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April 2018

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Equalization Transfers and the Pattern of Municipal Spending: An Investigation of the Flypaper Effect in Germany

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Abstract

We investigate how lump-sum equalization transfers affect expenditures and taxes in the municipalities of the largest German state North Rhine-Westphalia. In general, those general-purpose transfers cannot be treated as exogenous variables. Thus, for the identification of causal effects, two exogenous adjustments in the transfer allocation formula are used as instrumental variables. Findings suggest the existence of the "flypaper effect" – municipalities use transfers to increase expenditures but do not reduce tax rates. Extra money from transfers is mainly used to finance social expenditures and public facilities. A set of robustness checks, including a spatial dependence model, confirm the results.

JEL classification: H21; H70; H71; H72; H77

Keywords: flypaper effect, local government expenditure, transfers, local taxation

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1. INTRODUCTION

Equalization transfers from higher-level budgets play an important role as a source of revenue for municipal budgets. They are designed to cover the gap between the financial needs of the municipalities and their own tax revenues. The goals are, on the one hand, to help the municipalities provide an adequate level of public goods and on the other, to smooth regional disparities (Rosenfeld, 2010).

The main type of transfer to the municipalities in Germany is the so-called non-matching or general-purpose transfer. These transfers have a lump-sum character and are allocated on the basis of a formula that compares fiscal need and fiscal capacity. This type of financial support for municipalities exists in many countries. An often posed research question then is: What is the effect of such transfers on municipal spending? According to median voter theory, the effect on local government expenditures from changes in lump-sum intergovernmental transfers and from changes in private incomes should be equal (Bradford and Oates, 1971a, 1971b). This means that, depending on the income elasticity of the median voter, local governments should forward transfers to local taxpayers by lowering tax rates and increasing expenditure on the enhancement of public services and goods.

In empirical terms, however, many authors find that compared to a rise in revenue from other sources there is a stronger increase in public spending in response to a rise in lump-sum intergovernmental transfers. This is the so-called "flypaper effect" (Gramlich et al., 1973).[1] Another definition says that a flypaper effect appears if an increase in transfers is not used to cut local tax rates (Allers and Vermeulen, 2016). The implication is that political agents conceal the lump-sum character of transfers and use the money to extend their budgets instead of refunding it to taxpayers (Dollery and Worthington, 1996). Various theoretical justifications for a flypaper effect involve the role of budget-maximizing bureaucrats (Wyckoff 1988), political agency (Brollo et al., 2013) or dynamic interactions between politicians and other interest groups (Singhal, 2008).

In this paper, we examine the effect of general-purpose transfers on total and various subcategories of municipal expenditures and tax rates, taking the German federal state of North-Rhine Westphalia as a

[1] The flypaper effect was also initially examined by Oates (1979), Courant et al. (1979), and Oates (1988).

case study. The contributions of the paper are the following. First, to the best of our knowledge, no empirical study before investigated the effect of transfers on different expenditure subcategories in German municipalities. We look into various expenditure subcategories because the control variables commonly used in the flypaper effect literature (e.g. age structure and population density) arguably do not affect all types of expenditures equally. Second, we employ a novel identification strategy based on exogenous adjustments in the formula used to calculate and apply modern statistical tests to confirm the robustness of our results. Third, we additionally apply a model with instrumental variables and spatial dependence to capture spatial correlation in the economic performance of the municipalities, which may affect both, the expenditures and the transfers.

Many studies, e.g. Logan (1986); Grossman (1990); Dollery and Worthington (1995); Knight (2002) support the existence of the flypaper effect. However, several authors (e.g. Hamilton, 1983; Hines and Thaler, 1995) doubt its existence and criticize misguided empirical procedures (matching and non-matching transfers mixed up together) or errors in statistical modeling (endogeneity not considered). According to Becker (1996), the flypaper effect is sensitive to the specification of the expenditure equations and the modeling of transfers to municipalities. She argues that potential endogeneity of transfers due to unobserved municipal characteristics, could bias the estimate of the spending response and suggests correcting for this. Other authors, such as Knight (2002) for US highway aid transfers and Gordon (2004) for US school district aid transfers, find that the flypaper effect disappears altogether after accounting for endogeneity with instrumental variables. On the other hand, in their quasi-experimental studies examining the effect of non-matching transfers on local fiscal policy, Dahlberg et al. (2008) for Sweden, Allers and Vermeulen (2016) for the Netherlands, Ferede and Islam (2015) for Canada and Baskaran (2016) for Hesse in Germany find evidence for the existence of a flypaper effect (after accounting for endogeneity). The contradictory nature of these findings provides us with the motivation for a careful empirical investigation based on detailed data.

The analysis in the paper is performed for the federal state North-Rhine Westphalia (NRW). It has 396 municipalities that vary in wealth and other characteristics such as demographic composition and structure of expenditures. We exploit two adjustments in the fiscal equalization system in NRW to

identify the exogenous effect of transfers. The questions we ask are: Can a flypaper effect be identified for the municipalities of NRW? If so, which expenditure subcategories are influenced to a higher degree? Due to the fact that transfers are not earmarked it is especially interesting to see in which categories they are primarily spent, compared to the mean share of these categories within the overall municipal spending. Helpful insights for a central government can be derived – for instance if to some extend non-matching transfers should be earmarked instead.

Our study is most closely related to the studies by Ferede and Islam (2015) on Canadian provinces, Allers and Vermeulen (2016) on the Netherlands and Baskaran (2016) on Hesse in Germany. However, municipal transfers in Hesse are subject to special rules that do not exist in this form in other German federal states. In addition, we do not limit the estimations to a particular type of municipalities as done by Baskaran (2016). Different from the analysis of Ferede and Islam (2015) that concentrate on education expenditures only, we do not limit our investigation to one expenditure type. Instead, we include eight expenditure subcategories. Finally, and also in contrast to Allers and Vermeulen (2016), we apply a unique identification strategy based on the adjustments in the fiscal equalization system. Accordingly, we believe that our findings are more readily transferable to other German federal states and can claim greater overall validity.

The paper is organized as follows: The next section addresses the German fiscal equalization scheme and the background of the instruments used in the empirical part. The data is described in the third section. Section four specifies the empirical model. After that, the fifth section presents our results and discusses subsequent robustness checks. The sixth section concludes.

2. FISCAL EQUALIZATION SCHEMES AND INSTITUTIONAL BACKGROUND IN NRW

2.1. Municipal taxes and transfers in Germany

Germany's basic constitutional law gives each municipality the right to handle local matters as it sees fit (Article 28 (2) constitutional law). This so-called "autonomy of usage" is designed to encourage flexibility and ensure efficient expenditure planning. The federation imposes income tax, value-added

tax, and most excise taxes and tolls; the federal states impose vehicle and wealth taxes; and the municipalities mainly impose business and property taxes (Rudzio, 2003).

Business tax is a tax on the profits made by commercial enterprises. Property tax is levied on the possession of land and property. The municipalities decide on the level of the tax multipliers that have a direct impact on the amount of their business and property tax revenues. The multiplier is determined annually in the municipal budget statutes and represents a given percentage by which the basic federal rate is multiplied. A summary of the statistics on the levels of these tax multipliers is provided in Table 2. In comparison with other German states, NRW has high tax-multipliers (Goerl et al., 2013).

