EUROPEAN CENTRAL BANK
EUROSYSTEM

WORKING PAPER SERIES
NO 1029 / MARCH 2009

THE ROLE OF FISCAL TRANSFERS FOR REGIONAL ECONOMIC CONVERGENCE IN EUROPE

by Cristina Checherita,
Christiane Nickel
and Philipp Rother

EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1029 / MARCH 2009

THE ROLE OF FISCAL TRANSFERS FOR REGIONAL ECONOMIC CONVERGENCE IN EUROPE[1]

by Cristina Checherita[2], Christiane Nickel[3] and Philipp Rother[4]

In 2009 all ECB publications feature a motif taken from the €200 banknote.

This paper can be downloaded without charge from http://www.ecb.europa.eu or from the Social Science Research Network electronic library at http://ssrn.com/abstract_id=1349093.

1 We are grateful to Davide Furceri, Reiner Martin, Ad van Riet, and participants of an ECB seminar for helpful comments on previous versions of the paper. The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Central Bank.

2 European Central Bank, Kaiserstraße 29, D-60311 Frankfurt am Main, Germany; e-mail: cristina.checherita@ecb.europa.eu
George Mason University, School of Public Policy, 3401 Fairfax Drive, MS 3B1, Arlington, VA 22201, USA; e-mail: cchecher@gmu.edu
3 European Central Bank, Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany; e-mail: christiane.nickel@ecb.europa.eu.
Center for European Studies, WHU – Otto Beisheim School of Management, Burgplatz 2, D-56179 Vallendar, Germany.
4 European Central Bank, Kaiserstraße 29, D-60311 Frankfurt am Main, Germany; e-mail: philipp.rother@ecb.europa.eu

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Website
http://www.ecb.europa.eu

Fax
+49 69 1344 6000

ISSN 1725-2806 (online)

CONTENTS

Abstract

This paper provides evidence on the role of net fiscal transfers to households and EU structural funds for per-capita output convergence across a large sample of European regions during the period 1995-2005. We find that net fiscal transfers, while achieving regional redistribution, seem to impede output growth and promote an "immiserising convergence": output growth rates in poor receiving regions decline by less than in rich paying regions. EU structural and cohesion funds spent during 1994-1999 had a positive, but slight, impact on future economic growth, mainly through the human development component.

Keywords: Fiscal policy, convergence, regional economic growth, regional migration

JEL codes: E62, R11, R23

Non-technical summary

In this paper, we provide empirical evidence on the role of net fiscal transfers and EU structural funds policy for income and output convergence across European regions.

We analyse the *aggregate impact* of taxation and transfers on income and output convergence across a large sample of European regions, covering 19 EU member states during the period 1995-2005. The analysis is based on NUTS-2 regions, which are targeted by the European Commission in its evaluation of regional income disparities. We later include in the analysis the amounts of structural and cohesion funds spent at regional level during the period 1994-1999.

As regards our empirical investigation, we first use simple models of convergence of output and income indicators (household primary income and disposable income) and, thus, indirectly account for the role of fiscal transfers. To begin, we look at measures of per-capita income and output dispersion, or σ-convergence. Further, we compare the speeds of convergence as given by an absolute β-convergence model for household primary income, household disposable income and output per capita.

The conclusion from this analysis is that there has been a process of convergence across the European regions under study in terms of both per-capita output and income. The evidence of within country convergence is much more limited, primarily restricted to Italy. We find that disposable income across European regions in EU-19 converges during the period 1995-2005 at a higher speed than primary income, with the lowest speed obtained for output per capita. Since the difference between primary income and disposable income is given by the net impact of taxes and transfers, government intervention seems to lead to lower disparities among regions in terms of income ultimately available for households. On the other hand, given that the main difference between GDP per capita and household primary income per capita is explained by the commuting flows of workers, labour mobility appears to be particularly important for the process of income adjustment.

Our main empirical model is given by a system of simultaneous equations that captures the relationship between net fiscal transfers to households, labour mobility, and economic growth. Hence, we capture the impact of net fiscal transfers on output growth and labour mobility while taking into account the endogenous nature of net fiscal transfers, that is, relatively higher net transfers are granted to poorer regions. Regarding data construction, for net fiscal transfers we use the ratio between household disposable income and primary income, while for labour mobility we can capture only short-distance mobility or labour commuting.

We find that net fiscal transfers impede, on average, the output growth. Moreover, when we divide the sample into two ("receiving regions and marginal payers" and "heavily taxed regions"), we find a negative impact of net transfers on growth in the former group, and an even higher negative impact of net taxes on growth in the latter group. This points to a process of "immiserising convergence", with output growth rates in receiving poor regions declining by less than in paying rich regions in reaction to the tax-transfer scheme.

There is also some evidence that fiscal transfers impede labour commuting with higher net transfers reducing outward labour mobility. While this seems to be beneficial for economic growth (higher outward labour implies lower per-capita GDP growth), it is likely to impede factor adjustment. Yet, using population migration as an alternative variable, higher net transfers seem to be associated with higher outward migration.

We also account for the amounts spent during 1994-1999 out of the EU structural and cohesion funds. It seems that such funds have a slight positive impact on future economic growth, mainly through the human development component, but the results do not seem to be robust when country dummies are included.

While this is a preliminary investigation for the EU-19 regions as a pool, further research is needed to bolster these conclusions, especially investigating more thoroughly the national policy dimension of the regional convergence process, looking in more details at the role of labour migration in this process, as well as accounting for spatial dependency.

I. Introduction

The process of economic convergence at the regional level has been analysed extensively in the literature. Yet, the role of fiscal policy tools for convergence has been less thoroughly investigated empirically, at either country or regional level. On the one hand this is because the theoretical literature is still not clear about the contribution of fiscal policy, especially taxation and other distributional measures, to long-term growth and convergence. On the other hand there is a lack of reliable and consistent fiscal data at the regional level.

Knowing the impact of fiscal transfers on convergence is important for policy makers at both national and European levels. When deciding on measures that affect regional transfers, policy makers need to take into account the costs in terms of the distortions they induce on the side of the net payers as well as the net recipients. In particular, the pursuit of regional redistribution objectives must give due consideration to the cost of forgone or impeded economic growth.

In this paper, we provide evidence on the role of fiscal redistribution policies for output convergence across European regions. We analyse the impact of net transfers to households, and EU structural funds, on per-capita output convergence across a large sample of European regions, covering 19 EU member states[5] during the period 1995-2005. We also briefly investigate the role of fiscal transfers for income dispersion across the European regions.

We base the analysis on NUTS-2 regions,[6] which are targeted by the European Commission in its evaluation of regional income disparities. Our sample includes 230 NUTS-2 regions (listed in Appendix 1), for which various measures of regional per-capita income and output are available from Eurostat for the period from 1995 to 2005.[7]

To our knowledge, this is the first paper that uses a proxy for a fiscal policy variable to investigate economic convergence across European regions. We construct the variable net transfers as the ratio between household disposable income and primary income, thus capturing the aggregate impact of taxation and other distributional policy measures. Our main empirical model is given by a system of simultaneous equations that captures the relationship between net fiscal transfers to households, labour mobility, and economic growth. Hence, we capture the impact of net fiscal transfers on output growth and labour mobility while taking into account the endogenous nature of net fiscal transfers, that is, relatively higher net transfers being directed to poorer regions. At the same time, it should be noted that governments can use a range of additional tools to foster regional convergence which are not covered in this paper. These include

[5] The 19 EU countries of this study are: Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, The Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, and United Kingdom. The exclusion of eight EU member states is due to the lack of regional data and in some cases (e.g. Romania) the availability of only short time series.

[6] The acronym NUTS stands for "Nomenclature of Territorial Units for Statistics" and is a code standard developed by the EU to reference the administrative sections of a country statistically.

[7] Some regions will be dropped in the empirical specifications given the lack of data for various explanatory variables.

investment in infrastructure and human capital formation as well as corporate subsidies differentiated by region.

We find that net fiscal transfers contribute to income convergence (the distributional effect), but they also seem to impede, on average, output growth. Moreover, when we divide the sample into two ("receiving regions and marginal payers" and "heavily taxed regions") we find a negative impact of net transfers on growth in the former group, and an even higher negative impact of net taxes on growth in the latter group. This result points to a process of "immiserising convergence"[8] with output growth rates in receiving poor regions declining by less than in paying rich regions in reaction to the tax-transfer scheme.

The paper is structured as follows. After the present introduction, the second chapter introduces a short literature review of the theoretical and empirical aspects of the role of fiscal policy on economic growth and income convergence. It includes a review of the main results from the regional convergence studies across European regions. The third chapter presents simple empirical models to investigate convergence of per capita output and income indicators taking into account the role of fiscal transfers. First, it looks at measures of per capita income and output dispersion or σ-convergence. Further, it compares the speeds of convergence as given by an absolute β-convergence model for household primary income, household disposable income and output per capita. The fourth chapter contains our main empirical model and investigates with various panel and cross-sectional datasets the role of fiscal transfers on output convergence, with a focus on modelling the endogenous character of fiscal transfers. The last part concludes and contains recommendations for future research.

II. Literature Review

The process of economic convergence at regional level has been extensively analysed in the literature. A series of studies beginning with Barro and Sala-i-Martin (1990; 1992a), Barro et al. (1991) and continuing with Coulombe and Lee (1995); Shioji (2001); Rey and Montouri (1999) among many others, find evidence of absolute and conditional β-convergence[9] across U.S. states, Japanese prefectures, Canadian provinces and European regions.

[8] The term is reminiscent of Bhagwati's (1958) "immiserizing growth." Bhagwati used it in the context of international trade to denote the paradox that growth-induced deterioration in the terms of trade would outweigh the primary gain from growth so that the country could end up worse off (see Bhagwati (2008) for the description and origin of the term). In the case of the present paper, we use the term to denote the unintended effect of net transfers on convergence, i.e. even if convergence may be supported, it comes at the cost of a worse situation in both poor receiving and rich paying regions.

[9] Empirically, the so-called "***β-convergence***" model (Barro and Sala-i-Martin 1990, 1991, 1992a), arguably the most popular empirical model of convergence, tests whether in the long run the growth rate of per capita income across countries/regions is inversely correlated with the starting level of income per capita. In an *absolute β-convergence model*, the growth rate is regressed only on the initial level of per-capita income, while a *conditional β-convergence* model controls for other differences in cross-sectional units that could produce different steady-state growth rates.

Evidence of decreasing income disparities over long periods of time, or σ-convergence,[10] has also been unveiled across regions, although it is more difficult to find it over shorter periods. For instance, Sala-i-Martin (1996) finds evidence of σ-convergence in several EU countries in a long-term analysis over five decades, while Boldrin and Canova (2001) and Bouvet (2007) fail to uncover similar patterns for shorter term analysis ranging from one to three decades. Models of distributional dynamics do not find evidence of income polarization or convergence clubs across U.S. states (Quah 1996b; Johnson 2000), but there is some evidence of two-club income convergence among European regions if the new member states are included (Fischer and Stumpner 2007).

Regarding the role of fiscal policy in the process of economic convergence, the existing literature has identified several ways in which such a role can be investigated.

