover the main determinant of cross border capital flows, and with it the cross border transactions of public debt, is the level of financial market integration, constrained until now by institutional differences, imperfect information and exchange rate risk. Therefore the process of monetary unification in Europe, built up in order to reduce these impediments to full market integration, will accelerate the process described by equation (5) and (6).

2.2 The Governments

In each country the Government at time t has inherited a stock of debt from the previous period and, given the expectation of future income, it should determine the tax rate that satisfies the inter-temporal budget constraint. Because the population

[4]- The aggregate variables are defined as: $X_t = x_t^o + n x_t^1 + n(1+n)x_t^2 + ... + n(1+n)^{t-1}x_t^t$

is growing, the relevant budget constraint is defined as:

$$(1+r)\,D_t = E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(\tau_s Y_s) - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s)\right\} \tag{7}$$

and for the German counterpart

$$(1+r)\,D_t^g = E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(\tau_s^g Y_s^g) - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s^g)\right\} \tag{8}$$

The problem faced by the governments is to decide the tax-rate that satisfy the budget constraints (7) and (8) ex-ante, given the level of exogenous expenditure G and given the exogenous expected level of income.

A tax smoothing argument will therefore justify fixing the tax rate with respect to the *permanent* expected level of income Y and the *permanent* level of expenditure. For a constant interest rate r and a constant population growth rate, a permanent level of Y on a date t is defined by

$$\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}\left(\tilde{Y}_t\right) = \sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(Y_s) \tag{9}$$

or, otherwise,

$$\frac{1+r}{r-n}\tilde{Y}_t = \sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(Y_s) \tag{10}$$

Similarly the permanent level of expenditure is defined as

$$\frac{1+r}{r}\tilde{G}_t = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s) \tag{11}$$

The tax rate will then be decided on the basis of the following version of the budget constraint, expressed in terms of permanent values of the variables.

$$(1+r)\,D_t = \frac{1+r}{r-n}\tau\tilde{Y}_t - \frac{1+r}{r}\tilde{G}_t \tag{12}$$

giving the following result for the optimal tax rate:

$$\tau_t = (r-n)\,\frac{D_t}{\tilde{Y}_t} - \frac{r-n}{r}\frac{\tilde{G}_t}{\tilde{Y}_t} \tag{13}$$

Equation (13) shows level of taxes that, given the expected income, public expenditure and the inherited stock of debt, guarantees the sustainability of the fiscal plans. Substituting equation (5) and (13)in equation (3), and using the definition of permanent values of variable defined before, the aggregate consumption function

for Italy at the time t is redefined as:

$$C_t = (1-\beta)\left\{\begin{array}{l}(1+r)\left[(1-\phi)\,D_t^g + \left(\alpha - 1 + \frac{n}{r}\right)D_t\right] \\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s - \frac{r-n}{r}G_s\right]\end{array}\right\} \tag{14}$$

Equation (14) defines an aggregate consumption function in a integrated world with growing population. Note that the effect of cross border transaction of public bonds is to reduce the positive effect of national debt policies on national consumption. Indeed, although part of the present debt and future public expenditure will be paid by larger future generations, this positive wealth effect does not materialise in an increase in private consumption if the fiscal expenditure is financed with foreigner savings.

The same relation holds for Germany:

$$C_t^g = (1-\beta)\left\{\begin{array}{l}(1+r)\left[(1-\alpha)\,D_t + \left(\phi - 1 + \frac{n}{r}\right)D_t^g\right] \\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s^g - \frac{r-n}{r}G_s^g\right]\end{array}\right\} \tag{15}$$

Relations (14) and (15) show an effect of increasing market integration that certainly does not support the hypothesis of over-expansionary bias in EMU. In fact, the simple presence of cross border holding of public debt reduces the impact of national fiscal policies through the reduction of the net wealth effect from debt creation[5]. At the limit of pure Ricardian equivalence {n = 0}, the net wealth effect of budgetary policies is negative.

This result is strictly dependent on the assumption that the long run solvency of the public sector is guaranteed by the movement in taxes, assumption implicitly incorporated in the government budget constraint. Therefore, although this result seems to support a benign view on the use of fiscal policy in a monetary union, it does not address the main issue of the effect of "unsustainable" fiscal policies in EMU. Because the preoccupation is about the effect of unsustainable fiscal positions on the stability of the whole union, and the possibility that unsustainable fiscal positions would be used to force change in policy, either in the partner fiscal policy or in the European Monetary Policy, the model should be amended to incorporate the hypothesis of debt default.

