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Earmarking grants in a federal polity

by

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Abstract

The ongoing transition from layered-cake federalism to marble-cake federalism led to an increasing role of intergovernmental grants in many countries. The field of higher-education is an example. Central governments in federalist countries claim that earmarked resources can better achieve policy goals. This discussion paper evaluates the goal attainments in a billion-worth program for higher education in Germany, the higher-education pact (2007—2020). Two key objectives were concerned with the program: Firstly, to enhance teaching quality, measured by the student-faculty ratio—secondly, the promotion of enrolments in the STEM faculties.

This discussion paper is the first comprehensive assessment of the grant program. We find some notable flaws of centrally-provided grants and shed light on some unwanted effects from central-government intervention. Further, we study two economic issues on intergovernmental grants and find mixed evidence for flypaper behaviour and fungibility activities. Our results indicate little backing for funding higher education by grants-in-aid.

Key-words

higher-education funding, federalism, flypaper, fungibility

1. Introduction

The transition from dual federalism to a cooperative one, which Grodzins (1966) labelled the transition from a layer-cake to marble-cake federalism (for the US case, see, for instance, Weiser (2001)) is a well-documented phenomenon. Most federalist systems blot out their well-defined task-sharing arrangements. Since a task is ideally assigned to a specific tier, centre (federal) and state (sub-central) governments increasingly shared policy implementation responsibilities in practice.

Aside from the US, Germany is a good example of such a transition. More than 15 constitutional amendments have taken place throughout the last twenty years, and the direction of the measures is not always clear. The higher-education policy is a worth-mentioning example for the inconsistency embedded in the German federal system, as vividly outlined by Burkhart et al. (2008) and Kropp and Behnke (2016).[II]

This transition is accompanied by an increasing role of conditional intergovernmental grants. Simultaneously, unconditional grants are headed south in practice. In general, central-governmental grants to states and local entities have slowly grown over the penultimate decade within OECD countries (OECD, 2016, p. 23). In 2010, earmarked and non-earmarked grants were nearly in balance. Ten years later, earmarked grants grew by 5.4 per cent at the expense of non-earmarked ones. Moreover, mandatory grants significantly replace discretionary ones. Focusing on mandatory grants, those being matching grew by roughly ten per cent (OECD, 2016, p. 25). The OECD findings confirm previously reported observations (Baker et al., 1999; Huber et al., 2002; Huber and Runkel, 2006) and are in line with recent ones (López-Santana and Rocco, 2021).

This triumphal march of mandatory and matching grants (henceforth: *conditional grants*) is puzzling since it contradicts the traditional theoretical view on fiscal federalism. However, considerations of political expediency may explain the growing importance of conditional grants: For the centre, providing such grants instead of unconditional ones (or awarding a higher share of total tax revenue) may be more advantageous for several reasons:

1. The centre will forgo tax revenues only temporarily.
2. It is much less expensive for the centre to reach a particular aim by providing allocative grants (what we will demonstrate by a simple model in Ch. 3)
3. The centre can claim political success,
4. Conditional grants enable policy competition, which federal governments use to influence and control states' policy (Benz, 2007).
5. central-government incumbents may use grants-in-aid to enhance their re-election probability by granting financial aid to states in which they have or can gain the most supporters Cox and McCubbins (1986); Johansson (2003); Grossman (1994). In this line, Borck and Owings (2003) argue that the grant distribution to sub-central entities is at least partly determined by lobbying activities of regional governments. In a recent study, Baskaran and da Fonseca (2021) provide evidence for *hometown favouritism*[III] in Germany.

Another reason is what can be called a *collusion of line ministries*. When economists emphasize the welfare-improving impact of unconditional grants, they focus on an overall welfare measure (see Section 3). The primary beneficiary of such unconditional grants within a government is the treasury since s/he receives fungible funds and no co-financing obligation. Any line minister is then forced to negotiate with the treasury on how much funds will be directed to their particular sphere of responsibility. Earmarked grants avoid such discussions. Here, the grants must be used for a specific purpose, and line ministers can turn the tables since now the treasury is under pressure to put up financial resources for the co-financing. Therefore, joint line-minister conferences are interested in proposing conditional grants rather than claiming unconditional financial leeway. The interest of states' line ministers meets the central-government considerations listed above.

The politically relevant question is: are central governments successful in attaining their goals by granting financial resources to the tiers which hold legislative competence? Or are the concerns outlined by economic theory justified that the intertwined responsibilities lead to low target achievements? Is task-sharing a brake shoe or a means for efficient higher education policy-making? To assess these questions, we will contrast the goals and success of a billion-worth program for higher-education funding.

In 2007, the states and the central government agreed on the higher-education pact to enhance capacities in tertiary education. It had a term from 2007 to 2020. All states

received conditional grants in exchange for the enrolment of an increasing number of students. Half of the states were also eligible for unconditional grants. Two key objectives of the program are worth emphasizing. Firstly, to provide financial leeway for an expected higher-education expansion. Secondly, to promote enrolments in the natural sciences (STEM). We present the surrounding institutional background and further details of the program in Section 2. We aim to analyse the extent to which the program's goals were achieved. For a broader understanding of the economic theory of intergovernmental grants, we present a simple analysis of their impact upon state expenditures in Section 3. In this context, two strings in fiscal-federalism literature will be discussed and surveyed: the flypaper effect (a particular response of states to unconditional grants) and fungibility issues (the use of conditional grants distinct from the grantor's wishes).

We will empirically assess these two economic issues: Do we observe the flypaper behaviour of those states who received unconditional grants? Secondly, did the states find a way to make part of the conditional grants fungible? Overall, we will compare the centre's goals with the states' responses to intergovernmental grants.

Our results for both the target achievements and the economic issues, we will present in Section 4. A concluding Section **5** summarizes the results.

2. Institutional background

2.1. Fiscal federalism and federal reforms in Germany

Sixteen states build the federal state. Three of them are city-states (Hamburg, Berlin, and Bremen). Five states joined after reunification and are called the eastern states. We refer to the remaining states as the western territorial states.

Germany's constitution, the Basic Law, holds that as long as a legislative competency has not been assigned to the federal government, the legislative power lies with the states (Article 30). Thus, Germany's federal system was seen as a characteristic example of layer-cake federalism with clear task-sharing between the states and the central government.

Concerning the revenue side of Germany's federal system, the primary feature is the constitutionally mandated sharing of tax revenues. Despite VAT revenues, all significant tax revenues are divided between the federal and state governments. VAT revenues shall be distributed according to financial requirements of the central legislative and the states that

might change over time (Basic Law, Art. 106, 3). Both tiers shall have an equal claim to funds from current revenue to cover their necessary expenditures. This so-called *hinge of fiscal federalism* shall ensure task-sharing since as financial needs change, each tier can finance the expenditures to which it is competent under the Basic Law. The role of the VAT distribution for the functioning of fiscal federalism cannot be overestimated. It ensures the legal capacity of both tiers and is the mechanism that makes most intergovernmental grants obsolete. In recent years, the federal government has avoided negotiations about evolving financial requirements and the resulting adjustments of VAT revenue distribution as constitutionally mandated.

