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Skimming the Achieved? – Quantifying the Fiscal Incentives of the German Fiscal Equalization Scheme and its Reforms since 1970

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Abstract

Marginal rates of contribution (MRC), i.e., the rates at which additional revenues are skimmed via larger contributions or lower transfer receipts, quantify the incentives of a fiscal equalization scheme. The present paper is the first to calculate the marginal rates of contribution for the Laender (states) in the German fiscal equalization scheme for each of the 50 years since its establishment in 1970 and over five major reforms, taking into account all relevant revenues. Our results show that MRC have been at a consistently high level. Until 2019 the scheme induced an almost full skimming of additional tax revenues of recipient states. With the system's latest reform in 2020, MRC did increase further. Recipient states now face an over-skimming of additional tax revenues and thus, massive fiscal disincentives to maintain their own tax base. While these findings have been widely expected, comprehensive evidence has been missing so far.

Keywords: Fiscal equalization, Marginal contribution rates, Constitutional reform

JEL Codes: H71, H73, H77, H11

Acknowledgments: This paper extends and updates an earlier analysis by Burret et al. (2018) by particularly including the most recent reform of Germany's fiscal equalization system in force since 2020. We thank Thiess Buettner, Clemens Fuest, Justus Haucap, Heike Schweitzer, Volker Wieland and Berthold Wigger for the discussion about the reform of the fiscal equalization system in Germany. We thank Johanna Schworm, Christopher Hoegen and Amanda Benecke for excellent research support.

1. Introduction

A fiscal equalization scheme needs to balance two conflicting objectives. On the one hand, it has to level out financial resources across jurisdictions. On the other hand, it should not undermine the fiscal incentives for a jurisdiction to improve its own economic position. In Germany's state equalization scheme, the trade-off between these two objectives is particularly pronounced. On the one hand, the combination of comparable expenditure profiles and differing per capita revenues across the 16 federal states provides arguments for a system that levels out diverging revenues broadly. On the other hand, the states have political means to influence and improve their economic and fiscal situation by own efforts. The existing literature shows that, in designing their fiscal equalization scheme, the German states solved this trade-off by opting for a highly redistributive system. As a consequence, under this system it becomes fiscally less attractive for a state to maintain and improve its tax base as large parts of the fiscal benefits of such an improvement are redistributed towards the other states and the federal level (see e.g. Scherf 2007; Fuest and Thoene 2009; Feld et al. 2013; GCEE 2014; Hentze 2015; Buettner and Goerbert 2016; Scherf 2020a; Scherf 2020b). The degree to which the states have chosen equality in revenues over favorable fiscal incentives was, however, not static over time. Instead, it varied over five major reforms that the scheme underwent during the 50 years since its establishment in 1970. Therefore, also the fiscal incentives for a state to maintain and improve its tax bases varied with each of the scheme's reforms.

In this paper, we provide a comprehensive quantification of the fiscal incentives that the scheme exerted on each state in every year since 1970. This allows us to trace how the fiscal incentives exerted by the scheme developed over time and what effects the scheme's reforms had on them. To quantify the fiscal incentives of the scheme, we follow the literature and use state marginal rates of contribution (MRC) to the equalization system. The MRC reflect the share of a marginal increase in a state's revenues that is skimmed and does not remain in the state, either due to increased contributions to or reduced transfer receipts out of the equalization scheme. To calculate MRC for every state, we develop a simulation model for every fiscal year between 1970 and 2020 that considers all relevant revenue sources, all stages of the system as well as each reform of the equalization scheme. To the best of our knowledge, this paper is the first in which MRC of the German state equalization scheme are calculated comprehensively for all years, equalization stages and revenue sources. In contrast to our approach, other empirical studies that provide quantifications of the fiscal incentives of Germany's state equalization scheme calculate MRC based on a selection of revenue sources only (Baretti et al. 2002; Hauptmeier

2007, 2009; Boenke et al. 2017), use sole years (Scientific Advisory Board to the Federal Ministry of Finance, 2015), ignore repercussion effects of increases in a state's revenues on the average revenues of all states (Scherf 2020a) or only address the latest reform of the equalization system (Buettner and Goerbert 2016; Scherf 2020a). Our results show that MRC have been at continuously high levels. Thus, the system consistently induced unfavorable fiscal incentives for a state to improve its economic position. This is especially the case for transfer receiving states that face an almost full skimming of additional revenues over almost all years. Only the reform of 2005 led to improvements in the system's fiscal incentives. These improvements have been concealed by the reform of 2020 that pushed MRC to a historic high, inducing a skimming of up to 112% of additional state revenues for some states, meaning that the fiscal situation of a state after equalization worsens if its revenues before equalization increase.

The remainder of the paper is organized as follows. Section 2 discusses previous findings on the effects of high MRC on the economic and fiscal policy of a jurisdiction. Section 3 reviews the different stages of Germany's fiscal equalization scheme since 1970. In section 4, we describe our simulation model to calculate the MRC of a state. In section 5, we trace the development of the system's MRC over the five major reforms which the system underwent. Section 6 concludes.

2. Incentive Effects of MRC

The incentives that a fiscal equalization scheme exerts on a jurisdiction to improve its economic position can be quantified by the jurisdiction's marginal rates of contribution (MRC) to the scheme. MRC measure the effect of a marginal increase in state own revenues on the payments it has to make or it will receive out of the equalization scheme. For a state that contributes funds to the system, the MRC indicate the share of additional revenues that does not remain in the state because of increased transfer payments due to its increased financial strength. For a state that receives funds out of the equalization system, the MRC indicate the share of additional revenues that does not remain in the state due to a reduction of the payments the state receives out of the equalization system because of an increase in its financial strength. Hence, from a theoretical point of view the fiscal incentives for a state to improve its own tax base decrease the higher its MRC are, and the fruits of a growth promoting policy do not remain within the state but are redistributed to other states or the federal level (Koetheburger 2002; Buettner 2006; Berthold et al. 2006; Bucovetsky and Smart 2006; Feld et al. 2012; Baskaran et al. 2017).

To what extent MRC influence local fiscal and economic policies in Germany's fiscal federalism has been analyzed for the municipal and state levels. For the municipal level, Buettner

(2006) shows that municipalities in the state of Baden-Wuerttemberg increased their business tax rate after an increase in the MRC of the municipal equalization scheme. Using a regression discontinuity design, he avoids endogeneity of his empirical results. Egger et al. (2010) exploit a natural experiment in the state of Lower-Saxony where the municipal equalization scheme was reformed in the year 1999. Their results confirm the results of Buettner (2006). Egger et al. (2010) argue that the equalization scheme compensates municipalities for the erosion of their tax base due to higher tax rates. Hence, fiscal equalization lowers the incentives for jurisdictions to attract mobile production factors through lowering tax rates. Hauptmeier (2007) focusses on expenditure effects for municipalities in the state of Baden-Wuerttemberg. He shows that higher MRC have negative effects on municipal investment spending, measured as a fraction of the overall municipal budget. He argues that it becomes less attractive for a municipality to maintain its tax base through public investment the more the revenues that a municipality can attain from this tax base are skimmed by the equalization scheme.

For the state level, three studies investigate the impact of the equalization scheme's MRC on state fiscal policies. Hauptmeier (2009) focusses on public expenditures and shows for the period between 1980 and 2003 that increased MRC reduced state spending for infrastructure and education. Baretti et al. (2002) calculate the annual MRC in the German state equalization scheme for the period between 1970 and 1998 and provide evidence that MRC affected state revenues. They show that higher contribution rates to the equalization scheme had a negative effect on the tax revenues of the ten West German states. Following their results, an increase of the MRC of one percentage point reduces a state's tax revenues relative to GDP by 0.0096 percentage points. Boenke et al. (2017) use a similar framework for the years 1998, 2001 and 2004. Their results show that the tax collection effort of a state is lower, the higher MRC are.

All of these studies confirm that high MRC incentivize a jurisdiction to reduce its efforts in improving its economic and fiscal situation. However, for their empirical applications, the authors only calculate MRC for single years or for limited time periods and do not trace the system's fiscal incentives over time. Moreover, most of them only consider an increase in the income tax for their calculation of a state's MRC. Increases of other taxes that are relevant for a state's contribution to the equalization scheme, such as the corporate tax or the VAT are not considered. Hence, the MRC which are calculated by them tend to be too low. Given these limitations this paper is, to the best of our knowledge, the first in which the fiscal incentives of the German state equalization scheme are quantified for each federal state and every fiscal year since 1970 while taking into account all relevant revenues and distributive steps of the equalization system.

