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Macroeconomic implications of the German financial equalization system

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Macroeconomic Implications of the German Financial Equalization System (*Länderfinanzausgleich*)

(preliminary first-draft version, comments welcome)

Abstract

The provisions of the German financial equalization system (*Länderfinanzausgleich*), a specific form of a fiscal union among the federal states (*Länder*), will expire in 2019. In this paper, we assess the effects of the system as well as of reform proposals on key macroeconomic variables and welfare by means of a two-region general equilibrium model. We find that, on the one hand, as expected, abolishing tax revenue equalization would favor transfer paying states in terms of GDP and consumption, and significantly hurt receiving states. Furthermore, households living in the financially strong states would benefit from higher wages and more leisure. This induces migration towards these states. On the other hand, on aggregate, the average German household's welfare would be negatively affected, even though those who live in the paying states would gain. However, the negative macroeconomic effects involved by the abolition of the equalization transfers might potentially be countervailed by the concomitant reduction in disincentive effects for the budgetary policy.

Keywords: German federal states, financial equalization, general equilibrium model (JEL: H70, H77, E12)

1. Introduction

The German financial equalization system (*Länderfinanzausgleich*, henceforth LFA) represents a specific form of a fiscal union among federal states (*Länder*) within a federalized country. Its goal is to “adequately balance the financial capacities of the federal states” (Art. 107 of German Basic Law). As a result, per-capita state tax revenues are more or less equalized in order to make the *Länder* able to provide similar levels of public services. By this, the constitutionally enshrined principle, to provide almost equal living conditions across Germany, is guaranteed, too. The existing provisions of the LFA – as well as of the special federal grants for East German states – will expire in 2019, and a follow-up regulation is needed. At the same time, by 2020 the strict debt brake for state governments, which generally prescribes structurally balanced budgets, will enter into force, creating budgetary challenges for certain highly indebted states. Reforming the financial equalization system has always been subject to intense discussions in Germany – especially initiated by the financially strong transfer paying states of

Bavaria, Hesse and Baden-Württemberg, which basically want to keep more of the tax revenues collected in their states. A draft law for a reform of the current system is expected during 2016, and the *Länder* recently agreed on the basic principles of the reform. In this paper, we assess the macroeconomic implications of the existing provisions as well as of reform measures by means of a general equilibrium model. As the draft law for the reform proposal has not yet been published, we simulate abolishing the LFA entirely in the current version of the paper. However, given the detailed modeling of the existing LFA, it is straightforward to extend our analysis to simulating the precise reform proposal once details have been made publicly available.

The German fiscal constitution is characterized by the predominance of federally determined taxes (labor, corporate and capital income, and turnover taxes), the proceeds of which are shared among the different government layers. At the same time, state governments enjoy quite limited tax-raising powers, while local governments have more significant rights to set certain local tax rates. In a first step of the federal equalization system revenues from common federal taxes are distributed (vertically) between the federal, the state and the local governments. In a second step, then, the tax revenue share allocated to the state and local levels is distributed (horizontally) between the individual federal states. Within this procedure, part of turnover tax revenue is redistributed *a priori* to financially weak states (*Umsatzsteuervorwegausgleich*). The third step represents the proper financial equalization scheme between the federal states (*LFA im engeren Sinne*). There, federal states with per-capita financial capacities below average receive transfers from those states with a financial capacity above average. In a final fourth step, financially weak states receive supplementary grants from the federal government (*Bundesergänzungszuweisungen*) to further increase their relative financial capacity. As a result, the relative margin in terms of per-capita financial capacity between the 16 federal states is reduced on the whole from almost 70% to 40%. The current equalization system is largely criticized as being too complex and non-transparent, providing significant disincentives for the state budgetary policies. Due to the high degree of equalization, particularly financially weak states are not induced to increase their regional economic power and tax collection, since any additional tax revenue would largely reduce the transfers received. Therefore, most reform proposals aim at reducing these adverse effects and strengthening the financial responsibility of the individual states.¹ The latest proposal of the federal states, instead, implies no significant improvement with regard to this and comes at the expense of the federal government. The intended consolidation of the different equalization steps represents a certain simplification – the proper financial equalization scheme between the federal states is abolished and alignment of financial capacities occurs mainly through turnover tax redistribution and using a proportional linear tariff. However, at the same time, supplementary fed-

¹See, among others, Deutsche Bundesbank (2014), or Zimmer (2016), for more recent contributions; Bordo et al. (2013), also describe the German financial equalization system and, based on historical experiences there and in other fiscal federations, draw some lessons for deeper fiscal integration in Europe.

eral transfers are extended and the overall degree of equalization is not significantly reduced.

In order to assess the structural macroeconomic implications of the financial equalization system in Germany, in this paper, we build a two-region general equilibrium model. There, households make optimal choices regarding consumption, savings and labor supply. Firms in each region use physical capital and labor to produce goods and services which are then traded across regions. There exists a federal fiscal authority that levies taxes on consumption, labor income and interest yields, the proceeds of which are shared with the two regions and used to finance public expenditure. It redistributes part of the tax revenue between the regions according to the rules of the LFA. These proceeds are then used to finance (regional) public expenditures. Households are free to choose which region to live in endogenously, which is an important feature of the model given that the LFA aims at equalizing tax revenues *per-capita* (see also Myers, 1990). As a first scenario, we analyze what would happen if the different stages of the existing LFA were abolished entirely. By this, the effects on regional and aggregate GDP, consumption, employment, population reallocation and welfare are quantified. We compare expected long-run results and also analyze the transition from the initial to the new steady state. Then, we introduce the proposed reform measures of the new LFA and quantify the effects.

We find that, on the one hand, as expected, abolishing tax revenue equalization in Germany would favor transfer paying states in terms of GDP and consumption, and significantly hurt receiving states. The main reason for this is that, because households in the paying states no longer need to finance the transfers to the other states, their disposable income increases significantly. This also explains why households living in the financially strong states benefit from higher wages and more leisure, which further leads to migration into those states. On the other hand, on aggregate, the average German household's welfare would be negatively affected, even though those who live in the paying states would gain. However, two important limitations have to be made. First, since not all details of the complex equalization system could be incorporated and the model is restricted to two ideal-type-regions, no clear conclusions could be drawn with respect to the budgetary effects for each German federal state. And, second, one should bear in mind that the negative macroeconomic effects involved by the abolition of the equalization transfers might be countervailed by reduced disincentives for state budgetary policies – which are not addressed here.

Given that the German financial equalization system is a specific form of a fiscal union, our paper is most closely related to the macroeconomic literature discussing fiscal unions. Farhi and Werning (2012) show in a theoretical contribution that private cross-country insurance within a monetary union is inefficiently low and that, therefore, there is a role for contingent government transfers, which can be implemented by means of a fiscal union. In numerical simulations, they show that benefits from such an

insurance scheme can be large.² Building on a New Open Economy Macroeconomics framework this has already been demonstrated by Evers (2006), who also shows in a New Keynesian framework that simple transfer rules that target differences in nominal GDP can help to improve cross-country insurance (see Evers, 2012). Bernoth and Engler (2014) find similar results, while Moyen et al. (2016) show that cross-country insurance can also be achieved via a common unemployment insurance scheme. While the aforementioned studies focus on insuring against cyclical fluctuations, in principle ruling out structural transfers, Evers (2015) explicitly models a fiscal revenue equalization scheme. He shows that revenue equalization reduces international risk sharing and leads to welfare losses. His analysis is based on a two-country monetary union model in which both regions are symmetric in steady state (hence, implying no structural transfers in steady state) but face asymmetric shocks. Gadatsch et al. (2016b) relax the assumption of two structurally symmetric economies based on a New Keynesian model estimated for Germany in the EMU. They confirm that fiscal revenue equalization does not improve international risk sharing and also show that it goes hand-in-hand with structural transfers if the two countries are not symmetric. Based on a micro data simulation approach, Bargain et al. (2013) also discuss the introduction of a fiscal equalization scheme in Europe and come to similar results.