Most municipalities receive transfers representing a significant source of revenue for them. These transfers are of two major kinds: (a) non-matching transfers (*allgemeine Zuweisungen*) mainly formula-based transfers (*Schlüsselzuweisungen*), where the recipient municipality has full power of disposal, and (b) matching transfers (*zweckgebundene Zuweisungen*), where the transfer authority can influence the use of the funds in question. (Tanzmann, 2012).

2.2. Fiscal Equalization in NRW

In NRW, around 85 percent of all funds within the equalization scheme are allocated via formula-based transfers. About 80 percent of these transfers are assigned to municipalities and cities with county status; the rest goes to higher-order authorities (Goerl et al., 2013).

One important aspect of the institutional background is the way different-sized municipalities are treated. The fiscal need is determined by a formula that combines the main component (*Haupansatz*) or weight function (Baskaran, 2016), which depends on the population level lagged by two years, and the subordinate component (*Nebenansatz*), which takes other factors into account. To calculate the weight function, population of a municipality is multiplied by a weighting factor that depends on the population bracket a municipality belongs to.[2] This scheme is designed to account for the increasing fiscal expenditure for every additional citizen and the increasing costs for the provision of public goods and services (so-called *Einwohnerveredelung*). In NRW, and most other federal states, weighting factors

[2] In NRW there are 19 or 20 such brackets depending on the year of fiscal equalization, see Appendix Table A1.

corresponding to population between the staggered levels are calculated by linear interpolation. This is a difference to the practice of stepwise weighting in Hesse described in Baskaran (2016).

In the subordinate component of the fiscal needs formula, other factors such as the number of school students and a factor on municipal centrality are accounted for. The sum of the components gives the total (*Gesamtansatz*) to determine the fiscal need measure.[3] The compensation rate in NRW amounts to 90 percent. This means that if fiscal need is higher than fiscal capacity, 90 percent of the difference is made up for. If the fiscal need of a municipality is lower than its fiscal capacity, it is classified as "abundant". This applies to only a few municipalities in our sample.[4]

2.3. The Adjustments in the Formula-based Transfers in 2011 and 2012

In 2011 and 2012, two adjustments in the population brackets were implemented in NRW, which had the potential to change the bracket a given municipality belonged to (see Appendix Table A1) and thereby change the transfers a municipality received. The adjustments were carried out due to the requirement of the law on municipal financing and of the constitutional court of NRW to adapt to current developments and to changed statistical data. They were intended to guarantee equity for the distribution of transfers between municipalities (Ministry of Internal Affairs and Municipal Issues NRW (MIK), 2016). In both cases, the changes were agreed on shortly before the respective law on municipal financing came into force. Major structural changes were not intended by the adjustments. Changes in the equalization formula induced by reforms were previously studied in Lower Saxony, but with a focus on tax competition (Egger et al., 2010).

For the law on municipal financing 2011, basic data, which serve as the fundament for the projection of (so called "fictitious") fiscal need and tax capacity were updated to base year 2008. The update concerned for instance the data on the composition of the population and the number of school students. Such updates are implemented in irregular intervals in NRW, the previous one was in 2003 (to the base

[3] The NRW equalization law is available from: Ministry of Internal Affairs and Municipal Issues North Rhine-Westphalia (2013), https://recht.nrw.de/lmi/owa/br_vbl_detail_text?anw_nr=6&vd_id=13793&sg=0&menu=1.

[4] In a separate estimation in the section on robustness we restrict the sample to municipalities with transfers p.c. in the lowest 25 percent quantile which mainly includes abundant municipalities.

year 1999). Following the data update, fictitious fiscal need for the upcoming years was extrapolated based on regression analysis. As a result, adjustments in the population brackets were implemented.

In addition to data updating, the MIK periodically assigns researchers with expert reports on the analysis and advancement of the municipal fiscal equalization scheme.[5] They are carried out due to changes in socio-economic and institutional conditions. By the assignment of those reports, the government aims to identify requirements for adjustment based on the current legal situation. The last expert report (Büttner et al., 2008) inspired a lengthy debate on the projection methods employing regression analysis and on the overall design of the equalization scheme in NRW, e.g. on the elements included. On the basis of further research and consultations, a modification of the weight function was agreed upon (a demographic factor and a factor for the municipal area was inserted into the regressions). This again led to an adjustment of the population brackets, which came into force in 2012.

As the population of municipalities in each year is known, it is possible to calculate the corresponding change in weighting factors due to both adjustments for each municipality. For these calculations, the population lagged by two years must be applied, as is specified in the fiscal equalization law (MIK NRW, 2013). Figure 1 illustrates the effect of the two adjustments on the weight function and the transfers per capita in four exemplary municipalities. The left panel shows the difference between the initial level of the weight function in 2009 and the actual level in the following years (in percentage points). The right panel does the same for the received transfers per capita. As displayed, in 2011 all four municipalities received less transfers compared to the previous year. The adjustments of 2012 resulted in higher transfers. The figure suggests correlation between the changes in the weight function and the changes in transfers.

[5] Ministry for Internal Affairs and Municipal Issues of the state North Rhine-Westphalia, http://m.mik.nrw.de/themen-aufgaben/kommunales/kommunale-finanzen/kommunaler-finanzausgleich/analyse-weiterentwicklung.html.

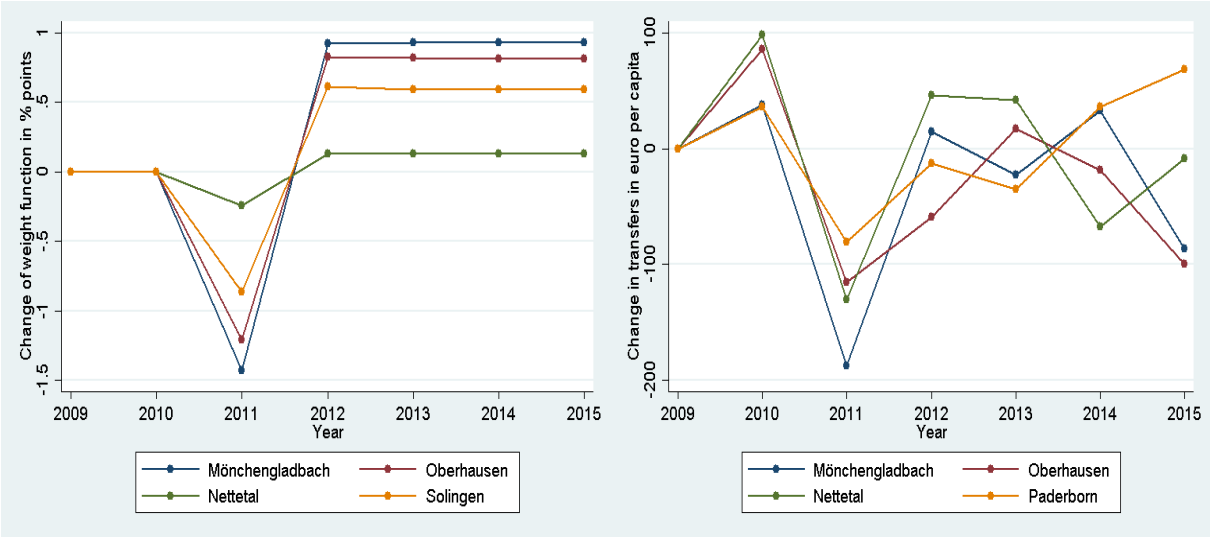

Figure 1. Illustration of the adjustment in the weight function and the changes in transfers per capita for four municipalities.

