Achieving Fiscal Discipline in Federations: Germany and the EMU

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Paper prepared for 'Fiscal policy in EMU: New Issues and Challenges" Workshop organized by European Commission, Brussels, 12 November 2004

"The creation of Debt should always be accompanied with the means of extinguishment."
Alexander Hamilton
Report on Public Credit, 1790[1]

This paper transforms Alexander Hamilton's simple dictum into an argument about how to achieve fiscal discipline in systems of multi-layered government. In short, all governments that are allowed to issue debt should have autonomy over the tax base that backs it up. Broadly speaking, this means one of two things: (1) the central government controls both taxation and borrowing, or (2) subnational governments have sufficient control over taxation to approach credit markets as sovereigns. As obvious as it may seem, this simple rule has been broken in a variety of federations ranging from Argentina to Germany, where subnational governments are free to borrow in spite of the fact that the "means of extinguishment" are firmly in the hands of the federal government. This paper argues that because of an underlying commitment problem, this combination can result in fiscal indiscipline with potentially serious macroeconomic consequences. Already clearly present in Germany, this problem could emerge from the process of fiscal decentralization in other EU member states if institutions are not designed with care.

The argument proceeds in several steps. In the first section, a basic problem of finance in multi-tiered systems is captured by a dynamic game of incomplete information. After facing an exogenous shock, subnational officials make decisions about whether to pursue politically costly fiscal adjustment based on their beliefs about the credibility of the central government's commitment not to bail them out in the event of a future debt crisis. When the central government can commit, subnational

[1] Report Relative to a Provision for the Support of Public Credit, New York, January 9, 1790, available in Syrett (1962), page 106.

governments are like miniature sovereigns, and fiscal discipline is enforced by voters and credit markets alone. But if the central government's commitment is not fully credible, subnational officials face incentives to delay or avoid adjustment by pursuing unsustainable borrowing.

The second section argues that the nature of the federal government's ongoing involvement in financing local public goods shapes its commitment. In short, when subnational governments are heavily dependent on revenue-sharing, grants, and loans from the central government and its intermediaries, the central government cannot fully commit to ignore future bailout requests. The third section demonstrates this by presenting data on credit ratings from several federations. When the central government takes on heavy co-financing obligations, credit rating agencies view the central government as implicitly responsible for subnational debts.

The fourth section examines the implications of such implicit guarantees for subnational fiscal incentives by briefly contrasting the fiscal behavior of the German Länder, arguing that transfer-dependence is a reasonably good proxy for the strength of bailout expectations. In spite of the fact that the constitution ensures equal fiscal capacity in all Länder, the more transfer-dependent Länder are more indebted and slower to adjust to negative revenue shocks.

The final sections explore policy implications for subnational governments within individual EU member states and for the European Monetary Union as a whole. A simple look at the division of tax authority in the European Union suggests that few subnational governments can approach credit markets as sovereigns. As a result, enthusiasm about the possibility of pure market discipline of subnational governments

should be kept in check. On the other hand, the framework presented in this paper provides few reasons to worry about the bailout problem among the member states of the EMU, which is frequently cited as a justification for the stipulations of the Excessive Deficit Procedure.

I. The bailout game

Consider a simple game played between a central government (CG) and a single subnational government (SNG), both of whom are concerned with the expected electoral consequences of their fiscal policy decisions. A simple dynamic game of incomplete information is displayed in extensive form in Figure 1.[2]

[FIGURE 1 HERE]

Information is incomplete because subnational governments do not know the central government's "type." That is, they do not know if, in the event of a future fiscal crisis at the final stage of the game, the central government will prefer to allow the subnational government to default (the resolute type) or will prefer a bailout (the irresolute type). The subnational government is faced with an adverse fiscal shock with lasting effects—for example a recession. In its first move after experiencing a negative shock, the subnational government may choose to adjust immediately and end the game, for which it receives EA—the payoff from early adjustment. Alternatively, it can refuse to adjust and deal with the shock by pursuing borrowing that may ultimately be unsustainable, hoping for an eventual bailout from the central government. The center must then decide

[2] The "bailout problem" has also been modeled as a sequential game driven by the central government's incentives by Wildasin (1997), who focuses on the structure of jurisdictions, and by Inman (2003), who considers a range of factors, including some of those discussed below. This approach is distinct, however, in that it focuses on incomplete information.

whether it will quietly resolve the burgeoning problem by providing some additional funding to reduce the subnational government's growing debt burden. If it decides to do so, the game ends with EB—the payoffs for "early bailout." If it decides not to provide the bailout initially, a second stage ensues where the stakes are higher, a debt crisis has emerged, and default is imminent. Again the subnational government faces a choice between adjusting and attempting to externalize the costs of adjustment, although this time the bailout will be more expensive and explicit. Once again, the central government must decide whether to provide it.

The expected utilities of the subnational government are driven by the expected electoral values of each outcome. Subnational officials are concerned about the negative electoral consequences of adjustment, and would prefer that the costs of adjustment be paid by citizens of other jurisdictions. The subnational government prefers a quiet early bailout (EB), but if it cannot get a bailout at the fist stage, it prefers to get one at the later stage (LB). If no bailout will be provided and the subnational government must pay the costs of adjustment itself, it would prefer a less costly early adjustment (EA) to a painful late adjustment (LA). The worst of all worlds is default without federal assistance (D). Thus the subnational government's payoffs, common knowledge to everyone, are:[3]

$$U_{sng}(EB) = 1 > U_{sng}(LB) > U_{sng}(EA) > U_{sng}(LA) > U_{sng}(D) = 0.$$

The central government's preferences are less clear. All players know that the central government prefers for the sub-central government to adjust by itself rather than run a large deficit and demand a bailout. The game is interesting, however, because the

[3] The payoffs are normalized to simplify calculations.

subnational government does not know the central government's preferences as the game continues. The subnational government does not know with certainty whether it will be more politically costly for the center to provide or deny a bailout. This is similar to a scenario that has been modeled by students of international conflict as the "deterrence game" (Morrow, 1994: 200), in which military challengers must make decisions about whether to wage war or back down without knowing the resolve of defenders. In the same way, sub-central governments do not know the resolve, or commitment, of the central government to resist the demand for bailouts.

The most intuitive way to deal with this kind of limited information is to follow Harsanyi (1967), capturing the uncertainty in the mind of the subnational government by thinking of the game as beginning with a chance move that determines the central government's type—either resolute or irresolute. The central government is informed of its own type, but the subnational government is not. The central government may try to announce its commitment up front, but the sub-central government knows that it may be cheap talk. If the central government is of the resolute type, it always prefers *not* to provide the bailout: The payoffs for a resolute and irresolute central government, respectively, are:

$U_{cgr}(EA) = 1 > U_{cgr}(LA) > U_{cgr}(D) > U_{cgr}(EB) > U_{cgr}(LB) = 0.$

$U_{cgi}(EA) = 1 > U_{cgi}(LA) > U_{cgi}(EB) > U_{cgi}(LB) > U_{cgi}(D) = 0.$

At each of its decision nodes, the subnational government does not know whether it is playing in the upper or lower branch of Figure 3.1, though it updates its beliefs about the center's type after observing the first round. The subnational government starts out believing that the center is resolute with probability p, irresolute with probability 1-p. When it reaches its second information set, p has been updated to $\overline{p}$.

First, consider the equilibria under perfect information. By backwards induction, it is clear that if p=1 (the subnational government believes with certainty that the center is resolute), the game ends quickly because the subnational government plays "adjust" in its first move, foreseeing that the center will play "no bailout" every step of the way, leaving the subnational government in the future with even less attractive options than adjustment. If the center is known to be irresolute (p=0), the subnational government will allow a fiscal crisis to develop by refusing to adjust, knowing that the center cannot tolerate a default. The game ends with an early bailout since the irresolute center can gain nothing by waiting.

We now have a clear way to think about subnational fiscal sovereignty. At one end of a continuum, if p=1 a subnational government is best understood as a miniature sovereign borrower. At the other end, where p=0 the government is a non-sovereign. Yet the game is interesting because information about the center's preferences over future bailouts is often incomplete. When this is true, the subnational government's decision about whether to adjust is shaped in large part by its evolving assessment of the central government's resolve.

The appropriate solution concept in this dynamic game with incomplete information is a perfect Bayesian equilibrium (PBE). The solution is discussed in detail

in the appendix, but the key insights are easily summarized. First of all, it is important to note that there is no separating equilibrium in pure strategies. In other words, the subnational government—though it updates its beliefs after the first round—cannot surmise that an irresolute center always plays "early bailout" and a resolved center always plays "no bailout" in the first stage. Such a posterior belief for the subnational government is not consistent with the incentives of an irresolute center, which would take advantage of these beliefs by always masquerading as the resolute type in the first period, playing "no bailout" and inducing its preferred outcome, "late adjustment" by the subnational government.

This means, quite simply, that if p is sufficiently high initially, the subnational government might mistake an irresolute for a resolved center after observing "no bailout" in the first round. The subnational government knows it might be making this mistake, but the probability of running into a resolute center is perceived to be sufficiently high that the subnational government prefers the fourth-best "late adjustment" payoff to prolonging the crisis and taking its chances by pressing further for bailouts. In this equilibrium, the subnational government has essentially tested the resolve of the center and backed down. It was sufficiently uncertain about the center's resolve that it was willing to avoid adjustment and borrow heavily at first, but after the center has done nothing and default emerges as a realistic possibility, the subnational government chooses to back down. Of course the game can also end in "late adjustment" if a resolved center plays "no bailout" and the subnational government wisely backs down.

Other things equal, lower initial values of p increase the likelihood that subnational governments will avoid adjustment in the first round. The appendix

establishes a critical value for *p*, below which it makes sense for a rational subnational government to push for bailouts in the first round. As these "resolve testing" equilibria demonstrate, this does not mean that bailouts will ultimately be received, nor does it mean that the subnational government will experience disastrous defaults. Irresolute central governments might use the intergovernmental transfer system to relieve debt burdens of subnational governments well before full-blown fiscal crises develop. Subnational governments might angle to position themselves for such transfers but ultimately give up before the debt-servicing crisis emerges. A dramatic last-minute bailout on the eve of default only happens when an irresolute center attempted to masquerade as resolute and the subnational government called its bluff. A dramatic default without a bailout should only happen when the subnational government misperceives the center's type.

