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How Do Sub-Central Government React to Cuts in Grants Received from Central Governments

Evidence from a Panel of 15 OECD Countries

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ABSTRACT

Cross-country evidence on sub-central governments' responses to cuts in grants received from central government shows the typical response is to adjust expenditure rather than offset cuts by raising 'own' revenues. Spending cuts are focused on the wage bill and, disproportionately, on capital expenditure. Even where countries have greater flexibility to offset the centrally imposed cuts, through a high degree of expenditure decentralisation, tax and borrowing autonomy, they tend not to exercise these powers. So, centrally imposed cuts result in expenditure restraint at the sub-central level, but the adjustment appears to suffer from short-termism, given the disproportionate focus on capital spending.

JEL Codes: E62, E63, H62, H77

1. INTRODUCTION

The relationships between different levels of government, and particularly their interactions, have been the subject of considerable scrutiny in recent years. There are broadly two strands to this literature. The first examines the optimal assignment of public service provision, and how this is financed, between different levels of government. This is the classic literature on fiscal federalism, a recent survey is provided in Oates (1999). The 'tax assignment problem', and the degree to which decentralized states use intergovernmental grants, tax sharing schemes, sub-central taxes and user charges, respectively, has been an important area of debate. A number of interesting issues have been identified within this broad area, primarily in studies that examine how different levels of government deploy grants, share taxation revenues, and react to changes in the balance between central government grants and local revenues. For instance, a number of researchers have studied and interpreted the so-called 'fly-paper effect', whereby spending by lower levels of government increases more markedly in response to increases in intergovernmental grants than in response to increases in locally raised revenues (see Gramlich, 1977, Oates, 1994, Hines and Thaler, 1995). This literature has been developed further in studies that examine whether lower levels of governments react differently to increases and decreases in intergovernmental grants. Gramlich (1987) suggests that a significant asymmetry is evident in US state and local government behavior. However, evidence against this 'super-fly-paper effect' is presented in Gamkhar and Oates (1996).

A second broad strand relates to macroeconomic management in multi-tiered governments. This literature is rather less developed, although it has received recent attention from the OECD (see Joumard and Kongsrud, 2003), and in academic studies (see Triesman, 2000, Rodden, 2002 and Rodden and Wibbels, 2002). This body of work emphasizes that the increasing tendency towards both decentralization and fiscal federalism and raises the issue of how to maintain sustainable public finances in this framework.

A number of industrialized economies have adopted fiscal coordination mechanisms to address this problem directly, as surveyed in Joumard and Kongsrud (2003). The mechanisms discussed range from formal sub-national fiscal rules (e.g. expenditure

and borrowing ceilings) to informal coordination mechanisms. A key issue here concerns the incentives faced by multi-tiered fiscal authorities. For instance, the problem of 'soft budget constraints' faced by lower tiers of government has attracted considerable attention in some countries (e.g. Germany, Italy). Rodden (2003) highlights how the possibility of cost-shifting can lead to expectations of budget bailouts for the fiscally weaker German Lander, and Bordignon (2000) demonstrates that in Italy the decentralization of essential services (health) has led to weak budgetary controls in the expectation of a central government bailout.

Much of the empirical evidence on the way in which sub-central governments react to changes in central government policies has focused on individual countries, particularly the US. However, the contribution of sub-central governments to attempts by central government to adjust their overall fiscal stance does seem to be an important issue in many OECD countries. In Darby *et al.* (2005a and 2005b) we show that quantitatively, sub-central tiers of government play a significant role in overall fiscal consolidation attempts.

In this paper we focus on a natural experiment which allows us to explore how sub-central tiers of government react to major discretionary shifts in intergovernmental grants offered by the central level[i]. Specifically, we construct a panel dataset for the major OECD economies and use Event Analysis to assess how components of sub-central expenditure and revenue respond to cuts in central government grants. We examine the extent to which sub-central governments adjust expenditures and/or use their own fiscal powers (where available) to offset the cuts in their grant allocations. In addition we group countries using key characteristics to test whether particular patterns are applicable to certain individual defined groups of countries.

In a companion paper, Darby et al. (2005b) we analyzed the behavior of sub-central governments during national fiscal consolidation attempts. We found that the sub-central tier play a significant role in consolidation episodes and that grants allocated by central to sub-central government play a critical role in central control of fiscal balances at the sub-central level. In this paper we investigate pay closer attention to precisely how cuts in grants impact on the adjustment decisions made by lower tiers of governments.

Our paper highlights a number of points. First, in response to, and in some cases, in anticipation of, cuts in their grants, sub-central governments tend to undertake significant and prolonged downward adjustments in their expenditure. In some respects this is akin to the 'fly-paper effect'[iii] working reverse. Second, we observe that a substantial proportion of the overall adjustment to sub-central expenditures is borne by cuts in capital investment programs. This result is consistent with evidence presented in Darby et al. (2005a). There we found that, during attempted fiscal consolidation episodes, a disproportionate amount of the overall sub-central contribution to consolidation attempts is accounted for by cuts in capital expenditure. Again this might reasonably be interpreted as a variant of the effect identified by Gramlich (1987) with sub-central governments apparently seeking to defend current service provision, and maintaining their spending on wages, rather than defending spending on infrastructure. Third, our results do not appear to offer strong support for the effect identified by Gramlich (1987) in the USA: sub-central governments do not tend to react to cut-backs in grants by raising own source revenues significantly. This failure to replenish revenues by raising sub-central taxation and user charges probably reflects the fact that the states/regions and local authorities in many of the OECD countries in our sample face less autonomy in varying their taxation revenues than US states. Finally, when we disaggregate by the degree of decentralization, tax and borrowing autonomy we observe that not only do sub-central governments react to a cut in grants by cutting expenditures, but remarkably those countries with structures that are more decentralized and apparently involve greater fiscal autonomy, tend to cut expenditures by a greater amount, and seem reluctant to raise sub-central taxes. This reverse 'fly-paper effect' might highlight either a low degree of effective fiscal autonomy, or a high effective degree of tax competition at sub-central level which serves to limit any offsetting increase in local taxation.

The structure of the remainder of the paper is as follows. In Section II we discuss the data and the scope of the study. In Section III we discuss the econometric methodology we employ. Section IV presents our key results and Section V concludes.

2. SCOPE OF THE STUDY

The data used in our study are annual and are taken primarily from the IMF's Government Financial Statistics (GFS), 2002 Edition, supplemented with data from the OECD Statistical Compendium, 2002 Edition. GFS provides the best internationally comparable data on fiscal variables for fifteen OECD countries that is disaggregated by tier of government[iii], subdividing these between three levels (central, state and local categories). This allows us to construct an unbalanced panel dataset with 336 observations covering the period 1970-99. A full description of the data is provided in an Appendix. The dataset covers not only federal, but also unitary countries. In practice, as we show in Darby et al. (2003) the distinction between these two categories in terms of the devolution of spending and financing arrangements is not as clear-cut as one might think.

