Currency Pegs and Fiscal Federalism[*]: The case of Argentina

Maria Laura Alzua[1]

April 7th, 2004

Abstract

This paper studies the different economic configurations that may give rise to incomplete fiscal decentralization, with the vertical imbalance problem associated to it. Particularly, we look at an economy which has given up monetary policy and cannot monetize national or sub-national government deficits. The question is whether dollarization is a commitment enough to discipline sub-national governments. Do incentives for Central Government bailouts disappear with dollarization? Does incomplete fiscal decentralization arises in equilibrium?

We obtain two different sets of equilibria as result of a game between national and sub-national governments according to the difference parameter configuration. In one of them the Central Government will give taxing autonomy to the sub-national governments while in the other it will keep the taxing authority because it is optimal to do so. In this sense, the economy gets stuck in an inefficient level of fiscal decentralization. The model may apply to economies like Argentina, Ecuador, the CFA in Africa and Eastern European countries willing to join the Euro.

JEL classification Numbers: E62, H63, H72

Keywords: Decentralization, default, taxes, sub-national governments.

1. Introduction

Recent history of developing countries has focused on diverse issues concerning monetary and fiscal policy. As far as monetary policy is concerned, given its history of mismanagement in some countries, especially in most of Latin American countries, how to conduct it in terms of reducing inflation has been an important issue of debate both at the academic and policy making level. On the other hand, fiscal reforms appear to be a pre-condition in all stabilization plans. Tax reforms, public spending re-direction and rationalization are necessary measures to achieve an improvement in the efficiency of the public sector in order to make it consistent with a more prudent monetary policy. The bulk of reforms in order to improve the performance of the public sector are mainly related to fiscal decentralization. We are interested in exploring here which is the kind of Central Governments commitment help to discipline sub-national government behavior. Specifically, we look at an economy without monetary policy, and hence, incapable of monetizing sub-national deficits.

[1] Boston University, malzua@bu.edu

Most Latin American countries suffered from high inflation during the 80's. This inflation resulted mainly from lack of discipline in government spending (both at the national and the state level). Tax incidence has been generally low and so large deficits were financed by issuing money. Some of Latin American countries suffered even from hyperinflation processes as a result of these policies[2]. In the process to reduce inflation, most of the countries adopted some form of peg for the exchange rate, which ranged from fixed exchange rates to currency boards or even dollarization.

One of the most important things that should be achieved in order to give credibility to the pegs is to design fiscal policies that should be consistent with these exchange rate regimes. Otherwise, large fiscal imbalances that should be monetized led to a loss of reserves and a subsequent speculative attack that forced governments to abandon the pegs, as in Krugman (1979) seminal paper. In order to give credibility to the pegs, governments should reduce their budget deficits. In terms of Rebelo (1997) words': "pegging the exchange rate tend to be associated with an increase in government efficiency in the present and in the future. This efficiency increase results from measures such as the reform of the tax system and the re-direction of government expenditures away from redistribution programs and *pork barrel* spending towards productive uses."

The task of reducing budget deficits is hard in nature, since it involves unpopular measures that are difficult to enforce in the short term. Most politicians are unwilling to pay the high costs of fiscal reforms. In this sense, fiscal decentralization aims at improving the performance of the public sector. The most widespread approach to decentralization in the public finance literature is known as *fiscal federalism*. It identifies three main functions for the public sector: macroeconomic stabilization, income redistribution and resource allocation. While macroeconomic stabilization and income redistribution functions are assigned to the central government, sub-national governments should be in charge of resource allocation mainly for efficiency reasons. In terms of the Decentralization Theorem: "... .in the absence of cost-savings from the centralized provision of a [local public] good and of inter-jurisdictional externalities, the level of welfare will always be at least as high (and typically higher) if Pareto efficient levels of consumption are provided in each jurisdiction than if any single, uniform level of consumption is maintained across all jurisdictions"[3]

Another line of reasoning in order to justify fiscal decentralization is the idea of fiscal correspondence and the common pool problem. When the provision of public goods and services is in charge of decentralized units (i.e. sub-national governments) but there is no decentralization in terms of revenue collection, the problem of fiscal correspondence appears. Individuals enjoying the benefit of consuming public goods do not bear the total cost of providing them. Moreover, the common pool problem refers to the fact that sub-national governments behave as if they did not face a hard budget constraint, increasing government spending and reducing regional tax effort.

Finally, implicit Central Government bailout assumption also acts as a dynamic relaxation of sub-national governments' budget constraint. In order to reduce the above mentioned problems, fiscal decentralization aims at improving the efficiency of public goods provision together with aligning incentives of public expenditure with regional tax collection effort.

---

[2] We can quote as historical cases of hyperinflation in the 80's Argentina, Bolivia and Brazil. Most of the rest of Latin American countries suffered from high and persistent inflation though not hyperinflation.
[3] Oates, (1972, p.54)

Most Latin American countries have started a decentralization of their fiscal sector when they started its macroeconomic reforms around a decade ago. The purpose of these decentralization processes was to improve the performance of their public sectors. Whereas most of the expenditures have been decentralized, the same cannot be said about revenue decentralization. Argentina has one of the most decentralized systems (in terms of expenditures) of all Latin America. For the specific case of Argentina, regional governments are in charge of most of the social expenditure (health, education, infrastructure, etc.), which accounts for 50% of all public sector expenditures are in the hands of sub-national governments. (In Brazil, this figure is 45.6% and in Colombia 39%)[4].

In Argentina, for example, while sub-national governments have constitutional taxing decisions, most of the regional governments have delegated its taxing authority to the national government not only for tax collection but also for setting tax rates and bases.

The imbalance between expenditures and revenues creates an incentive for the sub-national governments to run irresponsible deficits together with the common pool problem and the implicit bailout assumption, since they do not face the financial consequences of their actions. Numerous attempts have been made in Argentina during the last decade in order to limit the sub-national fiscal deficits. Unfortunately, little has been achieved in spite of the currency board adopted for more than ten years.

There are different issues present in the literature that can be used to address the problem of interaction between monetary and fiscal policy:

1. the problem of persistent positive inflation, caused when the monetary authority is not independent and the *"printing press"* is used to finance budget imbalances.
2. the deficit (either monetized or not) bias that results from some specific fiscal structures in some countries. Here it is important to consider the degree of fiscal decentralization/centralization of each country and the problems of fiscal imbalances generated by non-optimal decentralization schemes.
3. currency pegs, hard monetary rules and even dollarization as commitments not to finance budget deficits.

