Building Capacity in the Public Administration: Evidence from German Reunification

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Abstract

An effective public administration is essential for state capacity and economic prosperity. We provide the first causal evidence on the short and long-term impact of secondments, a key instrument for building administrative capacity. Our context is the large-scale capacity building in the East German tax administration after reunification, which was designed and implemented in a highly decentralized way. We exploit this unique institutional feature for identification, drawing on a major, novel data collection. Secondments significantly increased short-term output quantity with returns on investment of 1.5–3.1 and had persistent positive effects on long-term output quality. Effect heterogeneity suggests successful transfer of tacit knowledge as the main mechanism behind successful capacity building. Exploiting the richness of our data, we uncover three key design features of effective capacity building: support from offices with strong administrative traditions, intermediate secondment durations, and both task-specific and broad measures.

JEL codes: D73, H83.

Keywords: Administrative capacity, public administration, capacity-building, secondments, tax administration, knowledge transfer, German reunification.

1 Introduction

An effective state is key for economic prosperity (Besley and Persson, 2009). State effectiveness, in turn, relies on the capacity of the public administration, the engine behind successful policy implementation. Administrative capacity varies widely, both across and within countries.[1] Addressing disparities in administrative capacity can spur economic activity, increase welfare, and improve citizens' perception of the state, so there are many attempts to transfer capacity between administrative units. One of the main means of capacity transfer is to second officials from high-capacity units to low-capacity units of the public administration.[2] Yet, causal evidence on capacity building is scarce: we understand neither the effectiveness of such initiatives nor the determinants of their success.

This paper studies capacity building, exploiting the East German tax administration after reunification as our empirical setting. We pursue three goals: first, to provide causal evidence on the effectiveness of secondments for capacity building in the public administration; second, to shed light on the mechanisms behind successful capacity building; and finally, to offer insights into the design of future capacity-building initiatives. We overcome key challenges that have prevented empirical work to date: the lack of plausibly exogenous variation in capacity-building efforts and of sufficiently granular measures of both capacity building and administrative performance.

The establishment of the East German tax administration after reunification has three features that make it ideally suited to study the causal effect of secondments. First, capacity building took place on a large scale. As the former German Democratic Republic was a socialist state, there was virtually no tax administration. In contrast, in a market economy, the tax administration is a crucial part of the public administration, as taxes are the main source of government funding. With reunification, 113 new tax offices were set-up in the five new East German federal states. We use these tax offices as units of our empirical analysis. The tax offices were staffed mainly with employees from the finance departments of the former East German public administration. Capacity building had to qualify these employees for their roles in the tax administration and to establish the

[1]To give a few examples, the time that it takes to obtain a value added tax refund differs significantly even between comparable countries, ranging from five weeks in Germany and seven weeks in the United Kingdom to 63 weeks in Italy, according to the World Bank's Doing Business Indicators. Significant variation also exists within countries, for instance in the time that it takes to assess a personal income tax declaration or the audit cycle for companies with similar observable characteristics (information based on our data, see section 4, and Rechnungshof Baden-Württemberg, 2008).

[2]To give a few examples, the European Union uses the Twinning instrument for capacity building in the public administration as part of the European Neighbourhood Policy. Resident Twinning Advisors are seconded to the partner institutions (European Commission, 2017). France sends officials on secondment as technical experts to improve the financial governance in countries receiving French development assistance (Chauvet et al., 2019; Raffinot et al., 2019). The Norwegian Tax Administration and the Revenue Authorities of Mozambique, Tanzania, and Zambia maintain a partnership for capacity building that comprises secondments of Norwegian tax officials as advisors (Fjeldstad and Heggstad, 2012; Norwegian Agency for Development Cooperation, 2020).

organizational framework for well-functioning tax offices.

Second, there was no federal plan for capacity building. Instead, capacity building was implemented through partnerships between the West and the East German federal states, as the public administration is a state responsibility in Germany for historical reasons. Each East German federal state was assigned one or more West German partner states mainly based on geographical and political proximity. Importantly, within partner states, each East German tax office was assigned one or more West German partner tax offices. The West German partner tax office(s) had the primary responsibility for the capacity-building measures.

Third, the West German federal states adhered to the principle of voluntary participation of their staff in the capacity-building measures. To encourage their officials to participate, the West German states provided tax-free financial incentives. From the perspective of a West German tax official, the attractiveness of a secondment varied with the local real value of those financial incentives at home as well as with the distance to the East German tax office. The scale of the capacity-building measures therefore depended not only on the needs of the East German tax office, but also on their West German partner. The West German variation allows us to identify the causal effects of the capacity building on East German tax office performance.

The unique features of our institutional setting help us to address the key econometric challenge associated with our research question, the possible endogeneity of capacity-building measures. Weaker administrations may have demanded more support and therefore have received more secondments. This biases the estimated coefficients towards zero. We identify causal effects using an instrumental variable approach. The instruments exploit variation in the benefits and costs of being seconded across West German partner tax offices, captured by differences in the local real value of financial incentives and differences in the distance between West German and East German tax offices. As an additional instrument, we use the relative size of partner offices, which affects the potential supply of West German tax officials.

One may be concerned that East German tax offices were systematically matched to the most suitable West German partner offices, a process that would call into question our identification strategy. We show that this is highly unlikely based on quantitative evidence on partner (dis)similarity and given the rapid pace of events during reunification. Another potential confound is pre-existing differences in attitudes towards the public administration that may affect our results. In placebo checks, we show that our instruments are uncorrelated with differences in attitudes as reflected in the number of complaints and requests directed toward the administration of the former GDR.

Our analysis is grounded in a major, novel data collection. We assembled a unique data set with detailed information on secondments at the level of East German tax offices. While the decentralized organization of the capacity building provides the foundation of our identification strategy, it posed

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a major challenge for data collection. There was no systematic monitoring and recording of capacity building at the federal level, and record-keeping practices differed across federal states. We conducted more than 50 interviews with current and former politicians, public officials, and formerly seconded officials to obtain an in-depth understanding of the specific situation in each state and to uncover the data.[3] Ultimately, we obtained most of the data directly from the Ministries of Finance and the Higher Financial Directorates of the federal states. Some federal states even extracted information from individual personnel files for our project. We retrieved additional information from the Federal Archives and the archives of the federal states.

Most information was available only as hard copies. We digitized these documents, cleaned the data, and conducted extensive quality, consistency, and plausibility checks. Our final data set contains the number of workdays that West German officials spent in each East German tax office per year for 1991–1996 (1990 and up to 2000 for some offices). For a subset of offices, we also observe individual-level information, including the rank of the West German officials, the start and end dates of their secondments, and their tasks in both East and West Germany. This allows us to characterize the capacity-building measures in considerable detail.

We document that the characteristics of the West German partner tax office(s) indeed significantly determine the amount of the capacity-building measures. We measure capacity building as the number of workdays West German tax officials spent in an East German tax office per East German employee. A one-standard-deviation increase in the financial incentive, the distance between partners, or relative tax office size raises capacity-building days per employee in the average East German tax office by 0.2–0.5 standard deviations (SDs).

To assess the impact of capacity building on East German tax offices, we study two dimensions of tax office performance: the quantity and the quality of tax office output. We conceptualize the capacity-building measures as on-the-job training, as seconded West German tax officials supported and trained East German personnel in their day-to-day tasks. To estimate the impact on output quantity, we adapt the framework of Konings and Vanormelingen (2015), who study the effect of worker training on firm productivity, to our setting. We specify a tax office production function in which output quantity is a function of the effective labor input that depends on the number of employees and the capacity-building measures. We examine both short-term effects, while capacity-building was still ongoing, and long-term effects, after the measures had been completed.

Our main quantity measure is the number of cases assessed, which directly reflects performance in the core duty of tax offices. We do not use tax revenues because they are plausibly more affected by local economic conditions than by tax-office performance, especially given the substantial structural changes in East Germany after reunification.

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[3]The Data Appendix documents our data sources in detail.

Measuring the quality of tax office output is challenging. We study the effect of capacity building on the number of objections that taxpayers raise against tax office decisions. To our knowledge, this is the first paper to use objections as a measure of tax office output quality. Complaints are a primary means of bureaucratic oversight (Prendergast, 2003), and taxpayers have a legal right to object to any administrative decision. To shed light on the mechanisms we analyze both the number of objections and whether they are decided in favor of the taxpayer or the tax office. Combining measures of output quantity and quality enables us to examine whether a quantity-quality trade-off exists and whether capacity-building measures affect one margin more strongly or persistently than the other.

We find that capacity building had a positive short-term effect on tax office output. Seven more capacity-building days per employee (i.e., a one-SD increase) lead to a 10% increase in the number of declarations assessed per employee. The effect is more pronounced for more complex tax types, indicating that the gains are driven by successful knowledge transfer. We provide back-of-the-envelope calculations on the return on investment, comparing the additional tax declarations assessed in the East German tax office to the number of declarations that the seconded tax officials would have assessed in their West German office. Across capacity-building years, the return on investment ranges from 1.5 to 3.1. Thus, capacity building increased the total number of declarations assessed across East and West German tax offices. In the long run, capacity building no longer affects output. We document that output levels converge, which suggests that the capacity-building measures gave some tax offices a head start and that others caught up.

Turning to our second performance measure, we find that capacity building improves quality. In the short term, capacity building has no detectable effect on the number of objections. Given that enhancing capacity increases the number of declarations assessed, one would expect a higher number of objections if quality remains constant. The absence of an effect suggests a short-term quality increase. In the long term, the number of objections declines significantly with capacity building: a one-SD increase in capacity-building days per employee reduces objections by one-third of a SD. Both objections granted to taxpayers and objections rejected by the tax office decrease. We interpret the decline in granted objections as evidence that secondments improved the accuracy of tax office output, consistent with knowledge transfer. We view the decline in rejected objections as reflecting higher taxpayer trust in the administration, strengthened by higher-quality output. As a result, taxpayers raise substantially fewer objections, especially fewer unfounded objections that are ultimately rejected. This is in line with the idea that the capacity of the public administration affects the perception of the state.