In the next part the possibility of debt default is introduced via simple introduction of income (and therefore tax revenues) uncertainty and tax ceiling. The model so modified will be used in the following parts to analyse how the national and international response to a fiscal crisis is modified by the presence of a monetary union among the countries.

[5]- The effect of cross border holding of public debt on the effectiveness of fiscal policies is not often pointed out. In a closed economy, like in Barro (1979) or Blanchard (1985), the effect of fiscal policies depends exclusively on the degree of which present debt corresponds to future taxes. In the case we are analysing, the holder of the public debt is not necessarily the same person who will have to pay the taxes in the future. Therefore, national debt policies have not only an aggregate effect but also a distribution effect among countries. In the following part we will see that this result can be reverse when the possibility of fiscal default is taken in consideration.

3 Income Uncertainty and Default Risk

Monetary Unification is a regime shift for the European Economies, of which the long run results are highly uncertain. Moreover this uncertainty has long run characteristics (it could be said "systemic") which could affect the trend growth of income. Although at the aggregate level it is often assumed that the effect of monetary unification will be positive (Commissions of European Communities, 1990), many commentators have also argued for the possibility of structural difficulties for some member countries: either because European Monetary Union is not an Optimal Currency Area (Bayoumy and Eichengreen, 1993, Sala-y-Martin and Sachs, 1992) and therefore, in absence of an international shock absorber, asymmetric shocks could impose excessive costs to some of the participants: or, as argued by Krugman (1993), because monetary union will imply an increase in economic specialisation, and therefore an increase in structural asymmetries among countries, rendering difficult to forecasts the relative benefits of monetary unification.

Given this uncertainty about long term effects of monetary union, coupled with the presence of high debt countries inside the union itself, it is important to analyse how this uncertainty plays a role in the cross border effects of fiscal policy.

In order to keep the analysis simple, assume that either two states of nature may occur. The first state of nature, indicated by the index (h), Italian income is high and occurs with probability p. The second possibility is a bad state (b) where Italian income is low which occurs with probability $(1-p)$. Formally Italian income follows the following distribution:

$$\begin{cases} (p)Y_s = Y_h \forall s = t..\infty \\ (1-p)Y_s = Y_b \forall s = t..\infty \\ Y < Y_h \end{cases} \tag{16}$$

Assume furthermore that, if the good state Y_h is realised, the Italian government is willing and able to fulfil the inter-temporal budget constraint (12). On the other hand if the bad state Y_b is realised, then taxes that the government should impose to fulfil the budget are too high and it will have to default on at least part of its debt[6].

Although the Italian government is willing to respect the budget constraint (12) ex-ante, ex post the income realisation can impose default and force the partner Government to react.

Given condition (16) and considering the fact that the tax rate will be contingent

[6]- This outcome could be justified or on the basis that the marginal cost of taxation is higher than the marginal cost of default, or because of a Laffer curve type of argument. Because, in this model, income taxes are not distortionary, we leave this motivation to one side. An extension of the model incorporating labour decision to introduce the distortionary effect of taxation would complicate the analysis without adding very much to the result, based only on the presence of an upper limit of tax rate that can be charged.

to the income realisation, we can rewrite the budget constraint (12) as[7]:

$$(1+r)\,D_t = \frac{1+r}{r-n}\left[p\left(\tau_h\tilde{Y}_h\right) + (1-p)\left(\tau_b\tilde{Y}_b\right)\right] - \frac{1+r}{r}\tilde{G}_t \tag{17}$$

Before the income realisation is revealed, the Italian government can satisfy the budget constraint with a tax rate equal to:

$$\tau_t = (r-n)\,\frac{D_t}{p\left(\tilde{Y}_h\right) + (1-p)\left(\tilde{Y}_b\right)} + \frac{r-n}{r}\,\frac{\tilde{G}_t}{p\left(\tilde{Y}_h\right) + (1-p)\left(\tilde{Y}_b\right)} \tag{18}$$

What (22) tells us is that the satisfaction of the inter-temporal budget constraint ex-ante is not a sufficient condition for the stability of the fiscal position ex-post. In fact, the default risk persists because government plans are contingent to an uncertain income realisation. Ex post, when uncertainty is resolved we have two possible scenarios:

In the good state of nature, i.e. if $Y_s = Y_h$, we have that the budget constraint (17) is satisfied if:

$$\tau_h = (r-n)\,\frac{D_t}{\tilde{Y}_h} + \frac{\tilde{G}_t}{\tilde{Y}_h}\,\frac{r-n}{r} \tag{19}$$