In the case of persistent positive inflation there is a vast literature that tries to address this problem. We will not focus in the literature related to credibility of the monetary policy. An excellent account of the evolution of this literature can be found in Persson and Tabelini (2000). First, we will address the problem of inflation as a direct consequence of fiscal indiscipline and weak commitment power of the Central Government and the Central Bank (which we will treat as the same agent.)

The second point we will address is fiscal federalism. There is both empirical evidence and theoretical support to improve economic efficiency in the public sector by means of fiscal decentralization. Oates (1999) presents all the theoretical conditions for which both revenue and expenditure decentralization might be optimal. In terms of empirical evidence, we observe that an important group of countries spanning Europe, Asia, Africa and Latin America are undergoing a process of devolving fiscal responsibilities to their sub-national governments. Whereas each country presents differences in this process, a common feature can be observed. Most of the countries have given back expenditure

---

[4] For more details about this see Piffano (1998) and Tommasi, Sanguinetti and Saiegh (2001)

responsibilities without the accompanying revenue raising responsibilities. As we mentioned before, both the lack of fiscal correspondence and the implicit bailout assumption often create perverse incentives for sub-national governments which cause too much deficits and too much borrowing. Among the main reasons for an implicit bailout assumption in the Argentine case we can quote the country's political configuration (the Central Government often needs political support from sub-national leaders) and externalities ("too big too fail" argument, where an important sub-national government in problems becomes a problem for the Central Government) Here, Garcia Mila, Goodspeed and McGuire (2001) analyze the case of fiscal decentralization in evolving federations. They develop a theoretical model of regional borrowing decisions in which the incentives for regional borrowing depend on the regions' expectations about the federal system of finances is going to evolve. Their results suggest that if taxing authority is given back to the regions, then sub-national borrowing can efficiently correct any initial revenue deficiency. But, if regional governments expect the central government to increase grants as a response to increase in regional borrowing, then a "soft budget constraint" is created and there is a tendency to too much borrowing. Here, the decision of taxing autonomy and the perception of softness in the CG budget constraint appears as exogenous. It is important to achieve some explanation of why central governments may be reluctant to devolve taxing authority or why regional governments have no incentives to claim taxing responsibilities.

Finally, one of the main points for dollarization[5] (or currency boards) in one country is the idea that by delegating the monetary policy to another country the delegating country can achieve significant reduction in inflation. The most recent examples are Argentina[6] and Ecuador[7] in the nineties. The literature supporting dollarization is abundant. But the main line of reasoning behind dollarization can be summarized as follows:

There is a Central Government (CG) who likes to use the 'printing press' in order to finance current expenditures. The Central Bank (CB) is usually weak and finances government deficits. This causes inflation and all the accompanying problems that it brings. In this sense, dollarization or currency boards represent a commitment to stop the 'printing press', and this will reduce inflation.

Another line of reasoning[8] enhances the previous analysis by complicating the political structure of the inflation-prone countries. In this case, there are regional governments (RG) who can exert pressure on a weak CG by asking them to monetize its deficits. Here, a multiregional model is used, where many regions would like the CG to monetize its deficits, since the burden of the inflation tax would be borne by other regions. The equilibrium in this model is of a positive inflation.

In both types of models, what appears to be crucial is the lack of credibility of a commitment of the CG not to run deficits at the national level or to bailout fiscally irresponsible regions. The question is[9]: is dollarization enough of a commitment when the CG is susceptible to pressures from the regional governments? Regions will still have incentives to run deficits that will imply higher taxes in the future. So the CG should have to raise taxes in all regions, and the burden of higher taxes will be suffered for all. In terms of

---

[5] Here we are ignoring all the potential beneficial effects of dollarization on trade.
[6] Argentina had a currency board from April 1991 to December 2001.
[7] Ecuador dollarized its economy in 1999.
[8] See Cooper and Kempf (2001)
[9] As it appears at the end of Cooper and Kempf (2001)

Copper and Kempf (2001) words: "The core of the monetary problem is fiscal irresponsibility, not the choice of currency"

The present study is aimed at analyzing two things: first, the role played by dollarization as a commitment to impose fiscal discipline in a federation and second, how is the optimal scheme of decentralization of fiscal revenues and expenditures.

First of all, we have to make some comments. One is about what we mean by dollarization. For the sake of this paper, dollarization will be equivalent to any other currency regime where monetary policy is given up by the Central Government. For Argentina, the currency board of the nineties was the closest to a full dollarization experiment. In Ecuador, the economy is dollarized, while in the CFA zone in Africa, there has been Convertibility to the Franc (now the Euro) for more than thirty years. It should be noted that there are wide differences across the exchange rate regimes we are considering. But all of them share the common characteristic that the Central Government cannot use monetary policy to finance either national of sub-national deficits. Secondly, we have to address the problem of the different intergovernmental relations that may give rise to fiscally irresponsible behavior. We will address the problem as a conflict between national and sub-national governments, where the latter does not internalize the cost of providing public goods to its citizens. This conflict may also be represented as a conflict between Central Government and Congress, as it is mainly the case in some Central and Eastern European Countries.

Two examples which can be analyzed are Ecuador and Argentina, since the two countries underwent processes of giving up its monetary authority. While they achieved a significant reduction in inflation, they were not able to achieve fiscal discipline (at least at the sub-national level). This indiscipline caused great indebtedness and forced the central government to abandon the peg in the case of Argentina and to default on its debt. Dollarization is still in effect in Ecuador, but the central government is having a hard time in maintaining it since its public finances are far from sound.

Here we will look at the Argentine case, exploring different commitment mechanisms for the Central Government (CG) not to bail out sub-national governments (regions). Can the Central Government and the regions sign a contract to reduce the Central Government bailouts? Dollarization, per se, rules out monetization of regional deficits but this does not means that CG bailouts disappear. The Central Government can still bail out regional governments by means of higher taxes. i.e.: CG raises taxes to rescue regions running deficits.

Why is that some Central Governments find it so hard to push reforms in terms of revenue decentralization once they had given expenditures decentralization?

Here, we develop a model to study the interaction of CG and RGs in the context of a dollarized economy and random endowments. We look for the Weak Perfect Bayesian Equilibrium of the game between the Central and the Regional Government. The CG has to decide whether to give taxing autonomy to the regions or not.