The dataset used does have some weaknesses. An obvious one is that little or no distinction is made between tax revenues from taxes, where the sub-central tiers control both the tax rates and/or the tax base, and revenues from tax sharing arrangements. However, we have been able to supplement our data to take into account the extent of independent taxing powers available to sub-central tiers using OECD (1999) for the majority of countries and information provided by Jonathan Rodden of MIT in the cases of Canada and the USA. In our empirical work we use this additional data[iv] to distinguish between countries in terms of their differing degrees of fiscal autonomy.

Another potential weakness is that, to the extent that central government's can exert influence on sub-central spending patterns through directives (see Ebel and Yilmaz, 2002), GFS will overstate the true nature of sub-central expenditure autonomy. Nonetheless, the GFS data remain the best available for our purposes.

3. ECONOMETRIC METHODOLOGY

Event studies provide a regression based method of examining the time profile of key variables of interest around the occurrence of defined events, in our case cuts in grants received by sub-central governments. Event studies are relatively uncommon in

macroeconomics, but fairly commonplace in finance[v]. Here we use event study analysis to compare and contrast significant changes in key fiscal variables before, during, and after a year in which central to sub-central grant cuts occurred, as compared to 'normal' or reference conditions. This allows us to obtain the predicted time profile for each of the fiscal variables (expressed as percentages of GDP) immediately prior to, during and following the cut. More specifically, each event window comprises four years; one year prior to the period of cut in grants, the event period itself, and the two years that follow. The length of the event window is a choice variable, and was chosen based upon the significance of the time dummies in the full set of regressions. Our results suggest that the window encompassing one year prior to the cut and two years after is appropriate[vi].

The econometric methods we employ are similar to those employed by Tornell and Westermann (2002) in an analysis of business cycles around the time of financial crises. We apply panel methods, where the panel regressions include fixed effects to account for cross-country heterogeneity and use Weighted Least Squares (WLS) to account for the effects of heteroscedasticity[vii]. Each fiscal variable is regressed over the entire sample (for all countries, i, and all time periods, t) on a series of time dummies designed to capture the time profile of the variables. More precisely, the coefficients on the time dummies capture the differences between each period in the event window and the reference years.

The "event" periods are identified as years in which there was a cut in sub-central governments' grant receipts as a percentage of their previous period total revenue. This allows us to focus on all real terms cuts in grants and provides a total of 88 events in our dataset. From this we excluded two episodes, those relating to the UK in 1990/91, and Spain in 1985/86. In both these cases the adjustments in grants were linked to major reforms in local government finance. The chronology of the identified grant cuts is provided in Table 1.

Table 1: Chronology of Grant Cuts

	Year of cut in grants
USA	1983
UK	1977, 78, 79, 80, 82, 85, 88, 93, 95, 97 & 98
Austria	1985 & 89
Belgium	1981, 82, 87, 88, 89, 92, 96 & 97
Denmark	1981, 83, 84, 85, 86, 87, 95, 96 & 97
France	1984 & 96
Germany	1976, 77, 81, 82, 83, 93,94,95,97 & 98
Netherlands	1980, 84, 86, 87, 89, 93, 94 & 96
Norway	1977, 93, 95 & 96
Sweden	1978, 82, 83, 85, 86, 88, 91, 94, 95, 96 & 99
Canada	1980, 84, 86, 88, 93, 95, 96 & 97
Finland	1993
Ireland	1984, 86, 88, 89
Spain	1997
Australia	1982, 86, 87, 88 89, 94
Total	88

Source:
Identified using sample averages of data from IMF Government Financial Statistics

We carry out two sets of regressions. First we examine all episodes of grant cuts collectively, where T denotes the actual year of cut in grants.

$$y_{i,t} = \alpha_i + \beta_1 D_{i,T-2} + \beta_2 D_{i,T-1} + \beta_3 D_{i,T} + \beta_4 D_{i,T+1} + \beta_5 D_{i,T+2} + \varepsilon_{4i,t} \qquad (1)$$

where y_{it} is the fiscal variable of interest in country i at period t, and $D_{i,t+j}$ are time dummies, equal to 1 in +j/-j periods from the period where the cut takes place, and zero in all other periods. We focus on a variety of different variables: total expenditure, taxation, fees and user-charges, the wage bill, social transfers, expenditure of goods and services, and capital expenditure.

Since grant cuts appear in the sample regardless of size we also divide the events into two categories; 'large' and 'small' cuts in grants. One issue this allows us to investigate is whether there is some form of non-linear effect present that cannot be captured in the initial regressions. For instance it might be possible, given a certain degree of fiscal autonomy, for a sub-central government to react to a small cut in their grant allocation by raising their tax revenues. It might be less feasible to accommodate a large cut in their grant in this way and a significant cut in sub-central expenditure

might be the only available response. It's also possible that large and small cuts in grants might be sustained to different extents, and this too should have an impact on the likely response. For example, if large grant cuts tend to be reversed in subsequent periods we would expect them to have a different impact on the behaviour of sub-central governments from that of a series of small but sustained cuts.

In order to check whether the results are affected by the size of the grant cut we ranked the 86 cuts by size and then sub-divided them into two equal sub-samples representing 'large' and 'small' cuts respectively. The largest cuts averaged 2.77% of total sub-central government revenues, whilst the smallest cuts averaged 0.59% of total revenues. To investigate whether grant cuts are sustained or temporary and reversed we can note that on average, in the year following a large cut, grants are only increased by 0.1%. Small cuts tend to be partially but not wholly reversed, with an average post cut increase of 0.27%.

Having subdivided the events in this way we then perform the following event study regression:

$$
\begin{aligned}
y_{i,t} = \alpha_i &+ \delta_1 D_{i,P-2}^{L} + \delta_2 D_{i,P-1}^{L} + \delta_3 D_{i,P}^{L} + \delta_4 D_{i,P+1}^{L} + \delta_5 D_{i,P+2}^{L} \\
&+ \varphi_1 D_{i,Q-2}^{S} + \varphi_2 D_{i,Q-1}^{S} + \varphi_3 D_{i,Q}^{S} + \varphi_4 D_{i,Q+1}^{S} + \varphi_5 D_{i,Q+2}^{S} + \varepsilon_{5i,t}
\end{aligned}
\tag{2}
$$

where again $y_{i,t}$ is the fiscal variable of interest in country i at period t, $D_{I,P\pm j}^{S}$ are time dummies, equal to 1 in +j/-j periods from the period when the small cut in grants took place (denoted t=T) and zero in all other periods, and $D_{I,Q\pm j}^{L}$ are time dummies, equal to 1 in +j/-j periods from the period in which the large cut in grants took place (denoted t=V) and zero in all other periods.

Each estimated coefficient (β_k, δ_k, ζ_k) captures the estimated difference between period k in the event window and the average position in non-consolidation years. Thus, for instance, if the dependent variable is the annual change in sub-central government expenditure, a significantly negative β_i implies that in the year prior to the cut in grants, the change in sub-central expenditure was significantly lower than in years when grants were not cut (the 'normal', or reference period).