On the other hand in the bad state of nature, i.e. if $Y_s = Y_b$, the same level of debt and permanent expenditure will be satisfied at an higher level of tax rate:

$$\tau_b = (r-n)\,\frac{D_t}{\tilde{Y}_b} + \frac{\tilde{G}_t}{\tilde{Y}_b}\,\frac{r-n}{r} \tag{20}$$

Equation (19) and (20) give the ex-post tax rates required to satisfy the budget constraint. Having fixed the tax rate at the beginning of period t, the Italian government faces two possible outcomes, when the uncertainty will be solved. If the outcome of this new regime is the good state Y_h, the Italian Government will fulfil its plans reducing the tax rate to τ_h. If instead Y_b occurs, the tax rate τ_b is higher than the maximum possible tax rate T, and we have debt default for the part of the

[7]- In the budget constraint above implicitly we assume that differential bond default risks are not reflected in differential bond prices. This assumption is made in order to semplify the analysis, avoiding the complex dynamics that a differentiated term structure of interest rate would introduce. At the same time it reflects the uncertainty about the exact meaning of risk premium. Moreover, the price of a bond reflects the expected future revenue stream from the borrowing country's bonds. The market will price different bonds such that the expected future revenue streams from each of them should be equal. While the difference in price is important in analysing the dynamics of debt (see for example Hughes Hallett and McAdam, 1996), the difference in prices is irrelevant after default, because a market for that bond does not exist anymore. Given that our analysis deals with the appropriate reaction to a fiscal default, assuming away the difference in prices is not a particular strong assumption to make. Moreover if the optimal reaction to a default is to bail out, than the expected future stream of revenues is not affected by the probability of default, and the difference in prices would not appear anyway.

debt that is not guaranteed by future income. Formally

$$if\ Y_s = Y_b\ \forall \text{s=t+1.....}\infty$$

$$\tau_{\text{S=}T}$$

$$D_{t+1} = (1+r)\, D_t - \frac{1+r}{r-n}\left[\tau_b - T\right] Y_b, \tag{21}$$

where the second term of the right hand side is the amount of default necessary to satisfy the budget constraint.

Because not all Italian debt is in the hands of the Italian private sector, the actual cost of default in terms of private wealth for the Italian private sector is lower that it would have been otherwise. On the other hand, cross-border holding of public debt transfers part of the cost of default on the foreigner private sector. Therefore the German government which has as objective the maximisation of German private wealth, is forced to take into consideration the possibility of Italian default, not only ex-post, after the default has happened, but also ex-ante[8].

The ex post cost of Italian default for the German private sector should be compared with the cost of alternative policies. In the next section we will consider fiscal bail out (or substitution of the Italian debt with German guaranteed debt).

4 Default or Fiscal Bail-Out?

The effect of an Italian default on German private wealth is simply the capital losses sustained on the Italian Debt held in their portfolio. Considering the definition of non-human wealth given in (5), net losses would be (ceteris paribus)

$$\Delta B^g_{t+1} = -\left(1-\alpha\right)\frac{1+r}{r-n}\left[\tau_b - T\right] Y_b \tag{22}$$

The German government, on the other hand, faces the possibility of avoiding Italian default by bailing out Italian debt, either through direct transfers, or by buying back the Italian debt held by German citizens. In both cases, the measure implies an increase in German debt and therefore in future German taxes.

Consider first the operation of buying back the Italian debt held by German citizens. In this case the non-human wealth of the German citizens will not be affected, being the Italian debt replaced with German one. On the other hand human wealth will be affected because of the increase in future taxes that the operation implies. Formally the new level of taxes will be derived from the following budget constraint:

$$\frac{1+r}{r-n}\tau\tilde{Y}^g_t = (1+r)\, D^g_t + (1-\alpha)\frac{1+r}{r-n}[t_b - T]Y_b + \frac{1+r}{r}\tilde{G}_t \tag{23}$$

[8]- Imposing that any government should aim at the maximisation of the expected private wealth of its citizens is a natural extension of the assumption that the government is forward looking.

that gives the following sustainable tax rate:

$$\tau_g = (r-n)\frac{D_t^g}{Y_t^g} + (1-\alpha)\left[\tau_b - T\right]\frac{Y_b}{Y_t^g} + \frac{r-n}{r}\frac{G_t}{Y_t^g} \tag{24}$$

The increase in taxes required will therefore affect the private sector's human wealth as:

$$\Delta H_t^g = -(1-\alpha)\frac{1+r}{r}\left[\tau_b - T\right]Y_b \tag{25}$$

Confronting equation (25) with equation (22) it is clear that an ex post buy out of German private sector is always the optimal solution from the point of view of the German government. The non-Ricardian nature of the model is such that it is always optimal to defer in the future any cost of adjustment.