First, the impact of fiscal transfers on economic growth can be indirectly extended to economic convergence: if poorer regions receive fiscal transfers that could accelerate their growth rates relative to richer regions, then these instruments could contribute to reinforcing economic convergence. On the other hand, as argued in Barro (1999), transfer payments and the associated tax finance will generally distort economic decisions; a greater level of income redistribution induces more distortions, tends to reduce investment, and thus slow down economic growth. Furthermore, transfers and other distributional fiscal measures that are targeted at reducing income disparities could have the perverse effect of reducing labour mobility and thus hampering an automatic process of adjustment. The process of adjustment after asymmetric shocks, particularly relevant in a monetary union, can be a short-term indication for the capacity of regional economies to achieve long-term economic convergence, and particularly for the speed with which such convergence is achieved. Barro and Sala-i-Martin (1992a) discuss the importance of extending the neoclassical growth model to allow for "migration of persons," considered as "another force that promotes convergence of per capita product and income across economies."[11]

Obstfeld and Peri (1998) investigate the role of fiscal policy in regional adjustment after asymmetric shocks within a single currency area. They conclude that the key regional adjustment mechanisms should be (i) labour mobility and (ii) local relative price responses, while (iii) interregional transfer payments can be helpful in riding out temporary real shocks. They also find that outside the US (Germany, Italy, Canada, UK), there is a higher reliance on interregional transfer payments, less on labour migration, and the pace of regional adjustment appears to be slower. However, the high persistence of stabilizing transfers, even in the US, suggests their role goes beyond that of temporarily cushioning cyclical shocks. Rather, they represent long-lived inflows to regions confronting macroeconomic difficulties, and as such, contribute to a postponement of labour and price adjustments.

---

[10] ***σ-convergence*** treats the movement in time of the variance (or standard deviation, hence the name σ) of a cross-sectional income distribution. The two terms, σ and β-convergence, are coined "the classical approach to convergence" in Sala-i-Martin (1996). β-convergence is a necessary, but not sufficient condition for σ-convergence (Sala-i-Martin 1996; Furceri 2005).

[11] However, in the estimations, including net labour migration as an explanatory variable in the growth equations affects only marginally the β coefficient of convergence.

Kaufman et al. (2003) study the role of federal transfers in the process of economic convergence across Canadian provinces by looking directly at the impact of equalization payments on growth, and indirectly at the impact of employment insurance schemes on migration. They find that the equalization payments may have helped spur the process of output convergence, while the employment support scheme seems to have deterred convergence by discouraging migration across Canadian provinces.

Second, and related to the first approach, the role of fiscal policy for the process of convergence may be investigated by looking at σ-convergence, or how measures of income and output dispersion are influenced by fiscal variables. In this vein, Bouvet (2007) seeks to explain regional output inequality within 13 EU countries during the period 1977-2003, and uses social transfers as an explanatory fiscal variable. Somewhat surprisingly, social transfers are found significant in reducing output inequality only when Greece, Spain and Portugal (countries that received the largest support from the EU) are excluded from the analysis.

Third, some insights as to the impact of fiscal policy on income convergence may be revealed by comparing the convergence rates across various income indicators, such as per-capita GDP, personal income, and personal disposable income. The difference between the last two reflects the effect of tax and redistribution policies. Using this approach, Coulombe and Lee (1995) find that per-capita disposable income across Canadian provinces converges faster than personal income for the period 1961-1991, while the speed of convergence is the slowest for regional GDP per capita. They conclude that convergence has been helped by government transfers and taxes, but this refers only to income convergence, and they do not discuss the impact on output convergence.

Finally, in the case of European regions, the role and effectiveness of regional structural funds and other programs of fiscal support for backward regions can be investigated indirectly by comparing the economic growth rates and/or the dynamics of income distributions separately for regions that are recipients of such funds and for the other regions. In this vein, Boldrin and Canova (2001) investigate the role of European regional policies in promoting convergence in output per capita during the period 1980-1996. They conclude that there is no evidence that *structural and cohesion funds regions* behave differently from others or display any form of systematic catching-up with the rest of regional income distribution. However, others (European Commission 2001; Cappelen et al. 2001; Beugesdijk and Eijffinger 2003) found an opposite result. Martin (1999) finds some empirical support for the convergence model across the European regions during the 1980s and early 1990s, but concludes that a fast, automatic catch-up process is unlikely and that regional policy instruments can have a positive impact on regional convergence. As summarised in Tondl (2004), the overall evidence on this account is mixed.

Our paper builds upon this literature and expands its finding by using a comprehensive methodological approach applied at a cross-national regional level. We base our analysis on Barro and Sala-i-Martin (1990, 1991) in terms of conditional convergence, and Obstfeld and Peri (1998) in terms of the role of long-lived fiscal transfers on labour mobility adjustments. For our empirical investigation, we build on Coulombe and Lee's (1995) comparison of convergence across income and output per

capita, and continue with an empirical model similar to the one used in Kaufman et al. (2003).

III. A simple empirical investigation

As a first step in our empirical investigation, we take a look at convergence across three different indicators, namely GDP per capita, household primary income and household disposable income. Differences in the convergence rate of the three indicators (absolute β-convergence), as well as in the trend of their dispersion (σ-convergence), give an indication to what extent policy measures and other factor have contributed to regional convergence over the sample period.

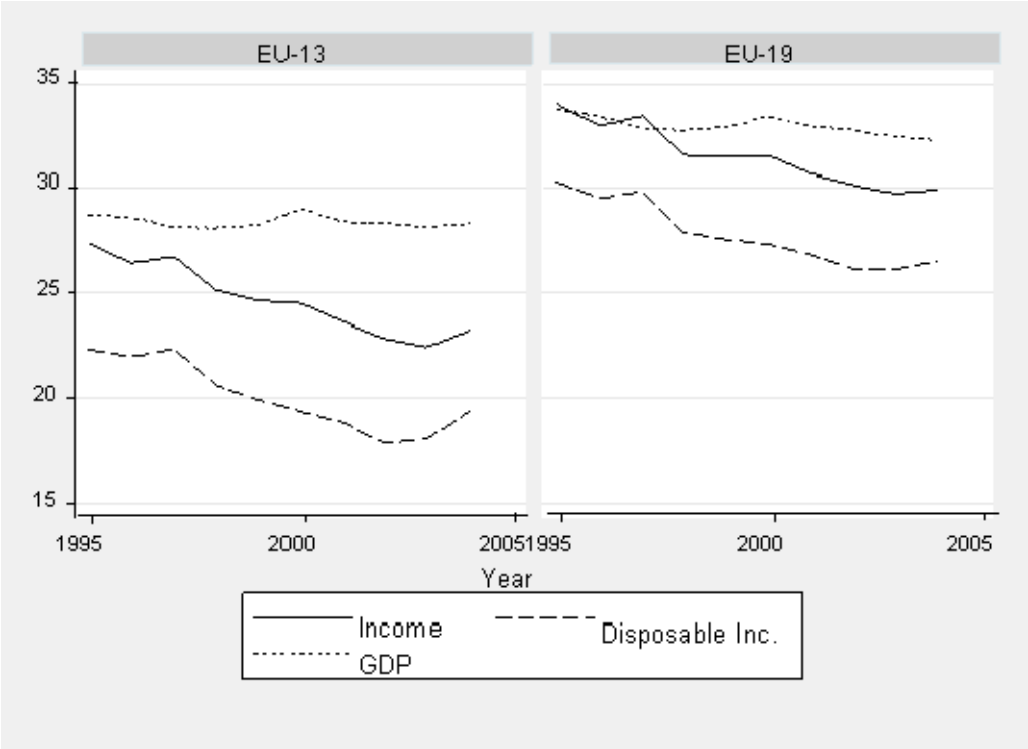
We first look at the dynamics over time of output and income disparities (σ-convergence) across the 230 regions in the 19 countries under study, and separately for the 199 regions in the 13 old EU countries). We calculate and compare the rates of β-convergence for three analytical measures. The indicators are expressed in purchasing power terms per capita, relative to the EU-19 average: regional GDP is expressed in purchasing power standards (PPS), and the income variables are treated accordingly, i.e. recalculated by Eurostat using PPS for private consumption (known as PPCS, *purchasing power consumption standards*). By using PPS relative to the EU-19 average: (1) we capture the differences in the cost of living across countries (but not across regions since conversion to PPS is done by Eurostat on the basis of national purchasing power parities); and (2) cushion against the impact of shocks common to all regions, while avoiding the problem of using arbitrary price deflators.

The difference between the three indicators provides an insight into the importance of labour migration and redistribution policies. In particular, according to the Eurostat methodology, the difference between GDP (output) and primary income of households comes primarily from the flow of commuting workers. This is because the first measure is based on the place-of-work, while the second measure is based on the place-of-residence. Additional differences reflect the balance of primary income (other than labour's) from outside the region, and the fixed capital consumption. Regarding redistribution policies, the difference between household primary income and disposable income reflects the impact of net government transfers on household income. These comprise redistribution mechanisms through social benefits and other transfers, as well as income and wealth taxes and social security contributions. Table A1 of Appendix 2 summarizes these methodological differences.

III.1. Regional income and output dispersion: A look at σ-convergence

Chart 1 presents the dispersion (standard deviation) of relative regional income, disposable income, and GDP per capita over the period 1995-2004.[12] The chart shows the dispersion measures for the pooled 230 regions, while Chart 2 reflects the dispersion measures within each country (and thus does not reflect between-country variation). By using the same scale at country level, Chart 2 also provides a crude comparison of national regional inequalities between the EU countries.

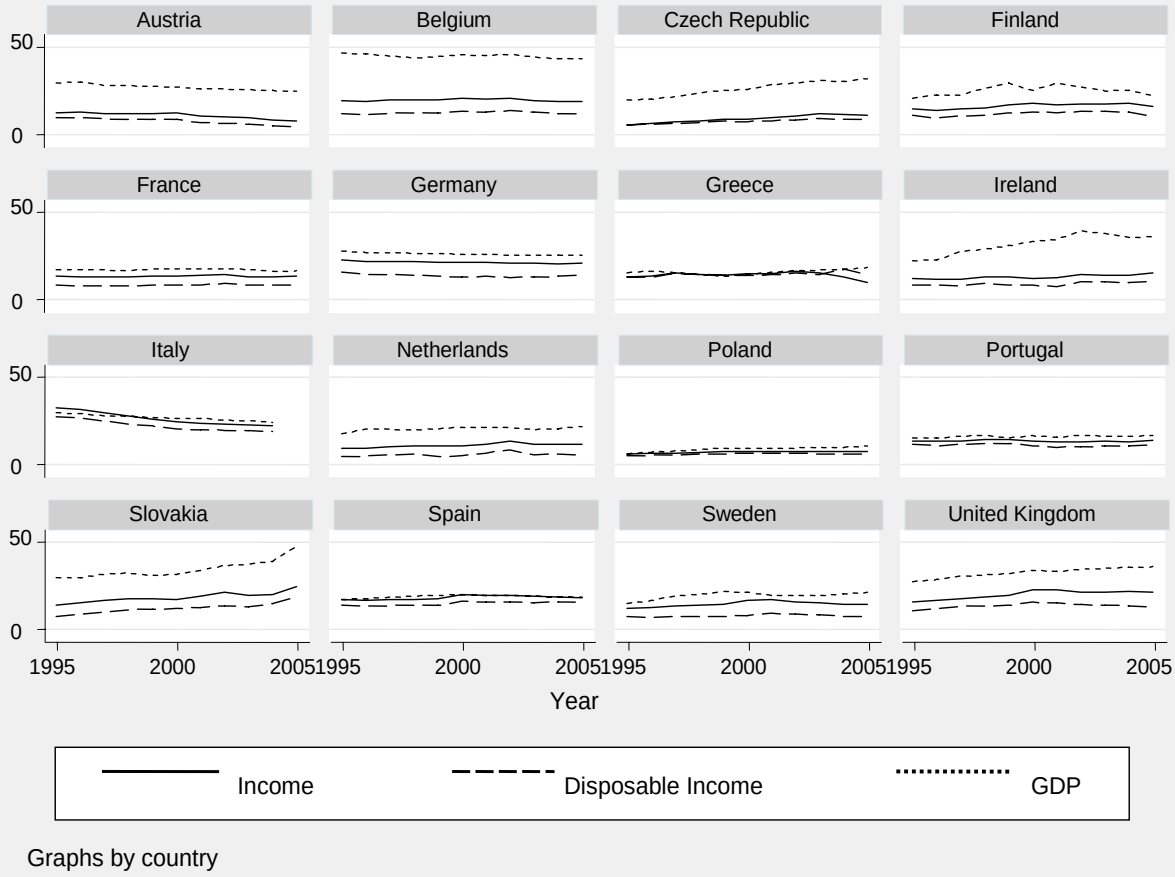
Chart 1: σ-convergence across all regions in EU-13 and EU-19



Note: EU-13 refers to regions in the following "old" EU countries: Austria, Belgium, Germany, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom; EU-19 includes, in addition, regions in the Czech Republic, Estonia, Lithuania, Latvia, Poland and Slovakia.