As we shall see below, having estimated the standard event study regression it is useful to test whether individual countries or groups of countries display significantly different behavior from the rest of the countries in the event sample. For instance, we might wish to consider whether different levels of sub-central fiscal autonomy respond differently from each other. Or we might want to analyze the significance of borrowing autonomy in determining whether sub-central governments display a different adjustment pattern. Equation 1 can be modified to incorporate tests of these hypotheses by including an interactive dummy variable:

$$
\begin{aligned}
y_{i,t} = \alpha_i &+ \beta_1 D_{i,T-2} + \beta_2 D_{i,T-1} + \beta_3 D_{i,T} + \beta_4 D_{i,T+1} + \beta_5 D_{i,T+2} + \\
&\lambda_1 C_l D_{i,T-2} + \lambda_2 C_l D_{i,T-1} + \lambda_3 C_l D_{i,T} + \lambda_4 C_l D_{i,T+1} + \lambda_5 C_l D_{i,T+2} + \varepsilon_{3i,t}
\end{aligned}
\tag{3}
$$

where C_l is a dummy variable which takes a value of unity in the case of a particular country or group of countries and is equal to zero in all other cases.

The estimated coefficient on the interactive dummy variable captures the additional effect of this category of country over and above that identified by the standard dummies. For instance, taking the previous example, if C_l is a dummy representing countries with high levels of sub-central fiscal autonomy, a significantly negative λ_l would indicate that in the year of the cut in central government grants, sub-central expenditure is significantly lower in countries with high as opposed to low fiscal autonomy.

Another key econometric issue relates to the potential endogeneity of the grant cut and the causal link implied by the event study. We essentially make the implicit assumption that grants cuts instigated by central government are determined exogenous and as causing reactions by sub-central governments. However, if in fact central grants adjust in response to the expenditure or taxation decisions made by sub-central governments this approach would be questionable[viii]. Gamkhar and Oates (1996) take account of potential endogeneity by instrumenting the cut in grants variable in their regressions. However, instrumenting is not an option in the event study regressions since the potentially endogenous variable, the cuts in grants, do not actually enter the regression. The question instead is whether one should test and

adjust for the potential endogeneity when determining the periods exogenous cuts in grants have occurred. This requires a slightly different approach. We have looked at auxiliary regressions in which the actual change in grants is regressed on lagged changes in grants and a set of variables identified as potential instruments by Gamkhar and Oates (1996). From these auxiliary regressions we are able to generate estimated exogenous cuts in grants (using predicted rather than actual changes in grants). This approach does lead to some minor changes in the episodes identified. However, a check of the subsequent event study regressions indicates little difference to the estimated signs and sizes of the time dummy coefficients and their standard errors so suggests that there is very little change in our key results and so little empirical significance of the potential endogeneity problem[ix]. Finally, even if one does not accept a strong causal link for all the cuts in grants events identified, the event study can still be seen as uncovering empirical regularities "stylized facts" that in some cases are likely to be picking up causal effects.

4. RESULTS

We present our key results in the form of a series of charts that show how the fiscal variables for the sub-central governments behave in proximity of the cuts in centrally allocated grants. The upper row of graphs in each panel shows the time profile for the fiscal variable of interest for, respectively, all cuts in grants, large cuts in grants and small cuts in grants. Alongside the coefficients we also plot the standard error bands which allow easy identification of the time periods in which the time profile implies a change which is significantly different from zero. The lower row of graphs in each panel shows the cumulative change in the fiscal variable of interest over the event window. This is obtained by summing the respective coefficients over all periods. We also show asymptotic standard error bands for these cumulative effects.

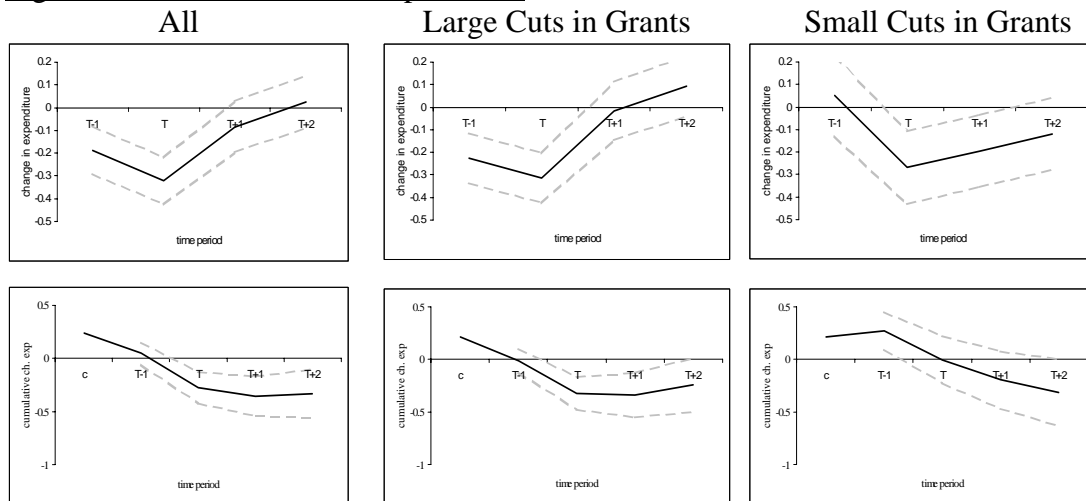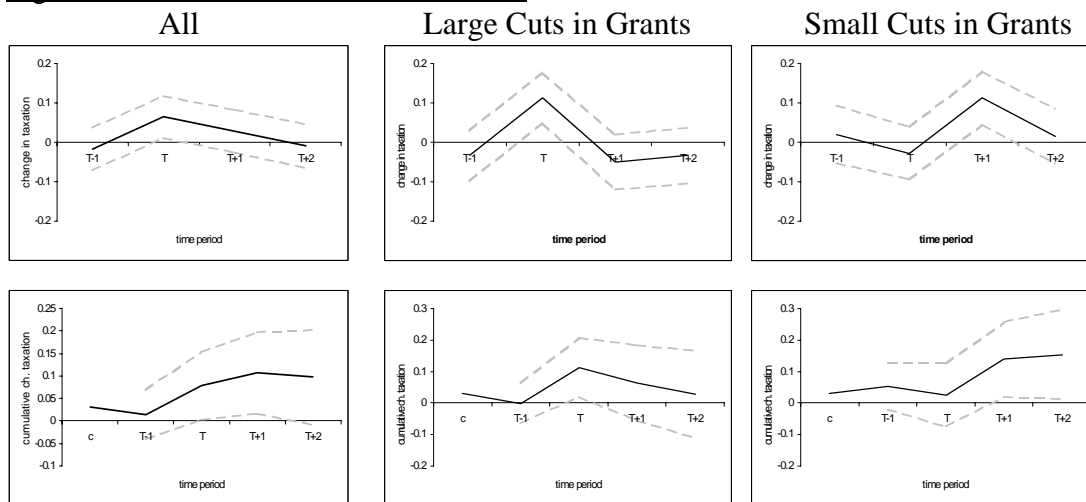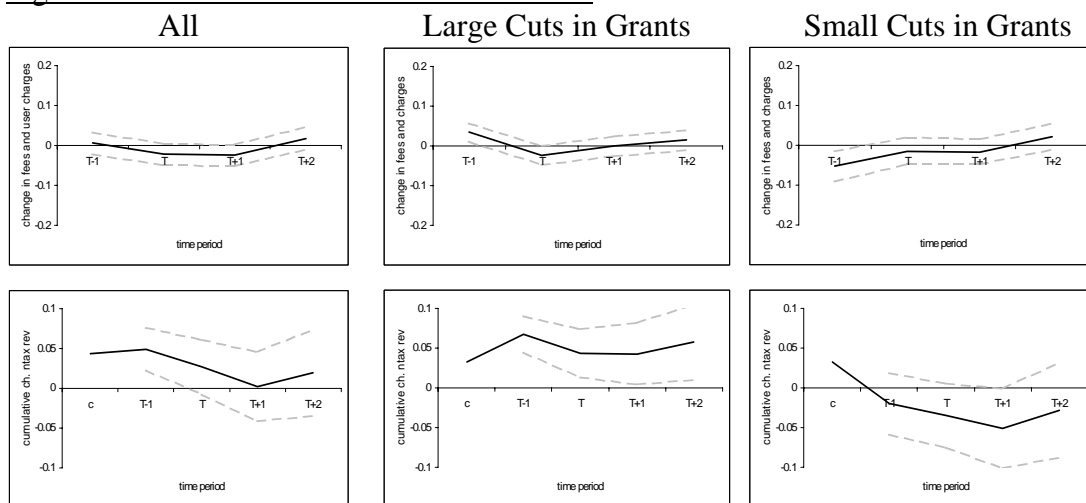Figure 1: Sub-Central Total Expenditure

