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Fiscal Decentralization and Regional Disparity: A Panel Data Approach for OECD Countries

Christian Lessmann

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Abstract

The advantages and disadvantages of public sector decentralization are widely discussed in economics and political science. While some authors argue that decentralization leads to an optimal provision of public services and a promotion of economic growth, others emphasize the dangers of competition associated with decentralization between sub-national governments especially for redistributive reasons. These authors argue that poorer regions could not compete for mobile factors with the richer ones and, therefore, poor regions would get poorer and rich regions richer. This paper studies empirically the impact of fiscal decentralization on regional disparities using panel data for 17 OECD countries from 1980 to 2001. As the measurement of decentralization and regional disparity is one of the main difficulties of this research, both are discussed extensively and different measurement concepts are elaborated. The findings of this study are that a high degree of decentralization is connected with low regional disparities. Hence, poor regions have no disadvantages from decentralization, quite the contrary.

JEL Code: H72, H77, R11, R50.
Keywords: Devolution, decentralization, regional disparity, inequality, fiscal federalism, convergence.

Christian Lessmann
Ifo Institute for Economic Research
Branch Dresden
Einsteinstr. 3
01069 Dresden, Germany
Phone: +49(0)351/26476-25
lessmann@ifo.de

1 Introduction

Over the past two decades there has been an increasing interest in the vertical organization of government in developed and developing countries, in unitary states as well as in federations. The discussion in Germany about reforming the federal system and the recent shipwreck of the deployed reform commission ("Föderalismuskommission") is an indicator for the evolving decentralization process. The main question is whether it is advantageous to give sub-national governments more authority and autonomy or whether it is better to make decisions at the central level of government. Many observers propose assigning more competencies to the German states ("Länder") especially in cases of levying own taxes. The main argument is that an increase in competition between sub-national jurisdictions would lead to a more efficient provision of public goods and, thereafter, a promotion of economic growth. Following the Tiebout 1956 metaphor of "voting by feet" that counts especially in the case of tax competition, individuals choose that region to settle in that provides the optimal combination of tax burden and public service supply. Contrariwise, opponents of such a reform direction, like Gordon 1983, Sinn 1997 and Sinn 2003 criticize this point of view due to allocation and redistribution reasons. Poorer regions could not compete with the richer ones and that would result in poorer regions getting poorer and rich regions richer. Prud'homme 1995 underlines this argumentation. He describes inter-jurisdictional competition as a vicious circle and concludes that "decentralization can therefore be the mother of segregation" (Prud'homme 1995, 203). The convergence process would slow down until the regions start to diverge. Finally, it seems that a conflict of goals emerges between economic performance of the whole country and regional inequality inside. Keeping in mind the country-specific case of Germany with the still comparatively high disparities[1] due to the unification fifteen year ago, the discussion is similar in a lot of other countries like Belgium, UK or Spain with an ongoing decentralization process. But not only highly developed countries are thinking about decentralization. Particularly the Eastern European states and new members of the European Union are decentralizing rapidly. Of course, the decentralization question is also very important for all member countries and the European Union itself, which tends to centralize more and more authorities in the Parliament and Commission as supranational institutions.

While the allocation aspect of decentralization, particularly the connection between growth and federalism, is analysed in several studies (see e.g. Davoodi and Zou 1998, Woller and Phillips 1998, Yilmaz 2000, Enikolopov and Zhuravskaya 2003, Thießen 2003 or Feld and Dede 2005), there has been only minor research on the impact of decentralization on regional disparity. Most of the existing articles are case studies of a single countries and not focussing directly on this issue (e.g. Kanbur and Zhang 2002 for China, Kim et al. 2003 for Korea or Akai and Sakata 2004 for the USA). Even rarer are cross-country studies whose results are usually better to generalize, because of the possibility to suppress country-specific effects (see Canaleta et al. 2002, Rodriguez-Pose and Gill 2003 or Shankar and Shar 2003).

The aim of this empirical paper is to investigate the impact of fiscal decentralization on regional disparities in a static and in a dynamic way. The purpose of the static analysis is to answer whether regional disparities are higher in centralized or decentralized states, applying cross-country data. The dynamic part expands the investigation to changes in federal structures and the consequences for convergence using panel data for

[1] This article uses regional disparity and regional inequality synonymously.

17 OECD countries from 1980 to 2001.

In the context of the present article, decentralization should be understood as "factual" decentralization. The "factual" decentralization does not reflect the legal structure of a federation only, because the real autonomy and authority power of sub-national jurisdictions is better reflected by their financial powers. Therefore, applied decentralization measures are calculated from several government finance statistics. This approach helps to get various detailed data on the degree of decentralization within countries, which also implies variations over time and makes a panel data analysis possible. Focussing merely on the legal structure would result in a time-invariant dataset and that would require a cross-section analysis. In the first step the empirical investigation starts with a cross-section analysis which leads over to the more detailed panel data analysis in the second step.

This paper is structured as follows: The next section reviews the theoretical and empirical literature dealing with the interactions between decentralization, economic performance and regional disparities. In section 3 the investigation approach is presented after a discussion of measurement concepts and descriptive statistics. Finally, section 4 discusses the obtained results of the analysis, and section 5 summarizes results and draws conclusions.

2 Theoretical and empirical background

From a theoretical point of view it is ambiguous whether regional disparities increase or decrease, or regions converge or diverge. Three branches of economic literature are important for this problem. The Neoclassical Growth Theory in the tradition of Solow 1956 predicts absolute or conditional convergence between regions if these are homogeneous with regard to preferences, savings and production technology. A more differentiated result comes out of the New Growth Theory in the sense of Romer 1986, Romer 1990 where regions could converge, diverge or grow parallel. Following the New Economic Geography based on Krugman 1991 all three development paths are possible, too. However, none of these theories focus on the interventions of governments in these processes, particularly with regard to the federal system. If the theory produces unsatisfying conclusions, empirical research is necessary.

Barro and Sala-I-Martin 1991, Barro and Sala-I-Martin 1992 and Barro and Sala-I-Martin 1995 have provided very important contributions to solve this problem. Based on an endogenous growth framework they detected an average convergence speed between nations of 2 percent p.a.[1] Several studies followed on the convergence process in the European community (an overview in Martin 2001) and single countries (for the case of Germany see Seitz 1995, Niebuhr 2001, Ragnitz et al. 2001, Kosfeld et al. 2002 or Eckey and Schuhmacher 2002). Most authors detected long-term convergence between nations in Europe and all over the world as well as long-term convergence within countries (see Barro and Sala-I-Martin 1995, 465). But does this trend still apply? The descriptive statistics of section 3 will focus on this question.

Theoretical and empirical analyses, based on Neoclassical Growth Theory, New Growth Theory or New

[1] The convergence speed accords to the estimated β in the growth model. A good summary on the differences between the concepts of sigma- and beta-convergence can be found in Barro and Sala-I-Martin 1995.

Economic Geography, determined that convergence processes are driven by migration, trade, knowledge spill-over effects, economies of scale, externalities, and miscellaneous factors. Besides these aspects it is obvious that the institutional design of countries, particularly a federal or unitary constitution, exerts influence on growth and regional disparities. The transmission channels on nationwide growth are frequently discussed in economics and political science. The standard argument follows Tiebout 1956, who postulates that fiscal competition leads to an efficient provision of local public goods, hence excites economic efficiency and growth. This view is criticized especially by Gordon 1983 and Sinn 1997, Sinn 2003 for allocation and redistribution reasons. Sinn 1997 points out that firstly, fiscal competition with congestion-prone public goods may be ruinous for governments; secondly, systems competition may suffer from adverse selection considering the insurance function of redistributive taxation; and finally, competition may lead to low quality standards of public goods. Furthermore, externalities between regions may lead to inefficiencies under fiscal competition (Wilson 1999), but principally they could become internalized by grants (Wildasin 1989). From the perspective of the political economy, fiscal competition results in smaller government in total and thus higher growth rates are achievable (Brennan and Buchanan 1980).

