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Does regional redistribution spur growth?

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Abstract:

After the German reunification, interregional subsidies accounted for approximately four percent of gross fixed capital investment in the new federal states. We show that between 1992 and 2005 infrastructure and (small) business aid had a negative net impact on regional economic growth. This suggests that regional redistribution was ineffective, potentially due to a lack of spatial concentration to create growth poles.

Keywords: Regional growth, redistribution, infrastructure, investment subsidies

JEL-Classification: R11, R42, R58.

Non technical summary

The regional redistribution of capital after the German reunification has been sizeable. From 1991 to 2007 investment projects totalling €237 billion have been supported with subsidies of €58.7 billion under the Joint Agreement for the Improvement of Regional Economic Structures.

The growth effect of capital subsidies continues to be a matter of debate in the theoretical and empirical literature. Capital subsidies have the potential to further the agglomeration of firms and thereby to provide a stimulus to employment and economic growth. However, it has been frequently argued that a broad support of too many regions can lead to a mis-allocation of productive resources and consequently to negative growth effects. So far the majority of empirical growth studies on regions have neglected capital subsidies due to the lack of data.

We use a data set of capital subsidies to economically and structurally weak German regions. The data consists of investment subsidies granted for business and infrastructure investments in East and West German districts for the period 1992 und 2005. Our results provide evidence for a lack of convergence between German districts and negative net effect of the capital subsidies. In our view, the results do not necessarily imply that capital subsidies are overall ineffective to stimulate growth. Rather, it may signal the lack of concentrating capital subsidies on regional growth poles i.e. regions where capital subsidies have the potential to lead to sustained growth.

Nicht technische Zusammenfassung

Die regionale Umverteilung von finanziellen Mitteln nach der deutschen Wiedervereinigung ist ökonomisch signifikant. Zwischen 1991 und 2007 wurden Investitionen im Umfang von €237 Milliarden mit regionalen Subventionen von €58,7 Milliarden im Rahmen der Gemeinschaftsaufgabe „Verbesserung der regionalen Wirtschaftsstruktur“ gefördert.

Der Wachstumseffekt solcher Subventionen ist sowohl theoretisch als auch empirisch unklar. Einerseits können Förderungsmassnahmen die Ansiedlungen von Unternehmen und somit Beschäftigung und Wachstum fördern. Andererseits kann eine zu breite Förderung zu vieler Regionen auch zu Fehlallokation von Produktionsfaktoren und somit negativen Wachstumseffekten führen. Die meisten empirischen regionalen Wachstumsstudien vernachlässigen diese Subventionen auf Grund der schwierigen Datenlage, so dass diese Frage unbeantwortet bleibt.

Wir nutzen detaillierte Daten regionaler Förderungsmaßnahmen hinsichtlich Infrastruktur und Gewerbe in ost- und westdeutschen Kreisen zwischen 1992 und 2005, um deren Wachstumseffekt empirisch zu bestimmen. Unsere Ergebnisse zeigen lediglich schwache Konvergenz der Kreise innerhalb der gesamten Bundesrepublik und einen negativen Nettoeffekt der beiden untersuchten Förderungsmassnahmen. Dies bedeutet nicht zwangsweise, dass regionale Subventionen keinen Wachstumseffekt haben. Vielmehr ist es ein mögliches Anzeichen dafür, dass Förderungsmassnahmen nicht ausreichend konzentriert sind, um Wachstumspole zu schaffen und nachhaltig zu unterstützen.

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1 Introduction

The German reunification in 1989 represented the fastest and most radical transformation of two juxtaposing economic systems in recent history with uncertain outcomes. Potential gains from a comprehensive and quick unification were expected to follow especially from large scale federal investment schemes to develop economically ailing regions, primarily in or close to the former German Democratic Republic (Jones and Wild, 1994). In fact, between 1992 and 1998, Burda and Hunt (2001) document infrastructure investment on the order of DM 140 billions in formerly eastern regions, which was around a third of the entire infrastructure investment volume.[1] Most of these funds are transfer payments from more prosperous regions to less developed, mostly eastern, as to facilitate economic growth and development.