3. Germany's System of Fiscal Equalization

In Germany's federalism, the Laender constitute an autonomous federal tier, while the municipalities are an integral part of the state level. To enable the states and their municipalities to fulfill their constitutional tasks, public revenues are distributed towards the different jurisdictions throughout a multilayered fiscal equalization scheme. This scheme becomes necessary due to two obligations the German constitution (Grundgesetz or Basic Law) sets for the states and the federal government. The Basic Law entitles the states to receive a high enough share of overall public revenues that enables them to fulfill their constitutional tasks (Art. 107 of the Basic Law). Moreover, the Basic Law establishes homogeneous living conditions among all citizens in the federation as a constitutional obligation (Art. 72 of the Basic Law). Thus, the constitution establishes not only an allocative, but also a highly (re-)distributive goal of the equalization system[1].

3.1 The Equalization System from 1970 until 2019

The state fiscal equalization scheme that was effective from 1970 until 2019 comprised four stages. On the first stage, revenues from the so-called "shared taxes" were assigned to the federal and (aggregated) state and municipal levels. These "shared taxes" are the income tax, the value added tax (VAT), the corporate tax and the capital (income) tax. Revenues from these shared taxes have been distributed to the (aggregate) state and municipal levels according to fixed shares (see Table 1).

On the second stage of the equalization scheme, the tax shares that had been assigned to the aggregated state level were distributed towards the individual states. For the income and corporate tax, this redistribution was based on the tax's occurrence. For the VAT, up to 25% of the overall aggregated state-share of VAT revenues was assigned to those states that had below-average per-capita tax revenues. The remaining 75% of the state share of VAT revenues were assigned to the states based on their population. Per-capita tax revenues comprised revenues from the income tax, the corporate tax and various state and municipal taxes. As states and municipalities can decide on the rates of some of their taxes autonomously, not actual tax revenues were considered. Instead, imputed tax revenues based on the average tax rates of all states entered the calculation of a state's tax strength.

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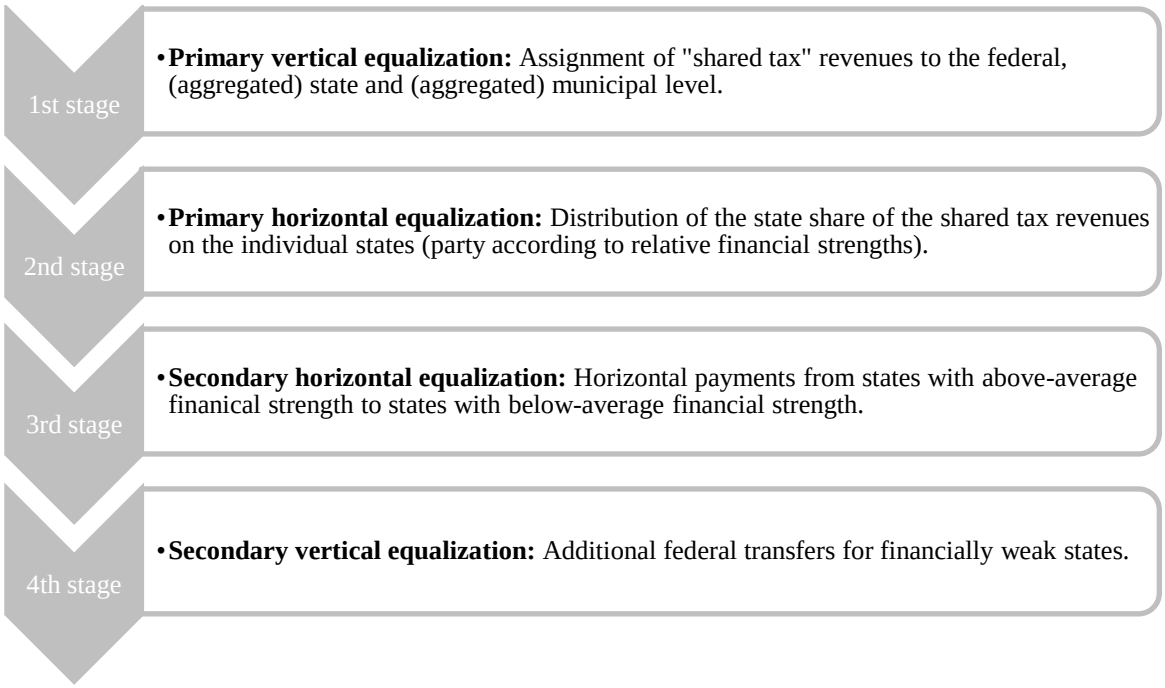
[1] Although this distributive goal is sometimes interpreted as a constitutional call on solving the trade-off between redistribution and favorable fiscal incentives for the states through entirely opting for the former, the German Constitutional Court explicitly made clear that "…the fiscal equalization scheme (…) is not an instrument to replace the (…) distribution of tax revenues by a system which is shaped by the sentiment of fiscal equivalence between the states, but does not consider the sovereignty and (fiscal) autonomy of the states anymore." (GCC 1987).

Figure 1: The Stages of the Federal Fiscal Equalization Scheme before 2020



Own depiction.

The distribution of VAT revenues based on the states' tax revenues already induced a strong horizontal redistribution of state revenues. Contributing states were those states that were worse-off compared to a distribution of VAT revenues that would have been based on population figures only. This redistributive effect showed up in a change of the revenue ranking for some states. For instance, the state of North-Rhine-Westphalia which had an above-average tax strength before the distribution of VAT revenues arrived at a below-average tax strength after the redistribution of VAT revenues. Thus, it turned from a contributing state on the second stage of the scheme to a receiving state on the subsequent stages of the equalization scheme.

On the third stage of the equalization scheme, differences in per-capita tax revenues were levelled out through horizontal transfers from states with an above-average *financial* strength[2] to those states with a below-average financial strength. These transfers were calculated according to a tariff that changed several times since 1970 (see Figure 2). There were three differences in the calculation of the financial strength of a state on this stage, compared to the stage before. First, on this stage, revenues from the VAT, from royalties and 65% of municipal tax revenues entered the calculation of a state's per capita financial strength. Again, not actual revenues from

[2] On the first and second stage of the system only tax revenues have been regarded for the fiscal position of a state. Therefore, the *tax strength* of a state was the relevant measure for redistribution on these stages. On the subsequent stages, also other revenues enter the calculation of a state's fiscal position. Therefore, from stage 3 onwards, the *financial strength* of a state is the relevant measure for a state's fiscal position. Still, some revenues are not or not fully considered in the fiscal equalization system, e.g., revenues from economic activities.

municipal taxes entered the calculation, but imputed revenues based on average tax rates. Second, to consider alleged additional financial needs, the population numbers of the city states Hamburg, Berlin and Bremen were weighted with the factor 1.35, while the population numbers of sparsely populated states were also multiplied by factors greater than one[3] in order to increase the calculated fiscal needs of these states. Third, since 2005, increases in a state's per capita tax revenues of up to 12% do not enter the calculation of a state's financial strength and thus remain within the state of occurrence. This so-called "premia-model" aims at reducing the skimming of additional tax revenues to improve the incentives of the equalization scheme.

Table 1: Vertical Distribution of Shared Tax Revenues

				Capital (Income) Tax	
	Income Tax	VAT	Corporate Tax	Debtor Capital Tax	Agent Capital Tax
Federal Level	42.5%	48.9%	50.0%	50.0%	44.0%
State Level	42.5%	47.7%	50.0%	50.0%	44.0%
Local Level	15.0%	3.4%	0.0%	0.0%	12.0%

VAT-revenue shares for 2019, EU- and social security shares are assigned to the federal level. Source: Federal Ministry of Finance.

The fourth and last stage of the old equalization scheme comprised two sorts of vertical transfers from the federal level to specific states. General federal transfers (GFT) were granted as non-earmarked grants to those states that still had a financial strength below 99.5% of the average financial strength of all states after the previous three stages of the equalization scheme. The remaining fiscal gap to 99.5% of the average financial strength was then closed at a rate of 77.5%. In addition to the GFT, the federal government also granted specific federal transfers (SFT), independently of the financial strength of a state which aimed to compensate individual states for special fiscal needs.

3.2 The Equalization System since 2020

In 2016, the federal government and the state governments agreed to rearrange the fiscal relations between the states as well as between the states and the federal government from 2020 onwards. The two horizontal stages of the equalization scheme described above have been fully replaced by an expanded distribution of VAT revenues that is now augmented by surcharges and deductions based on the per capita financial strength of a state. States with a below average

[3] Mecklenburg-West-Pomerania (with a factor of 1.05), Brandenburg (with a factor of 1.03) and Saxony-Anhalt (with a factor of 1.02) received this additional kind of population weighting.

per capita financial strength receive surcharges to their population-based VAT shares, while states with an above average per capita financial strength face deductions from the VAT share that would be assigned to them purely based on their population numbers. Both, surcharges and deductions, follow a proportional tariff that closes 63% of the gap between a state's per capita financial strength and the average per capita financial strength of all states. With two exceptions, the financial strength of a state is calculated in the same way as on the third stage of the old systems. First, municipal taxes are now included into the calculation of a state's financial strength with a discount factor of 75% instead of 64%. Second, state revenues from royalties are included with a discount factor of 33% only, instead of 100%. Other elements, for instance increased population weights for specific states or the premia model remained parts of the calculation of a state's financial strength. Vertical GFT from the federal government to specific states also remained part of the equalization system. Those states that still show a financial strength of less than 99.75% of the average financial strength of all states after the VAT distribution continue to receive GFT that close the fiscal gap to 99.75% at a rate of 80%. Note that both, the rate of the tariff and the tariff's threshold have been increased from 77.5% to 80% in case of the tariff and 99.5% to 99.75% in case of the threshold.

