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Welfare Competition in Germany: Decentralization, the Intensity of Competition and some evidence for the factor flow theory

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Abstract

This paper tests empirically for welfare competition between the 439 German counties. The first contribution of this paper is to provide evidence that the intensity of competition is sensitive to the degree of autonomy that local authorities have over their welfare policies. Using a major reform of Germany's welfare system in 2005 we show that the intensity of the strategic interaction has declined due to a move towards a less decentralized administration. Secondly, we discriminate empirically between different theories of welfare competition: We provide evidence that welfare competition in the time after the reform is confined to small, mobile households, suggesting that the strategic interaction is driven by factor-flows. Our results are complementary to those of Revelli (2006b) who argues that the interdependence of expenditure for social service provision in the UK is the result of an informational externality.

Keywords: strategic interaction, welfare competition, Hartz IV, yardstick competition, factor-flow theory

JEL Classification: C31, H72, H77

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1 Introduction

There is by now a large body of literature in public finance which analyzes the strategic interaction amongst local governments. With respect to welfare competition a number of authors have tested empirically whether local governments set their benefit levels inter-dependently (Figlio, Kolpin, and Reid 1999, Saavedra 2000, Brueckner 2001, Dahlberg and Edmark 2004, Fiva and Rattso 2006). By estimating the best-response function of a representative jurisdiction these researchers have found robust evidence that welfare competition emerges if benefits are provided decentrally.

The present paper makes three contributions to this literature. First, we provide evidence that welfare competition occurred in Germany's highly decentralized welfare system that was in place until the Agenda 2010 reforms that the red-green coalition enacted in 2004. Using data on average per-capita expenditure within the social assistance scheme (*Sozialhilfe*) in the years 2000 and 2004 we find strong evidence for welfare competition in the years prior to the reform. To the best of our knowledge this is the first time that such evidence is provided for a country with a conservative welfare model. So far, existing research is confined to countries with a liberal welfare state (Figlio, Kolpin, and Reid (1999), Saavedra (2000) and Brueckner (2001) for the U.S and Revelli (2006b) for the UK) or with a Scandinavian welfare model (Dahlberg and Edmark (2004) for Sweden and Fiva and Rattso (2006) for Norway).¹

Implicit in theoretical accounts of welfare competition (Wildasin 1991) is the prediction that this competition vanishes if welfare benefits were provided by the federal government which internalizes all spill-overs between jurisdictions. More generally, theory suggests that the intensity of competition should be the stronger the larger the influence of local politicians on benefit levels and the larger the share of welfare expenditure that has to be financed locally. While the focus of existing empirical work was mainly on demonstrating that welfare competition emerges if benefits are provided decentrally, the relationship between the degree of decentralization and the intensity of competition has been somewhat neglected.

A second objective of this paper is therefore to identify this relationship empirically. To achieve this aim we use an institutional change of Germany's major welfare assistance scheme (*Sozialhilfe*) in 2005 which reduced the autonomy of local authorities over their welfare policies. In a simple before-after comparison we compare the intensity of competition to the one estimated with the post-reform data. We find that the intensity of competition is smaller after the reform. This result is consistent with the hypothesis that the move towards a less decentralized administration has reduced the intensity of

¹Here we draw on the influential classification of welfare states of (Esping-Andersen 1990) who distinguishes three clusters of welfare states: The 'liberal' regime, typical for the U.S. and Great Britain, which is characterized by very modest welfare entitlements; the 'social-democratic' or 'scandinavian' variant in which welfare benefits are an universal right and the 'conservative' or 'corporate' welfare states in which welfare schemes are predominantly designed to preserve status differentials

competition.

While there now exists some evidence that welfare competition does occur it has been harder to identify the exact channel through which this interaction emerges (Revelli 2005). With respect to welfare competition there are two alternative theoretical accounts which can explain an observed strategic interaction between different jurisdictions. The factor flow theory assumes that the migration decisions of mobile welfare recipients depend on welfare levels in a jurisdiction. Under this theory, generous welfare payments attract recipients from neighboring jurisdictions and thus raise marginal welfare costs. In contrast, the yardstick competition hypothesis assumes that local electorates use the policy enacted in neighboring jurisdictions as a yardstick against which they assess the performance of local incumbents. In this theory it is an 'informational externality' which makes the policy of two jurisdictions interdependent. As both theories give rise to the same empirical model estimation of the best-response function is not sufficient to distinguish between the two.

A third objective of this paper is thus to discriminate empirically between these competing accounts of welfare competition. To this end we employ a rich data set on the welfare benefits administered within Germany's major welfare program Hartz IV. The data set includes monthly data on the average level of housing assistance (*Kosten für Unterkunft und Heizung*) in the 439 German counties (*Kreise and Kreisfreien Städte*) for the time between January 2006 and July 2007. What makes this data set unique is that average benefit levels are available by the size of the receiving household.

Our empirical strategy consists of estimating a jurisdiction's best-response function with respect to benefits provided to households of a given size. If yardstick competition is the sole factor driving the strategic interaction then the reaction function should be independent of household size. On the contrary, if factor-flows contribute at least partially to the interdependence of benefit levels then we should find that competition is more intense with respect to small households which are more mobile and also require higher expenditure in per-capita terms.

Since the implementation of the Hartz IV welfare program there has been at least anecdotal evidence (Eberhardt 2007) that the German counties choose the level of housing assistance strategically to induce welfare recipients to move to other jurisdictions. This suggests that the factor flow theory would explain at least a part of an observed welfare competition in Germany.

Our empirical results are indeed consistent with the hypothesis that factor-flows play a causal role in the welfare competition between the German counties. While our overall evidence for welfare competition in the time after the implementation of the reform is mixed, this evidence is confined to small households as one would expect if factor flows are a driving force of the competition.

This result is complementary to that obtained by Revelli (2006a) in his analysis of welfare competition between English local authorities. Revelli shows that welfare

competition vanished between two consecutive periods and attributes this finding to the establishment of a nationwide performance rating system which serves as a close substitute for comparisons between geographically connected jurisdictions.

The most likely source of the divergent results between his work and mine are differences in the type of welfare expenditures used for the empirical analysis. The present paper looks mainly on cash transfers to a mobile population. In contrast, Revelli considers the provision of welfare services (in-kind transfers) that are likely to benefit more immobile individuals, such as the elderly.

Some other papers have tried to discriminate empirically between different theoretical explanations for an observed spatial auto correlation in fiscal policy variables. Besley and Case (1995), Case (1993), Bordignon, Cerniglia, and Revelli (2003) and Sole-Olle (2003) all provide empirical support for the yardstick competition hypothesis by arguing that the sensitivity of local policy choices to neighboring jurisdictions' policies is dependent on exogenous variations in term-limits or the size of the majority in local parliaments. Evidence for the factor-flow hypothesis comes from Büttner's (2001) analysis of the tax-setting of German municipalities. However, apart from the work of (Revelli 2006b), none of these papers have looked at welfare policies.

The remainder of the paper is organized as follows. Section 2 summarizes the factor-flow and yardstick-competition theories and shows that both give rise to the same empirical specification. Section 3 provides some background on the German welfare system and its reform in 2005 and Section 4 discusses our identification strategy and some econometric issues. Section 5 then presents estimation results before Section 6 considers the robustness of the results. Section 7 concludes.

2 Two theories of welfare competition

The theoretical fiscal federalism literature has advanced a number of theories on why local governments might not set their fiscal policies independently of each other. Revelli (2006b) provides a review of these theories. With respect to welfare competition there are basically two theories that are able to explain an observed spatial interdependence of benefit levels. This section briefly summarizes both competing theories. The exposition follows that of Revelli (2006b) but it is adapted to the area of welfare competition.

The first theory assumes the presence of a mobile factor that local governments either wish to attract or the inflow of which they like to prevent by an appropriately chosen policy. Accordingly, this theory is also referred to as 'factor-flow theory' or the 'constraints interaction hypothesis' (Revelli 2006b).

Within the context of welfare competition this mobile resource is constituted by welfare recipients which are assumed to be mobile across jurisdictions or need at least considered to be mobile by local politicians. In this case the number of welfare recipients in a jurisdiction i , r_i , depends on the average benefit level in that region z_i as well as on

benefit levels in the neighboring jurisdiction z_j and some region specific characteristics $x_i^1 \in \mathbb{R}^m$. Hence, we can write that

$$r_i = r(z_i, z_j, x_i^1) \quad (1)$$

A natural assumption is that increasing benefit levels attracts recipients from other jurisdictions: $\partial r_i / \partial z_i > 0$ and $\partial r_i / \partial z_j < 0$.

Furthermore, it is maintained that utility of a representative agent or median voter in jurisdiction i depends on own consumption as well as on the level of welfare benefits in that region. Consumption is in turn linked to welfare expenditures through the budget constraint; i.e. $c = c(r_i z_i)$. Utility can hence be expressed as

$$u_i = u_i(c(r_i z_i), z_i, x_i^2) \quad (2)$$

where $x_i^2 \in \mathbb{R}^n$ is again a vector of socio-economic characteristics of jurisdiction i . Wildasin (1991) for instance assumes that the non-mobile residents in a jurisdiction are partially altruistic towards the poor, implying that $\partial u_i / \partial z_i > 0$.

If politicians in jurisdiction i choose benefit levels to maximize (2), taking the policy in the neighboring jurisdictions as given, the first-order condition

$$\left(\frac{\partial r_i}{\partial z_i} z_i + r_i \right) c'(r_i z_i) \frac{\partial u_i}{\partial c} + \frac{\partial u_i}{\partial z_i} = 0 \quad (3)$$

describes a reaction-function

$$z_i = z_i(z_j, x_i) \quad (4)$$

where $x_i = (x_i^1, x_i^2) \in \mathbb{R}^{m+n}$. The first-order condition (3) shows that under decentralization the choice of z_i is distorted as politicians anticipate that higher benefit levels attract recipients from other regions. This is captured by the term $(\partial r_i / \partial z_i) z_i$ in (3). Under standard assumptions benefit levels of neighboring jurisdictions are strategic complements; i.e. $\partial z_i / \partial z_j > 0$, implying that equilibrium benefits are lower than under centralization. This nicely represents the concern that the mobility of households can give rise to a 'race to the bottom' in welfare payments.

Another theory which helps explain why welfare levels of neighboring jurisdictions might be interdependent is the so called 'yardstick competition' hypothesis (Besley and Case 1995). This theory does not require welfare recipients to be mobile but assumes that an imperfectly informed local electorate uses the policies enacted in neighboring jurisdictions as a yardstick to obtain a signal about the quality of their local incumbent.

More formally, the yardstick competition theory assumes that the benefit level which recipients in a jurisdiction i are entitled to receive can be written as the sum of a non-stochastic component \bar{z} and a cost shock ϵ_i ; i.e. $z_i = \bar{z} + \epsilon_i$. In the context of this paper the cost shock might for instance arise from the fact that housing prices are higher in some counties which higher welfare expenditure.