As a guide to empirical research, the model suggests that manifestations of bailout expectations among subnational governments are not limited to dramatic defaults or last-minute bailouts under pressure from creditors, but in many plausible scenarios imply more routine early bailouts (gap-filling intergovernmental transfers) or delayed adjustment. The simplest empirical implication of this model, then, is that if one can identify institutional, demographic, or other factors that are associated with high values of *p*, one should expect to find that subnational governments adjust to external shocks and maintain long-term fiscal balance on their own. If institutional and political arrangements suggest sufficiently low values of *p*, one should expect a greater willingness of subnational governments to avoid or delay adjustment, resulting in larger and more persistent deficits.

II. Intergovernmental grants, taxation, and commitment

Elsewhere I examine a range of factors that shape perceptions of the center's resolve (Rodden 2005), but the remainder of this paper focuses on the most crucial factor: the basic structure of the intergovernmental fiscal system. The mixture of local taxes, fees, user charges, intergovernmental transfers, and borrowing that fund the expenditures of state and local governments help shape the incentives of subnational officials, and provide important signals to voters and creditors. In the bailout game, the preferences of the center and lower-level governments are driven by their expected electoral consequences. It is natural to assume that the electoral fortunes of subnational governments are driven primarily by their performance in providing local collective goods ranging from schools to police cruisers to a healthy local business climate. Central government officials are retrospectively evaluated by voters according to their performance in providing nation-wide collective goods like national defense, macroeconomic stability, and economic growth. Yet under some conditions, the center knows that it will also be held responsible for the (non) provision of purely local goods. Quite simply, this is most likely to happen when the center is heavily involved in funding the provision of such goods by subnational governments.

Thus intergovernmental grants are at the heart of the commitment problem. If subnational governments were financed purely by local taxes, charges, and borrowing, voters and creditors would view the obligations of local governments as autonomous and "sovereign" like those of central governments. That is, p in the bailout game would be

close to zero. As a matter of both normative theory and descriptive fact, however, intergovernmental systems always involve the vertical flow of funds between governments. Theoretical and empirical studies in public economics suggest that individuals view grants and "own-source" local revenues through different lenses. A key proposition of the "fiscal illusion" literature is that when the link between taxes and benefits is distorted or broken, as is the case with intergovernmental grants, voters are less likely to sanction overspending by politicians. Intergovernmental grants create the appearance that local public expenditures are funded by non-residents.[4] Grant programs often supply concentrated local benefits that are funded by a common national pool of resources. Local voters, local politicians, and regional representatives within the central legislature all receive fiscal or political benefits from grant programs without internalizing their full cost, causing them to demand more expenditures funded by grants than own-source taxation. The vast empirical literature on the so-called "flypaper effect" shows that increases in intergovernmental grants rarely lead to local-level tax reductions, and increases in transfers stimulate much higher expenditures than do similar increases in locally-generated revenues (for an overview, see Hines and Thaler 1995).

Although some aspects of the flypaper effect are still something of a mystery, the common theme in this literature is the notion that intergovernmental grants, as opposed to local taxation, alter perceptions and beliefs about the levels of local expenditure that can be sustained. As a result, decentralization might exacerbate rather than resolve the basic "common pool" problem of budgeting in representative democracy if it is driven by grants rather than own-source taxation. An empirical literature has established a link

[4] For an overview of concepts and measurements of fiscal illusion and a literature review, see Oates (1991). For a theoretical application to intergovernmental grants in particular, see Oates (1979).

between transfer-dependence and the growth of government (e.g. Winer 1980, Stein 1998, Borge and Rattsø 2002). The central proposition here is that transfer-dependence also alters beliefs about the sustainability of subnational deficits by encouraging local politicians—along with their voters and creditors—to believe that the central government will ultimately find it impossible to ignore their fiscal woes. Quite simply, when the central government is responsible for providing a large and growing share of local budgets, in the event of a local fiscal crisis, the eyes of voters and creditors will quickly turn to the central rather than the local government for a resolution.

When a highly transfer-dependent local government faces an unexpected adverse fiscal shock, it may not have the flexibility to raise additional revenue, forcing it to cut services, run deficits, or rely on arrears to employees and contractors. If the situation escalates into a fiscal crisis in which the subnational government is unable to pay workers or may default on loans, it can claim—in many cases with some justification—that it is not responsible for the situation. If successful in this strategy, eventually pressure from voters and creditors will be directed at the central government, which quite likely *can* resolve the crisis. It is then difficult for the central government to resist political pressure from bondholders, banks, local parents, or public sector unions. Knowing this, transfer-dependent local governments can face weaker incentives for fiscal responsibility. Even if subnational governments can take simple but politically costly steps to avoid an impending fiscal crisis, it may be more rewarding to position themselves for bailouts.

The vulnerability of transfer-dependent governments to shocks might be exacerbated by something similar to the so-called "Samaritan's Dilemma." Stephen Coate (1995) presents a model in which the government represents altruistic wealthy

individuals and makes transfers on their behalf to the poor. In this context, the dilemma arises because "the poor may have an incentive not to buy insurance and to rely on private charity to bail them out in the event of loss. The rich are unable to commit not to help out the unlucky poor even if the government is making the ex ante desirable transfer" (Coate 1995: 46). Coate goes on to demonstrate adverse efficiency effects associated with the poor failing to take out insurance in anticipation of private charity. A similar problem might arise in the intergovernmental arena. If the center reveals its redistributive intent with large transfer programs, the poorest and most transfer-dependent provinces might have few incentives to insure themselves against negative shocks, knowing that the center is unlikely to tolerate excessive suffering, and will step in with special emergency transfers. When this is the case, provincial governments have no incentives to save during good times or adjust to negative shocks.

III. Credit ratings and bailout expectations

A difficulty with testing this argument is that bailout expectations are difficult to measure. Lacking appropriate survey data, it is difficult to measure the beliefs of voters or subnational officials. However, the perceptions of creditors can be ascertained through default premia and credit ratings. Because dates of issue and maturity vary so widely across bond issues even within one country, it would be extremely difficult to come up with a comparable dataset of bond yields. However, credit ratings assembled by the major international rating agencies are meant to be assessments of default risk that allow for comparisons within a national and international peer group.

In the late 1990s the number of subnational entities around the world formally subjecting themselves to the credit rating process has dramatically increased. By obtaining credit ratings, subnational governments hope to increase their access to lower-cost international capital and promote investor confidence. Along with the proliferation of credit ratings has come a rising tide of optimism about the likelihood of increased market discipline among subnational governments. However, a brief look at some ratings and a discussion of their logic should stem the tide.

The most important rating agencies are Moody's, Fitch (Fitch, Ibca, Duff and Phelps), and Standard and Poor's. Ratings are based on many of the same criteria used to assess sovereign debtors: GDP per capita, the strength and growth of the tax base, debt and interest payments relative to GDP and revenues, recent budget deficits, whether borrowing is undertaken for capital or current expenditures, the diversification of the economy, and several judgmental factors pertaining to the quality of institutions, political leaders, and recent fiscal decisions.[5]

In addition, rating agencies pay careful attention to the system of intergovernmental finance in which the local or regional government is embedded. First of all, agencies take stock of the overall country risk, and the sovereign rating generally acts as a ceiling on subnational foreign currency ratings. This is because local governments may eventually be forced to rely on the central bank to secure the foreign exchange needed for external debt service. However, each of the major rating agencies also assembles separate domestic ratings that exclude the sovereign risks associated with converting and transferring currency outside the country.

[5] See Fitch Ibca, "Subnational Rating Methodology" (1998) and Standard and Poor's *Viewpoint*, "Local Government Ratings Worldwide" (2000).

One of the most important tasks of credit rating agencies when assessing a subnational government's default risk is assigning some probability to the likelihood of federal bailouts in the event that local governments are unable to service their debts. This requires a careful analysis of the system of intergovernmental transfers. Agencies clearly take a dim view of highly discretionary and unpredictable transfers, which may expose governments to sudden or arbitrary loss of revenue and cannot be relied on for debt servicing capacity in the future. On the other hand, stable and predictable transfers are viewed quite favorably, and whether or not governments explicitly pledge transfers as collateral to lenders, it would appear that rating agencies view guaranteed transfers as a reliable income stream for future debt servicing. "In some cases, the terms may come close to guaranteeing regional revenues and debts, and the implications for credit ratings will be favorable" (Fitch Ibca 1998). The most attractive transfer programs from the rating agencies' perspective are general-purpose equalization transfers that guarantee certain baseline revenue levels among all governments. "Certainly, these programs raise the credit profile of the recipients—economically disadvantaged regions. If the equalization system quickly adapts to changing fortunes, this type of system is a positive, even for those that are net contributors, in that they provide a safety net of varying importance during difficult times" (Standard and Poor's 2002: 7).

Rating agencies are quite clear in stating that highly transfer-dependent local governments are viewed essentially as extensions of the central government. In countries like the UK or Norway, local governments are able to finance infrastructure projects at subsidized interest rates through a guarantee by the central government or a public bank, but in return the central government allocates the capital and places restrictions on

borrowing. In this scenario there is little reason to bother with local credit ratings, and traditionally such municipal governments have not been rated. Recently, decentralization reform programs have focused on facilitating more autonomous local borrowing, especially in Europe, and investors have displayed a strong appetite for municipal bonds. Hence rating agencies have started to look carefully even at countries where the center essentially guarantees local borrowing by transfer-dependent entities. A Moody's report comments that if UK local governments apply for ratings—as seems possible as part of the government's decentralization program—centralized funding and regulation of local budgetary decisions lends sufficient comfort to investors that the local governments would likely receive the Aaa rating of the central government or something very close (Moody's 2001). Standard and Poor's (2002) acknowledges that "a track record that demonstrates general intergovernmental supportiveness may be cited as an extraordinary item incorporated into the entity's stand-alone rating." In this scenario, where local governments receive 74 percent of revenue from transfers, rating agencies attach relatively little weight to local fiscal and economic outcomes in the presence of a perceived central guarantee.

[TABLE 1 HERE]

But very often when central governments allow independent access of subnationals to international credit markets they do not provide an explicit guarantee. In most cases they make some form of "no bailout" pledge. In such cases, it is the job of the rating agency to assemble as much information as possible to gauge the likelihood of an implicit guarantee and assess the speed with which federal funds would likely be released. Above all, this requires analysis of the intergovernmental transfer system.

