Fiscal decentralization and budgetary stability: transitory effects and long-run equilibria

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Abstract

We study the effect of fiscal decentralization on budgetary stability. The novel contribution of this study is the focus on the effect of fiscal (de)centralization during reform periods. The empirical analysis with a sample covering 23 OECD countries over the period 1975-2007 provides evidence that tax decentralization exacerbates budgetary problems both during and in the immediate aftermath of reforms toward more tax decentralization. Expenditure decentralization reforms lead to higher deficits as well, but the effect is generally less robust. Tax and expenditure centralization reforms are neutral for deficits. These results suggest that decisive decentralization reforms should be avoided in countries with fiscal problems.

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1 Introduction

How much fiscal autonomy should subnational governments have? On the one hand, complete centralization of fiscal authority cannot be optimal. On the other hand, fully decentralized fiscal policy is presumably inefficient as well. But in between these two extremes, there is a myriad of choices for countries to make.

Among the arguments agaisnt too much subnational fiscal autonomy, a prominent one is that fiscal decentralization exacerbates budgetary problems. Indeed, there are several reasons why fiscal decentralization might cause fiscal imbalances. First, subnational tax autonomy could result in tax competition and inefficiently low levels of taxation (Wilson, 1986; Zodrow and Mieszkowski, 1986): if subnational governments are unable to reduce expenditures in response to declining tax revenues, tax competition might lead to higher deficits and more debt.

Second, subnational expenditure autonomy may result in over-borrowing if lower-level governments do not fully internalize the social costs of debt. For example, theoretical contributions such as Goodspeed (2002) and Wildasin (1997) show that if a subnational jurisdiction anticipates a bailout – i. e. if it expects that either the central government or other subnational jurisdictions will eventually cover a fraction of its debt – it will face strong incentives to over-borrow. Baskaran (2012a) Rodden (2005) provide empirical evidence that this phenomenon exists at the state level in Germany. Pettersson-Lidbom (2010) offers corresponding evidence for Swedish municipalities.

Third, it is more difficult to pursue specific budgetary goals if the public sector is decentralized. This potential disadvantage is particularly relevant for the European Economic and Monetary Union (EMU) member countries in view of the requirements of the Stability and Growth Pact (SGP), especially after its recent reform ("Sixpack"). The most important feature of the SGP is the imposition of an upper limit on general government

deficits. Since this budgetary target refers to the general government, the national *and* all subnational governments are responsible for achieving this target. Yet it is typically the national government that has to bear the blame if the target is missed (Joumard and Kongsrud, 2003). In view of this political reality, subnational governments might have few incentives to pursue painful austerity measures. Serious consolidation efforts, therefore, could be rendered futile if a country is fiscally decentralized.

While the arguments for why fiscal decentralization might cause budget imbalances are strong, there exists an opposing view. A number of authors argue that fiscal decentralization may actually improve budgetary stability. Arguments for a favorable effect of decentralization derive primarily from the Public Choice tradition (Brennan and Buchanan, 1980). Based on theories developed in this literature, it can be argued that fiscal decentralization subjects political decision makers to more public scrutiny by "bringing the government closer to the people". As a consequence, unnecessary and wasteful public expenditures could be lower and thus high levels of deficits and debt less likely in decentralized countries.

Given the ambiguous theoretical predictions, establishing the effect of decentralization on budgetary stability has to be ultimately an empirical endeavor. However, existing empirical results are inconclusive. One the one hand, studies such as De Mello (2000) and Rodden (2002) indicate that fiscal decentralization leads to more budgetary instability. On the other hand, studies by Schaltegger and Feld (2009) and Baskaran (2010) suggest that decentralization has no negative implications for deficits and debt. More ambiguous results are found by Freitag and Vatter (2008), Fornasari et al. (2000), and Stein (1998).

Most models that are estimated in the empirical literature implicitly impose the ex-ante assumption that fiscal decentralization has the same effect in all countries and under all circumstances. This feature of the empirical specification might provide an explanation for why their results are ambiguous or even contradictory. It is likely that the effect of fiscal

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decentralization on budgetary stability varies in time and space. The homogeneity assumption may therefore result in estimates that vary with particular samples, specifications, and estimation methods.

While some types of heterogeneity in the effect of decentralization on budgetary stability have been studied (Neyapti, 2010; Baskaran, 2012b), others remain unexplored. From a policy perspective, one important yet neglected question derives from the fact that fiscal decentralization has both a static and a dynamic dimension. Fiscal decentralization refers, on the one hand, to the long-run differences in the degree of subnational fiscal autonomy, either within or between countries. In this sense, it is a static concept. On the other hand, it refers to the process of reforming the vertical fiscal structure of a state. If perceived in this way, fiscal decentralization has a dynamic meaning.

Most studies on the budgetary consequences of decentralization estimate models in which the short-run effects are not properly separated from the long-run effects. In a nutshell, existing studies implicitly assume that a given difference in levels of fiscal decentralization has the same effect on budgetary stability irrespective of whether the difference emerges in the context of an ongoing reform or whether it signifies differences in long-run equilibrium levels. It is likely, however, that the short- and long-run effects of fiscal decentralization on budgetary stability vary.

For example, there might be initial problems with fiscal stability when a country begins to decentralize its public sector. Even if the reform has been completed, the first few years might be characterized by fiscal instabilities because the central and subnational governments are not familiar with the new fiscal arrangements. In the long-run, such initial difficulties could be over-come and fiscal decentralization might turn out to be beneficial. Conversely, it is also possible that granting subnational governments more fiscal autonomy is beneficial in the short-run because it introduces an element of competition into the

public sector. In the long-run, institutional sclerosis might set in and any beneficial effects of fiscal decentralization might disappear (Olson, 1984).

Even if fiscal decentralization is beneficial for fiscal stability in the long-run, the short-run costs of reforming the vertical fiscal structure of the state could be so high as to render the long-term benefits moot. On the other hand, it might not be particularly important that fiscal decentralization is not beneficial or even harmful for budgetary stability in the long-run if it has positive consequences in the short-run, i.e. during and in the immediate aftermath of a reform. In this case, fiscal decentralization could be a means to deal with any pressing fiscal problems.

It is, hence, important to study the short-run effects of fiscal decentralization on public deficits, and to explicitly separate them from the long-run effects. In this paper, we carry out such an analysis. More specifically, we study the consequences of fiscal decentralization for budgetary stability during and in the immediate aftermath of reform periods. This is in contrast to most existing studies which do not make a distinction between short- and long-run effects. Since reforms are rare events, existing studies thereby implicitly focus on long-run equilibria.

The analysis relies on a dataset consist of 23 OECD countries over the period 1975-2007. We estimate two-way fixed effects models that relate periods in which the vertical fiscal structure of the state is being reformed to public deficits. We distinguish between reform years and immediate after-reform periods. We consider reforms that decentralize and reforms that centralize the public sector. Finally, we differentiate between tax and expenditure decentralization.

Our main results are that tax decentralization is harmful for budgetary stability both during and in the immediate aftermath of a reform. Expenditure decentralization appears to be harmful as well, but the effect is less robust.

The plan for the remainder of the paper is follows. The next section describes the data. Section 3 discusses the empirical methodology. Section 4 provides some descriptive statistics on the relationship between reforms of the vertical fiscal structure of the state and fiscal outcomes. In Section 6, we collect the baseline results. Section 7 presents a number of robustness tests. Finally, a conclusion is offered in Section 8.

2 Data

The most important variables in our empirical analysis are measures of subnational fiscal autonomy. For the majority of the paper, we focus on two specific measures of fiscal autonomy: (i) a tax decentralization measure, i.e. the ratio of subnational tax revenue to total government tax revenue, and (ii) an expenditure decentralization measure, i.e. the ratio of subnational expenditures to total government expenditures.

