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**FISCAL DECENTRALISATION  
& ECONOMIC GROWTH IN  
HIGH-INCOME OECD COUNTRIES**

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**ULRICH THIEBEN**

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# FISCAL DECENTRALISATION & ECONOMIC GROWTH IN HIGH-INCOME OECD COUNTRIES

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ULRICH THIEBEN\*

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## Abstract

Following a brief review of the benefits and shortcomings of fiscal decentralisation, the paper attempts to empirically analyse for high-income OECD countries the relationship between per capita economic growth, capital formation and total factor productivity growth, on the one hand, and indicators of fiscal decentralisation, on the other hand. The evidence appears to be consistent with the hypothesis that the benefits of fiscal decentralisation on economic growth and capital formation are limited. However, satisfactory indicators of fiscal decentralisation are yet not existing so that the results are subject to serious qualifications.

JEL Classification: C33, H77, O47

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**COULD A CERTAIN DEGREE OF FISCAL FEDERALISM  
IN THE EU BE FAVOURABLE TO ECONOMIC GROWTH?**

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In the debate on the institutional set up of the European Union in the late 1980s the principle of subsidiarity became a major reference and was explicitly incorporated into the Maastricht Treaty. The principle was understood as implying that the EU should only be charged with tasks which national governments could not accomplish. In certain EU member states, furthermore, regional devolution also been accompanied by a debate on the appropriate distribution of competence between national and regional authorities.

The more precise content of the concept of subsidiarity has not been defined. In particular, it is still not clear on what criteria (efficiency, equity, stability, growth, etc.), the principle of subsidiarity should be applied. Furthermore the principle has been mainly referred to in the political debate while the costs and benefits of fiscal decentralisation have been only rarely, if at all, analysed.

However, this recent study by Ulrich Thiessen of the Berlin-based DIW of the effects on economic growth of fiscal decentralisation suggests that fiscal decentralisation may not be without costs, in particular in high-income countries.

Thiessen, first, examines the conceptual pros and cons with respect to fiscal decentralisation and concludes that the balance of these arguments is theoretically ambiguous. He then undertakes a cross-section analysis confronting the growth performance of OECD high-income countries and four middle-income countries (Argentina, Brazil, Korea and South Africa) with various measures of the degree of fiscal decentralisation, including however, a proxy for the financial support granted by the EU to Greece, Ireland, Portugal and Spain.

When measured by the share of sub-national government expenditure in consolidated general government expenditure, Thiessen finds a medium level of fiscal decentralisation (sub-national government expenditure corresponding to 30-45% of the total) to be associated with higher growth of GDP and the total capital stock than both low and high levels. Countries with a medium-level of fiscal decentralisation might therefore, according to Thiessen, find that increasing fiscal decentralisation beyond the upper limit of this range might eventually result in a certain slowdown of economic growth. This would be the case whether or not decentralisation would be accompanied by greater reliance on own resources to finance sub-national government expenditure.

When applied to the distribution of competence within the European Union, where the degree of fiscal decentralisation is extremely high, Thiessen's findings thus suggest that a certain degree of fiscal centralisation (including notably the EC's structural funds and other mechanisms of income redistribution) could be beneficial to economic growth in the whole EU. However, as stressed by Thiessen, the empirical analysis of fiscal decentralisation is still at an early stage and it is premature to draw definitive conclusions from these preliminary results.

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# FISCAL DECENTRALISATION & ECONOMIC GROWTH IN HIGH-INCOME OECD COUNTRIES

## *ENEPRI WORKING PAPER NO. 1*

**Ulrich Thießen**

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### **1. Introduction**

For several reasons the process of decentralising decision-making in the public sector has received much increased attention during the past decade. In some Western countries, a reassessment of the existing system of fiscal relations among the different levels of government was demanded by certain regions (e.g. Canada, Germany); in the member countries of the European Union, the debate intensified with regard to the functions the European Union should perform; in transition countries, the break-up of centralised decision-making forced the establishment of new systems of fiscal federalism; and in several developing countries fiscal federalism was discussed in particular with regard to its compatibility with macroeconomic stabilisation (e.g. Argentina, Brazil, India). Despite this debate, however, “systematic evidence on the contribution of fiscal decentralisation to economic performance is scarce” (Oates, 1995, p. 352).

Recent studies, all of which use the share of subnational government expenditures in consolidated government expenditures as the sole indicator of fiscal decentralisation, contributed to this empirical analysis. For China, Zhang and Zou (1998) found a statistically significant negative relationship between fiscal decentralisation and economic growth. Although the authors express their surprise about this result, it appears to be consistent with the hypothesis advanced by some development economists: Bahl and Linn (1992) argue that economic gains from fiscal decentralisation tend to emerge only beyond a certain threshold income level. It could be that China did not reach yet such a threshold income level. For 46 developed and developing countries, using average data and covering the period of 1970-89, Davoodi and Zou (1998) found for the developing countries in their study a negative effect of fiscal decentralisation on economic growth, albeit not significant, and for the developed countries no clear relationship. Xie, Zou and Davoodi (1999) found for the high-income country United States (covering the period since 1949) a highly insignificant effect of fiscal decentralisation on economic growth. They argue that the degree of fiscal decentralisation in

this country may be at an optimal level so that benefits from a further rise of fiscal decentralisation are unlikely.

This paper attempts to contribute to the empirical research of fiscal decentralisation by studying the experience of high-income OECD countries where a wide variety of the degree of fiscal decentralisation can be found. The empirical analysis of this paper differs from the approach employed in the mentioned studies and other studies examining growth effects by looking specifically at two potentially important channels through which decentralisation might affect growth: capital formation and total factor productivity. In addition, the cross-country study by Davoodi and Zou (1998) uses average data whereas this study uses average and time series data.

The paper is organised as follows: Section 2 reviews briefly the main theoretical arguments for and against fiscal decentralisation. Section 3 outlines the estimation framework to examine the impact of fiscal decentralisation on economic growth, capital formation and total factor productivity using panel data for approximately the past two decades. Section 4 presents and discusses the estimation results and Section 5 concludes.

## **2. The case for and failures of fiscal decentralisation**

In this paper, fiscal decentralisation connotes the (legal) power of sub-national governments to raise tax revenues and decide on spending programmes on their own will within legal criteria. The fact that there is no formalised theory on the relationship between fiscal decentralisation and economic growth may reflect conflicts inherent in fiscal decentralisation as shown by the following discussion.

### **2.1 The case for fiscal decentralisation**

#### **2.1.1 The “diversification hypothesis”**

The “diversification hypothesis” (or “decentralisation theorem”) maintains that uniform levels of public goods and services across jurisdictions will generally be inefficient (Oates, 1972, 1977). In a simple model of only two communities each of which has a different demand for a single public service being offered, and with immobile individuals, no economies of scale in the production of the public service, and no spill-over effects from one community to the other, a uniform level of public services offered in each community is inefficient. This is because marginal benefits and marginal costs of the public service differ, due to the different demand schedules in both communities. Resources can be saved without making anyone

worse off by diversifying government outputs in accordance with local demands. Hence, ‘Pareto’ efficiency can be raised through fiscal decentralisation. According to this model, the larger the variance in the demands for public goods, the larger the benefits of decentralisation tend to be. In other words, local government outputs need to be differentiated according to local tastes and circumstances but this requires discretion of local governments over spending programs, i.e. fiscal decentralisation.

Introducing mobility of people into this model causes incentives for individuals to move to the community that is perceived as supplying the best combination of public service and local tax rate. By so doing, individuals contribute to efficient resource allocation. This is also the main thrust of the famous Tiebout (1956) model.

However, freedom for local communities to decide on public spending and taxation themselves inevitably results in inequities. In addition, relaxing the restrictive assumptions of the above models such as no spill-over effects and no economies of scale makes apparent the need for central government intervention. However, this very intervention erodes fiscal decentralisation (Prud’homme, 1994, 1995) making clear a basic conflict inherent in fiscal decentralisation.

Nevertheless, Oates (1993) argued that the thrust of the basic case for fiscal decentralisation (greater allocative efficiency) should also apply to a dynamic framework of economic growth. It could be expected that centrally determined policies consider regional and local conditions in the provision of public goods and services less well than locally determined policies, for instance regarding infrastructure and education. Economic development and growth might therefore be promoted if local authorities have input into such policy decisions.

### **2.1.2 The “Leviathan restraint hypothesis”**

Brennan and Buchanan (1980) argued that governments may behave as revenue-maximisers to the detriment of taxpayers. Horizontal and vertical competition among different levels of government may prevent this revenue maximisation. Competing governments may concentrate on other objectives than revenue maximisation such as maintaining stable or even lowering tax rates and efficient production of public goods and services under certain revenue constraints. Hence, fiscal decentralisation may contribute to containing the size of their

budgets and thus restrain the overall size of the public sector.<sup>1</sup> It may thus prevent an oversupply of public goods and services and/or ‘x-inefficiency’ in the public sector.

### **2.1.3 The “productivity enhancement hypothesis”**

Fiscal decentralisation implies a transfer of responsibility associated with accountability to sub-national governments. This may provide incentives for them to not only consider local preferences of residents but to search actively for innovations in the production and supply of public goods and services. Production costs and prices of public goods and services could thus be lower and their quality better than in a uniform approach to providing public goods and services. In addition, fiscal decentralisation relieves the central government from many tasks. Thus, the latter may be able to better concentrate on efficient production of those public goods and services for which it still bears responsibility (ideally goods and services with large spill-overs among communities and/or substantial economies of scale in production).