[12] For regional dispersion within each country, the period 1994-2005 is shown for all countries except Italy, for which 2005 data were not available.

Chart 2: σ-convergence across regions within country



Note: Excludes Lithuania, Latvia and Estonia, each classified as a single NUTS-2 region. Regional data are available for the period 1995-2005 for all countries except Italy (only up to 2004).

Several preliminary conclusions emerge from the examination of these trends:

First, looking at Chart 1 income dispersion across all regions decreased during the 10-year period under study, providing some evidence for σ-convergence. This holds for both the whole sample and for the old EU-13. The evidence is less clear for output dispersion: inequalities among regions in terms of GDP-per capita remained broadly the same in the old EU-13 and declined slightly in the whole sample.

Second, when regional income disparities are examined within each country, Italy is the only country displaying a pronounced declining trend in regional inequality over the observation period. For the other countries, regional income and output dispersion remained either flat (most importantly in Germany) or increased (particularly in the new member states, such as Slovakia and Czech Republic, but also in the United Kingdom and Ireland[13]). In combination with the finding from the pooled observations in Chart 1,

[13] Ireland is divided in only two NUTS2 regions

this implies that the rest of the reduction in the overall regional inequality owes to the reduction of between-country disparities.

Third, the highest regional inequality is observed virtually across the board for relative output per capita, followed by household primary income, while the lowest inequality among regions is recorded for household disposable income. The difference between primary income and disposable reflects the impact of taxes and transfers. In other words, government intervention seems to lead to lower disparities among regions in terms of income ultimately available for households. On the other hand, given that the main difference between GDP per capita and household primary income per capita is explained to a large extent by the flow of commuting workers, labour mobility appears to be particularly important for the process of primary income adjustment.

Finally, as regards the dynamics of inequality, while both income and disposable income disparities follow broadly the same declining trend over time, the reduction in output disparity is much more subdued—a slight decline is observed for the whole EU-19 group of regions, but disparities remain broadly flat for the old EU countries. This may be a first indication that government intervention did not contribute as much to output convergence during the 10-year period under study. On the other hand, the big and growing gap between GDP dispersion and the primary income dispersion (especially for the old EU member states and, within countries, for Belgium, Austria, United Kingdom, Ireland, as well as for Czech Republic and Slovakia) suggests the important role of commuter flows in reducing income disparities across regions, while contributing to output agglomeration (labour flows to richer regions).

III.2. Evidence of absolute β-convergence

Broadly similar conclusions emerge from the analysis of absolute β-convergence. The evidence for output convergence is stronger than found above, which reflects the fact that β-convergence is a necessary but not sufficient condition for σ-convergence.

Regressions of the growth rates on the initial levels for all three indicators—per capita GDP, primary income and disposable income—show a negative, strongly statistically significant β coefficient, for both EU-19 and the old EU-13. The results remain robust independent of the approach. In particular, we use (i) a longer-term approach, i.e. regress the average annual growth rate over the entire period 1995-2005 on the levels in 1990 in a cross-sectional setting, (ii) a shorter term approach with annual panel data (regress annual growth rate $\gamma_{t;\,t+1}$ on levels in the preceding year Y_t) and (iii) a two period-panel with 5-year lags (regress the average annual growth rate $\gamma_{t;t+5}$ on levels Y_t).

Similar to Coulombe and Lee (1995) for Canadian provinces, we find that the speed of convergence across European regions is the highest for disposable income and declines for primary income and even more for output.[14] This provides additional

[14] This result remains robust to the three types of regression time-frames described above, as well as to using the fixed effects estimator in the panel settings. In this latter case, we obtain conditional β-convergence with each region converging to its own steady-state, as described in Islam (1995).

evidence that government transfer policies did contribute to reducing the dispersion in regional disposable income per capita.

Table 1: Beta coefficients in absolute convergence models, European regions, 1995-2005

Variable	EU-19		EU-13	
Cross-sectional				
	Beta	n	beta	n
GDP/cap	-1.5	230	-1.2	199
Income/cap	-1.7	230	-2.3	199
Disposable income/cap	-2.0	230	-2.3	199
Panel (random effects)				
Yearly growth rates (T=9)				
	Beta	nT	beta	nT
GDP/cap	-1.9	2070	-1.5	1791
Income/cap	-2.1	2026	-2.91	1747
Disposable income/cap	-2.6	2026	-2.93	1747
5-year annual average growth rates (T=2)				
	Beta	nT	beta	nT
GDP/cap	-1.9	460	-1.6	398
Income/cap	-2.0	460	-2.7	398
Disposable income/cap	-2.5	460	-2.8	398

IV. The empirical model and results

Building on the outcome of the descriptive analysis above, we proceed with the empirical investigation of the impact of government transfers on output convergence in a multi-equation framework. We base our analysis on Barro and Sala-i-Martin (1990, 1991) in terms of conditional convergence, and Obstfeld and Peri (1998). The latter find that long-lived fiscal transfers with redistributional effects may lead to a postponement of labour mobility adjustments, and thus hamper the ability of regional economies to handle idiosyncratic macroeconomic shocks, and ultimately impede growth in the respective economies.

We posit that the relationship between fiscal transfers to households, labour mobility, and economic growth is described by the following system of three simultaneous equations:[15]

1. Growth rate of relative GDP/cap = f (Initial level of relative GDP/cap; Net fiscal transfers; Labour mobility; controls; constant)
2. Labour mobility = f (Relative GDP/cap; Net fiscal transfers; Unemployment; constant)
3. Net fiscal transfers = f (Relative income/cap; constant)

[15] This is similar to the empirical specification in Kaufman et al. (2003).

We use a simultaneous equation model as our primary methodology to account for both the direct and indirect effects of fiscal transfers on economic growth and output convergence, and to factor in the endogenous nature of fiscal transfers. Net fiscal transfers may impact output convergence indirectly through the impact on labour mobility: by deterring labour mobility, net fiscal transfers could slow down economic adjustment and long-term convergence. A direct effect may result from induced distortions in economic decisions resulting from a higher average fiscal burden and potential crowding out effects.

In equation 1., we assume that the growth rate in relative per capita-output depends directly on (i) the initial level of income: a negative coefficient will indicate convergence in output per capita; (ii) (relative) net fiscal transfers; (iii) labour mobility; and (iv) other controls. For other control variables,[16] we use (i) regional investment as percent of GDP; (ii) the proportion of the labour force working in agriculture as a proxy for the regional economic structure; and (iii) time dummies to capture shocks common to all regions (time dummies are also used in the other two equations).

In equation 2., we model labour mobility to depend on (i) the level of relative output per capita (higher relative output is likely to encourage inward labour migration); (ii) the level of (relative) net fiscal transfers to households; (iii) the (relative) unemployment rate (the higher the unemployment rate in a region, the more labour is expected to flow outside that region).

In equation 3., we control for the endogenous nature of net fiscal transfers. The fiscal redistribution process implies that transfers are granted to poorer regions. Similarly, with progressive taxation, households in these regions also pay relatively lower taxes. We then posit that net transfers depend negatively on the level of relative income per capita (the higher the income of a region relative to the average, the lower the amount of net inward fiscal transfers).

Regarding data availability, harmonized fiscal data by region are not available from the Eurostat. Hence, for the net fiscal transfers variable, we use as a proxy the ratio between per capita disposable income and primary income.[17] This reflects the net impact of transfers received and taxes paid by households in a region, or net inward transfers by region.

To proxy the labour mobility variable, we use the ratio between a region's number of resident employees working outside the region and those working inside.[18] This

[16] The use of other controls is partly determined by the availability of harmonized regional data
Sala-i-Martin, Doppelhofer et al. (2004) investigate the significance of 67 explanatory variables in cross-country models of growth, using a Bayesian approach to construct estimates by averaging OLS coefficients across models. Out of 18 variables found to be significantly related to long-term growth, the strongest evidence was found for three—the relative price of investment, the initial rate of primary school enrolment, and the initial level of real GDP per capita, the last being relevant for β-convergence. We would have preferred to use a proxy for human capital endowment at regional level, e.g. educational attainment, but data is not available.

[17] Such a measure is also suggested in Obstfeld and Peri (1998) as a proxy for fiscal transfers. Another measure we tried and which yielded similar results is *relative transfers* (or the ratio of disposable Income to primary Income relative to the EU-19 average).

[18] Only these variables are available from Eurostat in terms of labour mobility.

gauges net outward labour commuting or short-distance labour mobility. We also use the Population migration variable by region to take into account long distance mobility,[19] but this measure is not restricted to labour flows only.

Table A2 in the second appendix shows the details of data sources and construction, and presents descriptive statistics for the variables used in the empirical analysis.

IV.1. Results with the full sample

Since labour data at NUTS-2 level is available only starting from 1999, we conduct the analysis for the period 1999-2005 (with T=6 years). We find conditional convergence in output per capita across the pooled European regions, as reflected by the negative and highly statistically significant coefficient of the initial level of GDP/capita (Table 2).

Table 2: Direct and indirect impact of net fiscal transfers on output growth and convergence; Simultaneous equation system, pooled time - cross-section data (1999-2005)

	System 1		
Ind. Variables	**Eq. 1 Output growth (1)**	**Eq. 2 Labour mobility (2)**	**Eq. 3 Net transfers (3)**
Relative GDP/cap_t (ln)	-3.976*** (1.187)	-29.363*** (4.705)	
Net transfers_t	-.137** (.059)	-2.002*** (.337)	
Investment/gdp_t	.012 (.024)		
Agriculture share_t	-.247*** (.083)		
Labour mobility_t	-.109** (.020)		
Unemployment_t		-.192 (.1849)	
Relative income/cap_t (ln)			-18.261*** (.707)
Time dummies (#)	Included (5)	Included (5)	Included (5)
Chi-sq (p-value)	80.9 (0.000)	682.6 (.000)	207.1 (.000)
Log-likelihood (LL) model	-7745.1		
Info. criteria:			
AIC	15544.3		
SC	15671.2		
NT	**815**		

As regards the impact of net fiscal transfers on output convergence, first, we find that net transfers have on average a direct negative and significant effect on economic growth. As discussed above, the estimation takes into account the endogenous nature of net fiscal transfers, i.e. the fact that net transfers depend on the level of relative income

[19] And to capture a longer time span (1995-2004) since labour data is available from Eurostat only starting with 1999.

per capita: a negative and highly statistically significant relationship is found in the third equation—the higher the relative income per capita in a region, the lower the amount of net transfers households receive on average.

Turning to the labour mobility equation (eq. 2), while the rate of unemployment is not statistically significant (either measured in absolute terms or relative to the EU-19 average), the level of output per capita is significant and has a negative sign: higher output per capita means that relatively fewer employees leave the region to commute to other regions. This may be evidence for economic agglomeration: richer regions attract more workers and grow further. Moreover, we find that net transfers have a negative, statistically significant impact on outward labour mobility, holding constant the level of output per capita and unemployment: The higher the net fiscal transfers to a region, the fewer of its employed labour force commutes outside the region, i.e. more labour stays in the region. This may imply a positive impact on economic growth (in the first equation, lower outward labour mobility means a higher growth rate as given by the negative, statistically significant coefficient of the labour variable). However, at the same time, by deterring labour mobility, higher net transfers may prevent necessary adjustment in factors and impede the capacity of regional economies to respond to shocks and achieve faster output convergence.