The tax decentralization variable is constructed with data from the OECD's Revenue Statistics database. The expenditure decentralization variable is constructed with data from the OECD's fiscal decentralization database.[1]

These decentralization measures have advantages and disadvantages. The advantage is that they can be constructed for recent years, i.e. up until 2007. The disadvantage is that they may not accurately reflect the true level of subnational fiscal autonomy (Ebel and Yilmaz, 2002; Rodden, 2004). That subnational governments are responsible for a large fraction of government expenditures does not necessarily imply that they can allocate these expenditures at their own discretion: it is possible that there are national spending mandates, effectively forcing subnational governments to spend on projects chosen by the national government. Similarly, that subnational governments collect a large fraction of the tax revenues does not necessarily imply that they have considerable tax autonomy. It is

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[1]The data is available at `http://www.oecd.org/ctp/fiscalfederalismnetwork/`.

possible that both rates and bases are set by the national government, reducing subnational governments effectively to collection agencies without any true fiscal authority.

Because of this disadvantage, we will also apply in robustness checks different measures for fiscal decentralization. More precisely, we first use data on tax decentralization provided from Stegarescu (2005). This measure has the advantage that it accounts for subnational tax autonomy. It has, however, the disadvantage that it is only available at most until 2001 (and for most countries in our sample only until 2000). Therefore, we report regressions with a self-constructed measure that updates the Stegarescu (2005) measure until 2005 by using data provided by the OECD.[2] The updated data is not fully consistent with the Stegarescu data, but displays reasonable values for most countries. See Baskaran and Feld (2012) for details.

Unfortunately, there is no similar measure for expenditure decentralization that takes subnational expenditure autonomy into account. Therefore, we opt to establish the robustness of the results with respect to the use of a different data source rather than exploring whether the results are robust to indicators of expenditure decentralization that take subnational expenditure autonomy into account. For this robustness test, we use an expenditure decentralization measure constructed with data form the IMF's GFS database.

In addition to different variables measuring fiscal decentralization, our dataset includes variables measuring budgetary outcomes. We use the primary deficit to GDP ratio as our main deficit concept. The primarily deficit is defined as gross deficit minus interest payments. This indicator for the budgetary stance of the government has, compared to other deficit concepts, the advantage that it captures the discretionary fiscal policy of the government particularly well. While interest payments are a function of the stock of debt and thus only partially under the control of the current government, net expenditures can presumably be adjusted more readily. To establish robustness, however, we also report

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[2]The data is available at http://www.oecd.org/ctp/fiscalfederalismnetwork/. They are discussed by Blöchlinger and King (2006) and Blöchlinger and Rabesona (2009).

regressions with a different deficit concept: the net borrowing to GDP ratio. Net borrowing is defined as total expenditures minus total revenues.[3].

Our dataset also includes a set of control variables, i.e. variables that can be hypothesized to affect deficits while at the same time being related to subnational fiscal autonomy. The control variables are GDP per capita growth[4], the inflation rate[5], gross financial liabilities[6] in the previous period (the stock of debt), population growth[7], the unemployment rate[8], the ideology of the central government[9], and the degree of party fractionalization of the central government[10]. The economic control variables should be self-explanatory. Ideology is defined on a three point scale, with 1 right-wing, 2 centrist, and 3 left-wing. Fragmentation is constructed as a Herfindahl-index with the number of parties represented in the government: larger values indicate more fractionalized governments. More generally, this variable is defined as the probability that two randomly chosen government officials will be from different parties.

3 Empirical methodology

The aim of this paper is to study the effect of fiscal decentralization during reform periods. We divide a reform period into two distinct phases. The first is the reform itself. The second is a relatively short period immediately after a reform, when a country has found a new equilibrium but has not yet remained in this equilibrium sufficiently long for institutional

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[3]More precisely, the OECD states that the net borrowing/lending concept:"... reflects the amount of financial assets that are available for lending or needed for borrowing to finance all expenditures - current, gross capital formation, non-produced non-financial assets, and capital transfers - in excess of disposable income". Source: http://www.oecd-ilibrary.org.

[4]Data source: OECD GDP database

[5]Data source: OECD Key Short-Term Economic Indicators

[6]Data source: OECD Economic Outlook.

[7]Data source: OECD Population database.

[8]Data source: OECD Economic Outlook.

[9]Data source: Beck et al. (2010)

[10]Data source: Beck et al. (2010)

sclerosis to evolve. To study the effect of fiscal decentralization during these two distinct periods, we have to establish criteria according to which we can identify periods of reform and periods where a country has settled into a new equilibrium.

For most of the paper, we say that a country is engaged in a decentralization reform in year t if the relevant measure of fiscal decentralization increases by at least 2 percentage points in year t or by at least 1.5 percentage points for two years in a row (i. e. in year t and $t+1$). To give an example: we say that a country is engaged in a tax decentralization reform in year t if the tax decentralization measure, i. e. the subnational tax share, increases by 2 percentage points in year t or begins to increase by 1.5 percentage points for two years in a row.

We apply a similar definition for fiscal centralization. We say that a country is engaged in either tax or expenditure centralization in year t when the relevant measure for fiscal decentralization decreases by 2 percentage points in year t or begins to decrease for two years in a row by 1.5 percentage points.

The definition of a rapid reform period follows the approach advanced by Alesina et al. (2006), Alesina and Ardagna (1998), and Alesina and Perotti (1995) to identify rapid fiscal adjustments. However, while they use their fiscal adjustment indicator as dependent variable, we use our measures for fiscal decentralization as explanatory variables. Therefore, our approach also shares similarity with the methodology developed by Giavazzi and Tabellini (2005) to study the economic consequences of democratic and economic reforms.

In addition to establishing criteria to define reform periods, we also establish criteria for identifying periods in which a country has settled to a new equilibrium. We call these periods after-reform periods. We say that a country is experiencing an after-reform period of a particular type in the three years following a particular reform *if* no new reform (either toward more centralization or toward more decentralization) is implemented within the three years. For example, we say that a country is experiencing an "after expenditure

reform period" in the three years in which a expenditure decentralization reform has been implemented in a country – as long as the country does not implement another reform to the level of subnational expenditure autonomy in these three years.

Based on these definitions, we construct dummy variables indicating reform and after-reform periods. The dummy variables are one in reform and after-reform periods, respectively, and else zero. Detailed definitions of the reform and post-reform variables can be found in Table 1. Summary statistics can be found in Table 2.

Figure 1 depicts the number of tax (subfigure a) and expenditure (subfigure b) decentralization and centralization reforms for each country in our sample during the 1975-2007 period. As indicated by subfigure a, Spain is the country with the largest number of tax decentralization reforms. It experienced eight reforms that increased the subnational tax share. On the other hand, it also experienced two reforms toward more tax centralization. Sweden is the country that saw the largest number of tax centralization reforms: six. On the other hand, Sweden also experienced five tax decentralization reforms.

With respect to subnational expenditure autonomy, subfigure (b) shows that Finland is the country with the largest number of expenditure centralization reforms. It experienced four significant decreases in the subnational expenditure share. Expenditure decentralizations are spread much more evenly: Belgium, Spain, Germany, Ireland, and Island experienced two expenditure decentralization reforms during the sample period.

Figure 2 shows the over-time distribution of tax (subfigure a) and expenditure (subfigure b) decentralization and centralization reforms in all countries. The number of tax decentralization reforms spike in 1975, 1982, 1987, 2000, and 2001. A significant number of tax centralizations take place in 1980, 1986, 1995, and 2000. With respect to subnational expenditure autonomy, we find that expenditure decentralization reforms spike in 2000 and 2006. On the other hand, a significant reforms leading to more centralization took place in 1992 and 2001.

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While there are notable spikes, reforms to the level of subnational tax and expenditure autonomy have happened throughout the sample period. There are no obvious trends or patterns.

4   Descriptive statistics

We begin our study of the relationship between the short- and long-run effects of fiscal decentralization on budgetary outcomes by presenting simple descriptive statistics. Figure 3 plots the average primary deficit to GDP ratio during centralization reforms, decentralization reforms, and all other periods.