These subsidies amount effectively to economic aid, which primarily takes two forms: infrastructure investment and corporate investment subsidies (CIS), especially to small and medium enterprises. The effectiveness of either form of economic aid continues to be subject to debate on both theoretical and empirical grounds (Aschauer, 1989; Easterly, 2003; Rajan and Subramaniam, 2005). Most of this debate concerns national economies. In this paper, we conjecture that the discussion on the effectiveness of redistribution payments also transcends to regional economic interactions. We investigate if the persistent and economically significant subsidies to districts primarily located in the new federal states facilitated regional growth.

A priori, this is unclear. For example, Démurger (2001) reports for 24 regions in China that especially transportation infrastructure helps to close regional income gaps. She finds that infrastructure investments spur growth directly through reducing transportation costs and indirectly by generating positive spatial spill-over effects across

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1 Burda and Hunt (2001) note that transfer payments are persistent and accounted for approximately 5 percent of German GDP, or 75 billion Euro p.a., in the period between 1990 and 2000.

regions. Cain (1997) draws similar conclusions for the regions in the US. However, Rodriguez-Pose and Fratesi (2004) report that the European Structural Fund support for objective 1 regions did not contribute to regional income convergence.[2] Their findings suggest that infrastructure subsidies and, to a lesser extent, business subsidies yield negative returns between 1989 and 1999. The absence of positive effects relates to theoretical explanations in Brakman et al. (2002). They extend the tax-competition model of Baldwin and Krugman (2000). Many studies conjecture that relatively high regional taxes can have 'spreading forces' since they induce entrepreneurs to re-locate. Brakman et al. (2002) argue that these centrifugal forces of economic activity have to be balanced with pecuniary benefits of effective (local) government spending. Put differently, spatial differences in the effective and efficient provision of public goods endogenously determine clusters of economic activity. The redistribution of tax-payers funds in the form of infrastructure projects, and direct investment support for business, can therefore influence regional economic output asymmetrically across districts. Specifically, agglomeration effects can be negative if *"the (in)efficiency of the government sector might frustrate the effectiveness of extra spending"* (Brakman et al. 2002). Put differently, if (local) governments are less efficient in the provision of public goods, such as infrastructure, this might induce firms to wander off where the trade-off between paying taxes and obtaining public services in return is more favorable for them.

Previous studies on regional growth in Germany neglect these substantial subsidies. To the best of our knowledge, the growth effects of interregional subsidies are therefore unknown.[3] We use unique data on interregional subsidies in a neo-classical growth model to assess the effect on growth in German districts between 1992 and 2005.

[2] Objective 1 regions are those below the 75% threshold EU average.

[3] Important studies of German regional growth focus on, for example, regional labor markets (Funke and Strulik, 1999), the formation of human capital (Funke and Niebuhr, 2005), or innovate on how to account for spatial autocorrelation (Kosfeld et al. 2006).

2 Methodology and data

We estimate a neoclassical growth model as in Kosfeld et al. (2006) covering 419 German districts (*'Kreise'*) located in both eastern and western states between 1992 and 2005.[4] Our main interest is if infrastructure subsidies and/or CIS yield a positive growth effect. We estimate the following model:

$$(1) \quad (\ln Y_{r,2005}) = \alpha_0 + \beta_1 \ln Y_{r,1992} + \beta_2 \ln INFRA_r + \beta_3 \ln CIS_r + \beta_4 \ln X_r + \varepsilon_r$$

Regional GDP per capita Y_r is regressed on the two types of subsidies and a vector of conventional controls in the neoclassical growth model X_r. The latter includes mean population growth per region and the investment ratio for the respective federal state of region r.[5] We also control for human capital to determine regional growth by specifying the average share of university educated citizens among persons enrolled in the regional social security system.

The key variables of interest are infrastructure and corporate investment subsidies *INFRA* and *CIS* per capita routed to region r. Both variables are averaged over the sample period. We obtain this data from the Federal Office for Building and Regional Planning and describe it in Table 1.

Table 1: Growth summary statistics German municipalities 1992 – 2005

Variable	N	Mean	Std. Dev.	Min	Max
GDP per Capita	5,867	22,386	9,284	6,382	83,463
Population growth	5,221	0.001	0.010	-0.083	0.062
Investment ratio	6,146	0.236	0.095	0.119	0.599
Human capital	5,707	0.040	0.025	0.000	0.189
CIS	6,585	39.36	106.75	0.000	2,830
INFRA	6,585	19.22	67.19	0.000	1,380

Notes: GDP, CIS and INFRA per capita in Euros. All remaining variables in percent.