Around twenty years ago, Germany's federal system was repeatedly subject to dissatisfaction and complaints. The federal polity was seen as a leading source of the inability to impose reforms, for instance, due to the latently-existing threat of oppositional veto in the second chamber, the Bundesrat, and due to legislative entanglements, which lead to gridlocks and the 'trap of federalism' Scharpf (1988). Furthermore, policy-making was described by a peculiar zig-zagging Kropp and Behnke (2016). This dissatisfaction leads to a twice-started attempt to revise the federal order (2003 and 2005). The second attempt led to a federal reform, adopted in 2006. It aimed to disentangle the intertwined levels of governments and return to a more layer-cake type of federalism, and towards (or back to) a *separation model* (Hillgruber, 2005). For an overview on policy fields where the states gained legislative power Dose and Reus (2016).

In a joint conference of the chancellor and states' prime ministers (meeting on December 14, 2005), the federal and the states' governments agreed that federalism-reform proposals should include inter alia

1. a clearer distinction of the legislative power of the federal and the states in order to strength legislative effectiveness, and
2. a significant reduction of joint-financing arrangements and an overall revision of federal-grants designs.

Overall, the target of the then-established reform commission II[IV] was to reduce intertwined decision-making, thereby strengthening both the federal government's legislative power and the space for Länders' self-employed policy-making.

However, the last-mentioned oath was broken with the expending possibilities for co-financing arrangements. The possibilities of allocating matching grants instead of adjusting

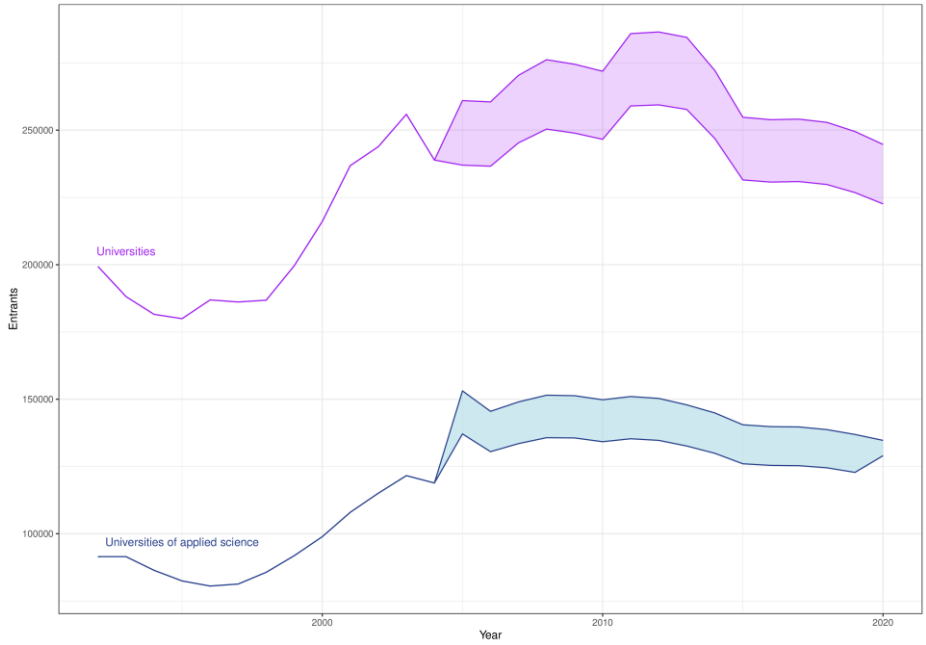
VAT revenues have increased in recent years, particularly in the field of (higher) education. As Kropp and Behnke (2016) pointed out, more entanglements than before the reform was adopted can be observed, and several reforms have reversed disentanglement.

In a more recent paper, (Benz and Sonnicksen, 2018, p. 139) argued similarly by emphasizing that reform outcomes 'appear as one step forward towards a separation of power and decentralization and two steps backwards towards power-sharing and centralization.' Burkhart et al. (2008) vividly showed how attempts to higher-education reform had ultimately run at cross-purposes with the just-mentioned goals of the federal reform commission. Burkhart et al. deal with the *excellence initiative*, a federal-funded and thus co-financed program (agreed on summer 2005) aimed at bolstering universities' quality in specific areas (see also Mergele and Winkelmayer, 2021, for a thorough evaluation). Burkhart et al. concluded that the simultaneity of federal reform and the excellence initiative 'exposes an irony at the heart of German federalism: in the precise moments that major projects of "disentangling" Germany's federalism take place, joint undertakings of federal and the state authorities continue to occur, reinforcing pre-existing patterns of politics' Burkhart et al. (2008).

2.2 The higher-education pact

A few weeks after the consent of the 2006 federal reform, the states and the federal government started their negotiation on the billion-worth higher-education pact, thus contradicting the overall goals of federal reforms. Initially, the states claimed a higher share of VAT revenues to enable their universities to cope with an expected rising number of new entrants. Figure 1 depicts the forecast for both types of universities.[V] High birth rates triggered this expected increase and the existence of two cohorts of high-school students graduating at the same time.[VI] Even an increasing rate of students qualifying for higher education leads to a prospected increase in enrolment.

Figure 1: Entrants forecast by the conference of education ministers, 2004.



Data source: Conference of education ministers

The central government rejected this proposal for more VAT revenues even though it approved the higher financial requirement resulting from the predicted number of first-year students (entrants). Instead, the centre offered an intergovernmental-grant program with conditional grants for additionally enrolled entrants. This strategy of the federal government was in line with the broader attempt to encroach upon Länders' exclusive legislative power in (higher-)education policy Kropp and Behnke (2016).

The centre faced sixteen states with very different starting positions and needs. The western territorial states and the city-states expected a considerable increase in new entrants. The eastern states, on the contrary, were shaken by the emigration of young people to the West (Kemper, 2004) and expected a correspondingly decreasing enrolment rate. In this respect, the western territorial states and the city-states had a great interest in finding an agreement.

A crucial constitutional feature is the unanimity requirement for programs in higher education. According to Art 91b, 1 of Basic Law, the unanimity requirement holds for all federal agreements primarily affecting institutions of higher education except for the construction of research facilities, including large scientific installations Gunlicks (2007).

Operators and scholars have feared suspicious package deals fostered by the veto power embedded in a unanimity demanding setup. These fears have been confirmed. The eastern states successfully negotiated an earmarking-free amount from the total funds to be granted even without additional first-year students. They were eligible to conditional grants in exchange for raising the number of entrants nevertheless.[VII]

The three city-states were only prepared to agree on unconditional grants for the eastern states if they too were to receive unconditional financial aid. The remaining negotiators, the western territorial states and the central government, i.e., those jurisdictions primarily dependent on reaching an agreement, consented. As a result, the western territorial states had to waive 22.5 per cent of the agreed amount per additional entrant (of EUR 11,000) to finance the fixed amounts for the eastern and city-states.[VIII] Therefore, three state groups are worth assessing separately and worth comparing to each other: The western-territorial states and the city-states were those under unprecedented pressure to expand their universities. However, only the city-states were eligible for earmarking-free grants. Finally, the eastern states had the lowest pressure but got unconditional grants.