With respect to subnational tax autonomy, subfigure (a) indicates that the primary deficit to GDP ratio while a country is engaged in tax centralization is -0.83. It is somewhat smaller than the -0.37 in periods where a country is neither engaged in a tax centralization nor a tax decentralization reform. But most strikingly, the average primary deficit to GDP ratio during tax centralization reforms is noticeably smaller than the ratio during tax decentralization reforms. In the latter case, the ratio is 0.42.

For expenditure autonomy, subfigure (b) suggests that the average primary deficit to GDP ratio is 0.77 during reforms toward more centralization, -0.33 during periods where a country is neither engaged in a reform toward more centralization or decentralization. When a country is engaged in expenditure decentralization, we find that the average primary deficit to GDP ratio is -1.89. It therefore appears that with respect to subnational expenditure autonomy, reforms toward more decentralization are associated with smaller deficits than reforms toward more centralization.

Figure 4 compares average primary deficit to GDP ratios in after-reform periods. Subfigure (a) indicates that after a tax centralization reform, the average deficit to GDP ratio is at -0.77. The average deficit to GDP ratio after a tax decentralization reform, on the

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other hand, is 0.74. The primary deficit to GDP ratio in all other periods is around -0.41. Overall, it appears that periods after a tax centralization reform are characterized by smaller deficits than periods after a tax centralization reform.

With respect to subnational expenditure autonomy, subfigure (b) indicates that after a reform toward more centralization, the average primary deficit to GDP ratio is -1.32 while the ratio is -1.43 after a reform toward more decentralization. In all other periods, the deficit is 0.35. Consequently, these subfigures indicate that after-reform periods are generally associated with lower deficits than all other periods in the case of subnational expenditures, irrespective of whether the reform increased or decreased the level of decentralization.

Overall, the descriptive statistics indicate that tax centralization improves budgetary stability while tax decentralization leads to less stability. On the other hand, deficits are smaller when a country is decentralizing with respect to expenditures than when it is centralizing. Finally, deficits after a reform of subnational expenditure autonomy seem to be associated with better outcomes than other periods, irrespective of whether the reform increases or decreases subnational autonomy.

While these conclusions are suggestive, they are only preliminary. The question is whether they survive a more rigorous empirical analysis. We now turn to this question.

5   Empirical model

To establish the short- and long-term effect of fiscal decentralization on budgetary outcomes, we estimate the following model:

$$\begin{aligned} \text{Deficit}_{it} =& \alpha_i + \gamma_t + \text{Deficit}_{it} \\ &+ \beta_1 \text{decentralization reform}_{it} + \beta_2 \text{centralization reform}_{it} \\ &+ \beta_3 \text{after decentralization period}_{it} + \beta_3 \text{after centralization period}_{it} \\ &+ \omega X_{it} + \epsilon_{it}, \end{aligned} \quad (1)$$

where the dependent variable is the primary deficit to GDP ratio (except in a robustness test).

The most important control variables are, first, the dummies for whether a country is engaged in year t in a reform of its level of subnational tax or expenditure autonomy (either toward more centralization or decentralization) and, second, the dummies for after-reform periods. In addition, we include in all estimated models country (α_i) and year (γ_t) fixed effects, and the lagged depended variable. Country fixed effects control for observed and unobserved time-constant country-specific factors. Year fixed effects control for year-specific (both observed and unobserved) shocks that affect all countries similarly. The lagged dependent variable controls for persistence in the primary deficit. In some models we also include further time varying control variables, summarized in Equation 1 with X_{it}. Finally, ϵ_{it} is the error term.

The estimations are conducted with a sample covering the 1978-2007 period, even though the panel covers 1975-2007. The reason for this restriction is our definition of after-reform periods. As they are defined to cover the three year following a reform and we have no information on reforms prior to 1975, we have to discard the observations prior to 1978.

We estimate this model with OLS. Even though the lagged dependent variable is included in this model, we do not use dynamic panel data estimators. While OLS leads to

the Nickell-Bias in models with lagged dependent variables (Nickell, 1981), the bias approaches 0 with the time dimension of the panel. Judson and Owen (1999) show that the Nickell-Bias can be ignored once the time dimension is around 30. In our regressions, the panel covers 1978-2007. The time dimension is therefore 30. Hypothesis tests are generally conducted with heteroscedasticity and cluster robust standard errors. We cluster at the country-level.

6 Baseline results

Table 3 presents the baseline results for subnational tax autonomy. The structure of the table is as follows. The first column presents results from a model without country and year fixed effects. The model reported in the second column includes country fixed effects. The model in the third column adds to Model II year fixed effects. Model III adds economic control variables. Model IV adds the two political control variables (government ideology and fragmentation). Finally, Model V adds the current level of the subnational tax share (i. e. the prevailing level of tax centralization / decentralization). This variable is included to test whether it is the prevailing level of decentralization rather then the process of reforming the prevailing level, is important for deficits. Alternatively, this variable can be interpreted as the long-run effects of fiscal decentralization.

According to the estimates collected in Table 3, deficits are higher when a country is engaged in a reform toward more tax decentralization. More precisely, the primary deficit to GDP ratio is about 1 to 1.5 percentage point larger when a country is engaged in a tax decentralization reform compared to other periods. The periods after a tax decentralization reform are characterized by higher deficits than other periods. Deficit to GDP ratios are on average 0.5 to 0.7 percentage points higher during after-reform periods. Tax centralization reforms have no effect on deficits. Similarly, after-reform periods also fail to

display significantly different deficits than other periods in the sample. Finally, note that the subnational tax share included in Model V is insignificant and that the inclusion of this variable neither affects the sign nor the significance of the remaining decentralization variables.

Overall, these estimates indicate that tax decentralization is detrimental for budgetary stability. When a country grants more autonomy to its subnational governments, deficits increase both in the short- and the long-run. Tax centralization, on the other hand, is neutral for deficits.

Table 4 presents the results for reforms of the degree of subnational expenditure autonomy. The structure of the table is as above. The results are as follows. Deficits appear to be about 1 to 2 percentage points higher during expenditure centralization reforms. The coefficient is, however, not always significant. There is also some evidence that deficits are about 0.4 percentage points higher in the three years after an expenditure decentralization reform.

Overall, there is some evidence that expenditure centralization reforms lead to higher deficits, even if the coefficient not fully robust. But the period after a reform is not characterized by higher deficits than other periods. Expenditure decentralization, on the other hand, has no immediate adverse consequences for deficits. But the period following a reform is characterized by slightly larger deficits than other periods.

7 Robustness tests

7.1 Different thresholds for reform periods

We report a number of robustness tests. First, we explore whether our baseline results are robust to different thresholds in identifying reform periods. Instead of the definition that a reform year is taking place if the respective decentralization variable increases by 2

percentage points or starts to increase by 1.5 percentage points for two years in a row, we apply a wider and a narrower definition. The wide definition uses as thresholds either a change by 1 percentage point or 0.5 percentage points for two years in a row. According to the narrow definition, a reform is taking place when the relevant measures changes by either 4 percentage points in year t or by 2.5 percentage points for two years in a row.

The results for subnational tax autonomy using different thresholds are collected in Table 5. The structure of the table is as follows. The first column presents regressions without any control variables except country and year fixed effects. The second column additionally includes the economic control variables. The third column adds to the list of controls the two political variables. Finally, Model IV adds the prevailing level of the subnational tax share. We only report the estimates for the decentralization variables and omit those for the control variables for brevity.

The baseline conclusions are generally confirmed by this robustness test. When the wide definition is used, we find that tax decentralization displays a negative coefficient. The estimate is statistically significant. The size of the estimated coefficient, however, is only about half as large as in the baseline models. The coefficient for the after-tax decentralization reform is positive as in the baseline models, but less significant. The tax centralization variable is consistently insignificant, as in the baseline models. Interestingly, the after-tax centralization dummy consistently displays a negative coefficient, which is significant in one case.