All	Large Cuts in Grants	Small Cuts in Grants

Figure 2: Sub-Central Taxation Revenue

All	Large Cuts in Grants	Small Cuts in Grants

Figure 3: Sub-Central Non-Taxation Revenue

All	Large Cuts in Grants	Small Cuts in Grants

A number of points emerge from these initial results. First, it is apparent from Figure 1 that cuts in grants are followed by significant and sustained cuts in total sub-central

expenditures. There is also evidence that some of these cuts are anticipated since the T-1 dummy variable is significant. This anticipation effect might be the result of pre-announced or signaled changes in the policies of central governments. Second, as highlighted in Figure 2, sub-central governments also tend to raise taxation revenues significantly in the period of a cut in their grant allocation. Notice that the estimated increase in sub-central tax revenue is significant at time T for all grant cut episodes, but that the response tends to be immediate for large cuts in grants, and delayed (to T+1) for small cuts. Also note that while there is some evidence that the tax effect is not actually sustained following large grant cuts, small cuts appear to have an impact that gradually builds up over time. Figure 3 shows that there is little evidence that non-taxation revenues (from fees and user charges) are used to offset the cuts in grants.

In summary, there appears to evidence of a significant shift towards revenue from sub-central taxation in response to grant cuts, although this is delayed in the case of small cuts and appears to be at least partially reversed in response to large cuts in grants. In terms of overall size, the impact on taxation is less than that on expenditure. In general this supports the notion that the 'fly-paper effect' operates in both directions, in that local governments choose not to fund certain expenditures if they have to provide funds from their own taxes. These results seem to corroborate those presented by Gamkhar and Oates (1996), but contrasts with Gramlich (1987).

Turning to our results based on further disaggregation of the expenditure data. Figure 4 provides some evidence of cuts in sub-central expenditure on goods and services, although the cumulative plots show that these are reversed and back to base levels by T+2. Figure 5 shows that there is only a small impact on social transfers, which is to be expected since the criteria for the majority of social welfare expenditures are nationally set and the payments themselves are generally the responsibility of central governments.

Figure 6 shows that the impact of cuts in grants on the sub-central government wage bill is significant at time T. When separating the cuts by size we discover that cuts in the wage bill are large and significant at T and T+1 in the case of large cuts in grants. The impact on the wage bill is only marginally significant at T for small cuts, and the

cumulative changes are never significantly below the starting point for the duration of the event window. So it would appear that large grant cuts are required to induce significant reductions in the sub-central government wage bill.

Figure 4: Expenditure on Goods and Services
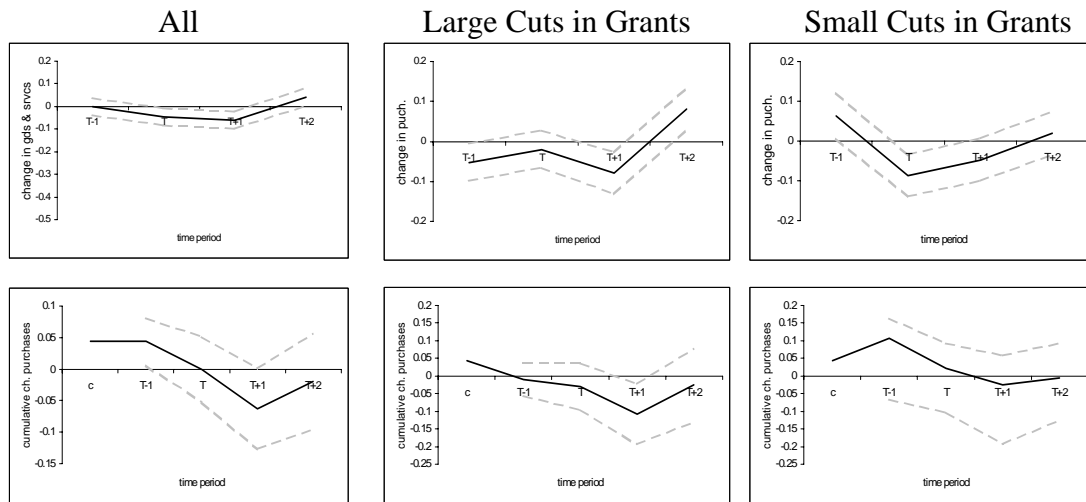
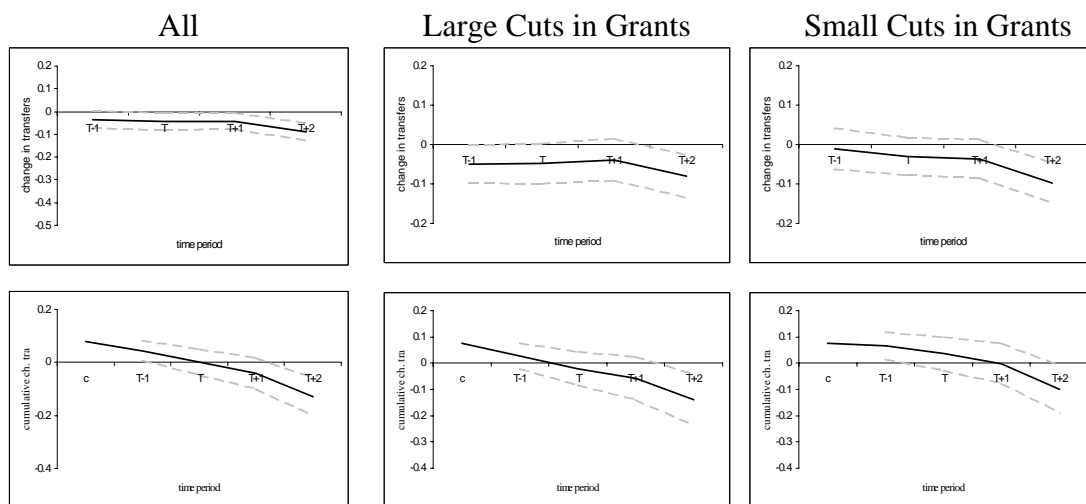Figure 5: Sub-Central Social Transfers