Politicians in a region finance welfare expenditures $E_i(z_i) = r_i z_i$ through lump sum taxes. Hence, if there are N tax-payers in a jurisdiction the budget balancing tax-rate is $t_i = E_i/N$. Incumbent politicians can claim that the region experienced a large cost-shock $\tilde{\epsilon}_i > \epsilon_i$. In this case revenue $E(\tilde{z}_i)$ exceeds actual expenditure $E(z_i)$ and office holders appropriate some rents $w_i(\tilde{z}_i) = E(\tilde{z}_i) - E_i(z_i) = r_i(\tilde{z}_i - z_i)$.

Voters cannot observe the cost shock but are able to obtain a signal on whether politicians divert rents by comparing the local policy \tilde{z}_i to that in the neighboring jurisdiction \tilde{z}_j . All that is required for this inference is that cost shocks are correlated between jurisdictions; i.e. $Cov(\epsilon_i, \epsilon_j) > 0$. Under these assumptions, the re-election probability p_i of an incumbent in jurisdiction i depends on relative transfer levels $p_i = p_i(\tilde{z}_i, \tilde{z}_j, x_i)$, where $\partial p_i / \partial \tilde{z}_i < 0$ and $\partial p_i / \partial \tilde{z}_j > 0$.

To see how expenditure levels of neighboring jurisdictions become interdependent it is sufficient to assume that incumbents can stay in office for at least one more period. Office holders choose benefit levels for the present and subsequent period (z_i^0, z_i^1) to maximize their discounted utility

$$u_i = v(w_i(z_i^0)) + p_i(z_i^1, z_j^1, X_i)v(w_i(z_i^1))$$

where $v'(\cdot) > 0$ and $v''(\cdot) < 0$. Upon solving this maximization problem one again finds that benefit levels in jurisdiction i depend on benefit levels in neighboring jurisdictions as in (4).

Having laid out both theoretical accounts of welfare competition we are able to identify two necessary conditions that have to be met in order for strategic interaction in the setting of benefit levels to emerge under either of the two theories: i) local governments must be able to manipulate welfare levels and ii) governments need to have incentives to do so, either because benefit levels affect utility of the median voter in a jurisdiction or because they feed back on the re-election probability of local incumbents. In addition, a prerequisite that applies only to the factor-flow theory is the existence of a mobile resource.

If these conditions are met one can test for the presence of strategic interaction. This is usually done by estimating a reduced-form of the reaction function (4). It is standard to assume this reduced-form to be linear, leading to the following empirical specification:

$$z_{it} = \rho \sum_j w_{ij} z_{jt} + \theta X_{it} + \epsilon_i \quad (5)$$

where w_{ij} represent a set of weights that aggregate the level of housing assistance of competitors of jurisdiction i into a weighted average. The vector X_{it} captures socio-economic characteristics of jurisdiction i that might influence the benefit level in that jurisdiction.

The key parameter of interest in equation (5) is the slope parameter ρ . If local governments set their welfare policies interdependently we expect this parameter to be

non-zero. From our earlier theoretical analysis we would expect ρ to be positive if local governments are engaged in welfare competition.

Note that both theories of welfare competition lead to the same reduced form empirical specification of the reaction function. Without further modeling a resource equation such as (1) or exploiting special features of the available data, estimation of (5) is not sufficient to discriminate between the two theories.

A simple hypothesis that can be derived from both theories of welfare competition concerns the intensity of the strategic interaction. As we have pointed out above, a necessary condition for the emergence of welfare competition is that benefits are administered and financed locally. As a federal government internalizes all fiscal externalities between different jurisdictions only local governments have an incentive to engage in welfare competition under the factor-flow theory. The same holds for the yardstick competition hypothesis where only the performance of local politicians can be assessed by using the policy in other jurisdictions as a yardstick. Accordingly, welfare competition should be intense if welfare benefits are provided decentrally, leading to a positive estimate of the slope parameter ρ in equation (5). In contrast, under a fully centralized system, we should cease to find any evidence for welfare competition.

In between the extreme cases of either pure centralization or complete decentralization the intensity of competition should therefore depend on the degree of decentralization; i.e. the more local politicians can influence benefit levels and the larger the expenditure share that has to be financed at the local level, the more intensive should the competition be.

The subsequent empirical analysis tries to identify this relationship between the degree of decentralization and the intensity of competition by making use of a reform of Germany's welfare system that became effective in 2005. The reform was associated with a move from a completely decentralized administration of a major assistance scheme to a more centralized provision in which welfare payments are jointly administered by the German counties and the federal government.

A second objective of the empirical analysis is to identify the exact channel through which welfare competition between the German counties emerges. This question will be addressed by estimating the best-response function (5) for specific groups of welfare recipients that differ in their degree of mobility. If we find that the intensity of competition is sensitive to the mobility of welfare recipients then we can conclude that factor-flows drive at least a part of the strategic interaction. On the contrary, if we find that the strength of the strategic interaction is independent of the recipient's degree of mobility this evidence would be only consistent with the yardstick competition theory.

Before we take a closer look at the available data and the concrete identification strategy the next section first describes some important features of Germany's welfare system and the reform that became effective in 2005.

3 Institutional Background

In this section we summarize the main features of Germany's welfare system. We begin with a short introduction to the system that was in place until the end of 2004 and then turn to a brief description of the current situation. The aim of this section is to show that the German welfare system exhibits a significant degree of decentralization to make it an ideal testing ground for the various implications of the welfare competition theories that we have identified above.

3.1 Germany's welfare system until 2004

Until 2004 the main welfare programme in Germany was the so called 'social assistance' (*Sozialhilfe*) which, together with the unemployment assistance for the long-term unemployment (*Arbeitslosenhilfe*), constituted the building block of Germany's welfare state. In 2003, two years before the new system became effective, both programmes together covered around 5 million welfare recipients.

In the empirical part of this paper we use data from the social assistance which covered the needs of those who were not entitled to receive benefits from other programs such as the federal unemployment insurance. Typically, individuals who received social assistance had either not contributed long enough to the unemployment insurance or they were classified as being permanently out of the labor force.

The administration of the social assistance lay in the hands of the German counties, the third level of Germany's multi-tiered federal structure, who were also solely responsible for financing the benefits.

In 2004 expenditure for social assistance in Germany amounted to approximately 25,59 billion Euros or roughly 1% of GDP (Statistisches Bundesamt 2004). The bulk of these expenditures took the form of the so called 'living assistance' (*Hilfe zum Lebensunterhalt*) and comprised regular benefits (*laufende Leistungen*) and non-regular benefits. The level of the former was oriented at some standard rates which were determined by state parliaments each year². Table 1 shows these rates for household heads for the years 1999/2000 and 2004/2005. A measure of the standard rates in a given year can then be obtained by calculating the average rate over the first and second half of a year.

Non-regular benefits mainly comprised housing assistance, such as the rent and costs for heating (*Kosten für Unterkunft und Heizung*). We use the German abbreviation (KUH) to refer to this expenditure category.

Total expenditure of a jurisdiction i on social assistance in the time prior to the reform can be written as the sum of regular benefits (REG), non-regular benefits and other expenditure (OTHER). As non-regular benefits comprise mainly housing expenses we obtain

²The new rates became effective on July, 1st each year

$$\text{TOTEXP}_i = \text{REG}_i + \text{KUH}_i + \text{OTHER}_i$$

where other expenditure comprises mainly health care and expenditure for the integration of disabled people into the labor market (Fichtner 2003).

Of importance for the ensuing analysis is the fact that the counties, through their local administrative units, had a substantial degree of discretion in determining actual benefit levels.

For example, the level of housing assistance specified in the law left room to some interpretation as the law code only ascertained that the level of housing assistance must be "appropriate".³

Moreover, while regular benefits were largely defined by the standard rates a local administration could deviate from this rates in exceptional cases when it assessed the needs of a recipient differently.

For the time prior to 2005 we therefore expect strategic interaction in welfare expenditure to occur through the non-regular benefits which constitute the largest expenditure block (Statistisches Bundesamt 2004) and are also most easily manipulated by local administrations due to the fact that the exact level of entitlement is not precisely defined by the law.

3.2 The Agenda 2010 Reform

With the Agenda 2010 reform, which became effective in 2005, this system has undergone some changes.

A first prominent change concerns the unification of the benefit schemes for the long term unemployed (*Arbeitslosenhilfe*) with the social assistance program (*Sozialhilfe*). Since the reform all unemployed individuals whose unemployment spell lasts longer than 12 to 18 month and their household members receive transfers through a common 'basic assistance' programme (*Grundsicherung für Arbeitslose*). This system is reminiscent to the former social assistance and also comprises almost all of its former members. The second part of the empirical analysis, where we try to discriminate between alternative explanations for an observed welfare competition will be based on expenditure data from the new basic assistance program.

The most important feature for the subsequent analysis is however the move from a very decentralized administration of welfare benefits to a more centralized system:

³At the time this paper is written the original text of the law reads as follows and does not differ from the respective passage in the time prior to the reform:

Leistungen für Unterkunft und Heizung werden in Höhe der tatsächlichen Aufwendungen erbracht, soweit diese angemessen sind. Erhöhen sich nach einem nicht erforderlichen Umzug die angemessenen Aufwendungen für Unterkunft und Heizung, werden die Leistungen weiterhin nur in Höhe der bis dahin zu tragenden Aufwendungen erbracht.⁴

In contrast to the old system, where expenditure for social assistance was entirely administered by the counties alone, expenditure for the basic assistance is now administered by newly created local employment agencies (*Arbeitsagenturen*) which are jointly operated by the Federal Employment Agency and the local county. In general, there is one such agency in each of the 439 German counties. A few exemptions exist where two counties jointly operate a single employment agency or where there are two employment agencies in one county.

There are a few exemptions to the joined administration of the basic assistance programme. To enable experimentation with different institutional settings there are 69 counties (the so called *Optionskommunen*) which administer their welfare payments independently of the Federal Employment agency. On the costs sharing side there are however no differences to the local employment agencies in counties with a mixed administration.

Non-withstanding the existence of the still relatively independent *Optionskommunen*, the introduction of the joined administration in the vast majority of the German counties has reduced the degree of decentralization of the German welfare system.

In the ensuing empirical analysis we will use this institutional change to identify a relationship between the degree of decentralization and the intensity of welfare competition.

The expenditure administered by the employment agencies falls into two categories: regular benefits (*Regelleistung*) to cover living expenses and housing assistance (*Leistungen für Unterkunft und Heizung*). Both expenditure categories are roughly equivalent to regular and non-regular benefits under the old system.

Total expenditure for basic assistance in a county i can therefore be expressed as the sum of regular benefits and housing assistance (KUH)

$$\text{TOTEXP}_i = \text{REG}_i + \text{KUH}_i$$

The respective section of the law defining the level of housing assistance has remained the same. In particular, the law still only requires that housing assistance must be 'appropriate', leaving it to the county administration to decide on the actual benefit level.