The previous option does not avoid the Italian fiscal default but simply try to insulate the German private sector from the cost the default. A more radical option would be to operate a direct fiscal transfer to avoid the default in the first place.

In the case of a direct fiscal transfer, once again the operation is composed by two different elements. On one hand there is an increase in German debt equal to the part of Italian debt "rescued":

$$\Delta D_t^g = \frac{1+r}{r-n}\left[\tau_b - T\right]Y_b > 0 \tag{26}$$

If we assume that the increase in German debt is absorbed with the same proportion by the two private sectors, as shown in equation (10) and (8'), the manoeuvre will produce an increase in German private sector stock of bonds (and the non-human wealth) equal to:

$$\Delta B_t^g = \phi\frac{1+r}{r-n}\left[\tau_b - T\right]Y_b \tag{27}$$

On the other hand it will have to increase the stream of future taxes in order to satisfy the German Government budget constraint. The amount of taxes required to balance the inter- temporal budget as a result is equal to:

$$\frac{1+r}{r-n}\tau_g Y_t^g = (1+r)\,D_t^g + \frac{1+r}{r-n}[\tau_b - T]Y_b + \frac{1+r}{r}G_t \tag{28}$$

that implies a tax rate equal to:

$$\tau_g = (r-n)\frac{D_t^g}{Y_t^g} + [\tau_b - T]\frac{Y_b}{Y_t^g} + \frac{r-n}{r}\frac{G_t}{Y_t^g} \tag{29}$$

The increase in taxes required will therefore affect the private sector's human wealth as:

$$\Delta H_t^g = -\frac{1+r}{r}\left[\tau_b - T\right]Y_b \tag{30}$$

The operation will be carried out only if the total cost of bailing out in terms of private wealth[9], given by:

$$\Delta W_t^g = \Delta B_t^g + \Delta H_t^g$$

is lower than the cost of leaving Italy to default. Therefore bailing out is the optimal response to Italian if:

$$\phi \frac{1+r}{r-n} \left[\tau_b - T\right] Y_b - \frac{1+r}{r} \left[\tau_b - T\right] Y_b > -(1-\alpha) \frac{1+r}{r-n} \left[\tau_b - T\right] Y_b \tag{31}$$

or, rearranging and simplifying, if:

$$\frac{\phi}{r-n} - \frac{1}{r} > -\frac{(1-\alpha)}{r-n} \tag{32}$$

In tables 1 to 3 the value of the two sides are presented for different parameter values.

Table 1: Analysis of candition 32 {r = 0.05, n = 0.003}

α; ϕ	Cost of Bail Out	**Cost of Default**
0	-20	-21.28
0.2	-15.74	-17.02
0.4	-11.49	-12.77
0.6	-7.23	-8.51
0.8	-2.98	-4.26
1	1.28	0

In table 1 a very low population growth is assumed $\{n = 0.003\}$, corresponding to the estimates of average population growth in Europe for the period 1995-2000. Therefore the model has a very low degree of departure from Ricardian equivalence. Nevertheless it is evident that bailing out is always the optimal solution for Germany. If the value of n is changed, forcing it towards a more generous interpretation as trend in income growth, assuming a value of $\{n = 0.02\}$, the results are even more dramatic, as shown in table 2.

Only in the case of perfect Ricardian equivalence $\{n = 0\}$ is there no difference, for the same proportion of foreign debt holding, between the cost of bailing out and of default. Because an operation of Bail Out is a way to guarantee foreign debt with national income (in terms of future taxes) the last result is not surprising. A bit

[9]- Because the model departs from Ricardian Equivalence for positive population growth, the operation of bailing out can produce an increase in private wealth in period t. The operation of bailing out Italian debt becomes a cost in terms of German private wealth only if the parameter ϕ is small, implying a high degree of integration between the two economies. On the other hand, as noted by Buiter (1990, pp.159-161), the steady state effect in terms of private wealth of a debt policy like the one described above is negative, because it increases the steady state level of taxation.