As a new element, new SFT have been included into the new system. Those states with municipal tax revenues of less than 80% of the average municipal tax revenues of all states receive vertical transfers (SFT) that close the gap between a state's municipal tax revenues and 80% of the average municipal tax revenues of all states at a rate of 53.5%. Scherf (2020b) argues that these SFT de-facto replace former SFTs that were granted to the eastern states to compensate them for politically defined special fiscal needs, independently of their actual financial strength. This new instrument extends the skimming of additional tax revenues to the municipal level. Hence, the new SFT are expected to increase the system's MRC significantly (Buttner and Goerbert 2016; Scherf 2020b). Besides the SFT for states with below-average municipal tax revenues, the federal level continues to grant additional SFT independently of a state's fiscal position, e.g., for states that show a weak performance in university research.

Although the reform led to major formal changes, there have been hardly any changes that would be substantive to the system's impacts or to its incentives (Scherf 2020b). Instead, the elements of the old scheme have been transformed into new redistributive instruments. Most of these new instruments are expected to even worsen the incentives the system exerts (Scherf 2020b; Buettner and Goerbert 2016; Feld et al. 2016). However, quantitative evidence on the fiscal incentives of the new scheme is missing so far.

4. Simulation Model

To quantify and trace the fiscal incentives that the equalization system and its reforms exert on the states, we calculate the MRC for each state and year for the period between 1970 and 2020. For our calculation we set up a simulation model of the German fiscal equalization scheme and use the ex-post data on actual tax revenues. In our model, we use the exact numbers that entered the calculation of the equalization transfers in the respective year for the respective state based on the annual accounts of the Federal Ministry of Finance. Thus, our simulations yield the exact ex-post MRC each state faced in every fiscal year[4]. Note, that the calculated MRC could be endogenous if a state adapts its policy to yield a specific (expected) MRC in the course of the year. This should, however, not cause biased simulation results. The reason for this is that state policymakers can form their expectations on their state's MRC in year t only based on the MRC in year t-1. As the MRC for an individual state within the existing system should however be largely constant, we do not expect that policy changes of a state within a fiscal year are prone to substantially influence the actual ex-post MRC.

Our simulation model is based on a methodology of the German Council of Economic Experts (GCEE 2014) and the existing literature (Baretti et al. 2002; Buettner 2006; Boenke et al. 2017). In our model, we apply the following four steps. Note, that the steps two to four are applied separately for each state.

1. ***Replication of the calculation of all equalization payments between the federal level and the states*** based on the actual revenues of each state in each year. We consider all stages of the equalization scheme. The calculated transfer payments are compared with the actual transfer payments in the respective year to ensure that our calculations yield the exact transfer payments in the respective year, considering all revenue sources, re-distributive instruments and (minor and major) legal changes in the equalization scheme correctly.
2. ***Increasing tax revenues in state A*** (stemming from the state shares on the shared taxes, state taxes and municipal taxes) by a marginal rate of 0.1%: Subsequently, the tax revenues of all states are increased by an amount x that can be traced back solely to the increased tax revenues in state A.
3. ***Calculation of the marginal retention rate*** of state A. The retention rate yields the share of the increased tax revenues that remains in state A. We calculate the retention rate as

[4] As the final accounts of state revenues are published six months after the end of the fiscal year, we need to use data of 2019 to calculate the states MRC for 2020, applying a simulation of the post 2019 system.

the ratio of the increased tax revenues from state A over the amount of the increase in tax revenues that remains in state A after applying all steps of the state fiscal equalization scheme.

4. ***Calculation of the marginal rate of contribution*** of state A (1-marginal retention rate).

We set up separate simulation models of the entire equalization scheme for each year for two reasons. First, the absolute and relative contribution rate of a state depends on its relative position among the other 15 states and thus, on the actual tax revenues of itself and of every other state in each year. Second, we need to recapitulate every annual (major and minor) change in the legal framework of the equalization scheme so that our calculations exactly mirror the scheme that was effective each year in every detail.

Note, however, that our replication of the fiscal equalization scheme deviates from the actual scheme in one respect. While municipal taxes entered the actual scheme discounted with a factor smaller than one, we include them without a discount factor in our baseline calculations for two reasons. First, in Germany's fiscal federalism the states are responsible to endow the municipalities with sufficient funds. Thus, for state policymakers the financial strength of the municipalities and their contribution to the equalization scheme is of similar importance as the financial strength of the state itself. Second, the discount factor to which municipal tax revenues were included in the calculation of a state's financial strength changed several times since 1970. As the factor to which municipal taxes are considered in the calculation of a state's financial strength directly influences its MRC (the higher the discount factor, the higher the influence of a change in municipal tax revenues on transfer payments) we need to hold the discount factor constant to evaluate how the other changes in the equalization scheme affected the development of a state's MRC. In an extension of our simulation model, we include municipal taxes with the discount factor that was effective in the respective year to validate our results.

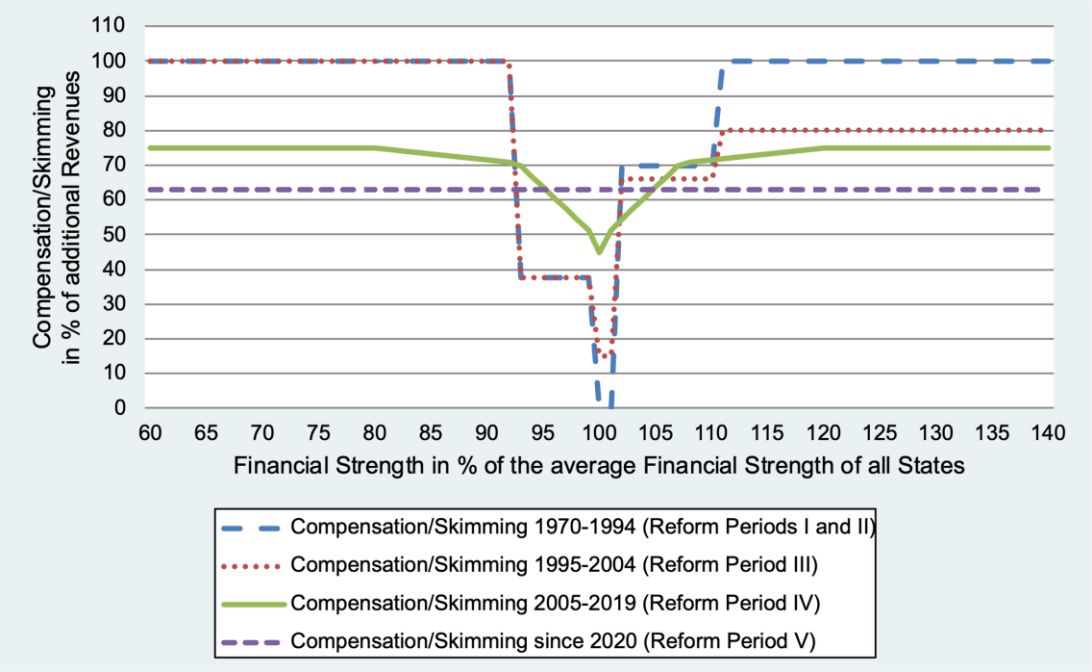
Apart from numerous minor changes, the German fiscal equalization scheme underwent five major reforms since its establishment in the year 1970:

- **Reform Period I** (1970-1987): Financial Reform Act of 1969 and introduction of the horizontal redistribution scheme
- **Reform Period II** (1988-1994): Introduction of the GFT
- **Reform Period III** (1995-2004): "Solidarity Package I" (integration of the East German states and introduction of the SFT)
- **Reform Period IV** (2005-2019): "Solidarity Package II" (conversion to a continuous tariff, introduction of a premia model into the calculation of a state's financial strength)

- **Reform Period V** (since 2020): General revision of the equalization scheme (elimination of the explicit horizontal stage, expansion of the financial strength based distribution of VAT revenues, introduction of SFT for states with relatively low municipal tax revenues)

Besides the introduction of the GFT in 1988, the periods differ in the equalization tariff applied as well as in the calculation of a state's financial strength. Between 1970 and 2004, a differential tariff was applied. Between 2005 and 2019 this tariff was changed to a linear-progressive one. Since 2020, the horizontal redistribution follows a proportional tariff (see Figure 2).