Table 1 allows for some explicit comparisons of the decisions of one rating agency—Standard and Poor's—in several federations (chosen purely on the basis of the availability of credit ratings and comparable supplementary data). Standard and Poor's has a long history of rating all but a handful of U.S. states and all of the Canadian provinces. Since the Australian Commonwealth government stopped borrowing on behalf of the states and allowed them to access international credit markets on their own in the late 1980s, S & P has rated all of the Australian states and the Capital Territory. In addition, relatively new ratings have now been assembled for the Spanish Autonomous Communities and German Länder.[6] Table 1 presents domestic currency credit ratings, as well as a numerical equivalent to facilitate some calculations.[7] The numerical scale starts with B+ = 0 and runs through AAA = 13. The table also presents some basic data on transfer-dependence, population, and GDP per capita.

Perhaps the most basic indicator for assessing default risk is a jurisdiction's existing debt burden. But an interesting question is whether the risk associated with a jurisdiction's debt burden should be evaluated relative to a state's total revenue—including shared taxes and grants over which it has little control—or only the revenue it raises from its own taxation. Both measures are provided in Table 1. Although a simple comparison of debt burdens, transfer dependence, and credit ratings is likely to miss a great deal of subtlety—for instance important determinates of creditworthiness like

[6] Table 1 presents data from 1996 for the U.S., Canada, and Australia because of limits on availability of more recent comparable debt data for Australia. It was necessary to present data from 1999 for Spain and Germany because this was the first year for which ratings were assigned to most of the autonomous communities and Länder.

[7] Foreign and domestic ratings are identical in the U.S., Germany, and Spain at both central and subnational levels. The Canadian and Australian federal governments have consistently faced lower foreign currency than domestic currency ratings due to perceived foreign exchange risk. Curiously, the foreign and domestic currency ratings have always been identical for the Canadian provinces until a recent upgrade of Alberta's domestic currency rating to AAA. Only in Australia are there systematic differences between the foreign and domestic ratings of the federated units.

economic diversity and unfunded pension liabilities—it can teach some important lessons.

Note that the average level of dependence on federal transfers for the U.S. states and Canadian provinces in 1996 is only around 23 percent, while the average for the Australian states and Spanish Autonomous Communities is roughly twice as high. The German system relies heavily on shared taxes that the Länder do not directly control, and thus provides even less revenue autonomy.

[FIGURE 2 HERE]

If S & P assesses the ex ante probability of an irresolute center as zero, provincial debts should be evaluated relative to own-source provincial taxes, and similar debt burdens should be associated with similar credit ratings in different countries. Figure 2 provides scatter plots and a fitted line for debt burdens and credit ratings in four federations. Within each country, provinces with higher debt burdens can expect lower credit ratings and presumably higher interest rates. Yet this correlation does not imply that credit markets "discipline" provincial governments. A Canadian province or U.S. state with a debt/own-source revenue ratio of 100 percent (the dashed vertical lines) can expect to be rated AA-. However, an Australian state with a similar debt burden can expect either AA+ or AAA. A similarly situated Spanish Autonomous Community can expect an AA rating.

The boost to Australian and Spanish subnational entities clearly comes from S&P's assessment of an implicit federal guarantee. When taken as a share of own-source revenue, the Australian states' average debt burden was almost twice that of the U.S. states, and only slightly lower than that of the Canadian provinces. Yet all of the

Australian states were clustered tightly around the Commonwealth Government's AAA domestic rating. Until 1990, all borrowing on behalf of the Australian states was undertaken by the Commonwealth government and on-lent to the states at the same interest rate. Since then, the states have been allowed to undertake independent borrowing and are progressively redeeming the debt issued by the Commonwealth government, with flexible yearly limits placed on new borrowing through negotiations with the central government in the Australian Loan Council (Grewal 2000). Prior to 1990, it was very difficult to view the states as sovereign borrowers; the Commonwealth government has implicitly stood behind the states' debts since the 1930s. Reforms in the 1990s have aimed at extracting the commonwealth government from state borrowing while increasing the accountability and independent fiscal responsibility of the states, but "Standard & Poor's believes… that the Commonwealth would probably provide emergency support to the states in a time of financial crisis" (Standard & Poor's 2002: 75). Moreover, the Commonwealth Government has been successful in influencing state borrowing by threatening to reduce the transfers of governments (Queensland in particular) that did not abide by global borrowing limits set by the Australian Loan Council (Grewal 2000). This creates the possible perception that Canberra would be able to withhold grants in the future in order to force debt repayment.

By 1996 the Australian states only had a six-year track record of truly independent borrowing, yet two of six states and the capital territory received AAA ratings. Contrast this with the U.S. states, where after over 100 years of independent borrowing without a default, only four of 39 states rated by Standard and Poor's received AAA ratings. In spite of a higher debt burden and a nagging problem with off-budget

pension liabilities, the average credit rating of the Australian states was higher than that of the U.S. states. The contrast with Canada is even more striking. No province has defaulted since the great depression, yet even the consistently low debt burdens of British Columbia and Alberta did not earn AAA ratings,[8] and the average rating was A+ compared with Australia's AA+. In fact, according to Standard and Poor's, the default risk for Newfoundland and Saskatchewan in 1996 was similar to that of Colombia, Croatia, or El Salvador.

The only way to make sense of the Australian ratings—especially that of Tasmania—is if Standard and Poor's assumes no implicit federal support and evaluates the debt burden relative to *own-source* revenue in Canada and the United States, while seeing the transfer system as implying a federal guarantee in Australia and evaluating the debt burden relative to *total* revenue.

Standard and Poors' assumption of an implicit federal guarantee is even clearer in the Spanish case. While the debt burdens of all the autonomous communities seem quite reasonable in international comparison when taken as a share of total revenue, they are extremely high (over 250 percent of own-source revenue) in four of the most transfer-dependent communities. Yet none of the autonomous communities receives a rating below AA-. In the most extreme case, Andalucia raises only 24 percent of its revenue from taxation, its debt is over 600 percent of own-source revenue, yet it receives S & P's AA- rating, similar to Pennsylvania. In the Spanish case, to infer a central government guarantee requires little imagination. With the exception of Navarra and País Vasco, the

[8] Alberta finally received a AAA rating in 2002.

Spanish Autonomous Communities have extremely limited tax autonomy.[9] The intergovernmental fiscal system insures that each autonomous community's share of the personal income tax will rise at least in line with Spain's nominal GDP on an annual basis. Furthermore, if any region's growth rate should fall below 90 percent of the average for other regions, compensating transfers will be made from a "guarantee" fund. An additional guarantee mechanism stipulates that per capita revenue for each region may not fall below 90 percent of the national average over a five-year period. The message taken away by rating agencies is clear:

> Thus far, the Spanish financial system has been supportive for those regions with a weaker economic base and Fitch has placed much value on the present revenue equalization system and guarantees in place that cushion the economically weaker regions and promote solidarity. The agency would like to see some kind of equalization mechanism kept in place… (Fitch 2000: 5).

[FIGURE 3 HERE]

Finally, debt burdens among the German Länder are so high that they require their own graphs with a different scale. Figure Three includes scatterplots with both debt/total revenue and debt/own-source revenue on the x-axes. The story is similar to Spain. The rating agencies clearly perceive an implicit federal guarantee in the fiscal constitution and equalization system, and have taken comfort in recent bailouts of troubled Länder. The states would not be creditworthy if their debt burdens were assessed relative to their meager own taxes (on average the ratio is almost 2000 percent). Debt is even quite high as a share of total Land revenue (175 percent). Yet Fitch is so confident in the federal government's implicit guarantee that it assigns its AAA rating to each of the 16 Länder—even bankrupt Berlin. Standard & Poor's rates only 8 of the Länder, three of which

[9] Even some of the revenues not counted as "grants" in Table 1 are actually "ceded taxes" over which the Autonomous Communities have very little control. See Garcia-Milà et al (1999).

receive AAA ratings, and on average the Länder are more highly rated than the U.S. states and Canadian provinces. Unlike Fitch, Standard & Poor's differentiates between the credit quality of the Länder primarily out of concern over the speed with which bailouts would be administered in the event of a debt servicing crisis.

These credit market perceptions are in stark contrast to analyses of Canada and the United States: "Fitch's evaluation… centers fundamentally on the creditworthiness of the (Canadian) provinces themselves and not on any benefits the provinces derive from federal support" (Fitch 2001a: 2). Canada also has an equalization program that essentially guarantees a revenue floor for the poorest provinces, but rating agencies apparently do not view the Canadian equalization plan as implying a federal guarantee. In fact, an ordered probit analysis of Canadian provincial S & P ratings by Cheung (1996) shows that even controlling for GDP and unemployment, transfer-dependence has a negative effect on credit ratings. Compared with the German and Australian central governments, the Canadian and U.S. federal governments have a great deal of discretion over intergovernmental transfers, and have a history of balancing their own budgets by slashing transfers to provincial and state governments. As a result, rating agencies apparently view relatively poor, more transfer-dependent provinces in Canada and the U.S. as more vulnerable to arbitrary cuts in transfers than the disadvantaged federated units in Australia, Spain, and Germany.

It appears that Fitch's statement about the Swiss Cantons sums up market perceptions of the U.S. states and Canadian provinces as well: "(they) should be considered more as small sovereign powers than simply local governments" (Fitch 2001b). Hopes for credit market discipline are reasonable when subnational governments

are fiscally autonomous and have long histories of independent borrowing. In federations like Australia, Spain, and Germany—where the central government has a history of regulating subnational borrowing and financing a large share of subnational expenditures through predictable rule-based transfers—creditors take comfort in the possibility that the central government would assure timely interest payments in the event of a subnational debt servicing crisis. In more transfer-dependent and regulated subnational sectors, credit ratings are tightly clustered around the central government's sovereign rating, and rating agencies give much greater weight to the central government's economic and fiscal performance than those of the provinces. Note the relatively low standard deviations for credit ratings in Australia, Spain, and Germany despite relatively high standard deviations in debt burdens.

III. The bailout game in action: A German case study

The previous section demonstrated that the central government's "no bailout" commitment is less credible in more transfer-dependent systems, though it also indicates that it is important to look carefully at the details of intergovernmental arrangements. This section examines implications for subnational fiscal behavior by taking a closer look at individual subnational governments. While voters and creditors are likely to examine a variety of additional factors beyond transfer-dependence when assessing the center's credibility, it appears to be a blunt but useful indicator. A danger is that when the intergovernmental fiscal system creates rational bailout expectations, the most transfer-dependent provinces will face incentives to adjust to negative shocks more slowly or not at all.