### **2.1.4 Political arguments**

For completeness, political arguments may be mentioned which, admittedly, are very vague. For transition countries it has been shown that economic reform and democracy (proxied by the civil liberties index constructed by Freedomhouse) are highly positively correlated (EBRD, 1999, p. 113). An empirical analysis of the political aspects of reform in these countries does not support the traditional view that concentration of political power and limited political competition enhances the prospects for successful and sustained economic reforms (EBRD 1999, chapter 5). Rather it is found that competition of governments, containment of vested interests, political integration of minority groups, well defined property rights, transparency in public transactions all tend to promote the development of markets and may better be guaranteed by a democratic than by an autocratic system. Fiscal decentralisation, however, appears to be compatible with a democratic system and not with a strictly autocratic system, because the latter may require strict control over decisions by lower levels of governments and because fiscal decentralisation facilitates political competition. Thus, it could be argued that fiscal decentralisation lessens concentration of political power,

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<sup>1</sup> Ehdai (1994) presents evidence supporting this hypothesis: For a sample of 30 industrial and developing countries that covers the period 1997-87, he finds that fiscal decentralisation, proxied by subnational own-source revenues over total government expenditures, yields a negative influence on the overall size of the public sector. The influence appears to be stronger if not only expenditure decisions are decentralized but also taxing decisions.



weakens the influence of vested interests on public policy and this could promote democracy, development and economic growth.

## **2.2 Potential shortcomings of fiscal decentralisation**

Fiscal decentralisation may cause shortcomings, which would require central government intervention. This intervention, in turn, inhibits fiscal autonomy, responsibility and accountability of sub-national governments. The case for fiscal decentralisation may also be weakened by problems of practical implementation. However, the following arguments include some extreme cases in order to make the point clear.

### **2.2.1 Variance of incomes among households and regions produces inequities under fiscal decentralisation**

The simple model described in Section 2.1.1 showed that fiscal decentralisation breeds social inequity: incomes and tax bases are unevenly distributed among jurisdictions and regions. Wealthier communities and regions are attempting to fend off low-income households. Thus, there needs to be a centralised redistribution policy.

### **2.2.2 Macroeconomic stabilisation**

In order for a country to be able to smooth out macro-economic fluctuations it needs to be able to intervene quickly on the macro-economic level, especially through fiscal policy. For sub-national governments, however, there may be few incentives and/or possibilities to act counter-cyclically, in a co-ordinated fashion and symmetrically with respect to recession and boom periods.<sup>2</sup> Fiscal decentralisation may change the income elasticities of revenues of the different government levels such that stabilisation becomes more difficult. Also, macro-economic stabilisation under fiscal decentralisation may be inhibited whenever spending and revenue decisions of lower levels of government do not conform to stabilisation goals.

As stressed by Tanzi (1995) the stabilisation task in many countries (especially transition countries) refers not only to counter-cyclical actions, but especially to fiscal adjustments needed to eliminate structural (chronic) fiscal imbalances. However, structural imbalances may be worsened by fiscal decentralisation: One extreme example for this is when one government level grants an exemption to a tax, the revenue of which is in large part received

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<sup>2</sup> It is generally agreed that the power of sub-national governments to borrow should be strictly limited and that bailouts of sub-national governments by the central government should be avoided. Obviously, this inhibits expansionary policies on the part of sub-national governments.

by another level of government. Thus, tax-sharing arrangements need to be carefully devised so that they are not associated with perverse incentives.

Fiscal decentralisation may contribute to predatory and unpredictable taxation (such as in Russia, see Zhuravskaya, 1999) promoting shadow economic activities. Furthermore, effective and timely co-ordination among the different government levels may be difficult to implement, thus hindering stabilisation.

### **2.2.3 Quality of governments and of local democracy**

If at the central government level there is a lack of quality of whatever kind (e.g. lack of knowledge, corruption) causing inefficiencies, then decentralisation could, in principle, be a remedy. However, it appears unreasonable to assume that local governments would be less affected by these problems. Some authors argue that central governments can in general achieve higher quality levels: They can attract more qualified people because of better career opportunities and salaries (Prud'homme, 1994). In addition, there may be cases where local democracies may offer less effective control by elected officials than occurs at the central level, because officials at the local level are closer to the people and therefore possibly more susceptible to personal influence. If the quality of government declines with the level of government, then decentralisation could increase inefficiencies. If the quality at all government levels is high, the case for decentralisation may be weakened because it could be argued that the central government may be able to collect and process the information necessary to achieve those efficient results that are expected from decentralisation.

### **2.2.4 Low per capita income level**

There are fixed costs involved with running and controlling sub-national administrations under a decentralised regime. In low-income countries these fixed costs could consume such a large share of the total funds available, that decentralisation might seem difficult to be justified (Prud'homme 1995). The importance of the income level was stressed first by Bahl and Linn (1992, p. 391-393): "Decentralisation more likely comes with the achievement of a higher stage of economic development". The authors argue that there is a relatively high threshold level of economic development at which fiscal decentralisation becomes attractive. Such a threshold level can be explained not only with the fixed costs of decentralisation but also by the fact that at a relatively low per capita income level, the demands for public goods and services may be concentrated on very few goods and have a small variance. Thus, at a

low-income level it may not be difficult for a central government to have all information necessary to make the right decisions regarding local public goods production. With a rising income level, or starting at a certain minimum level, the demands for public goods and services increase and so does their variance, i.e. the preferences of people become more heterogeneous. Hence, economic advantages from diversification of outputs within local jurisdictions emerge, and thus possibly also from fiscal decentralisation.

### **2.2.5 Small size of the country**

If a country and/or its population are relatively small, the outlooks of all its inhabitants might be relatively homogeneous. Hence, differences in individual preferences for public goods and services may not be pronounced, thus reducing the potential gains from decentralisation. In addition, the fixed costs which decentralisation implies may not be warranted.

### **2.2.6 Scarcity of good local taxes**

It is clear that decentralisation requires that sub-national governments have their own revenue sources. From the perspective of the expected benefits arising from competition and accountability of sub-national governments these revenue sources should be determined by the sub-national governments themselves. From the perspective of securing a “good” tax system that provides for equity, little distortions, low administrative costs, income elastic revenues, etc. the revenue sources need to be determined at the national level. As a compromise the traditional Musgrave (1959) view is still widely shared. This view holds that of the three main functions of a government (i.e. allocation, redistribution and stabilisation) only the allocation function may be shared by different levels of government. Its financing should rely - to the maximum extent possible - on the benefits-received principle in order to preserve fairness and economic efficiency. However, the important point is that taxes, fees and surcharges that satisfy this principle are scarce, and in general they do not yield sufficient revenue and their administration can be costly and difficult (McLure, 1995; Tanzi 1995).

### **2.2.7 Low degree of urbanisation**

Prud'homme (1994) argued that local governments of rural areas are faced with a poorly diversified tax base and democratic controls may function less well. Hence, in his view, a rising degree of urbanisation may facilitate decentralisation and vice versa.

### 2.2.8 Few goods and services are truly “public”

The idea of efficiency gains through fiscal decentralisation is based on the assumption that a government needs to supply goods and services which are “public” (non-excludable, non-rival). However, there are few goods and services that qualify for the strict definition of being public: basic education and health care, waste disposal services, utilities, security, prisons, etc. all could and sometimes are supplied by private companies. The activity of these private companies could be subject to governmental supervision to maintain minimum quality standards. Hence the question arises, whether instead of decentralisation a superior form of improving efficiency in supplying these goods and services could be simply to encourage their private supply. Equity aspects and positive externalities could be considered by introducing vouchers, issued by the central government to consumers, that allow a minimum consumption per capita at no direct cost to the consumer (McLure, 1995). Consumers would use the vouchers for their basic needs and thus decide directly and not via the local democracy on the types and quality of services they want to consume. If combined with means testing this approach could also consider equity aspects.

However, there may be drawbacks to this approach: it is the central government that would have to decide on the goods and services that can be obtained with the vouchers. But the central government is farther away from consumers than local governments. Misuse of the vouchers and difficulties with means testing are additional problems.

### 2.3 Summary

The overview identified potentially important determinants for the choice of the degree of fiscal decentralisation, such as per capita income, income differentials between households and between regions, the quality of local government and of local democracy, size of the country, the degree of urbanisation, minority groups, and presence of true public goods and services.<sup>3</sup> However, it underlined that the benefits of fiscal decentralisation for society and its relationship with economic growth are theoretically ambiguous. The more important empirical evidence becomes.

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<sup>3</sup> Panizza (1999) tests for the sign and significance of some of these determinants (income per capita, country size, the level of democracy, and ethnic fractionalisation). Using different estimation methods and a large set of countries, he finds for the period of about 1975 through 1985 that all these determinants are positively correlated with fiscal decentralization, thus supporting the respective hypothesis elaborated upon in this Section 2.

### 3. Analytical background and estimation proceedings

#### 3.1 Analytical background

With the rise of the theoretical endogenous economic growth models effects of economic policies on the growth process became explicitly recognised. In addition, human capital was introduced in the production function as a separate production factor. The growth accounting equation was modified to either include human capital separately or to replace raw labour by effective labour. With human capital counted separately, the growth accounting equation becomes:

$$(1) y = \beta_1 k + \beta_2 h + \beta_3 l + \beta_4 a ,$$

where  $y$  is the rate of growth of real GDP,  $k$  is the rate of growth of physical capital,  $h$  is the rate of growth of human capital,  $l$  is the rate of growth of raw labour,  $a$  is the rate of growth of overall efficiency in combining capital (physical and human) and raw labour, i.e. total factor productivity or the productivity residual, and  $\beta_i$  is the elasticity of economic growth with respect to argument  $i$ .

In endogenous growth models one or several of the right-hand side variables in equation (1) are made dependent on one or several variable(s) of interest, in particular policy variables. Usually, the steady-state growth rate in these models depends positively on the variable(s) of interest. Thus economic growth can be higher than in traditional neo-classical growth models. The growth rate can be larger than the sum of the exogenous rates of population growth and technical progress. The capability of these theoretical models to account for the potentially powerful effects of government policies on economic growth inspired extensive empirical work on these effects. Yet, there is still no consensus theoretical model to guide empirical work on growth.