Several authors have analyzed the impact of decentralization on growth in cross-country studies as well as case studies. The results are as ambiguous as the theory itself. Table 1 gives an overview of the results.

Overall it is still controversial whether decentralization effects economic growth, not even the direction is evident. But it appears that decentralization is harmful in developing countries and without greater importance in industrial states. A possible explanation is increasing corruption in decentralized developing countries (see Fjeldstad 2004 for a survey on decentralization and corruption).

In contrast to the studies mentioned above, the main focus of this paper is the impact of decentralization on regional disparities. Nevertheless, insights of the growth analysis are essential for a comprehensive understanding of the spatial effects of federalism and the trend towards decentralization.

The impact of decentralization on regional disparity is ambiguous, too. Prud'homme 1995 presumes an increase of disparities under inter-jurisdictional competition:

> "richer jurisdictions will have large tax bases (...), with tax rates that are either the same or lower than other, less rich jurisdictions. In the first instance, they will collect more taxes and therefore will be able to provide more local public services. In the second, they will offer the same services at lower tax rates. In both cases, these localities will be preferred by businesses and households, which will choose to settle there, enlarging the tax base and increasing the gap in income between regions. Decentralization can therefore be the mother of segregation" (Prud'homme 1995, p. 203).

The result is an inhibited convergence process between regions, and possibly divergence occurs. Following these arguments, fiscal competition should be eliminated by centralization, harmonization or a redistributive grant system.

McKinnon 1997, Qian and Weingast 1997 and more recent theoretical work handle decentralization as a commitment device and suggest that regional disparities may be related to the efficiency of public services. Hence, ex ante decentralization could contribute to enhancing efficiency as well as reducing ex post regional

Table 1: Empirical studies on fiscal decentralization and growth

Authors	Countries	Period	Method	Results
Davoodi and Zou (1998)	46 developing and developed countries	1970-1989 (averages)	FE	Dec. negative for growth
Woller and Philipps (1998)	23 developing countries	1974-1991 (averages)	FE, OLS	No significant effect
Yilmaz (2000)	30 developing and developed countries	1971-1990	FE, GLS	No significant effect
Enikolopov and Zharavskaya (2003)	91 developing and developed countries	1975-2000	OLS, 2SLS	Dec. negative for growth
Thießen (2000)	21 developed countries	1973-1998	OLS	Dec. positive for growth
Thießen (2003)	26 developed countries	1981-1995	GLS	Dec. positive for growth
Feld and Dede (2005)	19 developed countries	1973-1998	FE	No significant effect

Source: extended version based on Feld, Zimmermann and Döring (2003, p. 367 and 2004, p.14).

disparity.

Other authors agree with this point of view. Ludema and Wooton 2000, Kind et al. 2000, Anderson and Forslid 2003, Brakman et al. 2002, Baldwin and Krugman 2004, and Borck and Pflueger 2004 analysed the impact of fiscal competition on development in core and peripheral regions from the perspective of the New Economic Geography. These studies emphasize that especially tax competition is an important instrument for helping peripheral regions compete with core regions for mobile factors. In core regions the advantages of agglomeration permit governments to levy higher taxes than in peripheral regions. A good example is provided by Feld and Dede 2005: Northern Italy offers an excellent infrastructure, close markets, and highly qualified human capital so that the high Italian tax burden is possible. Ireland for example, as a peripheral region, does not have the advantages of agglomeration, and only a mix of low tax rates and public services remains to balance their local disadvantage. Centralization and harmonization would take away one of the only instruments of the peripheral regions to compete with core regions for mobile factors and would be harmful for regional development. This example could easily be assigned to the intrastate case.

In numerous countries a redistribution system exists between different regions for clearing regional disparities. But are such transfers effective for this purpose? Feld and Dede 2005 discussed this aspect. On

the one hand grants could give underdeveloped regions the scope they need for investments in infrastructure and human capital. On the other hand, it is doubtful whether they use capital effectively. It is also possible that instead of investing in growth stimulating factors, the payments are abused in consumption and support of the uncompetitive local industry. Hence, the necessary structural change becomes paralysed and the economic backwardness is sustained.

Again, the impact of decentralization is theoretically ambiguous and empirical research is required. In contrast to the relation between decentralization and growth, studies of the impact on regional disparities are very rare. At present, there are some case studies of single countries but only a few cross-country studies. The only known works that examine fiscal decentralization, at least in part, are Kanbur and Zhang 2002, Canaleta et al. 2002, Kim et al. 2003, Rodriguez-Pose and Gill 2003, Shankar and Shar 2003 and Akai and Sakata 2004. Kanbur and Zhang 2002 show that systems decentralization led to higher regional inequalities in Chinese Provinces during the period 1952-1999. That more decentralized countries have higher inequalities is concluded by Kim et al. 2003, who analyzed Korean time series data. As the authors use the spatial distribution of public services as measurement for decentralization, the results have to be interpreted with caution. Furthermore, a comparison with other studies is impossible. Shankar and Shar 2003 found a negative correlation between decentralization and regional inequalities on the basis of time series data of different developed and developing countries. The disadvantage of this study is that for several countries the used time series are very short and decentralization is not measured by financial accounts but only by a classification in unitary and federal states. A cross-section analysis is provided by Canaleta et al. 2002. They estimated the impact of different measures of regional disparity on different measures of decentralization for 15 OECD countries. In most cases they found a negative correlation between decentralization and regional inequality but only one measure is significant: the proportion of state and local government final consumption to general government consumption. But this measure does not incorporate local autonomy, as the local expenditures might be financed by central government grants.[2] Akai and Sakata 2004 analyzed US state level panel data and found a negative impact of decentralization on regional inequalities. This work is the pattern for the following empirical investigation. The main difference is that for the present paper a panel data set of OECD countries was compiled, while Akai and Sakata 2004 used panel data of US states. Their approach has the advantage of analyzing relatively homogenous regions within the US states, but perhaps the connection of decentralization and disparities is US-country-specific and, therefore, these results cannot be generalized for other countries. Of course, this is one of the main targets of the following analysis.

However, the impact of decentralization on regional disparity within countries is ambiguous in the theoretical as well as in the empirical literature. The aim of this paper is to contribute new empirical insights to this question, derived from different econometric methods. The next section discusses measurement concepts for the main variables of interest – regional disparity and decentralization – and shows descriptive statistics. The calculated measures, then, are used to estimate the correlation in a cross-section analysis as well as a panel data set of 17 highly developed OECD countries in the period from 1980 to 2001. The country sample was selected based on availability of data.

[2] The advantages and disadvantages of different measures for decentralization as well as disparity are discussed below.

3 Empirical analysis

The empirical analysis starts with a discussion of different measures of decentralization and regional disparity as well as economic and geographic control variables. Subsequently, a comparative-descriptive overview of the processes of disparity and decentralization is provided, and the investigation approach is described.

3.1 Measurement concepts of decentralization

The measurement of factual decentralization and regional disparity is very difficult. In the case of decentralization, researchers seek to measure how many authorities sub-national governments have compared to the central government. As already mentioned in the introduction, the present article defines decentralization as "factual" decentralization or, in other words, the decentralization of financial resources within a country. This approach enables a measurement of the real autonomy of sub-national jurisdictions in contrast to the potential autonomy measured by indices of the federal constitution of a federation. For this purpose most empirical studies rely on the share of sub-national government expenditure (or revenue) to general government expenditure (or revenue).[3] For a better comparability with former empirical work, the present paper adopts these measures (expdecwsoc, revdecwsoc). The last four letters imply that social expenditures (or revenues) are not considered in the decentralization measure, because it is not the aim of this paper to investigate interregional redistribution via the social security funds. However, Oates 1972 and other authors have already discussed the limitations of such "classical" decentralization measures.[4] There has to be taken into account that such a measure does not always represent the actual degree of decentralization, because it is important to consider the autonomy of sub-national government decisions on their expenditures or revenues. A simple example should illustrate this problem. In the case of German states the average of the degree of revenue decentralization between 1980 and 2001 was, at 0.61 (excluding social expenditures), very high compared to unitary countries.[5] But in fact, only very few possibilities exist for the sub-national governments to levy own taxes. Most German taxes are composite taxes, and the main legislation is assigned to the central government. Hence, the degree of revenue decentralization seems to be high if the sub-national revenues are not adjusted to autonomy. Such an advanced degree of revenue decentralization averages only 0.21 in the case of Germany.[6] Obviously, there is a large bias if an inappropriate measurement concept is applied. Ebel and Yilmaz 2003 show this by replicating previous studies with more comprehensive measures of decentralization and detect in some cases reversed results. Despite this problem, this paper operates with the controversial "classical" decentralization measures as well as recent ones for obtaining a better possibility of comparison to other analysis.