Figure 2: Tariff for the horizontal Equalization over the five Reform Periods



Source: Own depiction.

Scherf (2020a) shows that unadjusted MRC can also be calculated without simulating the entire equalization system. Instead of running simulations he sets up a system of equations to calculate the marginal contributions of a state across the different steps of the equalization scheme. The approach of Scherf (2020a) brings the advantage that a complicated simulation of the whole system is no longer needed. Moreover, his system of equations allows to observe the skimming effects for single tax sources of states and municipalities. There are, however, two downsides of this approach. First, the approach is only easy to implement for the post 2019 system with proportional tariffs and without the complicated two-stage horizontal redistribution of revenues that was effective before 2020. Second, the approach of Scherf (2020a) ignores repercussion effects of increased tax revenues of a single state on the average tax revenues of all states.

Therefore, his approach overstates MRC compared to a state's effective marginal contributions to the equalization system[5].

5. The Development of the System's Fiscal Incentives since 1970

The development of the system's fiscal incentives measured as MRC since 1970 is depicted in Figure 3. The MRC calculated in our simulations show that the German state fiscal equalization scheme constantly induced a high skimming of additional tax revenues and thus, unfavorable fiscal incentives. This is especially the case for transfer receiving states. For some of them the equalization scheme induced an up-to complete skimming (for the post 2019 system even an over-skimming) of additional revenues. However, there were notable differences in MRC levels across the different reform periods. These differences can be attributed to three elements of the equalization scheme. First, the tariff under which the horizontal redistribution is made. Second, vertical payments from the federal level that depend on a state's financial strength. Third, the procedure how the financial strength of a state is calculated.

5.1 Reform Period I: Financial Reform Act of 1969 and Introduction of the Horizontal Redistribution Scheme

During the first reform period (1970-1987) the core elements of the equalization scheme have been the horizontal, financial strength based redistribution of VAT revenues and direct horizontal transfer payments between the states. The equalization tariff that was effective between 1970 and 1994 induced a complete skimming of additional tax revenues of a state at a relative per-capita financial strength of ≥ 110% of the average per-capita financial strength of all states. On the contrary, if a state had a relative per-capita financial strength below 93% of the average per-capita financial strength of all states, it received funds through the equalization scheme to completely fill up the gap between its actual financial strength and 93% of the average per-capita financial strength of all states (see Figure 2).

Moreover, the equalization payments followed a differential tariff according to which the skimming and the granting of funds was increased in brackets. The fiscal incentives of such a differential tariff are, independently of its concrete design, unfavorable. These unfavorable effects stem from the situation of a state with a financial strength that comes close to one of the tariff's thresholds. If this state increased its financial strength marginally, it ended up in the next tariff-bracket which led to a sharp increase in transfer payments or a sharp decrease in transfer receipts and thus particularly high MRC.

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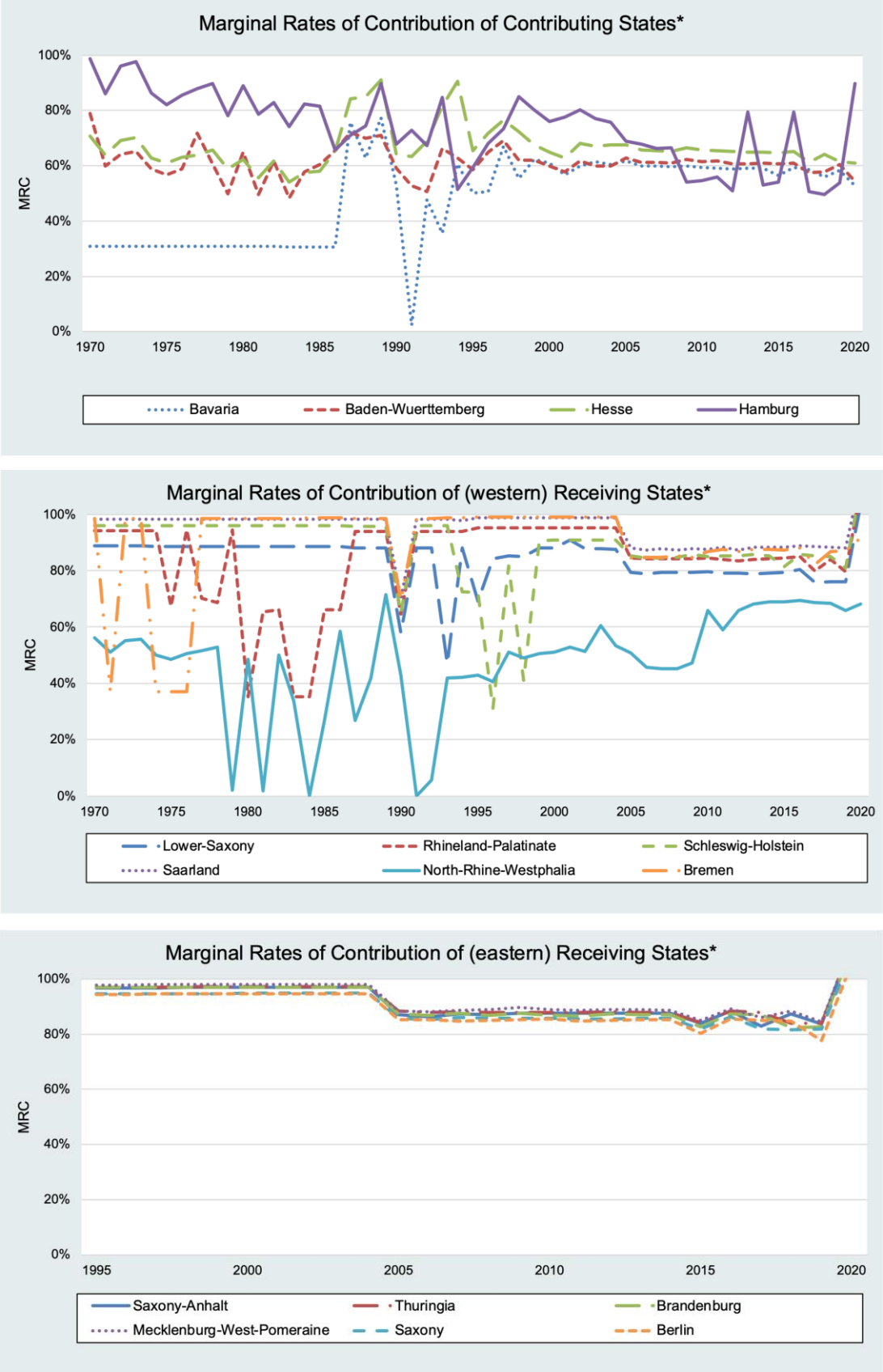
[5] Being aware of this issue, Scherf (2020a) denotes the MRC which he calculates "unadjusted" MRC.

Figure 3: MRC of Contributing and Receiving States since 1970



*States that changed their status as contributor or receiver are classified according to the status which they hold for more years. Municipal revenues fully included. Source: Own depiction based on simulations.

Our simulations confirm high MRC for the first reform period (see Figures 3 and 4). For contributing states, our calculations yield MRC between 50% (North-Rhine-Westphalia in 1976) and 98% (Hamburg in 1973). Note however, that Hamburg is an outlier due to its high financial strength, while the low level of the MRC of North-Rhine-Westphalia are already a forerunner of its transition from a contributing to a transfer receiving state. The MRC of Baden-Wuerttemberg and Hesse should be more representative for the MRC of contributing states in the first reform period. For these states, our simulations yield MRC of around 60%. For transfer receiving states our simulations yield MRC of up to 98% (especially for Saarland and Bremen) and thus an almost full skimming of additional tax revenues.