Our main contribution is to analyze the effect of structural fiscal transfers implied by an existing fiscal union in a national context, namely the German LFA, and the consequences of proposed reform measures by means of a general equilibrium model. Cyclical as well as risk-sharing aspects are only briefly touched upon. Within the macroeconomic literature we are, to the best of our knowledge, the first to introduce the German LFA in large detail into such a model. Other aspects of the German LFA, mainly concerning the implications of equalization transfers for the state budgetary policy and the disincentives with respect to enhancing regional tax bases, were analyzed empirically. For instance, Barette et al. (2002) present some evidence for the hypothesis that high marginal rates of absorption of tax revenue imposed by the equalization scheme reduce the tax enforcement activity of German states.³ In our macroeconomic framework, we abstract from modeling incentives to increase regional economic strength and tax base. Since German state governments generally lack autonomous tax-raising powers, the interaction between financial equalization and tax competition is neglected, too, though

²Earlier contributions range back to, among others, Persson and Tabellini (1996a,b), who show that it may be optimal to delegate stabilization and redistribution issues to a central/federal fiscal authority because national authorities may not take into account all repercussions of their actions, potentially even deliberately (moral hazard), or to Mundell (1961), McKinnon (1963) and Kenen (1969), who discuss the role of fiscal federalism within the debate on the optimum currency area. Buiter and Kletzer (1997), Kletzer (1999) and Kletzer and von Hagen (2001) also discuss the role for fiscal transfers as insurance instrument. Von Hagen (2007) discusses the empirical literature, which is mainly based on US data, however.

³See, also, Rodden (2006), Stehn and Fedelino (2009) and Potrafke and Reischmann (2014) for empirical evidence on the impact of equalization transfers on German federal state budgets, Smart (2007) with respect to Canadian provinces, or Rodden (2002) for international evidence.

it plays an important role at the local government level (e.g. Büttner, 2006). However, it is still something that should be elaborated more, even in macroeconomic models. For example, using a model of tax competition between regions, Köthenbürger (2002) finds that tax base equalization schemes are efficiency-enhancing whereas tax revenue equalization schemes tend to reinforce the effects of tax competition.⁴ Given our focus on the macroeconomic and redistributive consequences of the LFA, we leave including changes in the (regional) governments' behavior induced by equalization grants to further research. Another option to be considered, would be to extend the two-region-model to more regions in order to include all German federal states.

The rest of the paper is structured as follows. Section 2, describes the model and the implementation of the German LFA. In Section 3, we simulate the macroeconomic implications of both abolishing and reforming the current LFA, highlighting long-run consequences and transition dynamics. It also includes a welfare assessment. Section 4 concludes.

2. The model

We present a two-region general equilibrium model. The model is a significant extension of Baxter and King (1993), who were among the first to include fiscal policy in general equilibrium. In each region, a representative household makes optimal intertemporal choices regarding consumption, the provision of labor and savings. Firms in each region produce consumption and investment goods, which are then sold to both regions. A federal fiscal authority levies taxes on consumption, labor income and interest yields to finance public expenditures. Tax revenue are shared between the federal and the regional authorities. Furthermore, part of the tax revenue is redistributed between the two regions in three steps according to the rules of the LFA and the relative regional financial capacities. Households endogenously choose in which region to live in. In what follows, we will describe the economy in more formal detail.

2.1. Households

Total population is normalized to one. There are two regions, denoted by a and b , respectively. A share $\omega_t \in (0, 1)$ of population lives in region a at time t , while the remaining share $(1 - \omega_t)$ lives in region b . As in Galí et al. (2011), members of the representative German household are represented on the unit interval $x \in [0, 1]$. They are characterized by their personal disutility of living in region a relative to living in region b . The latter is given by x^m when living in region a and zero otherwise. Hence, following the idea of Sterk (2015), x^m represents the personal household member's (dis)utility flow of living in region b (or a) stemming from the degree of satisfaction with the location of residence.⁵ Regions a and b are calibrated to an aggregate of transfer paying

⁴Also see Kotsogiannis and Schwager (2008) for theoretical aspects of this nexus.

⁵Galí et al. (2011) use this strategy to model labor market participation in an otherwise standard Walrasian labor market. We simply re-interpret their way of modeling the labor market participation

and receiving federal states, respectively. Let E_t denote the expectations operator conditional on time- t information. Then, the household maximizes the following objective function:

$$\begin{aligned} U_t &= E_t \sum_{s=0}^{\infty} \beta^s \left\{ \int_0^{\omega_{t+s}} u(C_t^a, N_t^a) dx + \int_{\omega_{t+s}}^1 u(C_t^b, N_t^b) dx - \kappa^m \int_0^{\omega_{t+s}} x^m dx \right\} \\ &= E_t \sum_{s=0}^{\infty} \beta^s \left\{ \omega_{t+s} u(C_t^a, N_t^a) + (1 - \omega_{t+s}) u(C_t^b, N_t^b) - \kappa^m \frac{\omega_{t+s}^{1+m}}{1+m} \right\}, \end{aligned} \quad (1)$$

where

$$u(C_t^i, N_t^i) = \frac{(C_t^i)^{1-\sigma_c} - 1}{1-\sigma_c} - \kappa^N \frac{(N_t^i)^{1+\varphi}}{1+\varphi}.$$

Here, $\beta \in (0,1)$ is the subjective discount factor, C_t^i is per-capita consumption of a household member living in region i , with $i = a, b$, and σ_c denotes the coefficient of relative risk aversion governing the intertemporal consumption elasticity. N_t^i is the disutility-provoking per-capita provision of labor, where φ is the inverse of the Frisch elasticity and κ^N a scaling parameter. The parameter κ^m relates the disutility of living in region a to consumption and labor (dis-)utilities.

As both regions trade goods with each other, a region- i household per-capita consumption C_t^i is a composite good given by

$$C_t^i = \left(\frac{C_t^{a,i}}{v^i} \right)^{v^i} \left(\frac{C_t^{b,i}}{1-v^i} \right)^{1-v^i}, \quad (2)$$

where $C_t^{j,i}$ is consumption of a good produced in region $j = a, b$ consumed by a household member residing in region $i = a, b$, and $v^i \in (0,1)$ is the corresponding utility parameter. For $v^a > \omega_t$ and $v^b > 1 - \omega_t$, respectively, consumers have a relative preference towards consuming domestically produced goods. Assuming this relation to hold (in steady state) can be considered as a short cut for incorporating the existence of non-tradable goods (such as, for example, haircuts). Cost minimization by the household implies

$$\frac{C_t^{a,i}}{C_t^{b,i}} = \frac{v^i}{1-v^i} \frac{p_t^b}{p_t^a} = \frac{v^i}{1-v^i} rer_t, \quad (3)$$

where p_t^i is the *producer price index* of region i and $rer_t \equiv p_t^b/p_t^a$ is the real exchange rate between region b and a (i.e. “international” competitiveness of a relative to b). The above relation implies that the *consumer price index* in region i is given by $P_t^i =$

constraint as a choice of household members whether to live in region a or not – or, to be more precise, how much disutility living in region a provokes. It is also similar to modeling migration as in Sinn (2000).