Figure 7 shows that cuts in sub-central governments' capital spending, along with the wage bill, constitute a large proportion of the overall expenditure adjustment. Again the T-1 event dummy is significant, so it would appear that some cuts are brought forward ahead of the actual cuts in grants. Overall, Figure 7 shows that a substantial tightening takes place across the event window, and the size of the cuts is even more significant when one considers that capital expenditure tends to constitute a relatively small proportion of total expenditure at the sub-central level, ranging from 6.24% in

Canada to 28.7% in France over our sample period (see Table 2), so the cuts observed here make particularly large dents in total sub-central capital expenditure.

Figure 6: Sub-Central Wage Bill

| All | Large Cuts in Grants | Small Cuts in Grants |
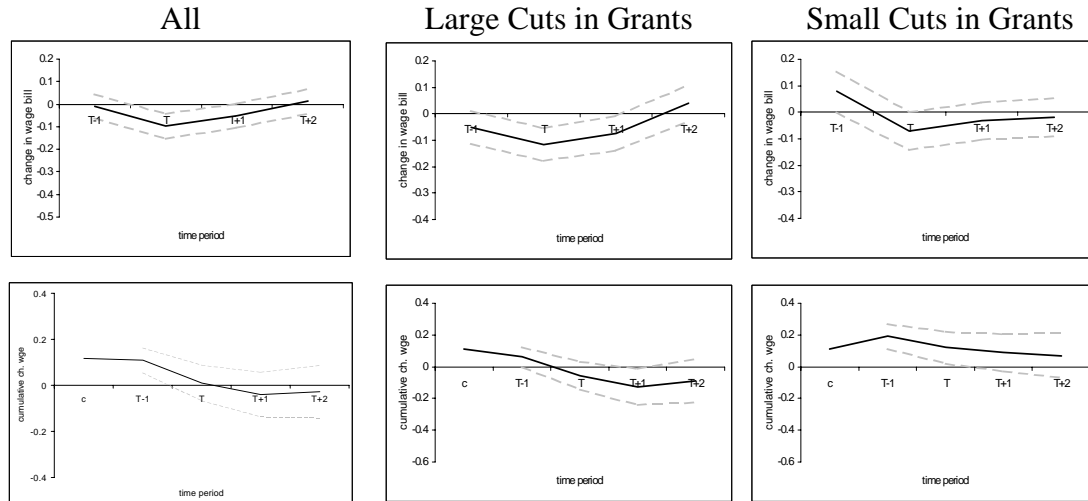
Figure 7: Sub-Central Capital Expenditure

| All | Large Cuts in Grants | Small Cuts in Grants |
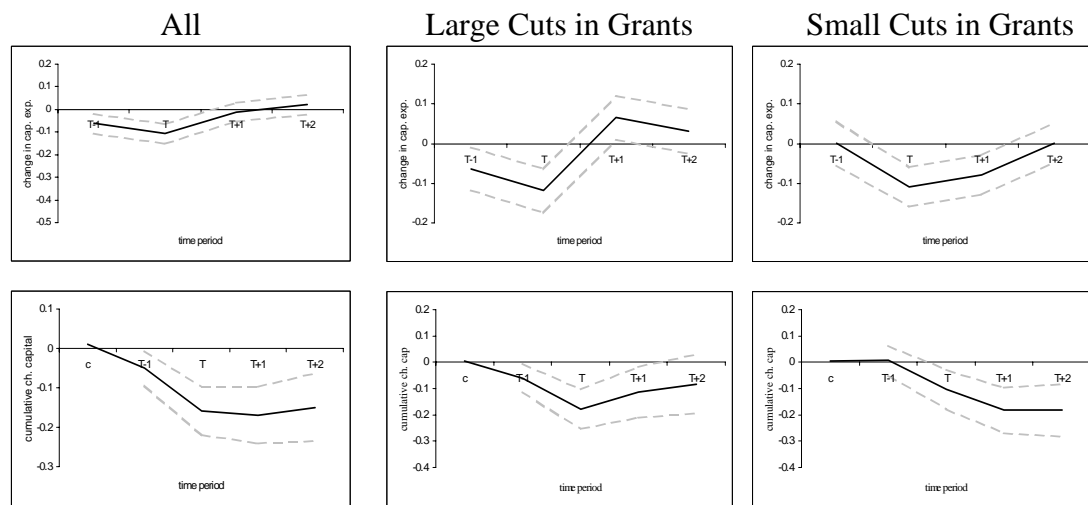
The cumulative results shown in Figure 7 indicate that small grant cuts account for more significant cuts in capital expenditure that are sustained for longer. The adjustments that follow large grant cuts appear to be temporary, and almost totally reversed by the end of the event window.

Table 2: Sub-Central Capital Expenditure as a % of Total Sub-Central Expenditure

Canada	6.24
Denmark	7.87
Sweden	8.47
USA	10.17
Norway	12.28
Finland	12.47
Netherlands	13.78
Belgium	14.22
UK	15.86
Ireland	17.40
Germany	19.09
Australia	19.33
Spain	22.67
Austria	23.08
France	28.72

Source: sample averages of data from IMF Government Financial Statistics

Overall, these results suggest that the major impact of cuts in grants appear to fall on the sub-central government wage bill and on capital expenditure and on tax finance. It would seem that sub-central governments use these adjustments to help defend the provision of public goods and services at pre-cut levels. These results concur with our findings from studying episodes of fiscal consolidation (Darby et al. 2005a, and b).

For the remainder of this paper we investigate whether these general conclusions are robust and consider whether they should be modified through grouping countries by key characteristics. In particular we investigate whether there are significant differences in the responses in countries that might be explained by the extent to which sub-central governments depend on grant finance and also the extent to which classifying countries by their degrees of expenditure decentralization, tax autonomy and borrowing autonomy impacts on our results.