Apart from the newly introduced joined administration differences to the old system lie mainly on the financing side. In contrast to the time prior to the reform, expenses for basic assistance are now jointly born by the federal government and the 439 German counties. While at the federal level the Federal Employment Agency accounts for expenses associated with the regular benefits (REG_i), each county has to cover the expenses for housing assistance (KUH_i).

As a minor point, note that the federal government participates in the expenditure for non-regular benefits through transfers. However, unlike in a classical matching-grant scheme, these transfers are determined ex-post and are negotiated between the federal

government and state governments (Kaltenborn and Schiwarov 2006). Hence, these transfers should not influence actual benefit levels in a county or the intensity of the strategic interaction between counties.

Concerning our empirical analysis of welfare competition we expect strategic interaction in the new system to occur through the level of non-regular benefits; i.e. housing assistance, as under the old social assistance system. In particular this expenditure category satisfies the two necessary conditions for the emergence of welfare competition: Firstly, local administration have some degree of discretion over the "appropriate" level of housing assistance and secondly, there are still substantial incentives to use the level of housing assistance as a strategic instrument: On the one hand, local governments can expect to induce an outflow of recipients by a restrictive interpretation of the law. On the other hand, given the fact that expenditure for non-regular benefits constitutes a large expenditure block, local politicians might try to undercut the expenditure of neighboring counties in an attempt to signal voters that they do not waste taxpayers money.

There is indeed some anecdotal evidence that some counties lowered the level of housing assistance in order to induce an outflow of recipients. In 2006 the local employment agency in Mannheim reported a drastic increase in the number of newly registered welfare recipients who migrated to Mannheim from the neighboring Rhein-Neckar county. The local administration in Mannheim publicly accused the employment agency in Rhein-Neckar to have deliberately cut housing-assistance in an attempt to induce recipients to move to Mannheim. The discussion has attracted some attention in the press (Eberhardt 2007). While this evidence clearly speaks in favor of factor-flows as the mechanism driving the welfare interaction it requires a systematic analysis of the available data before reliable conclusions can be drawn.

The German welfare system described in this section will now serve us as a testing ground for two predictions entailed in the welfare competition theories.

Our first hypothesis concerns the intensity of the strategic interaction. Using the change in the degree of decentralization accompanying the reform we are able to identify the effect of the degree of decentralization on the intensity of competition. This will be achieved by comparing the estimated reaction functions from the time prior to the reform to those after the reform. We expect that the intensity of competition has declined due to change towards a less decentralized system, resulting in a smaller slope of the reaction function.

A second question aims at the nature of the strategic interaction. Using data on average expenditure for housing assistance within the basic assistance program we are able to investigate whether the intensity of competition is also sensitive to household size. This analysis allows us to identify the source of welfare competition. If we find that welfare competition is more intense for smaller, more mobile households then we can conclude that the factor-flow hypothesis needs to be at least part of the explanation. If

the intensity of competition is however insensitive to household size, and hence household mobility, we can exclude the factor-flow hypothesis from the set of explanations for an observed spatial interdependence of welfare expenditure, leaving yardstick competition as the sole source of the interaction.

Before we turn to the estimation results the next section describes the data used in this analysis in more detail and also highlights some key issues of the empirical strategy.

4 Data and Empirical Strategy

To estimate the best response function (5) for the time before the Agenda 2010 reforms were in place we use annual data on total expenditure for social assistance in the 439 German counties (*Kreise und Kreisfreie Städte*). These data were obtained from the state branches of the Federal Statistical Office.

We use a cross-section of the 439 counties for the year 2000. By comparing the strategic interaction in the time immediately before the reform to that after the reform was in place we are able to identify the effect of changes in the institutional setup on the intensity of the strategic interaction. In a robustness check we also use a cross section for the year 2004.

In our first estimates, where we focus on the time before the reform was in place, we use total annual expenditure in a county normalized by the number of recipients for that year as the dependent variable. That is, we base our analysis on actual welfare benefits which has become quite standard in the empirical literature on welfare competition. A similar approach is for instance followed by Fiva and Rattso (2006) and Dahlberg and Edmark (2008). Note that we will refer to the dependent variable as per-capita expenditure although we actually mean expenditure per recipient.

As socioeconomic control variables we include the unemployment rate and the number of insolvencies per-capita as a proxy for local business activity. To control for the tightness of the local budget constraint we include the level of transfers received from upper level governments, measured in Euros per-capita, and the level of public debt, measured in 100 Euros per-capita. Note that these transfers are mainly intended to equalize differences in tax-revenue between jurisdictions and are thus independent of welfare expenditure. Also, we control for the per-capita income in a region and the vote share that parties from the left spectrum of the German political system received in the Federal Elections⁵. Controls for the share of left and right parties are sometimes included in empirical studies of welfare competition to account for the possibility that welfare benefits are higher in counties with a left-wing majority. Figlio, Kolpin, and Reid (1999) for instance control for the vote shares of Republicans but find no significant

⁵We defined as 'left' parties the Social Democrats (SPD), the PDS/Linke, and the Greens (Bündnis 90/Die Grünen)

influence on expenditure levels within the AFDC program.

Data for all co-variates were taken from various issues of the regional database *Statistic Regional* which is published annually by the Federal Statistical Office.

Furthermore, to control for the influence of the standard rate for the regular benefits we collected the level of these rates by consulting the respective state laws. Table 1 shows standard rates for household heads by state for the years 1999/2000 and 2004/2005 from which we can calculate an average standard rate for the years 2000 and 2004.

Summary statistics of the dependent variable as well as for the controls are shown in Table 2.

Our estimation results for the time after the implementation of the Agenda 2010 reform are based on monthly data on the average level of housing assistance in the 439 German counties for the time between January 2006 and July 2007. In particular, this information is available by household size. These data can be accessed over the website of the Federal Employment-Agency⁶.

Concerning the inclusion of socioeconomic controls we face the problem that some of the relevant data is not published on a monthly basis. Other information that one would ideally want to control for is only released with a substantial lag of several years - as for instance information about county budgets - and therefore not available at the time of writing this paper. However, it can be assumed that most socioeconomic controls are proxies for variables that are constant over a relatively short time period. We therefore estimate (5) in first-differences. That is, we test how changes in the average level of housing expenditure in one county depend on changes in the level of housing assistance in neighboring counties

$$\Delta z_{it} = \rho \sum_j w_{ij} \Delta z_{jt} + \theta \Delta X_{it} + \epsilon_i \quad (6)$$

In this approach individual county specific effects, such as the level of transfers received from higher levels of government, that are time invariant in the short run and for which we are not able to control are netted out.

To carry out the first-difference estimation we construct two panel data sets from the available data. Each panel consists of two cross-section samples. We use two panels that each range over a 12 month interval (January 2006-January 2007 and July 2006-July 2007) to avoid a confounding influence of seasonal changes of the unemployment rate.

For each panel we estimate the reaction function using the change in average monthly level of housing assistance to a n -person household, where $n \in \{1, \dots, 4, > 4\}$, as the dependent variable.

Table 3 shows summary statistics of average expenditure for each month in the panel. Note that the average level of housing assistance has increased between January 2006 and February 2007. This increase was strongest for one person households who have on

⁶www.arbeitsagentur.de

average received 24 Euros more housing assistance in January 2007 than in January 2006. A plausible explanation for this increase is an overall rise in energy prices in the time between January 2006 and January 2007. Over this period the price for gas increased by roughly ten per cent. Electricity prices have also soared by roughly three percent during the same period and continued to rise by more than five per cent between June 2006 and June 2007. Overall the rise in energy prices led to an increase of the consumer price index for Gas, Water and fossil fuels by 2.7% between January 2006 and July 2007 (Statistisches Bundesamt 2008). In the ensuing empirical analysis we need to make sure that we do not spuriously attribute the spatial correlation of benefit levels caused by this country-wide increase in energy prices to the presence of welfare competition. We return to this issue in Section 6.

Also, as can be seen from Table 3, larger households require less expenditure in per-capita terms than smaller households. Under the factor flow hypothesis this creates greater incentives for local governments to induce an out-migration of smaller households. This fact reinforces our hypothesis that -under the factor flow hypothesis- we should observe that the intensity of welfare competition depends on the size of the household at which expenditure is directed⁷.

Available socioeconomic control variables are the change in the unemployment rate over the respective twelve-month period as well as the change of the rent level between 2006 and 2007. It is to be expected that an increase in the average rent level is associated with higher expenditure on housing assistance. For the change in the unemployment rate we expect that rising unemployment tightens a county's budget constraint and leads to lower benefit levels. However, previous studies on welfare competition have sometimes found a positive relationship between unemployment and benefit levels (Shroder 1995, Brett and Pinske 2000).

Ideally, one would like to use more detailed proxies for a change in the tightness of a county's budget constraint such as the level of transfers from higher level governments or the debt level of a county. Unfortunately, these data is not yet available for the respective time period and will not be released on a monthly basis. However, it is plausible that local governments are only able to obtain full information about the exact state of their budget at the end of a year. One might thus consider the budget of a county as constant over a twelve month period in which case it constitutes a county fixed effect which is accounted for by the first-difference strategy.

Data on monthly unemployment rates were taken from the Federal Employment Agency. Information about rent-prices were kindly provided to us by the *Bundesamt für Bauwesen und Raumordnung*. These data are based on advertisements in regional

⁷One could also argue that, for a given amount of effort, inducing the outflow of a larger household provides a stronger relief for the local budget. In this case incentive would be reversed. However, mobility costs of large households are so high, due to various legal regulations, that we can safely ignore this possibility

newspapers and report an average annual rent level for each county.

On July, 1st in 2007 the state Sachsen-Anhalt re-organized the boundaries of its counties and reduced their number. Because this reform made it impossible to calculate the change in welfare expenditure for these counties they were excluded from the July panel. In case where these counties had neighbors in other states they were also removed from the neighbor list of these counties.

4.1 Econometric Issues

There are some econometric issues that need to be addressed before we can estimate equations (5) and (6). In particular, we need to specify the weight matrix that defines the competitors of a given county. In addition, we need to make sure that spatial autocorrelation in the data can indeed be attributed to strategic interaction.

4.1.1 Weighting Schemes

In theoretical models of welfare competition the policy of one region potentially exerts an influence on all other regions. In practice however, each region only interacts with a subset of all other regions. Estimation of equations (5) and (6) therefore requires that we specify a weights matrix W defining which counties interact with each other.

In this study we use a row-normalized binary contingency weight matrix which has become standard in the literature. Under this matrix two jurisdictions are assumed to interact with one another if and only if they share a common border. An entry in this matrix thus takes the form

$$w_{ij}^{nc} = \frac{w_{ij}^{bc}}{\sum_k w_{ik}^{bc}}$$

where $w_{ij}^{bc} = 1$ if i shares a common border with j and $w_{ij}^{bc} = 0$ otherwise. We denote this matrix as W^{nc} .