$(p_t^a)^{v^i} (p_t^b)^{1-v^i}$. By normalizing $p_t^a = 1 \forall t$, we will be able to express all relative prices in terms of rer_t , which is the advantage of assuming a Cobb-Douglas aggregator in equation (2). We assume an analogous aggregator for purchases of investment goods, I_t^i ; see also Stähler and Thomas (2012).

Household members living in each region i pool their income and, based on this aggregate budget constraint, the household head makes the optimal consumption/savings decision. In a way, we thus concentrate on the average household living in region i . This modeling choice is commonly applied in the labor market literature in which the average consumption/saving decision of household members is made independent of the individual member's employment history (commonly called "*full risk sharing of consumption within a household*"; see, for example, Andolfatto, 1996, and Merz, 1995). We further assume that, whenever a household member moves from region i to region $-i$, his per-capita asset holdings of last period stay within the region. Hence, any regional interest-bearing asset depending on last period's investment decision must be normalized by changes in population size when expressed in per-capita terms. Therefore, households living in region i face the CPI-deflated per-capita real budget constraint:

$$(1 + \tau_t^c) C_t^i + I_t^i + d_t^i + \frac{\Psi_d}{2} (d_t^i - \bar{d}^i)^2 = (1 - \tau_t^w) w_t^i N_t^i + (1 - \tau_t^k) r_t^i \Delta_t^i K_{t-1}^i + (1 + i_{t-1}^d) \frac{P_{t-1}^i}{P_t^i} \Delta_t^i d_{t-1}^i + TR_t^i + TR_t^f + \frac{\Pi_t^i}{\omega_t} + \frac{mc}{2} \frac{(\omega_t - \omega_{t-1})^2}{\omega_t}, \quad (4)$$

where τ_t^c , τ_t^w and τ_t^k are the common economy-wide tax rates on consumption and labor income as well as income from capital interest determined by the federal fiscal authority. TR_t^i are net per-capita transfers (if negative, net taxes) households enjoy when living in region i which are defined by the regional fiscal authorities.⁶ TR_t^f are transfers received from the federal authority. w_t^i is the average wage rate prevailing in region i , r_t^i the interest rate on capital investments, K_t^i the corresponding per-capita capital stock and d_t^i are per-capita holdings of an interregional bond traded with households residing in region $-i$. It can be interpreted as region i 's per-capita "net foreign asset position" with interest payments i_t^d . Trading in the interregional bond is associated with trading costs $\Psi_d/2 (d_t^i - \bar{d}^i)^2$.⁷ As the budget constraint is given in per-capita terms, $\Delta_t^a = \omega_{t-1}/\omega_t$ and $\Delta_t^b = (1 - \omega_{t-1})/(1 - \omega_t)$ corrects for changes in population size

⁶In Germany, state and local governments have the right to set autonomously certain tax rates such as, for example, for the property, property transfer or local business taxes. As we are not interested in these individual tax-raising powers, but rather in the distributional effects of the LFA, we abstract from explicitly modeling these taxes for simplicity.

⁷This assumption is simply to ensure stationarity of equilibrium, which has become a common assumption in multi-region RBC/DSGE models; see Schmitt-Grohé and Uribe (2003) for an in-depth discussion.

related to interest payments of last period's capital and asset holdings. Π_t^i are firms' profits and $mc/2(\omega_t - \omega_{t-1})^2/\omega_t$ are per-capita mobility costs including the financial costs of travel and relocation of property.

We know that the per-capita "net foreign asset position" of region a evolves according to

$$d_t^a = \left(1 - i_{t-1}^d\right) \frac{P_{t-1}^a}{P_t^a} \Delta_t^a d_{t-1}^a + \frac{1 - \omega_t}{\omega_t} rer_t^{-(1-v_a)} \left(C_t^{a,b} + I_t^{a,b}\right) - rer_t^{v_a} \left(C_t^{b,a} + I_t^{b,a}\right) + \frac{TR_t^{int,a} + (1 - \omega_t)BEZ_t^a - \omega_t BEZ_t^b}{\omega_t}. \quad (5)$$

It simply states that today's CPI-deflated per-capita net foreign assets are given by per-capita exports minus per-capita imports (taking into account the exchange rate) plus per-capita interest payment on outstanding assets and transfers resulting from the LFA, $TR_t^{int,a} + (1 - \omega_t)BEZ_t^a - \omega_t BEZ_t^b$, where BEZ_t^i are supplementary grants from the federal authority (*Bundesergänzungszuweisungen*, henceforth *BEZ*). All transfers will be described in more detail below. Because aggregate international assets are in zero net supply, it must hold that

$$d_t^b = -rer_t^{(v_b-v_a)} \frac{\omega_t}{1 - \omega_t} d_t^a.$$

The law of motion for the per-capita physical capital stock is given by

$$K_t^i = \left(1 - \delta^{k,i}\right) \Delta_t^i K_{t-1}^i + I_t^i, \quad (6)$$

where $\delta^{k,i}$ is the capital depreciation rate. Households' first order conditions with respect to consumption, labor and assets are given by⁸

$$\text{for } C_t^i: \quad (1 + \tau_t^c) \lambda_t^i = (C_t^i)^{-\sigma_c}, \quad (7)$$

$$\text{for } N_t^i: \quad (1 - \tau_t^w) w_t^i \lambda_t^i = \kappa^N (N_t^i)^\varphi, \quad (8)$$

$$\text{for } K_t^i: \quad 1 = \beta \cdot E_t \left\{ \frac{\lambda_{t+1}^i}{\lambda_t^i} \left[(1 - \delta^{k,i}) + (1 - \tau_{t+1}^k) r_{t+1}^a \right] \right\}, \quad (9)$$

$$\text{for } d_t^i: \quad 1 + \Psi_d (d_t^i - \bar{d}^i) = \beta \cdot E_t \left\{ \frac{\lambda_{t+1}^i}{\lambda_t^i} \frac{P_{t+1}^i}{P_t^i} (1 + i_t^d) \right\}, \quad (10)$$

representing the marginal utility of consumption, the consumption-leisure choice as

⁸Note that the average German household maximizes equation (1) subject to the budget constraint given in equation (4) multiplied by population size of region a , ω_t , and subject to the corresponding budget constraint for region b multiplied by that region's population size, $(1 - \omega_t)$. Households also take into account the corresponding capital law of motion, which can be substituted into the households' budget constraint.

well as the Euler equations for capital investments and asset holdings, respectively. Taking as given the consumption/savings and labor supply decisions of the household head as well as the allocation decisions of the other household members, the marginal household member who moves is determined by [check!!]

$$\begin{aligned} \kappa^m \omega_t^m &= u(C_t^a, N_t^a) - u(C_t^b, N_t^b) + mc[\omega_t - \omega_{t-1} - \beta(\omega_{t+1} - \omega_t)] \\ &+ BC_t^a - BC_t^b. \end{aligned} \quad (11)$$

Hence, for the marginal household member to be indifferent between living in region a or b , the differences in utilities and income between living in a and b plus marginal moving costs must equal the location dissatisfaction of living in a relative to living in b . Put differently, in order to make an inhabitant of the northern federal state of *Schleswig-Holstein* who likes sailing and water sports move to the mountainous southern state of *Bavaria*, he must be compensated for the disutility of giving up his water sports by sufficiently higher consumption, more leisure and higher income (and vice versa for a mountain-lover, who likes skiing, to move to the sea).