The OECD 1999 has developed an internationally comparable framework to assess and analyze the degree of control that sub-central governments have over their revenues. Table 2 presents the tax classification framework.

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[3] See e.g. Thießen 2003.

[4] A good overview on the problems of measuring fiscal decentralization is from Stegarescu 2004.

[5] Degree of total revenue decentralization is calculated from the IMF Government Finance Statistics.

[6] See Stegarescu 2004, p. 28. These measures are calculated from the OECD Government Revenue Statistics.

Table 2: OECD framework of tax classification

Classification of taxes (in decreasing order of control over revenue sources)
a) sub-central government (SCG) determines tax rate and tax base.
b) SCG determines tax rate only
c) SCG determines tax base only
d) tax sharing:
d.1) SCG determines revenue-split
d.2) revenue-split only changed with consent of SCG
d.3) revenue-split unilaterally changed by central government (CG) (fixed in legislation)
d.4) revenue-split unilaterally changed by CG (in annual budgetary process)
e) CG determines tax rate and tax base

Source: OECD 1999.

While the first three rows (a to c) could be interpreted as taxes with a wide degree of autonomy of sub-national governments, (d.1) and (d.2) are shared (or composite) taxes which are influenced by both central and sub-central governments. In the cases of (d.3), (d.4), and (e) the taxes are totally controlled by the central government. All kinds of taxes covered by the OECD Government Revenue Statistics are classified in this respect.

Hence, it is possible to calculate an advanced measure for the degree of revenue decentralization considering sub-national government autonomy. Stegarescu 2004 does this in two different ways.[7] One of his measures, which is also used in the following estimations, only considers the autonomous taxes and revenues of sub-national jurisdictions:

$$adrevdec = \frac{(a) + (b) + (c) + nontax\ revenue + capital\ revenue}{total\ government\ revenue}.^{8}$$

To come back to the example of the German states, this more comprehensive measure of revenue decentralization is much smaller than the "classical" one. Therefore – for receiving robust results – it is very important to apply different measures of decentralization. The great disadvantage of data generated in this way is that it is only available for OECD countries.[9] Whereas the often used "classical" decentralization measures – computable from the IMF Government Finance Statistics – are available for numerous developed and developing countries.[10] In addition to this, the OECD does not report government expenditures divided in central and sub-central ones.

[7] See Stegarescu 2004, p. 8.

[9] The data source is the OECD Revenue Statistics.

[10] IMF Government Finance Statistics covers 65 countries with more then one government level.

Besides these budgetary decentralization measures, several others exist. The size and number of sub-national authorities, the number of sub-national jurisdictions related to the population size,[11] or the number of vertical government tiers are used occasionally. From the perspective of political science, Schmidt 1996 provides different alternative measures for decentralization as the "constitutional structure", an additive index taking into account whether federalism is stronger or weaker, or whether there is a second chamber of parliament, etc. Other similar decentralization indices are developed by Lijphart 1984, or Castles 1999. Such measures do not measure "factual" decentralization as is the approach of this paper, and, therefore, they are not considered here.

From the OECD 1999 framework, another decentralization measure was derived: the decentralization of autonomous tax revenue calculated in a similar way as the advanced degree of revenue decentralization above, but considering taxes only.[12] The advantage of this measure is that it approximately indicates the degree of tax competition between sub-national governments. However, also this measure is only available for OECD countries.

Concluding the discussion of the different measurement concepts of decentralization, there are two main sources. The "classical" decentralization measures "degree of expenditure decentralization" (expdecwsoc), and the "degree of revenue decentralization" (revdecwsoc) was computed from the IMF Government Finance Statistics. Moreover, the advanced measure for the degree of revenue decentralization was derived from the OECD Government Finance Statistics (adrevdec) as well as the degree of tax revenue decentralization (taxdec). The section 3.3 gives an overview on the average values and variances of the different decentralization measures.

3.2 Measurement concepts of regional disparity

Before focussing on descriptive statistics, the measurement of regional disparity has to be discussed. Several problems arise while analyzing disparities. First of all, it is argued which is the best economic account basis for the calculations. Secondly, the optimal applied concentration measure is defined.

This article uses the gross domestic product per capita (GDP p.c.) as input variable following the OECD Territorial Outlook 2001. Other authors focus on the per capita income, but this has a great disadvantage: the income per capita also covers the benefits from the social security system. In contrast to these analyses, this paper focuses primarily on decentralization, and for this purpose the effects of other redistributive instruments should be excluded as far as possible. Another possible input variable is the gross domestic product per worker as used by Canaleta et al. 2002. But this measure also presents some drawbacks. Due to unequal employment between the compared regions, a bias could emerge that distorts the disparity measure. Furthermore, in some important countries this measure is not reported by the statistical officials (e.g. Austria and Belgium).

Of course, also the GDP per capita as input variable is not free from disadvantages. The biggest problem arises from the existing commuters between sub-national jurisdictions. For example in the German regions Hamburg, Bremen or Berlin there are many employers who work inside the town and commute from other

[11] See e.g. Oates 1985.

[12] See Stegarescu 2004, p. 7.

jurisdictions, which distorts the disparity measure. In this case the disparity gets overestimated. For minimizing the bias, the wider NUTS 2 classification is used in all European countries, because on this territorial level the total number of commuters is minimized. In countries outside Europe the state level is used as territorial classification according to the NUTS 2 approach.

The territorial level itself – to which our examination reverts to – is very important in analyzing regional disparities. The problem of commuters discussed above requires the application of a territorial level that minimizes this effect. Table 3 compares the coefficient of variation (cov) as disparity measure related on the GDP per capita for European countries based on NUTS 3 and NUTS 2 level.

Table 3: The dependency of regional disparity on the territorial classification

Regional Disparity		
Austria	0.26	0.19
Belgium	0.32	0.34
Denmark	0.25	0.12
Finland	0.22	0.23
France	0.33	0.20
Germany	0.40	0.38
Ireland	0.22	0.22
Italy	0.23	0.24
Netherlands	0.21	0.17
Portugal	0.29	0.21
Spain	0.20	0.19
Sweden	0.15	0.19
United Kingdom	0.43	0.32
Average	0.30	0.27

Source: EUROSTAT own calculations.

As expected the disparity based on NUTS 2 regions is, on average, somewhat smaller than for NUTS 3 regions. This shows that the effect of commuters is, at least partially, internalized. When using GDP per capita there arises a conflict of goals between using as much information as possible (NUTS 3 levels) and the consideration of commuters (NUTS 2 level). It would be also possible to adjust the NUTS 2 regions by aggregating such problematic core regions as Hamburg or Berlin in Germany with other regions, but this will lead to completely incomparable results. Moreover, the NUTS 2 classification reflects the federal structure of a country and is similarly constructed in all European countries. The distortion from agglomeration centres occurs in all countries, as in London, Paris, etc.