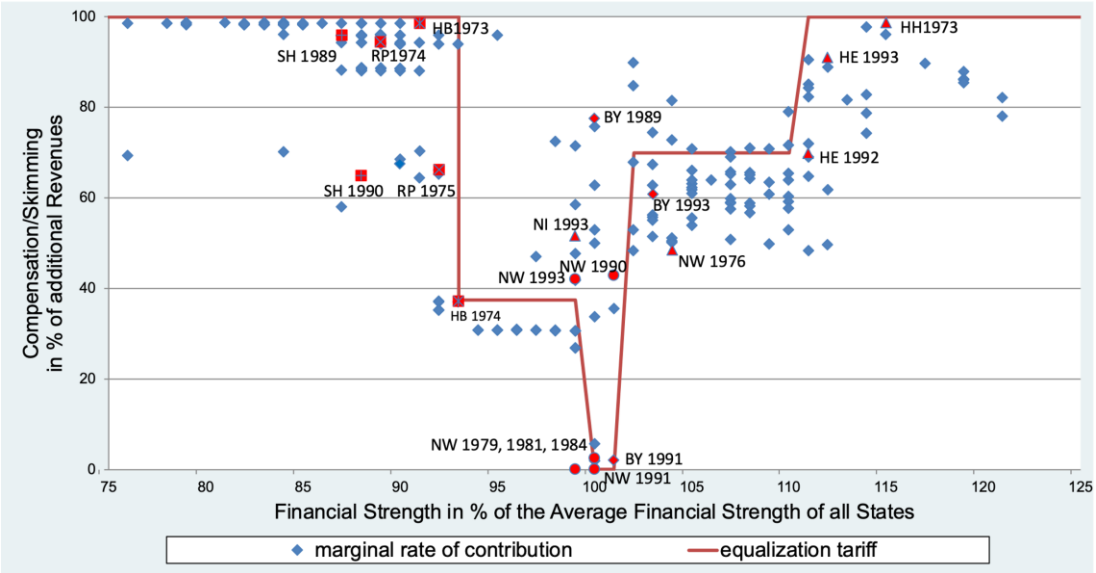
5.2 Reform Period II: Differential Tariff and Introduction of General Federal Transfers

In the second reform period, horizontal equalization continued to follow a differential tariff. We illustrate the effects of this tariff on MRC of transfer receiving states on the basis of some examples based on our simulations. During the years in which Rhineland-Palatinate ended up in the lowest bracket of the tariff (e.g., 1974) its MRC have been much higher than in the years 1975-1978 and 1985-1986 when it fell into the bracket next to the average financial strength of all states. The significant effects of the tariff's thresholds also appear in the case of Schleswig-Holstein in the years 1990 and 1994. Because of a full compensation of its gap in financial strength within the lowest bracket of the tariff, changing its position from the lowest to the next higher bracket of the tariff made a significant difference in the amount of transfer payments the state received. Consequently, this led to high MRC for Schleswig-Holstein in those years. The same effect can be observed for Bremen in the midst of the 1970s. That switching from one tariff bracket to the other also had unfavorable effects for contributing states can be observed for Hesse in the years 1993 and 1994. Hesse had an extraordinarily high financial strength in these years and ended up in the highest bracket of the tariff, which led to a full skimming of additional tax revenues that exceeded 110% of the average financial strength of all states.

While the differential tariff induced disincentives through an almost complete skimming of additional revenues for states that had a particularly high or a particularly low financial strength, it led to nearly no skimming of additional revenues for states with a financial strength close to the average financial strength of all states (see Figure 4). This can exemplarily be observed for the state of North-Rhine-Westphalia. At the beginning of the 1980s the financial strength of North-Rhine-Westphalia before and after the first stage of the equalization scheme was slightly above the average financial strength of all states. With the differential tariff this meant that

neither a skimming nor a compensation of additional revenues took place. Instead, the state entirely fell out of the horizontal stages of the equalization scheme, which explains the strikingly low MRC of North-Rhine-Westphalia in those years. The low skimming of additional revenues around the average financial strength of all states can also be observed if a state changed its status from a receiving to a contributing state and vice versa. North-Rhine-Westphalia changed its status from a contributing to a transfer receiving state during the years 1991-1993. During these years, the state again fell out of the horizontal elements of the equalization scheme. The same effect can be observed for Bavaria that changed its status from a transfer-receiving to a contributing state in the year 1991. In this year, Bavaria also fell out of the horizontal elements of the equalization scheme. Subsequently, both states show no or only very low MRC during the respective transition periods.

Figure 4: MRC and Equalization Tariff in the Reform Periods I and II (1970-1994)



Source: Own depiction based on simulations. Municipal revenues fully included.

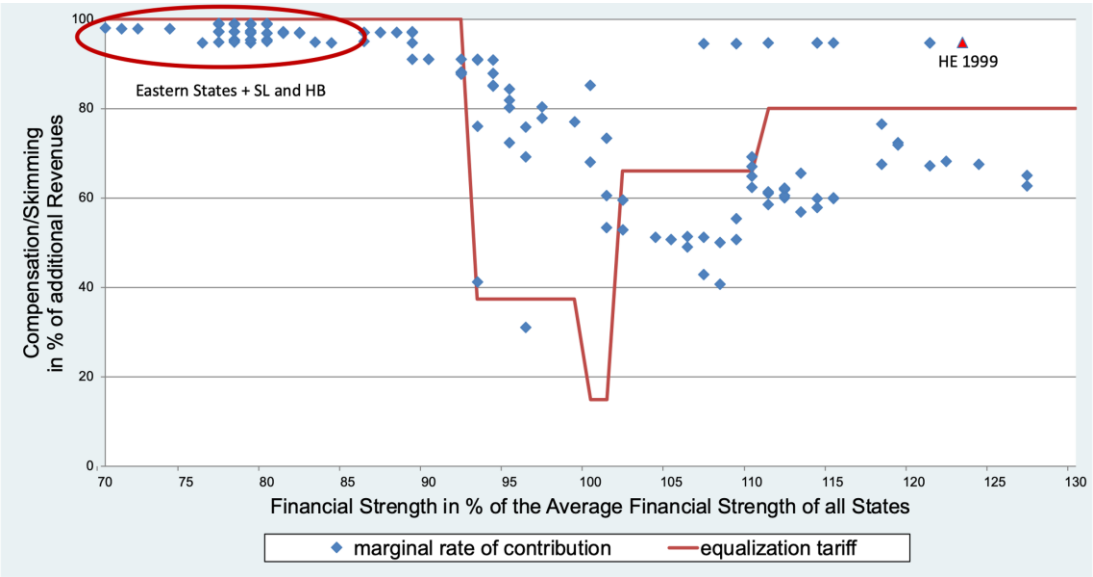
With the introduction of the general federal transfers (GFT) in the year 1988, the scheme was amended by its first vertical redistributive element. However, the introduction of GFT only slightly changed the development of MRC (see Figure 3) compared to the period before 1988. This can be attributed to the low volume of these vertical transfers compared to the dominating and unchanged horizontal elements of the scheme as well as to the unchanged equalization tariff. This does, however, not mean that the newly introduced vertical instrument would have been irrelevant for the states' MRC. The case of Lower-Saxony in the year 1993 shows how the GFT increased the MRC and thus, fiscal disincentives, for single states distinctly. In the year 1993, the state of Lower-Saxony yielded a relative per-capita financial strength that equaled the average per-capita financial strength of all states. According to the equalization

tariff, with a relative financial strength that equaled the average financial strength of all states, Lower-Saxony neither paid nor received transfers out of one of the horizontal components of the equalization scheme. Thus, the simulated MRC of 47% can be fully attributed to the general federal transfers (see Figures 3 and 4).

5.3 Reform Period III: Solidarity Package I and Integration of the Eastern States

The transition from the second to the third reform period (1995-2004) shows a pronounced increase in the MRC for most of the states. The reason for this is the integration of the East German states into the equalization scheme and the associated deferrals of the relative per-capita financial strengths of the West German states. While in the previous periods only Saarland, Bremen and Schleswig-Holstein were confronted with MRC of above 90%, from 1995 onwards all East German states were additionally confronted with MRC of above 90%. The reason for this was the high volume of received transfers compared to weak own tax base of the eastern states in the years after the German reunification (see Figures 3 and 5).

Figure 5: MRC and Equalization Tariff in the Reform Period III (1995-2004)



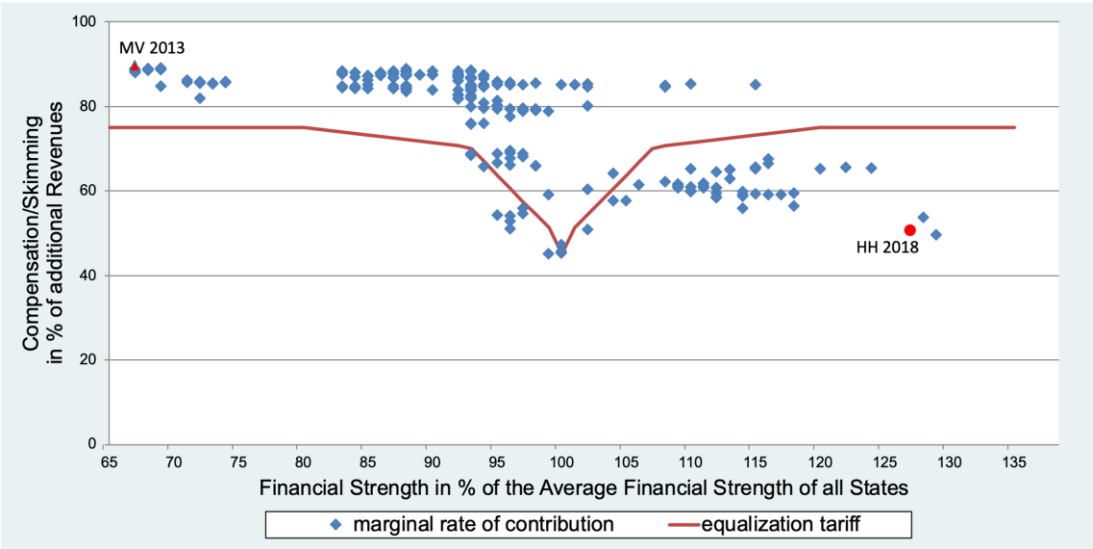
Source: Own depiction based on simulations. Municipal revenues fully included.