Finally, as regards the impact of the control variables, regions with a high share of income coming from agriculture seem to have grown at a lower rate on average. The share of investment in regional GDP is not found significant in determining economic growth in this specification.[20]

We conducted a number of robustness checks whose results are available upon request. In particular, we address possible autocorrelation in the time dimension, as well as issues regarding the econometric methodology. Furthermore, we expand the sample backwards (albeit at the cost of having to replace the labour mobility variable by population migration). Finally we add country dummies to adjust for possibly different intercepts.

Hence, we first estimated the system using cross-sectional data since annual cross-section time-series data may be subject to serial autocorrelation and idiosyncratic short term fluctuations (the common ones are controlled for by time dummies). For the dependent variable, we used the average annual growth rate over the period 1999-2005, and for the explanatory variables (except the initial level of GDP/cap), we use either six-year averages (1999-2004), or the level at the beginning of the period, i.e. in 1999 to mitigate simultaneity and estimate a lagged impact of these variables on growth. The results are similar with those obtained above: net fiscal transfers turn to be statistically significant and have a direct negative impact on growth while deterring labour mobility.

Second, various methodological robustness checks related to the estimation of a single consolidated growth equation (linking growth rates directly to the initial level of

[20] Unexpectedly, this variable proves to be very volatile across various models that we used. For instance, for the period 1995-2005 in a consolidated equation, investment has a positive significant impact on growth, with a regression in medians, but not with dynamic panel models, panels random effects, or 2SLS when investment is instrumented through its lags. For the period 1999-2005, investment has a positive significant effect with a panel feasible GLS model and 2SLS when instrumented through its previous three lags.

output per capita, net transfers, labour migration, and all our control variables) were implemented as follows:

(i) panel or cross-section: using the random effects estimator (RE); feasible generalised least square (FGLS); instrumental variables (IV) with the variable net Transfers instrumented by all its lags[21]; OLS with cross-section in which the explanatory variables are averaged over the period of the analysis or are lagged at the beginning of the period[22];

(ii) dynamic panel models: using the Arellano-Bond (difference GMM) and Blundell-Bond (system GMM) estimators.

(iii) panel estimation eliminating outliers[23] and pooled regression in medians (simple, or bootstrap simultaneous quintile regressions).

The direct impact of net transfers on growth remains negative and statistically significant across these specifications.

Third, we expanded our data span to the ten year-period for which output and income data was available (1995-2005). Given the limited availability of labour mobility data, we replaced the labour mobility variable with population migration. In this case, while the direct negative impact of transfers on growth remained unchanged, the impact on population migration was the opposite of the one on labour commuting: higher net transfers are associated with more outward population migration. One explanation may be that for the broader population, the level of wealth in a region is the definitive factor and this has an impact also on the perception of fiscal transfers (higher transfers are associated with poorer regions).

Finally, we included country dummies in the base line regression as well as the one with the extended sample period. Inclusion of country dummies requires constraining the model to "within-country convergence." In this specification, the significant impact of both net transfers and the initial level of GDP/capita on growth disappeared in the 1999-2005 model, but the results remained similar in the 1995-2005 model. The inclusion of country dummies did not affect the significance of regressors in the labour mobility equation.

---

[21] This was the specification for which the Hansen J statistic test (equivalent of Sargan test under heteroskedasticity) did not reject the null of valid overidentifying restrictions, i.e. that the excluded instruments are not correlated with the error term and are correctly excluded. Using fewer lags did not change the sign or the significance of net transfers (the size of the impact is reduced, as expected), but the Sargan/Hansen J test rejected the null.

[22] Under the simple OLS-estimated cross-section regressions, the net transfers variable loses significance. Yet, it becomes again significant and negatively associated with growth when the period is extended to ten years (1995 – 2005), and labour mobility is replaced by population migration.

[23] We found several extreme outliers in our dependent variable, that is, the relative output growth rate for the Greek regions in the year 2000 (associated with hosting the Olympic Games). It is interesting to note that while Athens recorded the highest annual growth rate of per capita output (relative to the average) of the whole sample, 20.5%, other Greek regions faced the largest declines in the same year: Voreio Aigaio -25.7%; Dytiki Makedonia -21.5%; Sterea Ellada -20.7%; Kentriki Makedonia -15.7%; Thessalia -14.1%). When we eliminate these regions from our dataset, the results remain robust: fiscal transfers continue to have a negative impact on growth in all our specifications.

IV.2. Results with the split sample

While these results show the average impact of net transfers on growth, the approach so far does not distinguish between regions that pay in and regions that receive transfers. Our net transfer variable (i.e. the ratio between disposable and primary per capita income) ranges from 65.6%[24] to 109.9%. In other words, the households in the richest regions pay up to one third of their income as net transfers while households in the poorest regions receive transfers of up to 10% of their primary income. For a list of the largest payers and receivers and their relative GDP per capita, see Tables A3.1. and A3.2. in Appendix 2. Chart A3.3. shows the inverse relationship between average relative output and average transfers over the 10 year period of our analysis.

To distinguish between the two groups, we split the sample into two (see Chart A3.4. in Appendix 2). A search over a range of threshold values for net transfers points to a level of 84% as the dividing line between the harmful effect of taxation and that of receiving transfers.

The regression results are reported in Table 3. In particular, for regions whose disposable income is below 84% of primary income (call the group "heavily taxed regions"), we find a positive impact of the variable net transfers on output growth, i.e., higher taxes have a negative impact on growth. Conversely, for regions whose disposable income is above 84% (call the group "receiving regions and marginal payers"), we find a negative impact of net transfers on output growth, which means that increasing fiscal transfers (or reducing taxes from an already low level) would also have a detrimental impact on growth. This suggests that the growth-impeding impact of distortive taxation is identified only above a minimum level, whereas the impact of transfers can be established at all levels.

[24] If we eliminate the Greek region *Ionia Nisia*, whose value for the variable *transfers* is 59% only in 2004, compared to 86% - 93% for all other years.

Table 3: Direct and indirect impact of net fiscal transfers on output convergence (1999 – 2005): Splitting the sample based on the net transfer threshold found at 84%

	System 1 Net transfers < 84			**System 2 Net transfers > 84**		
Ind. Variables	**Eq. 1 Output growth (1)**	**Eq. 2 Labour mobility (2)**	**Eq. 3 Net transfers (3)**	**Eq. 1 Output growth (1)**	**Eq. 2 Labour mobility (2)**	**Eq. 3 Net transfers (3)**
GDP/cap_t	1.104 (1.817)	-47.084*** (5.888)		-7.20*** (1.564)	-6.197 (4.771)	
Net transfers_t	.431** (.193)	-7.052*** (.964)		-387*** (.131)	.039 (.619)	
Investment/gdp_t	.101* (.056)			-.037 (.030)		
Agriculture share_t	-.198 (.414)			-.240*** (.088)		
Labour mobility_t	-.016 (.026)			-.181*** (.043)		
Unemployment_t		1.892*** (.573)			-.817*** (.147)	
Relative income/cap_t			-8.153*** (.359)			-10.638*** (.530)
Time dummies (#)	Included (5)	Included (5)	Included (5)	Included (5)	Included (5)	Included (5)
Chi-sq (p-value)	52.3 (.000)	95.9 (.000)	48.7 (.000)	78.8 (.000)	179.8 (.000)	419.7 (.000)
Log-likelihood (LL) model	-1744.5			-5428.7		
Info. criteria:						
AIC	3543.0			10911.4		
SC	3631.0			11031.1		
NT	**192**			**622**		

Although the "heavily taxed regions" sample is much smaller, it seems that the model has a better fit with this sample, as given by the log-likelihood and information criteria statistics. In addition, it appears that the net transfers variable has a significant impact on labour mobility only in this sample.

Regarding robustness of the estimates, similar results in terms of the impact of net transfers on output growth are obtained with the 1995-2005 dataset even when we include country dummies (see Table 4 below). In this case, the net transfers variable seems to be associated with higher outward population migration in both samples.

Another interesting point that emerges from both Table 3 and Table 4 is that the (negative) direct impact of net transfers on growth is larger in the sample of richer regions than in the sample of relatively poorer regions (as given by the coefficient of the variable net transfers$_t$ in the first equation of the system). In addition, the average relative growth rate for the former sample is -0.21% p.a. during 1995-2005, while for the latter it stands at 0.16% (a significant difference as given by a one-sided t-test). Hence, it seems that while fiscal transfers impede output growth in both samples, they have a stronger growth-reducing effect on richer regions. This could lead to an "immiserising convergence" where convergence occurs thanks to the slow growth of the richer regions rather than by virtue of the faster growth in the poorer regions.

Table 4: Direct and indirect impact of net fiscal transfers on output convergence (1995 – 2005): Splitting the sample based on the net transfer threshold found at 84%; country dummies included

	System 1 Net transfers < 84			System 2 Net transfers > 84		
Ind. Variables	**Eq. 1 Output growth (1)**	**Eq. 2 Population migration (2)**	**Eq. 3 Net transfers (3)**	**Eq. 1 Output growth (1)**	**Eq. 2 Population migration (2)**	**Eq. 3 Net transfers (3)**
GDP/cap_t	-9.987*** (1.695)	.245* (.139)		-.879 (1.118)	-.124 (.156)	
Net transfers_t	1.816*** (.562)	.108*** (.011)		-.222** (.107)	.052*** (.009)	
Investment/gdp_t	-5.085*** (1.086)			-.002 (.017)		
Population migration_t	-67.41*** (16.056)			4.075** (1.854)		
Relative income/cap_t			-18.967*** (1.061)			-18.944*** (.544)
Agriculture share_t		-.410*** (.055)			-.036*** (.010)	
Time dummies (#)	Included (9)	Included (9)	Included (9)	Included (9)	Included (9)	Included (9)
Country dummies (#)	Included (12)	Included (12)	Included (12)	Included (16)	Included (16)	Included (16)
Chi-sq (p-value)	159.22 (.000)	331.8 (.000)	41e+04 (.000)	204.5 (.000)	705.0 (.000)	1.02e+06 (.000)
Log-likelihood (LL) model	-2666.4			-6320.8		
Info. criteria:						
AIC	5474.9			12813.7		
SC	5754.9			13245.5		
NT	**381**			**1191**		

IV.3. Accounting for EU Structural and Cohesion funds

Our model also allows assessing the impact of EU transfers, which have the explicit objective of accelerating convergence, on regional growth differentials. Additional fiscal related-variables for the European regions were obtained from the ESPON database, a research initiative supported by the European Commission.[25]

ESPON includes data on structural and cohesion funds (SCF) spent at the NUTS-2 regional level, according to the objectives of the structural and cohesion funds, mainly: (i) Structural Fund (SF) expenditure related to Regional Development and Productive Infrastructure (*SF_reg.dev*); (ii) SF expenditure related to Social Integration and Human Resources (*SF_social*), (iii) SF Fund expenditure related to Agriculture, Rural Development and Fishery (*SF_agric*); (iv) Cohesion Fund (CF) expenditure related to transportation, and (v) CF expenditure related to environment.

[25] ESPON stands for European Spatial Planning Observation Network. The database is available at www.espon.eu

ESPON data are cumulative for the period 1994-1999,[26] expressed in euro terms and refer (to the extent possible) to the amounts actually spent out of the programmed amounts.[27] Given that the structural and cohesion funds were available for the respective period only for the old EU member states, our analysis will be restricted to EU-13 (cross-section). The amounts under PHARE[28] programs granted for then-accession countries are also available, but they are comparatively too small to be meaningful for our analysis. To obtain annual amounts, we assume an even distribution over the six years. We then calculated two alternative measures: (i) in terms of GDP; (ii) in terms of population and relative to the EU-13 SCF expenditure per capita (see Table A4.1. of the Appendix 2 for more details and descriptive statistics).