Another problem arises from the different size of the regions considered. An example should illustrate this problem: there is a two region country with one region with 1,000 inhabitants and a GDP p.c. of €

20,000. The second region has a GDP p.c. of € 10,000 but only 10 inhabitants. Without taking the different population size into account, a disparity measure would show a high disparity, although the disparity does not affect a lot of people. This problem is also encountered when using the widely homogenous NUTS 2 regions and state level for outside European countries. Furthermore, a robustness tests with a regional population size adjusted disparity measure are applied for eliminating this problem (wcov).[13]

The last question to be discussed is what indices are applicable for the measuring of regional disparities. In the literature it is well known that different measures of inequality do not always provide an unambiguous country ranking (for a comparison of different measures see Spieza 2003 and OECD 2003). There are different requirements that a measure has to satisfy, especially in country comparisons. Often used measures include the standard deviation, the standard deviation of the natural logarithms, the coefficient of variation, the adjusted Gini coefficient, the Herfindahl Index, and the Theil Index of inequality. All of these measures represent the concentration of GDP per capita within a country and satisfy the Dalton transfer principle, that is, a transfer from richer to poorer regions reduces inequality. But some are not applicable for the aim of this paper, because their domain depends on the number of regions. A good example is the Herfindahl Index (H):

$$H := \frac{\sum_{i=1}^{N} a_i^2}{\left(\sum_{i=1}^{N} a_i\right)^2}, \quad a_i (i \in [1; N]$$

where a_i denotes the regional GDP p.c. and N the number of regions. It has a range from $1/N \leq H \leq 1$. In a country with only two regions the lower limit is 0.5. In this case an index value of 0.5 is a sign for a very low concentration. But this value is not comparable with a country with more regions, because here 10 regions, for example, maintain a lower limit of 0.1 and now a value of 0.5 will indicate a higher concentration. Therefore, the Herfindahl Index is not applicable for cross-country analysis but merely for single country time series studies. Another problem is the sensitivity to higher or lower input values. For example the standard deviation (σ):

$$\sigma := \sqrt{\frac{1}{N} \sum_{i=1}^{N} \left(a_i - \frac{\sum_{i=1}^{N} a_i}{N}\right)^2}$$

is likely to be higher if input values are high. A case of two countries, each with two regions, where one country has regional GDP p.c. of € 1,000 and € 100, respectively, and the other country with € 100 and € 10, respectively, is a good example. In the first country the standard deviation of GDP p.c. is 450, whereas the standard deviation in the second country is only 45. Of course, the relative disparity is equal in both countries, thus, the standard deviation leads to an incorrect conclusion. Hence, the standard deviation has to be relativized by the mean value. This is called coefficient of variation (cov):

$$cov := \frac{\sqrt{\frac{1}{N} \sum_{i=1}^{N} \left(a_i - \frac{\sum_{i=1}^{N} a_i}{N}\right)^2}}{\frac{\sum_{i=1}^{N} a_i}{N}}, \quad 0 \leq Cov \leq 1.$$

[13] The different concentration measures applied are discussed below.

The main advantages of this disparity measure are that it is not sensitive to the amplitude of the input values and that it is independent of the number of considered regions.

The often used adjusted Gini coefficient (*adgini*) combines the same properties:

$$adgini := \frac{2\sum_{i=1}^{N} ia_i}{N\sum_{i=1}^{N} a_i} - \frac{N}{N-1}, \quad 0 \leq G \leq 1.$$

The last term on the right side of the equation is necessary, as the Gini coefficient has to be adjusted to the number of regions. Otherwise, the maximal value of the Gini coefficient is given by the reciprocal value of this term and the peerlessness of the countries reappears.

If the population is distributed unequally among regions as discussed above, it is also possible to calculate a population weighted coefficient of variation (*wcov*):

$$wcov := \frac{\sqrt{\sum_{i=1}^{N}\left[\left(a_i - \frac{\sum_{i=1}^{N} a_i}{N}\right)^2 \cdot \frac{pop_i}{\sum_{i=1}^{N} pop_i}\right]}}{\frac{\sum_{i=1}^{N} a_i}{N}}.$$

The right term under the root is the population share of region i. Now, if a region has only a very small share of the total population and the GDP per capita is very different, it has a smaller impact on the disparity measure than a bigger region.

Finally, the Theil Index (T) can be used for measuring regional disparities:

$$T := \sum_{i=1}^{N}\left[\left(\frac{a_i}{\sum_{j=1}^{N} a_j}\right)\ln\left(\frac{a_i}{\sum_{i=1}^{N} a_i}\right)\right].$$

Besides several advantages, the main disadvantage of this measure is the same as that of the Herfindahl Index: the domain depends on the number of regions, because there is no upper limit for inequality. Thus, the measure is also not applicable for international comparisons.

For all these reasons, this paper uses the coefficient of variation (*cov*), the adjusted Gini coefficient (*adgini*) as well as the weighted coefficient of variation (*wcov*) for measuring regional disparities. The following section provides descriptive statistics on "factual" decentralization and regional disparities.

3.3 Descriptive statistics

The values of the different decentralization measures discussed above are illustrated in Table 4.

The columns show five year averages of the measures: expenditure decentralization (expdecwsoc), revenue decentralization (revdecwsoc), adjusted revenue decentralization (adrevdec), and tax decentralization (taxdec) for two periods and 17 OECD countries. With regard to the "classical" decentralization measures, Switzerland, Germany, Canada, and the United States are the most decentralized countries, whereas Portugal and Belgium are more unitary. Changes over time are not very large, but large enough for the panel data analysis as the next section will show. In some countries decentralization has increased, while other countries tended to centralize more. In Spain, the strongest decentralization trend is observable.

The last four columns contain the more comprehensive measures, which reflect autonomy as well as competition. For most of the countries these measures are clearly below the "classical" values. Especially

Table 4: Decentralization in OECD countries

	Decentralization measures							
	expdecwsoc		revdecwsoc		adrevdec		taxdec	
Countries	1980-1985	1995-2000	1980-1985	1995-2000	1980-1985	1995-2000	1980-1985	1995-2000
Austria	41.4	43.2	42.7	42.9	14.1	14.8	3.5	3.5
Belgium	19.5	17.4	18.4	17.7	7.3	24.5	6.3	24.1
Canada	58.0	61.3	62.5	61.8	53.5	57.0	51.6	52.9
Denmark	47.7	48.1	48.7	46.2	30.6	31.7	29.0	31.7
Finland	44.3	40.8	44.5	42.4	31.5	31.9	26.2	26.0
France	27.6	29.7	25.3	30.2	16.0	23.2	13.2	19.3
Germany	64.9	64.0	61.9	60.9	22.0	20.8	7.5	7.3
Ireland	27.7	27.1	29.1	27.7	9.7	9.5	2.9	2.4
Italy	28.9	30.4	36.2	29.9	6.3	9.6	0.4	5.8
Netherlands	35.8	34.4	37.2	36.9	9.9	14.4	4.0	5.1
Norway	33.1	33.3	29.5	30.2	25.9	25.1	24.1	23.5
Portugal[a]	9.1	12.4	11.6	12.6	4.1	6.0	0.3	3.1
Spain	28.5	48.2	29.3	45.2	13.3	19.2	9.4	9.2
Sweden	40.7	45.5	5.9	39.3	44.5	40.5	43.6	44.1
Switzerland	69.8	69.1	70.0	70.9	63.7	63.0	58.0	56.6
UK	28.8	25.4	29.4	28.5	18.6	9.4	13.4	4.8
USA	50.6	58.9	56.5	60.1	41.9	46.3	35.9	36.8
Average	37.9	40.0	39.0	39.8	24.3	26.3	19.4	21.5

Note: a) expdecwsoc and revdecwsoc for Portugal refer to 1987.

Source: Own calculations from the IMF Government Finance Statistics and the OECD Government Revenue Statistics.

in the case of Germany the data reflect that the vertical government structure is strongly designed as a cooperative system, almost without any competitive elements. Only a few countries like Switzerland and Canada reach nearly the same values when the comprehensive measures are compared with the "classical" ones. These are the countries with the most competitive federal systems.