When the narrow definition is used, the results are once more almost identical to the baseline findings. Tax decentralization is associated with higher deficits both during reform and after-reform periods. Tax centralization, on the other hand, is insignificant.

Table 6 presents the corresponding results for expenditure decentralization. The structure of the table is identical to Table 5. In contrast to the results for subnational tax autonomy, the results for expenditure decentralization do not confirm the baseline find-

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ings, at least not with respect to statistical significance. None of the decentralization variables are significant, neither when the narrow or when the wide definition is used.

7.2   Alternative proxies for deficits

In this section, we explore the robustness of our results to an alternative deficit variables. We use the consolidated net borrowing to GDP ratio as dependent variable. This measure is essentially the gross deficit of the public sector. It has, however, the disadvantage that the discretion of the national and subnational governments over the net borrowing to GDP ratio is smaller than over the primary deficit to GDP ratio because it encompasses interest payments.

The results are collected in Table 7. The structure of the table is as in the previous robustness tests: the first column reports results for a model without any control variables except country and year fixed effects. The second column reports results for a model where economic control variables are additionally included. In the third model we add political control variables. Finally, the last column is from a model that appends Model III with the relevant measure for subnational tax or expenditure autonomy, respectively.

The results are very similar to the baseline findings. Tax decentralization reforms consistently have a positive and significant effect on deficits. Post-tax decentralization periods are also characterized by larger deficits. Tax centralization reforms and after-reform periods are insignificant. The expenditure decentralization variables is consistently negative and significant. The post dummies for the after-reform periods are insignificant. However, the subnational expenditure share has a significantly positive coefficient.

7.3   Different decentralization variables

One problem with the decentralization variables used in the previous analysis is that they might be inaccurate. As indicated, tax decentralization measures constructed as the share of subnational to total government tax revenues might not indicate the true tax autonomy of subnational governments. Similarly, expenditure decentralization measures constructed as the share of subnational to total government expenditures might not signify the real subnational expenditure autonomy in a country.

This issue, however, is presumably less problematic in our case compared to other studies. We focus at decisive changes over-time, while deemphasizing the prevailing level of decentralization. If there is a decisive change, we may be reasonably certain that there has been a significant change in the level of decentralization, whatever the current level of decentralization.

Nevertheless, it is reasonable to establish the robustness of the results to alternative decentralization measures. In addition, measures based on other data sources than the OECD might also help to establish robustness. We therefore conduct regressions with alternative decentralization measures.

Table 8 presents regressions with two tax decentralization measures that take the degree of subnational tax autonomy into account and a measure constructed with data from the IMF's GFS database. In the first column, we use a tax decentralization measure taken from Stegarescu (2005). The second model uses an updated Stegarescu-measure that is constructed with data taken from the OECD. In the third column, we present the results from a model with where we use an expenditure decentralization variable constructed with data from the OECD.

When the measures for subnational tax autonomy are used, the estimated coefficient for tax decentralization has consistently a positive coefficient. It is significant when Stegarescu's original measure is used, but not with the updated measure. The after-tax decen-

tralization variable is significantly positive with both measures. The estimated coefficient for the tax centralization and the post-tax centralization variables are insignificant. Overall, these results confirm that tax decentralization worsens budgetary outcomes whereas tax centralization is neutral.

When using the alternative measure for subnational expenditure autonomy, we find that expenditure decentralization reforms lead to higher deficits. All other decentralization variables are insignificant. Overall, the results for the regressions with the GFS measures suggest that expenditure decentralization reforms lead to higher deficits.

8   Conclusion

How does fiscal decentralization affect public deficits? We acknowledge in this paper that the effect of decentralization on deficits may not be constant. Decentralization might have a different effect during periods of rapid reform and during periods when countries have settled into a long-run equilibrium. Using a dataset that covers 23 OECD countries over the period 1975-2007, we find that tax decentralization reforms exacerbate budgetary problems. Tax decentralization reforms are associated with higher deficits both in the short- and the long-run. Expenditure decentralization seems to lead to higher deficits as well. The coefficient is, however, not always significant. Overall, these results suggest the conclusion that tax decentralization exacerbate fiscal problems in the short-run. Expenditure decentralization is also associated with higher deficits, even though the effect is not always robust.

There are a number of reasons why tax decentralization might lead to worse fiscal outcomes in the short-run. For example, subnational governments might use any new-found fiscal autonomy to immediately engage in tax competition while adjusting expenditures more slowly. As a consequence, we may observe higher deficits initially, i. e. as long as

expenditures have not adjusted. That expenditure decentralization has a negative effect on deficits could be due to the possibility that when subnational governments take over some tasks from national government, that the latter finds it difficult to cut expenditures immediately. For example, personal expenditures cannot be adjusted in the short-run if employees have fixed contracts or have tenure. Consequently, there might for some time a doubling of effort at the national and subnational level, leading to higher deficits in the short-run.

These results suggest as policy conclusions that if countries decentralize their public sectors, either on the expenditure or the revenue side of the budget, they will likely face costs in terms of budgetary instability. In some circumstances, countries might find it optimal to incur the costs to reap other benefits of decentralization. In other circumstances, they might consider the costs as too high. For example, many European countries are currently suffering from budgetary problems. Increasing the level of tax or expenditure decentralization will likely exacerbate such problems. Therefore, we cannot recommend such reforms for the time being for these countries. But under different circumstances, such reforms would be feasible.

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Table 1: DEFINITION AND SOURCE OF VARIABLES

Label	Description	Source
Dependent variables		
Primary deficit	Primary deficit, as a percentage of GDP.	OECD Economic Outlook
Decentralization variables		
Tax decentralization reform	Dummy variable based on the ratio of subnational tax revenue to total (local, state, and central) tax revenues (this ratio is denoted tax decentralization). Assumes the value 1 in years where the ratio increases by at least 2 percentage points or by at least 1.5 percentage points in two consecutive years, otherwise 0.	Own construction based on OECD Revenue Statistics - Comparative tables
Tax centralization reform	Dummy variable based on the ratio of subnational tax revenue to total (local, state, and central) tax revenues (this ratio is referred to as tax decentralization in the text). Assumes the value 1 in years where the ratio decreases by at least 2 percentage points or by at least 1.5 percentage points in two consecutive years, otherwise 0.	Own construction based on OECD Revenue Statistics - Comparative tables
After tax decentralization	Dummy variable that assumes the value 1 for the three years following a tax decentralization reform except if a new reform is implemented (either in the direction of more centralization or decentralization), otherwise 0. If a new reform is implemented within the three years following a reform, then the dummy is 0 in the year of the new reform.	Own construction
Post tax centralization period	Own construction	
After tax centralization	Dummy variable that assumes the value 1 for the three years following a tax centralization reform except if a new reform is implemented (either in the direction of more centralization or decentralization), otherwise 0. If a new reform is implemented within the three years following a reform, then the dummy is 0 in the year of the new reform.	Own construction
Expenditure decentralization reform	Dummy variable based on the ratio of subnational expenditures to total (local, state, and central) expenditures revenues (this ratio is referred to as expenditures decentralization in the text). Assumes the value 1 in years where the ratio increases by at least 2 percentage points or by at least 1.5 percentage points in two consecutive years, otherwise 0.	Own construction based on OECD Fiscal Decentralisation Database
Expenditure centralization reform	Dummy variable based on the ratio of subnational expenditures to total (local, state, and central) expenditures revenues (this ratio is referred to as expenditures decentralization in the text). Assumes the value 1 in years where the ratio decreases by at least 2 percentage points or by at least 1.5 percentage points in two consecutive years, otherwise 0.	Own construction based on OECD Fiscal Decentralisation Database
After expenditure decentralization	Dummy variable that assumes the value 1 for the three years following a expenditure decentralization reform except if a new reform is implemented (either in the direction of more centralization or decentralization), otherwise 0. If a new reform is implemented within the three years following a reform, then the dummy is 0 in the year of the new reform.	Own construction
After expenditure centralization	Dummy variable that assumes the value 1 for the three years following a expenditure centralization reform except if a new reform is implemented (either in the direction of more centralization or decentralization), otherwise 0. If a new reform is implemented within the three years following a reform, then the dummy is 0 in the year of the new reform.	Own construction

