

Titze, Mirko; Dettmann, Eva; Brachert, Matthias

Conference Paper

Identifying the effects of place-based policies – Evidence from Germany

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel -
Session: Industrial Policy, No. F02-V1

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Titze, Mirko; Dettmann, Eva; Brachert, Matthias (2016) : Identifying the effects of place-based policies – Evidence from Germany, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel - Session: Industrial Policy, No. F02-V1, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/145735>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Identifying the effects of place-based policies – Evidence from Germany

Abstract

The German government provides discretionary investment grants to structural weak regions to allow them to overcome disadvantages. The legislatives of the European Union (EU) however restrict the number of supported regions: The share of population in assisted regions is not allowed to exceed an arbitrarily defined threshold. We use a regression-discontinuity design that exploits a discrete jump in the probability to receive investment grants. Thus, we identify causal effects of the investment grant treatment on area level economic outcomes. We find positive effects for regional gross value added and productivity growth but no effects for employment and gross wages growth.

Keywords: evaluation, industrial policy, regression discontinuity design

JEL Classification: Z0, A11, D61, H20

1 Introduction

Place-based policies, commonly designed to raise employment and productivity particularly in disadvantaged areas, are en vogue in recent times. In the US state and local governments spend \$ 80 billion per year on location based policies while the federal government issue additionally \$ 15 billion (Kline and Moretti 2014). The same holds true for the European Union (EU), where a significant fraction (€ 278 billion or 28%) of the budget in the programming period 2007-2013 have been handed out to member countries via the Structural Funds to support lagging regions (Ciani and de Blasio 2015). Also Germany has spent about € 67 billion for regional policy since 1991 (BAFA 2015).

The normative goal of these place-based policies is to target inequalities especially with respect to income and living conditions between regions. From an economic theory perspective it remains questionable whether these policies work in the way they were originally intended (Glaeser and Gottlieb 2008, Kline and Moretti 2014). In the absence of market failures and with perfect labor mobility as well as inelastic housing supply in the targeted region, place-based policies cause in-migration and increased demand for housing. Hence, land owners are the recipients of benefits from this kind of policy intervention (Neumark and Simpson 2014). In contrast to this, the presence of market failures with a spatial dimension may justify an intervention. Moretti (2010) and Neumark and Simpson (2014) find agglomeration economies, spatial mismatch, network effects or equity motivations as potential rationales for place-based policy schemes. However, as Neumark and Simpson (2014, p. 14) highlight, it remains “questionable [...] that comprehensive welfare statements or calculations carry significant weight in many if not most policy decisions”

Rather reliable econometric evaluation studies that allow identifying causal effects can help to clarify if and how these policies work and for which policy schemes the results are promising (Criscuolo et al. 2012).

Our paper contributes to the literature on the identification of area level causal effects of place-based policies. It addresses the most important long-term German place-based policy, the discretionary investment grant based Joint Task for ‘Improving the Regional Economic Structure’ (GRW¹). We address identification issues by adopting a quasi-experimental research design that uses exogenously determined discontinuities in the eligibility of firms and local governments to receive investment grants. Applying a regression discontinuity design, we compare regions lying closely on either side of the eligibility cutoff to estimate the causal effect of the GRW. Due to still existing structural differences between East and West Germany, the analysis focuses on West German regions. We analyze effects on regional growth of employment, gross wages, gross value added (GVA) and productivity. Importantly, by looking on area level outcomes we are able to take into account indirect effects of the GRW on non-treated firms within a region – in particular intra-regional displacement effects.

Our dataset combines district level panel data for West Germany on eligibility, funding and a set of regional controls. In line with the EU regional policy framework we analyze the effects for two programming periods, namely 2000-2006 and 2007-2013. For the period 2000-2006 we first find positive effects of the GRW on regional GVA and productivity growth but no effect on the growth of regional employment and gross wages. For the period 2007-2013 we do not find any effect of the GRW. This result might be a direct consequence of the economic and financial crisis that took place during this period. Like most countries, Germany has provided huge support schemes to firms, banks and households to stabilize the economy during the crisis which distort the analysis of the effects of the GRW. Total expenditures for these short-term programs amount to € 176 billion in the period 2009-2012 while € 6 billion were spent within the GRW framework (IWH 2015).

¹ GRW represents the acronym for this instrument. The full German title reads as follows: **Gemeinschaftsaufgabe ‘Verbesserung der Regionalen Wirtschaftsstruktur’**.

The rest of the paper is organized as follows. The next section presents a brief literature overview on empirical findings on the effectiveness of regional policy schemes. Section 3 describes the Joint Task for 'Improving Regional Economic Structures' (GRW) design in more in detail and presents an identification strategy that allows applying a regression discontinuity design to identify the causal effects of the GRW on different area level outcomes. Section 4 discusses the main results of the regression analysis and gives a back-of-the-envelope-calculation of the net effect of GRW. Section 5 concludes the paper.

2 Review of the empirical literature

Place-based policy comprise of a variety of different measures ranging from enterprise zones (Neumark and Kolko 2010, Mayer et al. 2015), cluster policies (Falck et al. 2010, Martin et al. 2011) or large-scale regional development programs such as the Tennesse Vally Authority (Kline and Moretti 2014). We restrict our discussion to discretionary investment grant based policy schemes that are comparable to the GRW, e. g. the Law 488/1992 in Italy or the 'Regional Selective Assistance' program in the UK, both providing investment grants for lagging regions and the major infrastructure investments under the EU regional policy scheme.

2.1 Studies at the level of plants/establishments

Bernini and Pellegrini (2011) focus on the Law 488/1992 in Italy, which grants public subsidies to firms willing to invest in disadvantaged regions. They combine plant level data with information on subsidy allocation for the years 1996 to 2004. Using a combination of matching and difference-in-difference, they identify positive short run effects on output, employment and investment but negative long-run effects on productivity. Similarly, Bronzini and de Blasio (2006) evaluate the Law 488/1992 by comparing granted projects and rejections from 1993 to 2001. They identify a positive effect on investments but also find evidence for inter-temporal substitution due to the time restriction of the programming period. Pellegrini and Cetra (2006) analyze the effects of Law 488/1992 on plants in the Mezzogiorno region, finding on average a positive effect of funding on turnover, employment and fixed assets. Similar to the studies mentioned above, the effect on factor productivity (here labor) remains negative.

Devereux et al. (2007) present micro-economic evidence on the effects of the 'Regional Selective Assistance' (RSA) program in the UK on firm location decisions. Similar to the GRW and the Law 488/1992, the RSA provides discretionary grants to firms in disadvantaged regions. Devereux et al. (2007) find a small positive and significant effect of the RSA on the location choice of new entrants. Criscuolo et al. (2012) further analyze on the effectiveness of the RSA using administrative data in combination with firm level data for the years 1986 to 2004 and an instrumental variable approach. They find positive effects of the RSA on employment and investment at the firm-level but no effect of the program on factor productivity. When differentiating the effects by firm size, they show that small and medium sized firms experience the strongest effects while the effect for large firms is almost zero.

Comparable causal studies for Germany focus on the effects at the establishment level. A study of Stierwald and Wiemers (2003) uses data from the establishment panel of the Institute

of Employment Research (IAB) for the years 2000 to 2002 to find a positive effect of the GRW on the amount of investment per employee and on sales for East German establishments. The study by Bade and Alm (2010) uses matching together with a difference-in-difference approach and find positive plant-level effects of GRW on employment in the period 1999 to 2008. In a second step, Bade (2013) is also able to differentiate the effect of the GRW by firm size and finds stronger employment effects for larger establishments.

2.2 Studies at the regional level

Criscuolo et al. (2012) also present area level findings of the RSA. Herein, they show the RSA caused an increase in regional employment through existing firms and new firm entry. In addition to that, they find only little evidence for displacement effects on non-eligible neighboring regions.

Further insights on area level outcomes of place-based policies can be found in Becker et al. (2010). With the help of a regression discontinuity design they analyze causal effects of EU Structural Funds on regional performance measures. EU Structural Funds are used to co-finance regional support programs, such as innovation support schemes or regional labor market initiatives as well as investment aid instruments. Becker et al. (2010) find positive effects of the EU Structural Funds on GDP per capita growth but no employment growth effects. Subsequent studies using generalized propensity score methods demonstrate that EU transfers enable faster growth in the recipient regions but for quite a number of regions a reduction of transfers would not contribute to a reduction of growth (Becker et al. 2012). Finally, Becker et al. (2013) highlight that the effect identified in the RDD design is highly heterogeneous across regions and strongly depends on a regions absorptive capacity measured by human capital and the quality of institutions.

A first study that addresses the area level outcomes of the GRW to some extent is issued by von Ehrlich and Seidel (2015). They investigate the effects of a placed-based policy that assisted West German regions situated close to the border of the (former) German Democratic Republic and Czechoslovakia (the so-called 'Zonenrandgebiet' [ZRG]). This complex aid scheme (which has been applied between 1971 and 1994) consisted of five different program families to support: i) regional economic activities, ii) public transport infrastructures, iii) housing, iv) social housing, day care centers, and v) education and cultural activities. Financial resources within this program were allocated with the help of tax premiums and grants. Using a spatial regression discontinuity design the authors find small net effects of this policy scheme on area level outcomes. Although the GRW was part of the program family the complex nature of the ZRG does not allow deriving direct conclusions on the effectiveness of the GRW. Moreover, the GRW was not only assigned to ZRG-areas but also to a considerable number of regions outside this area (see also the maps in Appendix 1). Beyond that, studies on the GRW with clear identification strategy allowing causal inferences at the area level are missing.

Compared to the previous literature, this paper has two novel contributions. Firstly, the paper is the first to address directly the area level effects the GRW in the programming periods 2000-2006 and 2007-2013. Due to the access to detailed administrative data on the allocation scheme and absorption of funds we are able to estimate the causal effect of the GRW on different regional outcomes. Second, the focus on one specific program through which the money is spent also allows a narrow interpretation of findings in contrast to the broad evaluation of programs such as the entire set of EU Structural funds and hence of tailor-made advice for public policy.

3 Institutional details and identification strategy

Within the Joint Task for ‘Improving regional economic structures’ (GRW)² the German government³ provides subsidies for investment projects of firms and municipalities in structural weak regions. In the period 1991-2013, € 67.7 billion were spent under this program. However, a significant share of these expenditures was issued in the aftermath of the German reunification since especially the East German regions suffered from a period of deindustrialization. The main target of this instrument is to reduce spatial disparities between regions within Germany. In 1991 the overall yearly GRW budget was about € 5.9 billion. This amount decreased to still about € 1.3 billion in 2013 (BAFA 2015).