The equalization tariff was slightly changed in 1995. Additional revenues that overshot 110% of the average financial strength of all states were not skimmed completely anymore. However, the differential tariff and the full replenishment to a per-capita financial strength of 93% of the average per-capita financial strength of all states remained and so did most of the unfavorable fiscal incentives discussed above (see Figures 3 and 5).

5.4 Reform Period IV: "Solidarity Package II"

With the expiration of the transition period to include the East German states into the fiscal equalization scheme and the associated reform of the scheme in the year 2005, MRC have been reduced markedly. This becomes most obvious with regard to the transfer receiving states (see Figure 3). While our simulations indicate an almost full skimming of additional tax revenues in the previous scheme for several states, the maximum MRC that we calculate for this reform period is 89% (Mecklenburg-Western-Pomerania in 2013) (see Figure 6). The reason for the reduction of the MRC can be found in two changes of the equalization system.

Figure 6: MRC and Equalization Tariff in the Reform Period IV (2005-2019)



Source: Own depiction based on simulations. Municipal revenues fully included.

First, the differential tariff that was effective since 1970 was replaced by a continuous linear-progressive formula-based tariff. Hence, the brackets of the differential tariff and the associated jumps in the skimming of additional revenues at their thresholds did no longer exist (see Figure 6). Subsequently, MRC that were high at these thresholds formerly were reduced through the change of the tariff. The continuous tariff also caused the zone without any skimming around the average financial strength of all states to be ceased, which, ceteris-paribus, should have increased MRC. However, the newly induced skimming of additional revenues around the average financial strength of all states was overcompensated by the reduction of the skimming effects at the former thresholds of the differential tariff and in the tails of the distribution of financial strengths among the states.

Second, to reduce the skimming of additional revenues, a so-called "premia model" was included into the calculation of the financial strength of a state. Since 2005, additional per-capita revenues are cut by 12% before they enter the calculation of a state's financial strength. Thus,

an increase in a state's tax revenues was no longer fully included into the calculation of the transfers a state had to pay or was entitled to receive out of the equalization scheme. According to our simulations this reduced MRC for transfer receiving states markedly (see Figure 3). The city state of Hamburg shows that the premia-model also exerted MRC reducing effects on contributing states (see Figure 6). However, for the other contributing states, the MRC remained almost unchanged. This can be explained by the ceasing of the zone without any skimming around the average financial strength of all states, which overcompensates the premia model for the other contributing states.

Due to the implementation of the continuous tariff and the premia model, the outliers that we found when a differential tariff was applied are no longer present (see Figure 6). Note, however, that our simulation model yields reduced MRC after 2005 mainly because we assume a constant and full inclusion of municipal tax revenues when calculating the per-capita financial strength of a state. In the actual equalization scheme the MRC reducing effect of the reform of 2005 was partially compensated by an increase of the discount factor to which municipal taxes entered the calculation of a state's financial strength from 50% to 64%. This increase expanded the skimming effects of the scheme on municipal revenues and offset most of the reduction of MRC that was achieved through the reform elements discussed above (Scherf 2007).

5.5 Reform Period V: General Revision of the Equalization Scheme

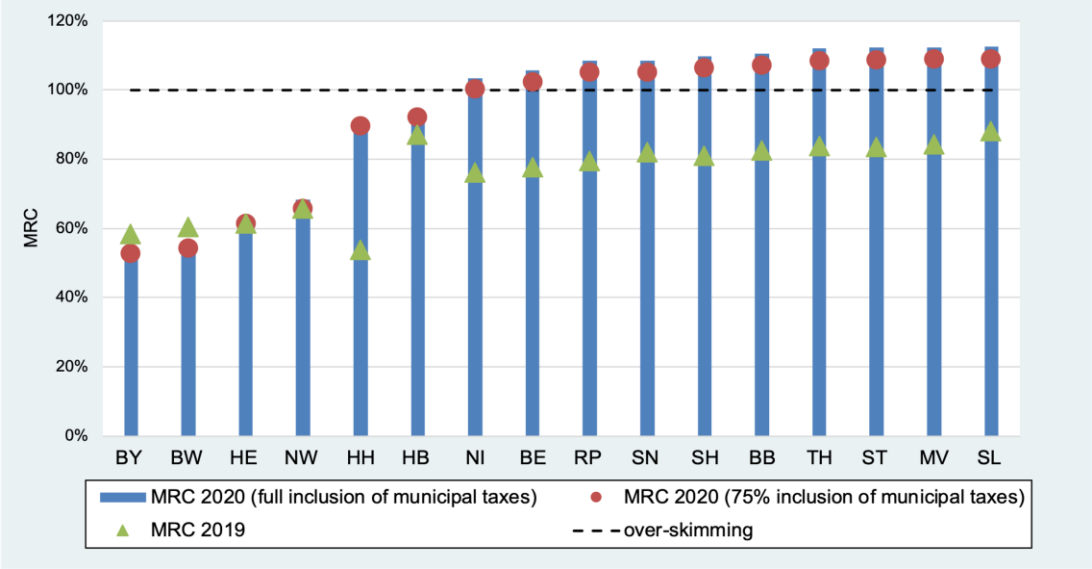
With the expiration of the Solidarity Package II in 2020, the equalization system underwent significant formal changes. Formally, the most important change was the conversion of the horizontal stages of the equalization system into vertical surcharges and deductions on a state's VAT share that follow a proportional tariff of 63% and have horizontal redistributive effects. Our simulations[6] show that the newly introduced proportional tariff that replaced the former linear-progressive one reduced MRC. This can be seen at the MRC of the two contributing states Bavaria and Baden-Wuerttemberg. Both states show reduced MRC compared to the pre 2020 system (see Figure 7 and Table 2). However, the introduction of the proportional tariff is the only element of the reform that improved the fiscal incentives the equalization system exerts on the states to maintain their tax bases.

While the conversion of the horizontal stages into the VAT distribution has been the most important change formally, substantively the expansion of the GFT and the introduction of SFT for states with relatively low municipal tax revenues turned out to be equally important for the

[6] As the final accounts of state tax revenues are published at the earliest six months after the end of the fiscal year only, we use tax data of 2019 for our simulation of the post 2019 system to calculate MRC for the year 2020.

fiscal incentives created by the system's latest reform. This becomes obvious if we turn to the transfer receiving states. For most of them our simulations yield sharp increases in MRC with an over-skimming of additional tax revenues, i.e., a reduction of transfers that is greater than the increase in a state's tax revenues. While smaller parts of the increase of MRC are caused by the expansion of the GFT, the by far largest part of MRC increases as well as the over-skimming of additional revenues can be attributed to the newly introduced SFT for under-proportional municipal tax revenues. Moreover, and in line with the findings of Scherf (2020a), our simulations show that states that receive the new SFT surpass states that exhibited a higher fiscal position before equalization in the ranking of financial strength.

Figure 7: Change in MRC after the 2020 Reform of the Fiscal Equalization Scheme



Source: Own depiction based on simulations with fiscal data of 2019.

Given both, the over-skimming of additional revenues and the change in the ranking of financial strength, the new SFT render it fiscally unattractive for a state with relatively low municipal tax revenues to improve its own revenue situation[7]. The over-skimming could even lead to a situation where states are incentivized to impair the tax base of their municipalities as they would fiscally benefit from a deterioration of their municipal tax base post equalization.

As the increase in MRC is mainly driven by the relative fiscal position of the municipalities of a state, our assumption to include municipal tax strengths without any discount factor could bias our results upwards. To assure that we are not overestimating MRC because of not including a discount factor, we also run our simulations applying the system's actual discount factor of 75%. Our results show that including the discount factor leaves MRC almost unchanged.

[7] Also, from a theoretical point of view these new SFT are highly problematic as they privilege the financial strength of municipalities over that of the states (Scherf 2020b).

Our results regarding aggregated MRC in the post 2019 equalization system are in line with the results of Scherf (2020a). As expected, the MRC calculated in our simulation model are lower than those derived by Scherf (2020a). The reason for this are repercussion effects of an increased financial strength of a state on the average financial strength of all states that are reflected in our simulation model but not in Scherf's (2020a) analysis.