Germany's system of fiscal federalism provides a very clear example. The *Länder* are responsible for almost 40 percent of public expenditures, though they possess miniscule autonomous taxing authority. The vast majority of their revenues come from shared taxes and intergovernmental grants. Thus the Länder have full autonomy over how much to spend and borrow each year, but very little control over revenue levels, which are determined by the allocation of relatively predictable shared revenues and grants. The fiscal constitution requires that each Land be able to provide public services that create "equivalent living conditions" throughout the federation. To that end, the equalization system goes to great lengths to even the expenditure capacities of the Länder through a three-stage process. In the first stage, up to 25 percent of the value added tax is redistributed to the Länder with the lowest revenue after the primary tax sharing receipts are calculated. Revenue is then redistributed from states whose "endowments" exceed their "needs" (based on national per capita tax income), bringing the relatively poor states up to 95 percent of their financial "needs." In the third stage of equalization, the federal government steps in to lift the recipient states up to at least 99.5 percent of the national average with so-called supplementary grants. By the end of the process, the recipient states actually have similar or even slightly higher revenues per capita at their disposal.

As shown in the previous section, creditors believe that the "equivalent living conditions" clause and the equalization system imply a rather straightforward federal guarantee of subnational debt. It is likely that state governments on the receiving side in the equalization system form similar impressions that affect their fiscal decisions. Budgeters in the recipient Länder make fiscal decisions with the knowledge that p in the model above is quite high, and though a bailout may be a distant prospect, they will not

be allowed to default. Even better, recent events make it clear that the courts will require federal bailouts well before default looms. In the 1970s and early 80s, bailout expectations among the recipient states were quite rational but had not yet been confirmed. Beginning in 1987, Bremen and Saarland started to receive special supplementary transfers explicitly aimed at coping with high public debt. The expectations were confirmed more explicitly in 1992 when the Federal Constitutional Court handed down its decision stipulating that the constitution required the *Bund* to make extra transfers to Bremen and Saarland amounting to around 30 billion DM over the period from 1994-2000 in order to reduce public debt without severe expenditure cuts (Seitz 1998). The text of the decision is now being used by Berlin in its current petition before the courts for a similar bailout. The decision clarified that an *emergency* exists in a Land if the deficit/expenditure ratio and interest payment/tax ratios are more than twice the Land average. If a Land government can prove that it has made serious efforts at fiscal consolidation on its own, it can trigger a bailout by declaring an *extreme emergency* if it can also prove that the normal mechanism of equalization is insufficient to reduce the debt burden without threatening the principal of equivalent service provision.

This decision clarified what was already implicit: the credibility of the central government's "no bailout" commitment is driven by a state's place in the equalization system. Only recipient states with high debt burdens can hope for bailouts. For the states that pay into the system—most notably Baden-Württemberg and Hessen—*p* in the bailout game is close to zero. Bailouts would only be possible in the event of years of economic decline and massive debt buildup with interest payments crowding out other politically popular expenditures. Thus these states face strong incentives to behave as

fiscal conservatives—reacting quickly to reduce expenditures in response to negative revenue shocks and avoiding massive increases in response to positive shocks in order to keep the debt burden low.

The states on the receiving end of the equalization system make a very different assessment of the center's credibility. Even if not currently preparing to declare an extreme emergency (this surely entails political costs) the recipient states understand that eventually they or a future government will have that option. This makes them more comfortable with a higher debt burden, and less willing to undertake politically painful expenditure cuts in response to negative shocks. Income from enhanced fiscal assistance in the future (multiplied by some probability) is taken into account when making current fiscal decisions.[10]

[FIGURE 4 HERE]

The simplest proposition arising from this framework is that long-term deficits and debts will be correlated with relative transfer-dependence. Figure Four, which plots average deficit/revenue ratios against average equalization payments per capita (1990 to 1995), provides strong evidence that this is the case. Even without the five new states clustered on the right, it is clear that transfer-dependent states run larger deficits. Rodden (2005) provides a series of econometric tests showing that the cross-sectional relationship is robust to the inclusion of a variety of control variables including state income, unemployment, federal and state partisanship, veto players, political fragmentation, and state size. Moreover, the relationship holds up since the 1970s and other things equal,

[10] The literature on consumption provides some useful analogs. Starting with similar income and debt burdens, and faced with a similar negative shock, a law student will be more willing to smooth consumption through borrowing than an art student because the former expects higher income in the future. Smoother expenditures and higher debt burdens will also be more attractive to individuals with aged, wealthy parents even if the contents of the will are unknown.

increasing dependence on transfers is associated with increased deficits within states over time in the long run.

Yet even with a good set of macroeconomic controls, one might suspect that omitted variables related to economic hardship and increased demands for public services drive the correlation between transfer-dependence and deficits. An alternative approach is to examine the dynamics of fiscal adjustment to revenue shocks in order to assess whether, as hypothesized above, relatively transfer-dependent states adjust more slowly to negative shocks. Every state has a so-called "golden rule" clause in its constitution, stipulating that borrowing only be used for capital projects. Given their inflexibility on the revenue side, these rules imply that expenditures should closely track revenues, and credit markets should not be used to smooth current expenditures. Yet the line between current and capital expenditures is notoriously porous for the German states, and it is not clear how the "golden rules" are to be enforced. Thus when revenue falls below expectations, it is tempting to avoid a fully corresponding cut on the expenditure side. Likewise, in years when revenues surpass expectations, it is tempting to spend the entire increase. The key argument here is that these temptations are strongest in the transfer-dependent states with rational bailout expectations.

[FIGURE 5 HERE]

Figure Five plots logged real expenditures and revenues per capita for each of the "old" Länder from 1974 to 1995. The gap between the two is the total deficit funded with borrowing. The first five states (Bremen through Schleswig- Holstein) were recipients in the equalization system throughout the entire period under review (See the horizongal axis in Figure 4). The next three (Bayern, Hamburg, and Nordrhein-

Westfallen) were very close to neutral over the long run, and have transitioned toward paying into the system in recent years. Finally, Baden-Württemberg and Hessen have paid into the system from the beginning.

Both revenues and expenditures are trending upward in all cases, and expenditures indeed track revenues closely. But note that revenues dip below the trend in the mid 1970s, the early 1980s, and again around the time of unification in the early 1990s. Almost every state avoids immediate corresponding expenditure cuts, and the gap between expenditures and revenues increases temporarily—evidence that in spite of the "golden rules," the Länder engage in consumption smoothing. Though not visually stunning, it appears that these gaps are larger and longer lasting in the first group of states—those with the most rational bailout expectations. In the extreme cases, compare the responses of Saarland and Bremen to those of Baden-Württemberg and Hessen.

In order to contrast the fiscal behavior of the states econometrically, I have calculated the gap between the smoothed trend in logged real revenues per capita (using the Hodrick-Prescott smoothing filter) and actual values each year, taken as a percent of the filtered value. I treat these revenue gaps or "shocks" as exogenous, and contrast the expenditure responses of the 5 states that either pay into the system or have been close to neutral over the entire period, with the responses of the 5 (pre-unification) states that were consistent recipients. Table 2 reports the results of separate fixed effects regressions for each group of states. The dependent variable is the change in real expenditures per capita. The "revenue gap" has been divided into separate variables for positive and negative shocks, and in order to examine dynamics over time, two lags of

each variable are also included. The model also includes the lagged change in real expenditures per capita.

[TABLE 2 HERE]

The coefficients for negative revenue shocks tell an interesting story. If states adhere strictly to the "golden rule" in the German context, the coefficient for a negative revenue gap should be positive. A larger negative deviation from trend should be associated with a corresponding reduction in expenditures. Yet in both models, the coefficient is negative for the current year, which indicates short-term consumption smoothing financed with borrowing. Yet the coefficient is more than twice as large for the "recipient" states. Furthermore, among the "paying" states, there is a significant positive coefficient for the second lag of the negative revenue gap almost equal in size to the negative coefficient for the unlagged variable. This indicates that after borrowing initially in response to the negative shock, these states moderate their expenditure growth by the second year. However, there is no indication of adjustment among the recipient states at all, where all of the "negative revenue gap" coefficients are negative. There is also no indication that the recipient states restrain themselves when revenue growth is unexpectedly strong. The only coefficients that approach statistical significance are positive, indicating that positive revenue gaps are spent. In contrast, though the coefficient for the lagged "positive revenue gap" is positive for the paying states, the coefficient is negative and slightly larger for the current year.[11]

Overall, this suggests a pattern of fiscally conservative behavior among the paying states, where in spite of some consumption smoothing, expenditures closely track

[11] Note that these results are not altered by the inclusion of controls for real gross state product per capita and unemployment.

revenues. The recipient states, on the other hand, demonstrate relative fiscal laxity: they increase expenditures during good times and do not significantly curb expenditures during bad times. This helps explain why their debt burdens have continued to grow much faster in recent decades than the paying states, in spite of the fact that their revenues have grown much faster.

IV. Is Germany an Outlier?

The basic problem in Germany is that Hamilton's dictum is broken: the central government has no control over the borrowing of the states, while its dominant role in taxation makes it implicitly responsible for the debts of the most transfer-dependent states. The problem should not be taken lightly. Berlin is currently attempting to extract a massive bailout, and other states may be poised to do so in the future. The skyrocketing debts of the (mostly recipient or neutral) Länder are a large part of the reason Germany has run afoul of the Stability and Growth Pact. A similar problem has characterized Latin American federations, but is this a common scenario among European countries? Using all of the European countries for which appropriate data were available, Figure 6 plots intergovernmental transfers as a share of subnational government revenues on the horizontal axis. On the vertical axis is an index that captures the extent of subnational borrowing autonomy allowed by the central government, adapted from the Inter-American Development Bank and extended by Rodden (2002).[12]

[FIGURES 6 AND 7 HERE]

[12] For countries with more than one subnational level, weighted averages are used.

The relatively clear negative relationship between transfer-dependence and borrowing autonomy is consistent with Hamilton's dictum. The central governments that allow relatively unfettered access to credit markets are those that fund a relatively small portion of local expenditures through intergovernmental grants. The clearest examples in Europe are Switzerland and Sweden. According to the framework laid out above, creditors, voters, and subnational governments will view the central government's "no bailout" commitment as credible. At the other end of the spectrum, in the UK and Bulgaria, the central government dominates taxation and in order to mitigate the resulting moral hazard problem, tightly regulates subnational access to credit markets.[13] Germany joins three other outliers—the Netherlands and especially Italy and Spain—in the Northeast corner of Figure 6, where the central government dominates taxation but cannot control subnational borrowing.