In this empirical work, growth equations are usually specified such that in addition to the independent variables suggested by traditional neo-classical growth theory (i.e. initial per capita income level, population growth and the share of physical-investment in GDP), variables are included that represent human capital investment, government policies and political factors (e.g. Levine and Renelt, 1992; Barro and Sala-i-Martin, 1992; Barro 1997). Variables that represent government policies include the share of government consumption expenditures in GDP, measures of the degree of openness of the economy, of the level of public infrastructure, and of macro-economic stability (inflation, domestic credit growth, standard deviation of inflation). However, this approach is associated with interpretation

difficulties, because it implicitly assumes that the independent variables included in the growth regression affect economic growth only through variables that are not included. For instance, when estimating a growth regression that includes measures for  $k$ ,  $h$  and  $l$  in equation (1) and a variable that represents a particular macro-economic policy, it is implicitly assumed that this variable does not affect economic growth through its impact on  $k$ ,  $h$ , and  $l$  but solely through its impact on the productivity residual  $a$ . However, macro-economic policies and fiscal decentralisation affect growth in particular via investment in physical and human capital.<sup>4</sup>

In order to study these channels, three types of cross-sectional equations were estimated: per capita growth equations (pure cross-sectional and pooled cross-sectional), equations of capital formation, and equations of the productivity residual (total factor productivity growth). The productivity residual was estimated for each country as explained in the appendix. Data constraints limit the time period for the pure cross-sectional equations to 1975-1995 and for the panel equations to 1981-1995.

## **3.2 Estimation proceedings**

### **3.2.1 Country sample**

The sample includes all high-income OECD countries (Table 1). Hence, the Eastern European member countries of the OECD, Czech Republic, Hungary, and Poland are excluded as well as Mexico and Turkey. However, a small additional control group is considered in an attempt to examine how the results are influenced by the impact of countries with a relatively similar institutional structure but considerably lower income. Since high-income countries are the focus of this study and in order to limit the data needs, the control group comprises only four countries (Argentina, Brazil, Korea, and South Africa, Table 1).

### **3.2.2 Indicators of fiscal decentralisation**

It is well recognised that fiscal decentralisation in one country may be different from that in another. Therefore an attempt was made to consider several indicators of fiscal decentralisation including those constructed by political scientists. The following indicators were used:

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<sup>4</sup> This has been pointed out by Elias (1992) and Fischer (1993).

The share of subnational government expenditures in consolidated government expenditures is the best known indicator of fiscal decentralisation (denoted “FDA”, Table 1). It is available on an annual basis since about the mid-1970s, although even for some advanced industrial countries there are gaps. The appendix describes these gaps and the method used to fill some of them. Averages of FDA for use in the pure cross-sectional equations (which use the period 1975-1995) were constructed for all sample countries. Annual time series of FDA for the period 1981-1995 for use in the panel regressions could be constructed for all high-income sample countries except Greece and Japan, and for the countries of the control group except Korea.

Two indicators of fiscal decentralisation have been found in the political science literature (denoted FDB and FDC in Table 1). They are available only as period averages, covering the period of about the past three decades, and not as time series. Thus, they can be used only in pure cross-sectional regressions. They were constructed by subjective judgements of their authors, which are not discussed here.

A further indicator was constructed by way of a simple transformation of indicator FDA to test for a non-linear (hump-shaped) relationship between economic performance and fiscal decentralisation. For the pure cross-sectional regressions this indicator (denoted FDA') was obtained by using a simple transformation method borrowed from Calmfors and Driffill (1988): low and high values of indicator FDA become low values whereas medium values become high values (see Table 2).<sup>5</sup>

However, with regard to the pooled cross-sectional regressions this method was not used. Instead non-linearities in the effects of fiscal decentralisation on economic growth, capital formation and total factor productivity were estimated using a spline function of indicator FDA. The function breaks at shares of 30 and 45 percent of subnational government expenditures in consolidated expenditures. The resulting three indicators (dummy variables) are denoted FDL for “low degree of fiscal decentralisation”, FDM for “medium degree of fiscal decentralisation”, and FDH for “high degree of fiscal decentralisation”.

A measure of the self-reliance of subnational governments, i.e. their own revenues as a share of their total revenues (denoted “SR”), is also considered together with its change (denoted CHSR), to test whether increasing self-reliance of subnational governments has effects on

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<sup>5</sup> Calmfors and Driffill (1988) tested whether a hump-shaped relation may exist between economic performance and the degree of centralisation of wage bargaining and found supporting evidence.

economic growth. Averages of the self-reliance ratio for the period 1975-1995 are available for all sample countries except Japan. The ratio is also available as a time series covering the period 1981-1995 for the sample countries with few exceptions (Greece, Japan, Korea, New Zealand, Portugal). However, Table 1 shows that interpreting the self-reliance ratio as an indicator of the degree of fiscal decentralisation can be criticised: some countries with a very low share of subnational government expenditures in total government expenditures (Greece, New Zealand, Portugal, Spain) have relatively high self-reliance ratios. Hence, the measure of self-reliance indicates to what extent subnational governments are allowed to cover their expenditures by own taxes and fees given a certain ceiling for their expenditures which they cannot determine themselves and which may be quite low.

Before turning to the estimations some simple correlations of the variables shown in Table 1 regarding the high-income OECD countries may be mentioned: There is a positive correlation between the per capita income level, on the one hand, and the fiscal decentralisation measures FDA, FDB, FDC and the self-reliance measures SR and CHSR, on the other hand. The highest correlation coefficient (0.54) is found for indicator FDA. By contrast, the correlation between per capita growth of these countries, on the one hand, and indicators FDA, FDB, FDC, and SR, on the other hand, is highly negative (with correlation coefficients ranging from -0.38 to -0.48). But if indicator FDA is replaced by indicator FDA' (the transformed indicator FDA), the correlation becomes positive (the correlation coefficient being 0.48). This latter correlation means that for the group of high-income OECD countries and regarding the period of about three decades since 1970, countries with a medium degree of fiscal decentralisation (as measured by the share of expenditures of subnational governments in consolidated government expenditures) achieved, on average, higher per capita growth than countries with either a relatively high or low degree of fiscal decentralisation. Growth regressions may shed more light on the question which of these correlations between economic growth and indicators of fiscal decentralisation are statistically significant, especially when appropriate control variables are considered.

### **3.2.3 Specification**

Limited specifications are used for both the pure cross-sectional growth regressions and the panel regressions so as to focus on a few key factors. Nevertheless, the specifications are consistent with a large assortment of endogenous growth models.



### 3.2.3.1 Pure cross sectional growth equations

The pure cross-sectional per capita growth regressions use the following four independent variables which are always included: first, the initial level of real GDP per capita in 1970 (RGDP70) from Summers, Kravis, Heston (1980) to consider the conditional convergence hypothesis (i.e. countries with relatively low initial income tend to grow faster than other countries after controlling for differences in the rates of investment in physical and human capital, population growth and technical progress); averages for the period 1975-1995 of, second, the annual rate of population growth (GPOP), and, third, the annual gross investment share of GDP (INVGDP); fourth, the initial secondary-school enrolment rate in 1970 (SEC70) as a proxy for the ratio of human capital investment to GDP.<sup>6</sup> Variables representing the degree of fiscal decentralisation are averages for the period 1975-1995 of indicators FDA, FDA' (to test for a hump-shaped relationship), and, from the political science literature, FDB and FDC. These four variables are denoted FD (fiscal decentralisation) variables and used as alternatives. In addition, the average self-reliance ratio during 1975-1995 (SR) and its average change during this period (CHSR) are also considered.

A dummy variable is included as a proxy for financial support granted by the European Union to the countries Greece, Ireland, Portugal and Spain (DEU4). These countries received substantial transfers from the European Union during the period considered and this should have influenced their economic growth. Finally, the average annual change in the unemployment rate (CHUER) is included as a proxy for macroeconomic disturbances affecting a country. Especially if structural rigidities are pronounced in a country such disturbances can have a relatively long lasting impact on economic growth. The estimated pure cross-sectional growth equation has thus the following general form:

$$(2) \quad \text{GYP}_i = \alpha + \beta_1 \text{RGDP70}_i + \beta_2 \text{GPOP}_i + \beta_3 \text{INVGDP}_i \\ + \beta_4 \text{SEC70}_i + \beta_5 \text{CHUER}_i + \beta_6 \text{DUE4}_i \\ + \beta_7 \text{FD}_i + \beta_8 \text{SR}_i + \beta_9 \text{CHSR}_i + \epsilon_i,$$

where GYP is the average annual growth rate of GDP per capita, FD is either FDA, FDA', B or C. The subscript *i* is indexing the country.

<sup>6</sup> In the estimations the initial school enrollment ratio was found to have a higher significance than the average school enrollment ratio over the considered period. This could be explained with lags between completion of education and its appropriate use as a production factor.

The equation was estimated using averages over the period 1975-95 for up to 26 countries. The expected signs of the estimated coefficients are as follows:  $\beta_1 > 0$ , if there is evidence for conditional convergence. The expected effect of population growth on per capita economic growth ( $\beta_2$ ) is negative. The effects of investment in physical capital ( $\beta_3$ ) and of past investment in human capital ( $\beta_4$ ), are clearly positive. To the extent that, due to structural rigidities of the economies, disturbances may have lasting adverse effects on economic growth,  $\beta_5$  is expected to have a negative sign.  $\beta_6$  is expected to be positive if this dummy coefficient captures the effect of grants from the EU and if these grants are used as intended, i.e. for improvements of the physical and institutional infrastructure of the recipient countries. Finally, the signs of major interest in this study  $\beta_7$ ,  $\beta_8$  and  $\beta_9$  are not clear because theory suggests that fiscal decentralisation may have a positive or negative influence on economic growth. In addition, it is not clear, a priori, whether there are nonlinear effects of fiscal decentralisation on economic growth: to test for a nonlinear relationship in the pure cross-sectional regressions, indicator FDA' is employed.