The simultaneous gains in output quantity and quality imply no trade-off between the two dimensions. While output quantity converges over time, quality improvements persist: offices receiving little

capacity building eventually match their peers in declarations assessed per employee but continue to receive more objections. This pattern suggests that secondments are particularly effective at transferring tacit, experience-based knowledge, that is, the know-how that is crucial for the discretionary judgments required when applying the tax code to idiosyncratic cases.

Our results indicate that effective capacity-building programs should foster the transfer of tacit knowledge. In the final part of the paper, we exploit additional variation in our setting and secondment-level data for a subset of tax offices to provide empirical insights into three key design feature of effective capacity-building initiatives. First, support from West German tax offices with stronger administrative traditions, proxied by location in the former Prussian empire (Heldring, 2020), is more effective, consistent with officials from these regions possessing deeper tacit knowledge. Second, intermediate secondment durations (around 3 months) appear optimal, balancing the coordination costs of frequent turnover against diminishing returns from extended secondments given ultimately finite individual expertise, even among highly knowledgeable officials. Third, both task-specific and broader institutional measures matter, suggesting that capacity-building initiatives should incorporate both types of support.

Our paper contributes to four strands of the literature. The first seeks to understand how state capacity relates to the personnel economics of the state and the organization of the public administration (see Jensen and Weigel, 2025; Besley et al., 2022; Finan et al., 2017, for surveys). This literature documents that the selection of public officials is crucial for administrative performance and studies how it responds to financial incentives (e.g., Dal Bó et al., 2013; Deserranno, 2019), hiring practices (e.g., Moreira and Pérez, 2024), and political discretion (e.g., Colonnelli et al., 2020; Muñoz and Prem, 2022; Voth and Xu, 2022; Xu, 2018). Moreover, it investigates how bureaucratic effectiveness and administrative performance depend on financial and non-financial incentives (e.g., Bandiera et al., 2021; Bertrand et al., 2019; Deserranno et al., forthcoming, 2025; Khan et al., 2016, 2019), task allocation (e.g., Basri et al., 2021; Decet, 2024), technology (e.g., Bachas et al., 2025; Dzansi et al., 2025; Knebelmann et al., 2024; Okunogbe and Pouliquen, 2022), and managers and management practices (e.g., Englmaier et al., 2022; Fenizia, 2022; Rasul and Rogger, 2018). Finally, it shows that monitoring through audits improves performance (e.g., Olken, 2007), but only when monitoring institutions are designed to withstand corruption (Vannutelli, 2022). We contribute a novel dimension to the literature by analyzing the impact of secondments, a common capacity-building instrument in the public sector. We provide the first causal estimates of the effects of seconding officials from high-capacity to lower-capacity administrations on both output quantity and quality.

Second, our results contribute to a nascent empirical literature on the state's production function. Best, Hjort and Szakonyi (2023) quantify the relative importance of individual bureaucrats and

bureaucratic organizations for public-sector output. Best, Fenizia and Khan (2023) offer guidance on measuring state performance using administrative data. We advance this literature by (i) conceptualizing the production function of the tax administration, a key branch of the public administration, (ii) estimating the returns to human-capital investment in the public administration, and (iii) documenting the importance of knowledge for administrative performance.

Since successful knowledge transfer is a plausible explanation for our results, our paper also relates to the literature on knowledge spillovers via labor mobility. Prior research documents that firm-to-firm labor mobility can enhance both firm and co-worker performance (e.g., Mion et al., 2024; Poole, 2013). Although anecdotal evidence suggests that firms use mobility to transfer knowledge, existing studies of corporate transferees remain correlational (e.g., Astorne-Figari and Lee, 2019; Lodefalk, 2016). In contrast, our analysis, albeit in a public-sector context, provides causal evidence that temporary employee transfers improve performance in the receiving organizations.

Finally, we study capacity-building in the East German tax administration after German reunification, an event that has served as a natural experiment in several economic studies. Prior work analyzes savings behavior (Fuchs-Schündeln and Schündeln, 2005; Fuchs-Schündeln, 2008), preferences for redistribution (Alesina and Fuchs-Schündeln, 2007), agglomeration forces (Ahlfeldt et al., 2015), and television and consumption (Bursztyn and Cantoni, 2016). Moreover, it studies the importance of market access (Redding and Sturm, 2008) and social ties for economic development (Burchardi and Hassan, 2013) and investigates the implications for East German science (Wernsdorf, 2025). Recent work exploits the large-scale privatization through the *Treuhand* agency to study industrial policy questions (Akcigit et al., 2023; Mergele et al., 2025). We add a novel angle by combining variation within both East and West Germany to improve our understanding of successful state capacity building.

The paper is structured as follows. Section 2 describes the institutional setting. Section 3 explains our conceptual framework, the measurement of tax office performance, and our estimation strategy. Section 4 presents the data that we collected. Section 5 summarizes our regression results and sheds light on the mechanisms. Section 6 derives recommendations for the design of future capacity-building initiatives. The last section concludes.

2   Institutional Setting

2.1   Large-scale capacity-building initiative

We study the measures taken to build capacity in the tax administration in the East German federal states (Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, Thuringia) after reunification on 3 October 1990. The German Democratic Republic (GDR) was a socialist state

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Table 1: Timeline of the establishment of the East German tax administration

9 Nov 1989	Fall of the Berlin Wall
18 Mar 1990	"Volkskammerwahlen" (parliamentary elections) Winner: "Allianz für Deutschland" → Goal: reunification
20 Apr 1990	Creation of partnerships for capacity-building in the public administration at the federal state level
18 May 1990	Treaty on the Economic, Monetary and Social Union between the GDR and the FRG
1 Jul 1990	Establishment of 121 tax offices Introduction of value added tax and wage tax in GDR
3 Oct 1990	Reunification of Germany
1 Jan 1991	Introduction of the West German tax system in former GDR

Sources: Bundesministerium der Finanzen (1990; 1992*a*, 2–3), Duda (2011, 122), Jäger and Walter (1998), Kartmann and Schipanski (2009, 220–231), Reuter (1990), Rosen (1993).

where taxes played a subordinate role for public finances. In 1988, only 8% of government revenues resulted from taxes (Eisold, 1990). Correspondingly, the GDR did not have a tax administration comparable to the one in the Federal Republic of Germany (Duda, 2011, 47, 67; Autorenkollektiv, 1981, 128; Richter, 2004, 911). As taxes are the main source of government funding in a market economy, it was of crucial importance to rapidly build a well-functioning tax administration after reunification (Ministerium der Finanzen der DDR, 1990, 1).

On 1 July 1990—three months after the people of the GDR had voted in favor of reunification in the parliamentary elections of March 1990, but before actual reunification—121 tax offices were established in the GDR (Kartmann and Schipanski, 2009, 121, 225): 8 in East Berlin, 21 in Brandenburg, 16 in Mecklenburg-Western Pomerania, 35 in Saxony, 21 in Saxony-Anhalt, and 20 in Thuringia (see Appendix B.1 for a list). On the same day, the West German value-added tax (VAT) and a simplified variant of the West German wage tax were introduced in the GDR as part of the Monetary, Economic and Social Union (Kartmann and Schipanski, 2009, 220). The full West German tax system was introduced on 1 January 1991 (see Table 1).

Employees were initially recruited from the finance departments of the former District Councils, the regional administration in the GDR (Ministerium der Finanzen der DDR, 1990, 6). The employees were thus used to working with numbers and had administrative experience, but they lacked knowledge of taxation or the organization and procedures of an effective tax administration (Kartmann and Schipanski, 2009, 220).

The stark difference in the relative importance of the tax administration between the GDR and the Federal Republic of Germany (FGR) is reflected in the number of employees. In the GDR, before

reunification, only 2,300 employees worked on taxes and levies, compared with 76,000 in the FGR. However, the number of employees grew quickly after reunification. Already by July 1991, almost 11,000 employees worked in the East German tax offices (excluding East Berlin). Their number grew to 20,200 tax office employees by the year 1999, when the East German tax administration reached a ratio of tax office employees to taxpayers comparable to that of the West.[4]

Our units of analysis are the 113 tax offices in the five East German federal states, excluding Berlin. We exclude the eight tax offices in the city-state of Berlin because the tax offices in East Berlin were integrated with the existing tax offices in West Berlin into a unified tax administration. This institutional arrangement makes Berlin a special case, both relative to the other East German states and to other capacity-building contexts.

2.2 Capacity-building through partnerships

For historical reasons, the public administration is a state responsibility, not a federal responsibility, in Germany (Article 30 of the German Constitution; Bogumil and Jann, 2009, p. 76). While the federal government holds legislative authority over taxation–ensuring uniform tax laws across Germany–the administration of taxes is the responsibility of the federal states (Schmitt, 2013, 1744). Accordingly, and consistent with Germany's federal constitutional order, it was a policy priority after reunification to build the administrative capacity of the new East German states. While the tax offices in each federal state administer taxes, the resulting revenues are pooled nationally and redistributed across the federal, state, and municipal levels according to fixed allocation schemes. As a consequence, local revenues do not remain with the local office, but flow into the broader intergovernmental fiscal system.

State-level partnerships.   The administrations of the federal government and the federal states are obligated to mutual legal and administrative support (Article 35 of the German Constitution). Article 5 of the German Reunification Treaty codifies that the West German federal states support the East German federal states in establishing their administration. In April 1990, the West German federal states formed partnerships to build capacity in the public administration of the five East German federal states, which were to be established as part of reunification (Bundesministerium der Finanzen, 1990; 1992*a*, 2–3). The partnerships comprised support to build capacity in all branches of the public administration, including the tax administration, the police force and the justice system (Kartmann and Schipanski, 2009, ch. 3.6; Bundesministerium der Finanzen, 1992*b*, 6).