The program was dubbed the higher-education pact and had four years (2007 - 2010, completing funding by 2013). The term was extended twice to 2020 (financed until 2023) with some amendments. A program's primary feature was a uniform grant for every on-top entrant. The number of entrants in 2005 served as the basis for the *on-top* requirement. One of the amendments the contracting parties made in the program's extension was an increase of the federal grant from EUR 11,000 to EUR 13.000. In addition, the fixed amount for the eastern states was moderately reduced in the second phase (2011 - 2015).

With the second roll-over in 2014, the central government tightened the states' obligations to match their grants. Some states should provide their universities with *additional* financial resources. Some other states were exempted from this obligation. The centre's main problem was that it could not check the "additional"-conditions since only the states knew how they would have financed their universities otherwise. Furthermore, the initial-number line, indicating the number of entrants in 2005, was manipulated for some states so that they could benefit from federal grants-in-aid even if they had not raised the number of entrants compared to 2005.

The key objectives of the German higher-education pact have been:

1. To provide financial envelopes to cope with the expected rising number of entrants without deteriorating the teaching quality. The achievement of this goal can be measured by the advising relationship (student-faculty ratio), and
2. the promotion of enrolments in the STEM (science, technology, engineering, and mathematics) faculties.[IX]

Between the start of the higher-education pact in 2007 and a decade later, more than one million prospective students were able to enrol in higher education, still measured in terms of on-top entrants. In this period, a total of roughly 18 billion Euros flowed to the states' universities.

A new treaty (called the future treaty, *Zukunftsvertrag*) with fundamentally different rules replaced the higher-education pact in 2020 and is now permanent (open-ended).

3. A simple model of intergovernmental grants to higher education

This chapter briefly describes the economic effects of intergovernmental grants to higher education. This chapter be skipped by readers familiar with the economic theory of intergovernmental grants. We will expand existing models (e.g., Dahlby, 2011) to the relevant case where both types of grants, conditional and unconditional ones, are simultaneously issued. This is done in light of the related program design outlined in the previous chapter.

Let us consider a central government as the grantor and as the recipient a state. The latter consists of one representative individual. Its preferences determine the state's social welfare and are represented by a Cobb-Douglas utility function, $u(\cdot)$, with the constant-return-to-scale property. The state's government can provide two private goods, x and q. q denotes the number of university places. x indicates a publicly provided composite good. For simplicity, we set x as a numéraire good. With α, we denote the partial elasticity of the marginal utility from x, and with $\beta=1-\alpha$, the partial elasticity of the marginal utility from q.

As the representative individual knows that she or he gains from universities, science, and better-educated people, he or she has preferences over the provision of university places even if she or he does not attend higher education.[X] Thus, both x and q are

"consumed" by all individuals. We neglect any form of redistribution to eliminate the effects of social welfare optimization. Both *x* and *q* are financed by an exogenously given tax revenue T which is raised without any allocative distortion (like a lump-sum tax). This feature allows neglecting *price-effects* from grants (Dahlby, 2011). The public budget constraint for any government providing the goods *x* and *q* depends on their prices.

The centre can provide two kinds of grants. Firstly, it supports the states with unconditional grants, *g*. Secondly, the state receives conditional grants. By the latter, promoting *q* should be achieved by offering a (fixed) amount for each additional study place, i. e., for each study place above the number of places that already existed when the program was launched q_0 . Designing a program in such a way is a common feature in practice as it corresponds to the centre's goal to minimize windfall gains. The grants-in-aid are denoted by τ, where τ' is constant (the same grant amount for each additional study place).

The response of a state to intergovernmental grants can be assessed in terms of the Lagrangian:

$$L = x^{\alpha} q^{\beta} + \lambda[T + g + \tau'(q - q_0) - p_x x - p_q q] \qquad (1)$$

Inserting the first-order condition

$$\alpha\, q^{(1-\alpha)} / x^{(1-\alpha)} = \frac{\beta\, x^{\alpha}}{q^{\alpha}\,(p_q - \tau')} \qquad (2)$$

into the budget constraint yields after some straightforward rearrangements the optimal supply of higher-education places:

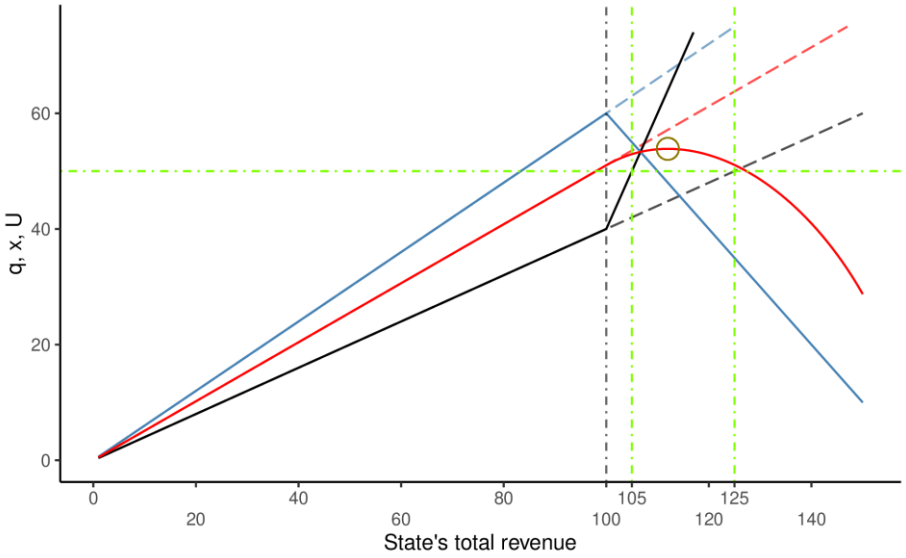
$$q* = \frac{\beta\, T}{p_q}\,(1 + g/T - \beta\, \tau' / p_q) - \qquad (3)$$

Eq. (3) is a general expression for describing the optimal level of the targeted good, *q*. It can readily be seen that providing either unconditional grants or conditional grants only are special cases. For instance, let the grants be entirely unconditional, then $q_u = \beta T(1 - +g)/p_q$. Deviations from the latter expressions are coined flypaper effects (see below). However, it is worth noting that unconditional grants have a higher impact on q* when conditional grants are granted for the same time. This leverage effect results from the fact that conditional grants reduce the effective price of the targeted good.