### 3.2.3.2 Pooled cross-sectional growth equations

Turning to the panel growth regressions, the initial income variable RGDP70 needs to be replaced because it is not a time series. In preliminary estimations the real per capita growth rate of the previous year was used as a replacement but this variable was in general not significant and its inclusion did not raise but lowered the explained variation of per capita growth. It was therefore dropped from most of the estimated panel equations. To account nevertheless for (conditional) convergence effects, a dummy variable was included for countries with relatively low income. In the regressions that use the data of the high-income OECD countries, a dummy is included for 5 countries with relatively low initial income, i.e. Greece, Ireland, Italy, Portugal, and Spain (denoted DEU5). Note, however, that four of these five countries (Greece, Ireland, Portugal, and Spain) received substantial net transfers from the European Union during much of the considered time period and, thus, this dummy is likely to capture at least two effects: potential (conditional) convergence effects and effects of financial support granted by the European Union. In regressions with data for the full sample the dummy that represents countries with relatively low initial income is denoted DLI.<sup>7</sup> In

<sup>7</sup> This dummy represents the countries Argentina, Brazil, Greece, Ireland, Italy, Korea, New Zealand, Portugal, Spain and South Africa.

regressions where only relatively wealthy countries or relatively less wealthy countries are considered and where the dummies DLI and DEU5 cannot be used, the growth rate of real per capita GDP, lagged one period, is employed.

Preliminary estimations also showed that the gross investment share of GDP was insignificant and in some cases even had the wrong sign. Therefore, this indicator of physical investment was replaced by the growth rate of real gross fixed capital formation (GKAP). Also included in the panel regressions are the secondary school enrolment ratio as a proxy for investment in human capital (SEC), the change in the unemployment ratio as a proxy for macroeconomic disturbances, and the measures of fiscal decentralisation. The latter are the share of subnational government expenditures in consolidated expenditures (FDA) and, as an alternative and in order to test for a nonlinear association between economic growth and fiscal decentralisation, the three categories of fiscal decentralisation (low, medium and high, denoted FDL, FDM, and FDH, respectively). In addition, the variables SR and CHSR are also considered. The general form of the estimated panel regressions thus is:

$$\begin{aligned}
 (3) \quad GYP_{i,t} = & \alpha + \beta_1 GYP_{i,t-1} + \beta_2 GPOP_{i,t} \\
 & + \beta_3 GKAP_{i,t} + \beta_4 SEC_{i,t} + \beta_5 CHUER_{i,t} \\
 & + \beta_6 DUE5_{i,t} + \beta_7 DLI_{i,t} + \beta_8 FD_{i,t} \\
 & + \beta_9 SR_{i,t} + \beta_{10} CHSR_{i,t} + \epsilon_{i,t},
 \end{aligned}$$

where GYP is the annual per capita growth rate, DEU5 and DLI are used alternately and FD represents the indicators of fiscal decentralisation, i.e. either FDA or the dummy variables FDL, FDM, and FDH to test for non-linear effects. The subscripts *i* and *t* are indexing the country and time period.

The equation was estimated for the period 1981 through 1995. The expected signs of the coefficients are as follows:  $\beta_1, \beta_2$ , and  $\beta_5 < 0$ ,  $\beta_3, \beta_4, \beta_6$ , and  $\beta_7 > 0$ , and the signs for  $\beta_8, \beta_9$  and  $\beta_{10}$  are not clear.

Two channels through which fiscal decentralisation may influence economic growth were also examined: Capital formation and total factor productivity growth (the Solow residual).

### 3.2.3.3 Capital formation

Capital formation is specified as a function of macroeconomic policy variables, including measures of fiscal decentralisation, of macroeconomic disturbances (cyclical effects) and of a dummy variable to capture catch-up effects of countries with relatively low initial income. Macroeconomic policy variables include the fiscal balance as a share of GDP (denoted

FBGDP), the inflation rate (denoted GCPI), and uncertainty of economic agents with regard to macroeconomic stability, which is proxied by the standard deviation of domestic credit for overlapping five year periods (denoted STDDC).<sup>8</sup> The employed measures of fiscal decentralisation are the same as those used in the previous equation (either FDA or, to test for nonlinear effects, the dummies FDL, FDM, and FDH). Macroeconomic disturbances are proxied, as before, by the change in the unemployment rate (CHUER). The regressions that are estimated with data for all sample countries include a dummy for countries with relatively low initial income (DLI) to control for convergence effects. In regressions that concern only high-income OECD countries, the dummy variable DEU4 represents countries with relatively low initial income, namely Greece, Ireland, Portugal, and Spain. Since these countries were also the recipients of substantial net transfers from the European Union the dummy will not only capture convergence effects but also effects coming from these grants. Thus, the estimated equations have the general form:

$$\begin{aligned}
 (4) \quad \text{GKAP}_{i,t} = & \alpha + \beta_1 \text{GKAP}_{i,t-1} + \beta_2 \text{FBGDP}_{i,t} \\
 & + \beta_3 \text{GCPI}_{i,t} + \beta_4 \text{STDDC}_{i,t} + \beta_5 \text{CHUER}_{i,t} \\
 & + \beta_6 \text{DEU4}_{i,t} + \beta_7 \text{DLI}_{i,t} + \beta_8 \text{FD}_{i,t} \\
 & + \beta_9 \text{SR}_{i,t} + \beta_{10} \text{CHSR}_{i,t} + \epsilon_{i,t},
 \end{aligned}$$

where the dummy variables (DEU4 and DLI) are used alternately. As before, FD represents either the indicator FDA or the dummies FDL, FDM, and FDH. The expected signs of the estimated coefficients are as follows:  $\beta_2 > 0$ , to the extent that the potential crowding out effect of budget deficits prevails,<sup>9</sup>  $\beta_3$ ,  $\beta_4$ , and  $\beta_5 < 0$ , since inflation, uncertainty and disturbances are likely to inhibit capital formation, and  $\beta_6$  and  $\beta_7 > 0$ , because of catch-up effects and effects of the grants provided by the European Union. Again, the effects of the measures of fiscal decentralisation  $\beta_8$ ,  $\beta_9$ , and  $\beta_{10}$  are unclear.

### 3.2.3.4 Total factor productivity

Finally, panel equations are estimated to examine the association between total factor productivity growth (RES) and fiscal decentralisation. Productivity growth was calculated for the sample countries as a Solow residual as explained in the appendix. Independent variables included are the unemployment rate (UER), lagged one period, as a measure of cyclical

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<sup>8</sup> The standard deviation is calculated for overlapping five-year periods where the last 4 years, the current year and the following year are considered.

effects on productivity growth, and dummy variables for countries with relatively low income (either DEU4 or DLI) to capture catch-up effects of these countries and effects of European Union grants, and the indicators of fiscal decentralisation. Hence, the general form of the estimated equations is:

$$(5) \quad \text{RES}_{i,t} = \alpha + \beta_1 \text{RES}_{i,t-1} + \beta_2 \text{UER}_{i,t-1} + \beta_3 \text{DUE4}_{i,t} \\ + \beta_4 \text{DLI}_{i,t} + \beta_5 \text{FD}_{i,t} + \beta_6 \text{SR}_{i,t} \\ + \beta_7 \text{CHSR}_{i,t} + \epsilon_{i,t} .$$

The expected signs are  $\beta_1 > 0$ ,  $\beta_2 < 0$ ,  $\beta_3$  and  $\beta_4 > 0$ . As before, the signs of  $\beta_5$ ,  $\beta_6$  and  $\beta_7$  are unclear.

## 4. Estimation results

### 4.1 Pure cross-sectional growth equations

Table 3 presents the pure cross-sectional regressions for the 20-year period 1975-1995.<sup>10</sup> The variables that are always included in the regressions (RGDP70, GPOP, INVGDP, and SEC70) have the expected sign and are in general highly significant. The coefficients show the effect in percentage points on the average per capita growth rate during 1975-1995 of an increase of one unit of the respective independent variable.

There is strong evidence for (conditional) convergence since higher initial income (RGDP70) is significantly associated with lower per capita economic growth. (A rise of the initial income in 1970 by one unit, i.e. 1000 US Dollars, is estimated to be associated with an approximately .02 percentage points lower average annual per capita economic growth rate during 1975-1995). Also population growth tends to lower the economic growth rate. However, this relationship is not obtained in all estimated equations and thus ambiguous. Investment in physical and human capital is clearly positively related to per capita economic growth. For instance, in the high-income OECD countries a one percentage point increase in the average investment to GDP ratio during 1975-1995 was associated, on average, with a .1 percentage point higher average annual per capita economic growth rate (equations 2a-2f). As shown by equations 2h-2i, that include all sample countries, the positive influence of investment on growth doubles when including the less wealthy countries of the small control group. The considered twenty year period was characterised by a trend rise of unemployment rates in

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<sup>9</sup> Note that FBGDP represents budget surpluses.

<sup>10</sup> For reasons of space only selected results are presented in the following. Full results of the estimations and the raw data are available from the author.

many countries reflecting structural rigidities which have been costly, as indicated by the estimated coefficients of the variable CHUER: a rise of the average unemployment rate during the considered period by one percentage point was associated with a loss of average annual per capita growth during this period in the order of about .01 percentage points. The estimated coefficient of the dummy variable for the four Western European countries with relatively low income (DEU4) is in most cases significant and positive (equations 2a-2f). It suggests that even when controlling for convergence effects (through use of the variable RGDP70), average annual per capita growth in these countries was almost .01 percentage points higher than in the other high-income OECD countries and other Western European countries. Hence, it appears that EU grants to these countries indeed had a positive impact on growth.