Table 2: Analysis of Condition 32 {r = 0.05, n = 0.02}

α; ϕ	**Cost of Bail Out**	**Cost of Default**
0	-20.00	-33.33
0.2	-13.33	-26.67
0.4	-6.67	-20.00
0.6	0.00	-13.33
0.8	6.67	-6.67
1	13.33	0.00

Table 3: Analysis of Condition 32 {r = 0.05, n = 0.0125, ϕ = 0.749}

α	**Cost of Bail Out**	**Cost of Default**
0.94	-0.027	-1.6
0.95	-0.027	-1.3
0.96	-0.027	-1.1
0.97	-0.027	-0.8
0.98	-0.027	-0.5
0.99	-0.027	-0.3
1	-0.027	0.0

more surprising is the fact that Germany will bail out Italian debt for any α <1. Moreover, given the overlapping generation structure of the model, for some values of the parameters the operation produce a welfare improvement for the German private sector[10].

Although it is not possible to infer direct empirical conclusions from the above numbers, it is interesting to look at the value of condition (33), substituting to ϕ and α their historical values in 1992, according to European Commission estimates (European Economy, 1995). Foreign investors held 25.9% of German government debt and only 6.1% of Italian government debt. Table 4 shows that, even if only 1% of the Italian debt was in German hands, bailing out is the optimal response to Italian fiscal imbalances.

The importance of the aforementioned conclusions is that the fiscal positions of the member countries are not independent, once a possibility of fiscal crisis arises. This is true both in the case of buy out of German private sector and in the case of direct transfer between the governments For the moment, consider only what condition (32) implies for the ex-ante form of the Government Budget constraint.

[10]As noted above, the welfare analysis would be different if, instead than impact analysis, we would perform a steady state analysis of the different policies. In this class of model, with endogenous interest rate, higher debt induce lower capital and higher interest rate in the steady state, therefore reducing the possible "positive" impact of bailing out Italian debt. On the other hand impact analysis seems more appropriate when analysing the effect of a crisis that has potentially a much higher cost that the one illustrated in the model.

From the Italian point of view, the government budget constraint must incorporate the possibility of bail out. Therefore the specification (17) must be modified to consider the expected value of bail out intervention from an economic partner. Formally the present value of the stock of debt, in order to be sustainable, must be equal to:

$$(1+r)\,D_t = \frac{1+r}{r-n}\left[p\left(\tau_h Y_h\right) + (1-p)\left(T_b Y_b\right) + (1-p)\left(\tau_b - T\right)Y_b\right] - \frac{1+r}{r}G_t \quad (33)$$

where the last term in the square brackets is the expected value of a possible Bail-out. On the other hand, even before the bail out happens, the present German Debt does not represent the expected value of future liabilities of the public sector, and that does not represent the expected amount of future taxes. Given that it is optimal for the German government to consider bailing the Italians out, the probability of doing so must be considered in the government maximisation process.

The future stream of budget surpluses can be written as:

$$S = \frac{1+r}{r-n}(p)\left(t_h^g \tilde{Y}_h^g\right) + \frac{1+r}{r-n}(1-p)\left(t_b^g \tilde{Y}_t^g\right) - \frac{1+r}{r-n}\tilde{G}_t^g \quad (34)$$

where the first term of the right hand side is the cost of paying back the present stock of debt D_t and the second term is the cost of paying back the debt plus bailing out Italy. Assuming the German Government wants to maintain a flat tax rate (ex-ante), the present tax rate will therefore be:

$$\bar{\tau}_g = \tau_s + (1-p)\left[t_b - T\right]\frac{Y_b}{Y_t^g} \quad (35)$$

and the inter-temporal budget constraint will have the form:

$$(1+r)\,D_t^g = \frac{1+r}{r-n}\bar{\tau}_s Y_t^g - (1-p)\frac{1+r}{r-n}[t_b - T]Y_b - \frac{1+r}{r}G_t \quad (36)$$

Condition (36) renders the interrelation between fiscal positions in a highly integrated economic area explicit. The difference between equation (36) and equation (33), the two inter-temporal budget constraints, is given only by the different way in which uncertainty presents itself. While the uncertainty in equation (33) is in the future income realisation, the uncertainty in equation (36) is introduced by the uncertain future level of taxes, conditioned by the expected income realisation in Italy. Note also that Germany is forced to run an *intertemporal* budget surplus in order to cover the risk of Italian default.

5 Fiscal Policy Interdependence and Private Sector Behaviour

The analysis in parts (3) and (5) suggests that while economic integration increases interdependence among the fiscal players, it does not necessarily increase the spill-over between fiscal and monetary policy. Nevertheless, the conclusion that fiscal

bail out is the optimal response to a fiscal crisis, produces a series of ex-ante effects which we are going to analyse in this section.