2.2. Firms

We assume that, in each region, goods are produced by a representative firm. Goods are traded in the entire economy and sold at a price p_t^i in both regions. We assume no price discrimination. Hence, the law of one price holds. Firms use capital and labor provided in each region as input factors. The aggregate production functions in regions a and b , hence, read

$$\begin{aligned} Y_t^a &= z_t^a \cdot (K_{t-1}^{g,b})^{\eta^a} \cdot (\omega_{t-1} K_{t-1}^a)^{\alpha} \cdot (\omega_t N_t^a)^{1-\alpha} \text{ and} \\ Y_t^b &= z_t^b \cdot (K_{t-1}^{g,b})^{\eta^b} \cdot ((1 - \omega_{t-1}) K_{t-1}^b)^{\alpha} \cdot ((1 - \omega_t) N_t^b)^{1-\alpha}, \end{aligned} \quad (12)$$

where $K_t^{g,i}$ is region i 's public capital stock. In line with, among others, Baxter and King (1993), D'Auria (2015), Gadatsch et al. (2016a) and Leeper et al. (2010), we assume that the public-sector capital stock fosters private-sector productivity and can, hence, be deemed 'useful' government spending (see also Bom and Ligthart, 2014, for a discussion and a literature survey on the issue). Its provision is outside the firms' control and determined by the fiscal authorities. $\eta^i > 0$ is a parameter determining how influential public capital is on private-sector productivity. z_t^i is a TFP scaling parameter which can be shocked and follows an AR(1) process. The shock is assumed to be iid normally distributed with mean zero. Maximizing profits, and taking into account that firms sell their products at producer prices, while wages and capital interest are deflated by consumer prices, labor and capital demand can be expressed as

$$w_t^a = (1 - \alpha) \frac{Y_t^a}{\omega_t N_t^a} \text{rer}_t^{-(1-v^a)} \text{ and } w_t^b = (1 - \alpha) \frac{Y_t^b}{(1 - \omega_t) N_t^b} \text{rer}_t^{v^b} \quad (13)$$

as well as

$$r_t^a = \alpha \frac{Y_t^a}{\omega_{t-1} K_{t-1}^a} r e r_t^{-(1-v^a)} \text{ and } r_t^b = \alpha \frac{Y_t^b}{(1-\omega_{t-1}) K_{t-1}^b} r e r_t^{v^b}. \quad (14)$$

CPI-deflated profits are, hence, given by $\Pi_t^a = r e r_t^{-(1-v^a)} Y_t^a - w_t^a \omega_t N_t^a - r_t^a \omega_{t-1} K_{t-1}^a$ and $\Pi_t^b = r e r_t^{v^b} Y_t^b - w_t^b (1-\omega_t) N_t^b - r_t^b (1-\omega_{t-1}) K_{t-1}^b$, respectively. Market clearing implies that

$$\begin{aligned} Y_t^a &= \omega_t (C_t^{a,a} + I_t^{a,a}) + (1-\omega_t) (C_t^{a,b} + I_t^{a,b}) + I_t^{g,a} + C_t^{g,a}, \\ Y_t^b &= (1-\omega_t) (C_t^{b,b} + I_t^{b,b}) + \omega_t (C_t^{b,a} + I_t^{b,a}) + I_t^{g,b} + C_t^{g,b}, \end{aligned} \quad (15)$$

where $I_t^{g,i}$ and $C_t^{g,i}$ denote public investment and consumption by region i 's fiscal authority. Note that we assume full home bias in regional government expenditures, which can be justified by the fact that there is evidence for a strong home bias in government procurement (see, among others, Trionfetti, 2000, and Brulhart and Trionfetti, 2004). We will describe the fiscal authorities in the next subsection in more detail.

2.3. Fiscal authorities

If we denote total revenues obtained by the different fiscal authorities as T_t^i , where the superscript $i = a, b, f$ denotes the fiscal authorities of regions a and b as well as the federal fiscal authority (f), their budget constraints are given by

$$\begin{aligned} T_t^a &= r e r_t^{-(1-v^a)} (C_t^{g,a} + I_t^{g,a}) + \omega_t TR_t^a, \\ T_t^b &= r e r_t^{v^b} (C_t^{g,b} + I_t^{g,b}) + (1-\omega_t) TR_t^b \text{ and} \\ T_t^f &= TR_t^f + BEZ_t^a + BEZ_t^b, \end{aligned} \quad (16)$$

where the regional budget constraints are expressed in terms of regional CPI, while the federal fiscal authority is deflated by region a 's CPI for convenience (remember that we assume full home bias in regional public investment and consumption). Fiscal authorities are forced to run a balanced budget each period, reached by adjustments in per-capita lump-sum transfers TR_t^i (lump-sum taxes if $TR_t^i < 0$). Supplementary grants of the federal authority, BEZ_t^i , augment T_t^i with $i = a, b$. For simplicity, we ignore that the federal authority consumes/invests itself. The law of motion of the aggregate public capital stock is given by

$$K_t^{g,i} = (1 - \delta^{k,i}) K_{t-1}^{g,i} + I_t^{g,i}. \quad (17)$$

Hence, we assume that private and public capital depreciate at the same rate $\delta^{k,i}$.

2.4. The federal financial equalization system

In order to determine tax revenues accruing to each region T_t^i , we will have to incorporate the detailed provisions of the German LFA.⁹ We can derive total German real tax revenues from labor income, consumption and capital interest taxation, expressed in terms of region a 's CPI, as

$$\begin{aligned}
 Rev_t^{agg,G} &= \underbrace{\tau_t^w \left[\omega_t w_t^a N_t^a + (1 - \omega_t) rer_t^{(v_a - v_b)} w_t^b N_t^b \right]}_{\equiv Rev_t^{w,G}} + \underbrace{\tau_t^c \left[\omega_t C_t^a + (1 - \omega_t) rer_t^{(v_a - v_b)} C_t^b \right]}_{\equiv Rev_t^{c,G}} \\
 &\quad + \underbrace{\tau_t^k \left[\omega_{t-1} r_t^a K_{t-1}^a + (1 - \omega_{t-1}) rer_t^{(v_a - v_b)} r_t^b K_{t-1}^b \right]}_{\equiv Rev_t^{k,G}}. \tag{18}
 \end{aligned}$$

Because population size is normalized to one, total tax revenues corresponds to per-capita tax revenues. As mentioned in the introduction, revenue from common federal taxes is distributed in four steps between the different fiscal authorities.