Turning to the fiscal decentralisation indicators and regarding the group of high-income OECD countries the following results are obtained (equations 2b-2f): The indicators FDA and FDB are not statistically significant, but indicator FDC and the transformed indicator FDA' are. The latter two variables remain significant at least at the 5 percent level and their signs do not change when the conditioning set of variables in the regression (variables CHUER, DEU4, SR, and CHSR) is changed. However, indicator FDA', which was constructed to test for a hump shaped relationship between economic growth and the degree of fiscal decentralisation, is in most of these regressions significant at the 1 percent level. By contrast, the significance of indicator FDC does in general not exceed the 5 percent level. This relative robustness of indicator FDA' lends support to the idea of a hump shaped relationship.

Performing these estimations for the 17 Western European countries in the sample yields similar results, i.e. support for existence of a hump shaped relationship, since the FDA' indicator is significant (equation 2g) whereas the FDA variable is not significant (not shown). However, the limited number of observations weakens this result. Interestingly, when adding the small control group of countries with relatively low income to the sample of high-income OECD countries (equations 2h-2k), the FDA' variable loses its significance and the FDA variable becomes highly significant. This would suggest that the hypothesis of a hump shaped relationship does not apply to the countries of the control group (the relatively less wealthy countries). For these countries it appears that increasing fiscal decentralisation was associated with higher growth, which is corroborated by the panel data estimations below. However, the apparent difference between the two country groups provides support for the arguments

discussed above that the income level is an important factor with regard to the relationship between economic growth and fiscal decentralisation.

Surprisingly, the measure of self-reliance of subnational governments (SR) and its change (CHSR) are negatively related to economic growth (equations 2f-2k). However, the panel regressions below show that this finding has qualifications.

#### 4.2 Pooled cross-sectional growth equations

Table 4 presents pooled cross-sectional growth regressions using time series data. While the variables population growth (GPOP) and capital stock growth (GKAP) have the expected signs and are highly significant, the school enrolment variable (SEC) is in all of the estimated panel equations not significant and even has in some cases the unexpected negative sign. Apparently, the addition of the time series dimension to the cross-sectional dimension causes a break down of the significance of this regressor. This result has been found also in other empirical growth studies (e.g. Knight et al., 1992). One major reason for this may be that there is a considerable time lag between accomplishment of school education and the contribution of educated labour to production and economic growth.<sup>11</sup>

The variables of main interest are the fiscal decentralisation indicators, i.e. FDA, the three categories of fiscal decentralisation FDL, FDM, and FDH (the dummies used to test for a nonlinear relationship between economic growth and fiscal decentralisation) and SR and CHSR.

FDA is never significant (Table 4). For reasons of space this result is shown only for high-income and Western European countries (equations 3a and 3e), but it was also obtained in regressions for other groups of countries and with different specifications. FDA is even negative for Western European countries (equation 3e).

Equations 3b-3f show that for high-income OECD countries, for Western European countries, and for the 12 countries with highest per capita income, a medium degree of fiscal decentralisation (FDM) was associated with a higher per capita growth rate than either a low degree (FDL) or high degree of fiscal decentralisation (FDH). In most of the estimated equations the FDM dummy was also more significant than either the FDL or FDH dummy. Thus, consideration of the time series dimension of the data appears to further support the hypothesis of a hump shaped relationship between per capita economic growth and fiscal

decentralisation (as measured by the share of subnational expenditures in consolidated expenditures) in high-income OECD countries.

The panel growth equations also confirm the impression of the cross-sectional growth regressions that the income level is an important determinant for the relationship between economic growth and fiscal decentralisation: When groups of countries of the sample with relatively low income are defined, the effect of fiscal decentralisation on growth tends to become stronger and more significant as fiscal decentralisation rises. This is shown in Table 4 only for the largest defined group of sample countries with relatively low income (equation 3h). However, this result needs to be interpreted with caution since the sample size is relatively small. Since there is higher variation in the data of the less wealthy countries in the sample than in the data of the wealthier ones, the results for the full sample resemble more the results for the former than those for the latter, i.e. with an increasing degree of fiscal decentralisation, the per capita growth rate tends to increase (equation 3g).

Regarding the measures of self-reliance of subnational governments (SR and its change CHSR), the addition of the time series dimension to the cross-sectional dimension causes the coefficient of CHSR to become positive and significant (equations 3c-3d, Table 4). Hence, the effect of CHSR on economic growth within each country over time was positive.

These results do not yet shed light on the question through which channels fiscal decentralisation and increasing self-reliance of subnational governments may affect economic growth. Two major channels are examined in the following two sections.

### **4.3 Capital formation panel equations**

Table 5 shows the panel regressions of capital formation. Capital stock growth lagged one period (GKAP (-1)), the inflation rate (GCPI), the proxy for macroeconomic disturbances (CHUER) and the dummy variables (DEU4, DLI) all have the expected signs and are in general highly significant. Interestingly, the estimated coefficients of the variables fiscal balance as a share of GDP (FBGDP), inflation (GCPI), and macroeconomic uncertainty (STDDC), are larger and more significant for the group of relatively wealthy countries (equations 4a-4g) than for the group of countries with relatively low income (equation 4i).

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<sup>11</sup> Given that this study focuses on the relationship between fiscal decentralisation and economic growth, no attempt has been made to redefine this proxy variable for human capital.



The association between capital formation and fiscal decentralisation is similar to the one between per capita growth and fiscal decentralisation: For high-income OECD and Western European countries the relationship does not appear to be linear (the FDA variable is not significant). Instead it is the medium category of fiscal decentralisation (FDM) that has the largest estimated coefficient among the three fiscal decentralisation dummies and it also tends to be more significant than the other two categories (equations 4b-4g). In other words, growth of the real capital stock tends to be larger under a medium degree of fiscal decentralisation than under either a high or low degree. Specifically, the estimated coefficients of the three fiscal decentralisation dummies (FDL, FDM, and FDH) for high-income OECD countries suggest the following: After controlling for the influence on capital stock growth of macroeconomic policies (fiscal balance, inflation), of uncertainty on the part of economic agents (standard deviation of domestic credit), of macroeconomic disturbances (change of the unemployment rate), and of convergence effects (DLI), the capital stock grew on average at least half a percentage point per year faster in countries with a medium degree of fiscal decentralisation than in countries with either a low or high degree of decentralisation. Given that the average annual growth of the estimated real capital stock for the 22 high-income OECD countries during 1975-1995 was about 2.5 percent, this is a considerable difference.

Again, there is evidence of the importance of the income level for the effects of fiscal decentralisation. For the group of 12 wealthiest countries in the sample (equation 4d) the estimations suggest that a medium degree of fiscal decentralisation as opposed to a relatively low or high degree was associated with a larger gain in annual capital stock growth than experienced by the whole group of high-income OECD countries or by the group of Western European countries. And for groups of countries in the sample with relatively low per capita income, capital stock growth increases with the level of fiscal decentralisation (equation 4i shows only the result for the largest defined group of countries with relatively low income).

The self-reliance indicators (SR and CHSR) have positive signs but they are not statistically significant (Table 5). However, as in the growth equations of Table 4, CHSR is always more significant than SR. Overall, it appears that there is a positive association between increasing self-reliance of subnational governments and capital formation in high-income countries.

#### **4.4 Total factor productivity growth panel equations**

Finally, the relationship between total factor productivity growth and fiscal decentralisation is examined (Table 6). Obtaining a satisfactory statistical fit proved hard. The explained portion

of the variation in total factor productivity growth (TFP) is relatively low. It has to be kept in mind that the data on TFP were constructed using the crude method explained in the Appendix.

Indicator FDA had always a negative sign with the exception of groups of countries with relatively low income in the sample. For European countries the measured negative influence of fiscal decentralisation on total factor productivity growth was significant. Also the test of a nonlinear relationship between total factor productivity growth and fiscal decentralisation (performed through the use of the three dummies of fiscal decentralisation FDL, FDM, and FDH) appears to suggest that increasing fiscal decentralisation in high-income countries was not conducive to total factor productivity growth: Table 6 suggests that for the high-income countries successively higher degrees of fiscal decentralisation are associated, on average, with decreasing TFP growth (equations 5b-5c, and 5e-5f). The opposite is found for countries with relatively low income in the sample (equation 5h). For them, the association between fiscal decentralisation and total factor productivity growth tends to become stronger as fiscal decentralisation increases.

No relationship could be found with respect to the self-reliance indicators since in all of the estimated equations these have been insignificant (shown only for high-income countries, equations 5a and 5c).

#### **4.5 Summary**

With all the necessary caution and qualifications, the estimated effects of fiscal decentralisation in OECD high-income countries on per capita economic growth and on two of the major determinants of economic growth, capital formation and total factor productivity growth, suggest that there may be limits for economic gains from fiscal decentralisation. Very tentatively, especially with regard to the results concerning TFP growth, the estimations may be summarised as follows: Starting at a relatively low level of fiscal decentralisation (measured by the share of subnational government expenditures in consolidated government expenditures) and increasing it to a medium level of between 30-45%, capital stock growth could tend to be promoted while total factor productivity growth may tend to decrease. The estimated coefficients of the dummies FDL, FDM, and FDH in the panel economic growth equations (Table 4) would suggest that the former effect dominates the latter so that economic growth could be promoted. If fiscal decentralisation would increase further, capital stock growth may, however, decline as could total factor productivity growth. The per capita

economic growth rate could therefore tend to decrease. But the lower the income level would be, the less likely would be any negative effects of increasing decentralisation on capital formation and TFP growth.

No relationship between economic performance of high-income OECD countries and reliance of subnational governments on own revenue sources to finance their expenditures could be found: although it appears that increasing self-reliance and capital formation are positively related, the associations between self-reliance, on the one hand, and TFP growth and economic growth, on the other, are unclear.

## **5. Concluding remarks**

In the empirical analysis of the association between economic growth and fiscal decentralisation an attempt was made to consider several indicators of fiscal decentralisation, but only for the indicator “share of subnational government expenditures in consolidated government expenditures” could a relationship to economic growth be discerned. The tentative evidence appears to support the hypothesis for the potential gains from fiscal decentralisation in high-income OECD countries to be limited. Using both average and panel data it appears that increasing fiscal decentralisation may eventually dampen capital stock growth and economic growth.