3.1 States' trade-off: increasing revenues vs. welfare deterioration

Intergovernmental grants from the central government raise the financial endowment of the state's government. This gain in resources is concerned with a *stimulation effect*: State's government is put in a position to provide more units of both goods without raising its own taxes. The overall stimulation effect, however, can be separated into an *income effect* and a *substitution effect*, respectively (Slutsky identity). The substitution effect occurs when a state alters its pre-grant allocation of resources according to the change in the price ratio. This substitution effect is concerned with a welfare loss. To provide an intuition, consider a conditional and matching grant in favour of good *q*. In order to provide more *q*-units, the state has to redirect financial resources from *x*-provision. Therefore, a diminishing provision of *x* pays the increasing supply of *q* (partially welfare-enhancing). The reduced provision of *x* yields a welfare-level reduction. In Figure 2 we depict the trade-off faced by the grants-receiving states. For the sake of simplicity, we neglect the leverage effect in our illustration (either conditional or conditional grants are considered).

Figure 2: Representation of the model.



The black line represents the Engel function for study places (*q*) and the blue line the Engel function for the composite good, *x*. We set a state's pre-grant revenue to *T*=100. Up to this point, the slopes of the Engel functions depend on preferences and price levels. The

dotted blue and black lines to the right of point *T* indicate the Engel function if grants are provided unconditionally.

When grants are given on a conditional basis, the slope of the Engel curves (for *T*>100) depends on the design of the grant programme rather than on preferences, i.e., the slope depends on how much more of a subsidized good a state has to provide to increase total revenue by landing a grant unit. Fungibility describes an empirically observed deviation from these Engel curves. In other words: the actual Engel curves do not exclusively depend on the programme design but on the ability of the receiving incumbents to shift earmarked grants to not-intended purposes.

Finally, the red lines indicate the utility level. The dashed red line indicates the utility level in the case of unconditional grants. The solid red line represents the utility level in the case of conditional grants. At its maximum level, indicated by the golden-coloured circle, we find the total revenue corresponding to the optimum level of *q*. The welfare loss is given by the vertical space between the two utility lines. Figure 2 also indicates why a grantor resorts to conditional grants despite its distorting effect: the centre needs significantly fewer financial resources to achieve a certain level of *q* compared to the resources required when unconditional grants are given. For instance, let us assume that the desired amount of *q* is 50. In the case of unconditional grants, the necessary financial resources correspond to the distance between the right vertical green-dotted line and *T* and the *saved* resources of the centre by providing conditional grants rather than unconditional ones correspond to the distance between the two green-dotted vertical lines.

3.2 Flypaper effect and fungible resources

Two other strings in literature are worth mentioning: The flypaper effect and grant fungibility. The flypaper effect results if an unconditional grant unit leads to higher local public spending than if the same amount is received from regional tax revenues. A plethora of studies has investigated the actual effect on the spending behaviour of state and local governments as a reaction to various types of grants. They give reason to believe that local governments respond differently to not-earmarked revenues. This result is dubbed a flypaper effect since a grantor's contribution *sticks where it hits* and is seen as 'anomaly' (Hines and Thaler, 1995). An equally considerable number of studies question the existence of the flypaper effect. Some papers find a statistical artefact (like Becker, 1996) or regard

the flypaper effect found in several empirical works as a consequence of inappropriate statistical models Megdal (1987). Thus, the empirical evidence is ambiguous, at least. Other research rejects the anomaly view. Roemer and Silvestre (2002) argue that most papers assessing the flypaper effect impose a single-consumer assumption. The non-equivalence between in-kind subsidies and income can be explained quite well by dropping it and using social-choice models instead.

The second string in literature assesses how recipients use conditional grants. This literature deals with *fungibility*. It describes the shifting of earmarked grants to other purposes. As an example, grants targeted to, say, investment in schools are used to enhance roads.

The first to show that this assumption is tenuous was McGuire (1978). Zampelli (1986) outlined four main strategies of a grants-receiving state to explain the fungibility of conditional grants: The state can reduce its regular funding of the targeted output, use a program or project which was going to be undertaken anyway, redefine budget categories, and finally re-allocate overhead costs.

In light of flypaper and fungibility effects, several efforts were made in research to design an optimal grant-program (e.g., Huber and Runkel, 2006; Breuillé and Gary-Bobo, 2007). This literature attempts to develop program designs that allow the central government to approach its goals best. The practical relevance must be questioned. Central governments in federalist systems have only limited power in designing financial programs. Often, even unanimity is required (e.g., for imposing some of the EU programs). We presented and discussed the unanimity requirement in Germany's constitution in Subsection **2.2**.

Such constraints are essential for assessing grant programs in practice and explaining why (aside from information asymmetries) it is often not feasible to provide optimal grants in a sense mentioned above. It is, therefore, all the more necessary to assess the actual effects of grants-in-aid. Similarly, Brooks and Phillips (2008) emphasized the role of the surrounding institutional setting in explaining states' responses to grants.

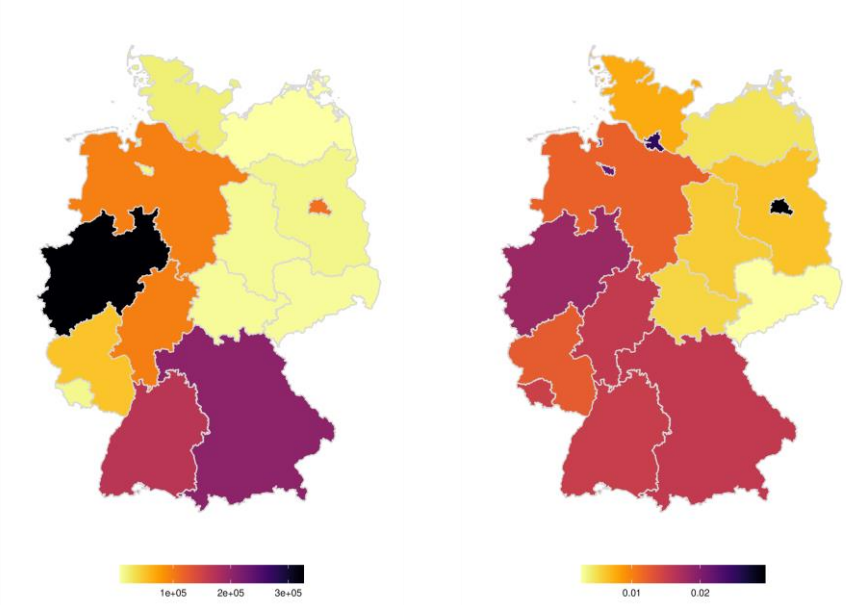
4. An empirical evaluation of the German higher-education pact

4.1 Data set

We took data from the federal statistical office and the joint conference of the ministers of finance and the ministers of science. The latter provides data on the financial transfers from the central government to states' governments; the first-mentioned source provides information on study places, the number of instructors, etc.

Further, we used prospect data by the conference of the ministers of science and education. Since demographic developments and other dependent variables might differ between the three state groups for reasons unrelated to the higher-education pact, we use their prospect data from the program's starting time to compare the prospected developments, which consider demographic trends, with the actual data.