Table A4.2. in the Appendix 2 ranks the first thirty regions in terms of their total yearly SCF expenditure (as percent of GDP), and shows the level of the regions' output per capita relative to the EU-19 average in 1995 and 2004. A quick inspection of this data indicates that receiving regions in Portugal and Spain seem to have performed well during the 10 year period, while most regions in Greece (with the notable exemption of Athens) and Italy have regressed in the output ranking.

We include the structural and cohesion fund expenditure in our main empirical model by considering the impact of the amounts spent during 1994-1999 on the growth rate for the period 1999-2005 (the other explanatory variables are averages over the period 1999-2004). The results from the simultaneous equation system are shown in Table 5 below. To facilitate the comparison, we first re-estimate our baseline system for the restricted sample of the "old" EU-13 countries without incorporating SCF. System 2 then includes the total expenditure under SCF in the growth equation and the structural fund expenditure dedicated to social and human resource objectives in the labour mobility equation. Moreover, we introduce a further equation linking the receipt of structural and cohesion funds to per capita output:

1. $Growth\ rate\ of\ relative\ GDP/cap_{1999\text{-}2004} = f\ (Relative\ GDP/cap_{1999};\ Net\ fiscal\ transfers_{1999\text{-}2004};\ Labour\ mobility_{1999\text{-}2004};\ SCF\_total_{1994\text{-}1999};\ controls_{1999\text{-}2004};\ constant)$
2. $Labour\ mobility_{1999\text{-}2004} = f\ (Relative\ GDPcap_{1999};\ Net\ fiscal\ transfers_{1999\text{-}2004};\ Unemployment_{1999\text{-}2004};\ SF\_social_{1994\text{-}1999};\ constant)$
3. $Net\ fiscal\ transfers_{1999\text{-}2004} = f\ (Relative\ income/cap_{1999};\ constant)$
4. $SCF\_total_{1999\text{-}2004} = f\ (Relative\ GDP/cap_{1999};\ constant)$

[26] Data correspond to the second European Commission programming period. Historical data for the first programming period (1989-1993) and the third period (2000-2006) are not (yet) available from ESPON.
[27] Where amounts spent are not available, programmed amounts are used instead.
[28] The PHARE programme is an EU pre-accession instrument whose objective is to assist applicant countries of Central and Eastern Europe in their preparation for joining the EU.

Table 5: Direct and indirect impact of net fiscal transfers and EU structural and cohesion funds on output convergence: NUTS-2 regions in EU-13, 1999-2005.

	System 1 (No SF var)			System 2 (with SF var)			
Ind. Variables	**Eq. 1 Output growth (1)**	**Eq. 2 Labour mobility (2)**	**Eq. 3 Net transfers (3)**	**Eq. 1 Output growth (1)**	**Eq. 2 Labour mobility (2)**	**Eq. 3 Net transfers (3)**	**Eq. 4 Structural & cohesion funds (4)**
GDP/cap_1999 (ln)	-40.64*** (11.201)	-28.00*** (7.165)		-95.53*** (32.089)	-28.85*** (7.125)		-66.84*** (8.129)
Net transfers_avg	-1.587*** (.422)	-1.361*** (.299)		-4.163*** (1.369)	-1.425*** (.297)		
Investment/gdp_avg	-.695*** (.238)			-2.611** (1.102)			
Agriculture share_avg	-.443** (.190)			.094 (.441)			
Labour mobility_avg	-.267*** (.029)			-1.763*** (.495)			
Unemployment_avg		-.428* (.242)			-.235 (.242)		
Relative income/cap (ln)			-25.84*** (1.840)			-25.54*** (1.851)	
SCF_total				.232** (.113)			
SF_social					-.009 (.047)		
Chi-sq (p-value)	79.8 (0.000)	197.2 (.000)	43.2 (.000)	80.8 (0.000)	195.5 (.000)	40.6 (.000)	67.6 (.000)
Log-likelihood (LL) model	-1700.1			-2668.5			
Info. criteria							
AIC	3424.3			5369.1			
SC	3462.2			5419.7			
N	**174**			**174**			

The conclusions from the results of System 1 remain broadly the same as for the estimation of the baseline model: net transfers continue to have a negative impact on growth and outward labour mobility among regions of EU-13 only. The difference is that when we exclude the regions in the new EU member states, the negative impact of net transfers on growth is larger than before (-1.587 compared to -.559 when all regions were included).

The variable net transfers ultimately reflects also the impact of those EU transfers reaching households in the targeted regions. When we control in System 2 for both transfer variables (net transfers and SCF_total) the coefficient of the former in the output growth equation reflects the net impact of the two variables. Hence, based on this model, the impact of net transfers to households excluding EU funds is found even more harmful to growth than before (as given by a higher negative coefficient for the variable net transfers in System 2 compared to System 1).

Regarding the impact of EU transfers, we find some evidence that the overall spending under structural and cohesion funds have a positive impact on regional output growth (but there is no significant impact on labour mobility). We also used the disaggregated components of the structural fund expenditure (since the cohesion funds

expenditure are smaller and granted to only fewer regions, we do not this category as a separate variable). The correlation between the three SF components is moderate reflecting the different economic objectives targeted (the highest correlation coefficient of .56 is between *SF_reg.dev* and *SF_social*). We can therefore include all the three disaggregated components without being confronted with problems of multicollinerity. With the separate categories included, it is somewhat surprising to find that the positive impact on growth comes from structural funds dedicated to the objective of social and human resource development, while the two other components turn to be insignificant in explaining growth (in some specifications, SF expenditure for agriculture is significantly associated with future negative growth).

However, when country dummies are included, the significance of the impact of EU funds - either cumulative or the disaggregated components - on growth disappears. National aspects are relevant in this case in terms of institutional issues, efficiency of spending the EU funds, and amounts available for co-financing,[29] but not how these funds are conceived and allocated. Overall, the lack of significance with country dummies remains problematic for a robust interpretation of the impact of EU funds on growth. Yet, as in the case of fiscal transfers, this result does not exclude the possibility of more robust results over a longer period of time.

V. Conclusions and areas of future research

The following conclusions emerge from the analysis.

First, we find that disposable income of households across European regions in EU-19 converged during the period 1995-2005 at a higher speed than primary income, with the lowest speed obtained for output per capita.

Second, while net fiscal transfers contribute to reducing disparities in income available to households at the regional level and thus achieve their intended distributional goal, they also impede output growth: there is a negative impact of net transfers on growth in receiving regions and small contributors, and a negative impact, as well, of net taxes on growth in paying regions (the big contributors). This may point to an "immiserising convergence" with output growth rates in receiving poor regions declining by less than in paying rich regions in reaction to the tax-transfer scheme. The fact that fiscal transfers contribute to reducing regional disparities in disposable income, but they are not similarly successful in reducing disparities in output per capita poses the question of a trade-off between distributional policies and policies targeted to growth and economic convergence. This trade-off is particularly important from a policy perspective.

Third, there is some evidence that fiscal transfers impede labour commuting, even when we control for national differences with country dummy variables. While this seems to be beneficial for economic growth (higher outward labour implies lower per-capita GDP growth), it is likely to impede factor adjustment. Our conclusions regarding (short-distance) labour mobility have to be regarded with caution given that there are other factors likely to have a significant impact on labour commuting (such as the real

[29] Unfortunately, such data are not available from ESPON.

estate price differentials) that we are not able to control for. These factors tend to matter most for relatively poor regions neighbouring very rich regions, and less for clusters of regions at similar levels of economic activity.

Fourth, EU structural and cohesion funds spent during 1994-1999 are found to have had a slight positive impact on economic growth, mainly through the human development component, but the results do not seem to be robust when country dummies are included.

Finally, while EU regions seem to converge as a pool, there is no strong evidence for within-country convergence. In fact, the evidence disappears in most specifications when we include country dummies.

Further research is needed to bolster these conclusions:

As regards the within-country convergence, it would be useful to analyse the disaggregated impact of fiscal policy, including by looking at country-specific regional convergence (e.g. in Germany, Spain, Italy, etc.) and thus taking into account a broader range of fiscal instruments.

Accounting for spatial dependency with spatial econometric models (Spatial Lag or Spatial Error Models) could also be valuable since location and regional spill-over effects are likely to play an important role in economic convergence.

Last, but certainly not least, investigating more thoroughly the role of labour migration in the process of regional output convergence would be essential, especially given our inconclusive results with respect to labour versus population migration.

References

Barro, Robert J. 1990. "Government Spending in a Simple Model of Endogeneous Growth." *The Journal of Political Economy* 98 (5):S103-S25.

———. 1999. "Inequality, growth and investment." *NBER Working paper* no. 7038.

Barro, Robert J., and Xavier Sala-i-Martin. 1990. "Economic Growth and Convergence across the United States." *NBER Working Paper No. 3419*.

———.1991. "Convergence Across States and Regions." *Brookings Papers on Economic Activity* 1991 (1):107-82.

———.1992a. "Convergence." *The Journal of Political Economy* 100 (2):223-51.

———.1992b. "Public Finance in Models of Economic Growth." *The Review of Economic Studies* 59 (4):645-61.

Beugesdijk, M., and S. Eijffinger. 2003. "The effectiveness of structural policy in the European Union: An empirical Analysis for the EU 15 during the period 1995-2001." In *Accounting, Auditing & Accountability Journal*. Tilburg: Tilburg University Center.

Bhagwati, Jagdish N. 1958. "Immiserizing growth: a geometrical note." *Review of Economic Studies* 25:201-5. Reprinted in International Trade: Selected Readings, ed. J. Bhagwati, Cambridge, MA: MIT Press, 1981.

———. 2008. "Immiserizing growth." In *The New Palgrave Dictionary of Economics*, ed. S. N. Durlauf and L. E. Blume: Palgrave Macmillan, 2008. The New Palgrave Dictionary of Economics Online, Second edition.

Boldrin, Michele, and Fabio Canova. 2001. "Europe's Regions: Income Disparities and Regional Policies " *Economic Policy* 16 (32):207-53.

Bouvet, Florence. 2007. Dynamics of regional income inequality in Europe and impact of EU regional policy and EMU. Paper read at the 4th DG ECFIN Annual Research Conference "Growth and income distribution in an integrated Europe: Does EMU make a difference", Brussels.

Cappelen, A., F. Castellacci, J. Fagerberg, and B. Verspagen. 2001. The impact of regional support on growth and convergence in the European Union. Paper read at European Meeting on Applied and Evolutionary Economics, Vienna.

Coulombe, Serge, and Frank C. Lee. 1995. "Convergence across Canadian Provinces, 1961 to 1991." *The Canadian Journal of Economics* 28 (4a):886-98.

European Commission. 2001. "Second report on economic and social cohesion." at http://ec.europa.eu/regional_policy/sources/docoffic/official/repor_en.htm.

Fischer, Manfred M., and Peter Stumpner. 2007. Income Distribution Dynamics and Cross-Region Convergence in Europe; Spatial filtering and novel stochastic kernel representations. Paper read at The 54th Annual North American Meetings of the Regional Science Association International, Savannah, GA, U.S.A.

Furceri, Davide. 2005. "β and σ-convergence: A mathematical relation of causality." *Economic Letters* 89:212-5.

Islam, Nazrul. 1995. "Growth Empirics: A Panel Data Approach." *Quarterly Journal of Economics* 110 (4):1127-70.

Johnson, Paul A. 2000. "A nonparametric analysis of income convergence across the US states." *Economics Letters* 69 (2):219-23.

Kaufman, M., P. Swagel, and S. Dunaway. 2003. "Regional Convergence and the Role of Federal Transfers in Canada." *IMF Working Papers* WP/03/97.