Case, Rosen, and Hines (1993) argue that it might well be possible that a jurisdictions benefit levels are influenced by jurisdictions other than its direct geographical neighbors. If the strategic interaction is driven by factor flows then this might for instance be the case if welfare recipients are mobile between economically similar regions but not so much between geographical neighbors. One could for example imagine that some individuals prefer to live in urban areas while others have a preference for living in rural areas. In this case we would expect migration flows between rural areas to be higher than flows from rural to urban areas and vice versa. To account for this possibility we also make use of a weighting scheme that is based on economical distance, rather than geographical distance. We follow Shroder (1995) who proxies for economic distance by using migration flows between counties. To this end let m_{ij} denote the number of individuals that moved

from region i to region j in the year 2004. Our measure of economic closeness is then

$$w_{ij}^M = \frac{m_{ji}}{\sum_k w_{ik}^M}$$

Under this weighting scheme the impact of region j 's benefit level on the benefit level in region i is assumed to rise with the number of individuals that moved from j to i in the year 2004⁸. The weight matrix for this set of weights will be denoted by W^m .

Note that using migration data from 2004 ensures that the weights are exogenous in the estimation of (5).

4.1.2 Sources of spatial auto-correlation

There are a number of well known empirical problems associated with the estimation of (5). A first econometric challenge is constituted by the fact that the spatial lag term $\sum_j w_{ij} z_{jt}$ is correlated with the error terms in (5). Intuitively this is due to the fact that observed benefit levels are determined simultaneously in a Nash-equilibrium. This simultaneity means that the spatial lag on the right-hand side of (5) is endogenous, leading an OLS estimation to yield inconsistent results (Anselin 1988a). To see this write (5) in matrix form

$$z = \beta W z + \theta X + \epsilon \quad (7)$$

A reduced form of (7) is then given by

$$z = (I - \beta W)^{-1} X \theta + (I - \beta W)^{-1} \epsilon \quad (8)$$

From the last term of equation (8) we see that the benefit level in jurisdiction j depends on the errors of all regions through the vector ϵ . The econometric literature has advanced a number of strategies to deal with this simultaneity. One way is to estimate (8) by Maximum Likelihood methods (Anselin 1988a). This method was for instance used by Saavedra (2000) and Brueckner and Saavedra (2001). Another frequently used method is to instrument for Wz by using an instrument matrix that contains own and neighbor's co-variates. This approach goes back to Kelejian and Prucha (1998) and has for instance been applied by Figlio, Kolpin, and Reid (1999) and Fiva and Rattso (2006). In this study our standard approach will be to estimate the reduced-form of the reaction function by the Maximum-Likelihood methods proposed by Anselin (1988a).

Estimation of (8) by Maximum-Likelihood techniques depends on the assumption that the errors are spatially independent. If errors are instead spatially correlated, as might for instance be the case in the presence of regional shocks, then an observed spatial auto-correlation need not be due to strategic interaction between counties.

⁸Data on migration flows between the German counties in the year 2004 were provided to us by the Federal Statistical Office

Suppose, for instance, that the errors are spatially dependent and satisfy the relationship

$$\epsilon = \lambda W\epsilon + \nu \quad (9)$$

where ν is a well behaved error vector. Then estimation of (8) would give a false impression of spatial lag dependence ($\rho \neq 0$) when $\rho = 0$ holds in the true model. Consequently, it is important to investigate whether spatial lag or spatial error dependence is the most likely source of spatial auto-correlation (Brueckner and Saavedra 2001). Several approaches exist for dealing with this problem. A standard test for the significance of the spatial lag parameter ρ is Anselin's (Anselin 1988b) test based on the Lagrange multiplier principle which estimates the hypothesis $H_0 : \rho = 0$. There is a similar test for the presence of spatial error dependence with the Null $H_0 : \lambda = 0$. These tests are henceforth denoted by 'LMlag' and 'LMerr' respectively. However, the power of the former test is not good when the errors are spatially correlated, while the latter test requires that $\rho = 0$.

A better solution is therefore to apply the robust LM tests proposed by Anselin, Bera, Florax, and Yoon (1996) which test for spatial lag and spatial error dependence and are robust to the presence of the other. In what follows we denote these tests by 'RLMlag' and 'RLMerr'.

4.1.3 Identification strategy

With a description of the data and the empirical strategy in place we are now able to state our identification strategy more precisely.

To identify the effect of the degree of decentralization on the intensity of welfare competition we start by estimating the slope parameter ρ at hand of the pre-reform data from the year 2000. This estimate will then be compared to the slope parameter obtained from the post-reform data. As the Agenda 2010 reform was associated with a partial centralization of the welfare administration we expect the estimate of ρ to be smaller after the reform, independently of household size. This would imply that in the time after the implementation of the reform local administrative units responded less intensive to changes of expenditure levels in neighboring counties than they did under the more decentralized system that was previously in place.

To disentangle different theories of welfare competition we are going to use the estimates of ρ for households of different size obtained by estimating (6) based on the data from 2006 and 2007. If factor flows are driving the strategic interaction then we expect competition to be more intense for smaller, more mobile households which are also associated with higher per-capita expenditures. In other words, if factor-flows matter, we expect to find a stronger spatial auto-correlation in the data if we look at smaller households. If, on the contrary, yardstick competition is the sole mechanism driving the strategic interaction then the estimates of the slope parameter should not depend on

household size.

5 Estimation Results

This section first presents estimation results for the cross-section for the time prior to the reform. Thereafter follows a description of the results for the post-reform period.

5.1 Estimation Results for 2000

Table 4 shows the results obtained from estimating the model (5) with the Maximum-Likelihood approach of Anselin (1988a) using the two weighting schemes discussed in the previous section and the cross-section for 2000. Probability values are shown in parenthesis. For each weighting scheme we estimate three different specifications of (5).

In our baseline model we include per-capita debt, the number of insolvencies per-capita, the level of transfers from higher levels of government and the vote share of the left parties as well as the standard rate in the vector of socio-economic controls. The coefficient estimates for this specification are in columns 1 and 4 of Table 4.

In a second specification we added the local unemployment rate to the socio-economic controls. The unemployment rate is an important proxy for the state of the local economy as well as for the tightness of a county's budget constraint. The reason why this variable is omitted from the baseline-specification is that the unemployment rate is potentially endogenous to the level of welfare expenditure per-capita. The results for this augmented specification are shown in columns 2 and 5 of Table 4.

In Germany, local elections are held simultaneously in each state but there might be differences in the timing of elections across states. To account for the fact that the timing of elections might have an influence on per-capita expenditure we add an election dummy in a further specification of the model which equals one if there was an election of the local parliament (*Kreistag*) in the year 2000. This applies to all counties in Schleswig-Holstein and North-Rhine Westphalia. Estimation results for this specification are in columns 3 and 6 of Table 4.

The key results in Table 4 are the estimates of the slope parameter ρ . This parameter is positive and significantly different from zero under all specifications and both weighting schemes. These results are consistent with the occurrence of welfare competition between the German counties in the year 2000. As expected, the reaction functions generated by this strategic interaction are positively sloped. The estimated slope parameters lie in the range between 0,7 and 0,85, implying that a reduction of average per-capita expenditure by 1 Euro in one county triggers its neighbors to reduce per-capita expenditure by 0,7 to 0,85 Euros. As can be seen in Table 4, the estimated slope parameter is robust to the inclusion of the unemployment-rate and the election dummy.

Amongst the socio-economic control variables only per-capita income, the vote-share of parties from the left and the standard rate have a significant impact on the average per-capita expenditure for social assistance. With one exception all coefficients have the expected sign. An increase in the per-capita income of a county by 1000 Euros is associated with a decrease in annual per-capita expenditure on social assistance of approximately 6,6 Euros. Similarly, counties with a higher vote share of the parties from the left spend more on welfare. If the vote share of the left parties increases by one percentage point this leads to a rise in per-capita expenditure of 192 Euro per year.

Note that this effect is only marginally significant under the migration weights where the effect is also smaller. However, for the present analysis it is only important that this covariate does not influence the intensity of the strategic interaction. We have therefore excluded the variable from the estimation which left the spatial lag parameter virtually unchanged.

Surprisingly, the standard rate has a significantly negative impact on per-capita expenditure. The magnitude of this impact is however very small. The interpretation of this coefficient estimate is the following: If a state increases the standard rate by 1 Euro (which corresponds to 12 Euros per year) the counties in that state decrease per-capita expenditure on social assistance by roughly 0,4 Cents per year. In theory, one would expect this coefficient to equal one because an increase in the standard rate should force local administrations to increase regular benefits by a similar amount. In practice however, a county can offset higher benefits in one expenditure category by cuts in another category. This highlights the importance of using actual benefit levels instead of welfare norms as the dependent variable as pointed out by Fiva and Rattso (2006).

Note that the baseline results reported in columns (1) and (4) of Table 4 remain virtually unchanged after the inclusion of additional control variables.

As noted above, the slope parameter ρ might be found to be significantly different from zero, although $\rho = 0$ holds in the true model, giving false evidence for the presence of strategic interaction. This situation occurs if the error terms in (5) are spatially dependent.

To determine whether spatial error dependence has been improperly ignored let us first look at Anselin's (Anselin 1988b) tests for the significance of the spatial lag parameter. As can be seen in Table 4, both tests (LMerr and LMlag) reject their respective null hypothesis, indicating that both spatial lag or error dependence might be the reason for the observed spatial auto-correlation.

To be able to conclude that the positive estimate of the slope parameter can indeed be attributed to the presence of welfare competition we therefore need to consult the test for the significance of spatial lag parameter ρ which is robust to the presence of error dependence (RLMlag). Table 4 shows that this test rejects the null-hypothesis of no spatial lag dependence under all specifications, indicating that the positively sloped reaction function can indeed be interpreted as evidence for the presence of welfare competition.

A potential problem is the result of the Breusch-Pagan test, which rejects the hypothesis of constant error variance under all specifications. To address this issue we repeated the estimations using the instrumental variables approach of Kelejian and Prucha (1998) for which it is possible to obtain heteroskedasticity-robust standard errors in the Software package R that was used for this analysis. The results obtained with this estimation procedure are qualitatively similar to those in Table 4. In particular, the slope-parameter is positive and highly significant. The results of these estimates for the standard weights are in Table 6.

The slope parameters in Table 6 are slightly higher than the one obtained from the Maximum-Likelihood strategies. This effect is not uncommon and has been observed in related studies. Fiva and Rattso (2006) for instance also find smaller estimates for the ML than for the IV estimates. They explain this pattern by the fact that the IV approach of Kelejian and Prucha (1998) is robust to omitted spatial error correlation while the ML approach is not.