Table 2: SUMMARY STATISTICS

Variable		Mean.	Std.	Min.	Max.	Obs.
Primary deficit to GDP ratio	overall	-0.372	3.310	-16.190	9.703	635
	between		1.564	-4.273	2.470	23
	within		2.936	-12.289	10.069	27.609
Tax decentralization	overall	23.682	16.479	-0.800	58.666	635
	between		16.721	1.236	54.766	23
	within		4.735	9.245	46.602	27.609
Expenditure decentralization	overall	36.869	15.863	9.061	68.776	401
	between		15.247	10.277	63.653	20
	within		3.481	19.394	47.219	20.050
Tax decentralization reform	overall	0.054	0.225	0.000	1.000	635
	between		0.069	0.000	0.250	23
	within		0.215	-0.196	1.022	27.609
Tax centralization reform	overall	0.044	0.205	0.000	1.000	635
	between		0.050	0.000	0.188	23
	within		0.200	-0.143	1.013	27.609
After tax decentralization	overall	0.107	0.309	0.000	1.000	635
	between		0.112	0.000	0.375	23
	within		0.291	-0.268	1.045	27.609
After tax centralization	overall	0.083	0.277	0.000	1.000	635
	between		0.086	0.000	0.281	23
	within		0.263	-0.198	0.990	27.609
Expenditure decentralization reform	overall	0.039	0.193	0.000	1.000	389
	between		0.059	0.000	0.167	20
	within		0.186	-0.128	1.007	19.450
Expenditure centralization reform	overall	0.031	0.173	0.000	1.000	389
	between		0.048	0.000	0.167	20
	within		0.167	-0.136	1.000	19.450
After expenditure decentralization	overall	0.054	0.225	0.000	1.000	635
	between		0.067	0.000	0.188	23
	within		0.216	-0.134	0.991	27.609
After expenditure centralization	overall	0.039	0.195	0.000	1.000	635
	between		0.060	0.000	0.176	23
	within		0.186	-0.137	0.977	27.609

Table 3: Reforms of the vertical fiscal relations between tiers of government and their effect on public deficits, subnational tax autonomy, OECD countries, 1978-2007.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Tax decentralization reform	1.376***	1.570***	1.208***	1.018***	1.249***	1.209***
	(0.416)	(0.470)	(0.325)	(0.289)	(0.235)	(0.201)
Tax centralization reform	-0.447	-0.233	-0.261	-0.304	-0.358	-0.346
	(0.380)	(0.344)	(0.362)	(0.330)	(0.360)	(0.340)
After tax decentralization	0.532***	0.748***	0.614***	0.598***	0.682***	0.638***
	(0.164)	(0.212)	(0.186)	(0.164)	(0.173)	(0.176)
After tax centralization	-0.249	-0.150	-0.284	-0.236	-0.193	-0.175
	(0.264)	(0.247)	(0.302)	(0.262)	(0.260)	(0.237)
Subnational tax share						0.010
						(0.022)
Primary deficit$_{t-1}$	0.859***	0.826***	0.798***	0.791***	0.795***	0.793***
	(0.024)	(0.024)	(0.025)	(0.032)	(0.030)	(0.030)
GDP per capita growth				-0.318***	-0.339***	-0.335***
				(0.068)	(0.068)	(0.067)
Inflation				-0.007	-0.016	-0.007
				(0.052)	(0.063)	(0.070)
Gross financial liabilities$_{t-1}$				-0.020***	-0.019***	-0.020***
				(0.006)	(0.006)	(0.006)
Population growth				-56.899***	-59.680***	-63.898**
				(19.500)	(20.601)	(26.224)
Unemployment rate				0.079**	0.068*	0.074**
				(0.035)	(0.037)	(0.037)
Government ideology					0.063	0.060
					(0.073)	(0.074)
Government fractionalization					-0.141	-0.074
					(0.585)	(0.559)
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
Countries		23	23	23	22	22
Observations	607	607	607	546	516	516
F	346.350	238.377	198.719	251.635	323.834	303.835

[a] This table relates substantial changes in the level of tax decentralization to public deficits. The dependent variable is the primary deficit to GDP ratio. The control variables of interest are dummy variables for periods of rapid tax decentralization or centralization and dummy variables for post-reform periods.

[b] Standard errors are given in parentheses below the coefficient estimates.

[c] Hypothesis tests are conducted with heteroscedasticity robust standard errors. Standard errors are also clustered at the country level.

[d] Stars indicate significance levels at 10% (*), 5% (**) and 1%(***).

Table 4: Reforms of the vertical fiscal relations between tiers of government and their effect on public deficits, subnational expenditure autonomy, OECD countries, 1978-2007.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Expenditure decentralization reform	-0.620	-0.396	-0.015	0.036	0.042	0.085
	(0.728)	(0.758)	(0.611)	(0.642)	(0.640)	(0.634)
Expenditure centralization reform	1.786*	2.080**	1.636*	0.969	1.074	1.005
	(0.947)	(1.040)	(0.885)	(0.723)	(0.747)	(0.759)
After expenditure decentralization	0.344	0.449***	0.169	0.436*	0.404*	0.438*
	(0.246)	(0.158)	(0.160)	(0.253)	(0.238)	(0.225)
After expenditure centralization	-0.241	0.038	0.120	-0.143	0.012	-0.058
	(0.391)	(0.320)	(0.335)	(0.323)	(0.328)	(0.333)
Subnational expenditure share						-0.017
						(0.023)
Primary deficit$_{t-1}$	0.851***	0.748***	0.717***	0.658***	0.662***	0.660***
	(0.040)	(0.040)	(0.041)	(0.051)	(0.051)	(0.053)
GDP per capita growth				-0.238***	-0.246***	-0.246***
				(0.060)	(0.059)	(0.060)
Inflation				-0.035	-0.032	-0.032
				(0.064)	(0.066)	(0.066)
Gross financial liabilities$_{t-1}$				-0.042***	-0.043***	-0.044***
				(0.012)	(0.013)	(0.013)
Population growth				-45.181*	-48.279*	-48.347*
				(23.572)	(26.208)	(26.811)
Unemployment rate				0.204***	0.196***	0.188***
				(0.056)	(0.059)	(0.056)
Government ideology					0.016	0.007
					(0.098)	(0.094)
Government fractionalization					-0.385	-0.426
					(0.723)	(0.748)
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
Countries		20	20	20	19	19
Observations	381	381	381	359	342	342
F	118.641	86.865	69.273	86.835	98.565	343.767

[a] This table relates substantial changes in the level of expenditure decentralization to public deficits. The dependent variable is the primary deficit to GDP ratio. The control variables of interest are dummy variables for periods of rapid expenditure decentralization or centralization and dummy variables for post-reform periods.
[b] Standard errors are given in parentheses below the coefficient estimates.
[c] Hypothesis tests are conducted with heteroscedasticity robust standard errors. Standard errors are also clustered at the country level.
[d] Stars indicate significance levels at 10% (*), 5% (**) and 1%(***).

Table 5: REFORMS OF THE VERTICAL FISCAL RELATIONS BETWEEN TIERS OF GOVERNMENT AND THEIR EFFECT ON PUBLIC DEFICITS, SUBNATIONAL TAX AUTONOMY, OECD COUNTRIES, 1975-2007, ROBUSTNESS TESTS: ALTERNATIVE THRESHOLDS FOR REFORMS.