2.4.1. Vertical tax revenue distribution

In the first step, total common tax revenue is distributed (vertically) between the three government layers: federal, state and local governments. Accordingly, the federal government is assigned a certain fraction $\gamma^{j,f}$, with $j \in \{w, k, c\}$, of total tax revenue, differentiated by category. The remaining revenues are split between the states (*Länder*) and the municipalities as a whole. In the present paper, we consolidate states with their municipalities, yet, as the revenues of the municipalities are in parts needed as basis of calculation of the equalization transfers, we will still calculate them separately.

Hence, we get that, of total tax revenues $Rev_t^{agg,G}$ (see equation (18)), the federal fiscal authority receives

$$T_t^f = Rev_t^{agg,f} = \gamma^{w,f} Rev_t^{w,G} + \gamma^{k,f} Rev_t^{k,G} + \gamma^{c,f} Rev_t^{c,G}, \tag{19}$$

while the regions get

$$\begin{aligned}
 Rev_t^{agg,reg} = Rev_t^{agg,b} + Rev_t^{agg,a} &= (1 - \gamma^{w,f} - \gamma^{w,mun}) Rev_t^{w,G} + (1 - \gamma^{k,f} - \gamma^{k,mun}) Rev_t^{k,G} \\
 &\quad + (1 - \gamma^{c,f} - \gamma^{c,mun}) Rev_t^{c,G}, \tag{20}
 \end{aligned}$$

and the municipalities receive tax revenues

$$Rev_t^{mun,a} = \gamma^{w,mun} \omega_t w_t^a N_t^a + \gamma^{k,mun} \omega_{t-1} r_t^a K_{t-1}^a + \gamma^{c,mun} \omega_t C_t^a \tag{21}$$

⁹See Federal Ministry of Finance, The federal financial equalization system in Germany, for an overview.

$$Rev_t^{mun,b} = rer_t^{(v_a-v_b)} (\gamma^{w,mun}(1-\omega_t) w_t^b N_t^b + \gamma^{k,mun}(1-\omega_{t-1}) r_t^b K_{t-1}^b + \gamma^{c,mun}(1-\omega_t) C_t^b).$$

Note that all revenues are expressed in region a 's CPI for convenience, which we will have to take into account when calculating T_t^i . In line with current legislation, it holds that $\gamma^{w,f} = 42.5\%$, $\gamma^{k,f} \approx 45\%$ and $\gamma^{c,f} = 53.5\%$; and $\gamma^{w,mun} = 15\%$, $\gamma^{k,mun} \approx 2.4\%$ and $\gamma^{c,mun} = 2\%$.¹⁰

2.4.2. Horizontal turnover tax redistribution (*Umsatzsteuervorwegausgleich*)

The state government's share of revenues from labor income and capital taxation is subsequently distributed (horizontally) between the individual federal states in principle according to the local tax incidence¹¹, while revenue from the consumption (turnover, VAT) tax are generally allocated depending on a the number of inhabitants. However, at maximum, 25% of turnover tax revenue pertaining to the states as a whole is distributed *a priori* to financially weak states (*Umsatzsteuervorwegausgleich*). This represents the first step of tax revenue equalization. For this purpose, each region's financial capacity, $FC_t^{Ust,i}$, is given by its labor income and capital tax revenues per capita.¹² Expressed in terms of region a 's CPI, this is

$$\begin{aligned} FC_t^{Ust,a} &= \tau_t^w w_t^a N_t^a + \frac{\omega_{t-1}}{\omega_t} \tau_t^k r_t^a K_{t-1}^a \\ FC_t^{Ust,b} &= \tau_t^w rer_t^{(v_a-v_b)} w_t^b N_t^b + \frac{(1-\omega_{t-1})}{(1-\omega_t)} \tau_t^k rer_t^{(v_a-v_b)} r_t^b K_{t-1}^b. \end{aligned} \quad (22)$$

Bearing in mind that total population is normalized to one, the relevant average financial capacity is given by

$$FC_t^{Ust,av} = Rev_t^{w,G} + Rev_t^{k,G}. \quad (23)$$

Turnover tax revenue equalization is based on a linear-progressive rate, specified in the federal financial equalization law. If a region's financial capacity is below 97% of the

¹⁰The system differentiates between corporate profit taxation (of which the federal and the state governments receive each 50%) and withholding taxation on capital (of which the federal and state governments receive each 44%, and the municipalities 12%). As we only have capital interest taxation in our model to proxy both, we take the average value and will assume that, in line with current legislation, the federal authority receives 45%.

¹¹This corresponds in the case of labor income taxation to the tax yields collected from the inhabitants of each region, while corporate tax revenues are allotted according to the places of business.

¹²At this stage, excluding tax revenues allocated to their municipalities. For reasons of simplicity, we abstract from including revenues from autonomous state government taxes, as laid down in the equalization law.

average value, i.e $FC_t^{Ust,i} / FC_t^{Ust,av} \in [0, 0.97)$, it is generally entitled to receive a transfer

$$\tilde{TR}_t^{Ust,1,i} = (1 - \gamma^{c,f}) FC_t^{Ust,av} pop_t^i \underbrace{\left[\frac{19}{20} \left(1 - \frac{FC_t^{Ust,i}}{FC_t^{Ust,av}} \right) - \frac{21}{4,000} \right]}_{=F_t^{1,i}} \quad (24)$$

where $pop_t^a = \omega_t$ and $pop_t^b = (1 - \omega_t)$, while the transfer it is generally entitled to if its financial capacity is between 97% of and just below average, i.e $FC_t^{Ust,i} / FC_t^{Ust,av} \in [0.97, 1)$, is given by

$$\tilde{TR}_t^{Ust,2,i} = (1 - \gamma^{c,f}) FC_t^{Ust,av} pop_t^i \underbrace{\left(1 - \frac{FC_t^{Ust,a}}{FC_t^{Ust,av}} \right) \left[\frac{35}{6} \left(1 - \frac{FC_t^{Ust,a}}{FC_t^{Ust,av}} \right) + \frac{3}{5} \right]}_{=F_t^{2,a}}, \quad (25)$$

No transfer will be paid if the regional financial capacity is equal to or above average. The actual transfer region i potentially receives after consumption tax redistribution is given by

$$TR_t^{Ust,i} = \zeta_t^{Ust,i} (1 - \gamma^{c,f}) Rev_t^{c,G}, \quad (26)$$

where

$$\zeta_t^{Ust,i} = \min \left(\frac{I_t^{Ust,1} \cdot \tilde{TR}_t^{Ust,1,i} + I_t^{Ust,2} \cdot \tilde{TR}_t^{Ust,2,i}}{(1 - \gamma^{c,f}) Rev_t^{c,G}}, 0.25 \right). \quad (27)$$

Here, $I_t^{Ust,1}$ is an indicator function equal to one if $FC_t^{Ust,i} / FC_t^{Ust,av} \in [0, 0.97)$ and zero otherwise, and $I_t^{Ust,2}$ an analogous indicator function equal to one if $FC_t^{Ust,i} / FC_t^{Ust,av} \in [0.97, 1)$. Note that, given the two-region economy, it generally holds that, if $\zeta_t^{Ust,i} > 0$, $\zeta_t^{Ust,-i} = 0$. $\zeta_t^{Ust,a} = \zeta_t^{Ust,b} = 0$ is possible only for the special case in which $FC_t^{Ust,a} = FC_t^{Ust,b}$.