The state-level partnerships emerged as a result of uncoordinated contacts between the West German

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[4]Data from Oberfinanzdirektion Chemnitz (1998, 11) for former GDR, Bundesministerium der Finanzen (1991) for FGR 1990, Arbeitskreis Organisation (1991, 6) for 1991, Bundesministerium der Finanzen (1999, 6) for 1999.

states and institutions in the former GDR after the fall of the Berlin wall (Kartmann and Schipanski, 2009, 48). Thus, partnerships were influenced by geographic and political proximity and historical ties. Figure 1a displays the partnerships as of July 1991.[5] Conservative-voting states appear in gray (dark for West, light for East), while states voting social democratic appear with hatching.

Figure 1: Partnerships between West and East German federal states and tax offices, July 1991

(a) State partnerships

(b) Tax office partnerships

■ West German state, conservative government

▨ West German state, social democratic government

▨ East German state, voting conservative in 3/90

▨ East German state, voting social democratic in 3/90

Tax offices in ▲ BB, ◆ MV, ■ SN, × ST, ● TH
Partner offices of ◇ MV, □ SN, × ST, ○ TH
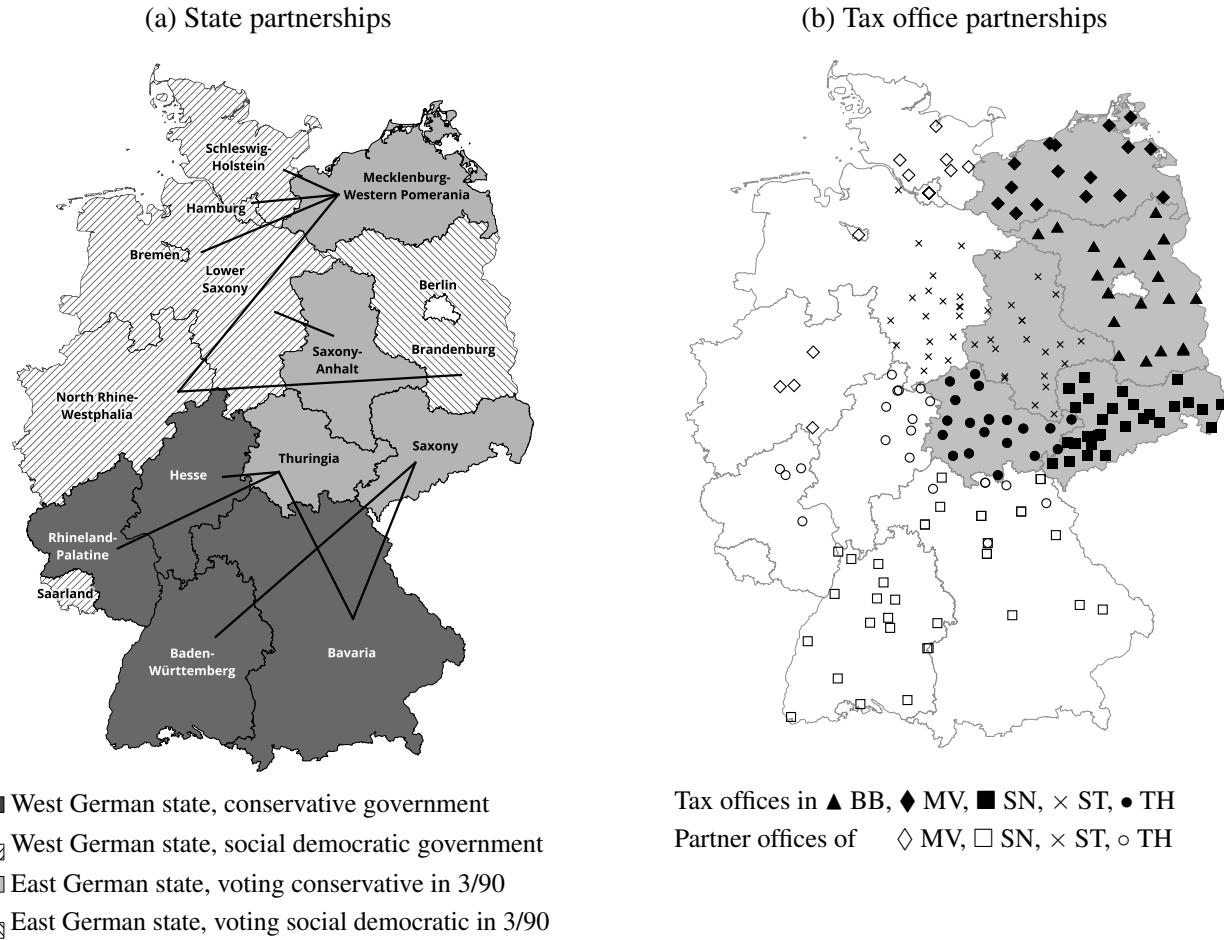
The West German federal states were responsible for the capacity-building measures. Until 1992, the West German federal states even covered the full costs (Ministerpräsidentenkonferenz, 1991). After 1992, they covered a substantial fraction of the costs (Rosen, 1993). The federal government did not issue a plan or guidelines for the states. While the federal states convened for regular coordination meetings to discuss progress, these meetings did not result in enforceable decisions prompting adjustments in the capacity-building efforts. The West German federal states had discretion in

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[5]Initially, the state of North Rhine-Westphalia supported the district of Leipzig in Saxony. However, due to the high geographic distance and the support provided for all tax offices in Brandenburg and those in the district Neubrandenburg in Mecklenburg-Western Pomerania, North Rhine-Westphalia withdrew from Saxony in the first half of 1991 (Oberfinanzdirektion Chemnitz, 1998).

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determining the extent of capacity-building measures without being required to provide a minimum amount (Bundesrechnungshof, 1994, 23).

Decentralized partnerships between tax offices. The state-level partnerships were complemented by decentralized partnerships. Each East German tax office was assigned at least one West German partner tax office (see Appendix B.1). This partner tax office was responsible for the capacity-building in the East German tax office. An exception was the state of Brandenburg, where East German tax offices were matched to one of the three Higher Financial Directorates in the partner state of North Rhine-Westphalia; the individual tax office level partnerships played only a subordinate role in practice (Finanzministerium des Landes Nordrhein-Westfalen, 1991). In all other federal states, tax office-level partnerships were central to the capacity-building efforts.

Importantly, the rapid pace of events precluded a careful matching of East and West German tax offices. After all, the co-existence of two separate German states was a possibility until the parliamentary elections on 18 March 1990. At the same time, the introduction of the VAT and simplified wage tax on 1 July 1990 created high time pressure (Der Spiegel, 1990; Annex IV to the Treaty on the Economic, Monetary and Social Union between the GDR and the FRG). The partnerships were announced even before the tax offices were officially established.[6] Decisions had to be taken based on limited information about the population and economic structure of the tax office districts, not least because the early 1990s were a period of economic turbulence and a high degree of emigration from the East German federal states. The offices were therefore matched mainly based on geographic proximity and similarity of locality and tax office size (e.g., Kartmann and Schipanski, 2009, 223; Oberfinanzdirektion Hannover, 1991).

Our own analyses confirm that East German tax offices were not systematically matched with West German partner tax offices. We examine whether partner tax offices were selected to resemble East German tax offices in terms of tax office staffing levels, the population of the tax office district, and, in Appendix B.2, the local number of firms and employees. To quantify similarity, we employ a *k*-nearest-neighbors algorithm (see Appendix B.2 for details). For each East German tax office, we determine the five and ten most similar tax offices from the West German partner state.

Table 2 shows the number of tax offices that would be paired with a partner among the *k* most similar tax offices under random matching, compared with the observed number of similar pairs (section 4 describes the data). Only a few East German tax offices are paired with their most similar West German counterparts. The results are robust to alternative similarity measures and distance

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[6]To give a few examples, Hessian tax office partnerships were announced on 18 June 1990, but Hessian tax officials traveled to the East German tax offices to assess their situation and needs only in July 1990. Bavaria informed its tax offices about the partnerships on 25 June 1990, while the structure of the Ministry of Finance in Saxony and its subordinate tax offices were only constituted in August 1990 (Richter, 2004, 522).

metrics.

Table 2: Few East German tax offices matched to similar West German partners

	# tax offices		Partner among 5 NN		Partner among 10 NN	
	East	West	Random	Observed	Random	Observed
	(1)	(2)	(3)	(4)	(5)	(6)
MV	10	130	0.4	0	0.8	1
SN	35	160	2.0	2	4.1	7
ST	21	57	6.4	7	12.8	12
TH	20	160	1.2	3	2.4	3

Notes: MV: Mecklenburg-West Pomerania, SN: Saxony, ST: Saxony Anhalt, TH: Thuringia. The table compares, by East German federal state, the observed number of East German tax offices that are matched with one of the five or ten most similar West German tax offices (columns 4, 6) to the hypothetical number if matching was random (columns 3, 5). Columns 1 and 2 display the number of East German tax offices and potential West German partner tax offices. We cannot include all 16 MV tax offices due to missing personnel for Hamburg and Bremen (section 4 provides details). *Method:* k-nearest neighbor matching algorithm using Euclidean distance; variables: tax office personnel (observed for WG, target for EG), population of tax office district in 1989/90.