The selection of eligible regions within the GRW framework is made according to a composite score that is computed at the level of labor market regions. It consists of a (weighted) combination of four single indicators (the average unemployment rate, annual gross salaries, an employment projection and the quality of business-oriented infrastructure) which are measured prior to the start of the respective programming period (Schwengler and Binder 2006). The actual formal eligibility status is however defined at the level of districts and district-free cities. Districts within the same labor market region all obtain the same scores. Figure 1 shows all 325 West German regions ordered by their respective scores for the programming periods 2000-2006 and 2007-2013.⁴ However, the number of assisted regions in the GRW is restricted according to the EU legislatives. The EU fixes an arbitrarily defined limit of overall population in assisted regions in relation to the population within the EU 25 member states for each programming period. This general share is broken down to the

² The operationalization of the program relies on a specific law (GRW-law, Bundesregierung 1969).

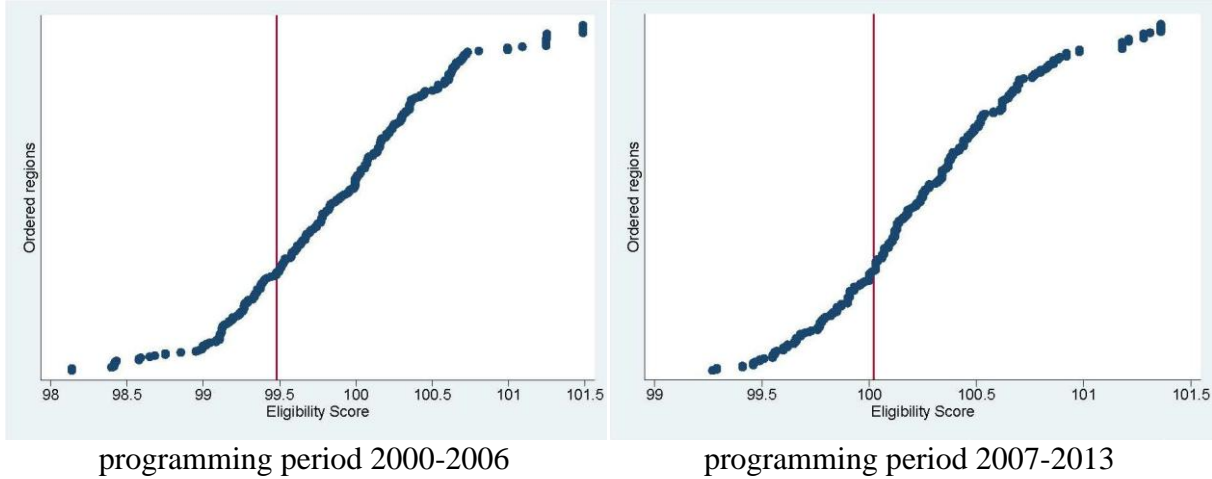
³ In Germany regional policy remains in the responsibility of the Federal States (Article 30 German Basic Law). However, the constitution permits that the Federation supports the Federal States in setting up, implementing and funding regional policy schemes.

⁴ The actual formal eligibility status is reported in the annually published Coordination Frameworks (volumes 29 to 37) that are edited by the German parliament (see also Appendix 4 for details). Statistics on annual GRW grants at the regional level are provided by the German Federal Office for Economic Affairs and Export Control (BAFA). The score values for the programming period 2000-2006 are taken from Koller, Schiebel, and Schwengler (2000), and for the period 2007-2013 from Eckey (2008) respectively.

Member States. For Germany this share was determined to 40.7 percent for the programming period 2000-2006 and 40.2 percent for the subsequent period 2007-2013 (Schwengler and Binder 2006; Coordination Frameworks [see Appendix 4]).

The first region in this ranking list that is formally not eligible is reflecting the need to limit eligibility to the exogenous population threshold of the EU. In the period 2000-2006 this is the district Amberg-Sulzbach (score 99.50) and in the second period under analysis the city Oberhausen (score 100.03). All regions with a score below these thresholds are formally eligible (on the left hand side of the red lines in Figure 1). As figure 1 indicates, the score follows a very smooth trend at this cut-off. Figure 2 compares the formal eligibility status with the actual eligibility status - the receipt of at least € 1 investment grants in the respective programming period, which is considered as the treatment. As expected, we first observe a considerable jump in the treatment status in both periods under analysis. This finding would give rise to a regression discontinuity design (RDD).

Figure 1: Eligibility scores and the first non-eligible region



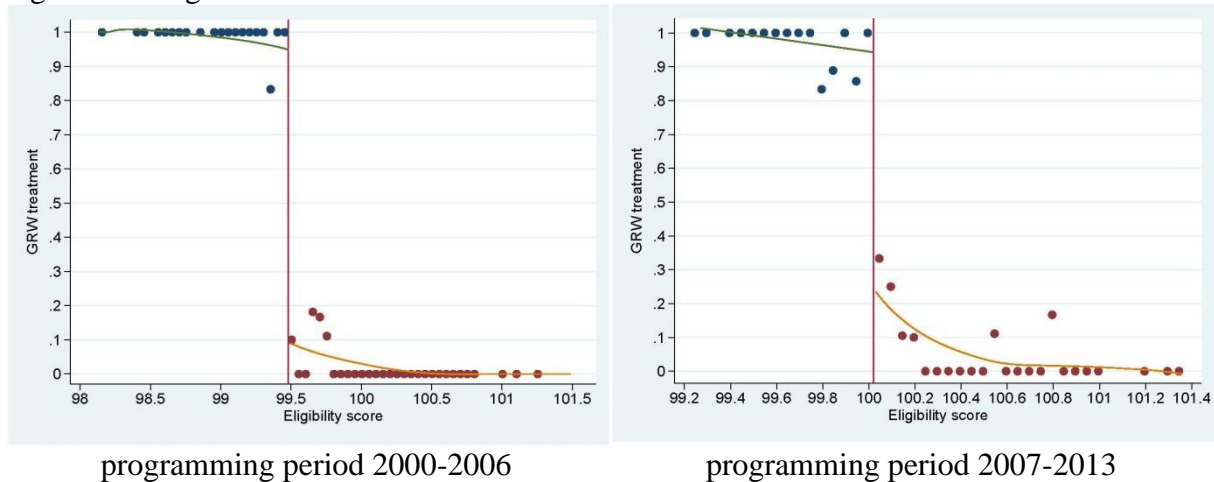
Note: The vertical red line represents the score of the “last” eligible region. The next region in this ranking is the first region that has a non-eligible status.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); formal eligibility status: coordination frameworks (see Appendix 4); own illustration.

However, we also observe some deviations from the general eligibility rule given by the score values which represents our forcing variable. On the one hand, regions that were formally eligible did not retrieve money: 2 in the period 2000-2006 and 3 in the period 2007-2013. On the other hand, regions at the right hand side of the cut-off received grants: 5 in the period 2000-2006 and 14 in the period 2007-2013 (see Appendix 4 for details). Exceptions of the latter category are made by a Coordination Committee⁵ which is part of the program's legal framework. Deviations from the general rule are justified with very localized constraints that are not observable at the level of labor market regions. One typical example for such an exception is the district Gifhorn in the programming period 2007-2013. It belongs to the labor market region of Wolfsburg. In the district Wolfsburg, the company headquarters and chief administrative offices of Volkswagen are located. Consequently, the score value of the labor market region Wolfsburg reported in Eckey (2008) is relatively high for both of the districts belonging to that region. Despite their equal score, districts within the region differ strongly. As a consequence, the Coordination Committee decided that Gifhorn is eligible under the GRW framework. The spatial allocation of the different types of regions is presented in two maps in Appendix 1. The general rule regarding the population share is not affected by these decisions. Against this backdrop, we use a fuzzy RDD design.

⁵ The members of the committee agree on the general rules for the provision of investment grants, e. g. the definition and calculation of the score.

Figure 2: Assignment and treatment status



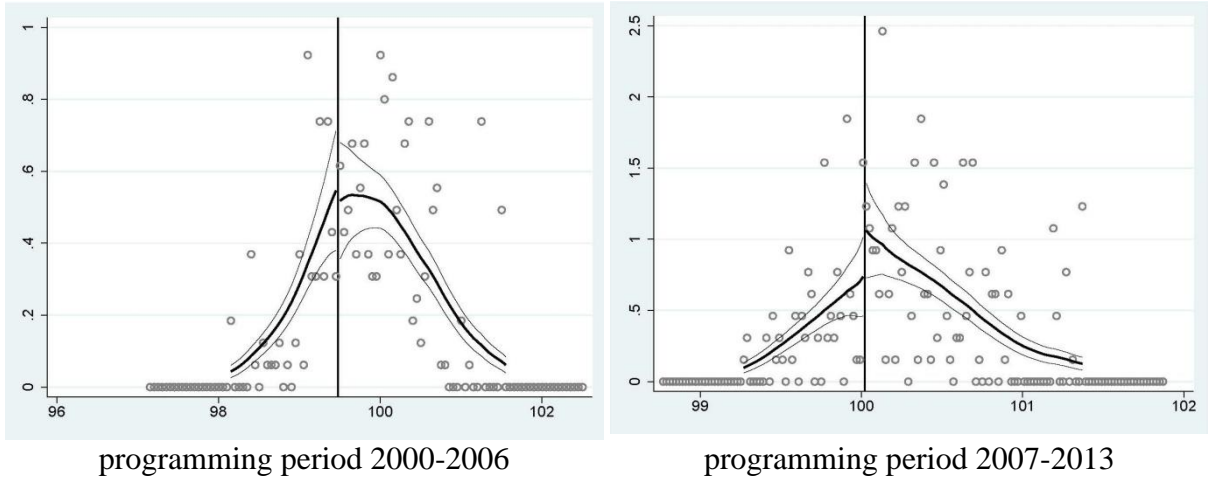
Notes: The figure shows average treatment rates in equally sized bins of 0.05. The fitted lines represent a local polynomial smooth of the treatment rates based on Epanechnikov kernel with rule-of-thumb bandwidth.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status BAFA (2015); own calculation and illustration.

The crucial question for all counterfactual research designs is whether the assignment is determined exogenously. The assignment status of each region consists of two elements: the population coverage limit and the eligibility score. It is obvious, that the population limit cannot be influenced by a single firm or municipality. Regarding the second element, Lee and Lemieux (2010) argue, that in a regression discontinuity design the assumption of exogeneity is fulfilled – at least in the vicinity of the cutoff - if the actors have imprecise control over the forcing variable. That means in our study, we must ensure that the applicants for GRW subsidies have no possibility to influence the eligibility score. This assumption is assumed to hold for three reasons: First, the score is defined at the level of labor market regions (which are comparatively large areas) and not at the level single firms or municipalities. Second, it consists of 4 indicators measuring the degree of the structural weaknesses of a labor market region. These indicators are out of the control for a single actor. Third, these indicators are measured at different points of time prior to the funding period. So, the assignment is exogenous for the actors for reasons of time and space.