Table 2: MRC before and after the Reform of 2020

	MRC 2020 (full inclusion of municipal taxes)	MRC 2020 (75% inclusion of municipal taxes)	MRC 2019	Over-skimming in 2020?	Eligible for municipal SFT in 2020?
BY	0.529	0.529	0.584	No	No
BW	0.545	0.544	0.604	No	No
HE	0.610	0.613	0.614	No	No
NW	0.683	0.658	0.658	No	Yes
HH	0.898	0.898	0.538	No	No
HB	0.916	0.922	0.870	No	No
NI	1.033	1.002	0.760	Yes	Yes
BE	1.056	1.025	0.777	Yes	Yes
RP	1.084	1.051	0.795	Yes	Yes
SN	1.085	1.052	0.820	Yes	Yes
SH	1.098	1.065	0.809	Yes	Yes
BB	1.106	1.073	0.826	Yes	Yes
TH	1.119	1.085	0.839	Yes	Yes
ST	1.123	1.088	0.837	Yes	Yes
MV	1.124	1.090	0.844	Yes	Yes
SL	1.126	1.091	0.882	Yes	Yes

Source: Own calculations based on fiscal data of 2019.

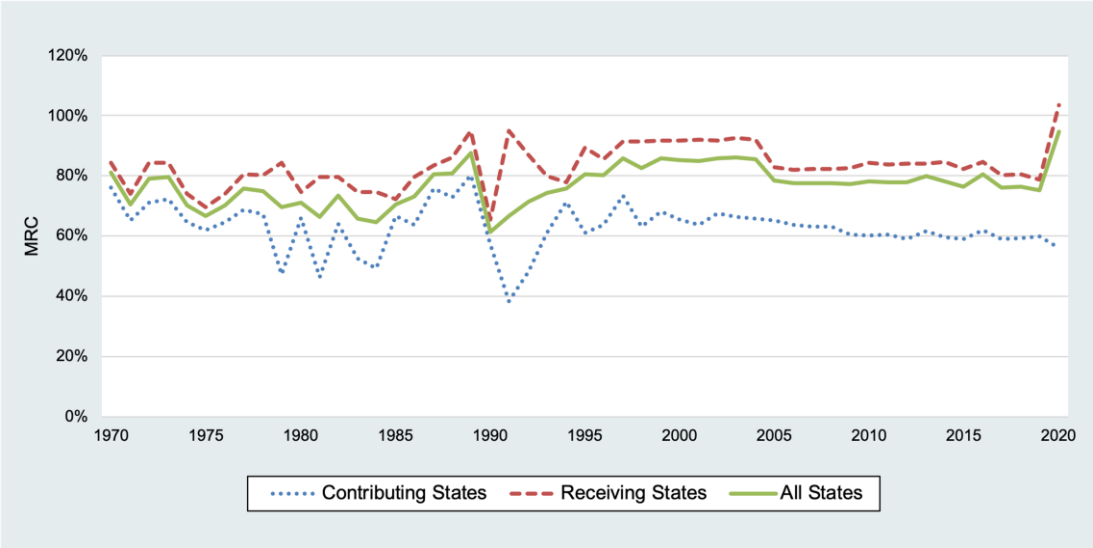
6. Conclusions

In designing Germany's state fiscal equalization scheme, the states and the federal government face the trade-off between redistributing diverging fiscal resources across states effectively without annihilating the fiscal incentives for a state to maintain and improve its tax base by own efforts. This paper is the first to provide a comprehensive quantification of the fiscal incentives that Germany's state fiscal equalization scheme exerted on each state in every year since the establishment of the equalization scheme in 1970. To quantify the fiscal incentives of the equalization scheme, we calculated each state's marginal rates of contribution to the scheme over 50

years and the scheme's five major reforms. To calculate the states' MRC, we developed a simulation model of Germany's equalization scheme based on all relevant revenues, all stages of the scheme and considering all of its reforms.

Our simulations yield MRC at constantly high levels (see Figure 8). For transfer receiving states, the system skimmed additional revenues almost fully and, since 2020, more than completely. Thus, in designing the fiscal equalization scheme the German states and the federal government decided to achieve horizontal and vertical redistributive goals. This comes at the cost of favorable fiscal incentives for the states to maintain and improve their own tax bases. Although these results have been expected, comprehensive evidence was missing so far.

Figure 8: Development of MRC for the Federation



Source: Own depiction based on simulations. Municipalt tax revenues fully included. States are classified as contributors and receivers according to their status in the respective year.

Since 1970, the equalization scheme was reformed five times. Our results show that, from all five reforms, only the reform of 2005 induced a reduction of the states' MRC and thus, an improvement in the fiscal incentives that the scheme exerted on the states to maintain and improve their tax base. All other reforms caused increases in MRC and worsened the fiscal incentives which the equalization scheme exerted on the federal states. Notably, most of the reforms followed the same pattern. While the skimming effects of the horizontal tariff have been gradually reduced in each of the reforms since 1995, extended and additional vertical transfer elements and an increased inclusion of municipal revenues into the calculation of a state's financial strength caused an additional skimming of state revenues. These newly caused vertical skimming effects did mostly exceed the reduction in the horizontal skimming of state revenues. This is especially the case for the system's latest reform in the year 2020 that pushed MRC to a historic height.

Studying the effects of the high MRC in the German fiscal equalization scheme on policy measures of the states based on the comprehensive data of this paper provides scope for future research. Note, however, that our simulations yield the states' ex-post MRC. For the incentive effects of the equalization scheme, anticipated (ex-ante) MRC should however be more relevant. Although anticipated MRC are not observable, they are likely to be approximated based on the realized ex-post MRC of the previous year. Thus, expected and realized MRC should be highly correlated. The only exception to this might be the case when a state scarcely changes its status from a contributing to a transfer receiving state (and vice versa).

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Appendix: Marginal Rates of Contribution 1970-2020

		North-Rhine-Westphalia	Bavaria	Baden-Wuerttemberg	Lower-Saxony	Hesse
Reform Period I	1970	0.562570925	0.308945013	0.790225737	0.887318629	0.708483006
	1971	0.510715653	0.308698773	0.597933957	0.887285581	0.638845585
	1972	0.55048721	0.308504608	0.642317008	0.887422258	0.690139105
	1973	0.557144243	0.308326954	0.653103009	0.887174095	0.701570115
	1974	0.501079771	0.308275964	0.589555962	0.886594343	0.629253419
	1975	0.484105733	0.308285971	0.568082441	0.886584955	0.609116275
	1976	0.504382909	0.308156007	0.589401622	0.886376512	0.631431642
	1977	0.515528691	0.307964969	0.71704179	0.886257304	0.638682638
	1978	0.529001987	0.307838795	0.608153872	0.886147899	0.656744161
	1979	0.0206906	0.307656012	0.498506597	0.886208589	0.588638478
	1980	0.484123908	0.307608072	0.648042981	0.886324676	0.622538235
	1981	0.019476877	0.307472327	0.495294138	0.886309957	0.55626651
	1982	0.500443939	0.307308567	0.618461829	0.88625263	0.617322798
	1983	0.336919475	0.307062497	0.482882546	0.886033328	0.540131731
	1984	0	0.30677076	0.577392879	0.885896663	0.575782731
	1985	0.269091288	0.306605242	0.603434049	0.885978354	0.581721689
	1986	0.585407579	0.306416056	0.654750676	0.886150482	0.650530494
	1987	0.269270041	0.75681621	0.719236248	0.881115498	0.84322847
	1988	0.418653128	0.627555596	0.698135632	0.881605805	0.851138967
	1989	0.714397422	0.774472233	0.709456242	0.881605835	0.909987979
Reform Period II	1990	0.427882451	0.530150727	0.591139984	0.580865729	0.639945887
	1991	0	0.024543469	0.52885201	0.881267856	0.634531027
	1992	0.057247558	0.476351686	0.50748816	0.881357881	0.689919176
	1993	0.419843876	0.355038688	0.661319064	0.470401637	0.814643899
	1994	0.420215114	0.607548435	0.627563223	0.880869499	0.905442256
Reform Period III	1995	0.42906864	0.500133896	0.584588184	0.691791399	0.655201469
	1996	0.406941127	0.507266662	0.648471787	0.843298767	0.718437215
	1997	0.511591504	0.669954482	0.691686298	0.851570417	0.764510947
	1998	0.489746475	0.55283328	0.621337554	0.848724438	0.722189978
	1999	0.50610729	0.62307414	0.620461581	0.880518461	0.674682916
	2000	0.51118134	0.609995821	0.598505207	0.879475219	0.649037884
	2001	0.527557781	0.56836163	0.578777789	0.908766089	0.627049945
	2002	0.512874491	0.600146355	0.618238158	0.878726769	0.682094509
	2003	0.604374341	0.61367981	0.600302098	0.877487667	0.670857583
	2004	0.532929536	0.604119462	0.598632803	0.875739428	0.674864085
Reform Period IV	2005	0.508867198	0.617803079	0.628392934	0.794499115	0.676285926
	2006	0.456412548	0.599426705	0.612036925	0.789430981	0.656587587
	2007	0.453162274	0.599508381	0.612442449	0.794623835	0.653657869
	2008	0.452065076	0.595406746	0.608408594	0.793716542	0.652233336
	2009	0.472253393	0.598215399	0.62219481	0.793792208	0.664378333
	2010	0.659417099	0.592783835	0.614227579	0.795524005	0.656696701
	2011	0.590686525	0.591099404	0.617314859	0.791714928	0.655776674
	2012	0.658855779	0.58720663	0.608202373	0.791358898	0.652133951
	2013	0.68162684	0.591091308	0.608165218	0.788121625	0.649803532
	2014	0.68840904	0.591254602	0.610148466	0.792148907	0.650368226
	2015	0.689471087	0.563650942	0.608068676	0.793229184	0.645553265
	2016	0.694805202	0.594516598	0.610098808	0.803663244	0.651540136
	2017	0.68792178	0.58569722	0.57639296	0.75882415	0.61155957
	2018	0.68410155	0.55946519	0.57686264	0.76017905	0.64117873
	2019	0.65783432	0.58432197	0.60361153	0.76090708	0.61386273
Reform 2020	2020	0.68275876	0.52900516	0.5446331	1.03307909	0.61040098