The dependent variables for the regressions are the different measures for regional disparity. Not included in the analysis are countries like Luxembourg or Iceland, because it is not reasonable to calculate disparity measures for very small countries. Iceland, for example, has only 280,000 inhabitants, 115,000 of whom live in Reykjavik. A disparity measure of Iceland would, therefore, be not comparable with that of big countries like the USA or Germany. Besides this problem, the statistical department of Iceland does not report regional GDP. Furthermore, otherwise interesting countries like New Zealand and Australia are also

not considered in the analysis, because regional GDP is not available. In the case of Japan, time series are partially available, but only from 1991 on. Other authors use concentration measures of income per capita instead of GDP per capita for countries where required data is missing, but this leads to inconsistent results. For example, the coefficient of variation of the disposable income per capita between U.S. States from 1980 to 2000 averages only 0.14, whereas the coefficient of variation of GDP per capita averages 0.35. Therefore, a consistent interpretation of the results of such analysis with mixed dependent variables is impossible.

Table 5 reports period averages of the three discussed disparity measures considering 21 OECD countries.

Table 5: Regional disparity in OECD countries

	Disparity measures					
	cov		adgini		wcov	
Countries	1980-1985	1995-2000	1980-1985	1995-2000	1980-1985	1995-2000
Austria	0.22	0.20	0.14	0.13	0.07	0.07
Belgium	0.40	0.37	0.19	0.19	0.12	0.11
Canada	0.25	0.22	0.15	0.14	0.04	0.04
Denmark	0.11	0.11	0.09	0.08	0.05	0.06
Finland	0.12	0.18	0.06	0.11	0.03	0.07
France	0.17	0.19	0.08	0.08	0.05	0.06
Germany	0.18	0.19	0.09	0.10	0.03	0.03
Ireland	0.11	0.19	0.10	0.19	0.06	0.11
Italy	0.25	0.25	0.15	0.15	0.06	0.06
Netherlands[a]	0.25	0.16	0.14	0.10	0.05	0.04
Norway	0.15	0.25	0.10	0.14	0.05	0.10
Portugal	0.26	0.20	0.14	0.12	0.11	0.09
Spain	0.21	0.20	0.13	0.12	0.04	0.05
Sweden	0.07	0.13	0.04	0.06	0.03	0.05
Switzerland	0.10	0.13	0.07	0.08	0.04	0.05
UK	0.25	0.29	0.10	0.13	0.05	0.06
USA	0.42	0.32	0.15	0.12	0.03	0.02
Average	0.21	0.21	0.11	0.12	0.05	0.06

Note: a) The disparity measures for the Netherlands refer to 1986 because of reorganization in the NUTS classification.

Source: Own calculations from data of national statistical offices.

Especially for the Scandinavian countries as well as Switzerland the coefficient of variation indicates a disparity far below average. In contrast, the countries with a very high regional disparity are Belgium, the

United Kingdom and the United States. This results hold also for the adjusted Gini coefficient. Disparities measured by the population-weighted coefficient of variation have a somewhat different structure.[14]

Altogether, focussing on the development over the two considered periods, the measures show static or slightly increasing average regional disparities. However, this does not count for the single countries. In some countries disparities have increased whereas disparities have decreased in others.

As Table 5 has shown, an application of different disparity measures produces various country rankings. Table 6 compares the country orders for the three considered disparity measures.

Table 6: Country rankings and different disparity measures

A country ranking based on average disparity measures for the period from 1995 to 2000			
Countries	cov	adgini	wcov
Austria	9	11	12
Belgium	17	16	16
Canada	12	13	3
Denmark	1	2	8
Finland	5	7	13
France	6	3	9
Germany	7	5	2
Ireland	8	17	17
Italy	13	15	10
Netherlands	4	6	4
Norway	14	14	15
Portugal	10	8	14
Spain	11	9	5
Sweden	2	1	6
Switzerland	3	4	7
UK	15	12	11
USA	16	10	1

Source: Own calculations from data of national statistical offices.

Obviously, different measurement concepts of regional disparity lead to different country rankings, but the varieties between the results of the coefficient of variation and the adjusted Gini coefficient are comparatively small. However, the following panel analysis will show that the results are robust anyway. Furthermore, the variations over time, which are important for the dynamic analysis, are quite similar for all disparity measures.

[14] See Table 6 for a comparison of the different disparity measures.

3.4 Investigation approach

In addition to the measures for decentralization and regional disparity as the main variables of interest in the following analysis, there are several important control variables, which presumably have an impact on regional disparities.

One of the most important fiscal redistribution instruments between regions is social security funds. For example the number of unemployed citizens in eastern Germany is much higher than in the western part of the country, and, therefore, the inhabitants of the western regions are, on average, net contributors to unemployment insurance and people of the eastern regions receive net transfers.[15] This also holds for the social security benefits. Thus it could be expected that countries with big social security funds have a strong indirect territorial redistribution system. For capturing the impact of the social security system on regional disparities within a country, the total social expenditures as a share of GDP (social) are taken into account in the investigation approach. The expected sign for the social redistribution variable is negative.

Another instrument for the redistribution between regions are the so called central government grants. These are payments from the central government to the sub-national jurisdictions in order to help the poorer regions catch up with the richer ones. The model includes the average grants per capita paid by the central government (grantspop). As mentioned above, the expected sign of the coefficient is unclear, because such payments may retard the structural change in poor regions.

As also discussed in the second chapter, the neoclassical growth theory as well as the theory of fiscal federalism emphasizes the role of the homogeneity of preferences within a country. With heterogeneous preferences different regions will develop on an own growth path and this leads only to conditional convergence and thus regional disparities. Thereby, it is necessary that the applied measure for heterogeneity reflects a territorial separation of the different ethnic or linguistic groups. As in previous studies[16] this paper measures inter-jurisdictional heterogeneity of preferences by the degree of the ethno-linguistic fractionalization (ethno). The variable is taken from the language encyclopaedia Ethnologue.[17] The ethno-linguistic index is calculated like the Greenberg 1956 linguistic diversity index. This contains the probability that any two people of the country selected at random would have different mother tongues. The highest possible value, 1, indicates total diversity (that is no two people have the same mother tongue) while the lowest possible value, 0, indicates no diversity at all. As could be expected, countries like Belgium or Switzerland have a high linguistic diversity index, whereas France or Germany, for example, have a low one. Other authors use differing measures and find a high fractionalization for countries like the USA or Australia, but this finding does not mirror regional varieties but immigrants without deeply rooted local traditions.

From the perspective of the New Economic Geography regional disparities are affected by globalization. Fujita et al. 1999 suggest that the opening of an economy to the world market could change internal comparative advantages and hence location patterns. Therefore, the regressions include the sum of the relation of imports to GDP and exports to GDP as a measure for globalization (global); the sign could not be predicted.

[15] The impact of the unemployment insurance on the convergence process is examined by Kaufman et al. 2003 for the case of Canadian provinces.

[16] See e.g. Panizza 1999, and Stegarescu 2004.

[17] See www.ethnologue.com.

As pointed out by Kuznets 1955, a high degree of agglomeration may increase regional disparities, and, therefore, the regional concentration of the population is considered in the investigation approach. Agglomeration can be measured in several ways. One possibility is to calculate the Gini coefficient of the regional population distribution (popgini). The advantage of this measure is that it reflects the total concentration of population within a country in respect to the different regions. Alternatively, other measures for agglomeration are used like the share of urban living people (urban), but this does not cover the total concentration of the population inside the country. It is also possible that the degree of urbanization is high within a country but equal in all considered regions, which means that these indices are not necessarily correlated. Hence, no information is left about the population concentration between the regions if only the degree of urbanization is considered.

Kuznets 1955 also suggests that farm-based economies have greater income inequality, and that a greater share of the labor-force employed in manufacturing is negatively associated with inequality. Because of the often observed regional concentration of agriculture and manufacturing, the share of working population employed in agriculture is also considered in the regressions (emplagri).

Furthermore, the wealth of a country might have an impact on regional disparities. If there is a bigger tax base, a government has more possibilities for redistribution policies. As a measure for a nation's wealth the GDP per capita is also considered in the regressions (gdppc). The predicted sign is negative.