Additionally, we apply a density test for the eligibility score. The idea of the test suggested by McCrary (2008) is that if manipulation would be possible, we should observe a density jump at the cutoff. In our case, the density on the left side should be a much higher. For both funding periods, we observe not higher densities left of the cutoff. The density difference at the cutoff is -0.09 for the first funding period, and 0.3 for the second one. It is not significant in both cases.

Figure 3: Results of the McCrary (2008) test



Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); own calculation and illustration.

To estimate the treatment effect within a fuzzy RDD framework, we use the following model:

$$y_i = \alpha_0 + \tau D_i + f(x) + u_i \quad (1)$$

where τ is the parameter of interest and D_i denotes the treatment status of region i . The function $f(x)$ is a polynomial function of the eligibility score, similar to the trend lines in the outcome pictures (Figures 4 and 5). We apply a model without constraints, that means we allow for different functional forms left and right of the cut-off⁶:

⁶ Constraining the functions to be the same for both sides of the cutoff would mean using data from the left side to estimate the parameters for the right side and vice versa. This would be '... inconsistent with the spirit of the RD design...' (see Lee and Lemieux 2010, p. 318). Although Angrist and Pischke (2009) state that estimating the restricted function and the more flexible one yield very similar results. We use $(x_i -$

$$f(x) = \beta_0(x_i - x_c) + \delta D_i(x_i - x_c)$$

Estimating an ordinary least squares regression (OLS) of equation 1 would be biased within a fuzzy RDD (Imbens and Lemieux 2008). Hahn, Todd, and van der Klaauw (2001) firstly showed the connection between fuzzy regression discontinuity design and the instrumental variables approach (IV) and suggested to use a two-stage-least-squares regression (TSLS). So we estimate IV instead of OLS, where treatment is instrumented by the assignment status Z_i :

$$D_i = \eta + \gamma Z_i + f(x) + \varphi_i \quad (2)$$

This TSLS can be estimated applying the usual heteroskedasticity-robust IV standard error terms (Imbens and Lemieux 2008, Wooldridge 2010). The estimator of τ in equation 1 can then be interpreted as the local average treatment effect (Hahn, Todd, and van der Klaauw 2001).

Using IV, we assume that the exclusion restriction is fulfilled. That means first, that the eligibility score has an impact on the treatment status. Because the eligibility score relies on the decision for the treatment status of a region, it is a valid instrument. Furthermore, we observed the strong connection between both variables in Figure 2. Secondly, the assignment must be exogenous. The assignment consists of two exogenous elements, the cut-off and the eligibility score, as is shown in the exogeneity discussion above. So we can estimate the local average treatment effect of GRW subsidies on the growth of our outcome variables.

xc) instead of the forcing variable itself to capture the treatment effect at the limit of both functions, the cut-off point (Angrist and Pischke 2009).

4 Empirical results

4.1 Descriptive statistics

Our dataset comprises the period 2000-2013 (2 full programming periods). Table 1 depicts annual figures of GRW funds in West Germany. Regarding the programming period 2000-2006 the amount of GRW subsidies ranges between € 1.4 and 3.3 million per region reaching its maximum value in 2003. In the first half of the programming period 2007-2013, the average amount of GRW subsidies increases. The mean amount of subsidies in a region rises from about € 1.2 to € 3.3 million. From 2010 on, subsidies are strongly reduced. This hump-shaped pattern points to a temporary expansion of the GRW program as reaction to the financial crisis in 2009.

Table 1: Descriptive statistics of GRW subsidies

	GRW per region	GRW per capita per region	total GRW
2000	1,515,197	134.71	145,458,880
2001	2,028,490	134.68	194,735,056
2002	2,506,709	134.73	240,644,096
2003	3,321,302	134.98	318,844,992
2004	1,616,599	135.25	155,193,552
2005	1,774,677	135.75	170,368,944
2006	1,450,640	136.41	139,261,440
Mean (2000-2006)	2,030,516	135.22	194,929,566
2007	1,164,446	131.42	122,266,816
2008	1,402,617	132.27	147,274,752
2009	3,344,110	132.99	351,131,520
2010	1,843,345	133.60	193,551,184
2011	845,149	135.55	88,740,664
2012	929,353	135.98	97,582,128
2013	517,079	136.29	54,293,296
Mean (2007-2013)	1,435,157	134.01	150,691,480

Note: Values in Euro.

Sources: Raw data, BAFA (2015); own calculations.

We focus on four economic outcomes which are of interest to policy makers and economists as well: regional growth of i) employment, ii) personal income (gross wages and salaries), iii) output (gross value added) and iv) productivity (gross value added per employee). These data are provided by the German Statistical Offices of the Federation and the Federal States.

Table 2: Descriptive statistics of the outcomes

	<u>Non-treated</u>			<u>Treated</u>		
	Mean	Min	Max	Mean	Min	Max
<i>Level values 2000</i>						
Employment ⁽¹⁾	109.06	20.50	1048.90	76.25	20.03	332.17
Wage sum ⁽²⁾	2603.89	447.09	28367.16	1648.03	332.25	7897.87
Gross value added ⁽²⁾	5673.67	959.33	70132.19	3350.87	742.17	17631.77
Productivity ⁽³⁾	47.72	36.58	97.77	42.68	33.67	56.62
<i>Period growth rate 2000-2006</i>						
Employment	0.008	-0.097	0.122	-0.021	-0.133	0.097
Wage sum	0.060	-0.069	0.265	0.008	-0.222	0.142
Gross value added	0.144	-0.067	0.521	0.107	-0.092	0.359
Productivity	0.135	-0.057	0.440	0.132	-0.028	0.375
Observations		229			96	
<i>Level values 2007</i>						
Employment ⁽¹⁾	113.27	19.75	1084.95	75.89	19.29	339.92
Wage sum ⁽²⁾	2901.72	470.48	31930.47	1725.41	347.40	8590.41
Gross value added ⁽²⁾	6903.00	1069.51	82939.42	3876.53	843.35	21521.82
Productivity ⁽³⁾	55.72	39.61	112.18	49.27	38.92	63.31
<i>Period growth rate 2007-2013</i>						
Employment	0.056	-0.038	0.270	0.036	-0.055	0.170
Wage sum	0.201	0.051	0.562	0.177	-0.029	0.525
Gross value added	0.138	-0.097	0.712	0.122	-0.124	0.286
Productivity	0.078	-0.148	0.493	0.083	-0.130	0.220
Observations		220			105	

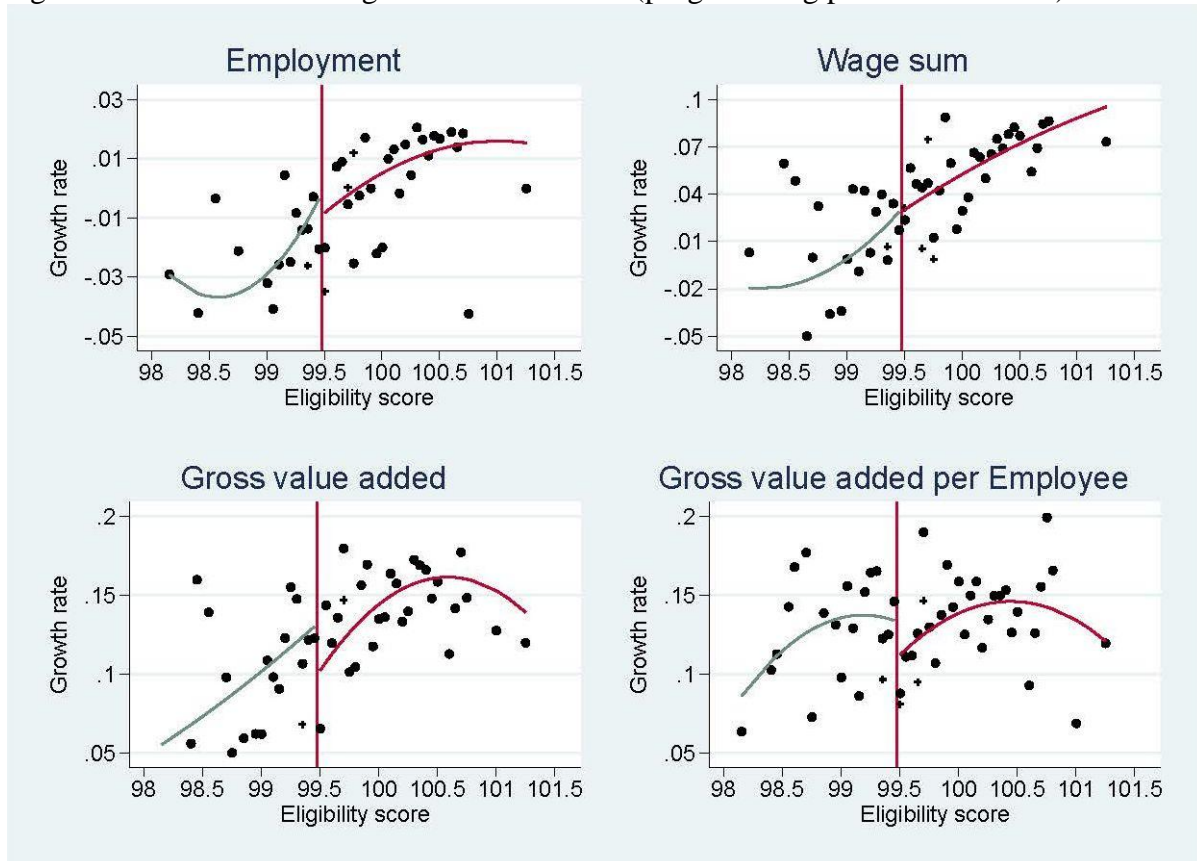
Notes: ⁽¹⁾ Number of employed persons in 1000; ⁽²⁾ Million Euro; ⁽³⁾ Gross value added per employee in € 1000.

Sources: Statistical Offices of the Federation and the Federal States.

Table 2 compares the outcomes of the treated regions with those of the non-treated. The mean level values of all four outcome variables for the years 2000 and 2007 are higher in the non-treated regions. The mean growth rates of employment, personal income and output are also – at least slightly - higher in the non-treated regions. This finding holds true for both periods under analysis. An exception is productivity which increases stronger in the treated regions in the period 2007-2013. However, a look at the minimum and maximum values reveals that there is much variation inside the groups.

However, to gain insights on the causal effects of the GRW we have to compare the outcomes near the cut-off described in section 2. A first description is presented in Figures 4 and 5. The fitted lines represent estimated trend functions of growth rates of the eligible treated regions (on the left), and the non eligible non-treated regions (on the right), or, in other words, of the dots in both figures. For the programming period 2000-2006 (Figure 4) we observe considerable gaps at the cut-off for regional output and productivity growth. The lines are slightly higher on the left side - pointing to a positive influence of investment subsidies for these two outcomes. The other two graphs do not reveal considerable jumps at the threshold indicating that there is no effect of regional investment subsidies on both outcome variables.