Source: Data from official statistical office NRW (Genesis online, 2016), own calculations.

Both adjustments were introduced when the respective law on municipal financing was adopted and came into force. Not until then the municipalities were informed about the effective amount of formula-based transfers they receive and could never influence these decisions in any kind. Municipalities were thus presumably not able to tailor their policies and expenditures in advance. As discussed in the section on the empirical strategy, our main identifying assumption in the estimation of the flypaper effect is that the exogenous adjustments of the population brackets and thus in the weighting factors in years 2011 and 2012 induce exogenous changes in formula-based transfers received by the municipalities. These adjustments will be used in the instrumental variables estimations below.

A note of caution has to be placed here. The changes in the population brackets and thus in weighting factors play an important role for the fiscal need measure but fiscal capacity stays unaffected. Thus, only one main factor for the calculation of the formula-based transfers is altered by the adjustments. In the estimations, we test whether this is enough to identify the exogenous variation of the transfers.

3. DATA

The investigation is performed using a dataset on all municipalities in the German federal state of North Rhine-Westphalia (NRW). In our sample, NRW consists of 396 municipalities for the investigation

period 2009-2015. Accordingly, the final sample contains 2,772 observations in NRW. The data were obtained from the statistical database Genesis online (2016).

The selection of NRW is mainly motivated by the two adjustments in 2011 and 2012, which are used for identification of the causal impact of transfers. Other reasons for the selection of the sample are the availability of detailed data on the structure of municipal revenue sources and municipal expenditures. In addition, NRW is the most highly populated state with almost a quarter of all German population. The relevant part of the transfer allocation scheme of NRW is very representative in the German context.

The investigation period is limited by data availability. Data before 2009 is not as suitable due to changes from the cameralistics to the double-entry bookkeeping. In addition, data on the structure of expenditures is provided with a delay of two years at least. The rather short time period could limit the conclusions that can be drawn, especially tax rates might be long run decisions. Nevertheless, municipal councils decide on changes in the tax multipliers each year again and as Table A3 shows, variation in the tax multipliers is high. Furthermore, previous studies based their estimations on datasets of similar length (e.g. Baskaran, 2016; Dahlberg et al., 2008). We normalized all monetary values using the consumer price index with the base year 2010.

Table 1. Average structure of municipal revenues and expenditures in NRW (2009-2015).

Revenue category	**Share**	**Expenditure category**	**Share**
Business tax	19-21 %	Transport, infrastructure, and construction (TIC)	13-14 %
Property tax	6 %	Administration	54-56 %
Income tax	12-13 %	Business development	1-2 %
Other general municipal taxes	1-2 %	Public facilities	3-4 %
Formula-based transfers	12 %	Culture and sports	3-4 %
Investment transfers	3-5 %	Health system	1 %
Transfers and grants for present purposes	4-5 %	Social system	12-14 %
Other general transfers	2-3 %	Education	6-7 %
Other revenue sources	33-41 %		

Source: own calculations based on Genesis online (2016)

Two major local revenue sources are business tax and income tax. Formula-based transfers constitute on average 12 percent of the overall municipal revenues. The public spending shares in Table 1 indicate that administration expenditure represents the major subcategory, followed by the social system and infrastructure (TIC) subcategories. Detailed definitions of the expenditure subcategories can be found in the Appendix (see Table A2).

Table 2 shows summary statistics and gives an overview of the variables used in the empirical analysis. As presented in this table, the variation of the outcome variables – expenditures and tax multipliers – is high. This expresses the large degree of spending autonomy municipalities in NRW have. The selection of control variables is mainly based on the previous literature. Certain expenditures in the municipalities may differ depending on the proportion of young and old people in the population. A high number of elderly people may lead to high health expenditures. Population density may capture higher per capita expenditures, notably in the large towns. Population density in our sample is rather strongly correlated with population size; therefore, the population variable is not separately included into the estimations. The variable unemployed per capita (the unemployment rate is not available at municipal level) is also included to control for temporal economic shocks at the municipal level. Finally, spending behaviour of municipalities controlled by an absolute majority of conservative parties could be different compared to

municipalities with other majorities, they might tend to be more rigorous savers. As a political control variable we hence introduce the percentages of votes for conservative/ right-wing parties.

Table 2. Summary statistics.

	Obs.	Population-weighted mean	Mean	Std. dev.	Min	Max
Expenditures (p.c.)						
Total expenditure	2772	2619.6	2032.7	538.2	1056.5	7878.6
TIC	2772	326.4	272.4	131.9	0.3	1065.2
Administration	2772	1187.5	1147.2	321.4	509.8	6486.1
Business development	2772	38.5	31.5	56.1	0	1443.5
Public facilities	2772	104.6	70.9	44.2	3.8	427.3
Culture/ Sports	2772	107.9	62.6	43.7	0	356.5
Health system	2772	19.45	12.9	9.1	0	267.8
Social system	2772	670.9	285.7	276.5	8	2008.1
Education	2772	164.3	149.4	68.1	13.6	569.4
Transfers (p.c.)						
Formula-based transfers	2772	311.2	194.2	170.5	-38.4	1116.9
Transfers for present purposes	2772	102.5	105.2	47.8	0.2	665.7
Investment transfers	2772	126.5	83.6	58.4	0	336.1
Tax multipliers						
Property tax multiplier, %	2772	479.2	436.2	74.7	240	876
Business tax multiplier, %	2772	448	428.4	28.7	285	550
Other Indicators						
% Age 65+	2772	20.5	20.2	2.16	12.3	31.7
Population density	2772	1246.2	504.9	533.3	43.2	3221.2
Conservative vote shares	2772	0.45	0.51	0.11	0.19	0.81
Unemployed p.c.	2772	4.29	3.16	1.18	0.66	7.25
Instruments (Cross-section)						
Adjustment 2011 (change in weighting factor rates 2011 compared to 2009), % points	396	-0.74	-0.14	0.38	-4.88	0
Adjustment 2012 (change in weighting factor rates 2012 compared to 2011), % points	396	0.88	0.17	0.52	0	4.88

Notes*:* Statistics for pooled observations 2009-2015. Monetary values in euro, prices of 2010. Summary statistics for the instruments reported for the year of the adjustments implementation only.

4. EMPIRICAL STRATEGY

To test for the existence of the flypaper effect we estimate the relationships between non-matching transfers and public spending as well as between non-matching transfers and tax rates set by municipalities. Different expenditure categories and tax rates are the dependent variables in the respective regressions. The key explanatory variable is always the value of the non-matching transfers (per capita). The flypaper effect exists if the value of the corresponding coefficient is statistically significant and positive in the expenditure regressions and not significant in the tax-rate regressions (Knight, 2002; Gordon, 2004; Dahlberg et al., 2008; Ferede and Islam, 2015; Baskaran, 2016).