Figure 3: Total additional entrants and total additional entrants per capita 2007 - 2017



4.2 Regional differences in university expansion

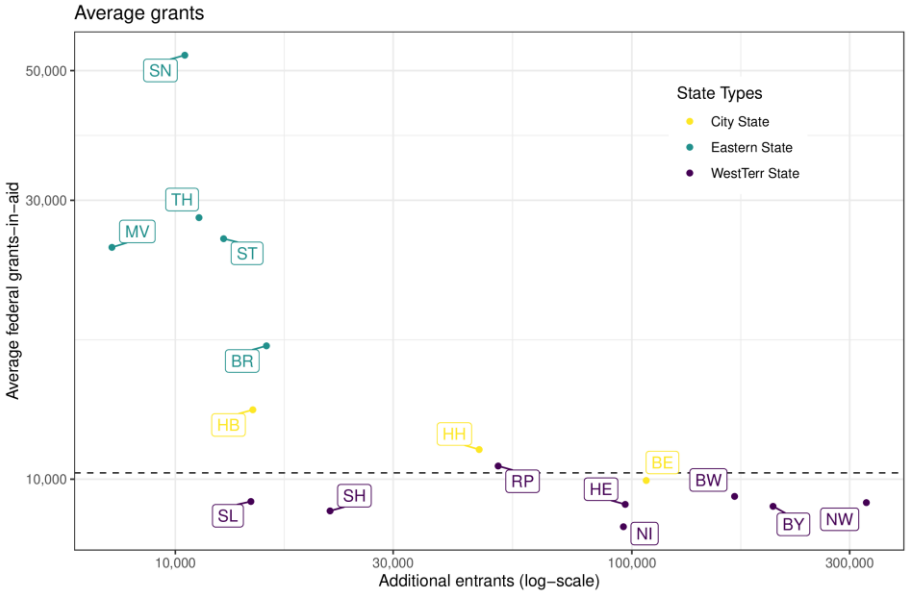
Between 2007 and 2017, a vast expansion in the higher-education system took place throughout the decade. Figure **3** shows that this expansion took place mainly in the western and city-states. The left-hand map depicts the additional entrants, and the right-

hand map sets the additional entrants relative to the states' number of inhabitants, hence additional entrants per capita.

4.3 The distribution of the grants-in-aid

Due to the unconditional grants received by half of the states, we find a remarkably skewed distribution of central-government funds. Figure 4 depicts the distribution and the average grant supplied across the states. The vertical dashed line indicates the average grant per additional entrant. As can be seen, almost all western-territorial states received a below-average grant per on-top entrant. The picture is different concerning the eastern states. They received a much higher average federal grant than all other states. The state Saxony (SN), for instance, got an average amount that was six times larger than that received by Bavaria (BY). This difference is remarkable, as Bavaria invested hugely in universities, whereas the expansion in Saxony took place almost solely in universities of applied sciences, as we will see later. Overall, the Figure indicates a negative correlation between expanding the universities and the grants received.

Figure 4: Average federal grants-in-aid versus additional entrants 2007 - 2017



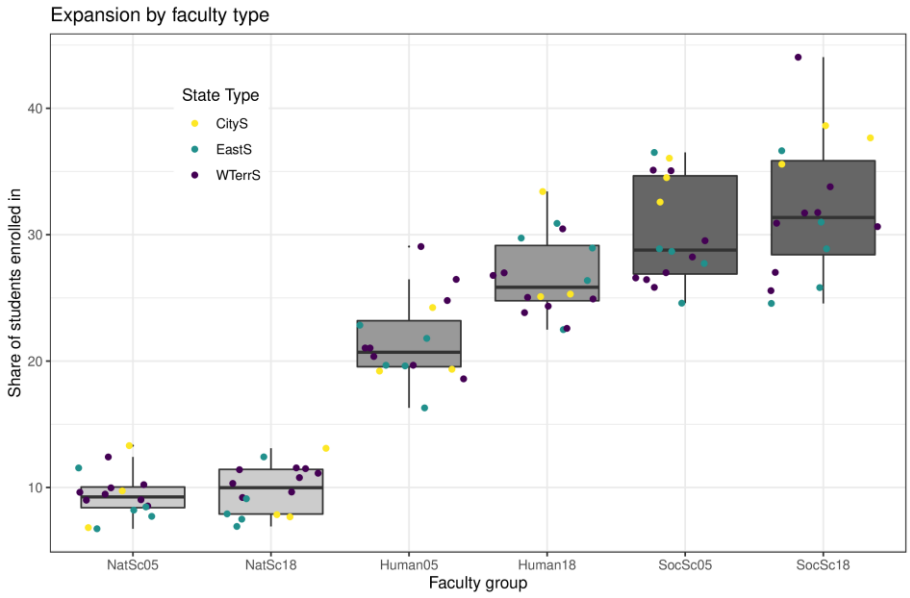
4.4 Higher education expansion by faculty groups.

Do the funds enhance enrolments in the STEM faculties? Since increasing the number of students enrolled in the STEM faculties has been a vital objective of the higher-education pact (see Subsection **2.2** and Fn. on page 26), we will focus on the development in the respective faculties. It should be noted that the treaty imposed no particular incentive in supporting it.

In order to evaluate which departments have enrolled additional entrants, we calculated the relative adjustment in three faculty groups: natural sciences (mathematics, physics, biology, and chemistry), humanities, and social sciences (law studies, economics, sociology, and political sciences).

We compared each faculty group on two dates, 2005 and 2018. Figure 5 depicts the result. The box plots indicate the overall distribution; the points show the respective values of the states.

Figure 5: Share of entrants being enrolled in three faculty groups



As can be seen, the states failed to make natural sciences / STEM more attractive. The share of students enrolled in natural sciences remained at a low level. In contrast, the most remarkable expansion occurred in the humanities, a development primarily pronounced in the eastern states. We found a significantly larger expansion in the eastern parts [XI] than in

the west. We depict this with the two middlebox plots and the upward movement of the green dots.

In this respect, not only was the goal to promote natural sciences missed but also a remarkable expansion in the (cheapest) faculty group of all, the humanities, was ignited. Additionally, those states with the highest federal funding (measured in relative terms) recorded a tremendous humanities expansion.