[4] We lack population data for Mecklenburg-Vorpommern and the districts Eisenach and Wetteraukreis before 1994.

[5] We assume that technical change g and depreciation rates δ jointly are 9 percent. Investment ratios at district level are not available.

3 Subsidies considered

The regional subsidies considered in this paper comprise investment support under the Joint Agreement for the Improvement of Regional Economic Structures.[6] It is the explicit objective of the Agreement to support economically and structurally weak regions and to enable these regions to participate in the general economic development. The funds under the agreement subsidize investment projects of primarily small and medium sized enterprises in the manufacturing industry and business relevant infrastructure. The Federal government and the federal states are jointly sharing the costs while the federal states are responsible for the management. Given that only structurally weak regions are supported under the agreement not all districts have access to subsidies under the agreement. German districts are differentiated in six different groups according to their structural problems, of which five groups are eligible for subsidies. With respect to subsidies to the manufacturing industry, the subsidy rates vary across the five groups and the type of firm that is supported. Firms in regions with more significant structural problems obtain larger subsidy rates. In addition, the subsidy component is also larger for small and medium enterprises (CIS). Figure 1 in the appendix provides an overview on the assisted regions and subsidy rates for the manufacturing industry. The majority of eligible regions is located near or in the new Federal States and Berlin. Investments in business relevant infrastructure can be subsidized at the discretion of the federal state with up to 90 percent. Table 2 contains the volume of subsidies separated by type of investment addressed and region. Table 5 in the appendix shows that the new federal states in the East benefited the most from the capital subsidies. They account for about 90 percent of all subsidies to manufacturing and infrastructure investments. Subsidies are primarily directed towards business investments which accounted for 66 percent of all subsidies.

[6] Gemeinschaftsaufgabe "Verbesserung der regionalen Wirtschaftsstruktur".

Table 2: Subsidy Volume by Type and Region in € million, 1991-2007

	All Federal States		Old Federal States		New Federal States	
Year	CIS	Infrastructure	CIS	Infrastructure	CIS	Infrastructure
1991	4,093	1,789	375	307	3,718	1,483
1992	2,884	1,555	329	215	2,555	1,340
1993	2,791	2,751	219	229	2,572	2,522
1994	2,959	2,811	229	137	2,730	2,674
1995	2,179	2,175	194	133	1,985	2,041
1996	3,131	1,047	213	109	2,918	938
1997	2,430	1,189	272	77	2,158	1,111
1998	3,019	822	264	58	2,756	764
1999	2,433	918	360	65	2,073	853
2000	1,601	762	185	67	1,415	695
2001	1,892	596	213	82	1,679	514
2002	1,715	874	184	170	1,531	703
2003	1,658	841	250	179	1,408	662
2004	1,474	516	153	100	1,322	416
2005	1,231	694	163	116	1,068	578
2006	1,854	384	217	64	1,637	320
2007	1,426	353	202	10	1,235	343
Sum	38,770	20,077	4,022	2,118	34,760	17,957

Source: Federal Office of Economics and Export Control
Note: Includes GA and EFRE.

4 Results

Baseline results in the first column of Table 3 show that the initial income coefficient provides evidence of existing, yet very slow convergence (0.9%). We then augment the model with both subsidy controls.

Table 3: District growth regression with subsidies 1992 - 2005

	Baseline	CIS	INFRA	BOTH	INTER
GDP_{1992}	0.890***	0.889***	0.883***	0.889***	0.891***
	[29.39]	[28.60]	[28.81]	[28.47]	[31.22]
CIS		-0.001		0.014*	-0.001
		[0.17]		[1.78]	[0.14]
INFRA			-0.016**	-0.028***	-0.079***
			[2.21]	[3.28]	[6.13]
CIS x INFRA					0.024***
					[5.09]
EAST dummy	0.199**	0.201**	0.248***	0.256***	0.054
	[2.18]	[2.21]	[2.69]	[2.74]	[0.59]
Investment ratio	0.308***	0.308***	0.301***	0.285***	0.263***
	[3.13]	[3.14]	[3.03]	[2.85]	[3.43]
Human Capital	0.059***	0.058***	0.056***	0.058***	0.053***
	[2.94]	[2.88]	[2.83]	[2.90]	[2.80]
Population growth	0.145	0.138	0.105	0.154	0.136
	[0.99]	[0.84]	[0.68]	[0.94]	[0.99]
Constant	2.380***	2.376***	2.345***	2.378***	2.266***
	[4.89]	[4.79]	[4.74]	[4.79]	[5.29]
Implied λ	0.0090	0.0091	0.0096	0.0091	0.0089
R-squared	0.88	0.88	0.88	0.89	0.90