For the estimations we employ a two-stage least squares method (2SLS) with instrumental variables applied to a panel dataset (for completeness, OLS results are presented in the Appendix Table A4). The motivation for this choice is the endogeneity problem known from previous literature. In particular, the size of the non-matching transfers is non-random. Hence, there may be a bias stemming from unobserved attributes of the municipalities that influence both, transfers and expenditures. Additionally, the amount of transfers a municipality receives also depends on its tax revenues and thus, presumably, on the own expenditures, i.e. transfers influence expenditures and vice versa (Becker 1996). This is the bias from reverse causality. Our identification strategy is based on exploiting two exogenous adjustments in the population brackets and thus in the weighting factors determining the fiscal needs (as explained in Section 2).

In the first stage of 2SLS, the transfer per capita variable is decomposed into a component explained by the instrument and a problematic component v_{it}. The first stage is specified as follows:

$$TR_{it} = \alpha_0 + \alpha_1 ADJ_{it}^{2011} + \alpha_2 ADJ_{it}^{2012} + \boldsymbol{a} \cdot \boldsymbol{X} + \mu_t + \gamma_i + v_{it}, \text{ where} \quad (1)$$

TR_{it} = non-matching transfers per capita of municipality *i* in year *t*;

ADJ_{it}^{2011}= the difference between the weighting factor applying to municipality *i* in year *t* according to the 2011 adjustment and the weighting factor applying according to the initial rules (equal to zero in years 2009-2010);

ADJ_{it}^{2012}= the difference between the weighting factor applying to municipality *i* in year *t* according to the 2012 adjustment and the weighting factor applying according to the 2011 adjustment (equal to zero in years 2009-2011);

X = vector of other explanatory variables;

μ_t = set of year fixed effects;

γ_i = time-invariant municipal fixed effects.

In the second stage of 2SLS, the fitted values of $\widehat{TR}$ from the first stage are used instead of the problematic (endogenous) value of *TR*. The second stage is specified as follows:

$$y_{it} = \beta_0 + \beta_1 \widehat{TR}_{it} + \boldsymbol{b} \cdot \boldsymbol{X} + \mu_t + \gamma_i + u_{it}, \text{ where} \quad (2)$$

y_{it}= either expenditures per capita (total and subcategories) or business tax multiplier or property tax multiplier.

As explained above, the motivation for the two adjustments came from the need to take account of the newest data and methods for the projection of the fiscal needs. The municipalities did not influence these decisions. Tasks or actual fiscal needs of the municipalities did not change due to these adjustments in the equalization scheme. The adjustments were not specifically intended to address indebted municipalities, which speaks against a possible reverse effect of the dependent variables on the instruments.[6] This was confirmed by the department on municipalities of the MIK in personal communications. Moreover, the adjustments were introduced straight away with no announcement period. Based on these considerations and the explanations in Section 2, we can rule out any direct effect of the instruments on the dependent variables.[7]

Furthermore, the adjustments had no other purpose than the determination of the fiscal needs measure, which only had an impact on the amount of non-matching transfers. Tax bases, tax rates, or other kinds

[6] Indebted municipalities were considered in an extra law on budget consolidation as of 2011 (*Stärkungspaktgesetz*). Extra consolidation aids are granted for 61 municipalities for restructuring their budgets. We address this in a separate estimation in the robustness section.

[7] To support the argument further that the adjustments changed the transfers quasi-exogenously, we divided the sample of affected municipalities into a top-50% group with strongest positive effects of the adjustments within their respective size categories, and a bottom-50% group. We then performed t-tests comparing actual before-shock expenditures of the two groups and did not find significant differences. Results can be obtained from the authors upon request.

of transfers were not directly affected by the two adjustments. We can therefore rule out effects running through omitted variables. The absence of the direct effect of the instruments on the dependent variables and of the effect running through omitted variables suggest that our instruments are valid and not correlated with the error term (exclusion restrictions).[8] To strengthen the argument that the instruments are exogenous we present the Hansen J test for overidentifying restrictions in the results section.

Municipal fixed effects are included in the regressions to capture the unobserved characteristics of the municipalities and reduce the omitted variables bias. Comparing the within-variance of the relevant regressors with their between-variance is an indicator for the power of the fixed effects model. The larger the within-variance, the better the performance of the fixed effects model will be (Plümper and Troeger, 2007). Table A3 in the Appendix reports total, between, and within standard deviations for the key variables. From this table it becomes clear that the within variation is not small, thus fixed effects can be included. Furthermore, year fixed effects are included to capture shocks common to all municipalities. In the robustness section, we also estimate specifications that include linear time trends.

We employ two main specifications: a model with a lagged dependent variable (Model I), and a model without the lagged dependent variable (Model II). Both specifications include a full set of year and municipal fixed effects. The set of other control variables includes population shares of residents older than 65 years, population density, vote shares for conservative parties in the municipal councils and unemployed per capita. Results of 2SLS regressions without these further control variables are also reported.

A lagged dependent variable could be used to untangle contemporaneous and past effects of transfers. Municipalities that received more transfers in the past - before the adjustments – could later have higher expenditures. Including this control should in our case not bias the estimation of the effect of transfers because the identification is based on the exogenous instruments (Baskaran, 2016).[9] If the results from

[8] Nevertheless, the robustness of our estimates to small deviations from the assumption of strict exogeneity of the instrumental variables is examined applying the methodology of Conley et al. (2012) in the robustness section.
[9] A lagged dependent variable should only be included if the stationarity condition of the dependent variable holds (Keele and Kelly, 2005). For short panels like ours this cannot be tested reliably. However, it does make sense to assume stationarity in our case. The Harris-Tzavalis panel-data unit-root test rejects the null hypothesis of our panel containing unit roots.

the two models are similar, we will however prefer the specification without the lagged variable due to econometric problems some other authors report (Achen, 2001; Keele and Kelly, 2005).[10]

5. RESULTS

5.1. Key Estimates

The results of the second-stage IV estimations for total municipal expenditures, eight expenditure subcategories and for the tax multipliers are presented in Table 3.[11] The first-stage results are reported in Table A6 of the Appendix. We report clustered standard errors with the municipalities as the unit of clustering in all estimations.[12]

As can be seen from the significance of the corresponding coefficients in the first stage (see Table A6), our instruments are strong predictors for the transfers per capita. The 2011 adjustment affected the level of transfers negatively on average, and the 2012 adjustment – positively. In addition, we report the Kleibergen-Paap Wald F-statistic as a test for the strength of our instruments in Table 3. The F-statistic values indicate that the instruments are strong and relevant. Additionally, looking at the *t*-values of the coefficients of the excluded variables in the first stage strengthens the belief that our instruments are relevant. Figure 1 furthermore shows that our instruments reasonably describe the changes of the transfers.

Because our model is over-identified (two instruments and one endogenous variable), we report the p-values of the Hansen J test. The joint null hypothesis is that the instruments are valid and hence uncorrelated with the error term as well as correctly excluded (Baum et al., 2003). The Hansen J test for the key models in Table 3 reports that both instruments are valid and correctly excluded, since the null hypothesis is not rejected in all estimations, except for the education subcategory. The results for the education subcategory are discussed below.

[10] In this case we also applied a system GMM estimation as suggested by Arrelano and Bond (1991). The results however do not differ significantly from the 2SLS results and can be obtained from the authors upon request.
[11] IV regressions are estimated using the Stata package XTIVREG2 by Schaffer (2010).
[12] Biased OLS results are reported in Table A4 in the Appendix. 2SLS estimates without further control variables are given in Table A5. They provide first signs for the existence of the flypaper effect in the total and social expenditures.