[FIGURE 7 HERE]

Figure 7 reproduces Figure 6, but the size of the bubbles corresponds to the combined state and local deficit as a share of GDP, averaged over the 1990s.[14] The tiny dots denote balanced budgets or surpluses. For the most part, central government restrictions on local borrowing are effective. With the exception of Norway, subnational deficits are quite modest in the lower half of Figure 7. Not surprisingly, the largest subnational debtors in Europe are those with relatively unrestricted access to credit markets. Among Europe's largest subnational deficits were those of the Swedish local governments and the Swiss local governments and Cantons. However, the German subnational governments (primarily the Länder) had the largest deficits in Europe

[13] For a similar finding, see Eichengreen and von Hagen (1996)
[14] Deficit data are taken from the IMF's *Government Finance Statistics*, and GDP data are taken from the IMF's *International Financial Statistics*. Note that appropriate data were unavailable for Belgium.

(around 1.4 percent of GDP). One of the other outliers, Spain, is close behind (driven primarily the Autonomous Communities). Though the data for Italy only include the local government sector (data for middle-tier governments are not provided by the IMF), its subnational deficits are also relatively large.

Given the framework laid out above, it appears that these three countries give special cause for concern. In each of these cases, powerful provincial and/or local governments prevent the central government from limiting their access to credit markets. In Germany and Spain, some of the provincial governments even own or control the banks through which they issue debt. At least in Germany, there is considerable cause for alarm about the tight links between state governments and the *Landesbanken*—a situation reminiscent of the disastrous relationship between Brazilian states and their banks. At the same time, the central government cannot commit ex ante to ignore local fiscal crises because its involvement in funding local public goods creates an implicit guarantee. Beyond the blunt measure of overall transfer-dependence, in each of these cases there are important differences in the incentives faced by different subnational governments. In both Italy and Spain there are dramatic cross-region differences in transfer-dependence. It is possible, for instance, that Autonomous Communities like Navarre, which has considerable control over taxation, can be viewed as a miniature sovereign debtor, while highly transfer-dependent entities like Andalucia and Catalonia are not (see Table 1).

Yet it does not necessarily follow that across localities within countries, transfer-dependence will be tightly linked to fiscal laxity as in Germany. In Germany, a state's place in the equalization system is a rather unambiguous guide to the rationality of bailout expectations. This may not be the case in other countries, and any argument

relating the intergovernmental fiscal system to cross-province differences in fiscal expectations must be tailored to the institutional context. For instance, analysis of Spain would require attention to the types of services the various regional entities have agreed to provide, whether the entities have elected to receive funding through ceded taxes or grants, whether they have received special debt-reduction transfers in the past, and their relative position in the "Interterritorial Compensation Fund" discussed above (See Garcia-Milà (1999). Moreover, this paper has not discussed a variety of other possible cross-region determinates of bailout expectations, including the well known "too big to fail" phenomenon (Wildasin 1997).

V. A summary of policy implications

As subnational governments in Europe gain greater autonomy over larger shares of public sector budgets, it may seem natural that they gain greater access to domestic and international credit markets. Subnational debt markets are expanding rapidly, and provincial and local governments throughout Europe are going through the credit rating process. On the surface this may seem like a good opportunity to enhance the efficiency of local infrastructural investment and build a more central role for markets rather than hierarchies in enforcing fiscal discipline. Especially among those who are attracted to the optimistic normative literature on competitive federalism, from Friedrich von Hayek to Charles Tiebout and James Buchanan, optimism about decentralization and enhanced efficiency abounds.

Yet this paper encourages skepticism about burgeoning market discipline among the vast majority of European subnational governments. For the most part, European subnational governments are highly dependent on shared taxes and grants. Even Figures 6 and 7 above vastly overestimate the extent of tax autonomy in Europe since central governments often regulate the bases and/or rates of taxes that are administered by subnational governments (see OECD 1999). The central argument of this paper is that credit markets, not to mention voters, are poorly suited to discipline the borrowing of subnational governments that do not have sufficient access to independent taxation. It has shown that creditors often view intergovernmental transfer programs as implicit central government guarantees of subnational debt.

Even within countries where aggregate data suggest relatively independent taxation among subnational governments, cross-jurisdiction differences are often vast. Often there are a handful of wealthy jurisdictions that depend primarily on own-source taxation and pay into redistributive schemes, and a larger number of jurisdictions that are heavily dependent on intergovernmental grants or redistributive shares of common pool tax revenue. While the former may have potential to be viewed as sovereigns, the latter will almost certainly not. Many European countries with highly decentralized service provision are characterized by pronounced inter-regional income disparities accompanied by persistent beliefs—sometimes codified or even constitutionalized—in equal access to government services throughout the country. This combination is not conducive to a system of pure laissez faire market discipline where the center backs away from regulating the borrowing of subnational governments, as in Switzerland. Perhaps the German case is extreme, but a similar dynamic can be imagined elsewhere. In countries

like Germany, the path to greater subnational fiscal discipline mostly likely involves enhanced federal oversight with strong enforcement mechanisms.

Finally, this paper provides a perspective on debates about the future of the European Monetary Union and whether it is necessary for the union to impose numerical limits on the deficits of member states. At least for now, the independent tax capacity of the central government is extremely limited, and the constituent units of the European Union are considerably more reliant on direct own-source taxation than any subnational governments in the world. And it is quite doubtful that voters and creditors perceive any implicit guarantees from the EMU. While the center has been steadily increasing its fiscal role, it has certainly not undertaken the kinds of obligations that would undermine its commitment to ignore future fiscal crises of member states. Given the experiences of other federations, it is difficult to justify the Stability and Growth Pact—which imposes monetary fines on countries that run "excessive deficits"—on the grounds that the center is vulnerable to manipulation by states demanding bailouts. The incentive structure in the EU is a far cry from the German federation. While there may be other justifications for central controls, the bailout problem addressed in this paper is not one of them.[15] While the German or Spanish federations might be well served by an internal excessive deficit procedure—though hopefully with much stronger enforcement mechanisms—the European Monetary Union as a whole should be able to rely on the discipline of voters and credit markets without imposing cumbersome hierarchical restrictions that reduce the ability of member states to conduct countercyclical fiscal policy.

[15] See also Eichengreen and von Hagen (1996), Eichengreen and Wyplosz (1998).