We obtain different sets of equilibria, depending on endowment volatility, size of the region and the distribution of debt holdings. We look for the Weak Perfect Bayesian Equilibrium, restricting ourselves to pure strategies. As mentioned before, we obtain different sets of equilibria. There are different configurations of parameters which support different choices for each level of government. We are interested in looking at the set of beliefs and strategies that give rise to the regional taxation equilibrium and to the equilibrium without fiscal decentralization. The former is the most efficient in terms of the decentralization theorem and reduces the deficit bias observed in regional governments. The

latter is of interested since many of the countries undergoing decentralization processes get "stuck" in this intermediate phase of fiscal decentralization. It is worth looking at which configuration of parameters give rise to this equilibrium. Also, this equilibrium suggests that dollarization does not eliminate CG bailouts and so it is not enough as a commitment to induce fiscal discipline in the regions.

2. Stylized facts for Argentina

The case of Argentina is just an example which can be extended to all Eastern European countries intending to join the Euro since any country joining a monetary union will have consequences for its fiscal sector. Giving up monetary policy limits the amount of tools available to finance government (both central and regional) deficits.

This section rests heavily on Saiegh and Tommasi (1999)[10] and tries to summarize briefly some of the main problems of Argentina's tax sharing regime. The two main problems are the lack of fiscal correspondence between sub-national revenues and expenditures and the central government recurrent bailouts of sub-national units.

First of all, there is a lack of fiscal correspondence, with very little tax effort on behalf of the provinces and a large proportion of services provided by them. Second, the bailout problem, where CG generally bails out lower levels of government, creates a moral hazard problem.

Argentina is a federal country[11], where the regional governments (provinces) have a great deal of autonomy. Expenditures are highly decentralized and provinces have borrowing autonomy. However, taxes are still heavily centralized at the national government. Taxes are collected by the Central Government (CG) and then re-distributed in the form of transfers to the provinces (RG) though a system called *"Coparticipacion Federal"* (tax-sharing agreement). Provinces differ in both share of the national income and in population. The tax-sharing agreement as it is today presents two main problems:

1. The unit of redistribution of CG revenues is the region and not the households. This has been historically the case since governors of the different regions give their support to the CG. The power of each governor in the Upper house of the Congress does not bear any relationship with the population or share of income of the different regions. So bigger regions are under-represented and smaller regions are over-represented. So, per capita transfers differ widely across regions.[12]

2. The second problem is derived directly from the first one, and it is the deficit bias that this way of sharing transfers creates. For bigger and wealthier provinces (wealthier in terms of higher share of income, not in terms of per capita income), the incentive to run deficits is too big. They create most of the taxable income of the country and they are not able to reap its benefits. Poorer regions do not have any incentives to reduce their deficits either. In this case, any fiscally responsible region will receive fewer transfers than its fiscally irresponsible neighbor. But, regardless of the wealth or the regions,

---

[10] Saiegh, Sebastian M, Tommasi, Mariano (1999)

[11] This is just a brief summary of the main pillars of Argentina fiscal structure. A much more detailed description can be found in Piffano (1998), Tommasi, Sanguinetti and Saiegh (2001).

[12] It is the case for example, that poor living in richer and highly densely populated provinces receive much lower transfers per capita than poor living in poorer and low density populated provinces.

there is a lack of fiscal correspondence between the benefit of enjoying public goods and the cost to provide them. Moreover, the fact that RGs have borrowing autonomy makes matters even worse, since many provinces generally run large deficits, borrow abroad and then wait for the CG to bail them out.

As mentioned before, Argentina historically financed its all level government deficits mainly by printing money. This mechanism resulted in high and increasing inflation, ending in two hyperinflation episodes in 1989-1990. In 1991 a currency board called "*Convertibility regime*" [13] was established. The main objective of this exchange rate regime was to reduce inflation. The peg, however, implied some well known policy trade-offs. Among many others, this exchange rate regime prevents the government from printing money to finance its deficits. In this sense, one of the results of adopting a currency board is that it acted as implicit hardening of the budget constraint. Given the structure of all level governments in Argentina, *Convertibility* meant that the CG should introduce reforms in the tax system and in government expenditures. The CG moved quickly in terms of expenditure decentralization but faced harder challenges when attempted tax reforms. Sub-national governments cannot cover their expenditures with local taxes and they must be financed by the CG by means of transfers or borrowing. This problem is known as *vertical imbalance*.(See Table 1)

Table 1

	Argentina	Brazil	Chile	Mexico	Latin American (average)
Decentralization [(1)] (%)	49.3	45.6	13.6	25.4	14.6
Vertical Fiscal imbalance [(2)] (%)	56.0	33.0	61.0	61.0	52.0
Borrowing autonomy[(3)]	3.0	2.9	0.0	1.8	n/a

(1): the ratio of sub-national/total government spending, (2): the ratio of intergovernmental (sub-national) /total revenue, (3): the value of the index ranks from zero (no borrowing autonomy) to a maximum of four points. Source: Inter-American Development Bank, Fiscal Stability with Democracy and Decentralization, 1997.

3. A real game in a dollarized economy.

Here, we develop a simple two period model to study an economy with the following characteristics:
- The CG has given up monetary policy, and has to look for other ways to finance national or sub-national budget deficits.

---

[13] The "*Convertibility Law*" was the cornerstone of a stabilization program. A currency board that lasted for 10 years was established, where one *peso* (Argentine currency unit) was equal to one USD. The peg was abandoned in January 2002. To see an account of the problems that led to the currency crisis see Galiani, Heymann and Tommasi (2002).

- The country is in the middle of the process of fiscal decentralization, expenditures are decentralized at a regional level but revenues are still centralized[14].

The economy is populated by N identical agents who live for two periods. There is a Central Government (CG) and two regions (R1 and R2), each with its own government (RG1 and RG2). Population in each region is N1 and N2, they may not necessarily be equal. The CG has given up monetary policy and has adopted dollarization[15]. Expenditure policy is determined at the regional level[16]. There is no production. Agents have endowments in both periods. While there is certainty in period one endowment, period two endowment is random. In period one CG makes transfers to the provinces $?_i g$, where i is region specific. While g is per capita grant, the factor $?_i$ is introduced in order to capture some measure of the "political power" each RG has[17]. Following Mila et al. (2000) we consider these transfers of period one to be exogenous. It is also assumed that there is a mismatch between $?_i g$, and RG spending in period one in order to introduce RG's borrowing or lending[18].