To avoid having to rely on data from only one cross-section we conducted a similar analysis for the year 2004. The results are shown in Table 5. The coefficient estimates are very similar to those obtained for the 2000 cross-section. In particular, the estimate of the slope parameter is of the same magnitude as before and also significantly different from zero at the 1% level for all specifications of (5).

Taken together, the results presented in this section clearly suggest that the German counties were engaged in welfare competition in the years before the implementation of the Agenda 2010 reform. The estimated slope of the reaction function lies in the range between 0,5 and 0,85 implying that when a county decreased its per-capita expenditure by 1 Euro its neighbors reacted by reducing their expenditure by 0,5 to 0,85 Euros.

The intensity of this competition is comparable to related studies that tested for welfare competition in other countries. Our estimates are however at the upper end of the results obtained in other studies. For instance Fiva and Rattso (2006), looking at welfare competition in Norway, estimate the slope of the reaction function as 0,81 which is comparable to the results reported here. Brueckner and Saavedra (2001) and Dahlberg and Edmark (2008) obtain estimates of around 0,3 for the slope of the reaction function. In the light of these findings, welfare competition between German counties in the time prior to the Agenda 2010 was intense, relative to welfare competition in other countries.

5.2 Estimation Results for 2006 and 2007

Having found robust evidence for the occurrence of welfare competition between the German counties in the years before the Agenda 2010 reform we now turn to the the results for the years 2006 and 2007, the time after the implementation of the reform. Recalling from our description of the institutional background that the reform was as-

sociated with a move towards a more centralized administration of welfare benefits we expect to find less auto-correlation in the data, indicating a decline in the intensity of competition. Concerning the relationship between the intensity of competition and household size the expected results depend on the mechanism driving the strategic interaction: If factor-flows are at least part of the explanation for an observed strategic interaction we should find that this competition is more intense for smaller households. If the intensity of competition is however independent of household size this would leave the yardstick competition hypothesis as the sole source for the strategic interaction.

5.2.1 January Panel

The results of estimating equation (6) with the January panel are in Table 7 in which probability values are shown in parenthesis. Again, we have estimated the model with a dummy indicating that a local election took place in the respective county either in 2006 or 2007. This dummy is set to one for all counties in Lower Saxony (which held elections in September 2006) and Sachsen-Anhalt (where elections were held in April 2007). The reason for the inclusion of Sachsen-Anhalt is the assumption that the election campaign started already at the end of 2007 and is thus likely to have affected the strategic interaction in the respective counties between 2006 and 2007. However, the results are virtually unchanged if the dummy is excluded.

Looking at Table 7 we see that the key parameter of interest, the slope parameter ρ , is positive and significantly different from zero under both weighting schemes and for one-, two-, four- and five-person households. For three person households the estimated slope parameter does not differ significantly from zero, indicating the absence of strategic interaction in the setting of average benefit levels for three-person households.

As expected, all slope parameters are significantly smaller compared to the time before the reform for all weighting schemes and household sizes. This finding is consistent with the hypothesis that the intensity of welfare competition has declined due to the introduction of the joined administration of the welfare benefits.

The socio-economic control variables fail to have a significant influence on average benefit levels for all estimations of (6).

So far we do not know whether the spatial auto-correlation of the benefits provided to one-, two-, four- and five-person households are an indication of welfare competition or merely reflect the presence of the spatial error correlation. The simple tests for the presence of spatial lag and spatial error correlation LMlag and LMerr indicate that both explanations might be the source of the observed spatial auto-correlation. We therefore need to take a look at the robust Lagrange-Multiplier tests. Turning first to four- and five-person households the robust test for the presence of spatial lag dependence fails to reject the null hypothesis of the absence of this dependence under both weighting schemes. Accordingly, there is no evidence that local governments set benefits levels to

four- and five- person households strategically.

For smaller one- and two-person households a different result is obtained. The robust test for spatial error dependence, RLMerr, indicate the absence of spatial error correlation while the robust test for spatial lag dependence, RLMlag, rejects the hypothesis of the absence of spatial lag dependence. Under the migration weights this null hypothesis is however only marginally rejected at the 10% level.

The results obtained from the robust tests for spatial lag dependence therefore indicate that the German counties set benefit levels to one- and two-person households strategically between January 2006 and January 2007. Concerning three-person and larger households, there is no evidence that the observed spatial autocorrelation is caused by welfare competition.

The results reported so far are consistent with the hypothesis that the intensity of welfare competition between the German counties has declined, or even completely ceased in the case of three- and more person households, due to the partial centralization associated with the welfare reform.

Moreover, the fact that we find evidence for welfare competition only when we look at average expenditure to small households is consistent with the hypothesis that local politicians take the mobility of welfare recipients into account when setting benefit levels. If yardstick competition was the sole channel driving the strategic interaction then the intensity of the observed competition should have been independent of household size.

Assuming that one-person households are more mobile than two-person households the intensity of competition should be larger for the former in order for the results to be fully consistent with the factor-flow theory. A further look at Table 7 shows that this is indeed the case.

In sum, the results from the January panel are therefore consistent with the hypothesis that the strength of welfare competition has declined after the implementation of the Agenda 2010 reform and that this decline is stronger for larger, less mobile households.

5.2.2 July Panel

Turning to the estimates of (6) for the July panel we fail to find evidence that the German counties set welfare levels interdependently. The ML coefficient estimates are in Table 8. It can be seen that the slope parameter ρ is only significantly different from zero for single-households. This provides a clear indication for the absence of a strategic setting of welfare benefits to larger households.

Looking more closely at the results for one person-households we see that spatial lag as well as spatial error dependence both qualify as the source of the observed autocorrelation. It is therefore crucial to consider the results of the robust LM tests. The RLMlag test however fails to reject the null hypothesis of the absence of spatial lag dependence. Accordingly, there is no evidence that the observed spatial auto-correlation

of benefit levels for one-person households can be attributed to the presence of welfare competition.

In total, for the July panel, we fail to find any evidence for the hypothesis that the German counties engage in welfare competition. A possible explanation for the difference in results between the two panels is indicated by the election dummy. In contrast to the January panel, this coefficient is positive and significantly different from zero at least for single households. Apparently, counties in which a local election took place have been more generous in their setting of benefit levels. It might thus be that in those counties short-run attempts to maximize reelection probabilities in upcoming elections have temporarily dominated the strategic objectives of local governments, making it impossible to identify any strategic competition that took place between July 2006 and July 2007.

However, the lack of evidence for welfare competition in the time between July 2006 and July 2007 is again consistent with the hypothesis that the intensity of welfare competition has declined due to the partial centralization of the welfare administration.

In sum, evidence for the presence of welfare competition in the time after the Agenda 2010 reforms is at best mixed. To some extent, this outcome was to be expected given that the introduction of the joined administration has reduced the autonomy of local authorities over welfare policies. Insofar, this result is consistent with the hypothesis that the intensity of competition depends positively on the degree of decentralization.

What might come as a surprise is the extent to which competition is reduced. After all, the counties still maintain a significant influence on the benefit levels and also share a large part of the financial burden. However, as argued above, the failure to detect evidence for welfare competition in the time between July 2006 and July 2007 might have to be attributed to the fact that local elections were held in some states during that period.

The pattern of strategic-interaction that we do observe after 2006 is clearly consistent with the hypothesis that welfare competition is at least partially caused by factor-flows between the German counties. If a yardstick competition process was the sole factor determining the interaction of local authorities, evidence as well as the intensity of competition in the time between January 2006 and 2007 should have been independent of household size.

The latter result matches anecdotal accounts of welfare competition (Eberhardt 2007), which suggested that factor-flows play a decisive role in this process.

Our results are therefore in part complementary to those of Revelli (2006b) in his analysis of welfare competition between English local authorities. Revelli shows that welfare competition vanished between two consecutive time periods and attributes this finding to the establishment of a nationwide performance rating system which would serve as a close substitute for comparisons between geographically concentrated jurisdictions. From this observation he concludes that yardstick competition must play a

causal role in the strategic interaction between local governments as otherwise his empirical findings should not have been affected by the widening of the voters information set.

The most likely source for the divergence in the results between his study and the present paper are differences in the type of welfare expenditures considered in the empirical analysis. In the present paper we have looked at monetary transfers to a mobile population. In contrast, the expenditure in (Revelli 2006b) is directed at the provision of welfare services that are likely to benefit mainly immobile individuals, such as the old.

6 Robustness and discussion of results

The results reported in the previous section are consistent with the hypothesis that i) a higher degree of centralization reduces the intensity of welfare competition and that ii) factor flows play a crucial role in the setting of benefit levels by the German counties. There are however still some issues that warrant a brief discussion before definite conclusions can be drawn. The first point concerns the evidence for strategic interaction in the post-reform period. Here, one might be concerned that the results are driven by an overall rise in energy prices over the observation period, rather than being caused by strategic interaction between the German counties. A second issue relates to the identification of the effect of the degree of decentralization on the intensity of competition. Our argument rests on the assumption that the move towards a more centralized administration has been the only change that could potentially influence the intensity of welfare competition. This section addresses both issues in turn.

6.1 The role of energy prices

In our discussion of the summary statistics in Section 4 we have pointed out that energy prices have been rising between January 2006 and July 2007. As these prices are likely to influence housing costs we need to make sure that we do not spuriously attribute a nation-wide increase in energy prices to the presence of strategic interaction.

There are two reasons why we think we can rule out that rising energy prices are driving the results. Firstly, this price increase should have influenced welfare payments to all households over the entire period between January 2006 and July 2007. However, we have only detected a spatial auto-correlation of welfare payments to small households and only in one of the two panels. This pattern makes it unlikely that the spatial auto-correlation found for small households was caused by rising energy prices.

To further test whether energy prices are driving the results we have estimated equation (6) using a random permutation of the weight matrix W^{nc} . More precisely, we have repeated the estimation of (6), using the change in average benefits for one- and

two-person households between January 2006 and January 2007 as dependent variable. Before each estimation the weight matrix was randomly permuted. In other words, we have altered the neighborhood relationship by assigning each county a random set of neighbors. This procedure is equivalent to randomly assigning each county a new location on a map of Germany. If rising energy prices, which affect all counties equally, have been the source for the spatial auto-correlation in the January panel then we should find that this correlation persists, even for a permuted weight matrix. If the auto-correlation was however caused by strategic interaction of neighboring counties we should cease to detect this correlation for the random weighting schemes.

The results clearly suggest that rising energy prices are an unlikely source of the spatial auto-correlation detected in the data. Under the randomized weighting schemes we only estimated a positive slope parameter in 450 out of 1000 runs in case of one-person households. When we looked at two person households the slope parameter was only positive in 459 out of 1000 cases. Only in 65 out of the 450 cases did the t-value, indicating the significance of the slope-parameter for one-person households, exceeded 1,5 which is a very generous interpretation of significance. Similarly, for two-person households, the t-value was greater than 1,5 only in 16 out of the 459 cases. Under a randomly permuted neighborhood relationship we thus fail to find any evidence for a spatial auto-correlation of benefit levels.