For the total municipal expenditures, Table 3 reports a coefficient of transfers positive and significantly different from zero (but not significantly different from unity) in all specifications. One can thus say that an increase in non-matching transfers by one euro per capita increases total expenditures by roughly one euro per capita. This is a large effect of transfers on public spending. The estimate of Baskaran (2016) for Hesse was in the range of 70-90 cents, fixed effects excluded. Dahlberg et al. (2008) found a similar effect of up to 1.46 euro (also not significantly different from one), fixed effects included.

In Table 3, we also examine the effect of transfers on the two tax multipliers. The estimates suggest no significant impact of transfers on the business tax multiplier throughout all models. A rise in non-matching transfers thus results in higher local spending but does not reduce taxes. These findings indicate the existence of the flypaper effect in the municipalities of NRW.

Next, we investigate the effect of transfers on different expenditure subcategories. For the specification including a lagged dependent variable and fixed effects (Model I), the coefficient of transfers is significant in only two subcategories: social system and public facilities (Table 3). The coefficient of the lagged dependent variable (not reported in the table) is significant in both cases.

In Model II, in line with Model I, the coefficient of the transfers is significant in these two subcategories, too. The public facility subcategory in particular covers spending on environmental, fire-protection and emergency services. The expenditure types with the largest share in the social system subcategory comprise primary care, basic social benefits and day care facilities for children. Both subcategories mainly include types of expenditures that are implemented at a faster pace as compared to e.g. spatial planning/ development or tourism expenditures from other subcategories. A lagged dependent variable is excluded and contemporaneous and past effects of transfers are thus conflated in Model II. We may conclude that in the two subcategories extra money from non-matching transfers is spent in the same year as received.

The insignificant effect of non-matching transfers on education and business development expenditures in all specifications can be explained by the fact that these expenditures are mostly financed at state level. Business development is mostly supported by dedicated or matched transfers, such as investment transfers. As far as municipal expenditures on education are concerned, these only include construction

expenses as well as general and material expenses of local schools, which are also likely to be related to dedicated financing. It is also worth noting that NRW grants extra flat transfers to support municipal tasks for the school sector and early childhood education (in addition to formula-based transfers).

Interestingly, the subcategory with the largest per capita expenses - administration - does not profit from general purpose transfers according to the key estimates. This finding is comparable with the results of Weicher (1972); Grossman (1990); and Moisio (2002), whose analyses of the flypaper effect are partly category-specific as well. Formula-based, non-matching transfers are thus used to increase spending on social system rather than for administrative expenses.

Concerning the other control variables, we find that the unemployed per capita and a high share of residents older than 65 years (age 65+) have the strongest impact on the expenditures. Both variables positively affect municipal expenditures.

To summarize, money from additional non-matching transfers has a large impact on total municipal expenditures (coefficient not significantly different from unity) but no effect on local tax rates (the flypaper effect is confirmed). This result is very plausible especially in the view of tight municipal budgets, which forces local governments to spend extra financial resources from transfers completely instead of lowering tax rates. It is consistent with the earlier findings in related studies. In addition, examining the flypaper effect in different expenditure subcategories produces interesting results. The effect of transfers on expenditure subcategories could only be identified in the social system and the public facility specifications.

Next section is given over to robustness checks where we examine the key estimates' sensitivity.

Table 3. Second-stage IV regression results.

Dependent variable:	**Total exp.**	**TIC**	**Admin.**	**Pub. facilities**	**Bus. devel.**	**Culture/ Sport**	**Health**	**Social system**	**Education**	**Property tax**	**Business tax**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Model I (lagged DV, FE)											
Transfers per capita	**1.049****	0.111	0.181	**0.092****	0.054	-0.039	-0.001	**0.974*****	0.029	0.019	-0.008
	(0.4210)	(0.1074)	(0.2533)	**(0.0446)**	(0.0585)	(0.0426)	(0.0105)	**(0.2157)**	(0.049)	(0.0496)	(0.0129)
N	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375
F	27.17	11.82	19.38	3.56	1.06	8.15	2.85	59.02	12.66	181.34	208
First-stage diagnostic											
Kleibergen-Paap F statistic	25.65	25.14	25.35	25.22	25.39	25.26	24.94	20.52	25.39	24.64	24.48
Over-Identification test (Hansen J, p-value)	0.8430	0.7890	0.4066	0.7687	0.3329	0.5440	0.9700	0.9214	0.0041	0.0509	0.8064
Model II (no lagged DV, FE)											
Transfers per capita	**1.656*****	0.158	0.164	**0.066***	-0.027	-0.011	-0.014	**1.35*****	-0.028	0.111	0.021
	(0.4717)	(0.1196)	(0.2334)	**(0.0393)**	(0.0487)	(0.0466)	(0.0128)	**(0.3139)**	(0.0616)	(0.0826)	(0.0214)
N	2771	2771	2771	2771	2771	2771	2771	2771	2771	2771	2771
F	16.79	7.54	13.50	2.57	0.58	5.13	2.88	34.84	6.47	68.71	59.69
First-stage diagnostic											
Kleibergen-Paap F statistic	18.36	18.36	18.36	18.36	18.36	18.36	18.36	18.36	18.36	18.36	18.36
Over-Identification test (Hansen J, p-value)	0.2953	0.9366	0.3288	0.1541	0.1107	0.4385	0.1782	0.2100	0.0379	0.0824	0.4122

Note: Statistics are robust to heteroscedasticity and within-municipality correlation. *: p<0.1, **: p<0.05, ***: p<0.01
Variables excluded from the second stage: Adjustment 2011 and adjustment 2012.

5.2. Robustness Checks

In this section, we perform a number of robustness checks to explore whether the key results are stable. We build on the specification without a lagged dependent variable and with municipal fixed effects included (Model II) because Models I and II differ not substantially and the inclusion of a lagged dependent variable may hold risks of biases (Achen, 2001; Keele and Kelly, 2005).

First of all, to assess the robustness of our IV estimates to small deviations from the assumption of strict exogeneity of the instrumental variables (plausibly but not strictly exogenous instruments) we use the method proposed by Conley et al. (2012).[13] More precisely, we apply the union of confidence interval (UCI) approach. The minimum and maximum priors for the coefficients of the two instrumental variables are constructed by adding and subtracting one standard deviation to/from the respective first-stage coefficients. For the relationship between non-matching transfers per capita and total expenditures per capita a 2SLS estimate in the [0.789, 5.162] 95 % confidence interval is found. Thus the results of the UCI check show that the 2SLS estimates are robust to deviations from the strict exogeneity assumption because the union of confidence interval excludes zero.

In the following, we add further control variables (in addition to the existing) or vary the sample.[14] As a robustness check, we include two other transfer variables as additional controls in the regression. Those are transfers for present purposes and investment transfers, which may also have an impact on the expenditures of the municipalities (see Table A7). To a large extent, other transfers are bound to a specific spending purpose (so-called matching transfers) and may be granted in favor of municipalities with low formula-based transfers. These variables are not exogenous and the corresponding coefficients are biased. However, similar estimates regarding the non-matching transfers would give an indication on the robustness of the key results.

[13] Another method to deal with so-called "imperfect instruments" is presented by Nevo and Rosen (2012).