The model must capture two different things: one, given the fact that we are in a context of a dollarized economy, the CG cannot bail out the RG by means of printing money, and second, the country is in an early stages of reform in terms of fiscal federalism, i.e.: while RG have spending responsibilities, they have not taxing authority yet. In this game, only RG1 is active[19]. The timing of the game is as follows:

Stage one:
- CG sets exogenous transfers to the provinces, decentralizes expenditures and dollarization starts
- RGs issue bonds b_i to finance the gap between CG's transfers and desired spending.
- All young agents make decisions in anticipation of period two government policies

Stage two:
- Regional governments observe the realization of endowments Y_h or Y_l (high and low endowment respectively)[20]
- CG decides to give taxing authority (TA) to RG or not (NTA).
- If CG gives taxing authority to RGs, RGs can choose to levy the tax (TAX) or pass the obligation to the CG (NO TAX).

---

[14] We assume this type of decentralization because it has been observed empirically. The first step towards decentralization has been generally expenditure decentralization, followed only later by revenue decentralization. For a detailed survey about this issue see Freire, Huertas and Darche (1998).

[15] It can also be a currency board; the key point is that the CG has delegated the control of monetary policy.

[16] We are in a context where the country that can be characterized as an "evolving federations" in the terms of McGuire et al. (2001). CG gave spending but not taxing responsibilities to RGs.

[11] So far $?_i$ is considered as given and equal to one but it can be also the resulting of a game between CG and RGs, where the CG needs RG's support in order to stay in power.

[18] In this point we follow McGuire et al. (2001).

[19] In a richer setting, an active behavior of RG2 can be considered.

[20] At this point we consider the realization of endowments is the same for both regions. This can be modified.

- CG can choose to bail out (BO) (by means of economy wide tax) RGs.
- If CG does not levy an economy wide tax, RGs will default (D), paying a penalty cost d.
- If CG does not pass the taxing authority (NTA) to RGs then it has to bail out (BO) RGs.

We search for a Weak Perfect Bayesian Equilibria (WPBE) of this game. The CG cannot make credible threats not to bail out RGs. We will analyze the equilibria when the CG lacks this commitment power. For simplicity, only RG1 is active, RG2 has no mismatch between CG grants and its expenditures. We can think, for example, that RG2 had borrowing restrictions in its constitution. The tree corresponding to this game can be seen in the appendix.

Individuals live for two periods where the superscripts *"y"* and *"o"* stand for young and old respectively.

3.1 Period 1 Optimization

Individuals derive utility from consumption of a private and public good.
Region i young agents solve:

$$\max_{b_i^i, b_j^i} u(c_i^y, g_i^y) + bEu(c_i^o, g_i^o) \text{, for } i=1,2 \qquad (1)$$

where u is assumed to be concave.

subject to:

$$c_i^y + b^i = Y_i^y \qquad (2)$$

$$g_i^y = g^y + b_i \qquad (3)$$

$$c_i^o = E(R)b_i + (1 - t_i - t)E(Y_i^o) \qquad (4)$$

$$g_i^o = g^y - E(R)b_i + t_i E(Y_i) + h_i T \qquad (5)$$

$$b_i = b_i^i + b_i^j \qquad (6)$$

where:

All the variables are expressed in per capita terms

g^y is real per capita transfer in youth to agents of region i

g^o is real per capita transfer when old to agents of region i

Y_i^y is endowment in youth

$E(Y_i^o)$ is endowment in old, which is random

b_i, debt issued by region i

b_i^j is debt issued by region i held in region j

t_i is a regional tax

t is a common tax collected by the Central Government

$T = \sum_{i=1}^{2} t Y_i$ $h_i \in [0,1]$ is a parameter that will indicate how much of the total tax is redistributed back to the regions.

Endowment is random and takes two values high or low with probability p and (1-p) respectively.

In a first stage both h_i is going to be equal to one, i.e.: there is no difference between transference to regions. Per capita transfers are equal across regions.

R is the return on holding regional Government debt, and it takes two values: R^h when output is high and $R^l = a R^h$, with $0 < a < 1$.

Given some initial conditions, this maximization problem is well defined and has explicit solutions for consumption and regional government debt holdings for some parametrical assumptions about the utility functions.

The first order conditions for this problem are:

$(b_i^i):$ $u'(c_i^y) - u'(g_i^y) = b[E(Ru'(c_i^o)) - E(Ru'(g_i^o))]$ (9)

$(b_j^i):$ $u'(c_i^y) = b E(Ru'(c_i^o))$ (10)

The LHS of (9) is the marginal cost of giving up consumption today. In this sense, increasing public good consumption reduces this marginal cost. The RHS represents the marginal benefit of consumption tomorrow. From (9) and (10) we obtain:

$u'(g_i^y) = E(Ru'(g_i^o))]$ (11)

and $\dfrac{u'(c_i^y)}{u'(c_i^o)} = \dfrac{u'(g_i^y)}{u'(g_i^o)} = E(R)$ (12),

which is the standard intertemporal efficiency relationship between present and future consumption for private and public goods. Here, agents are able to smooth private and public good consumption, achieving intertemporal efficiency, but, due to the lack of regional taxation in period one, intratemporal efficiency is not achieved. Issuing regional debt does not correct for initial mis-funding of regional governments.[21]

3.2 Period 2 payoffs

In order to consider the second period payoffs we make some simplifying assumptions. First, we will start by assuming a linear utility function $u(c^y) = c^y$ and $g^0 = 0$, which means that in equilibrium, $b^1 = b^2 = b$. Finally, CG transfers in period two will be equal to zero.
RG1 government is concerned with the welfare of its citizens. The CG government takes into account the welfare of both regions in the following way: the objective function of CG is the population-weighted sum of the utilities of each region's agents plus Π, which represents autonomous CG consumption.
This does not represent the Argentine situation, due to the fact that for political reasons CG may want to redistribute resources across regions for other factors than population[22][23].
We can write the welfare function of CG as follows:

$$W^{CG} = \Delta c_1^o + (1-\Delta)c_1^o + \Pi - \underline{g},$$

where Δ and $(1-\Delta)$ are the population weights of R1 and R2 respectively, and Π is autonomous government consumption. The term $\underline{g}$ will be different from zero only in the case that the CG has to bailout RG1 once it has taxing autonomy. This can be understood as an "extra effort" on behalf of the Central Government once it has given taxing authority to the regions. We are going to consider $\underline{g}$ as fixed, but in a more complicated environment, it can be made a function of t, the tax rate, the higher the tax rate, the higher the reduction in CG consumption. For the CG, the welfare of a CG bailout will then decrease, the higher the level of regional debt. [24]

We are going to analyze first the case where endowments shocks are perfectly correlated and equal across regions[25]. The rationale given for saying that the realization of output is observed by RG and not CG comes from the fact that in general RGs have much more

---

[21] This is the same result obtained in Garcia Mila et al. (2000)

[22] In the case of Argentina, CG often needs governors' support in Congress, so in terms of transferences to the provinces it is often the case that per capita transfers are higher in low densely populated provinces.