2.3 Exogenous variation in capacity-building measures

The aim of the capacity-building measures was to rapidly convey knowledge to the East German personnel, enabling them to carry out the duties of tax officials, including tax assessment, collection and enforcement. The capacity-building measures also aimed at creating efficient organizational structures and processes in the tax offices (Bundesministerium der Finanzen, 1992*a*, 3). To achieve these objectives, the West German tax offices sent tax officials on secondment to the East German tax offices (Bundesministerium der Finanzen, 1992*a*, 3). They recruited the seconded officials among their own workforce or, in case of personnel shortages, from neighboring tax offices in their state (Kartmann and Schipanski, 2009, 227–8, Oberfinanzdirektion Chemnitz, 1998, 5). The seconded tax officials provided on-the-job training to the East German personnel. They also assumed the managerial roles of head of tax office or head of department within a tax office, in particular in the early 1990s (Richter, 2004, 912). The secondments complemented compulsory training courses for the East German personnel, which were uniform across tax offices (Der Bundesminister der Finanzen, 1990; Oberfinanzdirektion Chemnitz, 1998, 16, 18, 27ff.; Bundesministerium der Finanzen, 1990, 47–48). However, officials often struggled to apply the primarily theoretical course content in practice (Bundesfinanzakademie, 1990), underscoring the importance of on-the-job training provided through the secondments.[7]

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[7]Permanent transfers of officials to the East German tax administration were rare, unlike in other branches of the public administration such as the judiciary. Those who transferred typically moved to state-level institutions–Ministries

The West German federal states followed the principle of voluntary participation to recruit tax officials for capacity building. To compensate tax officials for their capacity-building efforts, the West German federal states paid tax-free monthly allowances equal to 40%-60% of the baseline monthly salary (on top of their ordinary salary and travel reimbursements). The federal government issued recommended allowance levels by rank of the public civil servants, but the actual amounts varied across West German states and over time. Unlike in other countries, e.g., the United States, allowances (and base salaries) were nominally uniform within each federal state, leading to real-value differences across locations.

Combined with the tax-office level partnerships, the principle of voluntary participation yields a crucial feature of our institutional setting: variation in capacity-building measures that is exogenous to the situation and needs of the East German tax offices. This allows us to estimate the causal effect of capacity-building. As documented in the previous section, it is highly unlikely that the West German tax administration considered the expected needs of the individual East German tax offices when forming partnerships (we discuss other identification concerns in section 3.3). Our identification strategy builds on the assumption that West German tax officials traded off costs and benefits when deciding whether to participate in capacity-building. The benefit of capacity-building increases with the financial incentive, whose real value depends on the local price level at the location of the West German tax office, and thus varies across tax offices within federal states. The cost of engaging in capacity-building for tax officials (and their families) increases with the distance between the West and East German tax offices. As Figure 1b illustrates, some tax office pairs lay within commuting distance, while others required half-day travel. Finally, larger West German partner tax offices offered a larger supply of possible volunteers. Indeed, as we document in section 5.1, the real value of the financial incentive at the West German partner tax office, the distance between partner tax offices, and their relative tax office size significantly affected the amount of capacity-building measures received by East German tax offices.

3 Conceptual Framework

To understand the impact of the capacity-building measures, we study their effects on two margins of tax office performance: the quantity and the quality of tax office output. Both margins reflect important aspects of performance. Output quantity reflects the efficiency of the tax administration. Studying output quality allows us to assess whether capacity building affects the accuracy of the

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of Finance, Higher Financial Directorates, or state tax training academies. A list from the Thuringian Ministry of Finance shows that half of transferring officials moved to state institutions, implying an average of only three transfers per tax office. Aggregate figures for Saxony indicate a similar number of transfers per tax office by 1998 (Oberfinanzdirektion Chemnitz, 1998), compared to an average tax office personnel of around 180. Once transferred, officials performed regular administrative duties rather than capacity-building activities.

decisions of the tax administration.

3.1 Tax office output quantity

Estimation equation. We conceptualize the capacity-building measures as on-the-job training and specify a tax office production function to estimate their effect on output quantity. We build on Konings and Vanormelingen (2015), who estimate the effect of worker training on firm productivity. In their framework, firm output depends on effective labor input, which is a function of the number of workers, their average schooling level, their average training intensity, and unobserved worker attributes.

We adapt their framework to our setting and formalize tax office output quantity as a function of the tax office's effective labor input:

$$Y_{it} = \hat{L}_{it}^{\beta_\ell} \cdot \exp\{q_{it}\} \cdot \exp\{\varepsilon_{it}\} \tag{1}$$

Y_{it} denotes the output quantity of tax office i in year t. $\hat{L}_{it}$ is its effective labor input. β_ℓ denotes the labor input elasticity and q_{it} denotes unobserved tax office productivity. ε_{it} denotes unobserved transitory shocks. The effective labor input depends on the capacity-building measures. Following the approach in Konings and Vanormelingen (2015), we normalize the number of days that West German tax officials spent in an East German tax office by its size, in order to capture the average capacity-building intensity per tax office employee.

$$\ln \hat{L}_{it} = \ln L_{it} + \beta_T \frac{\#\text{days}}{L_{it}} + Z_{it} \tag{2}$$

L_{it} denotes the number of employees (measured in full-time equivalents) of the East German tax office. $\#\text{days}/L_{it}$ denotes the average capacity-building intensity. Z_{it} is the unobserved labor quality of the tax office employees.

Taken together, these assumptions yield the following log-linearized equation:

$$\ln Y_{it} = \beta_0 + \beta_\ell \ln L_{it} + \beta_\ell \beta_T \frac{\#\text{days}}{L_{it}} + \omega_{it} + \varepsilon_{it}, \tag{3}$$

where $\omega_{it} = q_{it} + \beta_\ell Z_{it}$.

Similar to the estimation of firm productivity, the number of employees may be endogenous in equation (3). Unlike firms, tax offices do not make hiring decisions. However, the number of positions allocated to the tax office by state level authorities increases with the population and the number of firms in the tax office district (Wenzig, 1989, 56 et seq.). Tax offices may be granted additional positions if they repeatedly fail to handle their workload. Therefore, in line with Best,

Fenizia and Khan (2023, 330), we reformulate equation (3) to express output per tax official, yielding our estimation equation:[8]

$$\ln \frac{Y_{it}}{L_{it}} = \beta_0 + \beta_\ell \beta_T \frac{\#\text{days}}{L_{it}} + \omega_{it} + \varepsilon_{it} = \beta_0 + \beta_1 \frac{\#\text{days}}{L_{it}} + u_{it}. \tag{4}$$

We examine the effects of the capacity building both in the short term, while it was still ongoing, and in the long term, after it was completed. To assess short-term effects, we set $\#\text{days} = \#\text{days}_{it}$. The sign of the short-term coefficient is ex ante ambiguous. A positive coefficient would indicate successful capacity transfer. A negative coefficient would not necessarily imply a lack of success; it could instead reflect that capacity-building efforts bind resources that otherwise would have been used to assess declarations, thus temporarily reducing tax office output.

To assess the long-term effects of capacity building, we set $\#\text{days} = \sum_{\tau=1990}^{1993} \#\text{days}_{i\tau}$ and consider output in the years 1995 onward. A performance-increasing effect of the capacity-building measures would be reflected in a positive sign of the coefficient. We focus on the capacity building during the years 1990–1993, as the capacity-building measures were directed only to a subset of tax offices with special responsibilities (in particular external tax auditing) from 1994 onward (for details see section 4.1).

Labor input L_{it} appears in both the dependent variable and the regressor, and we resolve the resulting endogeneity through an instrumental variable strategy (section 3.3). We control for the population of the tax office district to account for possible economies of scale in tax assessment. In our long-term regressions, we additionally include a dummy variable indicating tax offices with audit units as they are large in terms of their workforce.

Measuring output quantity. It is non-trivial to measure tax office output quantity. By law, tax offices are responsible for any taxation in their district, i.e., their designated geographic area. Responsibilities are centralized at a subset of tax offices for complex tasks (e.g., external tax audits) or infrequent taxes (e.g., the inheritance tax or the casino tax) in practice. Virtually all tax offices assess taxes on the firms and employees in their area.

We focus on the number of cases assessed in a tax office for the main tax types to measure the quantity of tax office output. Specifically, we aggregate the number of tax declarations assessed for corporate income tax, personal income tax, and wage tax (Appendix C.1 provides details on these taxes). The declarations for these taxes are subject to administrative assessment, so tax officials have to examine the declarations before issuing the tax bill to taxpayers (OECD, 2011, p.228). In contrast, the value added tax (VAT) follows a self-assessment procedure (Ebrill et al., 2001), which

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[8]Implicitly, the reformulation implies that $\beta_\ell = 1$. When we correlate tax office output and the number of employees, coefficients are not significantly different from 1.

does not require systematic administrative assessment by tax officials. Therefore, we do not include VAT declarations in our outcome measure.[9]

The tax declarations differ with respect to their complexity and in terms of the processing time required by a tax official, depending on their tax type (see Appendix C.1). To account for these differences, we weight the number of tax declarations per type by the amount of time budgeted for each type of declaration in the staffing planning of an East German federal state in the 1990s (similar to Fenizia, 2022, 1067). Indeed, the staffing planning allocates about six times more time to corporate income tax declarations than to wage tax declarations, and three times more time to personal income tax declarations. We exploit the heterogeneity to shed light on the mechanism behind the effects.

The number of cases assessed are a measure of the physical output quantity of the tax office. Tax revenues are an alternative measure that would be equivalent to sales often used as dependent variable in the production function estimation of firms. However, tax revenues depend not only on the performance of the tax office but are largely determined by the economic structure of the tax office district. Even if this economic structure is held constant, higher tax revenues do not necessarily indicate better tax office performance: firms in the tax district may make losses, and efforts to maximize tax revenue under such conditions may be counterproductive. In particular in a transition period like the period after reunification, good performance of a tax office may be reflected in acknowledging losses.[10] Accurately measuring tax office performance based on tax revenues would thus require assessing whether a tax office achieves its revenue potential, neither exceeding nor falling short of it. However, this revenue potential is inherently unobservable. While tax revenues may fluctuate due to transitory shocks, the obligations for citizens and firms to file tax declarations persists. Better tax office performance is unambiguously reflected in a higher number of cases assessed per employee.

Shortly after reunification, the record date of statistics on the number of tax declarations assessed differs between East German federal states and across years. To control for state-specific changes in record dates, we include federal-state specific time trends and exploit within-federal state-year variation only.

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[9]Shareholders of partnerships file personal income tax declarations, as these entities are taxed transparently. These tax declarations are captured by our measure.

[10]Tax authorities must determine and collect taxes in accordance with the laws. They must ensure that taxes are neither understated nor incorrectly levied, or that tax refunds and credits are neither improperly granted nor denied (Rechnungshof der Freien und Hansestadt Hamburg, 1994). Indeed, during the years 1991–2000, 93% of tax offices reported negative personal income tax revenues, and 38% reported negative corporate income tax revenues. Negative tax revenues occurred because of, e.g., tax loss carry-backs and very generous investment grants during these years.