Dependence on Central Government Grants

In Table 3 we have divided the sample into a small group of five countries (the UK, Spain (post-1985)[x], Belgium, Ireland and The Netherlands) that exhibit a 'high' degree of dependence on central government grants, specifically those with grants representing more than 50% of total revenues, and the rest, with grant dependence below 50%.

Figures 8-14 show the changes in the various fiscal variables following a cut in central government grants with the results separately identified for the counties with 'high' and 'low' grant dependence respectively. A striking feature of these results is that those least dependent on grants seem to cut expenditure more (i.e. there is a stronger reverse fly paper effect). It would appear that greater fiscal autonomy does not result in a willingness to offset grant cuts through an increase in sub-central tax revenues. Those countries least dependent on grant finance appear to be even more responsive in cutting all categories of expenditure – on goods and services, transfers and the wage bill and capital expenditure.

Table 3: Ranking by Grant Dependence:
(grants as % of total sub-central revenues)

Countries with Low Grant Dependence	
Spain (pre-1985)	18.56
Sweden	21.59
Germany	23.25
Canada	26.00
Austria	26.11
USA	29.53
Finland	32.19
France	37.14
Norway	37.41
Australia	44.82
Denmark	45.64
Countries with High Grant Dependence	
UK	55.74
Spain (post 1985)	56.42
Belgium	57.87
Ireland	69.77
Netherlands	77.41

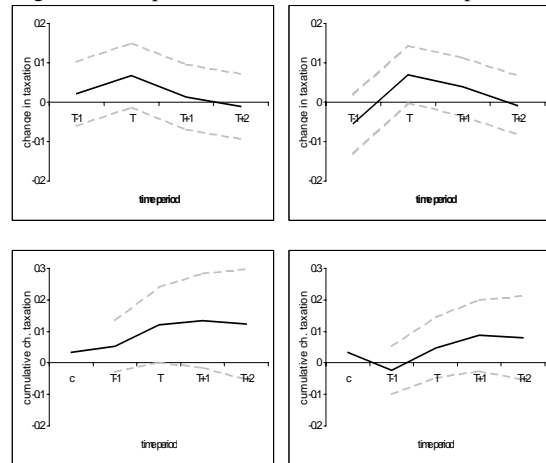*Source: sample averages of data from IMF Government Financial Statistics*

Figure 8: Total Expenditure

High Grant Dependence   Low Grant Dependence
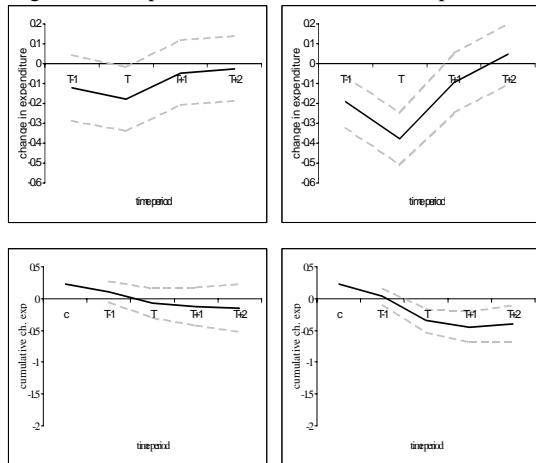
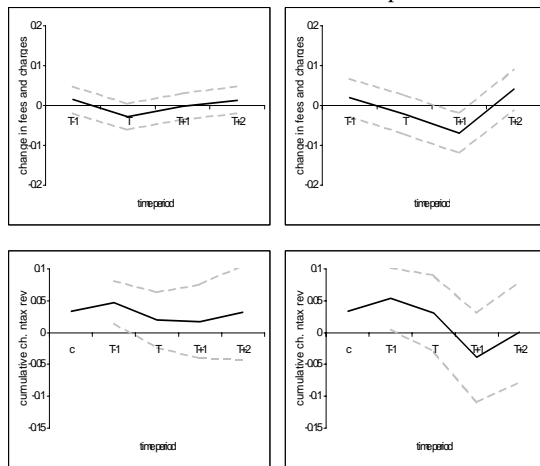## Figure 9: Taxation Revenue

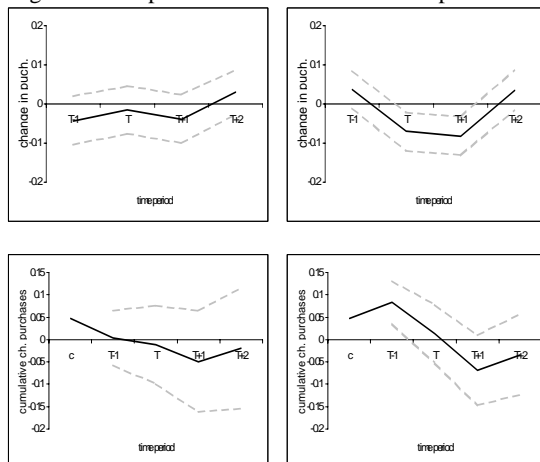High Grant Dependence   Low Grant Dependence

Figure 10: Non-Tax Revenues

High Grant Dependence   Low   Grant
Dependence

Figure 11: Expenditure on Gds & Svs

High Grant Dependence   Low Grant Dependence

Figure 12: Social Transfers
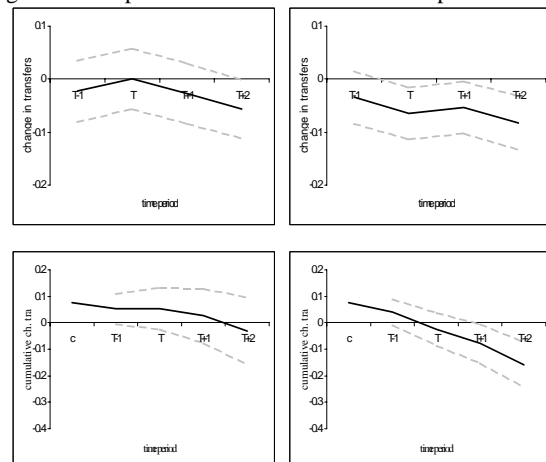
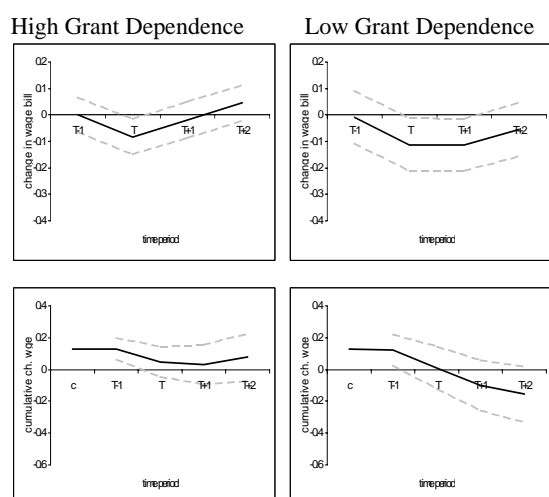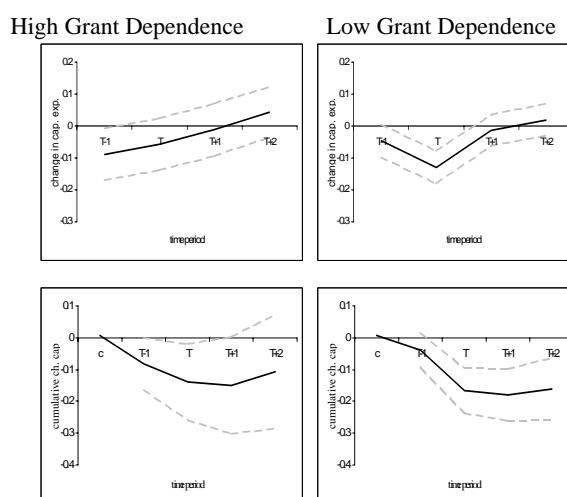High Grant Dependence   Low Grant Dependence