[23] These regional weights are not completely adequate for the example of Argentina. There, the tax sharing regime is based on the following weights, 65% on population, 10% according to demographic dispersion and 25% according to the development gap, defined as the difference between each province wealth with respect to the richest one.

[24] In the context of tax decentralization, the CG loses sources of revenues and so it has to resort to reduce its consumption in order to finance the regions.

[25] While the shocks are perfectly correlated, they may differ in the level, obtaining different per capita consumption and debt holdings.

information about the productivity and the real possibilities of their economies than the CG. We have a principal agent problem, where it is costly for the CG to monitor the activity in the regions.
We will write in turn the different payoffs for each state of nature.

3.2.1 CG gives taxing autonomy and RG_1 taxes its citizens.

This payoff corresponds to the state where complete fiscal decentralization is achieved. This is the "good equilibrium" in terms of the decentralization theorem. Here R1 individuals will bear the full cost of repaying period one debt. This equilibrium will be the one "preferred" by R2 individuals.

Payoffs when endowment is high:

$$c_1^o = R^h b^1 + (1 - t_1)Y_h \text{ (11) and } t_1 Y_h = R^h b^1 + \frac{(1-\Delta)b^2}{\Delta} \text{ (12)}$$

combining (11) and (12) we obtain:

$$W^{RG} = c_1^o = Y_h - R^h \frac{(1-\Delta)b^2}{\Delta} \text{ (13) for RG1 citizens}$$

$$W^{CG} = \Pi + Y^h \text{ for CG (14)}$$

which are the welfare functions of the regional and central government respectively.

Payoffs when endowment is low:

When endowments are low, return on regional debt is $R^l = aR^h$. a ranges between zero and one $0 < a < 1$, is the default rate, i.e. a low realization of endowment means partial default on period one government debt. If $a = 0$, debt can still be repaid when endowment is low. If this is the case, uncertainty over endowments plays no role over the beliefs on the players. Incomplete information on behalf of the CG plays no role in determining the different equilibrium of the game.
By introducing default risk, we will be able to look at two different things:
    -the role of endowment volatility as a parameter which affects the result of the game.
    -the role of informational asymmetries between CG and RG, in the sense that the latter knows the state of the economy before than the former.

$$W^{RG} = c_1^o = Y_l - aR^h \frac{(1-\Delta)b^2}{\Delta} \text{ (14) for RG1 citizens}$$

$$W^{CG} = \Pi + Y^l \text{ (15) for CG}$$

Regardless of the realization of endowments, ex-post consumption in R1 is lower the higher the proportion of debt held in R2. R1 individuals bear the tax burden to repay the

debt held in R2. (This will produce an analogous result to the one found in Cooper et. al., (2003), where they find an equilibrium with regional taxation when debt is held just in R1). As we will see later, debt holding distribution matters for the equilibrium that is chosen.

3.2.2. CG gives taxing autonomy and RG_1 does not tax and CG bails out RG by means of higher taxes

Payoffs when endowment is high:

$$W^{RG} = Ay^h - \left(\frac{1-\Delta}{\Delta}\right)R^h b^2 \text{, for RG (16)}$$

where $A = \left(\frac{\Delta + t(1-\Delta)}{\Delta}\right),$

$$W^{CG} = \Pi - g + y^h \text{, for CG (17)}$$

Payoffs when endowment is low:

$$W^{RG} = Ay^l - \left(\frac{1-\Delta}{\Delta}\right)aR^h b^2 \text{, (18) for RG}$$

$$W^{CG} = \Pi - g + y^l \text{, (19), for CG}$$

We are assuming that CG charges an uniform tax rate is t in both regions.

Here, A is greater than one, so payoff for the RG1 will be higher than in the case of regional taxation regardless of the level of b^2. This seems reasonable, since RG2 citizens bear also the burden of higher taxation in period two. This result will be preferred by RG1 citizens, since they can enjoy higher consumption in period one and share the burden of re-paying debt with R2 individuals.

CG has the above mentioned cost g, due to the fact that it has already given taxing authority to the regions, and so bailouts entail a higher effort that lowers CG autonomous consumption.[26]

---

[26] For the case of Argentina, one interesting example of this extra effort on behalf of the CG when collecting revenues was the privatization of the Social Security System in 1994. Abandoning the state-funded PAYG system reduced the amount of instruments in the hands of the CG in order to bailout regions, so it has to resort to borrowing, which resulted in an accumulation of an unsustainable level of debt.

3.2.3 CG gives taxing autonomy, RG does not levy a regional tax, and CG allows default

Payoffs when endowment is high:

$W^{RG} = y^h - d$, (20) for RG1 citizens

$W^{CG} = \Pi - \Delta d + y^h$, (21) for CG

Payoffs when endowment is low:

$W^{RG} = y^l - d$, (21) for RG1 citizens

$W^{CG} = \Pi - \Delta d + y^l$, (22) for CG

3.2.4 CG does not give taxing autonomy, bailing out RG

Here, the fiscal decentralization process is not complete. Regions do not have taxing autonomy, so the process of fiscal imbalance worsens. This creates deficit biases in region 1 and, while dollarization forbids the CG to print money to bail out RGs, the tax bailout has the same spirit than an inflation tax in a monetary economy. Dollarization does not solve any problem of fiscal irresponsibility.