Notes: 419 observations. Robust t-statistics in brackets. */**/*** significant at 10/5/1 percent. CIS denotes corporate investement subsidies to districts and INFRA measure regional infrastructure investment subsidies. All variables measures as logged mean values per district between 1992 and 2005. Implied λ denotes the speed of convergence.

The individual effect of policies to support individual firms to conduct investments did not enhance output growth at the district level. This could either indicate that subsidized firms are just not able to convert exogenous reductions of their cost of capital into profitable investment projects or simply windfall gains when investment projects would also have been taken place in the absence of any subsidy. Alternatively, local governments that select subsidy candidates may be poorly qualified to identify profitable entrepreneurs. The significantly negative infrastructure coefficient could indicate in line with Brakman et al. (2002) an inefficienct provision of public goods. If local governments provide (tax-financed) public goods inefficiently, spatial spreading of economic activity can be the consequence. The rational in their model is that given taxes, agents require a certain return in terms of an attractive socio-economic framework in the region, for instance in terms of schools, infrastructure, or other public goods provided. Effective public goods provision can then also compensate for relatively higher taxes. But failure to deliver such compensation leads in their model to migration of the mobile factor, i.e. capital, thereby reducing economic agglomeration.

The detrimental effects of subsidies for regional growth are most obvious for infrastructure investments. Individually, this effect is significantly negative. This result contradicts earlier findings that governmental public goods provision complements private investment and private wealth accumulation (see, for example, Aschauer, 1989 or Ravallion and Jalan, 1996). In the present regional context, however, negative growth effects of infrastructure may also indicate that better infrastructure reduces transportation cost, which causes economic activity to shift to other regions. We control more explicitly for possible spatial interdependencies below. Before, we test if the interaction of business and infrastructure subsidies spurs growth because Rodriguez-Pose and Fratesi (2004) note that support packages covering multiple dimensions, e.g. infrastructure and income aid, are more likely to promote growth compared to one-dimensional support schemes. The two rightmost columns in Table 3 show that this is not the case in our sample. The simultaneous specification of both forms of aid does imply that one percent more business aid spurs regional growth by 1.4 percent and even more when interacted with more infrastructure investment aid. But the negative individual effect of infrastructure investments outweighs any potential direct gains from business support.

We have two concerns regarding these results. First, a pooled sample of both eastern and western districts might neglect structural differences and the possibility that multiple equilibria exist across German regions (Funke and Niebuhr, 2005). While a number of western districts also receive subsidies, negative externalities from poor or non-existent infrastructure and hardly developed entrepreneurial support systems, for example a local financial service sector, may be particularly relevant in eastern regions. Therefore, the effect of subsidies in these regions is likely to be systematically different and we consider sub-samples in the first two columns in Table 4. Results confirm that business support subsidies have no significant impact in either region. The negative effect of infrastructure investment subsidies vanishes in the sample including only eastern regions. But it remains significantly negative for regions in the West.

This result does not necessarily imply that government infrastructure aid is always detrimental to growth. But it may suggest that the form of providing infrastructure support is ineffective to promote growth. Potentially, projects are supported without a

sufficient focus on (a few) core regions but aim instead at a spatially even distribution of support that does not permit any region to develop as a core of economic activity.