	(I)	(II)	(III)	(IV)
Wide threshold				
Tax decentralization reform	0.748***	0.439**	0.473**	0.422**
	(0.185)	(0.199)	(0.197)	(0.208)
Tax centralization reform	-0.530	-0.458	-0.613	-0.621
	(0.352)	(0.433)	(0.436)	(0.427)
After tax decentralization	0.337**	0.124	0.111	0.060
	(0.159)	(0.170)	(0.165)	(0.198)
After tax centralization	-0.402*	-0.196	-0.189	-0.185
	(0.208)	(0.204)	(0.210)	(0.212)
Subnational tax share				0.023
Narrow thresholds				
Tax decentralization reform	1.057***	0.850***	0.909***	0.830**
	(0.319)	(0.295)	(0.317)	(0.330)
Tax centralization reform	-0.947	-1.257	-1.219	-1.095
	(1.283)	(1.124)	(1.119)	(1.016)
After tax decentralization	0.991**	0.864*	0.908*	0.737
	(0.491)	(0.525)	(0.549)	(0.529)
After tax centralization	0.262	0.130	0.169	0.265
	(0.338)	(0.237)	(0.233)	(0.246)
Subnational tax share				0.024

This table presents robustness checks using different thresholds for identifying substantial reforms regarding the level of subnational tax autonomy. Three alternative thresholds are considered. The wide threshold presumes that a significant reform takes place in year t if the level of decentralization/centralization changes by at least 1 percentage point or begins to change in the same direction by at least 0.5 percentage points for two years in a row. The narrow threshold requires a change of at least 4 percentage points in year t or 2.5 percentage points for two years in a row. Model I includes only country and time fixed effects and the lagged dependent variable as control variables. Model II includes additionally the economic control variables: GDP per capita growth, Inflation, Gross financial liabilities$_{t-1}$, Population growth, and the Unemployment rate. Model III adds to Model II the political control variables: Government ideology and Government fractionalization. Model IV adds the subnational tax share. For further notes, see Table 3.

Table 6: REFORMS OF THE VERTICAL FISCAL RELATIONS BETWEEN TIERS OF GOVERNMENT AND THEIR EFFECT ON PUBLIC DEFICITS, SUBNATIONAL EXPENDITURE AUTONOMY, OECD COUNTRIES, 1975-2007, ROBUSTNESS TESTS: ALTERNATIVE THRESHOLDS FOR REFORMS.

	(I)	(II)	(III)	
Wide threshold				
Expenditure decentralization reform	-0.022	-0.030	-0.006	0.014
	(0.288)	(0.289)	(0.305)	(0.293)
Expenditure centralization reform	1.042*	0.615	0.553	0.524
	(0.545)	(0.446)	(0.491)	(0.471)
After expenditure decentralization	0.327*	0.288	0.278	0.295
	(0.186)	(0.220)	(0.237)	(0.230)
After expenditure centralization	0.410**	0.180	0.238	0.207
	(0.208)	(0.211)	(0.215)	(0.218)
Subnational expenditure share				-0.015
Narrow thresholds				
Expenditure decentralization reform	0.540	0.805	0.815	0.831
	(1.585)	(2.016)	(1.975)	(1.997)
Expenditure centralization reform	2.611*	1.598	1.590	1.529
	(1.561)	(1.320)	(1.297)	(1.348)
After expenditure decentralization	-0.054	0.364	0.375	0.389
	(0.401)	(0.298)	(0.309)	(0.305)
After expenditure centralization	0.307	-0.089	-0.043	-0.102
	(0.555)	(0.324)	(0.292)	(0.308)
Subnational expenditure share				-0.010

This table presents robustness checks using different thresholds for identifying substantial reforms regarding the level of subnational expenditure autonomy. Two alternative thresholds are considered. The wide threshold presumes that a significant reform takes place in year t if the level of decentralization/centralization changes by at least 1 percentage point or begins to change in the same direction by at least 0.5 percentage points for two years in a row. The narrow threshold requires a change of at least 4 percentage points in year t or 2.5 percentage points for two years in a row. Model I includes only country and time fixed effects and the lagged dependent variable as control variables. Model II includes additionally the economic control variables: GDP per capita growth, Inflation, Gross financial liabilities$_{t-1}$, Population growth, and the Unemployment rate. Model III adds to Model II the political control variables: Government ideology and Government fractionalization. Model IV adds the subnational expenditure share. For further notes, see Table 4.

Table 7: REFORMS OF THE VERTICAL FISCAL RELATIONS BETWEEN TIERS OF GOVERNMENT AND THEIR EFFECT ON PUBLIC DEFICITS, SUBNATIONAL TAX AUTONOMY, OECD COUNTRIES, 1975-2007, ROBUSTNESS TESTS: ALTERNATIVE DEFICIT VARIABLE (NET BORROWING).

	(I)	(II)	(III)	(IV)
Subnational tax autonomy				
Tax decentralization reform	0.910***	0.676**	0.871***	0.857***
	(0.306)	(0.274)	(0.239)	(0.207)
Tax centralization reform	-0.314	-0.357	-0.397	-0.393
	(0.306)	(0.285)	(0.315)	(0.299)
Post tax decentralization period	0.536***	0.440***	0.496***	0.481***
	(0.151)	(0.136)	(0.139)	(0.155)
Post tax centralization period	-0.351	-0.291	-0.271	-0.265
	(0.249)	(0.227)	(0.229)	(0.205)
Subnational tax share				0.003
				(0.024)
Subnational expenditure autonomy				
Expenditure decentralization reform	-0.011	0.097	0.119	0.259
	(0.617)	(0.643)	(0.622)	(0.643)
Expenditure centralization reform	1.459*	0.888	0.989	0.763
	(0.862)	(0.763)	(0.804)	(0.780)
After expenditure decentralization	0.315*	0.627**	0.578**	0.694***
	(0.177)	(0.289)	(0.270)	(0.227)
After expenditure centralization	0.012	-0.195	-0.037	-0.263
	(0.321)	(0.390)	(0.406)	(0.371)
Subnational expenditure share				-0.054***
				(0.020)

This table presents robustness checks using the net borrowing to GDP ratio as the dependent variable. Model I includes only country and time fixed effects and the lagged dependent variable as control variables. Model II includes additionally the economic control variables: GDP per capita growth, Inflation, Gross financial liabilities$_{t-1}$, Population growth, and the Unemployment rate. Model III adds to Model II the political control variables: Government ideology and Government fractionalization. Model IV adds the subnational tax and expenditure share, respectively. For further notes, see Table 3 and 4.

Table 8: Reforms of the vertical fiscal relations between tiers of government and their effect on public deficits, subnational fiscal autonomy, OECD countries, 1978-2007, Robustness tests: alternative decentralization measures.

|	Stegarescu	Stegarescu, updated	Expenditure dec. (GFS)
	(I)	(II)	(III)
Decentralization reform	0.948*	0.852	1.091***
	(0.523)	(0.524)	(0.373)
Centralization reform	-0.854	-0.512	0.760
	(0.670)	(0.560)	(0.484)
After decentralization	0.356*	0.395**	-0.027
	(0.201)	(0.196)	(0.329)
After centralization	-0.011	-0.114	-0.439
	(0.313)	(0.293)	(0.315)
Subnational fiscal autonomy	0.051	0.022	-0.023
	(0.033)	(0.026)	(0.022)
Primary deficit$_{t-1}$	0.772***	0.761***	0.639***
	(0.038)	(0.040)	(0.049)
GDP per capita growth	-0.330***	-0.345***	-0.297***
	(0.070)	(0.073)	(0.069)
Inflation	-0.028	-0.032	-0.109
	(0.081)	(0.084)	(0.075)
Gross financial liabilities$_{t-1}$	-0.042***	-0.037***	-0.065***
	(0.011)	(0.013)	(0.010)
Population growth	-17.001	-56.928*	-50.136
	(38.219)	(30.194)	(45.338)
Unemployment rate	0.135**	0.137**	0.250***
	(0.061)	(0.057)	(0.067)
Government ideology	0.149	0.147	0.209**
	(0.116)	(0.119)	(0.102)
Government fractionalization	0.211	0.350	1.330
	(0.618)	(0.661)	(0.863)
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Countries	22	22	17
Observations	372	387	282
F	292.552	311.183	1357.011