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Figure 1: The bailout game

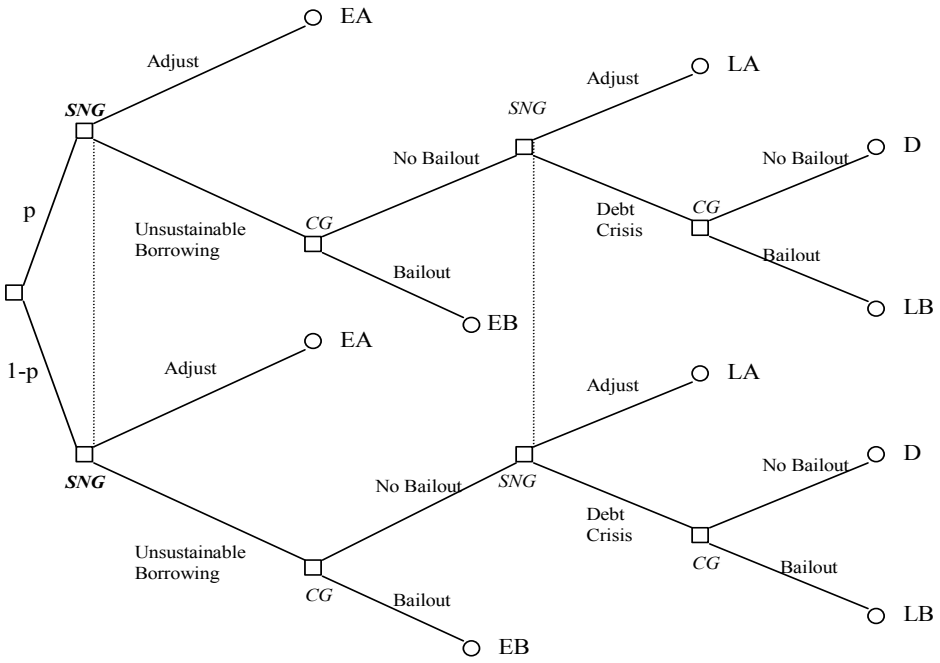

Figure 2: Debt burdens and credit ratings in four federations

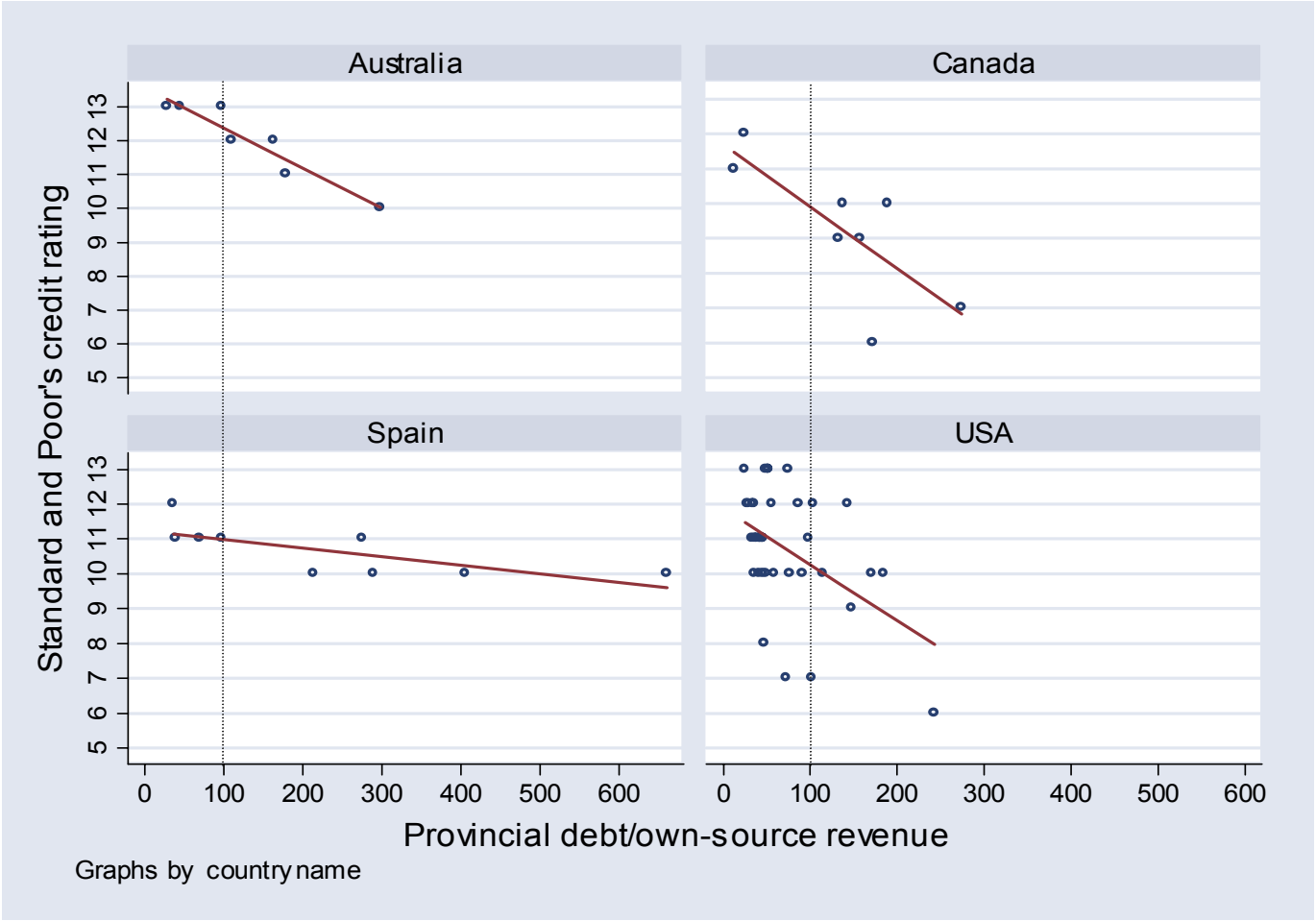

Figure 3: Debt burdens and credit ratings in the German Länder

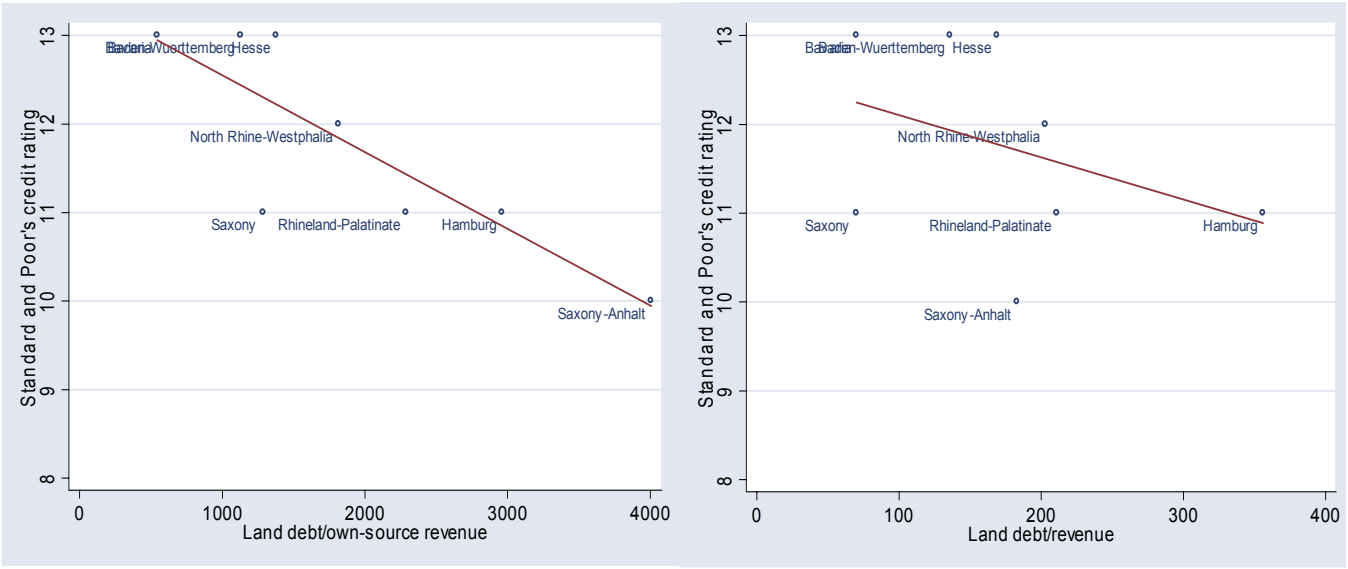

Figure 4: Equalization and Deficits among the German Länder

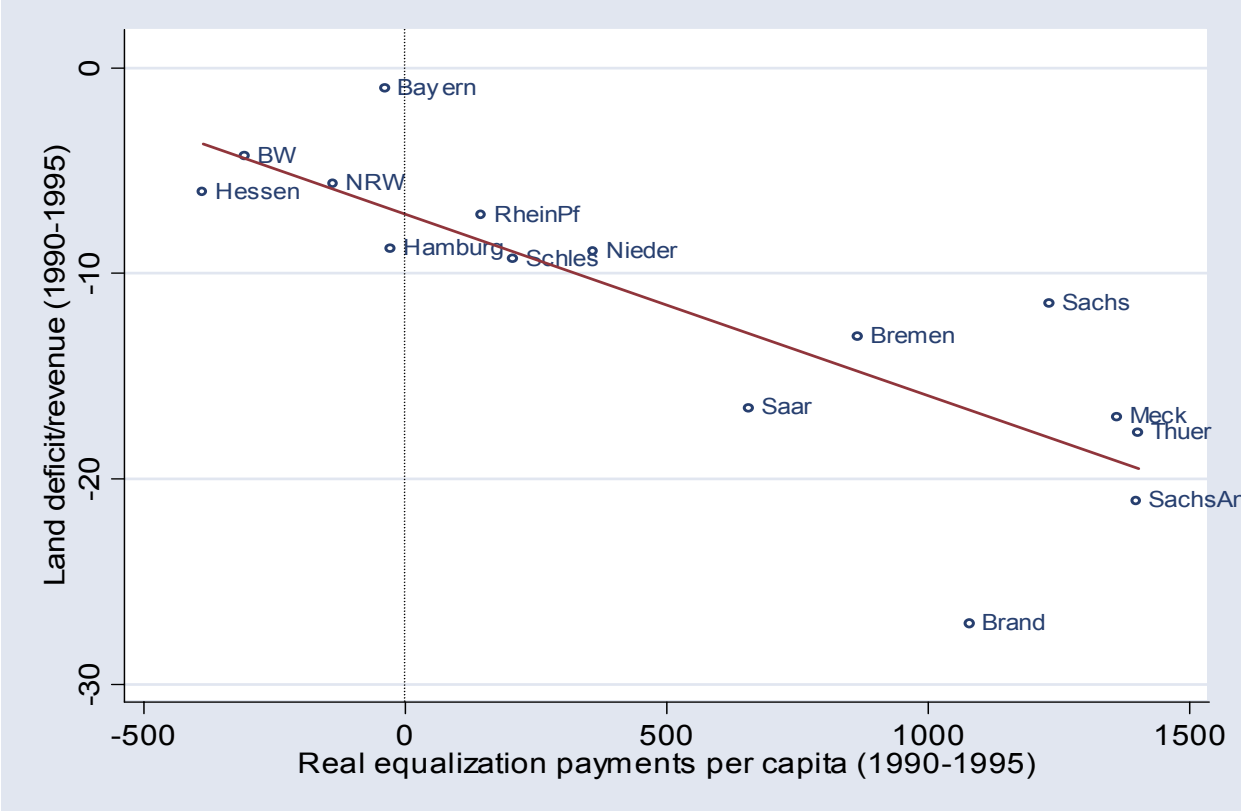

Figure 5: Log real expenditures and revenues per capita, 1974-1995

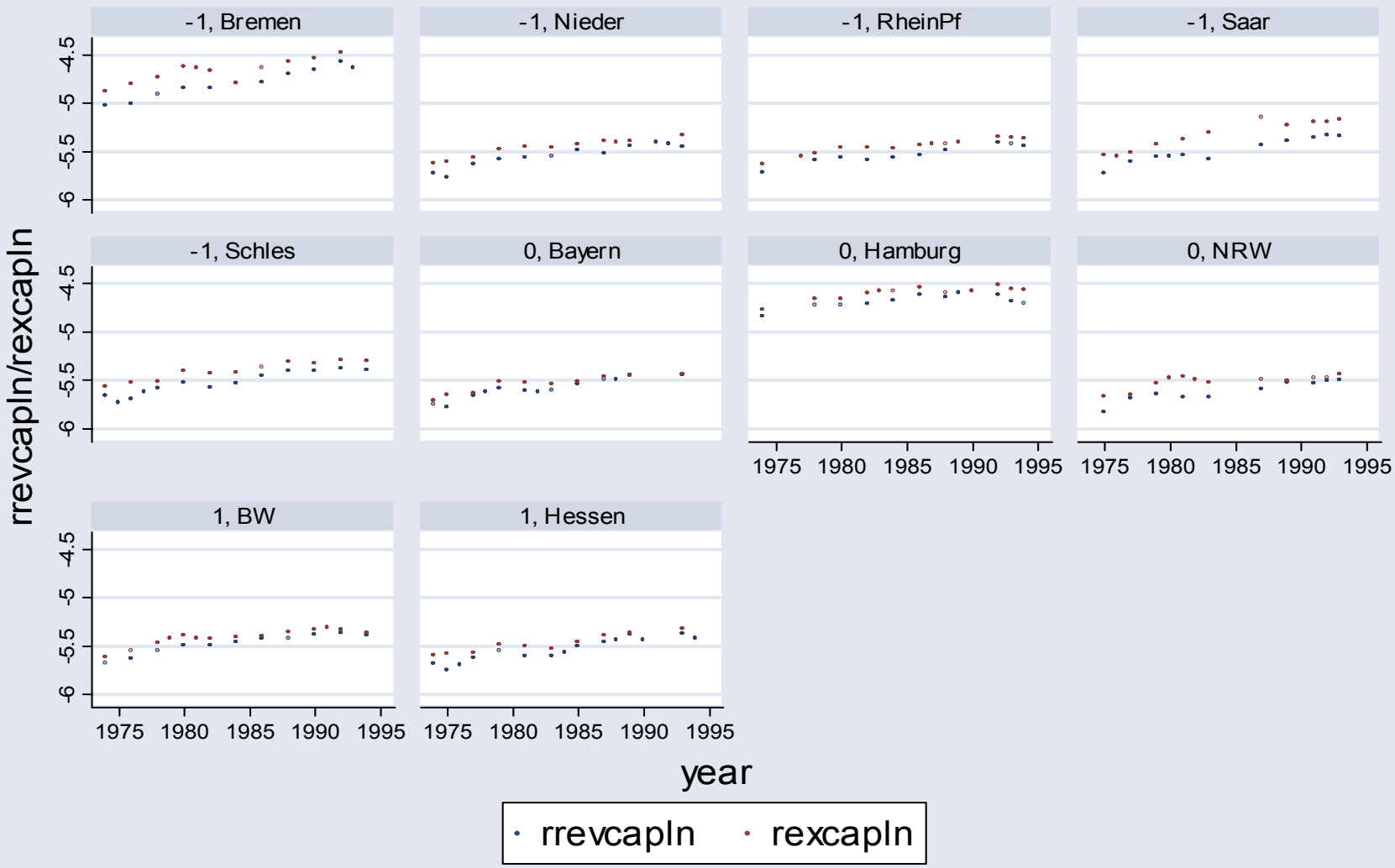

Figure 6: Transfer-dependence and subnational borrowing autonomy in Europe (1990s)