6.2 Identification of the centralization effect

We have argued above that the decline in the intensity of competition that we observed after the implementation of the reform was caused by the move towards a less decentralized administration of welfare benefits. However, implicit in this argument was the assumption that the alteration of the degree of decentralization was the only change that might have affected the intensity of competition. There are however two other institutional variations that potentially violate this assumption.

Firstly, one might worry that the merger of the assistance provided to long-term unemployed (*Arbeitslosenhilfe*) with the welfare assistance (*Sozialhilfe*) into the so called basic assistance has indirectly affected the intensity of competition. This point is rather subtle as it requires us to look more closely at the assignment of eligible individuals to either the federal unemployment insurance or the social assistance. Prior to the reform, for some individuals the affiliation to either of the two schemes was not unambiguously defined. A county therefore had a strong incentive to 'mis-classify' individuals who were actually 'permanently out of the labor force' as 'long-term unemployed'. In this case an individual became eligible in the federal unemployment insurance and was thus shifted from the local budget to the budget of the federal government. In the time prior to the reform local governments could therefore pursue two strategies to remove welfare recipients from the local budget: They could set low benefit levels to induce an outflow

of recipients to neighboring counties or they could try to move recipients onto the federal budget. After the reform only the first alternative was still available to the counties. If both strategies are complementary to each other then the observed decline in the intensity of competition could merely be caused by the abolition of the possibility to misclassify individuals and not by the gradual centralization of the welfare administration. However, in the appendix we develop a simple model which demonstrates that both strategies are in fact substitutes: The model shows that if counties are able to shift some recipients into the federal program they have less incentives to engage in welfare competition. Accordingly, the unification of both assistance schemes should, if at all, have led to a more intensive competition.

Secondly, the reform was associated with a standardization of benefit levels which reduced the possibility of local administrations to assess the needs of recipients individually. Accordingly, the reform went along with a loss of discretion over the actual level of local welfare expenditures. However, this loss in discretion affected mainly the regular benefits and not the housing-assistance on which the present analysis has focused. As we have pointed out in Section 3, the passage in the law which defines the 'appropriate' level of housing assistance was unaffected by the reform. Because these costs constitute the largest expenditure block within the non-regular benefits it seems fair to assume that our results are largely unaffected by the standardization of the regular benefits.

The attentive reader might of course suggest that one could also single out the effect of changes in the degree of decentralization on the intensity of competition by following a difference-in-difference strategy, using the Optionskommunen as the control group. In this approach, one would compare the change in the slope of the reaction function of the Optionskommunen over time to the reaction functions of the counties with a joined administration. An estimation procedure that allows to estimate different slope parameters for two groups of jurisdictions is in principle available (Allers and Elhorst 2005). However, due to a lack of sufficient data on benefit levels in the Optionskommunen - a point to which we will return below - it is infeasible to pursue this approach.

6.3 Missing Data

In the two panels for the post-reform time there are a number of missing observations. The January panel contains observations for 323 out of the 439 counties. In the July panel there are only slightly more observations; i.e. in 343 out of 439 cases. In general, this missing data results from the failure of the Optionskommunen to report the required information. In the July panel, we only have data for 55,8% of the Optionskommunen, but for 92% of the counties with a joined administration. For the January panel there is no data for the Optionskommunen but for 93% of the other counties. One explanation for this pattern is that all data are collected with the software platform A2LL which only a few of the Optionskommunen had implemented by July 2007. It is this lack of

data on the Optionskommunen that prevents us from using more elaborate identification strategies, discussed in Section 3.2.

In cases where no data was available for a county we had to exclude this jurisdiction from the neighbor set of other counties. Under the normalized weighting schemes employed in the preceding analysis, more weight is thus assigned to the remaining neighbors of a county. For spatial regressions it is hard to judge whether deletion of neighbors affects the estimation results. Figures 1 and 2 therefore show a map of the counties with missing observations in the January and July panel. We see, that the missings cluster in a few regions of Germany. This clustering minimizes the number of counties of which we had to alter the set of neighbors. While this does not warrant the conclusion that missing observations do not affect the results we obtain at least some indication that this issue could be more serious.

7 Summary and concluding remarks

This paper looked empirically on the strategic interaction of the 439 German counties with respect to the determination of welfare benefit levels.

Our first contribution was to show that the intensity of welfare competition - here measured as the slope of a jurisdiction's reaction function - has declined after a reform of Germany's major welfare scheme, which reduced the autonomy of the counties over welfare policies. Of course, it is difficult to exclude other forces that might be causal for this result. However, the evidence is at least consistent with the prediction that the intensity of the interaction should be the stronger, the higher the autonomy of local authorities over their welfare policies.

The results of this study have some direct policy implications. In December 2007 the German constitutional court decided that the current administration of the basic assistance scheme violates the autonomy of the counties and reminded politicians to reorganize the welfare administration until the end of 2010 (Bundesverfassungsgericht 2007). In general, it is expected that this reorganization will either encompass a move towards a complete centralization or decentralization of the administration. In the light of the findings presented in this study it is to be expected that - without a reorganization of the financing side - a decentralization will lead to a strengthening of welfare competition between the German counties.

A second objective of the paper was to identify the exact source of the interaction. Using a rich data set which allows us to discriminate between households of different sizes we saw that competition in the time after the reform was confined to mobile households. This evidence is inconsistent with the yardstick competition as the sole driving force for the observed strategic interaction.

Our results are complementary to those of (Revelli 2006a) who looks at social service provision in the UK and identifies an "informational externality" as the most likely

source of interaction. The difference in results are best understood by recalling that the expenditure in the study of Revelli benefits mostly immobile households, such as the elderly while the housing-assistance considered in this paper is also targeted at the mobile population.

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A A small model of welfare competition

In Section 6 we have argued that in the time prior to the reform counties were able to manipulate the number of recipients within their borders by trying to move them into the federal unemployment insurance. This was possible because in some instances it was not unambiguously defined whether a recipient had to be classified as a long-term unemployed person or as being permanently out of the labor force (in which case he received welfare assistance). After the reform, the affiliation to the unemployment insurance or the basic assistance scheme was more precisely defined. Accordingly, a strategic reduction of benefit levels remained the only way for local administrations to reduce their case-load.

Potentially, the abolition of the possibility to reduce the number of recipients on a counties budget by moving them into the federal unemployment insurance might confound the identification of the effect of centralizing the welfare administration on the intensity of welfare competition. This would be the case if the strategy to shift recipients into the federal unemployment insurance is complementary to inducing an outflow of recipients by lowering benefit levels.

However, with the help of a simple model, we show that both strategies are in fact substitutes. Accordingly, not being able to move some recipients out of the welfare assistance program should lead to a more intense competition. Hence, if at all, our identification strategy tends to underestimate the effect of a more centralized administration on the intensity of competition.

Note that the model developed in this section belongs to the class of factor-flow models, as this has been identified as the most likely source of the observed strategic interaction.

A.1 A simple factor flow model of welfare competition

We consider the competition between two identical jurisdictions A and B. Let us assume that amongst the residents of each jurisdiction lives a continuum of welfare recipients with mass one.

Welfare recipients are partially mobile between jurisdictions but differ in their migration costs μ which are uniformly and independently distributed over the support $[-\bar{\mu}, \bar{\mu}]$.

A recipient μ in jurisdiction $i \in \{A, B\}$ migrates to jurisdiction $j \neq i$ if the gain in expected welfare benefits exceeds his migration costs. Letting \tilde{z}_i denote average benefits in jurisdiction i this is the case if

$$\mu < \tilde{z}_j - \tilde{z}_i$$

If n_{ii} denotes the number of welfare recipients in jurisdiction i who do not migrate and $n_{ij} = 1 - n_{ii}$ denotes the number of movers then we can show that the total number of

recipients in jurisdiction i , $n_i = n_{ii} + n_{ji}$ equals

$$n_i(\tilde{z}_i, \tilde{z}_j) = 1 - \frac{\tilde{z}_i - \tilde{z}_j}{2\bar{\mu}}$$

The policy of each jurisdiction consists of choosing the benefit level z_i and the probability p_i with which someone who is entitled to receive welfare benefits actually does so. Here, the underlying assumption is that the fraction $1 - p_i$ of entitled individuals have been successfully misclassified by local administrations and receive benefits \bar{z} from the federal unemployment insurance.

We assume that marginal costs of public funds are constant and equal one. Hence, local policy makers seek to minimize welfare expenditure in their jurisdiction $E_i = p_i z_i n_i$.

Furthermore, let us assume that the benefit level defined in the law is \bar{z} . However, each jurisdiction can deviate from this level in which case it faces the probability of being subjected to a costly law-suit. We summarize the costs of deviating from \bar{z} (monetary or in terms of bad press) as $c(z_i) = 0.5\alpha(\bar{z} - z_i)^2$. Similarly, a local government can try to shift some recipients into the federal program in order to reduce local expenditure. Again, there are some constraints to this strategy which are summarized by the cost function $k(p_i) = 0.5\beta(1 - p_i)^2$. We require that $\beta > \frac{\bar{z}}{2\bar{\mu}}$. Later we will interpret the abolition of the possibility to move recipients into the federal program as an increase in β . The objective of the government is therefore to minimize local welfare costs

$$E_i(\tilde{z}_i, \tilde{z}_j) + 0.5\beta(1 - p_i)^2 + 0.5\alpha(\bar{z} - z_i)^2$$

Note that, given our assumptions, the expected welfare level in jurisdiction i is

$$\tilde{z}_i = p_i(z_i - \bar{z}) + \bar{z}$$

Both regions choose their policy (p_i, z_i) simultaneously, taking the policy of the other jurisdiction as given. Then, the first-order conditions describing the best-response function of jurisdiction i are

$$\begin{aligned}\Omega_{p_i} &\equiv \frac{z_i p_i}{2\bar{\mu}} + n_i z_i - \beta(1 - p_i) = 0 \\ \Omega_{z_i} &\equiv \frac{p_i^2}{2\bar{\mu}} + n_i p_i - \alpha(\bar{z} - z_i) = 0\end{aligned}$$

If we assume that the second-order condition $\Omega_{p_i p_i} \Omega_{z_i z_i} - \Omega_{z_i p_i} \Omega_{p_i z_i} > 0$ holds at all solutions of the first-order conditions then, by Cramer's rule, we obtain that welfare

levels are strategic complements; i.e.

$$\begin{aligned}
\frac{\partial z_i}{\partial z_j} &= \frac{\begin{vmatrix} \Omega_{p_i p_i} & -\Omega_{p_i z_j} \\ \Omega_{z_i p_i} & -\Omega_{z_i p_j} \end{vmatrix}}{\Omega_{p_i p_i} \Omega_{z_i z_i} - \Omega_{z_i p_i} \Omega_{p_i z_i}} \\
&= \frac{p_i \left(\frac{z_i - \bar{z}}{2\bar{\mu}} (1 - z_i) + \beta \right) + z_i \left(\frac{p_i}{\bar{\mu}} + n_i + \frac{z_i - \bar{z}}{2\bar{\mu}} p_i \right)}{\Omega_{p_i p_i} \Omega_{z_i z_i} - \Omega_{z_i p_i} \Omega_{p_i z_i}} \\
&= \frac{\frac{p_i(z_i - \bar{z})}{2\bar{\mu}} + \beta p_i + \frac{p_i z_i}{\bar{\mu}} + n_i z_i}{\Omega_{p_i p_i} \Omega_{z_i z_i} - \Omega_{z_i p_i} \Omega_{p_i z_i}} > 0
\end{aligned}$$

where the latter inequality follows simply from our assumption that $\beta > \frac{\bar{z}}{2\bar{\mu}}$ and from the fact that we assumed the second-order condition to hold.