[14] Our estimates could furthermore be sensitive to differential trends of municipalities that are affected differently by the adjustments – although municipal and time fixed effects are added. We therefore did two things: first, we included linear time trends and second, we constructed a placebo test, where the first adjustment occurs in 2009 and the second in 2010. Including linear time trends does not change the results significantly. Regarding the placebo test, both artificial adjustments do not survive the first stage, their coefficients are not significantly different from zero. Results are available upon request.

The results of the estimation are given in column (2) of Table A7 in the Appendix. First of all, the key estimates are confirmed in their main predictions. There is a significant and positive effect of transfers on total spending. Positive and significant effects are found in the same expenditure subcategories - social system and public facility - as compared to the key estimations. Transfers have no effect on the tax multipliers. As in the key estimations, the total expenditure coefficients are not significantly different from one and decreased slightly.

As another check, we vary sample size and run regressions for municipalities with population size above 25,000 inhabitants. The 25,000 threshold is chosen because the weighting factors stay constant until then (100 percent). It might be a matter of concern that we include all municipalities in the key estimations although only the municipalities with a population size above 25,000 inhabitants are affected by the adjustments of the weight function.

As can be seen from the larger coefficients in column (3) of Table A7, the effect of transfers on the total expenditures has increased compared to the key estimations even though coefficients are still not significantly different from one. The lower significance levels of the estimates can be explained by the smaller sample size. Here the only significant subcategory is social expenditure.

Next, we limit the sample to municipalities with transfers per capita in the lowest 25 percent quantile – including in particular abundant municipalities (municipalities with a high tax capacity that receive little or no transfers). The lowest 25 percent quantile includes approximately 100 municipalities. At such low levels of transfers (10 euro per capita on average), it should be difficult to identify a flypaper effect.

As expected, the estimations in column (4) of Table A7 show that there is no significant impact of transfers on expenditures as well as on tax rates. The sample size is particularly small and thereby no link can be made.

Further robustness checks of Table A7 estimate the effects of transfers on the expenditures and the tax rates for municipalities subject to consolidation aids. In 2011, the NRW state government commenced a program that supports indebted municipalities with extra consolidation aids. Municipalities that received such aids could be less dependent on non-matching transfers and thus distort our key estimation

especially regarding the expenditures in the subcategories. Column (5) however shows a pattern similar to the key estimates. The coefficients for the total expenditures and for public facilities are slightly insignificant, probably due to the smaller sample size. The impact of transfers on the social system expenditures, on the other hand, is still statistically significant.

In a final check, we exclude cities with county status (*Kreisfreie Städte*). Those do in general have a wider range of tasks as compared to district municipalities. This could make comparability problematic. As can be seen from Table A7, the coefficient for the total expenditures is positive and significant, but of course smaller as compared to the key results. The value of the coefficient is closer to the one reported by Baskaran (2016) who excludes cities with county status throughout all estimations. In addition, the coefficient on business tax is significant and positive in this subsample, although quantitatively close to zero. An increase in transfers by one euro per capita would lead to an increase by 0.055 percentage points in the tax multiplier, which is neglectable. District municipalities do not spend additional transfers on the public facility subcategory which is reasonable because this category is of minor importance for those municipalities.

The conducted robustness checks do not contradict the main finding about the existence of the flypaper effect in the municipal expenditures. Among the subcategories, the effect of transfers is most pronounced in the second-largest category, social expenditures and partly in the public facility category.

5.3. Accounting for Spatial Dependence

In the presence of spatial autocorrelation, least squares estimation technique is potentially biased and inconsistent (Anselin and Bera, 1998; Anselin et al., 2008). In our case, there may exist spatial correlation in the economic performance of the municipalities, which may affect both, expenditures and transfers.

We therefore make an assumption on which spatial units affect each other and thus define a neighborhood set for each municipality. We generate a spatial weight matrix, where the elements are equal to one for direct neighbors and are zero otherwise (Rook contiguity). We also standardize the weights such that the elements in each row sum to one.

To test for the existence of spatial autocorrelation, the Moran's (1950) I test is used. The null hypothesis states that there are no spatial effects. As can be seen from column (7) of Table A7 in the Appendix, spatial autocorrelation identified by the one-tailed Moran's I test specification is found for several expenditure subcategories and both tax multipliers. It means that a spatial model may be relevant.

A spatial lag operator is then added to the model, which creates a new variable (*Wy*) that provides the weighted average of the neighboring expenditures or taxes. For the estimation we use a spatial lag dependence model with 2SLS (Franzese and Hays, 2007; Elhorst, 2014). This setting is appropriate to be applied for panel data in our case.[15] It produces consistent and asymptotically efficient estimates under the conditions that the *X's* are exogenously related to *y*.

The estimations with a spatially lagged dependent variable in column (8) of Table A7 show that there is a significant and positive effect of transfers on the total expenditures in the spatial lag-IV regression model. Coefficients are slightly smaller than the key estimates in Table 3 – but not significantly different from them. The effect of transfers on the social expenditures stays the only significant effect. Similar to the key estimates, no effect on tax rates is detected. This again confirms the existence of the flypaper effect.

The results in this section also confirm the findings by Case et al. (1993) and Acosta (2010) in the context of the flypaper effect (smaller coefficient for expenditures when spatial dependency is accounted for).

6. CONCLUSIONS

In line with many investigations in the empirical literature, we find robust evidence for the existence of a flypaper effect in the expenditures of the municipalities in the German federal state North Rhine-Westphalia. We find that formula-based transfers increase municipal expenditures but do not reduce tax rates. Possible endogeneity problems are addressed by applying the instrumental variables method, where exogenous shocks from adjustments of the weighting function used to determine the fiscal needs

[15] Estimation is performed using the Stata command SPLAGVAR (Jeanty, 2010). It goes beyond the scope of this robustness section to test for other models such as e.g. spatial error model (no autocorrelation in the error term was encountered).

are employed as instruments. The instrumental variables are shown to be strong and relevant. Analysis by expenditure category at a sufficiently detailed level and the use of this identification strategy is novel in the literature on the flypaper effect in Germany.

As Inman (2008) puts it, "once viewed as anomaly, the flypaper effect should now be seen as a reality of fiscal politics". Studying the way transfers are spent then gives useful information about citizen preferences for local public goods (ibid.). In this regard, we can derive two particularly important conclusions from our findings about the spending behavior of the municipalities in NRW. First, we cannot identify a significant impact of transfers on general administrative expenditures. That may be a positive finding, suggesting that the municipalities do not use the lump-sum transfers just in order to increase the administrative staff. Second, an increase of transfers is mainly used for social expenditures and expenditures on public facilities. That could be either a sign of public preferences for these types of spending or a sign that the social system and public facilities are both underfinanced and can be covered with the help of additional transfers only. These findings however do not provide evidence of inefficient use of funds, which would support an idea of earmarking of non-matching transfers.

The robustness checks reveal that only limiting the sample to financially strong (abundant) municipalities eliminates the evidence of the flypaper effect in the expenditure subcategories. Accounting for spatial interdependence tends to reduce the estimated coefficients of transfers but keeps the key findings unaltered (significance does not change). Our findings should be transferable to most other German states, where similar weight functions are used.

Appendix

Table A1. NRW weight function and its adjustments.