18

Figure 13: Wage Bill   Figure 14: Capital Expenditure

High Grant Dependence   Low Grant Dependence   High Grant Dependence   Low Grant Dependence

These results are strongly suggestive of different reactions being elicited from sub-central governments depending on their institutional settings. In the next section we investigate which countries and what institutional features are the key driving factors generating these results.

Exploring the responses of Individual Countries

One way to examine how individual countries react is to introduce interactive dummies in the event study regressions (see equation 3). The significance of these individual country interactive dummies allows us to judge whether individual countries display a behavior which is significantly different from the others. Two countries, Finland and Spain, had to be dropped from this analysis since there were too few observations of grant cuts in the sample to allow discrimination. For the remaining countries we were able to use these additional regressions to check whether the profile of the fiscal variables evolves along a significantly higher or lower path than for the remaining group. In general there were few significant differences among the countries to report, however some consistent results do emerge[xi]. In particular, Belgium shows a lesser cut in expenditure relative to the reference value, Canada and the US display a smaller increase in taxation, and Austria and France showed a larger increase in taxation and higher expenditure, following cuts in grants episodes. Germany and France also displayed a significantly larger cuts in capital spending, but

Austria significantly less. In the UK, sub-central governments seem to anticipate cuts in grants and enact bigger cuts in expenditure at T-1.

In order to obtain more informative results, which use up less degrees of freedom, we next tried grouping the countries into different categories, depending on the institutional features of their fiscal arrangements.

Institutional Arrangements and Responses to Grant Cuts

Table 4 shows the ranking of the countries in our dataset by expenditure decentralization. A greater degree of decentralization in spending should presumably allow sub-central governments greater scope to adjust to a cut in grants.

Table 4: Ranking by Expenditure Decentralization
(s-c expenditure as % of total govt. expenditure)

Least Decentralized Countries	
Belgium	11.82
Spain (pre-1985)	15.74
France	16.93
Netherlands	24.99
Ireland	25.27
UK	25.37
Spain (post-1985)	27.83
Austria	30.73
Most Decentralized Countries	
Norway	33.63
Sweden	36.19
Finland	38.86
Australia	41.43
Germany	41.77
USA	44.51
Denmark	45.01
Canada	57.34

Source: sample averages of data from IMF Government Financial Statistics

The second grouping we investigate is based upon the degree of tax autonomy using information form OECD (1999) and Rodden (2002), see Table 5. There are two caveats with this data that we should note. The first is that we have had to lose observations for France and Australia since we have yet to find suitable data sources for these countries. The second is that the reference date for the OECD measures of tax autonomy is fixed at 1995. Nonetheless, given the available data this allows us to check whether those countries in which sub-central governments have greater tax autonomy react differently in response to cuts in central government grants.

Table 5: Ranking by Tax Autonomy

	s-c tax revenues as % of total s-c revenues (A)	% of s-c taxation for which s-c controls tax rate and/or tax base (B)	Tax Autonomy: 'own taxes' as % of total s-c revenues (C) = (A) x (B) /100
Countries with greatest tax autonomy			
Sweden	61.47	100	61.47
Canada	56.41	86	48.51
Finland	49.53	89	44.08
Denmark	43.75	95	41.56
USA	47.46	76	36.07
Countries with least tax autonomy			
Belgium	34.25	97	33.22
Spain	40.71	67	27.28
UK	24.15	100	24.15
Ireland	10.25	100	10.25
Netherlands	7.12	100	7.12
Germany	54.45	13	7.08
Austria	51.21	11	5.63
Norway	45.74	3	1.37
Australia	32.88	N.A.	N.A.
France	43.06	N.A.	N.A.

Sources: Column (A) - IMF Government Financial Statistics, calculated as sample averages.
Column (B) - Estimates for Canada and USA were provided by Jonathan Rodden and are based on control of both the tax rate and base, the remaining data are OECD (1999). All figures are for 1995.

The final grouping we investigate is based upon a measure of borrowing autonomy based on Rodden (2002) and reported in Table 6. The ability of any level of government to borrow can be helpful in facilitating short-term smoothing, and also perhaps assists in safeguarding finance for investment projects. However, threats to fiscal sustainability can derive from insufficiently hard budget constraints and a lack of expenditure restraint. These macroeconomic considerations lead many central governments to place restrictions on the ability of sub-central authorities to borrow, and might be expected to restrict the potential responses of the sub-central authorities to cuts in their grant allocations, see Pisauro (2001) and Rodden (*op. cit.*) for more detailed discussions of these issues.

Table 6: Ranking by Borrowing Autonomy

Lowest levels of sub-central borrowing autonomy	
Belgium	1.45
Denmark	1.45
UK	1.5
Austria	1.6
Norway	1.6
Ireland	1.75
Highest levels of sub-central borrowing autonomy	
Netherlands	2.3
Germany	2.3
Australia	2.5
Spain	2.6
Canada	2.7
France	3
Finland	3
Sweden	3
USA	3

Source: Rodden (2003) as adapted in Darby et al., (2003).

The key results using these country groupings are summarised in Table 7. Taxation, total expenditures, and expenditures on goods and services all show larger responses

to grant cuts in countries with high expenditure decentralization[xii]. Tax autonomy seems to be a less important discriminating factor, in that we found few significant effects for the countries with greatest tax autonomy in T. Even in countries with a relatively high degree of taxation autonomy the evidence of a reverse fly paper effect that we have already discussed remains. There is no significant attempt made to offset the consequences of lower grants on sub-central expenditure. Finally it appears that countries with the greatest borrowing autonomy react to cuts in grants by making larger cuts in their total expenditure and in particular in capital spending, relative to their reference values. Whilst these countries in principle would appear to be in a stronger position to offset the impact of the grant cut there is no evidence that they do so. Even for countries with high levels of autonomy, sub-central expenditure and grants appear to be strategic complements.