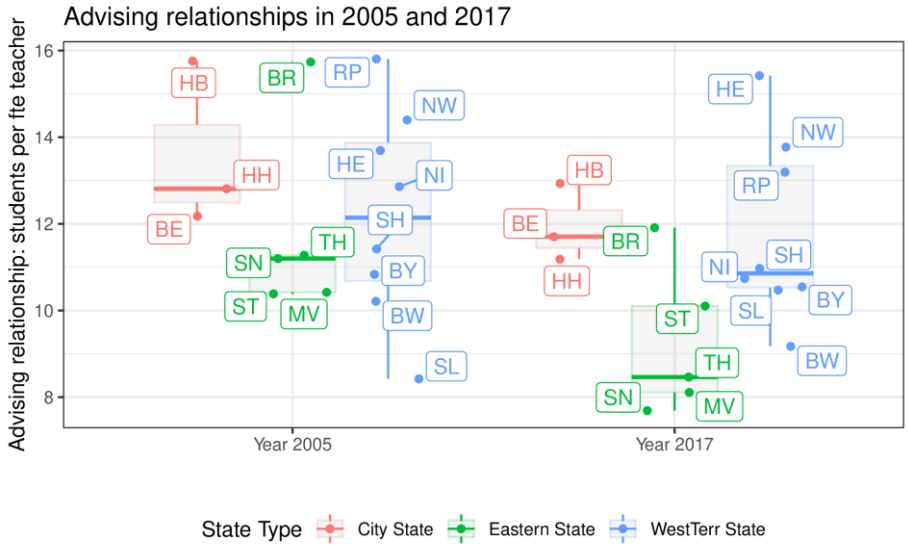
4.5 Student-staff ratio (advising relationship)

As noted in Subsection **2.2**, the second primary objective of the higher-education pact was to improve the student-faculty-ratio[XII] (advising relationship).

Since the pact funded the western territorial states below average and the eastern states above average, we may expect more funds to improve the advising relationships in the better-funded regions, i.e., in the eastern states.

We compare the advising relationships between 2005 and 2017. The results, sorted by state groups, are depicted in Figure 6. The left boxplot group indicates the advising relationships in 2005, the right group the 2017 values. In this period, almost all states enhanced their relationships. Two out of sixteen states (HE, SL) downgraded their values.

Figure 6: Advising relationships 2005 and 2017

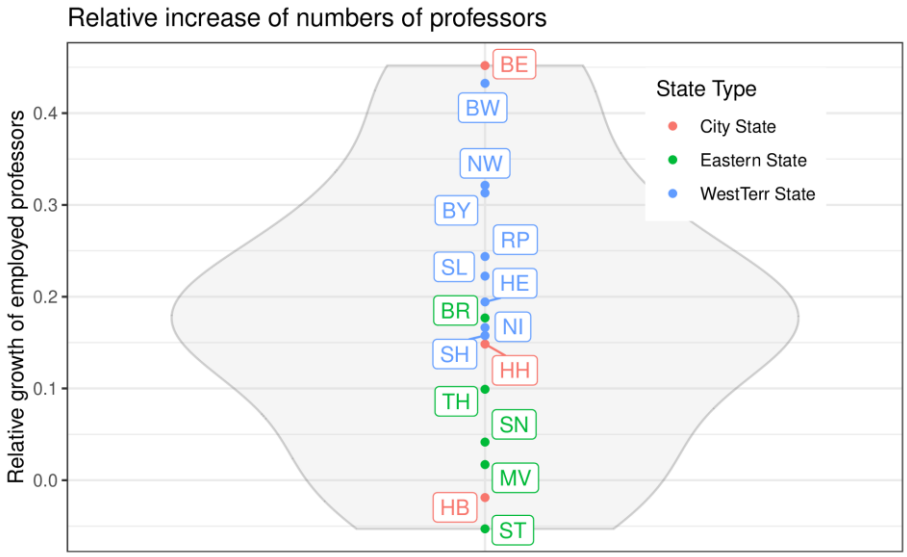


Overall, the median value for the advising relationship decreased (thus, became better). Though, the improvement was more pronounced in the eastern part.

Next, we will investigate whether the grants triggered the enhancements of the advising relationships. As a proxy for the states' financial effort, we will evaluate the increase in the number of instructors in a professorship position (henceforth: professors) during the same period. In particular, we wish to know whether improving the supervision ratio in the eastern parts coincides with a corresponding increase in the number of professors.

On average, the number of professors increased by 25 per cent. The violin plot[XIII] shows the respective values in Figure 7.

Figure 7: Number of professors between 2005 and 2017



Contrary to the expectations, the states with the most considerable improvements in the advising relationship were not the states which filled most teaching positions. The green-labelled values depict this result.

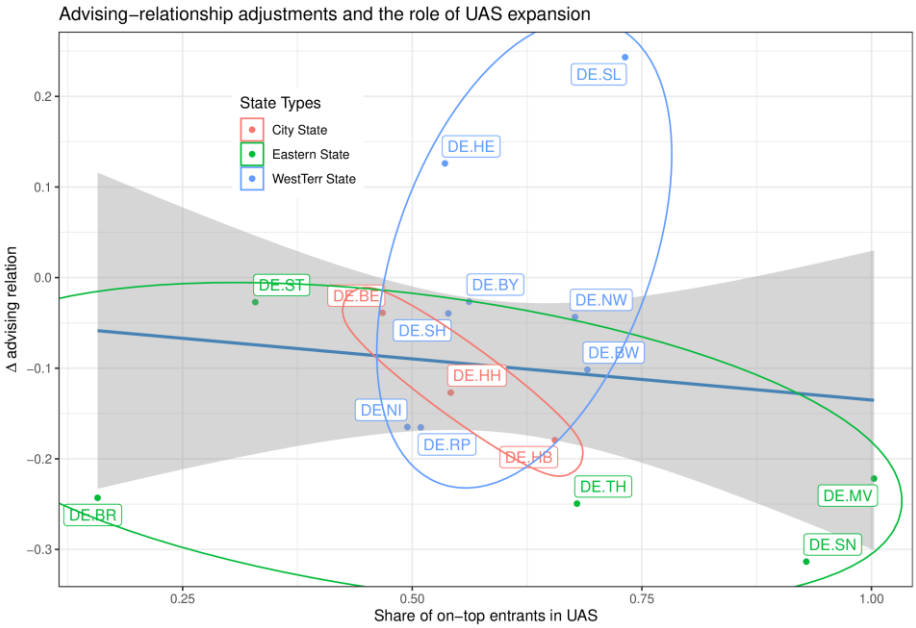
With the exemptions of the eastern state Saxony-Anhalt (ST),[XIV] all other territorial states increased their number of professors. As Figure 7 indicates, the overwhelming portion of this increase took place in the western part. Within the city-states, we find a mixed picture.

Summing up, an overall objective of the pact, the improvement of the student-faculty ratio, has been achieved. We find tremendous success in the better-funded eastern part by comparing the different state groups. However, we find the somehow puzzling result that

higher states' funding has not accompanied this improvement. Therefore, we will assess which factors affected the advising-relationship improvements in deeper detail.

In a simple regression analysis, we control for the enrolment share (the portion of a cohort entering a study), the federal funds per capita, and other variables. The regression results are presented in the Appendix (Table **1**). The variable "UAS share" has the highest explanatory value for improving advising relationships. It indicates the proportion of expansion at (the less expansive) universities of applied science. A similar effect on the advising relationship is due to an increase in humanities students (at a lower significance level). We thus conclude that a cost-saving expansion caused the enhanced advising relationship. We do not find an example where an improvement in the advising relationship coincides with an expansion in the natural sciences. We find only one example where an over-proportional expansion in traditional universities went hand in hand with an improved advising relationship (we will present this example further below). Figure 8 depicts the relationship between the student-staff ratio and the expansion in UAS. As can be seen, the overall effect is mainly driven by the eastern states.