Table 4: Spatially weighted subsidies and region specific samples

	EAST	WEST	Spatial CIS	Spatial INFRA	Spatial BOTH	Spatial INTER
GDP_{1992}	0.573***	0.954***	0.891***	0.891***	0.895***	0.895***
	[5.98]	[33.98]	[31.20]	[31.14]	[31.10]	[31.00]
CIS	0.145	0.001	-0.001	-0.001	-0.003	-0.003
	[0.70]	[0.11]	[0.15]	[0.12]	[0.38]	[0.37]
INFRA	-0.104	-0.042***	-0.079***	-0.078***	-0.073***	-0.073***
	[0.44]	[3.13]	[5.99]	[5.81]	[5.10]	[5.09]
CIS x INFRA	0.008	0.011	0.024***	0.024***	0.024***	0.024***
	[0.18]	[1.60]	[5.03]	[5.02]	[5.01]	[5.02]
Spatial weight CIS			0.001		0.116	0.083
			[0.03]		[1.00]	[0.48]
Spatial weight INFRA				-0.005	-0.118	-0.149
				[0.21]	[1.06]	[0.78]
Spatial weight (CIS x INFRA)						0.008
						[0.22]
EAST dummy			0.053	0.057	0.06	0.056
			[0.57]	[0.61]	[0.64]	[0.57]
Investment ratio	0.176	0.181***	0.263***	0.264***	0.258***	0.257***
	[1.20]	[2.72]	[3.43]	[3.45]	[3.34]	[3.33]
Human Capital	0.163***	0.036*	0.053***	0.053***	0.051***	0.051***
	[3.58]	[1.86]	[2.79]	[2.79]	[2.68]	[2.67]
Population growth	-0.039	0.310*	0.136	0.134	0.161	0.161
	[0.23]	[1.91]	[0.97]	[0.96]	[1.13]	[1.13]
Constant	4.733***	1.860***	2.264***	2.277***	2.189***	2.314***
	[2.77]	[4.21]	[5.35]	[5.37]	[5.13]	[3.19]
Observations	93	326	419	419	419	419
Implied λ	0.043	0.004	0.009	0.009	0.009	0.009
R-squared	0.64	0.91	0.90	0.90	0.90	0.90

Notes: Robust t-statistics in brackets. */**/*** significant at 10/5/1 percent. CIS denotes bussiness aid transfers to districts and INFRA measure regional infrastructure investment subsidies. All variables measures as logged mean values per district between 1992 and 2005. Implied λ denotes the speed of convergence.

Alternatively, the neglect of possible benefits from spatial spill-over effects may distort our results. While increased infrastructure investment may 'pull' economic activity out of a particular region, it may at the same time spur growth in neighboring regions. Therefore, we follow Anselin (1988) and include spatial lags to test if economic growth in region *r* depends on subsidies received in neighboring regions $s \in R$, where *R* is the set of all regions. To this end, we use a (geographical) distance matrix *W* to weight the subsidies received by all neighboring regions to measure if growth in region *r* is affected by subsidies received in regions *s*.

The results for individually and jointly specified spatial subsidy effects are insignificant. Either form of aid also fails to benefit regional growth through an indirect spill-over channel. The direct, negative net effect of infrastructure and corporate investment subsidies, in turn, remains unchanged. Therefore, our main conclusion remains that interregional subsidies for infrastructural and corporate investment did not spur economic growth in Germany's regions.

5 Robustness

We further test the robustness of our results along several lines of possible objections. First, so far we attempted to capture spatial spillovers using spatially weighted terms of our subsidy variables. However, macroeconomic interaction between regions may more properly be captured by spatially weighted GDP. In Table 6 in the appendix, we estimated a mixed spatial autoregressive model and show the results in column 1. The evidence regarding our key variables CIS and Infra remains unchanged. With regard to the spatially weighted GDP we observe a positive and significant effect which suggests that GDP in a region follows macroeconomic developments in neighboring regions.[7] Second, we instrument CIS and Infra to control for the potential endogeneity of subsidies. We specify GDP in 1994 as lagged endogenous variable and use GDP in 1992 as an instrument for CIS and Infra. Columns 2 to 5 in Table 6 contain the results which show that the results are largely in line with the previous finding that subsidies have not spurred growth. As a third concern we address the large migration of skilled labor out of East Germany. In column 6 of Table 6 we include the cumulative average growth rate (CAGR) of human capital over the period from 1994 to 2005 instead of human capital. The coefficients of CIS and Infra remain unchanged while the CAGR of human capital is insignificant. Finally, we use initial values instead of averages for human capital, the investment ratio and the subsidy variables to encompass alternative model specifications. The results regarding CIS and Infra in the Tables 7 and 8 mirror the previous results.