However, the indicator of fiscal decentralisation is crude and thus many questions are raised instead of answers provided. One important limitation of the indicator is that subnational governments do not have full control over their expenditures, for instance concerning social support mandated by the central government. If the central government issues laws that increase such support without providing adequate additional financing to lower government levels, then the latter may be forced to increase their fiscal deficits and/or decrease other expenditures, e.g. investment. This could dampen overall capital formation and the statistical analysis may find that increasing fiscal decentralisation results in decreased capital formation. Over the longer term such behaviour of a central government would probably not be sustainable. The central government would be forced to provide sufficient financing. However, an ideal indicator of fiscal decentralisation would take account of this problem as well as of the fact that fiscal decentralisation differs from country to country.

Apart from these qualifications, what could be explanations for potential limits of the benefits of fiscal decentralisation in high-income OECD countries? Arguments that caution against fiscal decentralisation, reviewed in Section 2, were:

Fiscal decentralisation causes fixed costs that may be viewed too high relative to its potential benefits;

demand for public goods may be relatively low and homogeneous;

the quality of local government and of local democracy may be poor;

income differentials between households and regions may be pronounced;

the degree of urbanisation may be low resulting in little diversified tax bases in the regions;

the size of a country and of its population may be small; and

there may be a scarcity of true public goods and services.

For high-income OECD countries, the first three characteristics may appear less relevant. The other four arguments could be potential explanations. If a high-income country is considered with a relatively large population, relatively diversified tax bases in all regions and relatively income elastic and high demand for public goods and services, then the fourth argument (income differentials) may appear particularly relevant. If income differentials between households and regions increase with a rising income level, central government redistributive intervention may be required so as to maintain social equity as a prerequisite for sustainable economic growth and development. Although redistributive policy is to a large extent carried out through a progressive income tax and grants and transfers to regional and local government budgets, it also entails relatively large payments from the central government budget to the recipients which are not going through regional and local government budgets, i.e. direct payments (e.g. child benefits in some high-income countries) and support provided by the central government to the social insurance system. Required growth of such expenditures by the central government in high-income countries could contribute to explaining limits of the benefits of increasing fiscal decentralisation. However, this raises the question as to whether growth promotion really requires the central government to incur these expenditures.

It may thus be stated that the empirical analysis of fiscal decentralisation is only at an early stage and could greatly benefit from new improved indicators.

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## **Appendix**

### **Data Sources, Definitions of Variables and Tables**

#### **Indicators of fiscal decentralisation**

The share of subnational government expenditures in consolidated government expenditures (denoted FDA) was taken from the Government Finance Statistics Yearbook from the International Monetary Fund.

The cross-sectional regressions use annual averages over the period 1975-1995. The following shorter periods had to be used for countries whose data are insufficient: Belgium: 1978-95, Greece: 1972-81, Italy: 1985-89, Portugal: 1987-95, Korea: 1976-78, New Zealand: 1978-81 and 1992-98, Brazil: 1975-94, and Japan: 1972-74.

These data constraints limited the time period for the pooled cross-sectional regressions, which use annual time series, to the years 1981 through 1995. Regarding six countries there were still gaps of the data needed to construct indicator FDA but in three cases it appeared justifiable to fill these gaps: For Italy missing data for 1990-94 were constructed by assuming that the indicator evolves linearly from 1989 to 1995. For Portugal and New Zealand the missing years 1981-86 and 1982-91, respectively, were similarly constructed. In these three cases a relatively minor variation in the indicator values that surround the missing years may justify the approach used here to fill data gaps. This procedure was, however, not deemed justifiable in the cases of Greece, Japan and Korea. Hence, for these countries the indicator FDA is not available as a time series.

The indicator of self-reliance of subnational governments (i.e. own revenues of subnational governments as a share of their total revenues, denoted SR, and its change, denoted CHSR) was also taken from the Government Finance Statistics Yearbook. These data have the same gaps as the data underlying indicator FDA. Therefore, construction of period averages of these indicators for the period 1975-1995 relied on the shorter periods given in the first paragraph. For the panel regressions missing data of SR and CHSR have been constructed only for Italy using the method described above. For the other countries with data gaps, this procedure did not appear to be justifiable. Consequently indicators SR and CHSR are not available as time series for Greece, Portugal, Japan, Korea and New Zealand.

To test for a non-linear relationship between economic growth, capital formation, and total factor productivity growth, on the one hand, and fiscal decentralisation, on the other hand, a

“spline” function of indicator FDA was used in the pooled cross-sectional regressions. The function breaks at shares of 30 and 45 percent of subnational government expenditures in consolidated expenditures. The resulting three dummy variables are denoted FDL for “low degree of fiscal decentralisation”, FDM for “medium degree of fiscal decentralisation”, and FDH for “high degree of fiscal decentralisation”. These dummies were constructed for all countries and all years in the sample. For Greece, Italy, Portugal and New Zealand the available FDA data are substantially below a 30% share of subnational government expenditures in total government expenditures. Therefore, years of missing data for these countries were classified as ones that fall in the category of a “low degree of fiscal decentralisation (FDL)”. In the case of Japan it was assumed that the medium range of fiscal decentralisation, which prevailed in the beginning of the 1970s, was maintained throughout the period under consideration. For Korea it was assumed that the relatively high degree of fiscal decentralisation, which prevailed in the second half of the 1970s, was maintained.

### **Total factor productivity**

A simple growth-accounting exercise is undertaken to estimate the growth rate of total factor productivity (the Solow residual, denoted RES), assuming a constant labour share of 0.65:

$$RES_{it} = GDPR_{it} - 0.35 GKAP_{it} - 0.65 GLAFO_{it} ,$$

where GDPR represents the growth rate of real GDP, GKAP denotes the growth rate of real capital (using the growth rate of real gross fixed capital formation), and GLAFO denotes the growth rate of the labour force. The subscript  $i$  indexes the country ( $i = 1, \dots, 26$ ), the subscript  $t$  indexes time ( $t = 1981-1995$ ). Admittedly, this estimation has well known limitations since it abstracts from the quality of factor inputs and time varying factor shares, due to data constraints.

### **Alphabetical list of variables used and sources**

CHSR: Annual change of the self-reliance ratio of subnational governments (i.e. own revenues of subnational governments as a share of their total revenues) from Government Finance Statistics Yearbook, International Monetary Fund.

CHUER: Annual change of the unemployment rate used as a proxy for external shocks hitting a country from World Development Indicators, World Bank.

DUE4: Dummy variable for the countries Greece, Ireland, Portugal and Spain. These countries received substantial transfers from the European Union during the period considered



and this may have influenced their economic growth. This dummy variable is used in cross sectional regressions that use period averages of the data.

**DUE5:** Dummy variable for the countries Greece, Ireland, Italy, Portugal and Spain who had relatively low initial income among the high-income OECD countries during the period considered. This dummy variable is used in panel regressions to control for effects of relatively low initial income (i.e. as a replacement for the variable RGDP70). However, it also catches effects of the substantial net transfers from the European Union to four of these countries.

**DLI:** Dummy variable for countries with relatively low initial per capita income during the period considered: Argentina, Brazil, Greece, Ireland, Italy, Korea, New Zealand, Portugal, Spain, and South Africa.

**FBGDP:** Annual fiscal balance as a share of GDP from International Financial Statistics, International Monetary Fund, and World Development Indicators, World Bank.

**FDA:** Annual subnational government expenditures in consolidated government expenditures from the Government Finance Statistics Yearbook, International Monetary Fund.

**FDB:** Indicator of the degree of fiscal decentralisation during 1971-1996 for high-income countries constructed by Arend Lijphart, *Patterns of Democracy, Government Forms and Performance in Thirty-Six Countries*, New Haven and London 1999, p. 313, (the indicator increases with rising fiscal decentralisation).

**FDC:** Indicator of the degree of fiscal decentralisation during 1971-1995 for high-income countries constructed by Manfred Schmidt, *Demokratietheorien*, Opladen, 1997, p. 245, (the indicator increases with increasing fiscal centralisation).

**FDL:** Dummy variable (“low degree of fiscal decentralisation”) that attains the value of one for years during which the share of expenditures of subnational governments in total consolidated government expenditures is below 30%.

**FDM:** Dummy variable (“medium degree of fiscal decentralisation”) that attains the value of one for years during which the share of expenditures of subnational governments in total consolidated government expenditures is between 30% and 45%.

**FDH:** Dummy variable (“high degree of fiscal decentralisation”) that attains the value of one for years during which the share of expenditures of subnational governments in total consolidated government expenditures is above 45%.

**GCPI:** Annual inflation rate, from International Financial Statistics, International Monetary Fund.

**GDPR:** Annual growth rate of real GDP, from International Financial Statistics, International Monetary Fund, and World Development Indicators, World Bank.

**GKAP:** Proxy for the annual growth rate of the real capital stock: growth rate of gross fixed capital formation deflated by the producer price index, both from International Financial Statistics, International Monetary Fund.

**GLAFO:** Annual rate of labour force growth from International Financial Statistics, International Monetary Fund, and World Development Indicators, World Bank.

**GPOP:** Annual rate of population growth from International Financial Statistics, International Monetary Fund.

**GYP:** Average annual growth rate of GDP per capita during 1975-1995.

INVGDP: Average annual gross investment share of GDP during 1975-1995 from International Financial Statistics, International Monetary Fund, and World Development Indicators, World Bank.

SEC: Annual secondary school enrolment ratio from United Nations, Unesco, Statistical Yearbook.

SEC70: Annual secondary-school enrolment rate in 1970 from United Nations, Unesco, Statistical Yearbook.

RES: Annual growth rate of total factor productivity, estimated as explained above.

RGDP70: Level of real GDP per capita in 1970 from Summers, Kravis, Heston (1980).