Figure 8: Advising-relationship adjustments 2005 to 2017 and UAS expansion



The observed enhancement in the advising relationship is, thus, closely related to an expansion in the less costly UAS. Since conditional grants have to spend for what they are

earmarked for, several states used the grants for an unprecedented expansion of the less costly UAS field. The states comply with the grant-program requirements but find a way to fulfil these with minimum effort. Such behaviour was dubbed *price-shifting fungibility* (Barbaro, 2022). It describes the effect of granting-receiving states minimising conditional grants' distorting impact by lowering the prices or quality of the targeted good.

Although this might be a sad story from the grantor's point of view, it is concerned with positive economic welfare effects. Since conditional grants harm states' welfare due to an altering price ratio, states create financial leeway to promote goods and services other than the targeted interest by reducing the expenditure for the subsidised good. By doing so, they can partly compensate for the welfare loss caused by conditional grants.

Next, we argue that the observed expansion in the UAS has taken place precisely because of the grant program (and would not have occurred without the federal grants). We underline our argument by demonstrating that the actual development in the UAS sector differs remarkably from the educational ministers' prospect. Conversely, actual development and prospected one in the sector of the traditional universities mostly coincide.

Figure 9: Student prospect versus actual data 2005 - 2018

We found clear indications that this unequal development has occurred precisely because of the grant program (and would not have occurred without the federal grants). As shown in Section **2.2**, the states in 2005 developed a student prognosis (prospect) as the basis for the treaty. According to this student prospect, the number of UAS-students should remain constant between 2005 and 2015, only to fall slightly after that. In contrast to the university of applied sciences, the federal government and the states expected an overly large increase in the traditional university sector, particularly between 2010 and 2015. Figure 9 depicts the deviation from the prospect. The lines indicate the extent to which the actual data deviate from the forecasted ones. In 2017, the number of entrants in traditional universities exceeds the prospected number by 16%. The same number in universities of applied science was 56%.

Summing up, the observed enhancement in the advising relationship occurred mainly by a fungibility phenomenon rather than by switching resources from other areas to higher education (see also Barbaro, 2022).

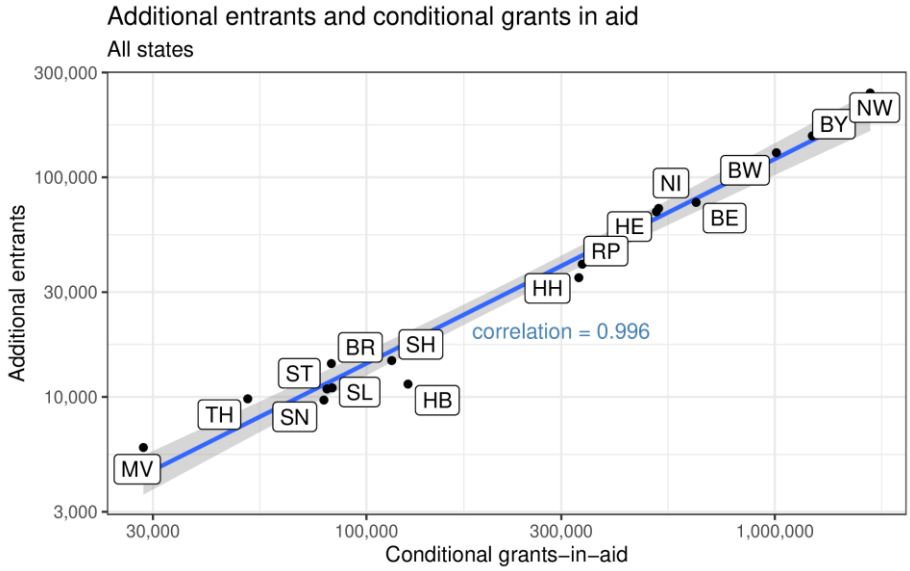
4.6 Comparing eastern and city states: the flypaper effect

We noted in Subsection **2.2** that all states received conditional grants, but the city-states and the eastern states also received unconditional grants. A genuine question is how city-states and eastern states used these unconditional grants. In particular, we wish to know whether they responded uniformly on unconditional grants or differently.

Standard economic theory predicts that the states' responses to unconditional grants are such that an additional grant unit leads to a proportional increase in the states' provision.

Hence, before focusing on the isolated effect from unconditional grants, we demonstrate a strong relationship between conditional grants and additional entrants. We depict this in Figure 10. We find a correlation coefficient between received conditional grants and additional entrants close to one. The grey area indicates the confidence interval.

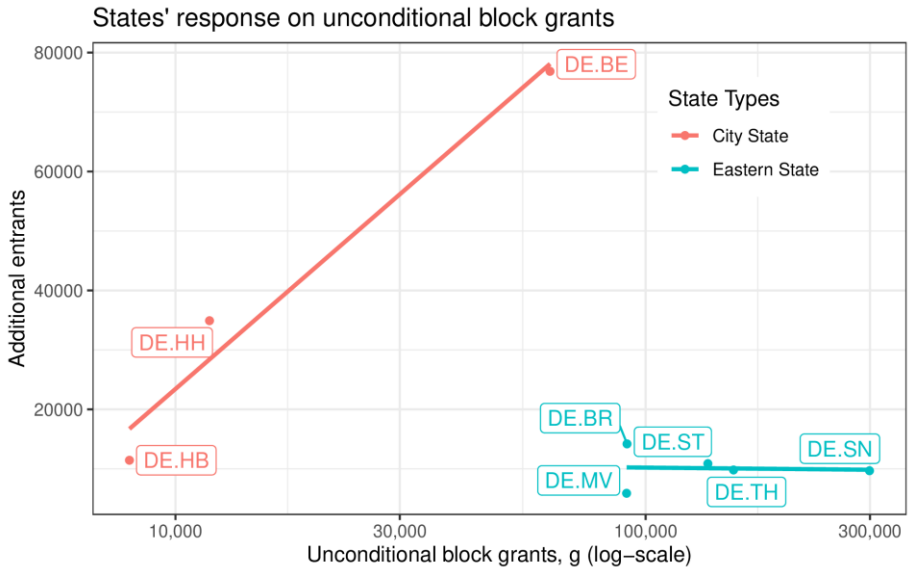
Figure 10: The effect of conditional grants on additional entrants



In a second step, we focus on how unconditional grants affect the number of entrants. We, therefore, separate those eight states which received unconditional grants.

The overall effect is ambiguous in sign. Considering both the city-states and the eastern states separately, we find remarkable differences between both groups. We calculate the regression lines representing the relationship between on-top entrants and the sum of unconditional grants received. We also control for the effect which arises from conditional grants. Figure 11 depicts the regression lines.