The remaining revenues from the consumption tax the states receive (at minimum 75%) are split at a per-capita basis. Hence, taking into account that we expressed transfers and financial capacity in terms of region a 's CPI, regional revenues after the $Um-$

satzsteuervorwegausgleich can now be expressed as¹³

$$\begin{aligned} Rev_t^{postUst,a} &= \omega_t \left[FC_t^{Ust,a} + \left(1 - \zeta_t^{Ust,a} - \zeta_t^{Ust,b}\right) (1 - \gamma^{c,f}) Rev_t^{c,G} \right] + TR_t^{Ust,a} \\ Rev_t^{postUst,b} &= (1 - \omega_t) \left[FC_t^{Ust,b} + \left(1 - \zeta_t^{Ust,a} - \zeta_t^{Ust,b}\right) (1 - \gamma^{c,f}) Rev_t^{c,G} \right] + TR_t^{Ust,b}. \end{aligned} \quad (28)$$

2.4.3. Financial equalization among the states (LFA im engeren Sinne)

In the third step of the financial equalization system, the financially weak federal states receive payments which are funded by the financially strong states. In order to calculate the transfers resulting from the so-called *LFA im engeren Sinne*, a new measure of financial capacity per capita is introduced, which takes tax revenues after turnover tax distribution into account and also includes 64% of the tax revenues allocated to the municipalities (*Finanzkraftmesszahl, FMZ*):¹⁴

$$\begin{aligned} FMZ_t^a &= Rev_t^{postUst,a} + 0.64 Rev_t^{mun,a} \\ FMZ_t^b &= Rev_t^{postUst,b} + 0.64 Rev_t^{mun,b}. \end{aligned} \quad (29)$$

The exact amount a state receives or has to pay depends on the degree by which its financial capacity per inhabitant falls below the average financial need per inhabitant (*Ausgleichsmesszahl, AMZ*):¹⁵

$$\begin{aligned} AMZ_t^a &= \omega_t (Rev_t^{agg,reg} + 0.64 Rev_t^{agg,mun}) \\ AMZ_t^b &= (1 - \omega_t) (Rev_t^{agg,reg} + 0.64 Rev_t^{agg,mun}), \end{aligned} \quad (30)$$

where $Rev_t^{agg,mun} = Rev_t^{mun,a} + Rev_t^{mun,b}$. States with *FMZ* below their *AMZ* are warranted a transfer

$$G_t = AMZ_t^i * F_{1,2,3} \quad (31)$$

¹³Hence, if the *Umsatzsteuervorwegausgleich* was the only redistributive element in the LFA, we would now get $T_t^a = Rev_t^{postUst,a}$ and $T_t^b = rer_t^{v_b - v_a} \cdot Rev_t^{postUst,b}$ relevant for regional revenues in equation (16), taking into account that $Rev_t^{postUst,b}$ are expressed in region *a*'s CPI. However, this is just one step in determining regional fiscal capacity relevant for the LFA.

¹⁴Here we abstract again from considering revenues from other autonomous state and local government taxes, as stipulated in the law.

¹⁵In principle, the system of financial equalization assumes that the financial need per inhabitant is the same in all *Länder*. However, in the case of the city-states of *Berlin, Bremen* and *Hamburg*, a higher financial need is assumed. For this purpose, their population is notionally increased by 35% when calculating the *AMZ*. Population of the three sparsely populated states of *Brandenburg, Mecklenburg-Western Pomerania* and *Saxony-Anhalt* is also slightly notionally increased for similar reasons, though only with respect to the municipal tax revenues considered. We abstract from considering these adjustments in our model, since they are on aggregate for the corresponding two regions rather limited. Yet, we have to bear in mind, that particularly the three city-states largely benefit from this peculiarity in practice.

according to the following linear-progressive rate:

For $FMZ_t^i < 0.8AMZ_t^i$:

$$F_1 = \frac{3}{4} \left(1 - \frac{FMZ_t^i}{AMZ_t^i} \right) - \frac{317}{20000} \quad (32)$$

For $0.8AMZ_t^i \leq FMZ_t^i < 0.93AMZ_t^i$:

$$F_2 = \left(1 - \frac{FMZ_t^i}{AMZ_t^i} \right) \left[\frac{5}{26} \left(1 - \frac{FMZ_t^i}{AMZ_t^i} \right) + \frac{35}{32} \right] - \frac{2121}{360000} \quad (33)$$

For $0.93AMZ_t^i \leq FMZ_t^i < AMZ_t^i$:

$$F_3 = \left(1 - \frac{FMZ_t^i}{AMZ_t^i} \right) \left[\frac{13}{7} \left(1 - \frac{FMZ_t^i}{AMZ_t^i} \right) + \frac{11}{25} \right]. \quad (34)$$

The transfers G_t are generally financed by the states with FMZ above their AMZ , using a linear-progressive rate as well; note, however, that in our case there is only one receiving and one paying region, which allows us to calculate the payment of the transfer paying region simply as $-G_t$. Once the average transfer to a receiving state exceeds 72.5% of the financial power of the paying states, the exceeding amount will be financed one half each by paying and receiving states.

2.4.4. Supplementary federal grants (*Bundesergänzungszuweisungen*)

Finally, if a receiving state's financial capacity (FMZ) after the *LFA i.e.S* is still below 99.5% of its financial need (AMZ), it receives a supplementary grant by the federal government (*Bundesergänzungszuweisungen*) to further equalize differences in per capita state tax revenues. These grants are calculated as

$$BEZ_t^i = 0.775 (0.995 AMZ_t^i - FMZ_t^i) \quad (35)$$

and are solely financed by the federal government. Other federal special-purpose grants mainly paid to the East German states, are not considered here, since they are not related to the equalization of financial capacities.

2.5. Calibration

We calibrate our model to quarterly frequency, where a represents the transfer paying and b the transfer receiving regions. While it is straightforward to sum-up the financially strong federal states of *Baden-Württemberg*, *Bavaria*, *Hesse* and *Hamburg* in the paying region, it is not so clear what to do with *North-Rhine-Westphalia* (NRW) because it is mostly a paying state in terms of the *Umsatzsteuervorwegausgleich* but, every now and then, received transfers within the proper *LFA* in the past. In our baseline, we include NRW in the modeled paying region, but also conduct an analysis in which NRW

belongs to the receiving region. It can be shown that the results do not change qualitatively.

For the general calibration strategy, we rely on Stähler and Thomas (2012). This means that our strategy consists of (i) matching steady-state values of selected model variables with the corresponding data averages (mainly fiscal variables and steady-state output relations) and (ii) choosing the remaining free parameters values in line with the existing literature. The data we use to calibrate federal tax rates is based on a large data set for the Euro Area containing a rich set of quarterly fiscal variables, described in more detail in Gadatsch et al. (2016a). The size of the transfer paying region is set to $\bar{\omega} = 0.6$ ($\bar{\omega} = 0.38$ when including NRW in the transfer receiving region). The bar indicates steady-state values. We normalize GDP in the paying region, \bar{Y}^a , to one and set $\bar{Y}^b = 0.5$ ($\bar{Y}^b = 1.2$ when treating NRW as receiving region), which corresponds to relative regional GDP according to German national accounts data. As regards the inter-regional linkages, we assume that steady-state net foreign asset position to be zero, $\bar{d}^a = \bar{d}^b = 0$, and normalize the terms of trade to unity, $r\bar{e}r = 1$. Then, we target the import share of the transfer paying states vis-à-vis the receiving states to be 10%, which forces us to derive the corresponding home bias parameters endogenously.