Although the effects of the following variables are difficult to predict, the unemployment-ratio (unempl), and the populations size (pop) are also included in the model to capture political influences and regional size effects.

Formally, the basic estimation equation for the cross-country regressions is

$$Disparity_i = \alpha + \beta \cdot Control_i + \gamma \cdot Decentralization_i + \epsilon_i.$$

$Disparity_i$ denotes the averages of the different measures for regional disparity from 1980 to 2000 in country i. $Control_i$ is a vector capturing some of the different control variables mentioned above, and last but not least, $Decentralization_i$ represents the period averages of the different measures for decentralization.

In the dynamic part of the investigation, the time effects are considered and the basic estimation equation for the panel analysis is

$$Disparity_{i,t} = \alpha_i + \beta \cdot Control_{i,t} + \gamma \cdot Decentralization_{i,t} + \epsilon_{i,t},$$

where α_i represents the country fixed effects.

The following section will show that some control variables of the cross-country analysis could not be included in the panel regressions because they are time invariant. This applies especially for the ethnologic fractionalization.

4 Estimation results

4.1 Basic estimation

The results of the cross-country estimations for the degree of decentralization and regional disparity are reported in Table 7.

Table 7: OLS Cross-country estimation results for regional disparity and decentralization

	Dependent Variable: Coefficient of variation				
	1	2	3	4	5
social	-0.011 *	-0.013 **	-0.013 **	-0.017 ***	-0.016 ***
	-1.98	-2.69	-2.66	-3.89	-4.00
ethno	0.101	0.105 **	0.105 **	0.111 **	0.114 **
	-1.46	-2.24	-2.18	-2.72	-2.87
urban	0.003 *	0.003 ***	0.003 **	0.003 ***	0.004 ***
	-1.92	-3.16	-3.03	-3.72	-3.95
popgini	0.248 *	0.231 **	0.243 **	0.240 **	0.246 **
	-1.79	-2.30	-2.34	-2.56	-2.73
expdec		-19.680 **			
		-2.84			
revdec			-18.578 **		
			-2.57		
adrevdec				-20.980 ***	
				-3.33	
taxdec					-20.830 ***
					-3.73
Obs	17	17	17	17	17
Rsq	0.4350	0.6010	0.5880	0.6440	0.6680

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

All equations are estimated with OLS and White 1980 heteroskedasticity-consistent standard errors and covariance. The 17 considered countries are the highly developed European and North American countries mentioned in the sections above.

First of all, the coefficients of the control variables show the expected signs. Nations with a high degree of social redistribution have smaller regional disparities; a high degree of ethnologic fractionalization as well as a high local concentration of the population is significantly associated with higher disparities. The other

mentioned variables do not have a significant impact on regional disparity, and, therefore, were dropped from the equations. However, the main variables of interest, the different decentralization measures, have all the same negative sign and are significant at least at a 5% level. Actually, the more comprehensive measures, the advanced degree of revenue decentralization measure (adrevdec) as well as the degree of tax decentralization (taxdec), are significant at a 1% level.

This leads to the conclusion that highly decentralized countries feature smaller regional disparities. The following panel data analysis deepens this analysis and permits a control for endogeneity.

Before estimating the impact of decentralization on regional disparity with a panel dataset, a panel unit root test has to be applied. The Breitung t-stat, the ADF Fisher-Chi-square test, and other tests negate the hypothesis of the existence of a unit root and indicate stationary time series. Furthermore, the Hausman 1978 specification test rejects model specifications using random effects; hence, country fixed effects models are applied. The results of the panel regressions are reported in Table 8. The coefficients of the country dummies are not reported due to space limitations.

Note, that the ethnolinguistic fractionalization could not be considered in the estimations, because it is time invariant and, therefore, captured by the country fixed effects.

As in the pure cross-section analysis the population distribution (popgini) has a positive impact on regional disparity, while the urbanization (urban) now has a significant negative one. Big countries as reflected by the population variable (pop) show lower disparities, and a high unemployment rate (unempl) is associated with higher regional inequality. Open economies (global) seem to have smaller disparities as well as countries with a large social redistribution system (social). Richer countries (gdppc) have higher regional disparities. Central government grants (grantspop) as well as the share of employees working in agriculture (emplagri) do not have a significant impact on regional disparity. The decentralization measures as the main variables of interest are all negatively associated with the disparity measure, at least at a 10% significance level. A problem arises from the Durbin-Watson test on serial correlation. For the underlying dataset the value of the statistic must be close to 2. The small values around 0.5 indicate a serious problem with autocorrelation of the residuals, which biases the estimation results. This problem could be solved in several ways. One way is to estimate in first differences, but with this method the results must be interpreted with caution, because the focus is on variations not on absolute levels. As the aim of this paper is to do the latter, another approach is considered: the FGLS and the Prais-Winsten regression. However, the results of an exemplary estimation in first differences can be found in the appendix (Table 12). Here we can only emphasize that these results support all findings of the following analysis.

Applying FGLS or Prais-Winston regression allows us to adjust the data set to the autocorrelation factor Rho. Note that FGLS-estimators are BLUE, whereas Prais-Winston estimators are consistent but possibly inefficient. The results of both procedures are presented in Table 9 and Table 10.

The signs of all coefficients stay the same with both methods, but some tend towards insignificance. The control variables popgini (+), pop (-), gdppc (+), and unempl (+) remain highly significant. Still the most interesting decentralization measures have all negative signs and are – except the degree of expenditure decentralization – highly significant.

Both approaches – the static cross-country regressions as well as the panel data estimations – indicate a

Table 8: Panel-OLS regressions with country fixed effects from 1980 to 2001

	Dependent variable: Coefficient of variation				
	1	2	3	4	5
popgini	75.982 *	87.116 **	66.364	118.522 ***	123.535 ***
	1.78	2.00	1.52	2.93	3.07
urban	-0.227 **	-0.244 **	-0.245 **	-0.188 **	-0.226 ***
	-2.42	-2.51	-2.58	-2.13	-2.60
pop	-0.395 ***	-0.345 ***	-0.324 ***	-0.363 ***	-0.389 ***
	-8.76	-6.83	-6.60	-8.58	-9.29
gdppc	0.292 ***	0.240 ***	0.234 ***	0.234 ***	0.321 ***
	5.58	4.25	4.32	6.55	6.73
emplagri	0.185	0.011	-0.019	0.222 *	0.206 *
	1.42	0.07	-0.13	1.80	1.69
unempl	0.277 ***	0.289 ***	0.375 ***	0.300 ***	0.360 ***
	3.54	3.68	4.58	4.09	4.88
global	-0.039 *	-0.047 **	-0.054 ***	-0.042 *	-0.043 **
	-1.67	-2.00	-2.31	-1.88	-1.99
social	-0.003	-0.057	-0.061 **	-0.079	-0.056
	-0.04	-0.63	-0.70	-0.96	-0.70
grantspop	-0.783	-0.507	-1.651	0.439	0.746
	-0.46	-0.30	-0.97	0.28	0.42
expdec		-12.702 *			
		-1.97			
revdec			-21.997 ***		
			-3.22		
adrevdec				-29.037 ***	
				-6.38	
taxdec					-29.068 ***
					-6.53
Obs.	286 (17)	281 (17)	281 (17)	281 (17)	285 (17)
R-sq.	0.3202	0.3286	0.3451	0.4114	0.4166
DW	0.483	0.501	0.502	0.579	0.573