SR: Indicator of self-reliance of subnational governments (i.e. own revenues of subnational governments, excluding grants, as a share of their total revenues, including grants) from Government Finance Statistics Yearbook, International Monetary Fund.

STDDC: Uncertainty of economic agents with regard to macroeconomic stability, proxied by the standard deviation of domestic credit, calculated for overlapping five year periods where the last 4 years, the current year and the following year are considered.

UER: Annual unemployment rate from World Development Indicators, World Bank.

*Table 1. Income level, growth performance, and fiscal decentralisation in high-income OECD countries and selected other countries*

Country	Income level (GNP per capita in US\$ 1998)	Growth performance 1970-98 (average annual growth rate of real per capita GDP)	Indicators of fiscal decentralisation:					
			FDA <sup>1</sup>	FDB <sup>2</sup>	FDC <sup>2</sup>	FDA' <sup>3</sup>	SR <sup>4</sup>	CHSR <sup>5</sup>
High-income European OECD countries								
1 Luxembourg	43386 <sup>6</sup>	2,07	16,5	1,0	0.79	9	56,2	0,4
2 Switzerland	40080	1,25	58.2	5,0	-1.53	3	77,0	0,0
3 Norway	34330	3,05	38,0	2,0	-0.08	23	64,4	-1,0
4 Denmark	33260	2,01	56.9	2,0	0.49	5	53,4	0,4
5 Austria	26850	2,61	33.5	4,5	-0.37	26	72,7	0,0
6 Germany	25850	1,64	46,2	5,0	-1.79	11	76,9	0,0
7 Sweden	25620	1,54	42,3	2,0	-0,06	15	76,8	0,6
8 Belgium	25380	2,26	12,8	3,2	0,19	7	41,3	0,4
9 France	24940	2,06	17,9	1,3	0,36	11	61,7	0,3
10 Netherlands	24760	2,70	31,1	3,0	0,33	23	20,5	0,8
11 Finland	24110	2,58	44,3	2,0	0,46	13	67,3	0,0
12 United Kingdom	21400	2,07	29,3	1,0	1,40	17	46,4	-1,4
13 Italy	20250	2,27	26,4	1,5	0,01	15	23,8	1,2
14 Ireland	18340	3,96	30,0	1,0	0,76	21	28,3	-0,7
15 Spain	14080	2,47	23,0	3,0	-0,23	13	57,5	-0,6
16 Greece	11650	2,24 <sup>7</sup>	4,2	1,0	0,64	1	67,5	-3,9
17 Portugal	10690	3,49	8,4	1,0	0,61	3	49,6	2,3

Other high-income OECD countries:								
18 Japan	32380	2,97	40,5	2,0	-1,11	19	-	-
19 USA	29340	2,03	50,9	5,0	-1,62	7	69,2	0,2
20 Australia	20300	1,95	50,2	5,0	-0,99	9	90,4	0,8
21 Canada	20020	2,00	68,5	5,0	-1,22	1	71,8	0,3
22 New Zealand	14700	1,07	11,3	1,0	2,16	5	90,4	0,1
Control group (selected relatively advanced middle-income countries):								
23 Argentina	8970	0,89	37,3	-	-	26	-	-
24 Korea, Rep.	7970	5,92	41,8	-	-	17	35,9	-0,5
25 Brazil	4570	2,50	38,3	-	-	21	68,7	-0,2
26 South Africa	2880	0,02	30,0	-	-	19	46,1	-1,5

1) Average share of expenditures of subnational governments in total consolidated government expenditures during 1975-1995. For several countries, shorter periods apply due to data constraints as explained in the appendix.

2) Indicators FDB and FDC were constructed by political scientists as averages for the period of 1971-1996.

Indicator FDB rises with increasing fiscal decentralization, whereas indicator FDC rises with increasing fiscal centralization.

Indicator FDB was constructed by Arend Lijphart, *Patterns of Democracy, Government Forms and Performance in Thirty-Six Countries*, New Haven and London 1999, p. 313. Indicator FDC was constructed by Manfred Schmidt, *Demokratietheorien*, Opladen, 1997, p. 245.

3) Transformed indicator FDA as explained in the text and in table 2.

4) Average share of own-revenues of subnational governments in their total revenues during 1975-1995. Due to data constraints shorter periods are used for several countries as explained in the appendix.

5) Average annual change of the share of own-revenues of subnational governments in their total revenues during 1975-1995. Shorter periods are used for some countries as explained in the appendix.

6) 1996.

7) Per capita growth of GNP since GDP series are not available over the entire period.

*Sources:* Income level: World Development Report 1999/2000 and World Development Indicators both from the World Bank; Growth performance: International Financial Statistics from the International Monetary Fund. Indicators of fiscal decentralisation: see appendix and footnote 2 of this table.

*Table 2. Derivation of indicator A' of fiscal decentralisation to test for a nonlinear relationship (a hump-shaped relation) between economic growth & the degree of fiscal decentralisation*

	Indicator FDA	Ranking	Indicator FDA' 1
Canada	0,684	1	1
Switzerland	0,582	2	3
Denmark	0,569	3	5
United States	0,509	4	7
Australia	0,502	5	9
Germany	0,462	6	11
Finland	0,443	7	13
Sweden	0,423	8	15
Korea	0,418	9	17
Japan	0,405	10	19
Brazil	0,383	11	21
Norway	0,380	12	23
Argentina	0,373	13	26
Austria	0,335	14	26
Netherlands	0,311	15	23
Ireland	0,300	16	21
South Africa	0,299	17	19
United Kingdom	0,293	18	17
Italy	0,257	19	15
Spain	0,230	20	13
France	0,179	21	11
Luxembourg	0,165	22	9
Belgium	0,128	23	7
New Zealand	0,112	24	5
Portugal	0,084	25	3
Greece	0,042	26	1

<sup>1</sup> Starting with the lowest and highest values of indicator A these are given a value of one. The next lowest and highest values of indicator A are given higher values and this procedure is continued up to the medium range values of indicator A which receive the highest values.

This transformation of indicator A allows to test for a hump shaped relationship between economic growth and fiscal decentralization as explained in the text.

*Source:* Own calculations.

Table 3. Cross-sectional growth regressions: Dependent variable: Average annual growth rate of real GDP per capita during 1975 through 1995<sup>1</sup>

Equation	Constant	RGDP70	GPDP	INVGD	SEC70	CHUER	DEU4	FDA	FDR	FDC	FDA'	SR	CHSR	R2-adjusted	F-statistic	Number of observations
High-income OECD countries:																
(2a)	-0.01 (-2.31)*	-0.36 (-9.12)*	0.07 (9.93)*	0.01 (5.85)*	-0.01 (-6.29)*	0.005 (4.30)*								0.99	1874.0	22
(2b)	-0.01 (-1.66)	-0.43 (-5.15)*	0.08 (6.20)*	0.01 (2.40)*	-0.01 (-5.25)*	0.005 (2.89)*	0.006 (2.06)'							0.99	601.7	22
(2c)	-0.01 (-2.09)	-0.30 (-2.73)*	0.07 (10.38)*	0.02 (4.66)*	-0.01 (-7.55)*	0.005 (3.77)*		-0.0002 (-0.63)						0.99	12748.7	22
(2d)	-0.04 (-0.68)	-0.61 (-6.34)*	0.08 (11.26)*	0.01 (3.25)*	-0.01 (-6.33)*	0.006 (4.24)*			-0.001 (-2.49)*					0.99	4012.5	22
(2e)	-0.01 (-1.18)	-0.26 (-4.42)*	0.07 (7.36)*	0.01 (2.76)*	-0.01 (-6.53)*	0.006 (4.87)*				0.027 (4.64)*				0.99	4120.1	22
(2f)	-0.02 (-3.15)*	-0.15 (-1.88)	0.10 (9.23)*	0.02 (6.16)*	-0.01 (-4.37)*	0.003 (1.50)						-0.01 (-4.34)*	-0.10 (-2.38)*	0.99	22253.4	22
17 Western European countries:																
(2g)	-0.015 (-2.07)	0.04 (0.28)	0.09 (7.13)*	0.01 (2.37)*	-0.007 (-5.16)*	0.003 (1.80)					0.002 (2.82)*	-0.014 (-3.42)*	-0.06 (-1.83)	0.98	116.1	17
Full sample (26 countries):																
(2h)	-0.018 (-4.28)*	-0.036 (-5.24)*	-0.52 (-4.54)*	0.18 (12.52)*	0.01 (3.27)*									0.99	2224.3	26
(2i)	-0.02 (-4.72)*	-0.02 (-2.56)*	-0.34 (-1.47)	0.21 (11.45)*	0.02 (2.89)*			0.012 (5.74)*				-0.02 (-6.16)*	-0.15 (-6.07)*	0.99	255.0	26
(2k)	-0.028 (-4.81)*	-0.041 (-0.54)	-0.19 (-1.01)	0.21 (10.0)*	0.02 (5.20)*					0.001 (1.44)		-0.02 (-4.82)*	-0.15 (-3.22)*	0.99	11927.8	26

<sup>1</sup> Variable definitions: See explanations in the text and in the Appendix.

Note: GLS method (with cross section weights) is used. T-statistics in parentheses; \* indicates significance of the respective variable at the 90 to 95 percent probability level.

' Indicates significance at the 90 to 95 percent probability level.

Source: Own calculations.