The main implication of the analysis in part (3) is that it is not always appropriate to consider the government budget constraints separately when considering the private sector optimisation. Recalling from above, the two government budget constraints are equal to:

$$(1+r)\,D_t = \frac{1+r}{r-n}\left[p\left(\tau_h Y_h\right) + (1-p)\left(T_b Y_b\right) + (1-p)\left(\tau_b - T\right)Y_b\right] - \frac{1+r}{r}G_t \quad (37)$$

for Italy, while for Germany, modified to incorporate the risk of Italian default, it looks like:

$$(1+r)\,D_t^g = \frac{1+r}{r-n}\bar{\tau}_s\tilde{Y}_t^g - (1-p)\frac{1+r}{r-n}[t_b - T]\tilde{Y}_b - \frac{1+r}{r}\tilde{G}_t \quad (38)$$

It is clear that the two equations are not independent. Aggregating (37) and (38) we obtain the following aggregate inter-temporal budget constraint:

$$(1+r)\left(D_t + D_t^g\right) = \frac{1+r}{r-n}\left[p\left(\tau_h Y_h\right) + (1-p)\left(T_b Y_b\right) + \bar{\tau}_s Y_t^g\right] - \frac{1+r}{r}\left(G_t + G_t^g\right) \quad (39)$$

Condition (39) simply synthesises the fact that Italian public debt can become a future tax liability for the German private sector every time there is a positive probability of default[11]. At the same time it redefines the trasversality condition for the Government and the private sector problems. What is important is that is that the only necessary condition to produce a result like (39) is that the private sector expect a positive probability of default in one member country big enough, or important enough, to threaten the stability of the union as a whole.

Does a condition like (39) produce an important risk of undisciplined strategic behaviour? After all, the discussion about the possibility of an over-expansionary bias in EMU is based upon the assumption that someone could exploit the inter-dependence that EMU would create to achieve national objectives. If we consider how the consumer maximisation problem is changed by a condition like (39), we can evaluate the conditions that renders a "beggar-thy-neighbour" policy feasible. It is easy to show that considering the aggregate budget constraint (39) modifies the consumption functions (18) and (15') as follows:

$$C_t = (1-\beta)\left\{\begin{array}{l}(1+r)\left[\left(\frac{n}{r}-\phi\right)D_t^g + \left(\alpha - 1 + \frac{n}{r}\right)D_t\right] + \\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s - \frac{r-n}{r}G_s\right] + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s^g Y_s^g - \frac{r-n}{r}G_s\right]\end{array}\right\} \quad (40)$$

[11] Condition (39) is similar to the case of fiscal bail out presented in Woodford (1996) and Bergin (1997). Their analysis shows that respecting an inter-temporal aggregate budget constraint like (39) is a sufficient condition to maintain price stability in monetary union. On the other hand, requiring a constant transfer of wealth from one member to the other, it is not an equilibrium condition, because every government would play the same expansionary policy. In our analysis, instead, condition (39) is independent from the actual behaviour of the fiscal authorities, but is only the result of their expected optimal behaviour in the presence of default.

and

$$C_t^g = (1-\beta)\left\{ \begin{array}{l} (1+r)\left[\left(\frac{n}{r}-\alpha\right)D_t + \left(\phi - 1 + \frac{n}{r}\right)D_t^g\right] + \\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s^g - \frac{r-n}{r}G_s^g\right] + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s Y_s - \frac{r-n}{r}G_s\right] \end{array} \right\} \tag{41}$$

An increase in Italian permanent expenditure not matched by an equal increase in expected revenues, will produce an increase in the portion of Italian debt guaranteed by German wealth. This will have a negative effect on German consumption, as long as the amount by which the Italian debt is absorbed by the German private sector is lower than the expected amount of fiscal bail-out. Therefore the strategic use of fiscal imbalances to transfer wealth from abroad is possible, but it is limited by the negative effect that an increase in integration has on the effect of fiscal policy on private demand.

6 A Europe of Nations Vs A Europe of Regions

As mentioned at the beginning, the main objective of the Maastricht fiscal rules was to provide a framework for a stable and disciplined monetary union, in which every member is the sole responsible to the market of their actions. The analysis so far suggests that a no-bail out rule could not be the better way to achieve this objective. This is because it is not optimal ex-post, cannot be credible ex-ante, and therefore does not solve the risk of a strategic use of fiscal imbalances.

The previous analysis shows that in order to cope with this form of "over-expansionary bias" the European institutions should be designed to reduce the external economic cost of default, therefore reducing the incentive to bail-out that produces the strategic dilemma illustrated. On the contrary, the choice made in Maastricht has been to increase the "political" cost of bailing out a country with fiscal problems while at the same time reducing the probability of default via strict rules on the use of fiscal policy.