Also, we see directly that competition gets more intense when β rises; i.e. when it becomes harder to move recipients from the locally to the centrally funded benefit scheme. In our context, this corresponds to a steeper slope of the best response function. We see immediately that this is the case by calculating

$$\frac{\partial(\partial z_i / \partial z_j)}{\partial \beta} = \frac{p_i}{\Omega_{p_i p_i} \Omega_{z_i z_i} - \Omega_{z_i p_i} \Omega_{p_i z_i}} > 0$$

The analysis of this section therefore highlights two points: i) per-capita benefit levels are strategic complements, independently of whether local governments are able to manipulate the number of welfare recipients by classifying some of them as non-eligible and ii) if it becomes harder for local governments to do so, for instance because it is no longer possible to shift some recipients into the federal assistance scheme, then we expect competition to become more intense.

The main insight gained from this formal analysis concerns the intensity of strategic interaction. We have seen that this intensity increases as it becomes harder for local governments to manipulate it's welfare caseload directly. Hence, the decline in the intensity of competition that we observed after the reform cannot be attributed to the more clearly defined affiliation of a recipient to either the basic assistance scheme or the federal unemployment insurance.

Table 1: Standard Rates by state and year

State	Standard Rate at July, 1 st in EUR			
	1999	2000	2003	2004
Hamburg	279,68	281,21	345	345
Bremen	279,68	286,84	345	345
Mecklenburg-Vorpommern	263,32	263,32	331	331
Baden-Württemberg	269,45	269,45	345	345
Bavaria	260,76	272,52	272,52	341
Brandenburg	255,65	255,65	283	283
Hesse	276,10	276,10	345	345
Lower Saxony	279,68	281,21	281,21	281,21
North Rhine-Westphalia	279,68	281,21	296	345
Rhineland Palatine	268,9	268,9	268,9	345
Saarland	268,9	268,9	268,9	345
Saxony	266,90	268,43	268,43	345
Sachsen-Anhalt	265,36	265,36	331	331
Schleswig-Holstein	268,94	268,94	268,94	345
Thüringen	256,67	256,67	256,67	331
Berlin	281,21	281,21	281,21	281,21

Rates for the year 1999 and 2000 are converted in Euros.

B Tables and Figures

Table 2: Summary statistics 2000 and 2004

Variable	Unit	2000			2004		
		N	Mean	Std. Dev.	N	Mean	Std. Dev
Debt	100 EUR per-capita	435	107.2	43.78	323	102.76	37.03
Insolvency	per 1×10^6 residents	435	50.54	19.62	323	129.8	45.95
Transfers	EUR per-capita	435	295.37	147.55	323	404.87	53.42
Unemployment	per cent	435	10.86	5.57	323	10.6	5.74
Rate	EUR	435	269.93	6.2	323	304.2	35.29
Left	share	435	0.51	0.097	323	0.48	0.12
Total Exp.	100 Euro per-capita per month	435	3.76	1.61	323	4.07	1.94
Income	1000 EUR per-capita	435	15.52	2	323	16.82	2.2

Counties with at least one missing observation are removed from the data.

Table 3: Average monthly level of household assistance by household size in Euro

	Household Size					
	1 person	2 persons	3 persons	4 persons	>4 persons	
January 2006	Mean	193.8	275.2	321.7	383.1	458.2
	Std. Dev.	35.2	44.75	50.76	57.86	68.53
July 2006	Mean	200.8	279.2	326.5	389.00	466.8
	Std. Dev.	35.24	44.65	50.1	56.14	68.6
January 2007	Mean	218.5	286.1	333.8	397.3	479.7
	Std. Dev.	35.37	45.98	53.5	60.00	73.73
July 2007	Mean	221.6	288.7	335.2	398.1	482.2
	Std. Dev.	35.8	46.56	54.68	60.27	73.67

Source: Bundesarbeitsagentur

Table 4: Maximum-Likelihood coefficient estimates for the 2000 cross-section

	2000					
	Total Expenditure					
	W^n			W^m		
	(1)	(2)	(3)	(4)	(5)	(6)
ρ	0.725*** (0.00)	0.722*** (0.00)	0.722*** (0.00)	0.85*** (0.00)	0.85*** (0.00)	0.85*** (0.00)
Debt	-0.001 (0.21)	0.00 (0.26)	0.00 (0.30)	0.00 (0.48)	0.00 (0.50)	0.00 (0.52)
Insolvencies	-0.001 (0.62)	0.00 (0.86)	0.00 (0.81)	0.00 (0.45)	0.00 (0.50)	0.00 (0.49)
Transfers	0.00 (0.53)	0.00 (0.42)	0.00 (0.40)	0.00 (0.56)	0.00 (0.54)	0.00 (0.54)
Income	0.066** (0.023)	0.04 (0.23)	0.05 (0.21)	0.04 (0.14)	0.04 (0.29)	0.04 (0.29)
Rate	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.00)	-0.03*** (0.00)	-0.03*** (0.00)
Left	1.92*** (0.01)	2.25*** (0.01)	2.32*** (0.00)	1.04* (0.09)	1.11 (0.102)	1.12 (0.10)
Unempl.		-0.02 (0.25)	-0.02 (0.25)		0.00 (0.83)	-0.03 (0.83)
Election			-0.06 (0.67)			-0.019 (0.89)
Tests of Error Spec.						
LM Breusch Pagan	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LM Test Spat. Error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LM Test Spat. Lag	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Robust Tests						
RLM Test Spat. Error	(0.16)	(0.03)	(0.02)	(0.88)	(0.09)	(0.16)
RLM Test Spat. Lag	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	435	435	435	435	435	435

p-values in parenthesis

*** denotes significance at the 1% level, ** denotes significance at the 5% level

and * denotes significance at the 10% level

Table 5: Maximum-Likelihood coefficient estimates for the 2004 cross-section

	2004					
	Total Expenditure					
	W^n			W^m		
ρ	0.70*** (0.00)	0.698 (0.00)	0.698*** (0.00)	0.85*** (0.00)	0.848*** (0.00)	0.85*** (0.00)
Debt	-0.003 (0.19)	-0.002 (0.30)	-0.002 (0.33)	-0.002 (0.18)	-0.002 (0.27)	-0.002 (0.32)
Insolvencies	0.00 (0.90)	0.00 (0.87)	0.00 (0.872)	0.00 (0.94)	0.00 (0.97)	0.00 (0.97)
Transfers	-0.004*** (0.01)	-0.003 (0.02)	-0.004** (0.018)	-0.003* (0.05)	-0.002* (0.09)	-0.003* (0.07)
Income	-0.03 (0.38)	-0.076 (0.13)	-0.075 (0.14)	-0.04 (0.27)	-0.007 (0.10)	-0.07 (0.11)
Rate	0.004* (0.06)	0.004* (0.10)	0.003 (0.14)	0.004* (0.08)	0.003 (0.12)	0.003 (0.19)
Left	2.81*** (0.00)	3.41*** (0.00)	3.42*** (0.00)	1.45* (0.05)	1.96** (0.02)	1.97** (0.02)
Unempl.		-0.029 (0.19)	-0.026 (0.27)		-0.025 (0.21)	-0.02 (0.35)
Election			-0.08 (0.74)			-0.134 (0.55)
Tests of Error Spec.						
LM Breusch Pagan	(0.32)	(0.03)	(0.0)	(0.11)	(0.01)	(0.00)
LM Test Spat. Error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
LM Test Spat. Lag	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Robust Tests						
RLM Test Spat. Error	(0.02)	(0.06)	(0.07)	(0.02)	(0.08)	(0.09)
RLM Test Spat. Lag	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	323	323	323	323	323	323

p-values in parenthesis

*** denotes significance at the 1% level, ** denotes significance at the 5% level

and * denotes significance at the 10% level

Table 6: Instrumental Variables Estimation: Standard Weights

Dependent Variable: Total Expenditure per recipient 2000			
ρ	0.875***	0.91***	0.939***
	(0.00)	(0.00)	(0.00)
Debt	0.00	0.00	0.00
	(0.60)	(0.74)	(0.73)
Insovencias	0.00	0.00	0.00
	(0.49)	(0.71)	(0.59)
Transfers	0.00	0.00	0.00
	(0.39)	(0.52)	(0.63)
Income	0.07 ***	0.054**	0.05
	(0.00)	(0.03)	(0.15)
Rate	-0.016*	-0.017*	-0.02**
	(0.08)	(0.09)	(0.04)
Left	0.71	0.62	1.096
	(0.29)	(0.40)	(0.19)
Unempl.		.01	-0.01
		(0.61)	(0.58)
Election			-0.106
			(0.46)
N	435	435	435

p-values in parenthesis

*** denotes significance at the 1% level, ** denotes significance at the 5% level and * denotes significance at the 10% level

Table 7: January Panel: Maximum Likelihood Coefficient Estimates by household size