[a] This table relates substantial changes in the level of fiscal decentralization to public deficits. The dependent variable is the primary deficit to GDP ratio. The control variables of interest are dummy variables for periods of rapid fiscal decentralization or centralization and dummy variables for post-reform periods. Different measures for fiscal decentralization are used. Model (I) uses the measures provided by Stegarescu (2005), Model (II) uses an updated version of the measure used in Model (I), Model (III) uses a expenditure decentralization variable constructed from the IMF's GFS data.
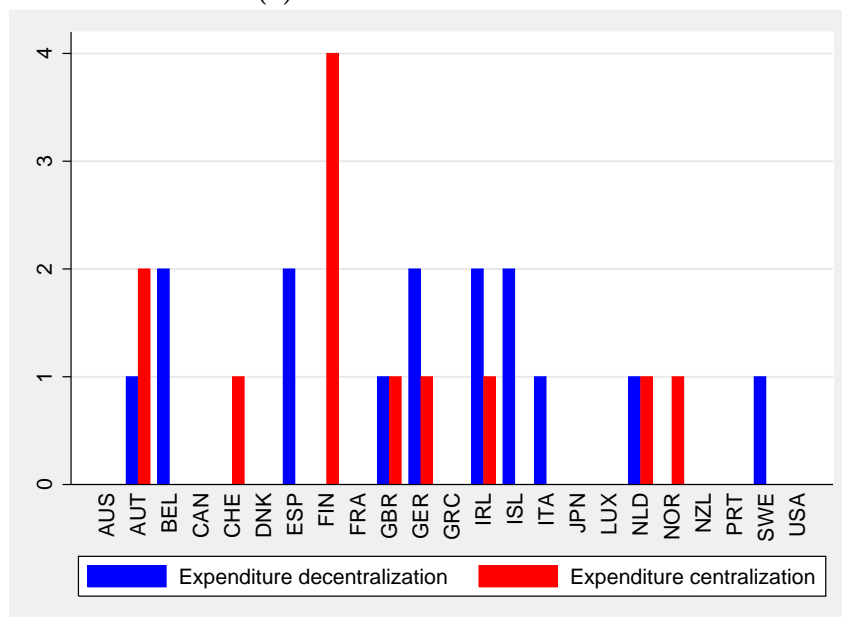[b] All models include the full set of economic and political control variables.
[c] Standard errors are given in parentheses below the coefficient estimates.
[d] Hypothesis tests are conducted with heteroscedasticity robust standard errors.
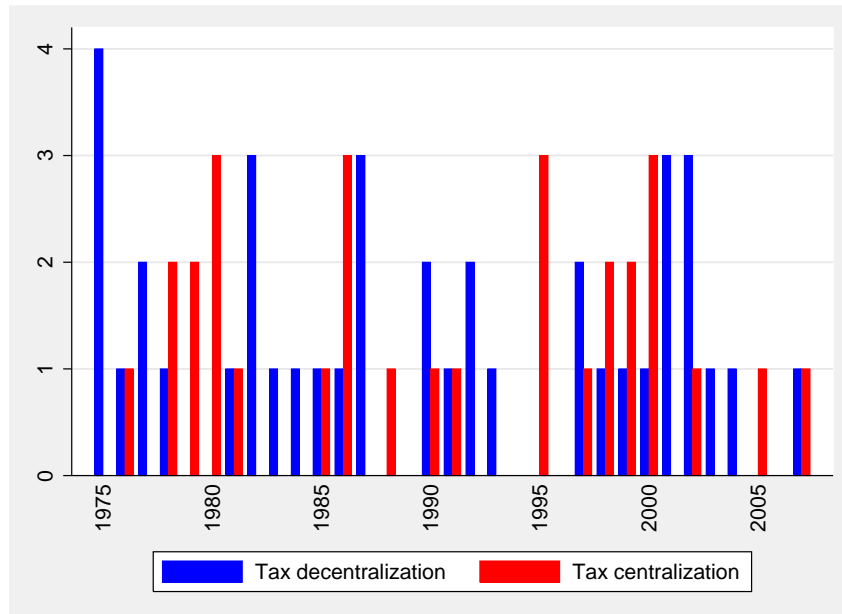[e] Stars indicate significance levels at 10% (*), 5% (**) and 1%(***).
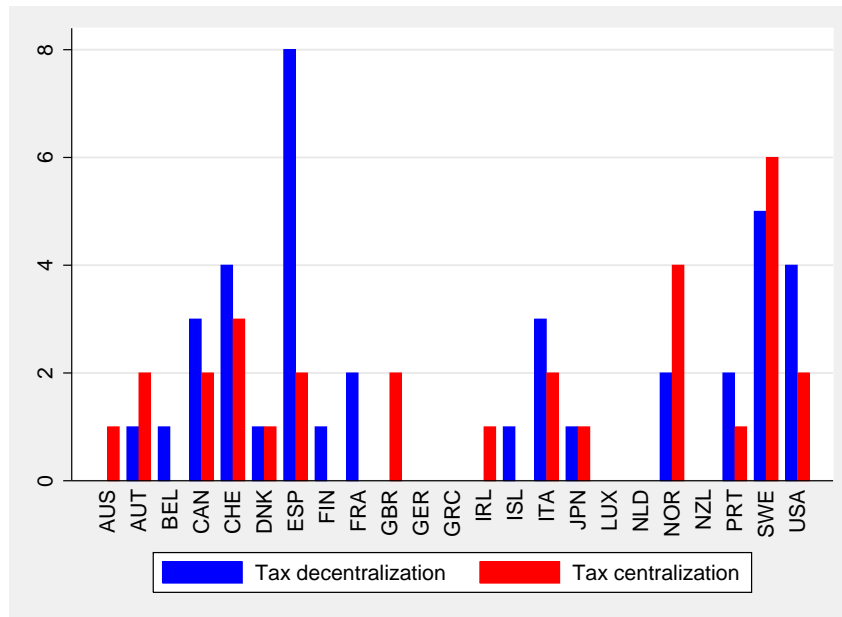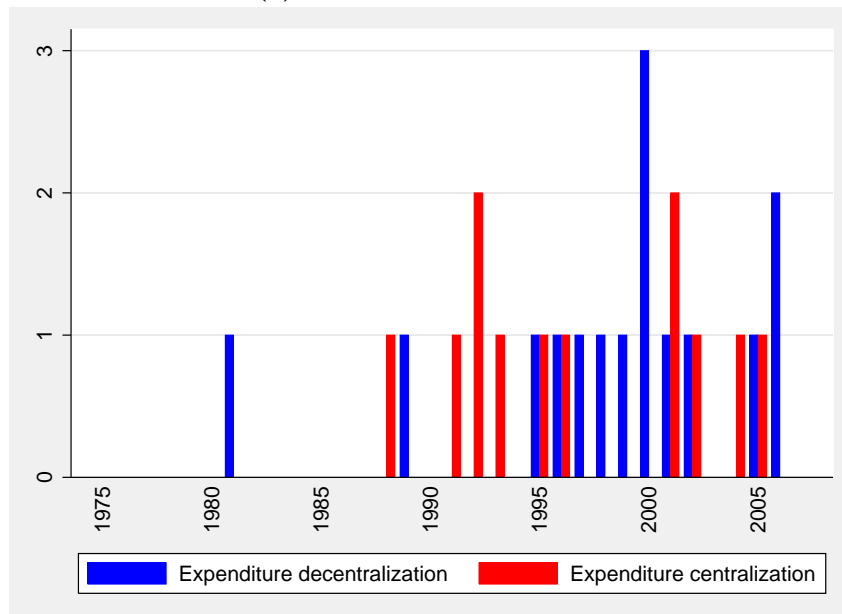
(a) Subnational taxation