Following the real-business-cycle literature, we normalize initial steady-state labor supply to one third, $\bar{N} = 0.33$. Furthermore, we assume that the government consumption-to-GDP ratio amounts to 20%, while the public investment-to-GDP ratio is 2%, which is both in line with European data and used as a proxy due to the lack of German state-specific national accounts data on this issue. As regards parameters, we set $\beta = 0.992$, which matches an annual interest rate of 2.5%. We choose a capital depreciation rate $\delta = 0.025$ and a capital exponent $\alpha = 0.33$ in the production function, which are standard parameters in real business cycle models. Regarding the effects of public investment on private production, we set $\eta = 0.1$. Thereby, we follow Leeper et al. (2010) who employ the same value of 0.1 in their simulations. For a discussion, see also Aschauer (1989), Nadiri and Mamuneas (1994), Holtz-Eakin (1994), Kamps (2004), and D’Auria (2015). Table 1 summarizes our baseline calibration choice.

Table 1: Targeted and calibrates values

Variable/Parameter	Symbol	Value	
		Donor	Recipient
Relative population share	$\omega; (1 - \omega)$	0.60	0.40
GDP	\bar{Y}	1.00	0.50
Steady-state per-capita labor	\bar{N}		0.333
Steady-state productivity	\bar{z}	0.44	0.43
Import shares		0.1	n.a.
Net foreign assets	\bar{d}		0.000

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Variable/Parameter	Symbol	Value	
		Donor	Recipient
Terms of trade	$r\bar{e}r$		1.000
Labor income tax rate	$\bar{\tau}^w$		0.304
Consumption tax rate	$\bar{\tau}^c$		0.183
Capital tax rate	$\bar{\tau}^k$		0.214
Gov. steady-state consum.	$\omega^{Cs} = \bar{C}^s / GDP$		0.200
Gov. steady-state invest.	$\omega^{Is} = \bar{I}^s / GDP$		0.022
Discount rate	β		0.992
Home bias in consumption ^e	v	0.269	0.313
Capital share in production	α		0.333
Capital depreciation	δ		0.025
Disutility of labor ^e	θ_l	1.661	1.526
Prod.-effect of publ. capital	η		0.100
Adjustment costs of trading interregional assets	Ψ_d		0.001

Source: Federal tax rates are calculated as in Gadatsch et al. (2016a). Other targets result from own calculations, normalization or other sources as described in the main text. The superscript ^e indicates that the parameter value was derived endogenously to meet the targeted steady state. We drop the region-indices for convenience.

3. Analysis

We start our analysis by evaluating how the different stages of the LFA affect the steady state of the economy. This will be a helpful step in order to understand how changes in the LFA legislation will affect the economy, which we analyze in a second step [to be done once precise reform measures have been published]. Last, we will evaluate the welfare consequences of the policy changes.

3.1. Abolishing the LFA

Figure 1 plots the effects that abolishing the LFA entirely would have on per-capita fiscal revenues of regions a and b , respectively. In our baseline simulation, we assume that the gains/losses of region i are used to increase/decrease per-capita transfers to households, TR_i^j . [In the discussion section, we will later also show the effects of a corresponding reduction in government consumption and investment; needs to be done]. We see that, as expected, the initially transfer paying region gains while the transfer receiving region loses. The first gains between around 10 percent of initial per-capita steady-state revenues, while the latter loses around 18 percent.

Figure 1: Medium-term effects of policy change on key fiscal variables

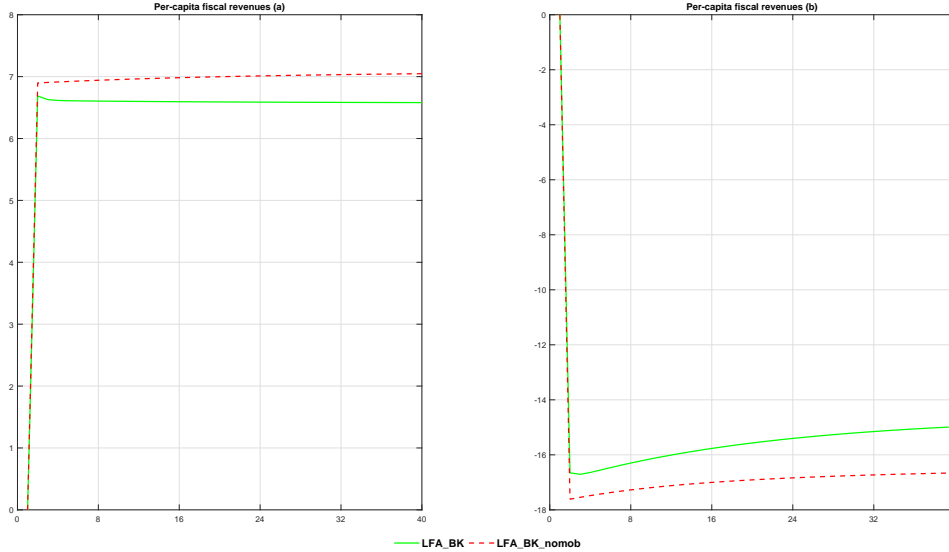


Figure 2 plots the effects of abolishing the entire LFA on key macroeconomic variables. As expected, households in the transfer paying region a consume more, because they receive higher transfers from their governments, while households in the recipient region b consume less. This holds both, in aggregate and per-capita terms. Aggregate consumption gains in the paying region are higher once we allow for mobility, because higher public per-capita transfers here induce some households from the recipient region to move. The same holds for consumption losses in the recipient region as well as for investment. This is also reflected in the regional GDP developments (see Table 2). It is interesting to note that, once allowing for mobility, the gain in per-capita GDP is much lower. The reason for that is that the increase in region a 's GDP is not sufficiently high to really compensate for the relatively high population inflow. Aggregate German GDP falls because the consumption gains in the donor region (including the fact that more people move there) does not overcompensate for the consumption losses in the recipient region.

As regards the reaction wages, interest rates and employment, they are as one would expect given GDP and consumption developments. Because consumption in the paying region increases, firms will have to offer higher wages if they want to leave employment unchanged (see equation (8)). In equilibrium they will increase wages but, at the same time reduce employment. Hence, in the paying region, production is shifted towards being relatively more capital intensive. The opposite holds in the transfer receiving region (see Figure 3 and Table 2). Overall, households in the paying region enjoy higher consumption and higher leisure, which makes more households want to move there.