Weight function 2009			**Weight function 2011**		**Weight function 2012**	
Category (Population size)	*Weighting factor %*	*Number of municipalities*	*Category (Population size)*	*Weighting factor %*	*Category (Population size)*	*Weighting factor %*
≤25,000	100	222	≤25,000	100	≤25,000	100
37,500	103	63	38,500	103	37,000	103
52,500	106	40	54,500	106	51,500	106
70,500	109	23	73,500	109	68,500	109
90,500	112	14	95,000	112	88,000	112
113,500	115	8	120,000	115	110,000	115
139,000	118	3	147,000	118	134,000	118
167,000	121	4	177,500	121	160,500	121
197,500	124	4	210,500	124	189,500	124
230,500	127	1	246,500	127	221,000	127
266,000	130	4	285,000	130	255,000	130
304,500	133	1	326,500	133	291,000	133
345,000	136	2	371,000	136	329,500	136
388,500	139	2	418,500	139	370,500	139
434,500	142	0	468,500	142	414,000	142
482,500	145	0	521,000	145	460,000	145
533,500	148	1	577,000	148	508,000	148
587,000	151	3	635,500	151	558,500	151
634,000	154	0	>635,500	154	611,500	154
>634,000	157	1			>611,500	157

Source*:* MIK NRW 2009, 2011, 2012.

Table A2. The expenditure subcategories.

Expenditure subcategory	**Type of expenditure**
Transport, infrastructure, construction (TIC)	Spatial planning and development, geo-information, construction and property regulation, housing- construction funding, electricity, gas, water, district heat supply, waste management, sewage disposal, municipal-roads, district-roads, state-roads, federal-roads, road cleaning, parking facilities, public transport, other passenger and goods transport, ports
Administration	Administration management and service, statistics and elections, regulatory affairs, funeral and cemetery services, taxes, general transfers and general levies, general financial economy
Business development	General institutions and companies, business development, tourism
Public facilities	Fire protection, emergency services, large-scale emergencies, disaster control, public green areas, nature and rural conservation, agriculture and forestry, environmental measures, immission protection, landscaping, public waters, water supply plants, monument conservation and care
Culture/ Sport	Museums, exhibitions, zoological and botanical gardens, theater, public music culture, music schools, adult education center, libraries, other adult education, cultural education, national education, clerical affairs

Health system	Health administration, hospitals, health care, recreational facility, spas and bath houses
Social system	Primary care, basic social benefits, benefits for asylum seekers, social facilities, war victim welfare, benefits under the Federal Pensions Act, benefits for severely disabled persons, funding of welfare carriers, benefits for living, inclusion of disabled persons, help with care, advances on maintenance payments, assistance services, funding for returnees and political prisoners, other social services, day care facilities for children, funding for children, youth work, services for young people and families
Education	Primary schools, secondary schools, combined primary and secondary schools, high schools, comprehensive schools, vocational schools, special schools, other formal school tasks, science and research

Source*:* Genesis online (2016).

Table A3. Between- and within-variation of key variables.

Variable		**Mean**	**Std. Dev.**	**Obs.**
Transfers p.c.	overall	194.2	170.50	N = 2772
	between		159.28	n = 396
	within		61.29	T = 7
Expenditures p.c.	overall	2032.7	538.16	N = 2772
	between		487.9	n = 396
	within		228.24	T = 7
Property tax multiplier	overall	436.2	74.71	N = 2772
	between		54.82	n = 396
	within		50.82	T = 7
Business tax multiplier	overall	428.4	28.68	N = 2772
	between		25.43	n = 396
	within		13.32	T = 7
Population share above 65	overall	0.2	.02	N = 2772
	between		.02	n = 396
	within		.004	T = 7
Population Density	overall	504.9	533.31	N = 2772
	between		533.76	n = 396
	within		11.66	T = 7
Share of right-wing votes	overall	0.5	0.11	N = 2772
	between		0.10	n = 396
	within		0.03	T = 7
Unemployed p.c.	overall	3.2	1.18	N = 2772
	between		1.16	n = 396
	within		0.25	T = 7

Table A4. Parsimonious OLS regression results.

Dependent variable:	**Total exp.**	**TIC**	**Admin.**	**Pub. facilities**	**Bus. devel.**	**Culture/ Sport**	**Health**	**Social system**	**Education**	**Property tax**	**Business tax**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Transfers per capita	**0.186***	0.035	0.038	0.001	0.005	-0.005	-0.001	**0.126*****	-0.014	**0.058*****	**0.012****
	(0.1099)	(0.0266)	(0.0839)	(0.0077)	(0.0123)	(0.0098)	(0.0011)	**(0.0339)**	(0.0122)	**(0.0191)**	**(0.0050)**
N	2772	2772	2772	2772	2772	2772	2772	2772	2772	2772	2772
F	25.25	9.28	17.94	2.74	0.77	7.46	3.45	126.23	9.33	114.72	82.97

Note: These OLS regressions include fixed effects and year dummies but no further control variables.

Table A5. Parsimonious IV regression results.

Dependent variable:	**Total exp.**	**TIC**	**Admin.**	**Pub. facilities**	**Bus. devel.**	**Culture/ Sport**	**Health**	**Social system**	**Education**	**Property tax**	**Business tax**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Transfers per capita	**1.76*****	0.159	0.29	0.05	-0.024	-0.013	-0.019	**1.328*****	-0.013	0.068	0.018
	(0.4587)	(0.1178)	(0.2205)	(0.0339)	(0.0404)	(0.0409)	(0.0121)	**(0.299)**	(0.0524)	(0.0783)	(0.0177)
N	2771	2771	2771	2771	2771	2771	2771	2771	2771	2771	2771
F	21.56	9.28	14.52	2.99	0.76	7.00	2.78	52.55	9.11	112.86	80.66
Kleibergen-Paap F stat.	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00

Note: These OLS regressions include fixed effects and year dummies but no further control variables.

Table A6. First-stage results for the instruments.

Dependent variable in the second stage:	**Total exp.**	**TIC**	**Admin.**	**Pub. facilities**	**Bus. devel.**	**Culture/ Sport**	**Health**	**Social system**	**Education**	**Property tax**	**Business tax**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Model I (lagged DV, FE)											
Adjustment 2011	**-26.58*** **	**-26.87*** **	**-26.6*** **	**-26.93*** **	**-26.99*** **	**-26.9*** **	**-26.82*** **	**-27.76*** **	**-26.76*** **	**-26.77*** **	**-25.91*** **
	(7.87)	**(7.98)**	**(7.68)**	**(7.98)**	**(8.01)**	**(7.99)**	**(8.00)**	**(7.65)**	**(7.95)**	**(7.98)**	**(7.86)**
Adjustment 2012	**36.39*** **	**35.65*** **	**35.92*** **	**35.67*** **	**35.68*** **	**35.7*** **	**35.7*** **	**32.43*** **	**35.81*** **	**35.13*** **	**35.39*** **
	(6.26)	**(6.27)**	**(6.28)**	**(6.27)**	**(6.29)**	**(6.28)**	**(6.28)**	**(6.95)**	**(6.27)**	**(6.33)**	**(6.29)**
Model II (no lagged DV, FE)											
Adjustment 2011	**-22.86*** **	Same as for total expenditures								Same as for total expenditures	
	(8.49)										
Adjustment 2012	**36.09*** **										
	(6.51)										

Table A7. Robustness checks (Model II, second-stage results).