Figure 11: Responses to unconditional grants



We see for the city-states that a higher unconditional grant is accompanied by a higher expansion in the higher-educational section. In contrast, we cannot observe this in the eastern states. We find no positive correlation between unconditional grants and on-top entrants there. The partial regression coefficient is negative, although not significantly different from zero.

What can explain these differences? An answer is the framing surrounding the unconditional grants received. Our explanation builds on a valuable but fall-into-oblivion contribution by Brennan and Pincus (1990). They vividly emphasise that grants may have an implicit contingent aspect.

As outlined in Subsection **2.2**, the eastern states were granted grants without any specific expansion objectives. Moreover, the subsidies were justified by not reducing the number of university study places in the eastern part. Even though the unconditional grants for the city-states were justified similarly, the starting position was quite different. The city-states have been and are still particular hotspots of higher-education development. Two numbers may illustrate the differences. In 2007, from all the city-state students, 86 per cent came from the states where a significant increase in first-year students has prospected. The exact number in the eastern states was 28 per cent only. It was clear that the federal grants for the city-states were assigned to support their higher-education expansion. In this sense, the local parliaments in the city-states discussed the appropriate use of funds, and

the universities in the city-states claimed the grants for themselves. Thus, the city-states invested the vast majority of total funds in their higher-education institutions, whereas the eastern states used the grants for other purposes. Since both state groups received unconditional grants with the same de-jure disposability, the de-facto disposability was quite different. This evidence supports the hypothesis that de-facto disposability should be considered when explaining receipt's behaviour towards grants.

Recalling the starting point of the pact negotiation, the western territorial states and the city-states had the main interest in agreeing on grants due to the demographic conditions. Summing up, the city-states treated unconditional grants like conditional matching grants and responded closer to the western territorial states. Conversely, the eastern states gained financial envelopes by receiving unconditional grants. The eastern states, tortured by emigration, had little interest to agree on an intergovernmental-grant program. The latter was the reason for taking advantage of their veto power that led to unconditional grants. Therefore, the different responses in the eastern part on federal funds can be explained by different pressure to expand higher-education institutions. These differences in political pressure may explain why enrolment in the eastern states was primarily limited to the UAS sector.

5. Conclusion

All available evidence suggests that grants are becoming increasingly important. This international development brings into question issues such as: Which governmental tier should bear responsibility for higher-education funding? Should the task be unequivocally assigned to one tier, or is a joint financing superior?

Intergovernmental grants in federal systems, and conditional ones, in particular, tend to harm welfare. We showed theoretically and empirically the states' responses to federal funds. Without considering informational asymmetries, we identified some undesirable effects using a financially extensive program of intergovernmental grants, the German higher-education pact. We found such undesirable effects from the grantor's perspective in both unconditioned and conditioned grants-in-aid.

The reaction to unconditional grants can be better explained if the surrounding framing is taken into account rather than the legal form of the grant alone. We presented empirical evidence in this paper, likely to support this point of view. Concerning the widely-discussed flypaper effect, we made a point of paying attention to the distinction between de-jure and de-facto power of disposal.

We found significant enhancements in the student-faculty ratio, thus achieving a critical goal. This enhancement was mainly due to states' fungibility strategy rather than the intended re-allocation of resources from other purposes. However, states' fungibility strategy helps reduce welfare losses caused by conditional grants-in-aid.

We conclude that the degree of accuracy of conditional grants hinges on the recipients' abilities to varying the subsidised good(s) concerning both price level and quality.

In the light of our research, we cannot scientifically support the tendency to blot out the well-defined task-sharing in federal systems. It seems that research on federal systems, in particular the yardstick-competition approach, does not play a significant role in the public debate. This conclusion must be reached by considering the often-imposed demands for uniform regulations in federal systems as a basis. This paper sheds light on the downside of federal grants-in-aid and attempts to provide a worthwhile contribution to the ongoing discussion about the future of federal systems.

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[II] We will present some institutional background of Germany's federal system and higher-education funding in Section 2.

[III] Hometown favouritism describes that municipalities that are the residence of a minister exhibit increasing government employment.

[IV] The first federal-reform commission was set up in 2003 but was unsuccessful in 2004 due to disagreements, particularly over educational issues. (see Gunlicks, 2007; Moore et al., 2008).

[V] Germany has two types of universities. *Traditional* universities, on the one hand, where half of professors' working time (and a vast share of total resources) are assigned to research activities. On the other hand, there are the so-called universities of applied science (UAS), where professors should more or less focus on advising and teaching students instead of investing resources in research. The teaching load at UAS is often twice as high as that at traditional universities.

[VI] See the preamble of the higher-education treaty dated August 20, 2007.

[VII] See Art. 1, §3 of the treaty on the higher-education pact.

[VIII] The eastern states received fifteen per cent of the total federal fund, Berlin four per cent, and the remaining 3.5 per cent went to Hamburg and Bremen.

[IX] See p. 17 of the STEM action plan by the federal ministry of science. 'The main focus lies on the increase of enrollments in the STEM faculties.' (*own translation*).

[X] The support for public education funding mainly depends on the generational composition (intergovernmental conflict hypothesis), see, e.g., Brunner and Johnson (2016); Saastamoinen and Kortelainen (2020). However, by comparing different countries Busemeyer et al. (2020), no clear pattern emerges.

[XI] By using an ANOVA and at a 95 per cent level.
[XII] The student-staff ratio is calculated in the official statistics as the number of students per full-time equivalent teacher. Thus, a lower ratio indicates an improvement. Note that we use student-staff ratio, student-faculty ratio, advising relationship, or even supervisory relationship synonymously.
[XIII] The violin plot combines the box plot and density trace in one plot.
[XIV] The state Saxony-Anhalt (ST) even reduced the number of professors during the observation period, although this state had received above-average grants of EUR 25,000 for only roughly 12,800 additional entrants.

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- a joint setting with both kinds of grants-in-aid, unconditional block grants are leveraged by conditional ones.

Appendix A: Regression results

Table 1: Regression result for the advising relationship 2018

	Dependent variable:	
	Advising relationship 2018	Advising relationship 2018
Additional entrants	0.00001	
	(0.00001)	
UAS share	−7.412	−5.769
	(2.929)	(2.161)
Enrolment share	0.082	
	(0.131)	
Expansion in Humanities	−7.765	−6.278
	(3.648)	(2.684)
Rel. growth of professors employed	−6.522 (5.254)	
Fed. funds per capita	−0.009	
	(0.028)	
Constant	14.677	16.069
	(2.785)	(1.618)
Observations	16	16
R	0.597	0.452
Adjusted R	0.328	0.368
Residual Std. Error	1.740 (df = 9)	1.688 (df = 13)
F Statistic	2.218 (df = 6; 9)	5.362 (df = 2;13)
Note:	p<0.1; p<0.05; p<0.01	p<0.1; p<0.05; p<0.01

Since there are only few degrees of freedom and issues of multicollinearity might arise, we run a second regression with two dependent variables only, the UAS share and the expansion in humanities. We still find significant effects for both, as shown in the right column.