Martin, Reiner. 1999. *The Regional Dimension in European Public Policy: Convergence or Divergence?* London: Macmillan Press Ltd.

Nordregio. 2005. "ESPON Report 2.2.1 "The Territorial Effects of the Structural Funds"." at www.espon.eu.

Quah, Danny. 1996b. "Empirics for economic growth and convergence." *European Economic Review* 40 (6):1353-75.

Rebelo, Sergio. 1991. "Long-Run Policy Analysis and Long-Run Growth." *The Journal of Political Economy* 99 (3):500-21.

Rey, Sergio J, and Brett D Montouri. 1999. "US regional income convergence: A spatial econometric perspective." *Regional Studies* 33 (2).

Sala-i-Martin, Xavier, Gernot Doppelhofer, and Ronald I. Miller. 2004. "Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach." *The American Economic Review* 94 (4):813-35.

Sala-i-Martin, Xavier X. 1996. "The Classical Approach to Convergence Analysis." *The Economic Journal* 106 (437):1019-36.

Shioji, Etsuro. 2001. "Public Capital and Economic Growth: A Convergence Approach." *Journal of Economic Growth* 6:205-27.

Tondl, Gabriele. 2004. "EU Regional Policy. Experiences and Future Concerns." In *Europainstitut Working Paper Nr. 59*. Vienna.

Appendix 1: List of NUTS 2 regions included in the analysis

Austria

Burgenland (A), Niederösterreich, Wien, Kärnten, Steiermark, Oberösterreich, Salzburg, Tirol, Vorarlberg

Belgium

Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest, Prov. Antwerpen, Prov. Limburg (B), Prov. Oost-Vlaanderen, Prov. Vlaams Brabant, Prov. West-Vlaanderen, Prov. Brabant Wallon, Prov. Hainaut, Prov. Liège, Prov. Luxembourg (B), Prov. Namur

Czech Republic

Praha, Střední Cechy, Jihozápad, Severozápad, Severovýchod, Jihovýchod, Střední Morava, Moravskoslezsko

Germany

Stuttgart, Karlsruhe, Freiburg, Tübingen, Oberbayern, Niederbayern, Oberpfalz, Oberfranken, Mittelfranken, Unterfranken, Schwaben, Berlin , Brandenburg - Nordost, Brandenburg - Südwest, Bremen, Hamburg, Darmstadt, Gießen, Kassel, Mecklenburg-Vorpommern, Braunschweig, Hannover, Lüneburg, Weser-Ems, Düsseldorf, Köln, Münster, Detmold, Arnsberg, Koblenz, Trier, Rheinhessen-Pfalz, Saarland, Chemnitz, Dresden, Leipzig, Sachsen-Anhalt, Schleswig-Holstein, Thüringen

Estonia

Estonia

Spain

Galicia, Principado de Asturias, Cantabria, Pais Vasco, Comunidad Foral de Navarra, La Rioja, Aragón, Comunidad de Madrid, Castilla y León, Castilla-la Mancha, Extremadura, Cataluña, Comunidad Valenciana, Illes Balears, Andalucia, Región de Murcia, Canarias (ES)

Finland

Itä-Suomi, Etelä-Suomi, Länsi-Suomi, Pohjois-Suomi, Åland

France

Île de France, Champagne-Ardenne, Picardie, Haute-Normandie, Centre, Basse-Normandie, Bourgogne, Nord - Pas-de-Calais, Lorraine, Alsace, Franche-Comté, Pays de la Loire, Bretagne, Poitou-Charentes, Aquitaine, Midi-Pyrénées, Limousin, Rhône-Alpes, Auvergne, Languedoc-Roussillon, Provence-Alpes-Côte d'Azur, Corse

Greece

Anatoliki Makedonia Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Attiki, Voreio Aigaio, Notio Aigaio, Kriti

Ireland

Border Midlands and Western, Southern and Eastern

Italy

Piemonte, Valle d'Aosta/Vallée d'Aoste, Liguria, Lombardia, Veneto, Friuli-Venezia Giulia, Emilia-Romagna, Toscana, Umbria, Marche, Lazio, Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna

Lithuania

Lithuania

Latvia

Latvia

Netherlands

Groningen, Friesland (NL), Drenthe, Overijssel, Gelderland, Flevoland, Utrecht , Noord-Holland, Zuid-Holland, Zeeland, Noord-Brabant, Limburg (NL)

Poland

Lódzkie, Mazowieckie, Malopolskie, Slaskie, Lubelskie, Podkarpackie, Swietokrzyskie, Podlaskie, Wielkopolskie, Zachodniopomorskie, Lubuskie, Dolnoslaskie, Opolskie, Kujawsko-Pomorskie, Warminsko-Mazurskie, Pomorskie

Portugal

Norte, Algarve, Centro (PT), Lisboa, Alentejo, Região Autónoma dos Açores (PT), Região Autónoma da Madeira (PT)

Sweden

Stockholm, Östra Mellansverige, Småland med öarna, Sydsverige, Västsverige, Norra Mellansverige, Mellersta Norrland, Övre Norrland

Slovakia

Bratislavský kraj, Západné Slovensko, Stredné Slovensko, Východné Slovensko

United Kingdom

Tees Valley and Durham, Northumberland Tyne and Wear, Cumbria, Cheshire, Greater Manchester, Lancashire, Merseyside, East Yorkshire and Northern Lincolnshire, North Yorkshire, South Yorkshire, West Yorkshire, Derbyshire and Nottinghamshire, Leicestershire Rutland and Northants, Lincolnshire, Herefordshire Worcestershire and Warks, Shropshire and Staffordshire, West Midlands, East Anglia, Bedfordshire Hertfordshire, Essex, Inner London, Outer London, Berkshire Bucks and Oxfordshire, Surrey East and West Sussex, Hampshire and Isle of Wight, Kent, Gloucestershire Wiltshire and Bristol/Bath area, Dorset and Somerset, Cornwall and Isles of Scilly, Devon West Wales and The Valleys, East Wales, Eastern Scotland, South Western Scotland, Northern Ireland

Appendix 2: Methodology and Data Description

Table A1: Eurostat methodology for output and income indicators

Variable name	Description	Comments	Source
Regional GDP	GDP at regional level is calculated using the output approach = the total value of goods and services produced in a region with labour employed in that region. The figure is place-of-production or "place-of work" based.	National GDP data are compiled by the national statistics offices in accordance with ESA 95. National figures are then distributed across the regions on the basis of regional contributions to the gross value added.	Eurostat Note (General and Regional Statistics) 104/2007
Household balance of primary income	Income of private households generated directly from market transactions: • income from the sale of labour as a factor of production; • property income – interest, dividends, rents; • income from operating surplus and self-employment minus • interest and rent payable = balance of primary income The figure is "place-of-residence" based.	Data at regional level (NUTS-2) are calculated according to ESA95 by the Member States and reported to Eurostat The figure is "place-of-residence" based. Primary income is used as a basis for calculating disposable income (or the secondary distribution of income).	Eurostat Note (General and Regional Statistics) 8/2008
Household balance of disposable income	Income of private households, after government redistribution policies. = Balance of primary income plus • social benefits and transfers other than in kind (resources) minus • current taxes on income, wealth, etc • social contributions; • other current transfers paid The figure is "place-of-residence" based.	Data at regional level (NUTS-2) are calculated according to ESA95 by the Member States and reported to Eurostat	Eurostat Note (General and Regional Statistics) 8/2008

Note: An alternative (experimental) calculation of the path from GDP to household disposable income following the national accounts approach is the following (see Eurostat Theme 1 Note 06/2003):

GDP at market prices
+ Balance of primary income from the rest of the world
- Fixed capital consumption

= *Net national income at market prices*
- Balance of current transfers

= ***Disposable income of all sectors*** (100%)
- Disposable income of financial/non-financial corporations and private non-profit organizations (average 4%)
- Disposable income of the State (general government) (average 25%)

= Disposable income of private households (average 71%)

Disposable income of households is by far the largest component of total disposable income (for the EU-15 average, it amounted to 71% in 2000).

Table A2: Data description, Eurostat, Regional Statistics

Variable name	Description	Source	Descriptive Statistics (year 2004)
Relative income per capita (rel_Y)	Balance of primary income of households at NUTS2 level, in purchasing power standard based on final consumption per inhabitant, relative to the EU-19 average (the EU-19 average is calculated as the sum of country income over the sum of population for the 19 countries in the sample; The same calculation applies to the other relative categories).	Authors' calculations based on data from Eurostat (Regional Statistics) (category reg_ehh2inc; indicator b6n_u; currency ppcs_hab)	N= 230 Mean = 96.6 Median = 101.4 St.dev. = 29.9 Range = [30.4; 182.5]
Relative disposable income per capita (rel_DY)	Disposable income of households at NUTS 2 level, in purchasing power standard based on final consumption per inhabitant, relative to the EU-19 average	Authors' calculations based on data from Eurostat (Regional Statistics) (category reg_ehh2inc; indicator b5n_u; currency ppcs_hab)	N = 230 Mean = 97.2 Median = 103.1 St.dev. = 26.5 Range = [36.8; 158]
Relative GDP per capita (rel_gdp)	Gross domestic product (GDP) at current market prices at NUTS2 level, in Purchasing Power Standards per inhabitant, relative to the EU-19 average	Authors' calculations based on data from Eurostat (Regional Statistics) (category reg_e2gdp; currency ppcs_hab)	N = 250 Mean = 96.5 Median = 96.0 St.dev. = 32.2 Range = [33.5; 288.3]
Growth rate of relative per-capita output (avgGDPrate)	Average annual growth rate of relative per-capita GDP at NUTS-2 regional level calculated as: $\ln(rel\_gdp)_{t+1} - \ln(rel\_gdp)_{t}$ (%)	Authors' calculations based on data from Eurostat (DG Regio)	N = 230 Mean = .04 Median = .11 St.dev. = 2.67 Range = [-7.6; 13.6]
Net transfers	Proxy for fiscal policy (cumulative impact of transfers to households and tax policy) calculated as the ratio between disposable income and primary income at NUTS-2 regional level $Transfers_{t} = DY_{t} / Y_{t}$ (%) A similar measure constructed in	Authors' calculations based on data from Eurostat (DG Regio)	N = 230 (Statistics in parentheses without the Greek region Ionia Nisia) Mean = 90.16 (90.3) Median = 90.12 (90.12)

Variable name	Description	Source	Descriptive Statistics (year 2004)
	terms of relative incomes, Transfers_rel $_t$ = rel_DY $_t$ / rel_Y $_t$ (%)		St.dev. = 8.3 (8.0) Range = [59.4; 109] ([69.6; 109])
Labour mobility	Proxy for (short distance) outward labour mobility or labour commuting calculated as the ratio of a NUTS-2 region's residents working outside the region and those working inside the region (%)	Authors' calculations based on data from Eurostat (DG Regio): category: reg_lfe2ecomm Employment and commuting among NUTS level 2 regions in thousands persons by wkplace: - oth_reg: *Working in another region* - same_reg: *Working in the same region*	N = 217 Mean = 10.12 Median = 6.14 St.dev. = 13.05 Range = [0; 93.5]
Population migration	Population outward migration by NUTS-2 region (normalized to average population) calculated as: = - [Change in population as of Jan.1st (yearly) – natural population increase]/annual avg. population (%)	Authors' calculations based on data from Eurostat (DG Regio): categories: - reg_d2jan - *Population at 1st January;* - reg_d3natmo - *Live births; Deaths* - reg_d3avg - *Annual average population*	N= 195 Mean = -.36 Median = -.22 St.dev. = .56 Range = [-2.4; .6]
Unemployment	Unemployment rate by region at NUTS 2 level	Eurostat (DG Regio) (category: reg_lfu3rt, age: y15_max)	N = 226 Mean = 9.09 Median = 7.8 St.dev. = 5.07 Range: [2.4; 24.9]
Agriculture share	Share of agriculture (and related NACE branches) in total employees' compensation (%) at NUTS-2 regional level	Authors' calculations based on data from Eurostat (DG Regio): Category: reg_e2rem Compensation of employees at NUTS level 2 - NACE total: *All NACE branches*; - NACE a_b *Agriculture, hunting, forestry and fishing*	N = 230 Mean = 1.71 Median = 1.11 St.dev. = 1.84 Range = [.003; 12.7]