Figure 4: Growth rates of regions near the cutoff (programming period 2000-2006)

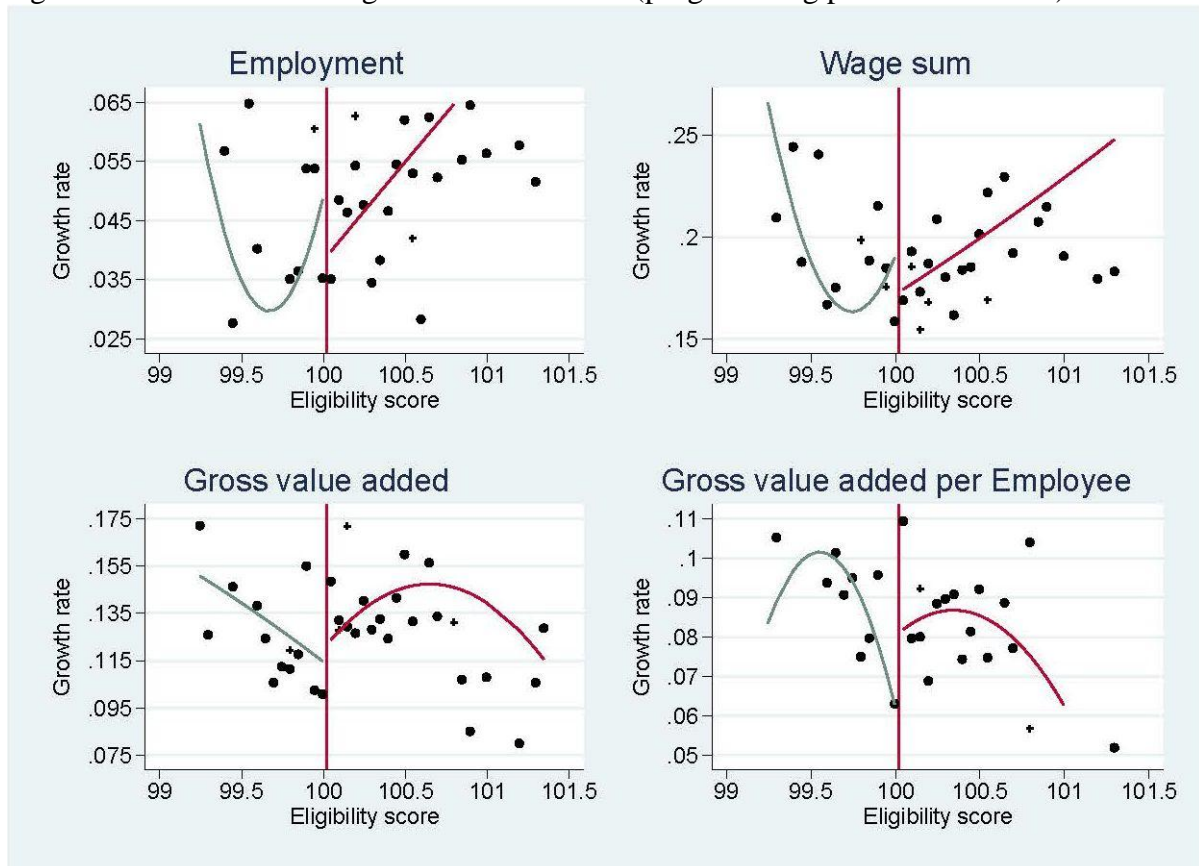


Note: The figure shows averages of the period growth rates in equally sized bins of 0.05. The fitted lines represent a 3rd order polynomial of the dots. Regions where the treatment status does not equal its assignment status are marked with crosses.

Sources: Statistical Offices of the Federation and the Federal States; Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status BAFA (2015); own calculation and illustration.

For the second funding period (2007-2013, Figure 5), we observe another picture: for the growth of regional employment and regional personal income, the effect is potentially positive, but for output and productivity growth, the graphs point to a negative effect.

Figure 5: Growth rates of regions near the cutoff (programming period 2007-2013)



Note: The figure shows averages of the period growth rates in equally sized bins of 0.05. The fitted lines represent a 3rd order polynomial of the dots. Regions where the treatment status does not equal its assignment status are marked with crosses.

Sources: Statistical Offices of the Federation and the Federal States; Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status BAFA (2015); own calculation and illustration.

4.2 Estimation results

We estimate the IV model for period growth rates for the two funding periods from 2000-2006, and 2007-2013. The presented results are based on polynomials of 3rd order (Table 3). For the first funding period, our estimates show a positive treatment effect on output in terms of the gross value added, and the productivity measured by the gross value added per employee. For the second funding period, we observe no significant effect of GRW at all.

We attribute this result to the financial crisis, and the massive fiscal and economy support programs to stabilize the German economy afterwards. The total amount of economic support

programs between 2009 and 2012 is € 176 billion (IWH 2015), compared to only € 6 billion for GRW. So, we presume that the effect of GRW investment subsidies is overlaid by the effects of these stabilization programs in the second funding period.

Table 3: Estimation results

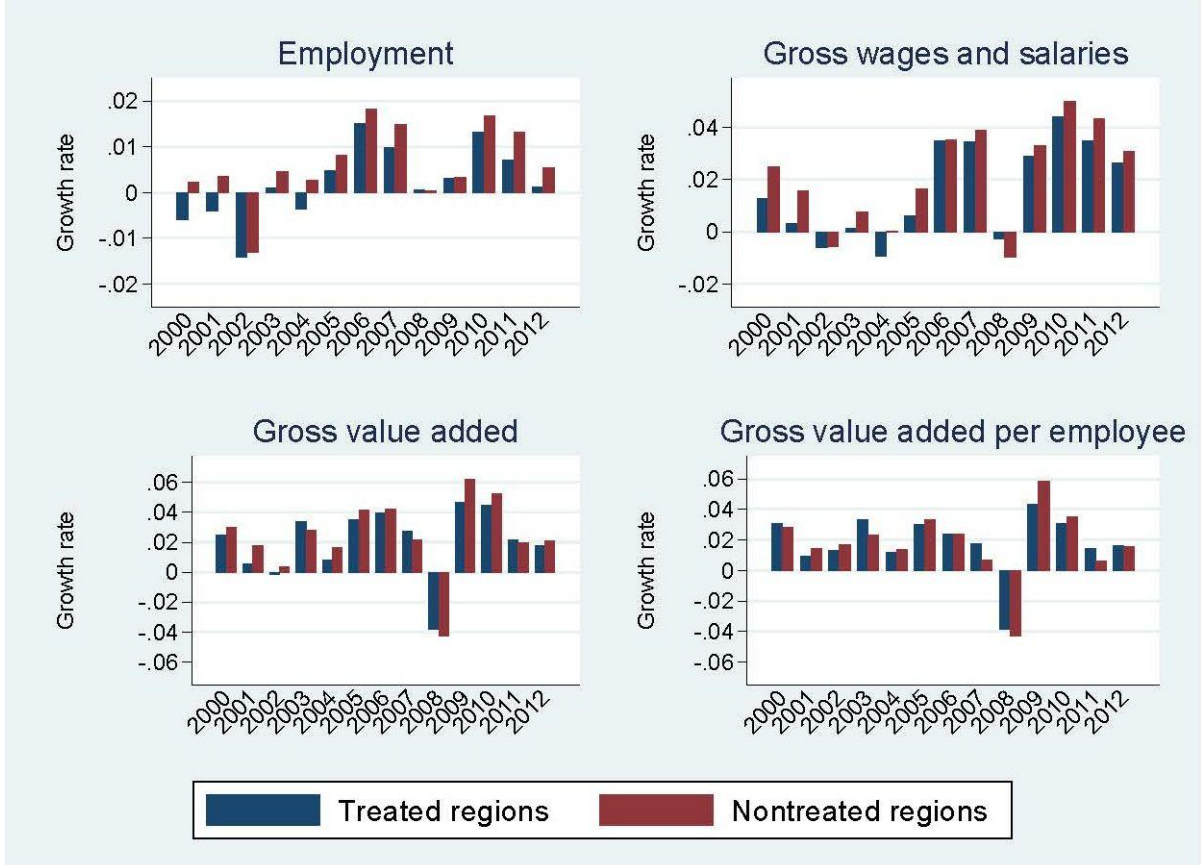
	Employment	Wage sum	Gross value added (GVA)	GVA/employee
<i>Funding period 2000-2006</i>				
Treatment	-0.00444 (0.0130)	-0.0183 (0.0169)	0.0514** (0.0222)	0.0561*** (0.0174)
Constant	-0.00667 (0.0102)	0.0387*** (0.0126)	0.0839*** (0.0164)	0.0912*** (0.0127)
adjusted R^2	0.146	0.225	0.0756	0.0139
<i>Funding period 2007-2013</i>				
Treatment	0.0225 (0.0150)	0.0301 (0.0296)	-0.00496 (0.0319)	-0.0274 (0.0252)
Constant	0.0278*** (0.0106)	0.156*** (0.0168)	0.123*** (0.0187)	0.0922*** (0.0157)
adjusted R^2	0.0562	0.0499	0.000331	0.0352

Notes: Robust standard errors in parentheses; Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Model specification: 3rd order polynomial of the eligibility score; no constraints (coefficients omitted).

Sources: Statistical Offices of the Federation and the Federal States; Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status BAFA (2015); own calculation.

Figure 6 depicts annual growth rates of our four outcomes of interest. Between 2007 and 2008 the growth rates of gross value added and productivity are higher in the treated regions in comparison with the non-treated ones. This finding holds also for the period 2008-2009 albeit growth rates are negative. From 2009 onwards (when the massive short-term compensation programs were set up) the effect turns in the opposite direction. In particular, in the years 2010 and 2011 the non-treated regions reveal higher growth rates for gross value added and productivity. The figures for the period 2012-2013 paint a mixed picture. Obviously, the general effects found for the programming period 2000-2006 continue during the first two years of the subsequent period.

Figure 6: Annual growth rates for the period 2000-2013



Note: The bars for year t present the growth rate from year t to t+1.

Sources: Statistical offices of the Federation and the Federal States; own calculation and illustration.

Since our analysis is conducted at a relatively small-scale regional level, we have to take into account potential interactions between a region and its neighbors. Regarding the neighbors, we distinguish between regions that were also treated within the GRW framework and non-treated regions. The influence of mutual interactions may differ between both categories. Whereas interactions to non-treated regions may reduce the effect of GRW subsidies in the supported region, the influence of other treated regions is not clear. To control for inter-regional spillovers, we introduce two dummy variables for each region in the regression model, one for the existence of treated neighbor and one for the existence of a non-treated neighbor.