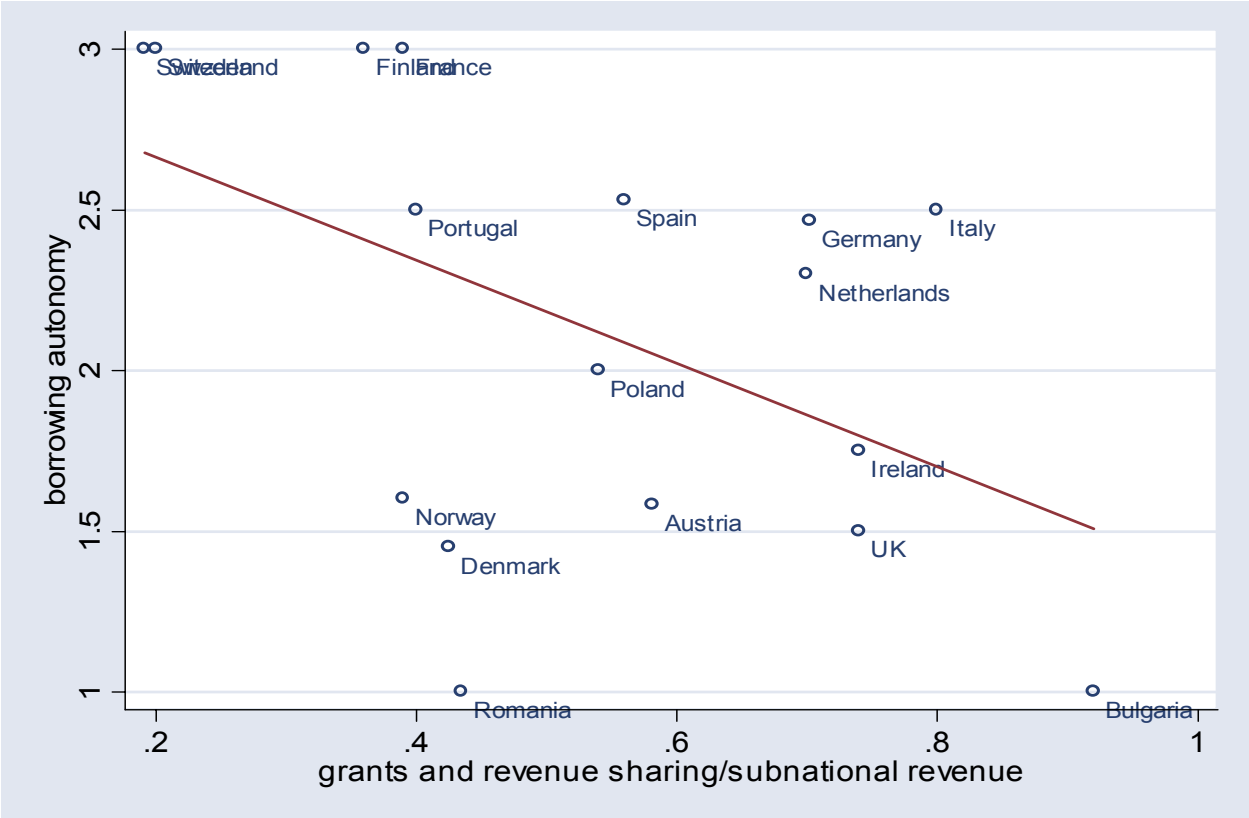

Figure 7: Transfer-dependence, subnational borrowing autonomy, and subnational deficits in Europe (1990s)

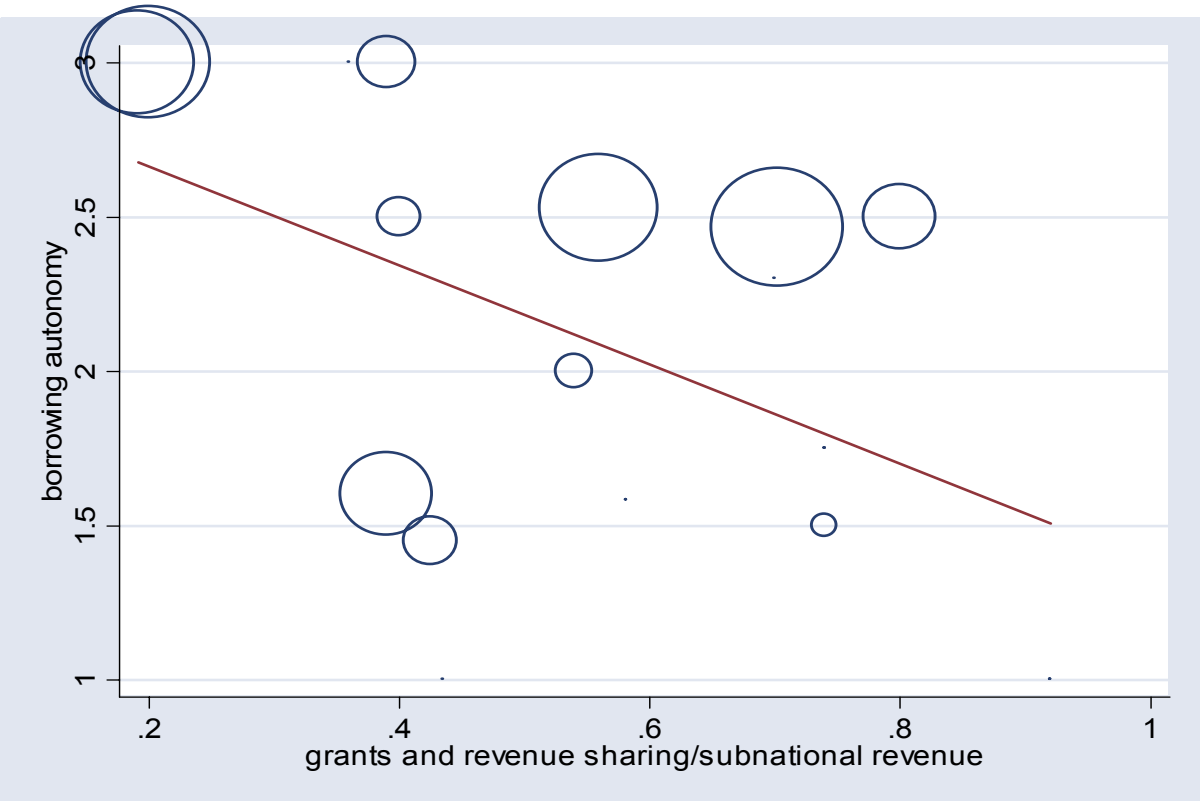

Table 1: Credit Rating Comparisons

	Federal transfers and revenue-sharing/ total revenue	Population	GDP per capita (local currency)	Total debt as share of own-source revenue	Total debt as share of total revenue	S & P rating (long-term domestic currency)	S & P Rating (13 point scale)
United States (1996)							
Sovereign Domestic Currency Rating: AAA							
Sovereign Foreign Currency Rating: AAA							
Alabama	0.26	4291000	23138	0.39	0.29	AA	11
Alaska	0.12	605000	42602	0.44	0.38	AA	11
Arkansas	0.25	2505000	22673	0.33	0.25	AA	11
California	0.22	31762000	30647	0.47	0.37	A	8
Connecticut	0.19	3264000	38038	1.85	1.50	AA-	10
Delaware	0.18	727000	39891	1.44	1.18	AA+	12
Florida	0.20	14425000	25395	0.46	0.37	AA	11
Georgia	0.24	7334000	29932	0.36	0.28	AA+	12
Hawaii	0.19	1187000	31584	0.99	0.80	AA	11
Illinois	0.21	11934000	31502	0.77	0.61	AA-	10
Louisiana	0.29	4340000	26928	0.73	0.52	A-	7
Maine	0.29	1238000	23364	1.04	0.74	AA+	12
Maryland	0.19	5058000	28680	0.75	0.60	AAA	13
Massachusetts	0.21	6083000	34543	1.48	1.16	A+	9
Michigan	0.19	9734000	27238	0.45	0.36	AA	11
Minnesota	0.17	4648000	30452	0.28	0.24	AA+	12
Mississippi	0.29	2710000	20876	0.36	0.25	AA-	10
Missouri	0.22	5369000	27293	0.53	0.42	AAA	13
Montana	0.28	877000	20609	0.91	0.65	AA-	10
Nevada	0.13	1600000	34103	0.43	0.38	AA	11
New Jersey	0.18	8008000	35682	0.87	0.71	AA+	12
New Mexico	0.21	1708000	25828	0.34	0.26	AA+	12
New York	0.24	18142000	34937	1.02	0.78	A-	7
North Carolina	0.23	7309000	27956	0.25	0.19	AAA	13
North Dakota	0.25	643000	24658	0.42	0.32	AA-	10
Ohio	0.19	11170000	27425	0.36	0.29	AA	11
Oklahoma	0.20	3296000	22711	0.46	0.37	AA	11
Oregon	0.21	3195000	28704	0.49	0.39	AA-	10
Pennsylvania	0.21	12034000	27394	0.45	0.35	AA-	10
Rhode Island	0.25	988000	26980	1.71	1.29	AA-	10
South Carolina	0.24	3737000	24044	0.56	0.42	AA+	12
Tennessee	0.32	5307000	26767	0.30	0.21	AA+	12
Texas	0.25	19033000	29064	0.38	0.28	AA	11
Utah	0.25	2022000	25481	0.49	0.36	AAA	13
Vermont	0.30	586000	25020	1.15	0.80	AA-	10
Virginia	0.17	6667000	29991	0.52	0.44	AAA	13
Washington	0.15	5519000	29313	0.43	0.36	AA	11
West Virginia	0.30	1820000	20451	0.59	0.41	AA-	10
Wisconsin	0.15	5174000	27261	0.44	0.37	AA	11
Mean	**0.22**	**6052538.46**	**28440**	**0.66**	**0.51**	**AA**	**10.9**
Standard Deviation	**0.05**	**6235392**	**5084**	**0.40**	**0.31**		**1.4**
Canada (1996)							
Sovereign Foreign Currency Rating: AA+							
Sovereign Domestic Currency Rating: AAA							
Newfoundland	0.42	564307	17841	2.43	1.41	BBB+	6
Nova Scotia	0.40	929645	20251	2.74	1.65	A-	7
New Brunswick	0.34	752332	21404	1.38	0.91	AA-	10
Quebec	0.19	7259020	24162	1.57	1.27	A+	9
Ontario	0.14	11029000	29289	1.90	1.63	AA-	10
Manitoba	0.27	1130790	24174	1.33	0.96	A+	9
Saskatchewan	0.17	1016290	26016	1.72	1.42	BBB+	6
Alberta	0.10	2759460	32632	0.12	0.10	AA	11
British Columbia	0.10	3834660	27025	0.24	0.22	AA+	12
Mean	**0.24**	**3252834**	**24755**	**1.49**	**1.06**	**A+**	**8.9**
Standard Deviation	**0.12**	**3423502.4**	**4338**	**0.83**	**0.54**		**2.0**