It is clear that by themselves these rules, they go in the right direction, offer no guarantee against "time inconsistent" behaviour of the governments. As recent experiences in the world financial markets demonstrates[12], without an institutional structure robust to all possible state of nature the possibility of bail out cannot (and

[12]- The financial and economic crisis in Asia of 1997-1998, the default of Russian debt in summer 1998 and the bail out of the Long Term Capital Management hedge fund by the Federal Reserve has spark new interest in the design optimal institutions for financial stability. As far as we are concerned the interest is given by the fact that not only it demonstrates the possibility of fiscal default in particular circumstances, but more importantly it shows the time inconsistency of any no-bail out commitment if not supported by institutions that can minimise the external costs of a crisis. As argued by the Chairman of the Federal Reserve Greenspan " had the failure of LTCM triggered the seizing up of markets, substantial damage could have been inflicted on many market participants, including some not directly involved with the firm, and could have potentially impaired the economies of many nations, including our own" (Greenspan 1998). Therefore although bailing out is not the optimal policy ex-ante, because it would promote free riding behaviour on the public good, i.e. stability, it is optimal ex-post given the overall costs of a crisis.

should not) be ruled out.

But the analysis so far suggests also a possible institutional solution to the described "time inconsistency" problem. What drives the results in not only the level of integration (represented by the parameters α and ϕ), but also by the dimension of the member in fiscal distress respect to the union as a whole.

The point is made clear if we consider the case that the union is formed by (m) countries, perfectly identical in term of preferences and initial conditions. Thus, the total amount of government debt in this enlarged union is given by

$$D_t^{emu} = \sum_{i=1}^{m} D_t^i \tag{42}$$

As before, the private sector has a preference for national assets and is indifferent between the foreign ones. Therefore the national resident will hold a fraction α of national debt, while the rest of the community will absorb the rest. Each country will though hold *(1-*α*)* of the average of the remaining total debt. Given the assumption of perfect symmetry among countries, the aggregate wealth in country (i) at time (t) will be thus composed by a portfolio of debt issued such as:

$B_t^i = \alpha D_t^i + \frac{(1-\alpha)}{m-1} \sum_{j=1}^{m-1} D_t^j$ j≠i (40)

Consider the possibility of default in one country arises in the same way we have described in the two country setting. For example, a generic country (i) faces the possibility of default that would produces a cost for its own private sector equal to:

$$\Delta W_{def.}^i = -(\alpha)\frac{1}{r-n}\left[\tau_b - T\right]Y_b \tag{43}$$

Similarly, the default of country (i) debt will impose a cost on the private sector of the other member countries equal to:

$$\Delta W_{def.}^{j\neq i} = -\frac{(1-\alpha)}{(m-1)(r-n)}\left[\tau_b - T\right]Y_b \tag{44}$$

Equation (44) shows that the cost of default is an inverse function of the number of the members of the union (or the relative weight of any local authority issuing debt respect to the union). Moreover the enlargement (or fragmentation) of the Union only affects the external cost of default but not, as shown by (43) the cost for the country in crisis.

On the other hand the enlargement does not affect the cost of bail out, as it has been defined above, unless a co-ordinated action of the other member countries to rescue country (i) was possible[13]. In an enlarged union, the cost of bail-out would

[13]- We abstract from analysing this case, not because it has no relevance, but because, given the fact that increasing the number of players decreases the cost of default, the incentive to co-operate in order to reduce the cost of bailing out decreases as well.

again be equal to:

$$\Delta W_{bo}^{j} = \frac{\alpha}{r-n}\left[\tau_b - T\right] Y_b - \frac{1}{r}\left[\tau_b - T\right] Y_b \tag{45}$$

In figure (1) equations (44) and (45) are graphed for different values of α and m given a value of $r = 0.05$ and $n = 0.02$. The horizontal lines are the cost of bailing out (a positive value is an increase in country (j) private wealth following a bail-out operation of country (i)), independent of the number of country members of the Union.

As argued before, the cost of bailing out one country increases the greater is the amount of national debt held abroad (α smaller) and the lower is the degree of departure from Ricardian equivalence. Bail out is the optimal response to a fiscal crisis only if the Union is composed by a relatively small number of countries and the degree of cross-border transaction of public bonds is small. On the other hand, as we saw in section 2.4, the increase in openness increases the cost of default but the increase in the number of union members softens the problem, reducing the possibility of the single member to determine the outcome for the whole union.