Table 4: Estimation results including potential inter-regional spillovers

	Employment	Wage sum	Gross value added	GVA/employee
<i>Funding period 2000-2006</i>				
Treatment	-0.00494 (0.0129)	-0.0159 (0.0167)	0.0513** (0.0220)	0.0567*** (0.0176)
Treated neighbor	-0.00334 (0.00550)	-0.00760 (0.00813)	-0.00505 (0.0119)	-0.000923 (0.0107)
Non-treated neighbor	0.00566 (0.00844)	-0.0149 (0.0125)	0.00368 (0.0142)	-0.00375 (0.0143)
Constant	-0.00803 (0.0136)	0.0571*** (0.0185)	0.0856*** (0.0223)	0.0950*** (0.0184)
adjusted R^2	0.143	0.226	0.0705	0.00772
<i>Funding period 2007-2013</i>				
Treatment	0.0152 (0.0165)	0.0223 (0.0325)	-0.0109 (0.0338)	-0.0247 (0.0264)
Treated neighbor	0.00665 (0.00706)	0.0133 (0.0142)	-0.00376 (0.0145)	-0.0112 (0.00969)
Non-treated neighbor	-0.0186 (0.0116)	-0.0115 (0.0223)	-0.0265 (0.0226)	-0.00441 (0.0143)
Constant	0.0427*** (0.0158)	0.159*** (0.0283)	0.153*** (0.0281)	0.104*** (0.0221)
adjusted R^2	0.0781	0.0516	0.00255	0.0328

Notes: Robust standard errors in parentheses; Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Model specification: 3rd order polynomial of the eligibility score; no constraints (coefficients omitted).

Sources: Statistical Offices of the Federation and the Federal States; Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); matrix of neighboring regions: BBSR; own calculation.

As we can see in Table 4, the estimation results do not change, and we find no hint for an influence of inter-regional spillovers - neither to treated nor to non-treated regions.

In a next step, in line with Becker, Egger, and von Ehrlich (2010), we assess the net effect of a € 1 GRW subsidy.⁷ This calculation provides some information on the efficiency of the program. We use the outcomes with significant treatment coefficients, namely output and productivity growth in the first programming period. Table 5 summarizes the calculation steps.

⁷ The assumptions of this estimation are discussed in footnote 28 in Becker, Egger, and von Ehrlich (2010, p. 589).

Table 5: Effect of € 1 GRW subsidy

	Output	Productivity
Estimated coefficients	0.0514	0.0561
Effect per annum (percentage points)	0.86	0.93
Level values the year 2000 (Euro)	3,350,870,000.00	42,680.00
Effect per annum in the average region (Euro)	28,705,786.33	399.06
Total GRW costs per annum (Euro)	194,929,566.00	
Total GRW costs per annum per region (Euro)	2,030,516.00	
Net effect (effect-costs-ratio) per annum	14.137188	0.000197

Sources: GRW expenditures: BAFA (2015); own calculation.

The coefficients of the estimated influence of GRW on the growth of gross value added (output) and the gross value added per employee (productivity) are the starting point. In case of gross value added, for instance, the coefficient is 0.0514 (column 3 in Table 3). That means output growth in treated regions is 5.14 percentage points above the non-treated regions during the programming period 2000-2006. Thus, the average effect of GRW on the growth of gross value added per annum is about 0.86 percentage points (5.14 percentage points/6 years), or 0.0086.

At the beginning of the observation period, the output level in the average treated region is about € 3.35 billion (Table 2). Hence, GRW treatment causes the gross value added to rise by about € 28.7 million in a treated region.

The total costs of GRW per annum are about € 195 million for all treated regions, and about € 2 million for the average treated region (Table 1). Relating the effect and the costs of GRW per annum for the average region, we may conclude that the net effect of GRW subsidies on the growth of output is about 14. In other words, € 1 expenditure for regional investment subsidies yields € 14 additional output per annum in the average treated region. Accordingly, the net effect of € 10,000 regional investment subsidies on the growth of productivity (gross value added per employee) is about € 2 per annum in the average treated region.

4.3 Robustness checks

Beyond potential spillovers to neighbor regions, we scrutinize our identifying assumptions and the robustness of our results in this section. First, we check whether factors that may also affect the growth rate of the outcomes follow a ‘smooth’ trend at the cut-off. Any jumps at the threshold in these controls would cast doubt on the validity of the regression-discontinuity-design.

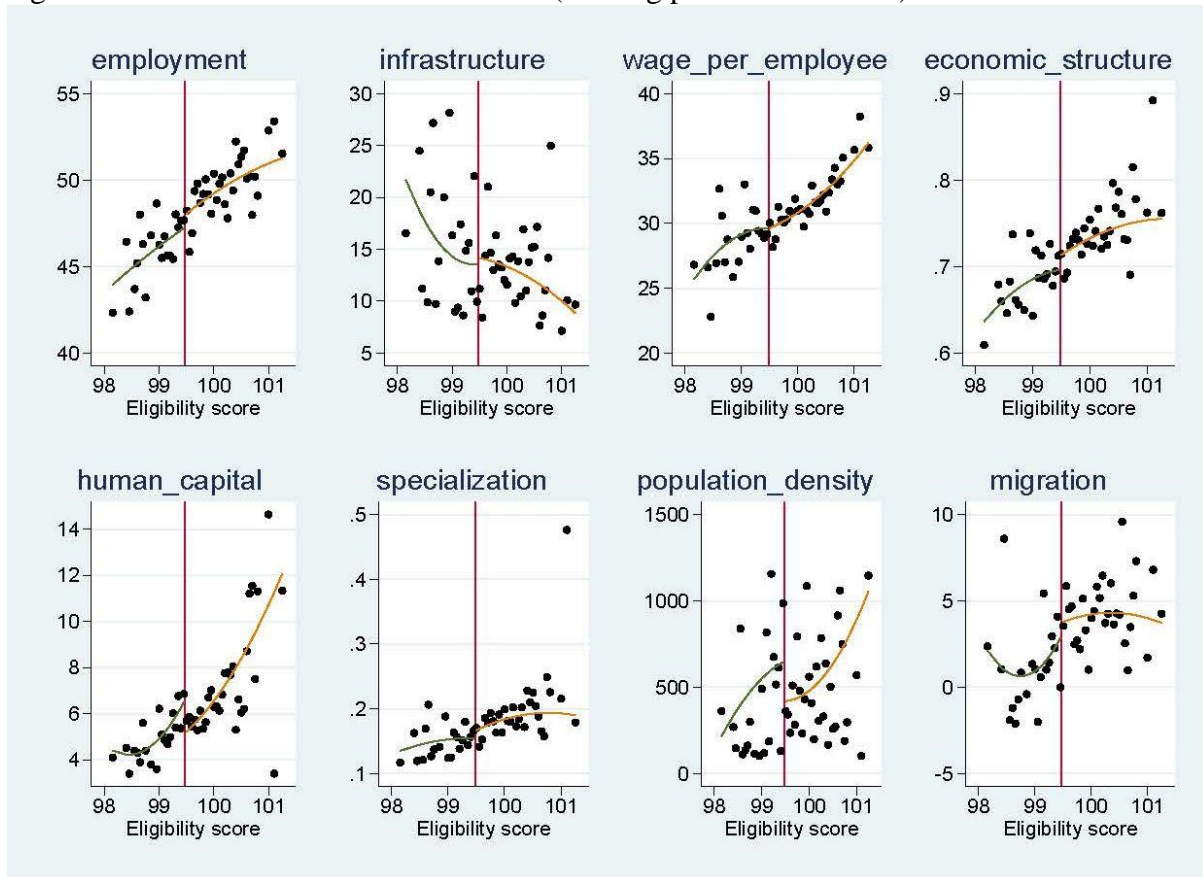
For the robustness analysis, we use several regional control variables which are selected to capture potential influences on the assignment status (in our case the eligibility score) of a region. We observe all covariates for the years before the treatment. First, we consider a set of controls that is typically recognized as indicators for the level of regional economic development: the rate of employment and gross wages per employee. Both variables are provided in the database ‘Indicators, Maps and Graphics on Spatial and Urban Monitoring (INKAR)’. A second set of controls is associated with the regional endowment of production factors, namely the quality of infrastructure (data stem from the INKAR database), the share of high qualified employees as a proxy for human capital and migration as proxy for future work force. Data for the latter two variables are taken from the statistics of the German Federal Employment Agency (BA). A third set of variables is addressed to sectoral structures and issues of agglomeration economies. Within this category of controls we take into account that some industries are excluded from receiving investment subsidies according to the EU legislatives. This mainly applies to the industries of the primary sector but also to selected industries of the manufacturing (e. g. chemical fibers, building of ships etc.) and the service sector. Therefore, we control for the share of employment in eligible sectors in a region. Information on the eligibility of industries is provided by the German Federal Office for Economic Affairs and Export Control (BAFA). Data on sectoral employment is taken from the BA dataset. We also address issues of agglomeration economies by considering regional

specialization that is measured with the help of the Herfindahl-Index. This indicator is calculated at the level of divisions within the manufacturing section C (2-digit level, including the share of each division number in the range from 15 to 37 of the Classification of Economic Activities, Edition 2003 [WZ 2003] on total manufacturing employment).⁸ Finally, we consider the population density. Data stem from the BA dataset. Appendix 2 contains the descriptive statistics for all controls.

The following Figures 7 and 8 report control values in the year prior to the funding period (1999, and 2006 respectively), summarized in equally sized bins of 0.05. Similar figures for mean control values for the three years before funding starts (1997-1999 and 2004-2006) yield very similar figures. The fitted lines represent 3rd order polynomials.

⁸ Specialization is measured for the industries of the manufacturing sector because the lion's share of GRW grants is allocated within this sector. This does not imply that this instrument is solely addressed to the manufacturing sector. Quite the contrary, investment subsidies within the GRW framework are not restricted to a specific industry. The requirement for the eligibility is the criterion of „supra-regional sales“ – the applying firm has to sell its goods or services outside a radius of 50 km from the production location. This characteristic is also fulfilled by many industries of the service sector. Nevertheless, the number and the amount of investment projects in the manufacturing sector are larger in comparison with the service sector.