3.2 Quality of tax office output

The number of cases assessed reflects only the quantity margin of tax office performance. It is equally important that the assessments are correct. Under German law, taxpayers may file an objection against a tax assessment or any other decision of the tax office if they disagree with it. Filing an objection is free of charge. This allows us to study the effect of the capacity-building measures not only on the quantity, but also on the quality of tax office output.

Estimation equation.   We specify a reduced form estimation equation:

$$\frac{Y_{it}}{L_{it}} = \gamma_0 + \gamma_1 \frac{\#\text{days}}{L_{it}} + \eta_{it} + \upsilon_{it} = \gamma_0 + \gamma_1 \frac{\#\text{days}}{L_{it}} + \upsilon_{it}, \tag{5}$$

where Y_{it} denotes the number of objections in tax office i in year t. η_{it} denotes the unobserved tax office quality and υ_{it} denotes unobserved transitory shocks. Unlike for tax office output quantity, successful capacity building would be indicated by a negative coefficient, as taxpayers file fewer objections against erroneous tax office decisions.

Measuring output quality.   Objectively measuring output quality is notoriously difficult. We use the number of objections filed by taxpayers as our main measure of tax office output quality. When an objection is filed, the tax administration reevaluates the case and potentially makes adjustments before the matter may be taken to court. We exploit the outcome of objections to shed light on the mechanism behind variation in tax office output quality. The reevaluation can lead to three different outcomes. (i) The tax office revises its decision and grants the taxpayer's objection; (ii) the tax office rejects the objection and the taxpayer withdraws her objection; and (iii) the tax office rejects the objection and the taxpayer pursues legal action. Consistent with the interpretation of the tax administration (Bundesministerium der Finanzen, 2020), we assume that an objection is granted if the decision by the tax office was indeed at least partly incorrect, and that an objection is rejected if the tax office decision was actually correct.[11] We interpret a lower number of granted objections as an indication of successful knowledge transfer, either as tax office employees make fewer mistakes or they handle objections more effectively. We interpret a lower number of rejected objections as sign of higher trust of taxpayers, as they raise fewer unfounded objections.

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[11]An objection may be rejected after the tax office issued an amendment notice which addressed the taxpayer's concern. Likewise, an objection may be granted because the taxpayer submitted additional information which were missing in the original tax declaration (Bundesministerium der Finanzen, 2020). Evidence from the state of Saxony-Anhalt, which is the only federal state that records the type of objection resolution (rejection, approval, or court decision) together with the outcome from the taxpayer's perspective (fully unsuccessful, partly successful, or fully successful), indicates that such cases are rare: fully unsuccessful objections are usually rejected by the tax office, while fully and partly successful objections are typically granted by the tax office (see Figure C.1 in Appendix C.2).

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3.3 Identification strategy

The average capacity-building intensity per East German tax office employee is an endogenous variable in equations (4) and (5). Archival documents suggest that weaker East German tax offices demanded more support. West German tax officials likely responded to these requests, so $\text{Cov}(\#\text{days}/L_{it}, \omega_{it}) < 0$ for quantity and $\text{Cov}(\#\text{days}/L_{it}, \eta_{it}) < 0$ for quality. In result, the coefficient of the capacity-building measures is biased towards zero.

To address this concern, we exploit the principle of voluntary participation and implement an instrumental variables (IV) strategy. Our instruments capture the costs and benefits of being seconded for West German tax officials. We use the local real value of the financial incentive at the West German partner tax office location, measured in square meters of construction-ready land, to capture the benefit of secondments. The distance between the East German and West German partner tax office proxies the commuting costs associated with secondments. Finally, we use the ratio of the size of the West German tax partner office before reunification relative to the East German tax office in order to capture the supply of tax officials that could volunteer for secondments in East Germany.[12] In short, we estimate the following first-stage specification:

$$\frac{\#\text{days}_{it}}{L_{it}} = \alpha_0 + \alpha_1 \text{real fin. incentive}_{it} + \alpha_2 \text{distance}_i + \alpha_3 \frac{\#\text{West German FTE}_{i,1990}}{\#\text{East German FTE}_{it}} + u_{it} \quad (6)$$

We use contemporaneous variables to instrument the short term capacity-building measure $\#\text{days}_{it}$. To instrument the long-term, aggregate capacity-building measure $\sum_{\tau=1990}^{1993} \#\text{days}_{i\tau}$, we use the average values of the IVs in the years 1990–93.

As explained in section 2.2, the seconded officials came from many West German tax offices, not only the partner office. Our identification strategy is conservative as it uses only the variation from the partner office, not the actual real value of the financial incentive received by the seconded official, their actual distance to the East German tax office, or the actual size of their tax office.

Composition of capacity-building measures. We interpret the 2SLS estimates of β_1 and γ_1 in equations (4) and (5) as the causal effect of the capacity-building measures per full-time equivalent (FTE) on tax office performance. This interpretation implicitly assumes that the IVs change only the number of days of capacity building per FTE. One may be concerned that the IVs also affect the composition of tax officials. Existing research offers little guidance regarding potential composition effects. Previous studies focus on selection *into* public service (e.g., Besley et al., 2022, sec. 3.2). In contrast, we are concerned with selection *within* the public sector: the officials providing the capacity-building measures already self-selected into the West German tax administration. In

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[12]If personnel information is not available for 1990, we use the earliest year available (see Data Appendix section 2.3).

addition, while the literature focuses predominantly on the extensive margin, capacity building depends on both officials' participation decision at the extensive margin and the length of their involvement at the intensive margin.

We leverage data on secondments at the individual level for Saxony (see section 4.1 and section 2 in the Data Appendix) to examine how the instrumental variables correlate with the composition of seconded officials. The data include officials' rank, which varies with education and tenure and thus proxies qualification. We compute the share of days provided by officials in the higher, upper-intermediate, and intermediate service tiers. We find that the composition of secondment days is uncorrelated with the real value of the financial incentive and with the relative size of tax offices (see Appendix C.3). The share of officials in the upper-intermediate service–which accounts for most of the secondment days–is also uncorrelated with the distance between tax offices. However, distance is weakly positively correlated with the share of officials in the higher service, i.e., the most highly qualified officials. Thus, while tax offices farther from their partner offices receive less capacity building (see section 5.1), the quality of the support received is higher. This pattern suggests that our estimates represent a lower bound of the causal effect of capacity building.

One may be concerned that composition varies along unobservable dimensions. Archival documents show that the financial incentives were key as it was considered impossible to recruit a sufficient number of tax officials merely based on their intrinsic motivation (e.g., Nds. Ministerium für Finanzen, 1990). This suggests that higher financial incentives could not only increase the number of days of capacity building, but also induce less intrinsically motivated individuals to volunteer. If this is the case, and if higher intrinsic motivation increases the effectiveness of capacity building, the estimated coefficients would provide a lower bound of the causal effect. Similarly, a larger relative size of the West German compared to the East German tax office may have shifted the composition of capacity-building measures toward less intrinsically motivated officials. If West German tax officials considered the impact of their absence on colleagues, it is plausible that only more intrinsically motivated tax officials volunteered in smaller tax offices, where fewer replacements were available. While we cannot correlate the IVs and unobservable intrinsic motivation, reassuringly, results are similar (albeit less precisely estimated) if we use subsets of the IVs.

Another possible concern relates to spillovers between tax offices. Less productive tax offices may have learned from more productive tax offices by copying best practices or employee mobility. Again, our estimates would provide a lower bound for the effect of capacity building, as such spillover effects decrease the performance differential between tax offices.

Placebo test. Although the tax administration was newly created, one may still worry that tax office districts differ for reasons unrelated to capacity building, in particular with respect to citizens' propensity to raise objections that may vary for social or cultural reasons. To assess the concern, we

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conduct a placebo test using statistics on complaints and requests directed at the administration of the former GDR from the Potsdam Grievance Statistics File (Class et al., 2018). If our instruments captured pre-existing differences in citizens' propensity to challenge administrative decisions, they should predict complaint behavior in the late 1980s. They do not: complaints and requests in 1988 and 1989 are uncorrelated with our instruments (Appendix Table C.2), suggesting that the instruments are unlikely to pick-up pre-existing differences.

4 Data

4.1 Capacity-building measures

We collected data on the scope of secondments in workdays at the tax office-year level for all East German federal states. Collecting the data was a major challenge. The key benefit of the institutional set-up for identification implied significant difficulties for data collection. Since capacity-building was organized in a decentralized manner by the West German federal states–or even by individual West German tax offices–there was no coordination among the West German states whether to document the capacity-building measures, let alone on which authority should maintain the records or what format should be used.

We conducted more than 50 interviews to understand the specific situation in each federal state and to locate the capacity-building records. The interviewees include former prime ministers, former and current ministers of finance and state secretaries of East German federal states, former and current heads of tax departments, current and former West German tax officials involved in capacity-building and East German tax officials (Appendix A provides a list of interview partners). We approached the Ministries of Finance and Higher Financial Directorates of the federal states and convinced them to grant access to internally stored documents on the capacity-building measures. We complemented the data with information retrieved from the Federal Archives ("Bundesarchiv") and the archives of the German federal states ("Landesarchive"). Table 3 provides an overview of the main sources of the capacity-building data by East German federal state and their West German partners. Section 2 in the Data Appendix describes the data sources in detail.

For a subset of federal states, we uncovered data on individual secondments (comprehensively for Saxony; for subsets of tax offices or time periods for Mecklenburg-Western Pomerania and Thuringia). In fact, the data from two West German federal states was recovered from individual personnel files by the researchers and by the personnel department of the tax administration. This individual level data contains information on each seconded tax official (hierarchical rank, gender, tax office of origin) as well as information on each of their secondment spells (start and end date, tax office of destination, performed task at destination).