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

Table 9: FGLS panel estimations with country dummies from 1980 to 2001

	Dependent variable: Coefficient of variation				
	1	2	3	4	5
popgini	92.513 ***	88.280 **	90.332 **	131.619 ***	126.581 ***
	2.58	2.51	2.51	4.00	3.91
urban	-0.138	-0.114	-0.079	-0.108	-0.136
	-1.02	-0.84	-0.57	-0.82	-1.05
pop	-0.352 ***	-0.281 ***	-0.293 ***	-0.304 ***	-0.329 ***
	-3.49	-2.77	-2.94	-3.26	-3.60
gdppc	0.275 ***	0.204 ***	0.215 ***	0.287 ***	0.294 ***
	5.34	3.85	4.02	6.22	6.39
emplagri	0.119	-0.078	0.026	0.083	0.053
	0.97	-0.59	0.21	0.67	0.42
unempl	0.089	0.109 *	0.146 **	0.105 *	0.146 **
	1.47	1.84	2.33	1.76	2.41
global	-0.011	-0.016	-0.016	-0.018	-0.009
	-0.73	-1.07	-1.01	-1.17	-0.62
social	0.110	0.084	0.110	0.057	0.075
	1.36	1.05	1.37	0.71	0.93
grantspop	-0.732	-0.857	-1.112 *	-0.500	-0.448
	-1.16	-1.48	-1.65	-0.69	-0.54
expdec		-10.680 ***			
		-3.30			
revdec			-9.926 **		
			-2.28		
adrevdec				-17.718 ***	
				-5.46	
taxdec					-18.995 ***
					-5.76
Obs.	286 (17)	281 (17)	281 (17)	281 (17)	285 (17)
Rho	-0.6173	-0.6153	-0.6117	-0.5818	-0.5732
Wald chi^2	28,616	31,646	29,965	35,921	35,418
$prop > chi^2$	0.00	0.00	0.00	0.00	0.00

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

Table 10: Prais-Winsten regressions with country fixed effects from 1980 to 2001

	Dependent variable: Coefficient of variation				
	1	2	3	4	5
popgini	89.654 **	98.541 **	84.477 **	110.317 ***	110.690 ***
	2.42	2.49	2.11	3.05	3.22
urban	-0.313 *	-0.296 *	-0.282 *	-0.251	-0.292 *
	-1.91	-1.72	-1.65	-1.55	-1.90
pop	-0.365 ***	-0.345 ***	-0.318 ***	-0.343 ***	-0.363 ***
	-3.07	-2.88	-2.82	-3.20	-3.38
gdppc	0.322 ***	0.291 ***	0.274 ***	0.329 ***	0.336 ***
	4.49	3.79	3.67	4.98	5.08
emplagri	0.185	0.142	0.100	0.224	0.185
	1.08	0.68	0.53	1.31	1.12
unempl	0.284 ***	0.295 ***	0.357 ***	0.291 ***	0.340 ***
	2.84	2.99	3.57	3.03	3.47
global	-0.036 *	-0.036 *	-0.038 *	-0.030	-0.029
	-1.68	-1.69	-1.85	-1.51	-1.47
social	-0.009	-0.026	-0.024	-0.024	-0.022
	-0.06	-0.19	-0.18	-0.18	-0.16
grantspop	-1.090	-0.917	-1.459 *	-0.445	-0.120
	-1.62	-1.48	-1.95	-0.63	-0.16
expdec		-5.3762			
		-0.91			
revdec			-17.773 ***		
			-2.72		
adrevdec				-21.744 ***	
				-4.86	
taxdec					-22.760 ***
					-5.76
Obs.	286 (17)	281 (17)	281 (17)	281 (17)	285 (17)
R-sq.	0.9744	0.9747	0.9756	0.9785	0.9790
Rho	0.6230	0.6205	0.6165	0.5910	0.5863

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

negative relationship between the degree of decentralization and regional disparities. The higher the degree of decentralization, the lower are the regional disparities in a federation. The fears of possibly negative redistributive effects of decentralization as expressed by Prud'homme 1995 seem to be exaggerated and there is a strong support for the hypothesis of Qian and Weingast 1997 that decentralization could restrain disparities.

4.2 Sensitivity analysis and robustness checks

In order to check for the robustness of the results, several sensitivity analyses have been carried out. While the estimations above have already used different measures of decentralization, it is necessary to repeat this procedure with alternative measures of regional disparity. For this reason the empirical analysis is repeated for the adjusted Gini coefficient (adgini) as dependent variable as well as the weighted coefficient of variation (covw). See Table 13 in the appendix for the results of Prais-Winston regressions in econometric specifications comparable to the estimations above. The tests show that the results for the main variables of interest are also robust for alternative measures for regional disparity. Therefore, the results of this investigation are independent of the measurement concept of regional disparity as well as decentralization.

As a problem of endogeneity between decentralization and disparity might appear, the estimations are repeated with the Two-Stage-Least-Squares (TSLS) method, where the instrument variable is a one period lagged value of the decentralization measure. The results are presented in the appendix in Table 14 for the coefficient of variation. The TSLS estimations show that there is no endogeneity problem within the calculations. All results hold also for this procedure and, therefore, seem to be highly robust.

As a control for the problem of autocorrelation and possibly for less variation in the data, Table 12 in the appendix presents the results of estimations in first differences with the coefficient of variation as dependent variable. Even though the results have to be interpreted slightly differently, they also support all the findings about the relationship between decentralization and regional disparity.

5 Summary and conclusions

The aim of this paper was to analyze the impact of fiscal decentralization on regional disparity. The motivation was to find first empirical evidence for the ambiguous theoretical findings. Hence, different measurement concepts for "factual" decentralization as well as regional inequality have been discussed, calculated, and applied in several estimations. Cross-country regressions have shown that countries with a high degree of decentralization exhibit small regional disparities. 17 OECD highly developed countries have been taken into account and period averages from 1981 to 2000 have been considered. This result also holds for different disparity measures as well as different decentralization measures.

In a second step a panel data set has been deployed, and the estimations have been repeated. These estimations also support the results of the cross-country case. Decentralization is not harmful for the distribution between the regions of a country, quite the contrary, decentralization lowers regional disparity.

But some remarks are necessary. These results could only be generalized for high developed countries

like those considered in the analysis. It is also possible that decentralization in poor countries has a negative impact on the equity of regions. Assuming an undeveloped country with high corruption, decentralization could give the local authority the chance to exploit the citizens and local companies. Therefore, decentralization might be harmful in poor countries. In transition economies like the Eastern European ones, decentralization could increase inequality between regions as well, because of a completely different historical background with the centralized, communist fiscal organization, and very fast growing agglomeration centers. This question could not be answered in this paper, because available time series are too short for analyzing the transition economies. However, test calculations indicate a positive impact of decentralization on regional disparity, but the results are not significant. In this respect it is a question for further research to analyze this relationship for developing countries. Data availability would be the prerequisite for such research.

However, the paper was motivated by the case of German federalism. The policy implication of this study is that the postulation of some authors like Feld and Dede 2005 for an increasing decentralization in Germany would not be harmful for the convergence process. Moreover, the results of this empirical analysis could be assigned to the case of supranational centralization progresses as in the European Union. The message is to abandon an extensive centralization and harmonization. Competition between countries could reduce regional disparities.

6 Appendix

Table 11: Data sources and definitions

Variable	Definition	Source
cov	Coefficient of variation of regional GDP per capita.	Several national statistics, own calculations
wcov	Weighted coefficient of variation of regional GDP per capita.	Several national statistics, own calculations
adgini	Adjusted Gini coefficient of regional GDP per capita.	Several national statistics, own calculations
ethno	Ethnolinguistic fractionalization is the probability that any two people of the country selected at random would have different mother tongues. The highest possible value, 1, indicates total diversity (that is no two people have the same mother tongue) while the lowest possible value, 0, indicates no diversity at all.	www.ethnologue.com
popgini	Gini coefficient of the population concentration among national regions.	Several national statistics, own calculations
urban	Share of urban living population.	World Bank (WDI)
pop	Total Population.	World Bank (WDI)
gdppc	GDP per capita.	Several national statistics, own calculations
emplagri	Share of employees working in agriculture	World Bank (WDI)
unempl	National unemployment rate	World Bank (WDI)
global	Sum of the relation between imports and GDP and the relation of exports and GDP	World Bank (WDI)
social	Share of total national social expenditures in relation to GDP.	World Bank (WDI)
grantspop	Central government grants per capita	IMF (Government Finance Statistics)
expdec	Share of sub national expenditures in relation to total government expenditures without social funds.	IMF (Government Finance Statistics)
revdec	Share of sub national revenue in relation to total government revenue without social funds.	IMF (Government Finance Statistics)
adrevdec	Autonomous revenue decentralization.	OECD (Revenue Statistics)
taxdec	Decentralization of tax revenue.	OECD (Revenue Statistics)