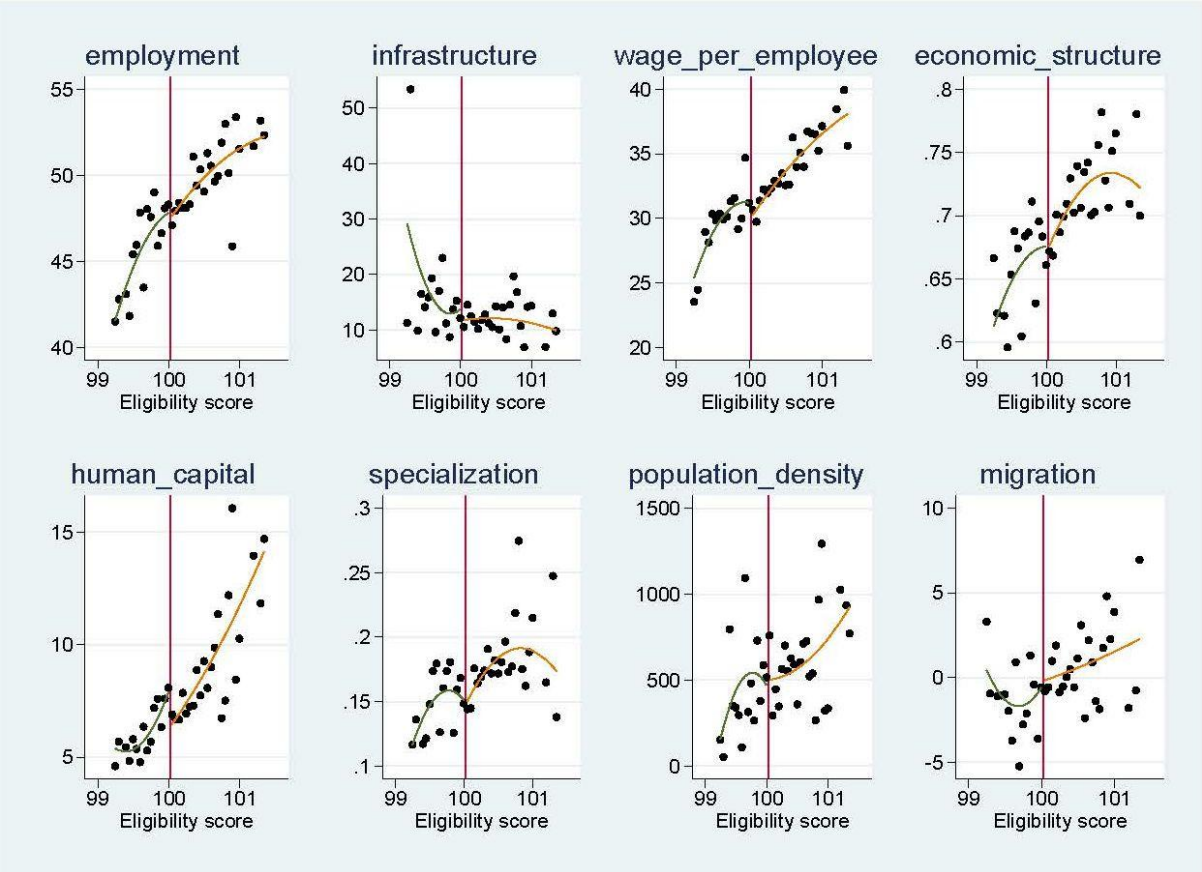
Figure 7: Control variables near the cutoff (funding period 2000-2006)



Note: The figure shows averages of the period growth rates in equally sized bins of 0.05. The fitted lines represent a 3rd order polynomial of the dots.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); regional controls: INKAR dataset, German Federal Employment Office; own calculation.

Figure 8: Control variables near the cutoff (funding period 2007-2013)



Note: The figure shows averages of the period growth rates in equally sized bins of 0.05. The fitted lines represent a 3rd order polynomial of the dots.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); regional controls: INKAR dataset, German Federal Employment Office; own calculation.

We find hints for small discontinuities in case of human capital and, in the first funding period, for population density in our graphical analysis. To assess this important issue in a more thorough manner, we use the estimation model (see equations 1 and 2) to regress the controls on the eligibility score. Reassuringly, we cannot find any statistically significant coefficient for the eligibility score in any of the eight regressions presented in Table 6.

Table 6: Robustness check: Estimation results for the controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Funding period 2000-2006</i>								
Treatment	-1.036	-0.784	-0.268	-0.0144	1.031	-0.0140	272.2	-0.0356
	(0.929)	(3.232)	(1.144)	(0.0181)	(0.758)	(0.0146)	(197.8)	(1.947)
adjusted R^2	0.249	0.0145	0.268	0.122	0.334	0.0578	0.0156	0.0903
<i>Funding period 2007-2013</i>								
Treatment	0.395	2.158	1.871	0.0178	1.573	0.0172	-50.25	-0.0240
	(1.335)	(3.556)	(1.508)	(0.0226)	(1.242)	(0.0170)	(291.2)	(1.708)
adjusted R^2	0.238	0.0514	0.329	0.125	0.286	0.0563	0.00648	0.0427

Notes: Notes: (1) Employment rate; (2) Infrastructure; (3) Wage sum p.a. per employee; (4) Share of sectors eligible for GRW; (5) Human capital; (6) Specialization; (7) Population density; (8) Migration. Robust standard errors in parentheses; Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Results of estimations with polynomials of 3rd order; Coefficients of the eligibility score omitted.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); regional controls: INKAR dataset, German Federal Employment Office; own calculation.

Furthermore, the validity of estimation results depends on whether the chosen model provides an adequate description of the connection between outcome and forcing variable at the cutoff (Angrist and Pischke 2009). We apply different strategies to check the sensitivity of the estimation results to potential deviations from the ‘correct’ model. We verify the sensitivity of the results to the inclusion of additional variables, check different polynomial functions for the score, and include different data ranges. Table 7 summarizes the results.

Part (I) of Table 7 presents the results for the regressions if we include the above mentioned controls (equations 1 and 2 with a polynomial of 3rd order for the eligibility score). We cannot find any change of the estimated treatment effects - neither for the first programming period nor for the second one. Full estimation results are included in Appendix 3. Part (II) of Table 7 shows robust results with respect to the choice of the polynomial.

Additionally, we restrict the value range of the eligibility score around the cut-off to contrast the regression approach with a kind of local linear regression as discussed in Lee and Lemieux (2010). The results are presented in Part (III) of Table 7. In a relatively broad

bandwidth, we include all regions within the double standard deviation around the cutoff (including score values between 98.11 and 100.85 for the first funding period, and between 99.089 and 100.95 for the second). A narrow bandwidth defines the data range according to the standard deviation around the cutoff (including score values between 98.79 and 100.17, and 99.56 and 100.49, respectively). A third bandwidth excludes ‘the outliers’ at the boundaries, resulting in data ranges from 98.9 to 100.55, and 99.55 to 100.55 for the two funding periods. It turns out that the results are in range to the results for the whole sample. To sum up, the results of the reliability and robustness checks provide strong evidence for the validity of our identification strategy.

Table 7: Further robustness checks

	Employment	Wage sum	Gross value added	GVA/employee
(I) Estimation including controls				
<i>Funding period 2000-2006</i>				
Treatment	-0.00143 (0.0120)	-0.0120 (0.0170)	0.0549** (0.0221)	0.0558*** (0.0182)
Constant	0.164*** (0.0596)	0.101 (0.0826)	0.141 (0.138)	-0.0543 (0.121)
adjusted R^2	0.287	0.279	0.103	0.0640
<i>Funding period 2007-2013</i>				
Treatment	0.0163 (0.0143)	0.0337 (0.0270)	-0.00328 (0.0323)	-0.0191 (0.0255)
Constant	-0.0947 (0.0622)	0.309*** (0.116)	0.135 (0.111)	0.241*** (0.0858)
adjusted R^2	0.154	0.170	0.0771	0.109
(II) Estimation using different polynomials				
<i>Funding period 2000-2006</i>				
<i>4th order polynomial</i>				
Treatment	-0.0156 (0.0143)	-0.0247 (0.0182)	0.0495** (0.0235)	0.0669*** (0.0185)
Constant	0.00293 (0.0108)	0.0420*** (0.0127)	0.0891*** (0.0163)	0.0856*** (0.0128)
adjusted R^2	0.148	0.220	0.0717	0.00680
<i>5th order polynomial</i>				
Treatment	-0.0108 (0.0145)	-0.00813 (0.0199)	0.0496** (0.0231)	0.0625*** (0.0198)
Constant	-0.00559 (0.00915)	0.0351*** (0.0113)	0.0816*** (0.0152)	0.0874*** (0.0120)
adjusted R^2	0.174	0.224	0.0745	0.00244
<i>Funding period 2007-2013</i>				
<i>4th order polynomial</i>				
Treatment	0.0151 (0.0122)	0.00957 (0.0224)	-0.0123 (0.0269)	-0.0280 (0.0229)
Constant	0.0316*** (0.00921)	0.167*** (0.0139)	0.127*** (0.0162)	0.0925*** (0.0150)
adjusted R^2	0.0666	0.0592	-0.00222	0.0290
<i>5th order polynomial</i>				
Treatment	0.0178 (0.0146)	0.00357 (0.0272)	-0.0113 (0.0345)	-0.0307 (0.0283)
Constant	0.0333*** (0.0108)	0.180*** (0.0173)	0.132*** (0.0207)	0.0965*** (0.0169)
adjusted R^2	0.0628	0.0809	-0.00221	0.0257

Table 7 (continued):

	Employment	Wage sum	Gross value added	GVA/employee
(III) Estimation using varying bandwidths around the cutoff				
<i>Funding period 2000-2006</i>				
<i>broad (2* Standard deviation)</i>				
Treatment	-0.0115 (0.0138)	-0.0207 (0.0175)	0.0538** (0.0223)	0.0669*** (0.0174)
Constant	-0.000773 (0.0110)	0.0407*** (0.0135)	0.0821*** (0.0171)	0.0825*** (0.0133)
adjusted R ²	0.121	0.182	0.0753	0.0138
Observations	301	299	300	300
<i>narrow (1* Standard deviation)</i>				
Treatment	-0.00654 (0.0132)	-0.0134 (0.0175)	0.0532** (0.0220)	0.0605*** (0.0181)
Constant	-0.00736 (0.00923)	0.0349*** (0.0113)	0.0803*** (0.0161)	0.0883*** (0.0122)
adjusted R ²	0.0458	0.0817	0.0505	0.0135
Observations	201	201	201	201
<i>data driven (excluding outliers)</i>				
Treatment	-0.0151 (0.0151)	-0.0184 (0.0198)	0.0470** (0.0235)	0.0635*** (0.0198)
Constant	-0.00436 (0.00992)	0.0359*** (0.0121)	0.0782*** (0.0161)	0.0830*** (0.0134)
adjusted R ²	0.0985	0.159	0.113	0.0274
Observations	251	249	250	250
<i>Funding period 2007-2013</i>				
<i>broad (2* Standard deviation)</i>				
treatment	0.0228 (0.0159)	0.0308 (0.0297)	0.000859 (0.0312)	-0.0236 (0.0249)
Constant	0.0286** (0.0119)	0.158*** (0.0176)	0.122*** (0.0186)	0.0909*** (0.0156)
adjusted R ²	0.0554	0.0645	0.0282	0.00435
Observations	298	296	297	297
<i>narrow (1* Standard deviation)</i>				
Treatment	0.0304** (0.0153)	0.0323 (0.0287)	0.00189 (0.0341)	-0.0305 (0.0280)
Constant	0.0264** (0.0112)	0.166*** (0.0178)	0.125*** (0.0211)	0.0965*** (0.0169)
adjusted R ²	-0.0361	0.0390	-0.0142	-0.00665
Observations	209	207	208	208
<i>data driven (excluding outliers)</i>				
Treatment	0.0321** (0.0161)	0.0322 (0.0304)	0.0136 (0.0366)	-0.0216 (0.0297)
Constant	0.0236** (0.0119)	0.159*** (0.0188)	0.116*** (0.0220)	0.0906*** (0.0178)
adjusted R ²	-0.0565	-0.0234	-0.0165	0.00819
Observations	229	227	228	228

Notes: Robust standard errors in parentheses; Significance level: *** p<0.01, ** p<0.05, * p<0.1. Model specification for (I) and (III): 3rd order polynomial of the eligibility score no constraints (coefficients omitted).