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Table 3: Sources of data on capacity-building measures

EG state	WG state	Main data source	Complementary source(s)
BB	NW	Ministry of Finance, BB + State Archive, NW	Higher Financial Directorate, NW
MV	HB	Ministry of Finance, HB	Ministry of Finance, MV State archive, NW
	HH	Ministry of Finance, HH	
	NW	State Archive, NW + Higher Financial Directorate, NW	
	SH	State Chancellery, Ministry of Finance, SH	
SN	BW	Ministry of Finance, SN & Higher Financial Directorate, BW	
	BY	State Office for Taxes, BY	Ministry of Finance, SN
ST	NI	Higher Financial Directorate, ST	State archive, NI
TH	BY	State Office for Taxes, BY	
	HE	Higher Financial Directorate, HE	
	RP	Higher Financial Directorate, RP	

BB: Brandenburg, BW: Baden-Württemberg, BY: Bavaria, HB: Bremen, HE: Hesse, HH: Hamburg, MV: Mecklenburg-Western Pomerania, NI: Lower Saxony, NW: North Rhine Westphalia, RP: Rhineland Palatine, SH: Schleswig-Holstein, SN: Saxony, ST: Saxony-Anhalt, TH: Thuringia.

Most of the data was available on typewritten or handwritten hard-copies only. We digitized and cleaned the data. We implemented numerous plausibility checks and, whenever possible, consistency checks across different data sources (for details, see section 2 in the Data Appendix). Our diligent work resulted in a data set that contains information on the capacity-building measures implemented in all tax offices in East Germany.

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4.2 Tax office performance

We consider two dimensions of tax office performance: the quantity and quality of output. As outcome measures, we collected data on the number of cases assessed for the main tax types, the number of objections that taxpayers raised against tax office decisions, and the outcome of those objections. Our data stem from official statistics of the tax administration. We contacted the Ministries of Finance and the Higher Financial Directorates of the East German federal states, and retrieved information from the Federal Archives as well as the archives of each East German federal state. As the capacity-building data, with few exceptions, the information was only available in hard copy. We digitized the data and performed extensive quality, consistency, and plausibility checks (for details, see section 3 in the Data Appendix).

4.3 Instrumental variables

The West German federal states offered tax-free monthly allowances as financial incentives to encourage their tax officials to engage in capacity building. We manually collected the information on the financial incentives from federal-state specific regulations and documents, which we obtained from the Ministries of Finance and the Higher Financial Directorates of the West German federal states, the Federal Archives, and the archives of the federal states of Hamburg, Hesse, Lower Saxony, Rhineland-Palatinate, and Schleswig-Holstein. We convert the nominal financial incentives into their real values using local prices for building land from the Statistics of Land Purchase Prices that are available at the district level from the statistical offices of the West German federal states.

We approximate the travel costs for West German tax officials using the airline distance between the East German tax office and its West German partner tax office(s) as of 1990. We determine the location of the tax offices in that year using address lists obtained from the tax administration.

4.4 Controls

Each tax office is responsible for taxation within its designated geographic district. In practice, responsibilities are centralized for complex tasks (e.g., external tax audits) or infrequently levied taxes (e.g., inheritance tax). We collected information on all such special responsibilities for all tax offices and years in our sample from the regulations on tax office jurisdictions (*Finanzamtszuständigkeitsverordnungen*). We collected information on the population in the geographic district to control for differences in workload (see section 4 in the Data Appendix for details).

4.5 Sample

Our data contain information on the capacity-building measures for all tax offices. Despite our best efforts, we were not able to obtain complete information on all outcome variables. Specifically, data on corporate income tax declarations are missing for Saxony-Anhalt in 1992–93 and are available only for a subset of years in 1995–2000. We therefore cannot include Saxony-Anhalt in the contemporaneous analyses and exclude the state from the main sample for all analyses for consistency. We document that our results are robust to including Saxony-Anhalt in the Appendix.

For Brandenburg, the tax-office level partnerships turned out to be less relevant in practice than for the other states (see section 2.2). For Hamburg and Bremen, it was impossible to obtain reliable information on the size of the individual tax offices and the price of building land used to compute the real value of the financial incentive. The IV regressions therefore can only be implemented for tax offices in the East German states of Thuringia, Saxony, and Mecklenburg-Western Pomerania, excluding those partnered with offices in Hamburg and Bremen (the "IV sample"). We report OLS results for both the IV sample and a sample that additionally includes Brandenburg and the Mecklenburg-Western Pomerania offices partnered with Hamburg and Bremen (the "OLS sample").

4.6 Descriptive statistics

Figure 2 depicts the amount of capacity building, as measured by the number of workdays that West German tax officials spent in an East German tax office. Panel A shows the average amount of capacity-building measures per tax office and year. Tax officials were present in East German tax offices on only relatively few days in 1990 (148 workdays, on average). The amount of capacity building dynamically increased in 1991 and 1992, reaching the peak of 1,701 workdays (on average) in 1992. This is equivalent to the annual number of workdays of almost seven full-time tax officials. At the same time, the number of West German tax officials was small compared to the overall workforce in the East German tax offices. In the average (median) tax office, there was one West German tax official for every 18 (19) East German tax office employees.

Panel B shows the average number of workdays separately for tax offices with (circles) and without (diamonds) units for external tax audits. Units for external audits were centralized in only a few offices and were established mainly during 1994–1998, i.e., later than, for example, the assessment units that were established and supported in 1990–1993. External tax audits are retrospective, conclusive reviews of tax cases, a timing reflected in Panel B: tax offices with an audit unit received sustained levels of capacity building throughout 1997, declining only thereafter. In contrast, offices without an audit unit experienced much lower levels of support after 1993, and these levels faded quickly. By 1999/2000, the number of workdays is close to zero for both types of tax offices.

Figure 2: Capacity building over time
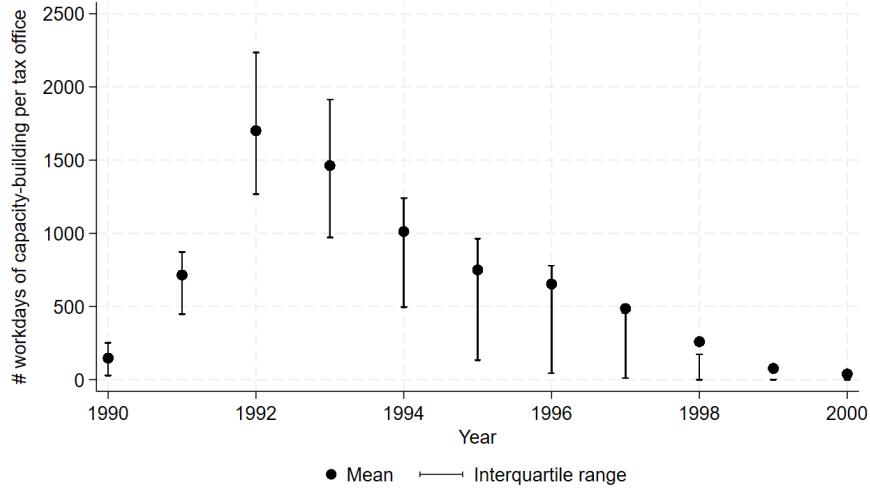
(a) Panel A: Number of days, by year
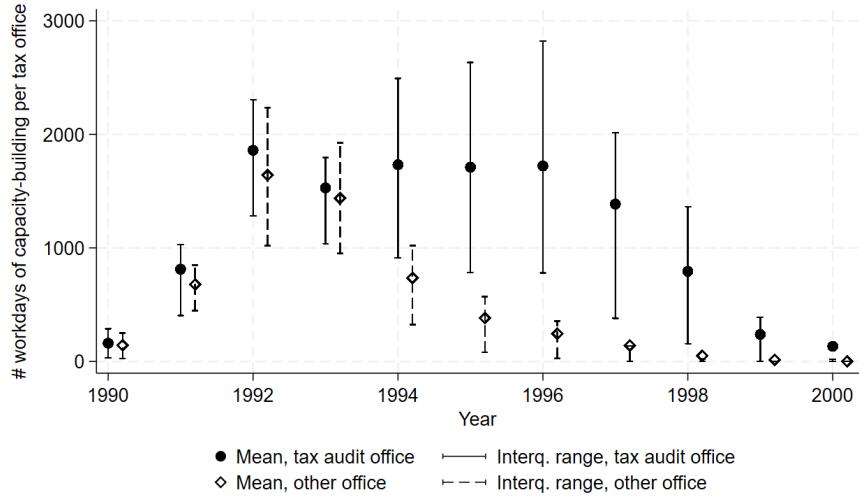
(b) Panel B: Number of days, by year and audit unit

This figure plots the mean and interquartile range of the amount of the capacity-building measures per East German tax office over time. Panel A pools statistics across all tax offices; Panel B provides statistics separately for tax offices with and without unit for external tax audits. The figure includes tax offices in the IV sample, i.e., offices in Mecklenburg-Western Pomerania (except those supported by Hamburg and Bremen), Saxony and Thuringia. Appendix Figure D.1 documents similar patterns for the tax offices in our OLS sample.

Based on Figure 2, we distinguish three phases of capacity building. In the first phase (1990–1993), all tax offices received substantial support; in the second phase (1994–1998), capacity building was concentrated in tax offices with audit units. In the third phase (from 1999/2000), capacity building came to an end. Our analyses focuses on the first phase, 1990–1993, for two reasons. First, all

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tax offices received capacity-building measures during this period. Second, the support targeted functions such as tax assessment which are directly related to our outcome measures. Information on the tasks of West German tax officials and documentation from the state of Saxony confirm that capacity building in tax auditing began only in 1994 (Oberfinanzdirektion Chemnitz, 1998, p. 37ff.).