(b) Subnational expenditures

Figure 1: Number of decentralization and centralization episodes in OECD countries during the 1975-2007 period. This figure presents the number instances where countries substantially changed the degree of subnational fiscal autonomy either toward more decentralization or centralization.
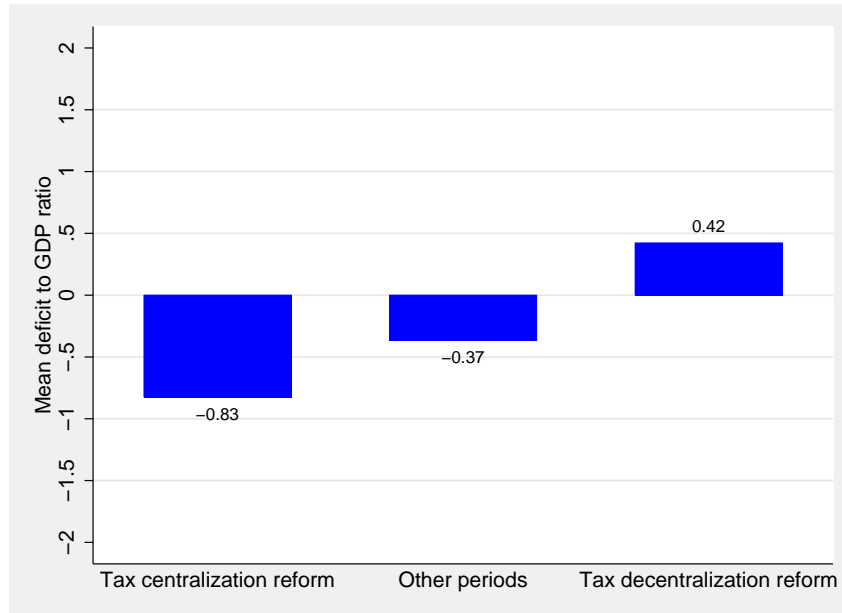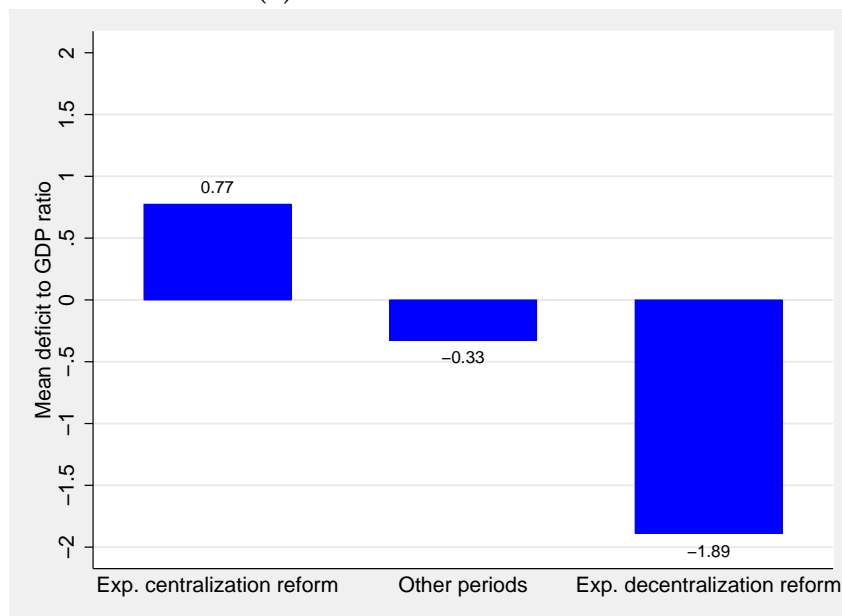
(a) Subnational taxation

(b) Subnational expenditures

Figure 2: Number of decentralization and centralization episodes per year during the 1975-2007 period. This figure presents the number of substantial changes in the degree of subnational fiscal autonomy either toward more decentralization or centralization in each year during the 1975-2005 period.
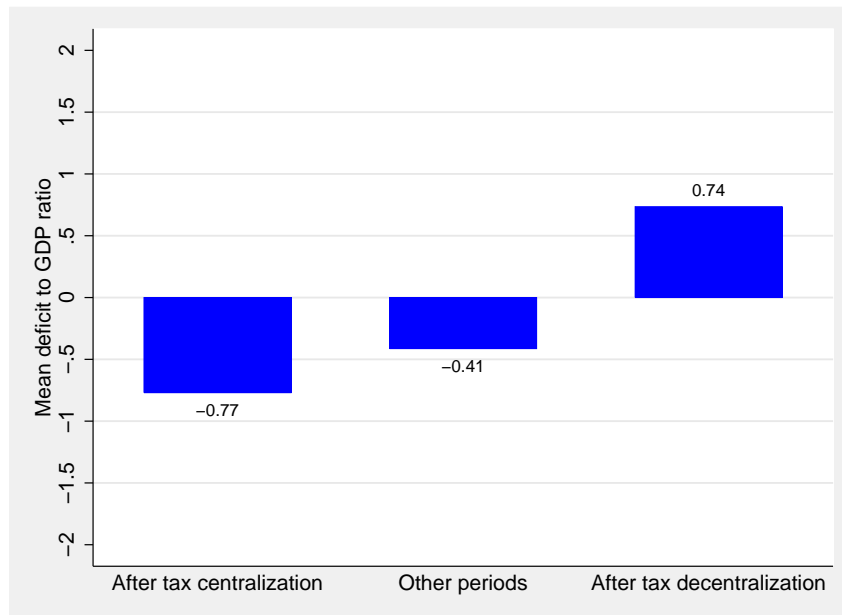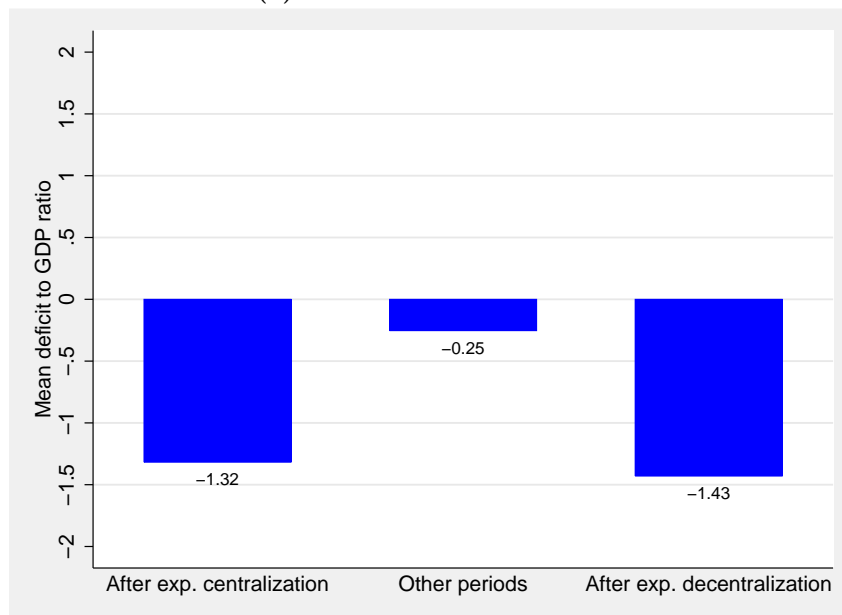
(a) Subnational taxation

(b) Subnational expenditures

Figure 3: Average deficit to GDP ratio in periods of decentralization and centralization. This figure presents the average deficit to GDP ratio for periods in which countries reform their public sector toward more centralization, toward more decentralization, and all other periods.

(a) Subnational taxation

(b) Subnational expenditures

Figure 4: Average deficit to GDP ratio in periods that follow a reform toward more decentralization or more centralization. This figure presents the average deficit to GDP ratio for periods after which countries have reformed their public sector toward more centralization, toward more decentralization, and all other periods.