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); regional controls: INKAR dataset, German Federal Employment Office; own calculation.

5 Summary and conclusion

This paper explores causal effects of the most important regional policy scheme in Germany. It provides grants for investment projects in lagging behind regions to trigger endogenous growth potentials. The overarching goal of this program is the reduction of regional disparities between German regions.

The allocation of regional grants is organized according to the legislatives of the EU: the number of assisted regions must be significantly lower than those which do not receive transfers. For this reason, the EU arbitrarily defines a threshold for the share of population living in assisted regions. For the programming period 2000-2006 this share was fixed to 40.7 percent and for the subsequent period 2007-2013 to 40.2 percent respectively. These shares are broken down to Member States of the EU.

In Germany the determination of eligible regions is made according to a composite score that is computed before the programming period starts. The regions are ordered according to their score, and there is exactly one region where this German population share is reached. This rule gives rise to a regression discontinuity design. It exploits the jump in the probability of the eligibility status for regions representing nearly identical scores.

The analysis is focused on West German regions and the programming periods 2000-2006 and 2007-2013. In the majority of cases this rule is strictly applied: 93% (2000-2006) and 84% (2007-2013). The rest of the regions did not receive funds although they were formally eligible or obtained investment grants although these regions were not formally eligible. Against this backdrop we applied a fuzzy regression-discontinuity-design, where the treatment status is instrumented with the assignment status within a 2SLS estimation procedure.

Our results can be summarized as follows. We find a positive effect of regional investment subsidies on the growth of gross value added and productivity by about 5% in the programming period 2000-2006. We find no effect on the growth of regional employment and personal income for this period. Regarding the programming period 2007-2013 the results are insignificant at all. We attribute this result to massive governmental interventions to stabilize the German economy in the aftermath of the financial crisis that took place during that period. Total expenditures for these short-term programs amount to € 176 billion in the period 2009-2012 while only € 6 billion were spent within the regional investment program framework. However, for the period 2007-2009 we observe effects that are in line with our findings for the period 2000-2006.

Regarding the effects found for the period 2000-2006 the investment support scheme obviously improved the competitiveness of treated regions close to the cut-off. However, these regions were not capable to transform their gains in competitiveness into significant employment growth. This finding is in line with some theoretical considerations where investment support schemes might distort the production structure towards an inefficient factor allocation. In other words, labor is substituted with capital. Finally, we estimated the net effect of this program for the first programming period under analysis. We find that € 1 expenditures for regional investment subsidies yield € 14 additional output per annum in the average treated region. Accordingly, the net effect of € 10,000 regional investment subsidies on the growth of productivity is about € 2 per annum in the average treated region.

References

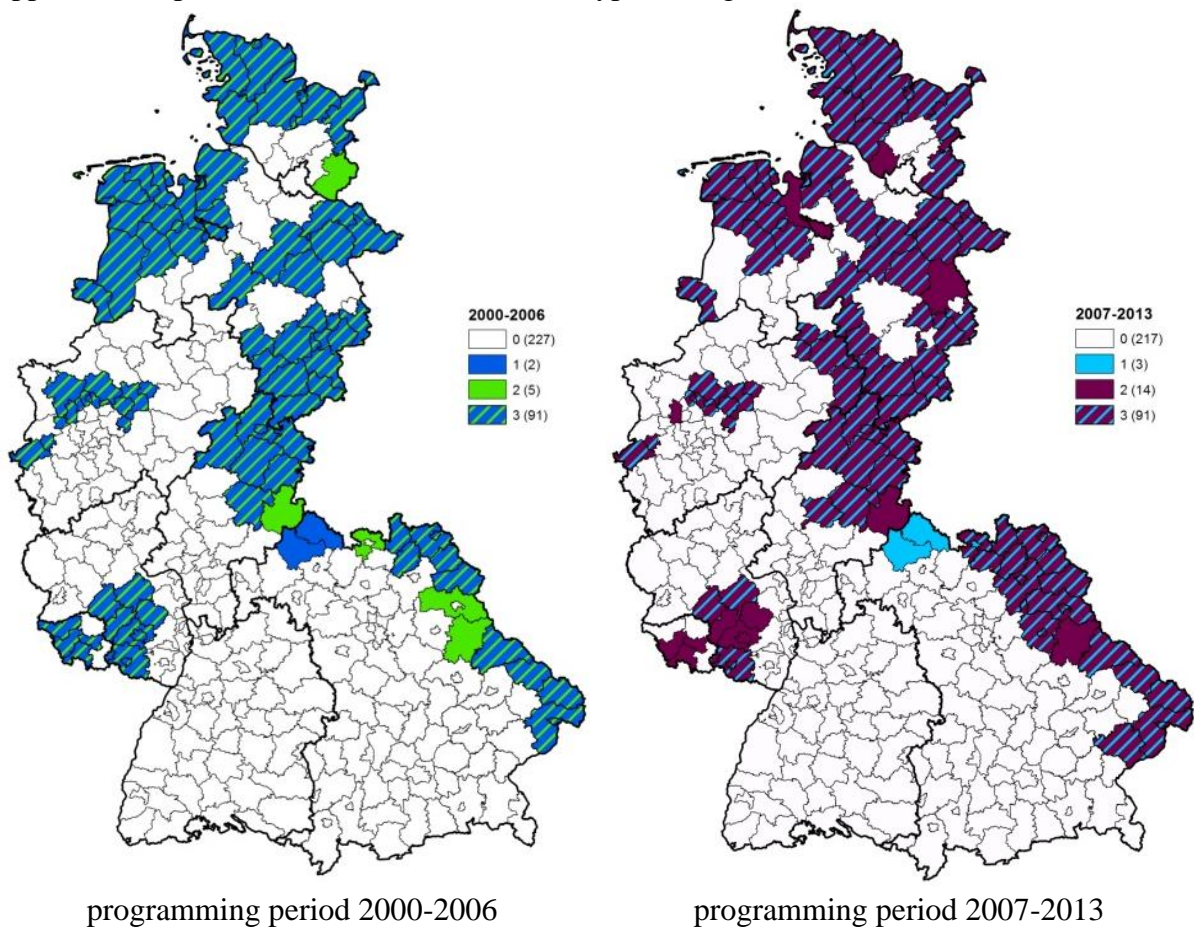
- Angrist, J. D. and J.-S. Pischke (2009): *Mostly Harmless Econometrics*. Princeton, New Jersey: Princeton University Press.
- BA, German Federal Employment Office: *Employment Statistics*.
- Bade, F.-J. (2013): *Bedeutung und Wirksamkeit der Förderung größerer Unternehmen durch den gewerblichen Investitionszuschuss im Rahmen der Gemeinschaftsaufgabe „Verbesserung der regionalen Wirtschaftsstruktur“* (GRW). Tech. rep. BMWi.
- Bade, F.-J. and B. Alm (2010): *Endbericht zum Gutachten Evaluierung der Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur (GRW) durch einzelbetriebliche Erfolgskontrolle für den Förderungszeitraum 1999-2008 und Schaffung eines Systems für ein gleitendes Monitoring*. BMWi Research Report. access: 2015-01-07. Bundeswirtschaftsministerium. url: <http://www.bmwi.de/DE/Mediathek/Publikationen/publikationenarchiv,did=376256.html>.
- BAFA, German Federal Office for Economic Affairs and Export Control (2015): *Statistik der Gemeinschaftsaufgabe "Verbesserung der regionalen Wirtschaftsstruktur", Bewilligungsbescheide seit 1991*, Eschborn, den 8.6.2015.
- Becker S., Egger P., von Ehrlich, M. (2013): *Absorptive capacity and the growth and investment effects of regional transfers: a regression discontinuity design with heterogeneous treatment effects*. In: *American Economic Journal: Policy* 5, pp. 29-77.
- Becker, S., Egger P., von Ehrlich, M. (2012): *Too much of a good thing? On the growth effects of the EU's regional policy*. In: *European Economic Review* 56, pp. 648-668.
- Becker, S., P. H. Egger, and M. von Ehrlich (2010): *Going NUTS: the effect of EU Structural Funds on regional performance*. In: *Journal of Public Economics* 94, 9-10, pp. 578–590.
- Bernini, C. and G. Pellegrini (2011): *How are growth and productivity in private firms affected by public subsidy? Evidence from a regional policy*. In: *Regional Science and Urban Economics* 41, pp. 253–265.
- Bronzini, R. and G. de Blasio (2006): *Evaluating the impact of investment incentives: The case of Italy's Law 488/1992*. In: *Journal of Urban Economics* 60, pp. 327–349.
- Bundesregierung (1969): *Gesetz über die Gemeinschaftsaufgabe "Verbesserung der regionalen Wirtschaftsstruktur" (GRW-Gesetz)*. Bundesgesetzblatt I S. 1861. zuletzt geändert 2007 (BGBl I S. 2246). Bundesregierung.

- Ciani, E., de Blasio, G. (2015) European structural funds during the crisis: evidence from Southern Italy. *IZA Journal of Labor Policy* 4, 20.
- Criscuolo, C., R. Martin, H. Overman, and J. van Reenen (2012): The causal effect of an industrial policy. NBER Working Paper 17842. Cambridge: National Bureau of Economic Research.
- Devereux, M., Griffith, R., Simpson, H. (2007): Firm location decisions, regional grants and agglomeration externalities. In: *Journal of Public Economics* 91, pp. 413-435.
- Eckey, H.-F. (2008): Verbesserung der regionalen Wirtschaftsstruktur. Gesetz über die Gemeinschaftsaufgabe vom 6. Oktober 1969. In: *Handbuch der regionalen Wirtschaftsförderung*. Ed. by H. H. Eberstein, H. Karl, and G. Untiedt. Vol. 1. Köln: Otto Schmidt Verlag. Chap. V.
- Ehrlich, M. v.; Seidel, T. (2015): The Persistent Effects of Place-Based Policy: Evidence from the West-German Zonenrandgebiet. CESifo Working Paper No. 5373 (May 2015).
- Falck, O., Heblich, S., Kipar, S. (2010): Industrial innovation: direct evidence from a cluster-orientated policy. In: *Regional Science and Urban Economics* 40, pp. 574-582.
- Glaeser, E., Gottlieb, J. (2008): The economics of place-making policies. *Brookings Papers on Economic Activity*, Spring, pp. 155-239.
- Hahn, J., P. Todd, and W. van der Klaauw (2001): Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design. In: *Econometrica* 69.1, pp. 201–209.
- Imbens, G. W. and T. Lemieux (2008): Regression discontinuity designs: A guide to practice. In: *Journal of Econometrics* 142.2, pp. 615–635.
- IWH, Leibniz-Institut für Wirtschaftsforschung Halle (IWH), Kiel Economics (ed.): Ökonomische Wirksamkeit der konjunkturstützenden finanzpolitischen Maßnahmen der Jahre 2008 und 2009. Forschungsvorhaben im Auftrag des Bundesministeriums der Finanzen. IWH Online 4/2015. Halle (Saale) 2015.
- Kline, P. and Moretti, E. (2014) People, places and public policy. Some simple welfare economics if local economic development programs, *Annual Review of Economics*, 6, pp. 629-662.
- Kline, P., Moretti, E. (2014): Local economic development, agglomeration economies, and the big push: 100 years of evidence from the Tennessee Valley Authority. In: *Quarterly Journal of Economics* 129, pp. 275-331.
- Koller, Martin; Schiebel, Winfried; Schwengler, Barbara (2000): Neuberechnung der Regionalindikatoren zur Neuabgrenzung der Fördergebiete (Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur). Project Number 502. Policy Consulting Report.