*Table 4. Pooled cross-sectional growth regressions: Dependent variable: Annual growth rate of real GDP per capita*<sup>1</sup>

Equation	Constant	GDPR(-1)	GPOP	GKAP	SEC	CHUER	DEU5	DIJ	FDA	EDI	EDM	EDH	SR	CHSR	R2	F-	No. of ob-
															adjusted	statistic	servations
High-income OECD countries:																	
(3a) 2)	0.02 (3.45)*	-0.60 (-15.9)*	0.13 (10.78)*	0.0001 (0.11)	-0.01 (-6.72)*		0.004 (2.01)*	0.001 (0.19)							0.69	114.6	301
(3b)		-0.58 (-16.80)*	0.11 (10.30)*	-0.0001 (-0.30)	-0.01 (-8.17)*		0.004 (1.91)'		0.019 (3.97)*	0.022 (4.18)*	0.020 (4.05)*				0.68	99.8	330
(3c) 3)		-0.59 (-16.87)*	0.13 (10.39)*	-0.0004 (-0.83)	-0.01 (-6.33)*		0.005 (2.49)*		0.023 (3.80)*	0.024 (3.64)*	0.023 (3.66)*	-0.003 (-0.55)	0.04 (1.89)'		0.71	76.4	283
12 countries with highest per capita income 4):																	
(3d)	-0.10 (-2.11)*	-0.55 (-14.36)*	0.10 (6.18)*	-0.004 (-0.48)	-0.009 (-5.86)*				0.021 (2.19)*	0.024 (2.32)*	0.021 (2.05)*	0.0006 (0.08)	0.11 (2.26)*		0.72	51.9	180
Western European countries:																	
(3e) 5)	0.02 (3.04)*	-0.60 (-15.68)*	0.13 (10.59)*	0.002 (0.48)	-0.004 (-4.70)*	0.005 (2.52)*		-0.006 (-0.89)							0.70	96.1	241
(3f)		-0.59 (-16.74)*	0.11 (10.09)*	-0.001 (-0.18)	-0.005 (-5.99)*	0.004 (1.81)'			0.017 (3.25)*	0.018 (3.13)*	0.013 (2.38)*				0.70	84.0	255
26 countries (full sample) 6):																	
(3g)		-0.67 (-14.66)*	0.18 (20.80)*	0.003 (0.62)			0.003 (1.79)'		0.012 (2.56)*	0.013 (2.65)*	0.015 (3.07)*				0.63	111.9	390
9 countries with relatively "low" per capita income 7):																	
(3h)	0.07 (1.19)	-1.50 (-7.46)*	0.13 (8.51)*	-0.004 (-0.43)					0.026 (3.04)*	0.031 (3.31)*	0.063 (5.87)*				0.71	56.3	135

1) Annual data for the period 1981 through 1995. Variable definitions: see explanations given in the text and in the appendix.

Note: GLS method is used (cross section weights). T-statistics in parentheses; \* indicates significance of the respective variable at the 95 percent probability level or higher ' indicates significance at the 90 to 95 percent probability level.

2) Excluding Greece and Japan due to missing FDA data.

3) Excluding Greece, Portugal and New Zealand due to missing data on "self-reliance" of subnational governments.

4) Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, Sweden, Switzerland, USA.

5) Excluding Greece due to missing FDA data.

6) Variable CHUER not included due to missing unemployment data for South Africa.

7) Argentina, Brazil, Greece, Ireland, Korea, New Zealand, Portugal, South Africa, Spain.

Source: Own calculations.

*Table 5. Pooled cross-sectional regressions: Capital formation as a function of macroeconomic policy variables and external factors*<sup>1</sup>

Equation	Constant	GKAP(-1)	FBGDP	GCPI	STDDC	CHUER	DEU5	DJI	FDA	FDI	FDM	FDH	SR	CHSR	R <sup>2</sup> adjusted	F-statistic	Number of observations
High income OECD countries:																	
(4a) 2)	0.065 (5.74)*	0.15 (3.30)*	0.24 (2.45)*	-0.31 (-3.45)*	-0.10 (-2.88)*	-0.04 (-11.92)*		0.03 (3.49)*	-0.02 (-1.10)						0.54	51.7	300
(4b)		0.16 (3.56)*	0.20 (2.12)*	-0.27 (-3.06)*	-0.10 (-2.82)*	-0.04 (-12.31)*		0.04 (3.77)*		0.05 (6.11)	0.060 (7.98) <sup>1</sup>	#### (7.08)*			0.53	47.8	330
(4c) 3)		0.15 (3.16)*	0.26 (2.46)*	-0.34 (-3.68)*	-0.06 (-1.41)	-0.04 (-11.72)*		0.04 (3.36)*		0.04 (2.51)	0.044 (2.56) <sup>1</sup>	#### (1.91)	0 (1.3)	0.15 (1.58)	0.55	35.8	283
12 countries with highest per capita income 4):																	
(4d)		0.16 (2.64)*	0.20 (1.69)'	-0.45 (-3.61)*	-0.07 (-1.48)	-0.04 (-10.00)*				0.05 (2.27)	0.06 (2.52) <sup>1</sup>	0.05 (2.01)	0 (0.4)	0.27 (1.26)	0.58	28.5	180
Western European countries:																	
(4e) 5)	0.063 (4.75)*	0.19 (3.70)*	0.15 (1.45)	-0.41 (-4.45)*	-0.09 (-2.12)*	-0.04 (-10.45)*	0.04 (3.60)*		-0.01 (-0.46)						0.56	45.4	241
(4f)		0.17 (3.22)*	0.17 (1.58)	-0.34 (-3.41)*	-0.08 (-2.04)*	-0.04 (-10.78)*	0.05 (4.08)*			0.06 (6.01)	0.06 (7.03) <sup>1</sup>	#### (5.78)*			0.54	38.7	255
(4g) 6)		0.18 (3.45)*	0.22 (1.90)'	-0.48 (-5.60)*	-0.05 (-1.33)	-0.04 (-10.40)*	0.04 (3.32)*			#### (2.64)	0.05 (2.50) <sup>1</sup>	#### (1.64)	## (1.5)	0.16 (1.64)	0.61	36.3	229
26 countries (full sample) 7):																	
(4h)		0.40 (8.93)*	0.13 (1.37)	-0.01 (-2.84)*	0.003 (0.89)			0.015 (1.48)		0.01 (1.64)	0.03 (3.49) <sup>1</sup>	0.02 (3.34)*			0.23	17.6	390
Countries of the sample with relatively "low" income 8):																	
(4i)		0.30 (3.92)*	0.0003 (0.001)	-0.01 (-3.22)*	0.004 (1.07)					0.01 (0.85)	0.03 (1.23)	0.1 (4.43)*			0.27	9.2	135

1) Dependent variable: GKAP, proxy for the growth rate of the real capital stock; other variable definitions: see explanations given in the text and in the appendix.

Note: GLS method is applied (with cross section weights) using annual data for the period 1981-95 for the same countries as explained in Table 4, footnote 1).

T-statistics in parentheses; \* indicates significance of the respective variable at the 95 percent probability level or higher;

' indicates significance at the 90 to 95 percent probability level.

2) Excluding Greece and Japan due to missing FDA data.

3) Excluding Greece, Portugal and New Zealand due to missing data on "self-reliance" of subnational governments.

4) Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, Sweden, Switzerland, USA. (Japan excluded due to missing data).

5) Excluding Greece due to missing FDA data.

6) Excluding Greece and Portugal due to missing "self-reliance" data.

7) Variable CHUER not included due to missing unemployment data for South Africa.

8) Argentina, Brazil, Greece, Ireland, Korea, New Zealand, Portugal, South Africa, Spain.

Source: Own calculations.



Table 6. Pooled cross-sectional regressions: Total factor productivity growth and fiscal decentralisation<sup>1</sup>

Equation	Constant	RES (-1)	UER (-1)	DEU5	DEU4	EDA	EDI	EDM	EDH	SR	CHSR	R2 adjusted	F-statistic	No. of observations	
High-income OECD countries:															
(5a)	0.02 (2.63)*	0.38 (7.09)*	-0.07 (-2.41)*	0.003 (1.10)		-0.007 (-0.79)					-0.005 (-0.84)	-0.012 (-0.37)	0.14	12.7	283
(5b)		0.32 (6.37)*	-0.001 (-1.91)'	0.003 (0.92)			0.011 (3.33)*	0.007 (2.75)*	0.006 (2.29)*				0.15	11.5	330
(5c)		0.38 (7.14)*	-0.001 (-2.67)*	0.003 (1.10)			0.013 (2.58)*	0.009 (1.72)'	0.008 (1.35)	-0.006 (-0.08)	-0.009 (-0.28)		0.23	12.3	283
Western European countries:															
(5d)	0.02 (3.80)*	0.36 (6.32)*	-0.001 (-3.24)*	0.005 (1.81)'		-0.026 (-2.34)*							0.24	20.2	241
(5e)		0.33 (5.86)*	-0.001 (-3.18)*	0.003 (0.98)			0.016 (4.45)*	0.012 (3.72)*	0.003 (1.02)				0.19	12.9	255
(5f)		0.33 (5.86)*	-0.001 (-3.18)*	0.003 (0.98)			0.016 (4.45)*	0.012 (3.72)*	0.003 (1.02)				0.19	12.9	255
15 countries with highest per capita income 2):															
(5g)		0.29 (4.66)*	-0.0001 (-0.25)				0.008 (1.66)'	0.007 (1.89)'	0.001 (0.20)				0.10	6.9	225
Countries of the sample with relatively "low" income 3):															
(5h)		0.15 (1.63)	-0.001 (-3.11)*		0.019 (2.92)*	0.024 (1.72)'							0.15	6.6	241
(5i)		0.15 (1.81)'	-0.001 (-2.74)*	0.015 (1.89)'			0.006 (0.82)	0.012 (1.57)	0.013 (1.62)				0.08	3.1	121

1) Total factor productivity is the Solow residual (RES) as explained in the Appendix.

2) Austria, Belgium, Denmark, Finland, France, Germany, Italy, Japan, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, USA.

3) Argentina, Brazil, Greece, Ireland, Korea, New Zealand, Portugal, Spain. (South Africa excluded due to missing unemployment data).

Note: GLS method is applied (with cross section weights) using annual data for the period 1981 through 1995 for the same countries

as explained in Table 4, footnote 1). T-statistics in parentheses; \* indicates significance of the respective variable at the

95 percent probability level or higher.

' indicates significance at the 90 to 95 percent probability level.

Source: Own calculations



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