Figure 2: Medium-term effects of policy change on key macro variables

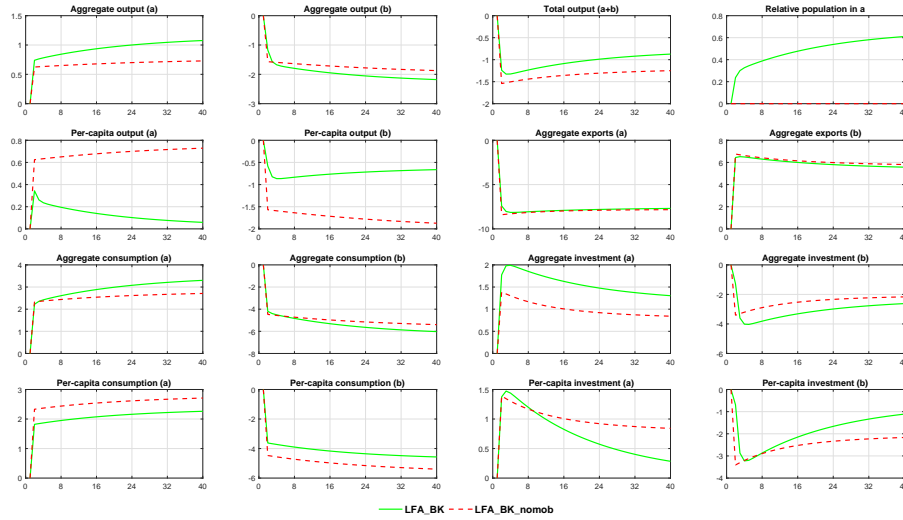


Figure 3: Medium-term effects of policy change on key household income variables

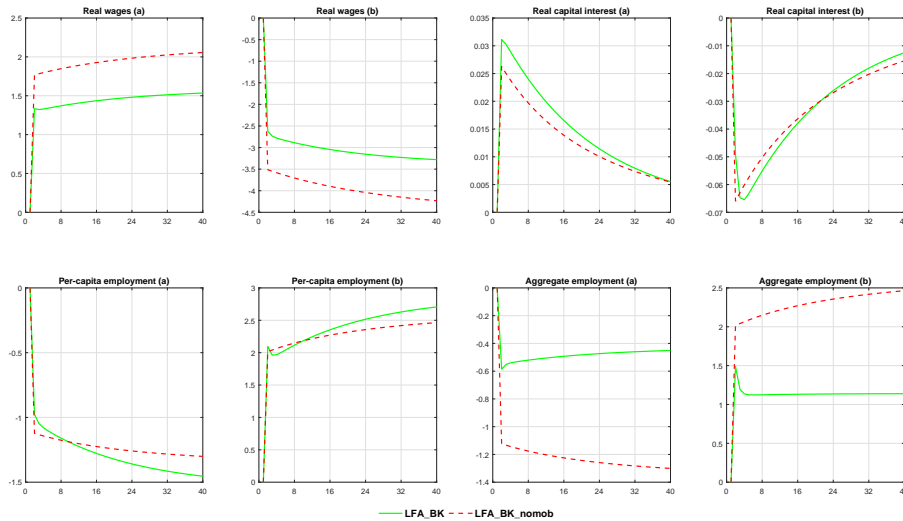


Table 2: Long-run effects of policy change

Variable	Baseline	No mobility
Relative population share in a	1.13	0.00
Regional GDP (a)	1.15 (0.03)	0.75 (0.75)
Regional GDP (b)	-2.29 (-0.61)	-2.02 (-2.02)
Aggregate German GDP	-0.76	-1.20
Consumption (a)	4.74 (3.01)	3.71 (3.71)
Consumption (b)	-8.42 (-6.06)	-7.52 (-7.52)
Investment (a)	1.60 (-0.07)	1.01 (1.01)
Investment (b)	-3.02 (-0.51)	-2.62 (-2.62)
Employment (a)	-0.38 (-2.03)	-1.76 (-1.76)
Employment (b)	1.27 (3.88)	3.49 (3.49)
Wages (a)	1.99	2.82
Wages (b)	-4.23	-5.90

Source: Table shows long-run effects of policy change relative to initial steady state, in percentage (point) deviations. The term in brackets indicates per-capita values, while the regular term indicates aggregate values.

3.2. Simulating the actual reform proposal

To be done (whenever draft law publicly available...).

3.3. Welfare assessment

The previous section has shown that households in both regions are affected differently. As households in the paying region enjoy more consumption and leisure, they seem to be winners of entirely abolishing the financial equalization scheme, while the households in the transfer receiving region seem to lose. However, it is now interesting to know by how much households in the paying region win and by how much they lose in the recipient region, and what happens with the national aggregate. In order to address this question, we conduct a welfare analysis. The theoretical model enables us to calculate (household type-specific) welfare to address this issue. In doing so, we compute the life-time consumption-equivalent gain of each type of household as a result of the change in fiscal policy. We will take into account the welfare difference between the initial and the final steady state as well as the transition thereto. More precisely, we calculate the consumption-equivalent welfare gain, ce^i , such that

$$\sum_{t=0}^{\infty} (\beta^i)^t U \left((1 + ce^i) \bar{c}^i, N^i \right) = \sum_{t=0}^{\infty} (\beta^i)^t U \left(c_t^i, N_t^i \right),$$

where the utility function $U(\cdot)$ is given by equation (1). Hence, ce^i represents the amount of initial steady-state consumption a household living in region i is willing to give up in order to live in the alternative regime after the policy change. Economy-wide welfare is computed taking into account the weighted sum of both regional utilities plus the disutility of living in region i . Results are summarized in Table 3.

Table 3: Welfare effects of policy change

Variable	Baseline	No mobility	NRW as recipient
Welfare of region- a inhabitants	3.01	3.71	5.24
Welfare of region- b inhabitants	-6.06	-7.52	-4.55
Aggregate German welfare	-0.62	-0.93	-0.89

Source: Table shows welfare effects of policy change expressed in consumption equivalents as described in the text.

Positive values imply a welfare gain, while negative values signal a welfare loss. We see that, as expected, households in the paying region gain, while all other households lose. However, the consumption and leisure gains of households in the paying region cannot overcompensate for the losses in the recipient region plus the disutility of having to live in region a . Hence, from a macroeconomic aggregate perspective, it does not seem convenient to abolish the LFA entirely.

4. Conclusions

The provisions of the German financial equalization system (*Länderfinanzausgleich*), a specific form of a fiscal union among the federal states (*Länder*), will expire in 2019. In this paper, we assess the effects of the system as well as of reform proposals on key macroeconomic variables and welfare by means of a two-region general equilibrium model.

We find that, on the one hand, as expected, abolishing tax revenue equalization in Germany would favor transfer paying states in terms of GDP and consumption, and significantly hurt receiving states. The main reason for this is that, because households in the paying states no longer need to finance the transfers to the other states, their disposable income increases significantly. This also explains why households living in the financially strong states benefit from higher wages and more leisure, which further leads to migration into those states. On the other hand, on aggregate, the average German household's welfare would be negatively affected, even though those who live in the paying states would gain.

However, two important limitations have to be made. First, since not all details of the complex equalization system could be incorporated and the model is restricted to two ideal-type-regions, no clear conclusions could be drawn with respect to the budgetary effects for each German federal state. And, second, one should bear in mind that the negative macroeconomic effects involved by the abolition of the equalization transfers might be countervailed by reduced disincentives for state budgetary policies – which are not addressed here.

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