- Lee, D. S. and T. Lemieux (2010): Regression Discontinuity Design in Economics. In: Journal of Economic Literature 48.2, pp. 281–355.
- Martin, P., Mayer, T., Mayneris, F. (2011): Public support to clusters. A firm level study of French “Local Productive Systems”. In: Regional Science and Urban Economics 41, pp. 108-123.
- Mayer, T., Mayneris, F., Py, L. (2015): The impact of Urban Enterprise Zones on establishment location decision and labor market outcomes: evidence from France. In: Journal of Economic Geography (forthcoming).
- McCrary, J. (2008): Manipulation of the running variable in the regression discontinuity design: A density test. In: Journal of Econometrics 142, pp. 698–714.
- Moretti, E. (2010): Local Labor Markets. In: Card, D., Ashenfelter, O. (Eds.), Handbook of Labor Economics, Volume 4B. Elsevier, Amsterdam.
- Neumark, D., Kolko, J. (2010): Do enterprise zones create jobs? Evidence from California’s enterprise zone program. In: Journal of Urban Economics 68, pp. 1-19.
- Neumark, D., Simpson, H. (2014): Place-Based Policies. NBER Working Paper 20049.
- Pellegrini, G. and M. Cetra (2006): Growth and efficiency in subsidized firms. In: Workshop ‘The Evaluation of Labour Market, Welfare and Firms Incentive Programmes’. Istituto Veneto di Scienze, Lettere ed Arti. Venezia.
- Schwengler, B.; Binder, J. (2006): Lösungsansatz zum Gewichtungproblem der Förderindikatoren beim Übergang zu einem gesamtdeutschen Modell (in English: Solutions for the weighting problem of regional aid indicators when changing to one model for Germany). In: Raumforschung und Raumordnung 4, pp. 284-298.
- Stierwald, A. and J. Wiemers (2003): Auswirkungen der Gemeinschaftsaufgabe zur "Verbesserung der regionalen Wirtschaftsstruktur" auf die Investitionsfähigkeit. Eine einzelwirtschaftliche Wirkungsanalyse für Betriebe des Verarbeitendes Gewerbes in Ostdeutschland. Diskussionspapier 185. Institut für Wirtschaftsforschung Halle.
- Wooldridge, J. M. (2010): Econometric Analysis of Cross Section and Panel Data. 2nd. Cambridge, Massachusetts: MIT Press.

Appendix

Appendix 1: Spatial allocation of the different types of regions



Notes: Figures in parentheses represent the number of regions. Type = 0: assignment status = treatment status = 0; Type = 1: assignment status = 1, treatment status = 0; Type = 2: assignment status = 0, treatment status = 1; Type = 3: assignment status = treatment status = 1.

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); formal eligibility status: coordination frameworks (see Appendix 4); treatment status: BAFA (2015); own illustration.

Appendix 2: Descriptive statistics of the controls

	<u>Non-treated regions</u>			<u>Treated regions</u>		
	Mean	Min	Max	Mean	Min	Max
<i>Level values before the period 2000-2006</i>						
Employment rate	49.71	38.80	55.10	46.62	39.20	56.70
Infrastructure ⁽¹⁾	12.41	0.40	43.09	14.60	1.32	66.68
Wage per employee ⁽²⁾	31.83	23.32	43.90	29.14	21.59	49.34
Economic structure ⁽³⁾	7.71	3.00	22.80	5.35	2.70	11.80
Human capital ⁽⁴⁾	0.73	0.52	0.89	0.69	0.55	0.89
Specialization ⁽⁵⁾	0.18	0.10	0.48	0.16	0.10	0.41
Population density	590.60	77.47	3847.58	510.65	42.71	3416.84
Migration	4.30	-15.40	18.40	2.26	-13.60	13.70
Observations		229			96	
<i>Level values before the period 2007-2013</i>						
Employment rate	49.85	36.50	56.10	46.18	38.90	55.40
Infrastructure ⁽¹⁾	12.14	0.40	41.15	13.91	1.32	64.29
Wage per employee ⁽²⁾	33.51	22.44	53.21	30.35	21.39	41.08
Economic structure ⁽³⁾	8.92	3.60	27.20	6.44	3.30	16.80
Human capital ⁽⁴⁾	0.71	0.50	0.89	0.66	0.48	0.84
Specialization ⁽⁵⁾	0.18	0.09	0.48	0.15	0.11	0.34
Population density	580.44	58.67	4169.83	534.83	41.72	3306.57
Migration	0.58	-20.80	36.30	-1.12	-9.30	8.00
Observations		220			105	

Notes: Notes: (1) Travel time to next motorway in minutes; (2) in € 1000; (3) share of sectors eligible to GRW subsidies; (4) share of high qualified employees; (5) Herfindahl index.

Sources: INKAR dataset, German Federal Employment Office; own calculation.

Appendix 3: Estimation results including control variables

	Employment	Wage sum	Gross value added	GVA/employee
<i>Funding period 2000-2006</i>				
Treatment	-0.00143 (0.0120)	-0.0120 (0.0170)	0.0549** (0.0221)	0.0558*** (0.0182)
Employment	-0.00285*** (0.00100)	-0.00406*** (0.00157)	-0.00461** (0.00225)	-0.00125 (0.00182)
Infrastructure	-0.000875*** (0.000248)	-0.000781* (0.000417)	-0.000424 (0.000585)	0.000593 (0.000436)
Wage/employee	-0.000818 (0.00134)	0.00275** (0.00138)	0.00157 (0.00217)	0.00235 (0.00261)
Human capital	0.00104 (0.00124)	0.000520 (0.00178)	-0.000693 (0.00259)	-0.00165 (0.00224)
Economic structure	0.0114 (0.0711)	0.0710 (0.100)	0.147 (0.146)	0.147 (0.109)
Specialization	-0.0563 (0.0763)	0.0729 (0.119)	0.0975 (0.245)	0.143 (0.195)
Pop. density	-1.49e-05*** (3.90e-06)	-2.24e-05*** (5.71e-06)	-7.43e-06 (8.53e-06)	9.18e-06 (7.79e-06)
Migration	0.00110* (0.000572)	0.00119 (0.000827)	0.00300** (0.00141)	0.00165 (0.00117)
Constant	0.164*** (0.0596)	0.101 (0.0826)	0.141 (0.138)	-0.0543 (0.121)
adjusted R^2	0.287	0.279	0.103	0.0640
<i>Funding period 2007-2013</i>				
Treatment	0.0163 (0.0143)	0.0337 (0.0270)	-0.00328 (0.0323)	-0.0191 (0.0255)
Employment	-8.44e-05 (0.000998)	-0.000241 (0.00176)	0.00179 (0.00189)	0.00179 (0.00144)
Infrastructure	-9.84e-05 (0.000274)	-0.00114** (0.000546)	-0.000630 (0.000501)	-0.000460 (0.000389)
Wage/employee	0.000854 (0.00135)	-0.00736** (0.00293)	0.000191 (0.00235)	-0.000900 (0.00133)
Human capital	0.000789 (0.00117)	0.00127 (0.00223)	-0.00453** (0.00224)	-0.00515*** (0.00177)
Economic structure	0.179*** (0.0638)	0.102 (0.128)	-0.116 (0.118)	-0.301*** (0.0885)
Specialization	-0.0946 (0.0941)	0.171 (0.189)	0.183 (0.206)	0.262* (0.139)
Pop. density	-1.21e-05*** (4.38e-06)	-3.82e-06 (8.33e-06)	-2.18e-05** (9.46e-06)	-7.85e-06 (7.17e-06)
Migration	0.00273*** (0.000968)	0.00473*** (0.00157)	0.00467*** (0.00159)	0.00158* (0.000884)
Constant	-0.0947 (0.0622)	0.309*** (0.116)	0.135 (0.111)	0.241*** (0.0858)
adjusted R^2	0.154	0.170	0.0771	0.109

Notes: Robust standard errors in parentheses; Significance level: *** p<0.01, ** p<0.05, * p<0.1. Model specification: 3rd order polynomial of the eligibility score; no constraints (coefficients omitted).

Sources: Scores 2000-2006: Koller, Schiebel, and Schwengler (2000), scores 2007-2013: Eckey (2008); treatment status: BAFA (2015); regional controls: INKAR dataset, German Federal Employment Office; own calculation.

Appendix 4: Relevant coordination frameworks (legal documents)

Coordination framework	Bundestags-Drucksache (reference number)	Date of publication	Period
22. Rahmenplan	12/4850	19.05.1993	1993-1996 (1997)
23. Rahmenplan	12/7175		1994-1997 (1998)
24. Rahmenplan	13/1376	16.05.1995	1995-1998 (1999)
25. Rahmenplan	13/4291	09.04.1996	1996-1999 (2000)
26. Rahmenplan	13/7205	13.03.1997	1997-2000 (2001)
27. Rahmenplan	13/9992	27.02.1998	1998-2001 (2002)
28. Rahmenplan	14/776	19.04.1999	1999-2002 (2003)
29. Rahmenplan	14/3250		2000-2003 (2004)
30. Rahmenplan	14/5600	12.03.2001	2001-2004 (2005)
31. Rahmenplan	14/8463	06.03.2002	2002-2005
32. Rahmenplan	15/861	10.04.2003	2003-2006
33. Rahmenplan	15/2961	22.04.2004	2004-2007
34. Rahmenplan	15/5141	14.03.2005	2005-2008
35. Rahmenplan	16/1790	07.06.2006	2006-2009
36. Rahmenplan	16/5215	27.04.2007	2007-2010
Koordinierungsrahmen	16/13950	08.09.2009	from 2009

Note: All documents are available at the following homepage: <http://pdok.bundestag.de/>.

Source: Own compilation and illustration.