6 Conclusion

We use data on interregional infrastructure and corporate investment subsidies among 419 German districts to assess the effects on regional growth. Using a neo-classical growth model, we find that the net effect of subsidy payments is significantly negative. This result is robust for both districts located in old and new federal states. Convergence among eastern districts is fairly slow (4.3%) but virtually non-existing when considering western regions, too. Only when higher infrastructure investments are

[7] Note that these results are subject to an important caveat since estimation of spatial autoregressive models can yield biased and inconsistent coefficients (Anselin (1988)). Further research using spatial mixed autoregressive models is therefore warranted but out of the scope of the present paper.

paired with regional business support, we identify a statistically significant growth impetus. This is, however, crowded out by the negative influence of infrastructure subsidies on growth, which indicates a dominant 'pull' effect of economic activity out of districts. This absence of positive subsidy payment effects on regional growth persists after accounting for spatial spillover effects. Our results do not imply per se that infrastructure and other interregional aid is detrimental to growth. They may rather indicate a too uniform regional development policy that fails to promote growth poles paired with regional governments that possess no comparative advantage to identify successful entrepreneurs and an efficient provision of infrastructure.

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Appendix

Figure 1: Investment Funding: Map of Assisted Areas

Subsidies Rates of Assisted Areas

Assisted Areas	SME	Non-SME
A	50%	35%
B	43%	28%
C	28%	18%
D	7.5% - 15%	0%
E	7.5% - 15%	0%
F	0%	0%

Table 5: Percentage Share of Subsidies to CIS and Infrastructure in Total Subsidies to respective Regions and Total Subsidies in % of Gross Fixed Capital Investment (GFCI), 1991-2007

	Old Federal States			New Federal States		
Year	**CIS**	**Infrastructure**	**as % of GFCI**	**CIS**	**Infrastructure**	**as % of GFCI**
1991	9.2%	17%	0.23%	91%	83%	9%
1992	11.4%	14%	0.18%	89%	86%	5%
1993	7.8%	8%	0.16%	92%	92%	5%
1994	7.7%	5%	0.13%	92%	95%	5%
1995	8.9%	6%	0.11%	91%	94%	4%
1996	6.8%	10%	0.11%	93%	90%	3%
1997	11.2%	6%	0.12%	89%	93%	3%
1998	8.7%	7%	0.10%	91%	93%	3%
1999	14.8%	7%	0.13%	85%	93%	3%
2000	11.6%	9%	0.07%	88%	91%	2%
2001	11.3%	14%	0.09%	89%	86%	3%
2002	10.7%	19%	0.11%	89%	80%	3%
2003	15.1%	21%	0.13%	85%	79%	3%
2004	10.4%	19%	0.08%	90%	81%	3%
2005	13.2%	17%	0.09%	87%	83%	2%
2006	11.7%	17%	n.a.	88%	83%	n.a.
2007	14.2%	3%	n.a.	87%	97%	n.a.
Average	10.4%	11%	0.12%	90%	89%	4%

Table 6: Robustness: Spatially weighted GDP, IV Estimation and Cumulative Rate of Change (CAGR) for Human Capital

	Spatial GDP	IV CIS	IV Infra	IV CIS Both	IV Infra Both	CAGR HC
$GDP_{t=1}$	0.899***	0.947***	0.942***	0.982***	0.96	0.938***
	[32.44]	[17.30]	[25.56]	[2.67]	[1.50]	[38.36]
CIS	0.00	0.018		0.133	0.274	-0.003
	[0.02]	[0.25]		[0.14]	[0.04]	[0.41]
Infra	-0.068***		0.021	-0.143	-1.516	-0.080***
	[4.98]		[0.25]	[0.30]	[0.04]	[5.98]
CIS*Infra.	0.023***			0.002	0.309	0.025***
	[4.97]			[0.01]	[0.05]	[4.95]
Population Growth	0.183	0.075	0.027	0.387	0.206	0.139
	[1.34]	[0.19]	[0.12]	[0.12]	[0.03]	[1.00]
Inv.Ratio	0.269***	0.175*	0.198**	0.021	-0.813	0.178**
	[3.58]	[1.94]	[2.52]	[0.02]	[0.04]	[2.33]
Human Capital	0.048**	0.041	0.039*	0.05	-0.041	
	[2.56]	[1.55]	[1.76]	[0.34]	[0.02]	
dyEAST	0.055	-0.052	-0.076	0.102	-0.848	0.185**
	[0.62]	[0.26]	[0.26]	[0.06]	[0.05]	[2.06]
Spatial GDP	0.075**					
	[2.46]					
CAGR Human Capital						0.025
						[0.73]
Constant	1.477***	1.316***	1.293***	1.458	-0.145	1.545***
	[3.12]	[2.61]	[2.82]	[0.60]	[0.00]	[5.02]
Observations	419	419	419	419	419	419
R-squared	0.9	0.9	0.89	0.84	0.83	0.89