Table 12: Panel-OLS estimation in first differences

	Dependent variable: differenced coefficients of variation d(cov)									
	Model specifications with all variables					Model specifications with significant variables				
	1	2	3	4	5	6	7	8	9	10
d(popgini)	48.125	39.128	51.350	45.163	44.381					
	0.54	0.45	0.60	0.51	0.52					
d(urban)	-0.547**	-0.541**	-0.497*	-0.483	-0.521**	-0.595*	-0.589*	-0.539*	-0.534	-0.564*
	-1.83	-1.78	-1.67	-1.60	1.71	-1.84	-1.80	-1.68	-1.62	-1.71
d(pop)	-0.249	-0.245	-0.224	0.235	-0.249					
	-0.96	-0.93	-0.89	-0.92	-0.98					
d(gdppc)	0.304***	0.291***	0.281***	0.301***	0.316***	0.217**	0.209**	0.198*	0.216*	0.222*
	2.82	2.88	2.71	2.92	2.92	1.95	1.98	1.81	1.94	1.97
d(emplagri)	0.129	0.124	0.135	0.171	0.144					
	0.84	0.85	0.91	1.17	0.97					
d(unempl)	0.226**	0.229**	0.268**	0.219*	0.247**	0.212**	0.217**	0.273**	0.215**	0.241**
	1.95	1.93	2.08	1.80	1.96	2.13	2.12	2.32	2.00	2.21
d(global)	-0.026	-0.022	-0.023	-0.022	-0.021					
	-1.40	-1.18	-1.26	-1.12	-1.07					
d(social)	0.001	0.004	0.032	0.017	0.008					
	0.01	0.06	0.41	0.26	0.12					
d(grantspop)	-1.079	-1.051*	-1.237***	-1.029	-0.623	0.662	-0.943	-1.138***	-0.953	-0.613
	-1.58	-1.65	-2.77	-1.49	-1.56	-1.44	-1.53	-2.64	-1.35	-1.45
d(expdec)		-0.150					-1.097			
		-0.02					-0.14			
d(revdec)			-17.088**					-18.561**		
			-1.98					-2.15		
d(adrevdec)				-10.992**					-11.970**	
				-1.86					-2.06	
d(taxdec)					6.753*					-12.993**
					-1.67					-1.97
Obs	267 (17)	262 (17)	262 (17)	262 (17)	261 (17)	273 (17)	268 (17)	268 (17)	267 (17)	271 (17)
R-sq.	0.0292	0.0242	0.0402	0.0320	0.0358	0.0324	0.0293	0.0486	0.0380	0.0425

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

Table 13: Robustness test - Prais-Winston regressions with alternative disparity measures

	Dependent variable: Adjusted Gini coefficient					Dependent variable: Weighted coefficient of variation				
	1	2	3	4	5	6	7	8	9	10
popgini	25.910	29.663	23.652	35.803*	33.035*	169.095***	177.901***	174.829***	186.794***	191.115***
	1.40	1.52	1.22	1.91	1.85	5.88	5.66	5.47	6.68	7.13
urban	-0.153**	-0.146**	-0.137**	-0.122*	-0.147*	-0.271*	-0.263	-0.263	-0.239	-0.260*
	-2.41	-2.16	-2.03	-1.88	-2.37	-1.68	-1.55	-1.55	-1.49	-1.71
pop	-0.139***	-0.119***	-0.118***	-0.129***	-0.136***	-0.208***	-0.206***	-0.195***	-0.186***	-0.202***
	-4.78	-4.17	-4.40	-5.01	-5.16	-5.92	-5.19	-5.40	-6.33	-6.91
gdppc	0.159***	0.136***	0.137***	0.158***	0.163***	0.366***	0.353***	0.345***	0.373***	0.378***
	5.17	4.03	4.24	5.42	5.53	5.74	5.17	5.25	6.33	6.43
emplagri	0.022	-0.032	-0.013	0.042	0.019	0.136	0.145	0.115	0.143	0.124
	0.32	-0.37	-0.17	0.61	0.28	0.80	0.70	0.62	0.85	0.76
unempl	0.083*	0.089*	0.114**	0.083*	0.103**	0.297***	0.307***	0.321***	0.313***	0.358***
	1.72	1.88	2.34	1.79	2.14	3.88	4.02	4.12	4.21	4.71
global	0.002	0.002	0.002	0.007	0.006	-0.035*	-0.034*	-0.035*	-0.033*	-0.030*
	0.18	0.16	0.12	0.55	0.48	-1.79	-1.73	-1.79	-1.85	-1.68
social	-0.009	-0.024	-0.018	-0.012	-0.012	-0.027	-0.034	-0.037	-0.047	-0.042
	-0.14	-0.36	-0.27	-0.19	-0.18	-0.32	-0.39	-0.44	-0.56	-0.52
grantspop	-0.806**	-0.704**	-0.948**	-0.560	-0.465	-0.872	-0.796	-0.911	-0.363	0.074
	-2.19	-2.37	-2.45	-1.63	-1.30	-1.49	-1.37	-1.43	-0.57	0.11
expdec		-5.772*					0.730			
		-1.96					0.15			
revdec			-7.486**					-3.797		
			-2.47					-0.77		
adrevdec				7.839***					19.161***	
				-3.48					-4.99	
taxdec					-8.442***					-21.658***
					-3.59					-5.53
Obs	286 (17)	281 (17)	281 (17)	281 (17)	285 (17)	286 (17)	281 (17)	281 (17)	281 (17)	285 (17)
R-sq.	0.9798	0.9816	0.9812	0.9822	0.9815	0.9845	0.9841	0.9843	0.9869	0.9873
Rho	0.6348	0.6109	0.6202	0.6087	0.6209	0.5819	0.5864	0.5839	0.5455	0.5436

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

Table 14: Test for Endogeneity - TSLS Estimation

	Dependent variable: Coefficient of variation				
	1	2	3	4	5
popgini	75.982 *	102.958 **	70.809	140.223 ***	133.167 ***
	1.78	2.25	1.54	3.27	3.04
urban	-0.227 **	-0.101	-0.113	-0.051	-0.217 **
	-2.42	-0.98	-1.12	-0.53	-2.42
pop	-0.395 ***	-0.345 ***	-0.295 ***	-0.364 ***	-0.395 ***
	-8.76	-6.18	-5.63	-8.23	-8.73
gdppc	0.292 ***	0.189 ***	0.166 ***	0.282 ***	0.346 ***
	5.58	3.07	2.87	5.36	6.60
emplagri	0.185	-0.051	-0.186	0.172	0.246 *
	1.42	-0.29	-1.19	1.35	1.94
unempl	0.277 ***	0.209 **	0.334 ***	0.237 ***	0.376 ***
	3.54	2.55	3.93	3.10	4.84
global	-0.039 *	-0.035	-0.050 **	-0.034	-0.039 *
	-1.67	-1.48	-2.13	-1.52	-1.76
social	-0.003	-0.044	-0.062	-0.082	-0.086
	-0.04	-0.49	-0.71	-1.00	-1.03
grantspop	-0.783	-0.507	-1.920	0.688	0.863
	-0.46	-0.25	-0.95	0.36	0.45
expdec		-13.202			
		-1.51			
revdec			-35.139 ***		
			-3.94		
adrevdec				-33.136 ***	
				-6.23	
taxdec					-34.288 ***
					-6.48
Obs.	286 (17)	266 (17)	266 (17)	266 (17)	273 (17)
R-sq.	0.3202	0.3139	0.3977	0.3977	0.3977

Note: T-values are reported below the coefficients; ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All estimations are calculated with Stata 8.2.

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