Payoffs when endowment is high:

$$W^{RG} = Ay^h - \left(\frac{1-\Delta}{\Delta}\right)R^h b^2$$, (23) for RG1 citizens

$W^{CG} = \Pi + y^h$, (24) for CG

Payoffs when endowment is low:

$$W^{RG} = Ay^l - \left(\frac{1-\Delta}{\Delta}\right)aR^h b^2$$, (25) for RG1 citizens

$W^{CG} = \Pi + y^l$, (26) for CG

3.3 Equilibria

We look for the Weak Perfect Bayesian Equilibrium, restricting ourselves to pure strategies. As mentioned before, we obtain different sets of equilibria.[27] There are different configurations of parameters which support different choices for each level of government. We are interested in looking at the set of beliefs and strategies that give rise to the regional taxation equilibrium and to the equilibrium without fiscal decentralization. The former is the most efficient in terms of the decentralization theorem and reduces the deficit bias observed in regional governments. The latter is of interested since many of the countries undergoing decentralization processes get "stuck" in this intermediate phase of fiscal decentralization. It is worth looking at which configuration of parameters give rise to this equilibrium. Also, this equilibrium suggests that dollarization does not eliminate CG bailouts and so it is not enough as a commitment to induce fiscal discipline in the regions.

3.3.1. Equilibrium with fiscal decentralization and regional taxation

In and equilibrium with fiscal decentralization and government taxation, CG will give taxing autonomy to R1 under the following configuration of parameters:

$$\underline{\varepsilon} > \Delta d, \text{ (27)}$$

$$d > \left(\frac{1 - \Delta}{\Delta}\right) R^h b^2 \text{ (28)}$$

and $d > \left(\frac{1 - \Delta}{\Delta}\right) a R^h b^2$ (29).

Whenever (28) is satisfied, (29) is satisfied too.

The range of values such that CG will give taxing autonomy to the regions and RG will choose regional taxation will increase:

- as $\underline{\varepsilon}$, higher cost of bailout once taxing autonomy has been given.

-default costs are sufficiently high for the regions but not so high so as CG does not grant taxing autonomy in the first place.

-the smaller the size of RG1

-Return structure of government debt

Here, it's interesting to note that output volatility does not matter for the CG to decide to grant taxing autonomy or not. CG will grant it only when it will allow RG to default instead of bailing it out. Whenever CG prefers a bailout to a default, taxing autonomy is not granted, since CG's welfare is higher than decentralizing. Output volatility matters only to the decision of RG whether to tax or not once taxing autonomy has been conceded.

3.3.2 Equilibrium without fiscal decentralization

The configuration of parameters such that CG will not give taxing autonomy to R1 is such that

$$\underline{\varepsilon} \leq \Delta d$$

---

[27] Please refer to the appendix for a detailed analysis of equilibria.

Here CG always prefers not to grant taxing autonomy regardless of *p*. Again, output volatility plays no role in CG decision. Low decentralization costs ξ makes a CG bailout after taxing autonomy has been granted more attractive, and so CG prefers not to give taxing autonomy in the first place.

There are no restrictions on CG beliefs for which it will prefer a BO to a default. It only depends on the fiscal cost of a BO2 with respect to the default costs in CG's government function. This also depends on R1 population, since allowing default is more costly the bigger R1 is. Given that CG always bailout R1, then it is always the case than RG1 will not choose regional taxation, regardless of output realization. Here regional tax effort is non existent and complete fiscal decentralization will never take place.
In the case that $\xi > \Delta d$, then CG will allow R1 default. If this is the case, sufficiently large default costs will ensure RG choose regional taxation. But, as d increases, then the set of values for which CG allows default is reduced, unless the R1 is sufficiently small. Whenever default costs are relatively high to R2 debt holdings, then there is an equilibrium with regional taxation and a positive level of debt. Regional taxation also depends on a. If a is low, then the cost of regional taxing becomes smaller, and RG1 will tax its citizens when output is small.

Policy implications:

There is nothing in dollarization which eliminates RG's incentives to overspend, given the possibility of a CG bailout. This mechanism penalizes fiscally prudent regions, which end up bearing part of the cost of repaying other regions debt. Whenever there is a CG bailout, resources for second period consumption are being shifted from R2 to R1.

Increasing default costs have two opposite effects:

On one hand, it reduces the attractiveness of RG's default with respect to the costs of reional taxation. But, on the other hand, it increases CG incentives for a bailout in the first place, unless the region we are considering is sufficiently small.

Limits to B:
If issuing debt is not allowed for RGs, then the problem disappears. But this solution is a bit hard to implement in a context of federal countries.

Returns on debt:
If the returns on debt are made state contingent, i.e. a is sufficiently low for the bad state of nature increases the probability that RG will choose regional taxation.

4. Conclusions

The model can be understood as follows: the central government (CG) is a mechanism used by the provinces to pass to each other tax pressure to finance their expenditure levels, here, only from R1 to R2. In this sense, it can be compared to a model with externalities, pollution externalities, for example, in which there is a higher than optimal level of pollution. This can be solved either with a central planner or privatizing the cost and benefits of fiscal decisions. For the case of the paper, the solution is either centralizing back all regional expenditures. The only difference with typical externality models is the existence of risk, i.e. the possibility of an adverse shock in the second period. Here, output volatility plays no role in the sense that CG actions are independent of p. It matters just for RG's decision whether to tax its citizens or allowing default. Given this externality, there is a higher level of regional debt, and hence, increasing the probability of a fiscal crisis. Me parece que está mal esto, pero ver como lo arreglo y en donde lo pongo en el paper.

There is nothing about dollarization that aims at eliminating this mechanism. The only thing that is different is the way of "taxing" the externality.

The different sets of equilibria obtained will have different welfare implications for the individuals in each region. The equilibrium with regional taxation is preferred by individuals in region 2, while individuals in region 1 prefer to be bailed out by the Central Government. As it was mentioned before there are different parameters configurations that matters for the choice of equilibrium. The first of them is regional size, since the Central Government weights each region according to its population. The bigger region 1 is, the lower the range of parameters for which the Central Government will give taxing autonomy. Secondly, endowment volatility will also matter. Higher endowment volatility also reduces the scope for granting taxing autonomy for regional governments. Finally, debt holding distributions also should be taken into account. Any legal limitation to the holding of debt outside the region or debt caps to regional debt will also work in this direction.