Table 7: Summary of Results using Country Groupings

Criteria used for grouping countries	Significant NEGATIVE effects
Highest expenditure decentralization	Total Expenditure Expenditure on Goods and Services Taxation Revenue
Highest tax autonomy	Total Expenditure Taxation Revenue
Highest borrowing autonomy	Total Expenditure Capital Expenditure

5. CONCLUSIONS

In this paper we have examined the behavior of sub-central governments during episodes when their grant finance from central government has been cut. We have used event analysis to examine not only how sub-central governments react to these adjustment episodes, but also to gain information on the time profile of the adjustment. In undertaking this analysis we have been able to implement the first comprehensive cross-national study of how sub-central governments' react to financial squeezes enacted by central government.

The results which emerge are set out in detail in the body of the paper. However, it is worth highlighting some general points from our empirical investigation. Our first observation is that the burden of adjustment in response to a cut in their grant allocations is met by cuts in sub-central expenditure. We observe that across our event window, during episodes of grant cuts, expenditures are cut by significant amounts and that such cuts appear to be sustained.

The second general theme is that cuts in grants are not generally offset by large and persistent increases in sub-central taxation revenues. Overall, the increase in sub-central taxation following episodes of cuts in grants tend to be weak, and this, coupled with our observations on the expenditure side, offers support for the presence of a reverse 'fly-paper' effect, although not the asymmetric 'fly-paper effect' suggested by Gramlich (1987).

The third general point is that the sub-central wage bill and capital spending are important areas of adjustment for sub-central governments following cuts in grants. Although the nature of the adjustment does depend to some degree upon the size of the cut in inter-governmental grant, it is striking that capital spending whilst being a small component of sub-central expenditure suffers disproportionately following the centrally imposed squeeze. This possibly highlights a degree of short-termism on the part of local governments in adjusting their fiscal position.

Finally, even where countries have greater flexibility to offset the centrally imposed cuts, through high degrees of expenditure decentralization, tax and borrowing

autonomy, they appear unlikely to exercise these powers. Indeed our evidence suggests that the most decentralized and autonomous sub-central governments exercise the greatest expenditure restraint. We can speculate that the even stronger links between grant cuts and spending squeeze in these cases reflect the ease with which the sub-central governments can convince their electorate to attribute the blame for the cuts to the centre.

DATA APPENDIX

All variables unless otherwise stated are from the IMF GFS [2002] database and are in current prices.

Total Expenditure = [All Current Expenditure (including Wages and Salaries, Employer Contributions, other Purchases of Goods and Services, Subsidies, Transfers to households and Transfers abroad) less Interest Repayments less Transfers to other tiers of national government] + [All Capital Expenditure (including acquisition of Fixed Capital Assets, Purchases of Stocks, Purchases of Land and Intangible Assets and Capital Transfers) less Capital Transfers to other tiers of national government.]

Total revenue = Tax revenue + Non-Tax revenue + Capital Revenue + Grants (total grants less grants received from other tiers of national government).

Tax revenue = Income, Corporate and Capital Gains taxation + Social Security Contributions + Payroll taxation + Property taxation + Domestic and International Indirect taxation.

Non-tax revenue = Entrepreneurial and Property Income + Administrative Fees and Charges + Fines and Forfeits + Other Non-tax revenue.

Grants = Grants received from other tiers of national government. Grants received from super-national authorities such as the EU are excluded.

Social Transfers = Transfers to households and non-profit organizations + Subsidies to firms.

Government Wage Bill = Expenditure on Wages and Salaries.

Purchases of Goods and Services = Non-Wage Expenditure on Goods and Services.

Capital Expenditure = Acquisition of Fixed Capital assets, Purchases of Stocks, Land and Intangible Assets + Capital Transfers.

Debt to GDP ratio = Gross National Debt as a percentage of GDP; source OECD Statistical Compendium 2002.

GDP = Gross Domestic Product (Expenditure approach) at current prices; source OECD Statistical Compendium 2002.

ENDNOTES

[i] Whilst it is difficult to analyse these issues in countries where the relationship between tiers of government has changed over time, we do take steps to account for major shifts in fiscal responsibility that have occurred during our sample.

[ii] It should be stressed that originally (Gramlich, 1977) the term 'fly-paper effect' was used to describe the observation that the expenditure stimulus to local public expenditures from unconditional grants was in excess of equal increases in private income. However, since then, empirical studies (see e.g. Gamkhar and Oates, 1996, and Oates, 1999) have associated the term 'fly-paper effect' with tests of the extent to which changes in government grants impact on local expenditures without reference to changes in private income.

[iii] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, the Netherlands, Norway, Spain, Sweden, the UK and the USA.

[iv] Unfortunately, no such data appears to be readily available for Australia and France, so in the extensions to the basic analysis that involve fiscal autonomy data we have to drop some sample observations.

[v] See for instance MacKinlay (1997) and Campbell et al. (1997). For example, in finance these methods are used to examine the impact of 'news', such as the announcement of profit figures, on share prices in the immediate and surrounding periods.

[vi] Initially we experimented with an event window which included two years prior to the cut in grants. However, the dummy variable in this period were never significant in the regressions and hence we have chosen to narrow the event period and eliminate the T-2 dummy from this analysis.

[vii] In a recent paper Bertrand *et al.* (2004) note that 'difference in differences' estimates might be affected by the presence of serial correlation. Although our study is not a conventional 'difference in differences' study, the presence of serial correlation may result in inconsistent standard error estimates. In order to check if this is a problem, we conducted two robustness checks: first we added a lagged dependent variable to our event study regressions; and second, we re-estimated

our regressions using a GLS (Cochrane-Orcutt) estimator. In all cases we found little change in the sign, size and significance of the time dummy variables. We continue to report the OLS estimates because of the difficulty in plotting event windows in the presence of lagged dependent variables. We are grateful to our discussant at the NBER/CESifo TAPES 'Fiscal Federalism' conference, Thiess Buettner, for pointing this issue out to us.

[viii] For instance, excessive sub-central expenditure or reductions in sub-central taxation might lead to increases in intergovernmental grants.

[ix] To be precise, our auxiliary regressions involve cuts in grants regressed on lagged changes in grants, some conditioning economic variables (lagged unemployment, output) and a set political variables (political party in power, type of government using the data from Woldendorp et al., 2000). We then used these regressions to identify predicted cuts in grants, and used the predicted cuts to re-run the event study regressions. The signs, sizes and standard errors of the time dummies were very similar and hence accounting for endogeneity would not seem to alter the results in a major way.

[x] Given that Spain underwent major reforms in the financing of sub-central governments in the 1980s, we have divided the observations for Spain into two groups, those relating to the pre-1985 reforms period, where Spanish sub-central governments depended less on central grants, and the post-1985 period.

[xi] These results are not tabulated for reasons of space. However, the results are available from the authors on request.

[xii] In tabulating these effects we focus on the interactive dummies at time T. In some cases, we found that the interactive dummies were significant in other time periods. However these effects are difficult to explain in terms of institutional features in the country groupings, and seem to be less important.

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