Table A3.1. The thirty largest payers and their relative output per capita (10-year averages for the period 1995-2004)

Code	Region	Country	Transfers (%)	Relative GDP/cap (%)
se11	Stockholm	Sweden	70.74	160.02
nl31	Utrecht	Netherlands	71.23	151.80
nl23	Flevoland	Netherlands	72.27	90.25
nl32	Noord-Holland	Netherlands	73.76	143.76
nl33	Zuid-Holland	Netherlands	74.02	127.02
be24	Prov. Vlaams Brabant	Belgium	74.31	120.09
nl41	Noord-Brabant	Netherlands	74.79	122.02
be31	Prov. Brabant Wallon	Belgium	75.26	106.89
nl22	Gelderland	Netherlands	75.86	106.05
sk01	Bratislavský kraj	Slovakia	76.62	107.88
fr10	Île de France	France	76.68	168.16
be23	Prov. Oost-Vlaanderen	Belgium	77.31	103.54
fi18	Etelä-Suomi	Finland	77.46	125.25
de21	Oberbayern	Germany	77.48	162.26
be21	Prov. Antwerpen	Belgium	77.53	137.97
de71	Darmstadt	Germany	77.71	157.94
se23	Västsverige	Sweden	77.92	112.62
nl21	Overijssel	Netherlands	77.95	105.66
nl34	Zeeland	Netherlands	78.28	110.30
se21	Småland med öarna	Sweden	79.01	106.17
se12	Östra Mellansverige	Sweden	79.24	101.71
be22	Prov. Limburg (B)	Belgium	79.34	99.16
nl13	Drenthe	Netherlands	79.64	98.93
be10	Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest	Belgium	79.96	239.17
es30	Comunidad de Madrid	Spain	80.36	122.30
be25	Prov. West-Vlaanderen	Belgium	80.45	110.36
be35	Prov. Namur	Belgium	80.57	81.93
nl42	Limburg (NL)	Netherlands	80.58	109.04
nl12	Friesland (NL)	Netherlands	80.89	101.15
uki1	Inner London	United Kingdom	80.98	265.90

Transfers are calculated as the ratio between disposable income and income (%) by region. Relative GDP/capita is regional GDP/cap in PPS relative to the EU-19 average (%). See Table A2 for details.

Table A3.2. The largest transfer receivers and their relative output per capita (10-year averages for the period 1995-2004)

Code	Region	Country	Transfers (%)	Relative GDP/cap (%)
ded1	Chemnitz	Germany	107.73	75.28
pl31	Lubelskie	Poland	106.52	32.75
pl33	Swietokrzyskie	Poland	106.45	34.75
ukl1	West Wales and The Valleys	United Kingdom	105.10	75.31
dee0	Sachsen-Anhalt	Germany	104.63	76.00
ukk3	Cornwall and Isles of Scilly	United Kingdom	104.04	69.46
pl32	Podkarpackie	Poland	103.93	32.62

Code	Region	Country	Transfers (%)	Relative GDP/cap (%)
ukk4	Devon	United Kingdom	103.68	88.76
pt16	Centro (PT)	Portugal	103.40	61.27
gr30	Attiki	Greece	103.13	96.56
ukd5	Merseyside	United Kingdom	103.06	79.31
ded2	Dresden	Germany	102.33	81.85
ded3	Leipzig	Germany	102.29	85.00
pl34	Podlaskie	Poland	102.16	34.60
pl11	Lódzkie	Poland	102.09	40.57
gr25	Peloponnisos	Greece	102.03	73.89
pl21	Malopolskie	Poland	101.86	39.13
pt18	Alentejo	Portugal	101.41	65.75
deg0	Thüringen	Germany	101.36	76.02
pl62	Warminsko-Mazurskie	Poland	100.72	35.25
itf6	Calabria	Italy	100.32	67.77
pl43	Lubuskie	Poland	100.24	40.80
gr41	Voreio Aigaio	Greece	100.16	64.97
gr11	Anatoliki Makedonia, Thraki	Greece	100.08	61.57

Transfers are calculated as the ratio between disposable income and income (%) by region. Relative GDP/capita is the regional GDP/cap in PPS relative to the EU-19 average (%). See Table A2 for details.

Chart A3.3. Relationship between transfers and elative per-capita output (10-year averages for the period 1995-2004)

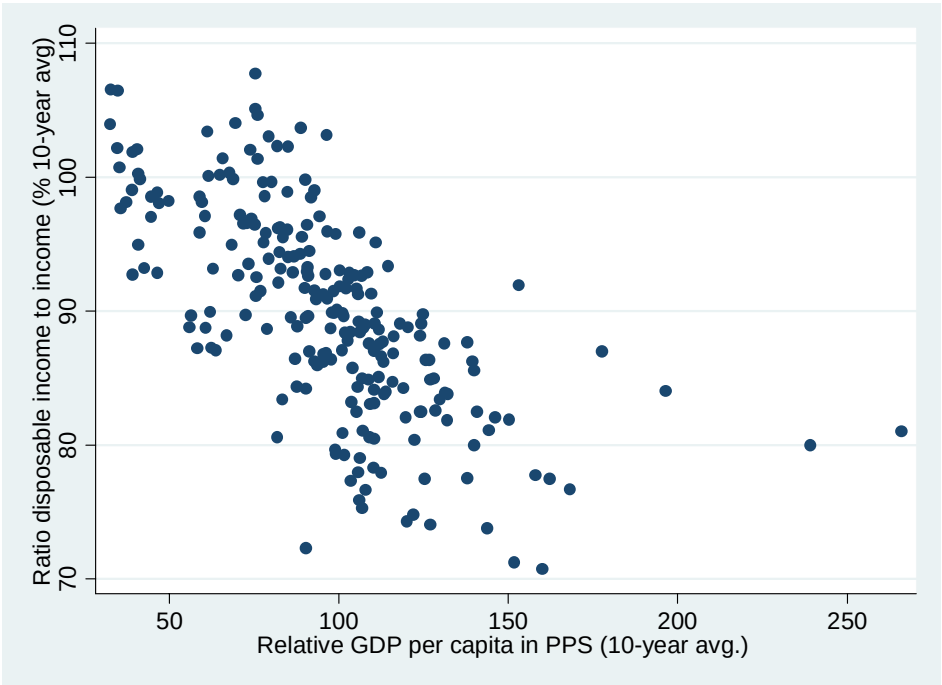
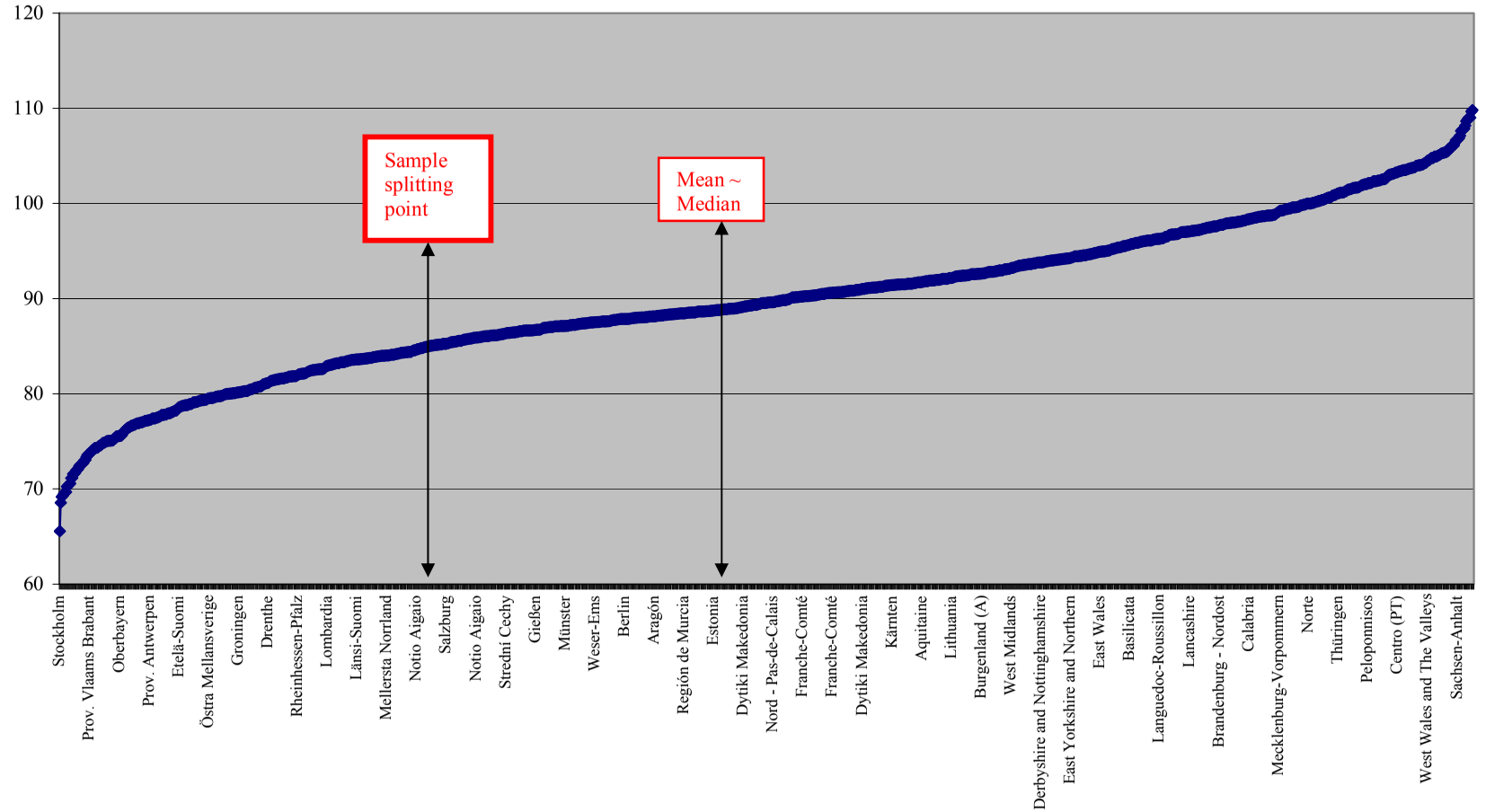


Chart A3.4. Distribution of the variable net transfers (disposable income/income %) by region, yearly 1995 - 2005



Note: Regions on the horizontal axis may appear multiple times as they are recorded in different years.