		Rhineland-Palatinate	Schleswig-Holstein	Saarland	Hamburg	Bremen
Reform Period I	1970	0.942187903	0.960217238	0.982245557	0.98623185	0.984969379
	1971	0.942354972	0.960065328	0.98237555	0.860417432	0.371272958
	1972	0.942505749	0.959976486	0.982540649	0.960538341	0.98513384
	1973	0.942629425	0.959915436	0.982703741	0.977933401	0.985300965
	1974	0.942806447	0.959860623	0.98265753	0.862573833	0.370482406
	1975	0.674350637	0.959779231	0.982755299	0.820993679	0.370498267
	1976	0.943024717	0.959586691	0.982785628	0.854356734	0.370914153
	1977	0.702581165	0.95946573	0.982877447	0.878411623	0.985764667
	1978	0.685900228	0.959394934	0.982999591	0.89780288	0.985847107
	1979	0.943290154	0.959334567	0.983118226	0.780307019	0.985957621
	1980	0.352681629	0.95934618	0.983211167	0.888845193	0.986093584
	1981	0.652285259	0.959265817	0.983297269	0.78656994	0.98618281
	1982	0.661786428	0.959187758	0.983361308	0.828830498	0.986249926
	1983	0.352677171	0.959086564	0.983409878	0.742862086	0.986356926
	1984	0.352606881	0.958945426	0.983374202	0.82240136	0.986533917
	1985	0.661182302	0.958844211	0.983377391	0.815859607	0.986602631
	1986	0.660576719	0.958862607	0.983442311	0.656246197	0.986755639
	1987	0.940303115	0.957368825	0.98268479	0.709106416	0.986164867
	1988	0.940246012	0.957758529	0.982712308	0.743635852	0.986158566
	1989	0.940247173	0.957764756	0.982712374	0.898615955	0.986136335
Reform Period II	1990	0.645163919	0.648610831	0.702067469	0.678375811	0.693272844
	1991	0.940169266	0.958521378	0.982977224	0.727221345	0.986155568
	1992	0.93987914	0.95866912	0.983129228	0.673632329	0.986305336
	1993	0.93973557	0.95875276	0.983223264	0.847616623	0.986523962
	1994	0.939493634	0.725015033	0.978095518	0.515809583	0.986574404
Reform Period III	1995	0.952555192	0.72305678	0.987125135	0.594505274	0.989088531
	1996	0.952548819	0.310914417	0.987159603	0.680491681	0.9891374
	1997	0.952294678	0.817272734	0.98718138	0.733023997	0.989192761
	1998	0.952200402	0.411436622	0.987249832	0.850750128	0.989281603
	1999	0.952111887	0.907125495	0.987312002	0.803470687	0.989361265
	2000	0.952161842	0.908618608	0.987361257	0.759651391	0.989445149
	2001	0.952102314	0.909237457	0.987413517	0.777144406	0.989480864
	2002	0.952078556	0.909733774	0.987457966	0.801714	0.989496414
	2003	0.952027585	0.909433313	0.987492259	0.770154347	0.989470289
	2004	0.951998	0.907606856	0.987535662	0.757460234	0.989472331
Reform Period IV	2005	0.844645598	0.851327668	0.880194406	0.688553954	0.843893625
	2006	0.842513848	0.845667385	0.873711093	0.67757293	0.848233075
	2007	0.841773994	0.845788352	0.877875545	0.661142004	0.848165172
	2008	0.842895807	0.848542553	0.873659022	0.665953429	0.851463025
	2009	0.84287744	0.857124293	0.878968885	0.540690788	0.848654236
	2010	0.845325272	0.850777557	0.876331338	0.546171433	0.867909688
	2011	0.840991332	0.851821004	0.881984313	0.55895041	0.876004938
	2012	0.834767917	0.852479244	0.872803989	0.509893046	0.867759423
	2013	0.840221164	0.856855011	0.883986205	0.793424476	0.876293794
	2014	0.842607774	0.852217972	0.883166789	0.529459746	0.874649417
	2015	0.844022218	0.814532805	0.88370129	0.542145331	0.872316305
	2016	0.849216475	0.858592976	0.889442912	0.794343101	0.881732497
	2017	0.79877302	0.85246647	0.88571303	0.50683343	0.82177314
	2018	0.84096498	0.85020353	0.88368057	0.496894	0.86666293
	2019	0.79540394	0.80926	0.88171261	0.53815619	0.87046683
Reform 2020	2020	1.08375693	1.09754287	1.12639124	0.89780728	0.9155774

		Saxony-Anhalt	Thuringia	Brandenburg	Mecklenburg-West-Pomeraine	Berlin	Saxony
Reform Period III	1995	0.967301555	0.970152923	0.96984548	0.978259759	0.944303103	0.945604756
	1996	0.967618453	0.970401751	0.969822918	0.978416906	0.944508017	0.945974187
	1997	0.967786667	0.970580798	0.97038108	0.978502211	0.944912598	0.94624254
	1998	0.968132841	0.970754165	0.96944612	0.978650831	0.945387233	0.946607115
	1999	0.968459463	0.970765262	0.969278882	0.978652536	0.945809908	0.947010271
	2000	0.968842378	0.97112455	0.969254418	0.97890151	0.946023114	0.947452943
	2001	0.969314808	0.971406164	0.969351199	0.979119293	0.946108727	0.94800515
	2002	0.969788045	0.971685029	0.96952452	0.979344557	0.94611747	0.948566311
	2003	0.970152208	0.971929943	0.969678999	0.9795356	0.946117249	0.948975863
	2004	0.970443075	0.972140375	0.969756286	0.979673686	0.946174733	0.949288891
Reform Period IV	2005	0.869696524	0.883220763	0.874056293	0.884773418	0.853123434	0.85870449
	2006	0.863073287	0.877110423	0.867204384	0.880961615	0.851480318	0.852878231
	2007	0.871903887	0.879698928	0.87515648	0.886229797	0.846824931	0.859344185
	2008	0.869855317	0.877081092	0.867787797	0.887865758	0.849248222	0.856887299
	2009	0.874671213	0.879550721	0.87481849	0.895617833	0.851998572	0.857752171
	2010	0.87457556	0.878217716	0.866573432	0.888463673	0.853801783	0.856206389
	2011	0.874508827	0.879136803	0.865163052	0.887028779	0.847075926	0.855043996
	2012	0.875012584	0.879750632	0.8739826	0.888866414	0.850854627	0.855807371
	2013	0.875506097	0.879022398	0.87119422	0.88892668	0.851557868	0.857011526
	2014	0.875246796	0.877840164	0.869185438	0.887211403	0.851756154	0.857603044
	2015	0.838836724	0.842280219	0.827186443	0.848727521	0.802003148	0.819603743
	2016	0.883831702	0.883486395	0.872951705	0.890785698	0.855662945	0.86280019
	2017	0.82760379	0.87782321	0.86931488	0.86057505	0.84872077	0.81941205
	2018	0.87300481	0.83891345	0.82264648	0.88330027	0.84578014	0.81701697
	2019	0.83665113	0.83906874	0.825914	0.84428887	0.77692639	0.81955777
Reform 2020	2020	1.12285565	1.11946679	1.10610844	1.12422571	1.05580871	1.08473631

Source: Own calculations with 100% inclusion of municipal tax revenues.

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