The goal of this paper was to twofold. First, check whether dollarization or hard pegs are successful in inducing fiscal discipline. In this sense, we observe that central government bailouts do not disappear. While in Cooper et. al (2003) bailout takes the form of monetization of regional deficits, dollarization does not rule out bailouts totally, since a Central Government tax bailout is always possible. Secondly, we wanted to see if it was theoretically plausible to obtain economies that get "stuck" in the middle of a process of incomplete fiscal decentralization. Here, the problem of vertical imbalance continues, and regional deficits and regional debt is too high. The model can be applied to economies like Argentina, Ecuador and African countries in the CFA zone.

References

[1] Alzua, M.L. "Optimal debt Management: the case for Venezuela", working paper, May 2002

[2] Cooper, Russell, Kempf, Hubert, "Designing Stabilization Policy in a Monetary Union", NBER Working Paper 7607, March 2000.

[3] Cooper, Russell, Kempf, Hubert and Peled, Dan. "Is it is or is it Ain't my obligation? Regional Debt in Argentina, mimeo, Boston University, April 2003.

[4] Cooper, Russell and Hubert Kempf. "Dollarization and the Conquest of Hyperinflation in Divided Societies", Federal Reserve Bank of Minneapolis Quarterly Review, 25 (3).

[5] Freire, Maria E., Marcela Huertas and Benjamin Darche. "Sub-national Access to Capital Markets: the Latin American Experience", unpublished, the World Bank, 1998.

[6] Galiani, Sebastian, Daniel Heymann and Mariano Tommasi ,"Great Expectations and Hard Times: The Argentine convertibility plan", *Economia, Journal of the Latin American and Caribbean Economic Association*, Vol 3 (2), 2003, pp. 109-160

[7] Garcia Mila, Teresa and Therese McGuire, "Do Interregional Transfers Improve the Economic Performance of Poor Regions? The Case of Spain", mimeo, December, 1996.

[8] Giugale, Marcelo, Adam Korobow and Steven Webb, "A New Model for Market-based Regulation of Sub-national borrowing: The Mexican Approach", mimeo, World Bank

[9] Gonzalez, Christian, David Rosenblatt and Steven Webb, "Stabilizing Intergovernmental Transfers in Latina America: A Complement to National/Subnational Fiscal Rules?", World Bank Policy Research Working Paper 2869, July 2002

[10] Krugman, Paul, "A Model of Balance of Payments Crises", Journal of Money, Credit and Banking, Vol , No. 3 (August 1979), 311-325

[11]Oates, Wallace, "An Essay on Fiscal Federalism", JEL, Vol XXXVII (September 1999), pp 1120-1149

[12] Tommasi, Mariano, "Federalism in Argentina and the Reforms of the1990's", Working Paper 147, Center for Research on Economic Development and Policy Reform, Stanford University, August 2002.

[13] Tommasi, Mariano, Sebastian Saiegh and Pablo Sanguinetti, "Fiscal Federalism in Argentina: Policies, Politics and Institutional Reform", Revista Economia, Spring 2001

[14] Shah, Anwar, "Fiscal Federalism and Macroeconomic Governance: For Better or for Worse?", mimeo, World Bank, June 1997

Appendix

Game: Figure XX
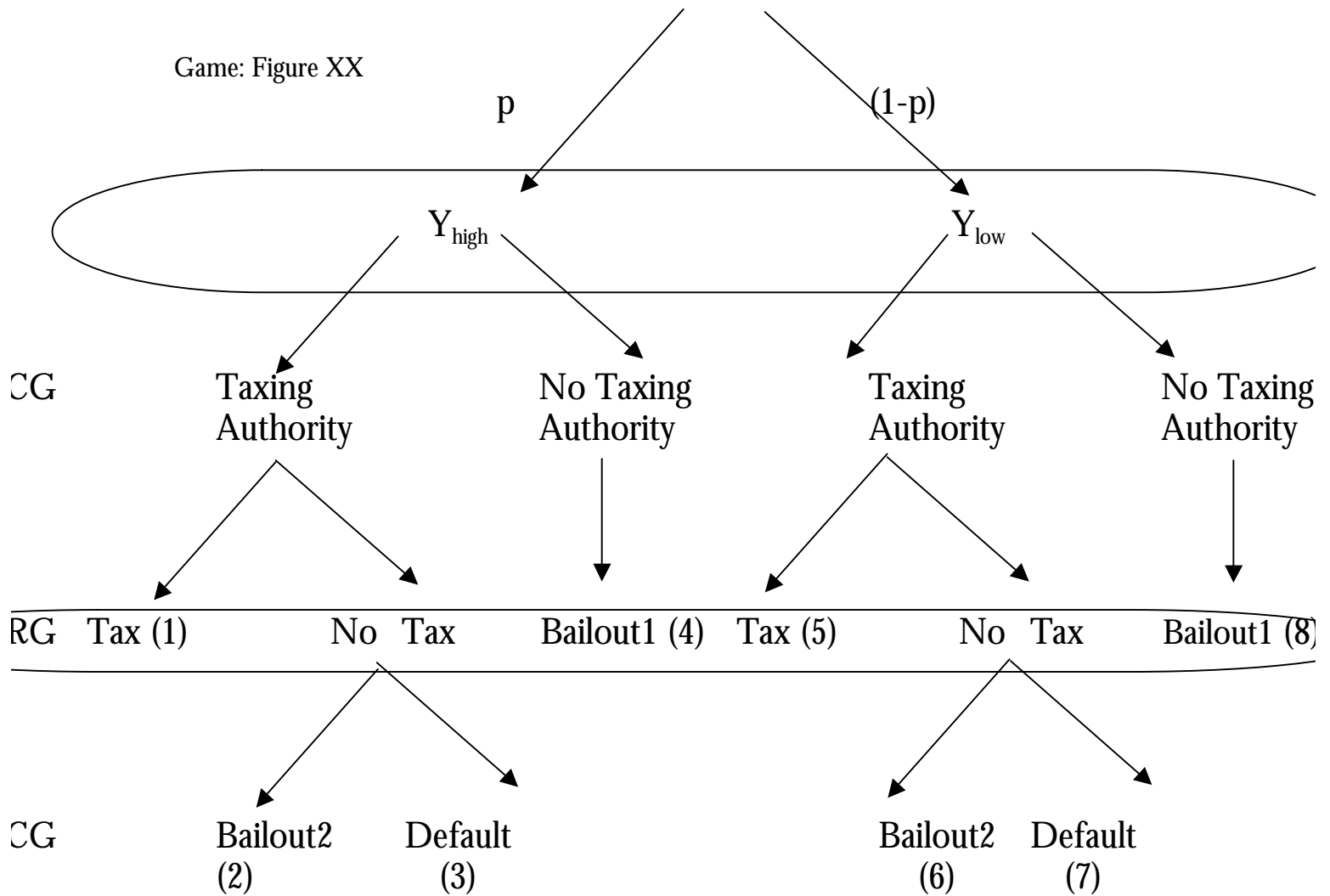
The joint strategies of both players are:

$\Gamma = \Gamma(CG, RG) = \{[(TA, BO2), (Tax,Tax)], [(TA, BO2), (Tax,No Tax)], [(TA, BO2), (No Tax,Tax)], [(TA, BO2), (No Tax,No Tax)], [(TA, D), (Tax,Tax)], [(TA, D), (Tax,No Tax)], [(TA, D), (No Tax,Tax)], [(TA, D), (No Tax,No Tax)], [NTA(BO1), -i]\}$, where *i* is any action taken by RG1.