The analysis of this part seems to conclude that, while deepening integration, European countries have to widen integration at the same time, or otherwise reduce the size of the building blocks of the Union from the States to the local or regional level. The two processes reinforce each other because, reducing the external cost of default reduces the incentive to resort to default, or the threat of it, therefore inducing discipline not through external enforcement but through self interest. It is a sort of perfectly competitive monetary union.

7 Conclusions

This paper had the aim of looking at the conventional wisdom about fiscal default and verify if in a monetary union there is, as often argued, an incentive to excessive use of the fiscal instrument. Our findings in this respects are partly validating the idea that a strategic use of default risk could be used to force a fiscal bail-out from other member states, especially if the country using this "instrument" is big enough with respect to the whole union. Although this is a theoretical possibility common to any integrated economic space, in a monetary union fiscal bail-out becomes more likely and this affects the ability of the market to asses specific country risks. The more interesting results, in this respect, is that the optimality of a fiscal bail out produces interdependence of national fiscal positions. In some curious way it is the creation of a fiscal federalism by default.

Is then the no-bail out clause the institutional solution to this possible strategic use of fiscal default risk? We have argued that it is not, requiring a substantial political commitment to pay the cost of a possible fiscal default of the economic partner. Because this external cost of default can be far superior that the cost of a fiscal bail out, the rule to be credible requires a commitment mechanism that is not in the Maastricht Treaty.

On the other hand the relative dimension of the players is the single determining

factor of the strategic problem analysed. Therefore an enlargement of the Union, or a transfer of the power of issuing debt to a lower institutional level could reduce the cost of default, making a commitment mechanism as the No Bail-out rule easier to implement.

References

[1] Alesina, Alberto, Alessandro Prati and Guido Tabellini (1990) "Public Confidence and Debt Managment: a Model and a Case Study of Italy" in *Public Debt Management: Theory and History,* ed. Rudiger Dornbusch and Mario Draghi, 94-118, Cambridge, U.K., CUP..

[2] Barro, Robert J (1979) "On the Determination of Public Debt" *Journal of Political Economy,* 87, 940-971.

[3] Bergin, P (1997) "Fiscal Solvency and Price Level Determination in a Monetary Union" University of California, Davis.

[4] Blanchard, Oliver J. (1985) "Debt,Deficits and Finite Horizons" *Journal of Political Economy,* 93, 223-247.

[5] Buiter, Willem, Giancarlo Corsetti and Nouriel Roubini (1993) "Excessive Deficits: Sense and Nonsense in the Treaty of Maastricht" *Economic Policy*, 16, 59-99.

[6] Calvo, Guillermo (1988) "Servicing the Public Debt: The Role of Expectations" *American Economic Review*, 78,647-661.

[7] Eichengreen B. and Portes R. (1995) "Crisis? What Crisis? Orderly Workouts for Sovereign Debtors" CEPR, London.

[8] Goldstein, M. and Woglom, G. (1992) "Market-based Fiscal Discipline in Monetary Unions: Evidence from the US Municipal Bond Market" in *Establishing a Central Bank: Issues in Europe and Lessons from the US* , ed. Matthew Canzoneri, Vittorio Grilli, and Paul Masson, Cambridge University Press, Cambridge.

[9] Greenspan, A. (1998) Testimony Before the Committee on Banking and Financial Services, U.S. House of Representatives. January.

[10] Krugman, P. (1993) "Lessons of Massachusetts for EMU" in Torres,F. and Giavazzi, F. eds.(1993) *Adjustment and Growth in The European Monetary Union* , Cambridge University Press, Cambridge, U.K.

[11] Hughes Hallet A. and P. McAdam (1996) "Fiscal Deficit Reductions in Line with the Maastricht Criteria for Monetary Union: an Empirical Analysis" *CEPR Discussion Paper*, 1351, London.

[12] Sala-i-Martin, X. and Sachs, J. (1992) "Fiscal Federalism and Optimum Currency Areas: Evidence for Europe from the United States" in Canzoneri, M.B., Grilli, V. and Masson P.R. eds. (1992) *Establishing a Central Bank: Issues in Europe and Lessons from the US*,Cambridge University Press, Cambridge, U.K.

[13] Weil, Philippe (1987) "Permanent Budget Deficit and Inflation" *Journal of Monetary Economics,* 20,393-410

[14] Weil, Philippe (1989) "Overlapping Families of Infinitely lived Agents" *Journal of Public Economics*,38,183-198

[15] Woodford, M. (1996) "Control of the Public Debt: A Requirement for Price Stability?", Discussion Paper 5684, NBER, Cambridge MA.