Table A4.1. ESPON data description

Variable name	Description	Source	Descriptive statistics (relative to GDP)
All Structural and Cohesion Fund expenditure (SCF_total)	Structural Fund and Cohesion Fund expenditure - All funds included in Operational Programmes and SPDs, Objectives 1, 2, 3, 5b and 6, in EUR terms, cumulative, for the period 1994-1999. Variable in relative terms are calculated as follows: 1. Relative to GDP: • first calculate an annual average SCF expenditure assuming equal amounts during the 6-year period for all EU-13 countries, except Austria, Sweden and Finland, for which a 5-year period is used; • divide the above measure to the nominal GDP in EUR terms in the year 1999 (%) 2. Relative to population and the EU-13 average: • divide the measure from the first step to the average population; • normalize to EU-13 average (total SCF expenditure over total population) (%) Same methodology applied to each disaggregated expenditure category (below) to obtain the variables in relative terms.	Authors' calculations based on data from ESPON and Eurostat, and partly following the methodology from ESPON Report 2.2.1 "The Territorial Effects of the Structural Funds" (Nordregio 2005)	N = 195 Mean = 0.50 Median = 0.11 St.dev. = 0.90 Range = [0.003; 5.99]
SF_reg.dev	Structural Fund expenditure related to Regional Development and Productive Infrastructure (Obj. 1, 2 and 6 ERDF), in EUR terms, cumulative, for the period 1994-1999.	ESPON	N = 195 Mean = 0.33 Median = 0.05 St.dev. = 0.70 Range = [0; 5.19]
SF_social	Structural Fund expenditure related to Social Integration and Human Resources (Obj. 1, 2, 3 and 6 ESF), in EUR terms, cumulative, for the period 1994-1999.	ESPON	N = 195 Mean = 0.08 Median = 0.04 St.dev. = 0.11 Range = [0; 0.78]
SF_agric	Structural Fund expenditure related to Agriculture, Rural Development and Fishery (Obj. 5b and 6, EAGGF, IAGF), in EUR terms, cumulative, for the period 1994-1999.	ESPON	N = 195 Mean = 0.06 Median = 0.02 St.dev. = 0.11 Range = [0; 1.09]

Note (source: ESPON): Data manipulated in some cases

Table A4.2. The thirty largest EU fund spenders during 1994-1999 and their relative output per capita in 1995 and 2004

Code	Region	Country	SCF_total % GDP 1994-1999	Relative GDP/cap (%) 1995	Relative GDP/cap (%) 2004	Cumulative growth (%) 1995-2004
pt20	Região Autónoma dos Açores (PT)	Portugal	5.99	54.47	62.40	14.6
gr13	Dytiki Makedonia	Greece	5.46	80.19	71.41	-10.9
pt30	Região Autónoma da Madeira (PT)	Portugal	4.07	69.17	88.70	28.2
gr21	Ipeiros	Greece	4.00	58.02	68.69	18.4
gr11	Anatoliki Makedonia, Thraki	Greece	3.51	65.02	61.81	-4.9
gr23	Dytiki Ellada	Greece	3.15	66.27	56.46	-14.8
gr14	Thessalia	Greece	2.91	70.47	69.94	-0.8
es43	Extremadura	Spain	2.52	55.81	64.04	14.7
itf5	Basilicata	Italy	2.01	78.42	72.05	-8.1
gr41	Voreio Aigaio	Greece	1.99	66.42	61.91	-6.8
gr43	Kriti	Greece	1.89	78.60	80.00	1.8
pt15	Algarve	Portugal	1.81	73.30	74.52	1.7
pt18	Alentejo	Portugal	1.80	63.33	65.87	4.0
pt11	Norte	Portugal	1.75	59.98	56.52	-5.8
ie01	Border, Midlands and Western	Ireland	1.75	74.29	98.37	32.4
gr24	Sterea Ellada	Greece	1.74	119.38	97.08	-18.7
es42	Castilla-la Mancha	Spain	1.70	71.46	76.07	6.5
gr12	Kentriki Makedonia	Greece	1.69	77.61	73.13	-5.8
itf2	Molise	Italy	1.61	86.73	73.56	-15.2
es13	Cantabria	Spain	1.47	80.96	93.71	15.7
es12	Principado de Asturias	Spain	1.41	76.74	83.18	8.4
gr25	Peloponnisos	Greece	1.41	71.87	75.23	4.7
pt16	Centro (PT)	Portugal	1.35	59.66	60.78	1.9
es11	Galicia	Spain	1.33	71.02	77.68	9.4
pt17	Lisboa	Portugal	1.32	100.18	100.61	0.4
es41	Castilla y León	Spain	1.31	83.60	90.61	8.4
gr30	Attiki	Greece	1.26	86.18	119.07	38.2
es61	Andalucia	Spain	1.20	64.94	74.50	14.7
es24	Aragón	Spain	1.19	93.76	102.80	9.6
itf6	Calabria	Italy	1.14	68.48	65.20	-4.8

Note: SCF_total as % of GDP represents the Total Structural and Cohesion Fund expenditure, *annual average* for the period 1994-1999 relative to the 1999 GDP. *Relative GDP/capita* is regional GDP/cap in PPS relative to the EU-19 average (%).

European Central Bank Working Paper Series

For a complete list of Working Papers published by the ECB, please visit the ECB's website (http://www.ecb.europa.eu).

973 "Do China and oil exporters influence major currency configurations?" by M. Fratzscher and A. Mehl, December 2008.

974 "Institutional features of wage bargaining in 23 European countries, the US and Japan" by P. Du Caju, E. Gautier, D. Momferatou and M. Ward-Warmedinger, December 2008.

975 "Early estimates of euro area real GDP growth: a bottom up approach from the production side" by E. Hahn and F. Skudelny, December 2008.

976 "The term structure of interest rates across frequencies" by K. Assenmacher-Wesche and S. Gerlach, December 2008.

977 "Predictions of short-term rates and the expectations hypothesis of the term structure of interest rates" by M. Guidolin and D. L. Thornton, December 2008.

978 "Measuring monetary policy expectations from financial market instruments" by M. Joyce, J. Relleen and S. Sorensen, December 2008.

979 "Futures contract rates as monetary policy forecasts" by G. Ferrero and A. Nobili, December 2008.

980 "Extracting market expectations from yield curves augmented by money market interest rates: the case of Japan" by T. Nagano and N. Baba, December 2008.

981 "Why the effective price for money exceeds the policy rate in the ECB tenders?" by T. Välimäki, December 2008.

982 "Modelling short-term interest rate spreads in the euro money market" by N. Cassola and C. Morana, December 2008.

983 "What explains the spread between the euro overnight rate and the ECB's policy rate?" by T. Linzert and S. Schmidt, December 2008.

984 "The daily and policy-relevant liquidity effects" by D. L. Thornton, December 2008.

985 "Portuguese banks in the euro area market for daily funds" by L. Farinha and V. Gaspar, December 2008.

986 "The topology of the federal funds market" by M. L. Bech and E. Atalay, December 2008.

987 "Probability of informed trading on the euro overnight market rate: an update" by J. Idier and S. Nardelli, December 2008.

988 "The interday and intraday patterns of the overnight market: evidence from an electronic platform" by R. Beaupain and A. Durré, December 2008.

989 "Modelling loans to non-financial corporations in the euro area" by C. Kok Sørensen, D. Marqués Ibáñez and C. Rossi, January 2009.

990 "Fiscal policy, housing and stock prices" by A. Afonso and R. M. Sousa, January 2009.

991 "The macroeconomic effects of fiscal policy" by A. Afonso and R. M. Sousa, January 2009.

992 "FDI and productivity convergence in central and eastern Europe: an industry-level investigation" by M. Bijsterbosch and M. Kolasa, January 2009.

993 "Has emerging Asia decoupled? An analysis of production and trade linkages using the Asian international input-output table" by G. Pula and T. A. Peltonen, January 2009.

994 "Fiscal sustainability and policy implications for the euro area" by F. Balassone, J. Cunha, G. Langenus, B. Manzke, J. Pavot, D. Prammer and P. Tommasino, January 2009.

995 "Current account benchmarks for central and eastern Europe: a desperate search?" by M. Ca' Zorzi, A. Chudik and A. Dieppe, January 2009.

996 "What drives euro area break-even inflation rates?" by M. Ciccarelli and J. A. García, January 2009.

997 "Financing obstacles and growth: an analysis for euro area non-financial corporations" by C. Coluzzi, A. Ferrando and C. Martinez-Carrascal, January 2009.

998 "Infinite-dimensional VARs and factor models" by A. Chudik and M. H. Pesaran, January 2009.

999 "Risk-adjusted forecasts of oil prices" by P. Pagano and M. Pisani, January 2009.

1000 "Wealth effects in emerging market economies" by T. A. Peltonen, R. M. Sousa and I. S. Vansteenkiste, January 2009.

1001 "Identifying the elasticity of substitution with biased technical change" by M. A. León-Ledesma, P. McAdam and A. Willman, January 2009.

1002 "Assessing portfolio credit risk changes in a sample of EU large and complex banking groups in reaction to macroeconomic shocks" by O. Castrén, T. Fitzpatrick and M. Sydow, February 2009.

1003 "Real wages over the business cycle: OECD evidence from the time and frequency domains" by J. Messina, C. Strozzi and J. Turunen, February 2009.

1004 "Characterising the inflation targeting regime in South Korea" by M. Sánchez, February 2009.

1005 "Labor market institutions and macroeconomic volatility in a panel of OECD countries" by F. Rumler and J. Scharler, February 2009.

1006 "Understanding sectoral differences in downward real wage rigidity: workforce composition, institutions, technology and competition" by P. Du Caju, C. Fuss and L. Wintr, February 2009.

1007 "Sequential bargaining in a new-Keynesian model with frictional unemployment and staggered wage negotiation" by G. de Walque, O. Pierrard, H. Sneessens and R. Wouters, February 2009.

1008 "Liquidity (risk) concepts: definitions and interactions" by K. Nikolaou, February 2009.

1009 "Optimal sticky prices under rational inattention" by B. Maćkowiak and M. Wiederholt, February 2009.

1010 "Business cycles in the euro area" by D. Giannone, M. Lenza and L. Reichlin, February 2009.

1011 "The global dimension of inflation – evidence from factor-augmented Phillips curves" by S. Eickmeier and K. Moll, February 2009.

1012 "Petrodollars and imports of oil exporting countries" by R. Beck and A. Kamps, February 2009.

1013 "Structural breaks, cointegration and the Fisher effect" by A. Beyer, A. A. Haug and B. Dewald, February 2009.

1014 "Asset prices and current account fluctuations in G7 economies" by M. Fratzscher and R. Straub, February 2009.

1015 "Inflation forecasting in the new EU Member States" by O. Arratibel, C. Kamps and N. Leiner-Killinger, February 2009.

1016 "When does lumpy factor adjustment matter for aggregate dynamics?" by S. Fahr and F. Yao, March 2009.

1017 "Optimal prediction pools" by J. Geweke and G. Amisano, March 2009.

1018 "Cross-border mergers and acquisitions: financial and institutional forces" by N. Coeurdacier, R. A. De Santis and A. Aviat, March 2009.

1019 "What drives returns to euro area housing? Evidence from a dynamic dividend-discount model" by P. Hiebert and M. Sydow, March 2009.

1020 "Opting out of the Great Inflation: German monetary policy after the break down of Bretton Woods" by A. Beyer, V. Gaspar, C. Gerberding and O. Issing, March 2009.

1021 "Rigid labour compensation and flexible employment? Firm-level evidence with regard to productivity for Belgium" by C. Fuss and L. Wintr, March 2009.

1022 "Understanding inter-industry wage structures in the euro area" by V. Genre, K. Kohn and D. Momferatou, March 2009.

1023 "Bank loan announcements and borrower stock returns: does bank origin matter?" by S. Ongena and V. Roscovan, March 2009.

1024 "Funding liquidity risk: definition and measurement" by M. Drehmann and K. Nikolaou, March 2009.

1025 "Liquidity risk premia in unsecured interbank money markets" by J. Eisenschmidt and J. Tapking, March 2009.

1026 "Do house price developments spill over across euro area countries? Evidence from a global VAR" by I. Vansteenkiste and P. Hiebert, March 2009.

1027 "Long run evidence on money growth and inflation" by L. Benati, March 2009.

1028 "Large debt financing: syndicated loans versus corporate bonds" by Y. Altunbaş, A. Kara and D. Marqués-Ibáñez, March 2009.

1029 "The role of fiscal transfers for regional economic convergence in Europe" by C. Checherita, C. Nickel and P. Rother, March 2009.