We construct the pay-offs for each node of the game:

(1) $W^{CG} = \Pi + y^h$

$$W^{RG} = y^h - \left(\frac{1-\Delta}{\Delta}\right)R^h b^2$$

(2) $W^{CG} = \Pi - \boldsymbol{g} + y^h$

$$W^{RG} = Ay^h - \left(\frac{1-\Delta}{\Delta}\right)R^h b^2, \text{ where } A = \left(\frac{\Delta + \boldsymbol{t}(1-\Delta)}{\Delta}\right)$$

(3) $W^{CG} = \Pi - \Delta \boldsymbol{d} + y^h$

$W^{RG} = y^h - \boldsymbol{d}$

(4) $W^{CG} = \Pi + y^h$

$$W^{RG} = Ay^h - \left(\frac{1-\Delta}{\Delta}\right)R^h b^2$$

(5) $W^{CG} = \Pi + y^l$

$$W^{RG} = y^l - \left(\frac{1-\Delta}{\Delta}\right)aR^h b^2$$

(6) $W^{CG} = \Pi - \boldsymbol{g} + y^l$, where

$$W^{RG} = Ay^l - \left(\frac{1-\Delta}{\Delta}\right)aR^h b^2$$

(7) $W^{CG} = \Pi - \Delta \boldsymbol{d} + y^l$

$W^{RG} = y^l - \boldsymbol{d}$

(8) $W^{CG} = \Pi + y^l$

$$W^{RG} = Ay^l - \left(\frac{1-\Delta}{\Delta}\right)aR^h b^2$$

Equilibria

In order to define a Weak Perfect Bayesian Equilibrium we must define a set of strategies and system of beliefs (s, m) such that s is sequentially rational given the system of beliefs m and the system of beliefs m is derived from strategy profile s through Bayes' rule whenever possible.

Last stage of the game

CG will prefer Bailout2 to default for the following set of beliefs:

$$BO2 \succ_{CG} D \leftrightarrow m(\Pi + y^h - g) + (1 - m)(\Pi + y^l - g) \geq$$

$\geq m(\Pi + y^h - \Delta d) + (1 - m)(\Pi + y^l - \Delta d)$, which requires $g < \Delta d$ with no restrictions on CG's beliefs.

If $g < \Delta d$, there are no restrictions on beliefs, and CG will always prefer to bail out the regions than to allow default. As g increases, a bailout becomes more costly in terms of CG welfare. This also will depend of the size of R1 and the technology that penalizes default. Note than here, increasing default costs, increases the set of values of g for which CG will prefer a bailout. Also, there are no restrictions on beliefs m, so output volatility does not matter in order for the CG to choose a course of action.

Second stage of the game

RG1 has the following strategies for each realization of endowment: (Tax, Tax), (Tax, No Tax), (No Tax, No Tax), (No Tax, Tax)

a) $\underline{g} < \Delta d \Leftrightarrow BO2 \succ_{CG} D$

a.1. Left node: $No\,Tax \succ_{RG} Tax$, whenever $t(1-\Delta) \geq 0$, which is always the case. RG will always choose no regional taxation.

a.2 Right node: $No\,Tax \succ_{RG} Tax$, whenever $t(1-\Delta) \geq 0$, which is always the case. RG will always choose no regional taxation as in the left node. Here again, output volatility plays no role in the set of strategies that is chosen.

Whenever RG1 knows CG will proceed to a bailout, then, they will never choose taxation, since by a bailout RG can pass the cost of repaying RG1 debt to R2 individuals. This means higher consumption for R2 agents in the second period.

b) $\underline{g} < \Delta d \Leftrightarrow D \succ_{CG} BO2$

b.1. Left node: $No\,Tax \succ_{RG} Tax$, whenever $d \leq \left(\dfrac{1-\Delta}{\Delta}\right) R^h b^2$ (*)

b.2 Right node: $No\,Tax \succ_{RG} Tax$, satisfied whenever $d \leq \left(\dfrac{1-\Delta}{\Delta}\right) a R^h b^2$.(**)

Default costs d which satisfy (**), will also satisfy $d \leq \left(\dfrac{1-\Delta}{\Delta}\right) R^h b^2$, since $a < 1$. If, (*)

holds but (**) does not, then RG will choose taxation in the bad realization of endowment but no taxation when endowments are high. This seems a little counterintuitive, since one would expect that the lower realization of output would induce the RG to be more inclined towards a bailout. This depends on a. When a small, then the tax effort in terms of output is is low, so consumption will increase with regional taxation relative to default.
By increasing default costs, the set for which (*) holds is reduced, but the probability of a CG bailout increases. Unless the loss in welfare for CG $\underline{g}$ is too high, then increasing default costs has this potential harmful effect in terms of regional taxation.

First stage

a) $\underline{g} \leq \Delta d \Leftrightarrow BO2 \succ_{CG} D$ and $No\,Tax \succ_{RG} Tax$ (under $t(1-\Delta) \geq 0$)

$NTA \succ_{CG} TA \Leftrightarrow$, is always preferred regardless of p. Here, output volatility plays no role in deciding whether CG will give taxing autonomy or not. Given that CG will bailout RG, then it prefers not to grant TA in the first place, increasing CG welfare by $\underline{\epsilon}$.

b) $\underline{\epsilon} > \Delta\alpha \Leftrightarrow D \succ_{CG} BO2$ and $No\,Tax \succ_{RG} Tax$ (under (*) and (**)

$NTA \succ_{CG} TA$, always.