	Key estimates	**Other transfers added as controls**	**Sample variation: Population >25000**	**Sample variation: Transfers p.c. in the lowest 25 % quantile**	**Sample variation: municipalities with consolidation aids**	**Sample variation: excluding cities with county status**	***Moran's I (p)***	**Spatial Lag IV (lag order 1)**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Total expenditure	**1.656*** **	**1.432*** **	**2.405** **	9.124	1.675	**1.341***	***0.0288****	**1.634*** **
	(0.4717)	**(0.4656)**	**(1.0246)**	(29.58)	(1.093)	**(0.7154)**	***(0.0135)***	**(0.4512)**
N	2771	2771	1196	704	427	2624		2771
Wald test (p-value) H_0= coefficient not signif. different from 1	0.1644	0.3536	0.1703	-	-	0.6338		0.1598
TIC	0.158	0.141	0.351	-4.304	0.172	0.023	*0.016*	
	(0.1196)	(0.1187)	(0.2453)	(11.16)	(0.2118)	(0.1694)	*(0.1782)*	
Administration	0.164	0.1	0.356	3.44	-0.035	0.272	*0.006*	
	(0.2334)	(0.2436)	(0.5225)	(26.72)	(0.3851)	(0.5242)	*(0.5785)*	
Public facilities	**0.066***	**0.065***	0.061	-0.042	-0.079	0.074	*0.017*	
	(0.0393)	**(0.0383)**	(0.0816)	(1.65)	(0.0563)	(0.0603)	*(0.1453)*	
Business development	-0.027	-0.031	0.111	-3.06	-0.071	-0.07	*0.003*	
	(0.0487)	(0.0509)	(0.0834)	(6.58)	(0.1019)	(0.0678)	*(0.7585)*	
Culture/Sport	-0.011	-0.026	-0.065	0.104	0.03	-0.037	***0.021****	-0.013
	(0.0466)	(0.0463)	(0.0919)	(1.792)	(0.0528)	(0.0791)	***(0.07)***	(0.0439)
Health	-0.014	-0.011	-0.047	0.164	-0.001	-0.02	*-0.0002*	
	(0.0128)	(0.0128)	(0.0277)	(0.436)	(0.0046)	(0.0169)	*(0.9922)*	
Social	**1.35*** **	**1.244*** **	**1.669** **	12.3	**1.725***	**1.155*** **	***0.03**** **	**1.281*** **
	(0.3139)	**(0.3254)**	**(0.6435)**	(15.37)	**(0.9744)**	**(0.2961)**	***(0.0095)***	**(0.2961)**
Education	-0.028	-0.047	-0.029	0.491	-0.065	-0.051	*0.009*	
	(0.0616)	(0.0617)	(0.1181)	(2.092)	(0.0939)	(0.1054)	*(0.412)*	
Property tax	0.111	0.11	0.056	-3.52	-0.343	0.089	***0.023****	0.093
	(0.0826)	(0.0861)	(0.1767)	(5.673)	(0.2456)	(0.1012)	***(0.0503)***	(0.0772)
Business tax	0.021	0.02	0.044	-2.735	-0.041	**0.055***	***0.035**** **	0.018
	(0.0214)	(0.0221)	(0.0446)	(4.836)	(0.0482)	**(0.0316)**	***(0.0025)***	(0.0208)

Note: Statistics are robust to heteroscedasticity and within-municipality correlation: *: p<0.1, **: p<0.05, ***: p<0.01.
Variables excluded from the second stage: Adjustment 2011 and adjustment 2012.

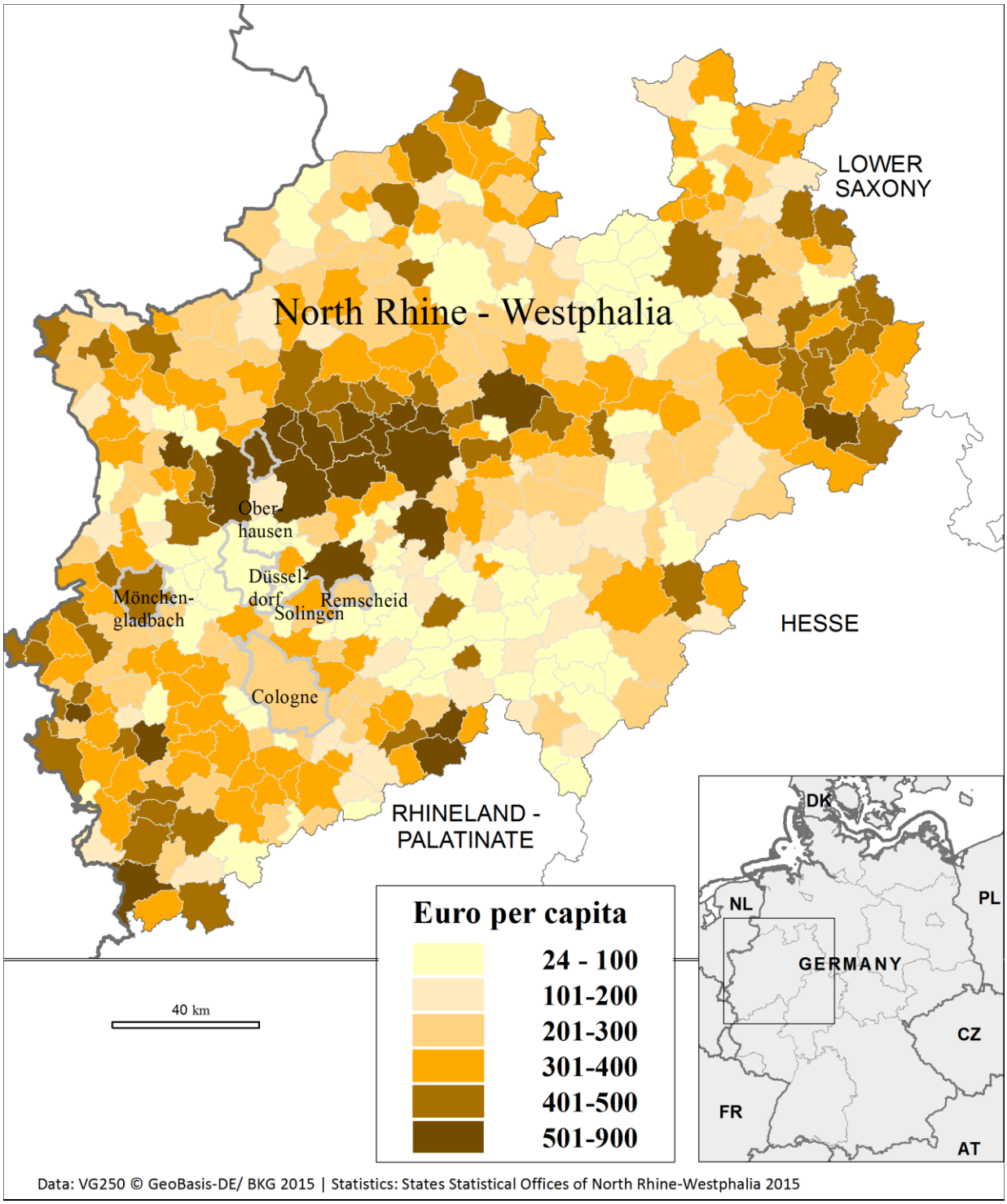

Figure 2. Per capita levels of total non-matching transfers in the municipalities of NRW (2016).

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