Note: Robust t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The initial value of the endogenous variable $GDP_{t=1}$ refers to the year 1994 in the IV estimation given that GDP per capita in 1992 was used to instrument CIS or Infra respectively. The cumulative average growth rate (CAGR HC) is calculated over the period 1994 to 2005

Table 7: Robustness: Baseline Specification using Initial Values

	Baseline	CIS	Infra	Both	Inter
GDP1992	0.883***	0.887***	0.881***	0.887***	0.887***
	[29.84]	[29.74]	[29.72]	[29.68]	[30.13]
CIS		0.005		0.007	0.001
		[0.93]		[1.22]	[0.21]
Infra			-0.004	-0.006	-0.026***
			[0.72]	[1.03]	[3.29]
CIS*Infra					0.006**
					[2.56]
Population Growth	0.131	0.146	0.129	0.151	0.088
	[0.95]	[1.03]	[0.95]	[1.08]	[0.63]
Inv. Ratio	0.341***	0.344***	0.335***	0.337***	0.314***
	[4.66]	[4.70]	[4.48]	[4.53]	[4.46]
Human Capital	0.060***	0.061***	0.059***	0.060***	0.056***
	[3.24]	[3.26]	[3.13]	[3.15]	[3.03]
dyEAST	0.107	0.091	0.124	0.109	0.092
	[1.22]	[1.01]	[1.33]	[1.17]	[1.01]
Constant	2.450***	2.446***	2.449***	2.444***	2.257***
	[5.38]	[5.44]	[5.37]	[5.45]	[5.09]
Observations	419	419	419	419	419
R-squared	0.89	0.89	0.89	0.89	0.89

Robust t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
All explanatory variables as of 1992 except population growth which enters as an average
and human capital which starts in 1994.

Table 8: Robustness: Specification using Initial Values and Spatial Control Variables

	East	West	Spatial CIS	Spatial Infra	Spatial Both	Spatial Inter
GDP_{1992}	0.500***	0.957***	0.885***	0.886***	0.886***	0.886***
	[6.50]	[34.48]	[30.19]	[30.11]	[30.66]	[30.58]
CIS	-0.021	-0.005	0.002	0.002	0.001	0.002
	[0.69]	[0.89]	[0.26]	[0.26]	[0.17]	[0.27]
Infra	-0.103***	-0.021***	-0.025***	-0.025***	-0.027***	-0.026***
	[3.68]	[2.62]	[3.13]	[3.06]	[3.32]	[3.23]
CIS*Infra	0.018**	0.010***	0.007***	0.006***	0.007***	0.007***
	[2.61]	[2.80]	[2.71]	[2.59]	[2.96]	[2.84]
Spatial CIS			0.00		-0.001*	-0.001*
			[1.29]		[1.96]	[1.95]
Spatial Infra				0	0.002	0.002
				[0.84]	[1.59]	[1.43]
Spatial (CIS*Infra)						0.00
						[0.68]
Population Growth	-0.047	0.249*	0.052	0.067	0.044	0.045
	[0.29]	[1.73]	[0.35]	[0.46]	[0.30]	[0.31]
Inv. Ratio	0.282***	0.214***	0.337***	0.325***	0.356***	0.353***
	[2.73]	[3.51]	[4.76]	[4.61]	[5.05]	[5.02]
Human Capital	0.134***	0.030*	0.057***	0.057***	0.056***	0.056***
	[2.80]	[1.66]	[3.11]	[3.09]	[3.10]	[3.09]
dyEAST			0.094	0.097	0.068	0.071
			[1.04]	[1.06]	[0.75]	[0.79]
Constant	5.925***	1.688***	2.242***	2.249***	2.237***	2.253***
	[6.83]	[4.08]	[4.99]	[5.02]	[5.04]	[5.07]
Observations	93	326	419	419	419	419
R-squared	0.59	0.91	0.89	0.89	0.89	0.89

Robust t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

All explanatory variables as of 1992 except population growth which enters as an average and human capital which starts in 1994.

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