Table 4: Summary statistics

	1992–1993		1995–2000	
	Mean	SD	Mean	SD
Capacity-building measures				
# days per FTE, same year	12.706	6.633	.	.
# days per FTE, 1990-93	.	.	25.991	11.394
Performance measures				
# cases assessed per employee				
all tax types (weighted)	270.176	106.174	416.462	76.394
corporate income tax	2.794	2.593	7.392	3.678
personal income tax	37.055	18.603	66.806	16.039
wage tax	138.350	51.730	169.049	40.072
# objections per employee				
filed	14.034	11.154	26.212	6.960
rejected	2.278	1.485	6.534	1.910
granted	8.741	8.763	16.377	5.229
Instruments and controls				
Mean financial incentive (in sqm land)	0.664	0.474	0.690	0.497
Mean distance to partner (in km)	251.632	151.062	249.168	152.010
Relative tax office size	2.141	1.107	2.384	1.179
Audit unit (0/1)			0.285	0.452
Population (in thsd.)	138.167	84.215	137.913	82.239
Observations	120		326	

Summary statistics, IV sample. *Capacity-building measures:* average # of days per FTE in 1990–93 is lower than three times the corresponding average per year as the number of FTE in the tax offices increase. *Performance measures:* # cases assessed for all tax types is the weighted sum of the # cases assessed per tax type, using as weights the amount of time budgeted for each type of declaration in the staffing planning of one East German federal state (see section 3.1). # of observations is lower for corporate income tax (CIT) cases assessed (1992–93: 90; 1995–2000: 237) as only a subset of tax offices in Thuringia assesses CIT. # of observations in 1995–2000 is lower (282) for the # objections per employee due to missing data for Thuringia in 1995–1997 and 2000. Appendix Table D.1 documents similar figures for the tax offices in our OLS sample.

Table 4 provides descriptive statistics on the capacity-building measures, the performance measures, as well as the instrumental and control variables. The table splits our data in years 1992–1993 (columns 1 and 2, short-term) and years 1995–2000 (columns 3 and 4, long-term). On average, East German tax offices received 13 days of capacity-building measures per full-time equivalent employee during 1992–1993. This accumulated to an average of 26 days in the years 1990–1993, with considerable variation across tax offices (standard deviation of 11).

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Concerning tax office output quantity, the (weighted) average number of all cases assessed per employee rises significantly from about 270 in 1992–93 to 416 in 1995–2000. At the same time, the variance across tax offices decreases, suggesting convergence in performance. This pattern appears across tax types. For the corporate income tax, the average number of cases assessed more than doubles from 3 (1992–1993) to 7 (1995–2000), while the standard deviation increases only modestly. For the personal income tax, the average rises from 37 (1992–1993) to 67 (1995–2000), accompanied by a decline in the standard deviation. For the wage tax, the least complex tax, the increase in the average number of cases assessed is more modest, but the standard deviation falls by one fifth. Overall, tax office performance in assessment significantly improved over time.

Concerning tax office output quality, the number of objections raised by taxpayers increases from 14 objections per tax office employee in 1992–1993 to 26 in 1995–2000. This increase does not necessarily reflect a reduction in tax office output quality. Instead, as reflected in the statistics on the number of cases assessed, every tax office employee assesses a greater number of tax declarations in later years, mechanically increasing the number of objections per employee.

With respect to the instrumental variables, German tax official receive financial incentives equal to 0.7 square meters of building land per workday on secondment, reflecting that the financial incentives were substantial. The mean distance between the East German tax office and their West German partner was about 250 km, with substantial variation across offices. West German tax offices (in terms of full-time equivalents in 1989) were about 2.1 times larger than East German tax offices in years 1992–1993. About 29% of tax offices have an audit unit, and roughly 140 thousand individuals live in one tax office's district.

5 Results

5.1 West German tax office characteristics determine capacity building

First, we document that the amount of capacity building received by East German tax offices varied with characteristics of their West German partner office. Thus, the extent of capacity building was indeed partly determined by factors exogenous to the situation and needs of the East German tax offices.

We use as instruments the local real value of the daily financial incentive, the distance as proxy for the travel costs, and the relative size of the West to East German tax offices. Figure 3 displays the relation between the instrumental variables and the number of days of capacity-building measures per East German tax office employee in 1991–93. Consistent with our priors, the financial incentive and the relative tax office size are positively correlated with capacity-building measures, while the distance correlates negatively.

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Figure 3: Correlations of West German partner characteristics and amount of capacity building
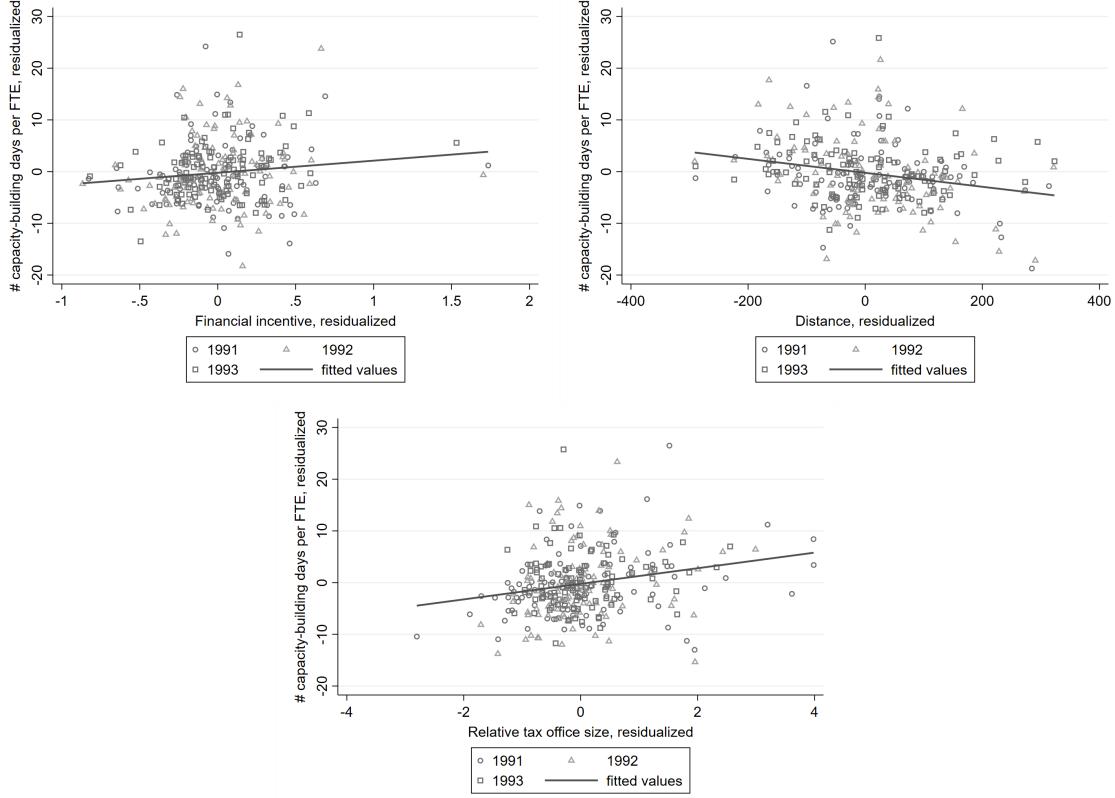
Scatter plots show correlations between residualized instruments (financial incentive, distance, relative tax office size) and residualized number of capacity-building days (1991–1993), partialling out the effect of the other instruments and federal-state specific time trends. IV sample (see section 4.5).

Table 5 shows the results from regressing the number of capacity-building days per East German employee on the instrumental variables (equation (6)). Column 1 is estimated at the tax office level. Column 2 is estimated at the city level, because population is only available at the city level.

Financial incentives, distance, and relative tax office size are each important determinants of the amount of capacity building. Increasing the financial incentive by one standard deviation (SD) leads to an increase of the capacity-building measures by 0.23 SDs according to our estimates in column 1. Similarly, a one-SD lower distance increases capacity building by 0.34 SDs. An East German tax office partnered to an office in the West with relatively more personnel receives a larger amount of capacity-building measures: a one-SD increase in the relative size of West to East German tax offices increases the amount by 0.47 SDs. This finding reflects that a larger number of West German tax officials could volunteer if the partner tax office was relatively larger. Overall, West German tax office characteristics have high explanatory power, with an R^2 of 0.46 and an F-statistic of 26.1.

Our results are robust to controlling for population as a proxy for the workload in each tax office.

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Table 5: Characteristics of West German tax offices determine the amount of capacity building

| | # days per FTE, same year | |
| | Tax office level | City level |
	(1)	(2)
Mean real financial incentive (in sqm land)	3.385**	2.701*
	(1.482)	(1.492)
Mean distance to partner	−0.015***	−0.015***
	(0.003)	(0.003)
Relative tax office size	2.237***	1.855***
	(0.402)	(0.425)
Log population		−0.517
		(1.152)
Constant	2.460	10.631
	(2.923)	(13.773)
EG state trend	✓	✓
Number of Observations	195	180
R^2	0.462	0.465
F-statistic	26.120	21.202

Notes: The table shows that West German tax office characteristics determined the amount of capacity-building measures received by East German tax offices (estimation equation (6)). *Dependent variable*: number of workdays of capacity-building measures per East German tax office employee per year. *Independent variables*: daily financial incentive for West German tax officials (in square meters of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices, log population (column 2). Average incentive, distance and relative size for East German tax offices with several partner tax offices. Column 1 estimated at the tax office level; column 2 estimated at the city level. Standard errors clustered by tax office (column 1) and city (column 2) in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample, 1991–93. The table shows results for years 1991–93.

As population is only available at the city level, and as cities often have several tax offices that may specialize in certain tasks,[13] we aggregate tax offices in cities to one unit of observation. Regression results at the city level (column 2) are similar despite fewer observations. A one-SD increase in the financial incentive increases capacity building by 0.20 SDs. The corresponding figures for lower distance and larger relative size are 0.34 and 0.41 SDs. The F-statistic decreases slightly to 21.2. Overall, our results show that the amount of capacity building in East German tax offices significantly depends on characteristics of West German partner tax offices.

5.2 Capacity-building measures increase short-term output quantity

We exploit the exogenous variation in the capacity-building measures to identify causal effects on East German tax office output quantity. We measure output quantity with the number of tax

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[13]For example, one city tax office may specialize on the assessment of employees, while another city tax office may specialize on assessing the corporate income tax.