Australia (1996)

Sovereign Foreign Currency Rating: AA

Sovereign Domestic Currency Rating: AAA

Australia Capital Territ	0.46	308549	32779	0.26	0.14	AAA	13
New South Wales	0.37	6241899	28339	0.89	0.56	AAA	13
Queensland	0.46	3369344	24104	0.41	0.22	AAA	13
Victoria	0.39	4584649	28087	1.49	0.90	AA+	12
Western Australia	0.45	1782700	30752	1.00	0.55	AA+	12
South Australia	0.48	1476917	23946	1.62	0.84	AA	11
Tasmania	0.58	474233	21416	2.71	1.15	AA-	10
Mean	**0.46**	**2605470**	**27060**	**1.20**	**0.62**	**AA+**	**12.0**
Standard Deviation	**0.06**	**2052624**	**3767**	**0.77**	**0.34**		**1.1**

Spain (1999)

*Sovereign Foreign Currency Rating: AA/AA+**

*Sovereign Domestic Currency Rating: AA/AA+**

Andalucia	0.76	7340052	10999	6.60	0.52	AA-	10
Aragon	0.59	1189909	15864	2.14	0.54	AA-	10
Baleares Islands	0.19	845630	16809	0.39	0.26	AA	11
Canarias	0.52	1716276	14305	0.70	0.22	AA	11
Catalonia	0.63	6261999	18172	2.76	0.76	AA	11
Galicia	0.65	2731900	12177	4.06	0.65	AA-	10
Madrid(aut.com)	0.20	5205408	20149	0.98	0.62	AA	11
Navarre	0.02	543757	18856	0.36	0.32	AA+	12
Valencia	0.66	4120729	14172	2.90	0.59	AA-	10
Mean	**0.47**	**3328407**	**15723**	**2.32**	**0.50**	**AA**	**10.7**
Standard Deviation	**0.25**	**2364003**	**2904**	**1.94**	**0.18**		**0.7**

Germany (1999)

Sovereign Domestic Currency Rating: AAA

Sovereign Foreign Currency Rating: AAA

Baden-Wuerttemberg	0.88	10,449,000	53363	11.27	1.36	AAA	13
Bavaria	0.87	12,117,000	54750	5.43	0.70	AAA	13
Hamburg	0.88	1,702,000	81293	29.62	3.56	AA	11
Hesse	0.88	6,043,000	57308	13.77	1.69	AAA	13
North Rhine-Westphali	0.89	17,984,000	48219	18.16	2.03	AA+	12
Rhineland-Palatinate	0.91	4,028,000	42368	22.88	2.11	AA	11
Saxony	0.95	4,475,000	31558	12.86	0.70	AA	11
Saxony-Anhalt	0.95	2,663,000	30195	40.05	1.83	AA-	10
Mean	**0.90**	**7432625**	**49882**	**19.26**	**1.75**	**AA+**	**11.75**
Standard Deviation	**0.03**	**5609085**	**16301**	**11.21**	**0.91**		**1.16**

* Upgrade to AA+ on March 31, 1999

Sources:

Credit ratings:Standard and Poors.

All U.S. data: Census Department

All Canada data: Statcan

Australian data: Grants Commission, "Report on State Revenue Sharing Relativities," 2002 Update (Supporting Information), Courchene (1999), and Australian Bureau of Statistics

Spanish data: *Spain Regional Accounts 2000* (available at http://www.ine.es) and "Spanish Regions: An Analytical Overview," (published by *Fitch, IBCA, Duff & Phelps*)

Table 2: Expenditure responses of Länder to deviations from revenue trend

Dependent variable: Change real expenditures per capita (log)	Paying and neutral Länder			Recipient Länder		
	Coef.	PCSE		Coef.	PCSE	
Positive revenue gap$_t$	-2.82	0.92	***	2.60	1.54	*
Positve revenue gap$_{t-1}$	2.54	0.86	***	-1.46	1.68	
Positive revenue gap$_{t-2}$	-0.64	0.81		2.59	1.53	*
Negative revenue gap$_t$	-1.83	0.78	**	-4.31	1.54	***
Negative revenue gap$_{t-1}$	-1.07	0.78		-2.48	1.58	*
Negative revenue gap$_{t-2}$	1.63	0.77	**	-0.17	1.56	
Lag change real expenditure per capita (log)	-0.01	0.11		-0.59	0.11	***
Constant	0.00	0.01		0.01	0.02	
Observations	100			98		
# of Länder	5			5		
R^2	0.30			0.46		

Fixed effects model assuming first-order autocorrelation

* p<.1

** p<.05

*** p<.01

Appendix

Proceed by backward induction using beliefs. Begin with the subnational government's final decision whether to provoke a debt crisis. There is a critical updated belief about the resolve of the center, $\bar{p}^*$, that makes the SNG indifferent between late adjustment and provoking a debt crisis. Equate expected utilities:

$$U_{sng}(LA) = U_{sng}(D)\bar{p}^* + U_{sng}(LB)(1-\bar{p}^*)$$

Solve for $\bar{p}^*$:

$$\bar{p}^* = \frac{U_{sng}(LB) - U_{sng}(LA)}{U_{sng}(LB)}$$

If $\bar{p} > \bar{p}^*$, SNG prefers "late adjustment" to provoking a debt crisis.

If $\bar{p} < \bar{p}^*$, SNG is sufficiently optimistic about the likelihood of a bailout to provoke a debt crisis rather than adjust.

Next consider the central government's first move. The resolute type always plays "no bailout." The irresolute type, however, conditions its move on the likely response of the SNG. The SNG adopts a mixed strategy that avoids adjustment with probability z and conducts "late adjustment" with probability (1-z). Find the probability, *z*, of the SNG playing "debt crisis" that makes an irresolute center indifferent between "no bailout" and "early bailout" at its first decision node:

$$U_{cgi}(EB) = U_{cgi}(LB)z + U_{cgi}(LA)(1-z)$$

Solve for *z*:

$$z = \frac{U_{cgi}(EB) - U_{cgi}(LA)}{U_{cgi}(LB) - U_{cgi}(LA)}$$

The SNG must have beliefs equal to $\overline{p}^*$ in order to play this mixed strategy. Now consider the CG's mixed strategy that creates these updated beliefs for the SNG. Upon observing "no bailout" in the first round of the game, the SNG must assess the probability that the center is in fact resolute. There is no pure strategy separating equilibrium. That is, the SNG knows that there is a positive probability, q, that an irresolute center is masquerading by playing "no bailout" in the first round. Using Bayes' rule:

$$p(R \mid nobailout) = \overline{p}^* = \frac{p(R)p(nobailout \mid R)}{p(R)p(nobailout \mid R) + p(I)p(nobailout \mid I)}$$

where R and I refer to "resolute" and "irresolute" central governments. This can be expressed as:

$$\overline{p}^* = \frac{p}{p + q - pq}$$

Solve for q:

$$q = \frac{p(1 - \overline{p}^*)}{\overline{p}^*(1 - p)}$$

Expressed in terms of SNG's utilities for the outcomes:

$$q = \frac{p[U_{sng}(LA)]}{(1 - p)[U_{sng}(LB) - U_{sng}(LA)]}$$

Now it is possible to discuss the first move made by the subnational government. If the game starts with $p > \overline{p}^*$, the SNG will always adjust early. It is already sufficiently convinced of the center's resolve that it would be foolish to avoid adjustment in an effort to attract bailouts. However, when $p < \overline{p}^*$, the SNG is not necessarily deterred. It will compare the expected utility of pressing for a bailout, calculated from the center's mixed strategy, with the expected utility of adjusting. The critical value for p can be obtained

by finding the original belief at which the SNG is indifferent between early adjustment and starting down a path of unsustainable borrowing:

$$U_{sng}(EA) = p^{*}[U_{sng}(D)] + (1 - p^{*})\{(1 - q)[U_{sng}(EB) + q[U_{sng}(LA)]\}$$

Substitute for q and solve for p.

$$p^{*} = \frac{[U_{sng}(LB) - U_{sng}(LA)][U_{sng}(EA) - 1]}{[U_{sng}(LA)]^{2} - U_{sng}(LB)}$$

To sum up, when p is greater than this expression, the SNG will adjust in the first round. This is a Perfect Bayesian Equilibrium. When beginning beliefs in the center's resolve are below this threshold, the subnational government plays "unsustainable borrowing" in its first move and the Perfect Bayesian Equilibrium involves the mixed strategies described above. In its first move, the resolved government always plays "no bailout" while the irresolute government plays "no bailout" with probability *q* and "early bailout" with probability 1-*q*. If it observes "no bailout," the region chooses "debt crisis" with probability *z*, and "late adjust" with probability 1-*z*. At the final stage, the resolved government always plays "no bailout" while the irresolute government always plays "late bailout."