	$n = 1$		$n = 2$		$n = 3$		$n = 4$		$n > 5$	
	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m
ρ	0.183*** (0.00)	0.308*** (0.00)	0.09 (0.16)	0.174* (0.06)	0.003 (0.96)	-0.00 (0.99)	0.14** (0.04)	0.199** (0.04)	0.14** (0.04)	0.19** (0.04)
Constant	19.97*** (0.00)	16.86*** (0.00)	8.4*** (0.00)	7.27*** (0.00)	11.76*** (0.00)	11.79*** (0.00)	13.05*** (0.00)	11.6*** (0.00)	13.05*** (0.00)	11.52*** (0.00)
Δ Unemployment	0.362 (0.33)	0.25 (0.49)	-0.14 (0.77)	-0.17 (0.72)	0.78 (0.28)	0.78 (0.29)	1.22 (0.19)	1.13 (0.22)	1.22 (0.19)	1.13 (0.22)
Δ Rent	1.34 (0.69)	1.38 (0.67)	3.27 (0.45)	3.27 (0.45)	-3.24 (0.62)	-3.27 (0.62)	0.01 (0.99)	-0.32 (0.97)	0.01 (0.99)	-0.32 (0.97)
Election	0.23 (0.80)	0.73 (0.43)	-0.93 (0.44)	-0.68 (0.57)	0.08 (0.96)	0.08 (0.97)	0.07 (0.97)	0.30 (0.97)	0.07 (0.97)	0.29 (0.90)
Breusch-Pagan	0.54 (0.01)	0.44 (0.00)	0.13 (0.03)	0.15 (0.04)	0.98 (0.90)	0.98 (0.95)	0.75 (0.03)	0.78 (0.04)	0.75 (0.03)	0.78 (0.04)
LMErr	0.00 (0.75)	0.00 (0.15)	0.13 (0.01)	0.04 (0.09)	0.96 (0.73)	0.99 (0.23)	0.03 (0.88)	0.04 (0.58)	0.03 (0.87)	0.04 (0.61)
RLMLag	0.04 (0.04)	0.107 (0.107)	0.04 (0.04)	0.11 (0.11)	0.72 (0.72)	0.23 (0.23)	0.79 (0.79)	0.50 (0.50)	0.55 (0.55)	0.78 (0.78)
N	343	343	343	343	343	343	343	343	343	343

p-values in parenthesis

*** denotes significance at the 1% level, ** denotes significance at the 5% level

and * denotes significance at the 10% level

Table 8: July Panel: Maximum-Likelihood Coefficient Estimates by household size

	$n = 1$		$n = 2$		$n = 3$		$n = 4$		$n > 5$	
	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m	W^{nc}	W^m
ρ	0.177*** (0.00)	0.34*** (0.00)	-0.01 (0.89)	0.08 (0.40)	-0.05 (0.49)	-0.02 (0.82)	0.003 (0.64)	0.02 (0.82)	0.03 (0.64)	0.02 (0.82)
Constant	16.12*** (0.00)	12.78*** (0.00)	8.4*** (0.00)	7.51*** (0.00)	8.97*** (0.00)	8.85*** (0.00)	5.63*** (0.00)	5.59*** (0.01)	5.63*** (0.00)	5.59*** (0.01)
Δ Unemployment	0.41 (0.33)	0.33 (0.42)	0.44 (0.36)	0.38 (0.42)	1.23* (0.09)	1.22* (0.09)	-0.50 (0.61)	-0.52 (0.60)	-0.5 (0.61)	-0.52 (0.60)
Δ Rent	0.36 (0.92)	0.08 (0.98)	-5.99 (0.14)	-5.9 (0.14)	-5.04 (0.40)	-4.63 (0.44)	-10.62 (0.19)	-10.75 (0.19)	-10.6 (0.20)	-10.75 (0.19)
Election	2.33** (0.04)	2.33** (0.04)	-0.11 (0.89)	-0.08 (0.95)	1.46 (0.45)	1.39 (0.47)	3.50 (0.19)	3.59 (0.18)	3.49 (0.19)	3.59 (0.18)
Breusch-Pagan	(0.81)	(0.91)	(0.02)	(0.02)	(0.00)	(0.00)	(0.32)	(0.33)	(0.32)	(0.33)
LMErr	(0.00)	(0.00)	(0.91)	(0.43)	(0.45)	(0.70)	(0.68)	(0.84)	(0.68)	(0.84)
LMlag	(0.00)	(0.00)	(0.89)	(0.40)	(0.47)	(0.81)	(0.63)	(0.82)	(0.63)	(0.82)
RLMErr	(0.36)	(0.93)	(0.31)	(0.38)	(0.83)	(0.02)	(0.64)	(0.78)	(0.64)	(0.78)
RMllag	(0.29)	(0.72)	(0.31)	(0.35)	(0.92)	(0.02)	(0.60)	(0.76)	(0.60)	(0.76)
N	330	330	330	330	330	330	330	330	330	330

p-values in parenthesis

*** denotes significance at the 1% level, ** denotes significance at the 5% level

and * denotes significance at the 10% level

Missing Observations in January Panel

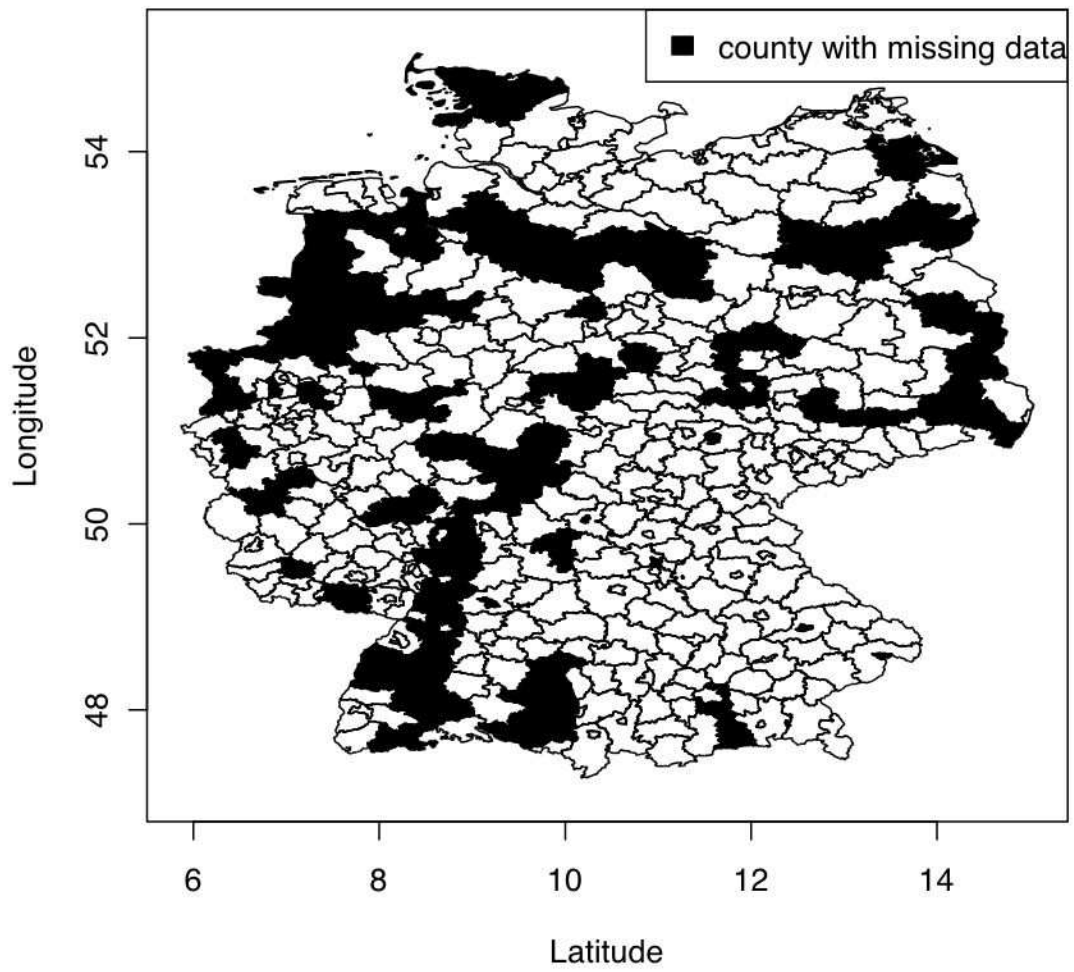


Figure 1: Missing data between July 2006 and July 2007

Missing Observations in July Panel

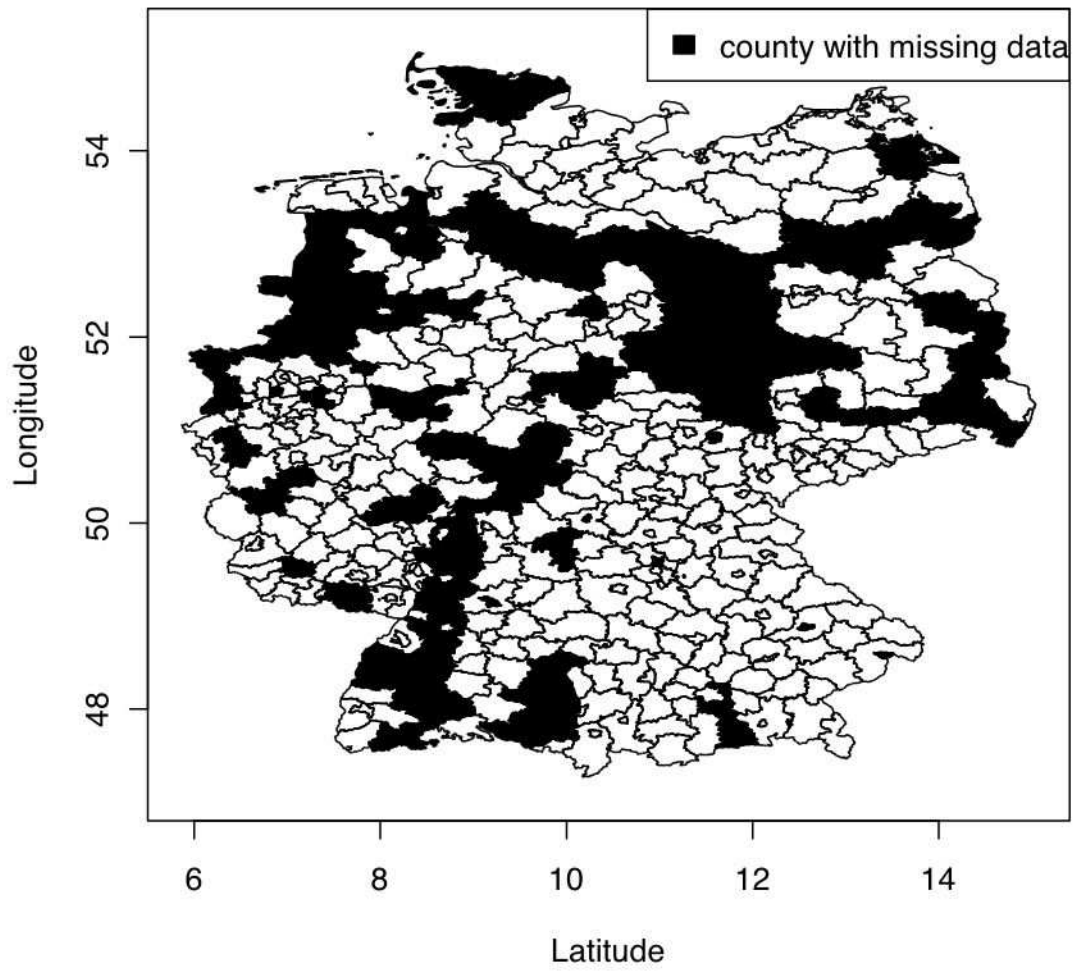


Figure 2: Missing data between January 2006 and January 2007