Table 6: Capacity-building measures increase tax office output quantity in the short term

| | Log # of tax declarations per FTE | | | | | |
| | Short-term | | | Long-term | | |
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	0.009*** (0.002)	0.011*** (0.002)	0.016*** (0.006)			
# days per FTE, 1990-93				-0.001 (0.001)	-0.000 (0.001)	0.001 (0.003)
Audit unit (0/1)				-0.196*** (0.032)	-0.227*** (0.035)	-0.221*** (0.038)
Log population	0.131*** (0.040)	0.112*** (0.037)	0.134*** (0.040)	0.078* (0.040)	0.076* (0.039)	0.085* (0.043)
Constant	3.496*** (0.465)	3.893*** (0.438)	4.251*** (0.488)	5.134*** (0.490)	5.101*** (0.469)	5.134*** (0.549)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	174	120	120	448	326	326
R^2	0.863	0.895		0.337	0.381	
F-statistic			15.683			8.415

Notes: The table documents that the capacity-building measures increase tax office output quantity in the short term (estimation equation (4)). *Dependent variable*: log number of declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

declarations assessed as explained in section 3.1. We investigate short-term and long-term effects based on equation (4). We run the regressions at the city level and cluster standard errors accordingly in order to include population as control variable and to account for possible specialization on tax types at the city level.

Table 6 presents the results. The estimates for capacity building are positive and highly significant in the short term. The IV coefficients are slightly larger than the OLS coefficients, suggesting that weaker tax offices received a higher amount of capacity-building measures. An increase in capacity building by seven workdays per FTE (i.e., one SD) increases the number of declarations assessed per tax office employee by 10.6% (IV, column 3). Our specification has high explanatory power for short-term output quantity with R^2 of 0.86 and 0.89 in the OLS regressions. The point estimates for

the long-term effects of the capacity-building measures are both statistically and economically zero (columns 4–6). Concerning the controls, tax offices in districts with a larger population assess a higher number of declarations per employee. The higher tax office efficiency is likely related to the more efficient use of overhead resources. It is consistent with recommendations from 1989/90 that the East German tax offices should not be too small (Ministerium der Finanzen der DDR, 1990, p.2).[14] Tax offices with tax audit units, which became active in the longer term only, assess significantly fewer tax declarations per employee, reflecting that part of their workforce is assigned to other tasks.

Returns to capacity-building. We use the regression results on output quantity to conduct back-of-the-envelope calculations of the implied returns to capacity building. To do so, we compare the increase in the number of tax declarations assessed per year of secondment to its opportunity costs, i.e., the number of tax declarations that the seconded official would have assessed in their West German tax office. At the mean, an additional year of capacity building increases the number of tax declarations assessed per employee by 5.2 (in 1992) to 9.7 (in 1993), or 720 to 1,531 declarations per tax office and year. On average, a West German tax official assessed 500 tax declarations in 1990. The return to one year of secondments, relative to the foregone tax declarations in the West, is thus in the ballpark of 1.5 (in 1992) to 3.1 (in 1993). Accounting for the financial incentives reduces the return, but it remains larger than one and sizable at 1.1 (in 1992) and 2.4 (in 1993).[15] Capacity building increased the total number of declarations assessed across East and West German tax offices.

Mechanisms. Why do the capacity-building measures increase tax office output quantity, and why do the differences across tax offices disappear quickly? To make progress on the first question, Table 7 reports regression results separately for the three tax types, wage tax, personal income tax, and corporate income tax. The taxes differ in their complexity for tax officials when assessing declarations (see Appendix C.1). We find that the short-term effects are strongest for the corporate income tax, somewhat smaller for the personal income tax, and smallest (though not statistically different) for the wage tax. The corporate income tax is the most complex of the three, requiring many case-specific judgments; the personal income tax also requires substantial case-by-case decisions; and the wage tax is the most standardized. The stronger effects for more complex tasks point to knowledge transfer as the underlying mechanism.

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[14]Motivated by this finding, we explore effect heterogeneity across urban and rural tax offices, as population and population density are higher in cities. We find that capacity-building measures tend to be more effective in cities in the OLS regressions (see Appendix Table E.1). Interestingly, variation in population affects efficiency only for rural tax offices. However, we do not have enough power to ascertain this heterogeneity in the IV regressions.

[15]We provide details on our calculation in Appendix E.2.

Table 7: Larger effect of capacity-building measures for complex tax types

	Log # of declarations per FTE		
	OLS	OLS	IV
	(1)	(2)	(3)
Panel A: Corporate income tax			
# days per FTE, same year	0.015***	0.025***	0.034***
	(0.005)	(0.006)	(0.012)
EG state trend	✓	✓	✓
Number of Observations	142	88	88
R^2	0.772	0.836	
F-statistic			16.607
Panel B: Personal income tax			
# days per FTE, same year	0.010***	0.013***	0.013**
	(0.003)	(0.004)	(0.006)
EG state trend	✓	✓	✓
Number of Observations	174	120	120
R^2	0.823	0.851	
F-statistic			15.683
Panel C: Wage tax			
# days per FTE, same year	0.007**	0.009**	0.017*
	(0.003)	(0.004)	(0.010)
EG state trend	✓	✓	✓
Number of Observations	174	120	120
R^2	0.762	0.732	
F-statistic			15.683

Notes: The table documents that the capacity-building measures have a larger impact on short-term tax office output quantity for more complex tax types (estimation equation (4)). *Dependent variable*: log number of declarations assessed per East German tax office employee and year. The corporate income tax (CIT) is more complex than the personal income tax (PIT), and PIT is more complex than the wage tax (WT), see Appendix C.1. Only a subset of tax offices has CIT responsibilities in Thuringia, resulting in a lower number of observations in panel A. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, unreported: log population, federal-state-specific time trends. Columns 1, 2: OLS results; columns 3: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables. Standard errors clustered by city in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$. *Sample:* IV sample; column 1 additionally includes Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993. Appendix Table E.9 reports the absence of long-term differences by tax type.

Regarding the second question, it is crucial to determine whether differences disappear because all tax offices converge to a high level of output quantity, or because they fall to a uniformly low level. We find clear evidence of convergence at a high level from the mid-1990s onward. As shown in Figure 4, differences in the number of cases assessed between offices that received comparably high and low amounts of capacity building per employee vanish by 1995. Output levels converge

upward, and output variance declines. This pattern again points to successful knowledge transfer as the mechanism underlying the effects of capacity building. Importantly, all tax offices received substantial support after reunification (minimum in 1992: 1.3 days per full-time equivalent; 10th percentile: 7.3 days). The variation in capacity building gave some tax offices a head start, but learning-by-doing enabled offices with fewer secondments to catch up over time.

Figure 4: Number of cases assessed converges at high level and variance declines quickly
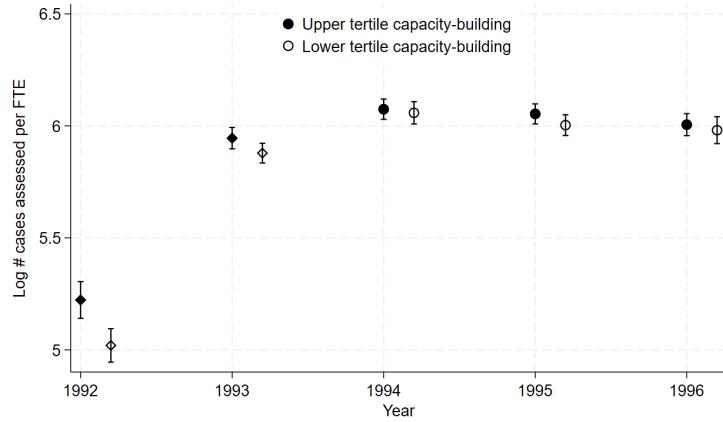
Notes: This figure plots the mean and 95% confidence interval of the log number of cases assessed per FTE per East German tax office over time and shows that output converges at a high level by 1995. Solid (hollow) symbols refer to tax offices in the upper (lower) tertile of the capacity-building per FTE distribution. IV sample.

Robustness. Parts of the former German Democratic Republic lay within Prussian territory before World War I. Since Prussia had strong administrative traditions and high state capacity (Heldring, 2020), one might worry that our results are confounded by geographic factors correlated with historical institutional quality. Table E.2 shows that controlling for whether an East German tax office was located in former Prussian territory leaves our estimates virtually unchanged. We find a weakly positive effect of the Prussia indicator in the OLS sample, but this effect disappears in the IV sample (in both OLS and IV specifications). Moreover, interacting the capacity-building measures with the Prussia indicator provides no evidence of differential effectiveness in historically Prussian areas.

Another concern is that output quantity may be affected by differences in filing behavior, since only filed declarations can be assessed. Several findings alleviate this concern. Assessment rates were relatively low during our sample period: on average, only 40% (58%) of tax declarations filed in 1991 (1992) were assessed by the end of 1992 (1993), indicating that filing constraints were not binding. No tax office achieved a 100% assessment rate, even for the wage tax, the least complex tax type. In unreported regressions, we also observe that assessment speed is significantly positively

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correlated with the amount of capacity-building measures per FTE. Taken together, these findings support the conclusion that the capacity-building measures increased tax office productivity.

One may worry that seconded officials contributed not only knowledge but also additional labor. This is unlikely, given that we estimate a return on investment of greater than one. Nevertheless, we probe this possibility by normalizing the number of assessed tax declarations with a measure of labor supply that includes capacity-building days (converted into FTE). The resulting coefficients are statistically indistinguishable from our baseline estimates (Appendix Table E.3).

Prior work shows that the removal of the inner-German border differentially affected West German regions close to the former border by placing them in a more central geographic position (Redding and Sturm, 2008; Burchardi and Hassan, 2013). To exclude possibly confounding effects, we include the airline distance to the former inner-German border as control variable. Our coefficients of interest hardly change (Appendix Table E.4).

Finally, Appendix Table E.5 documents that results are robust to including Saxony-Anhalt in the sample. Table E.6 shows that results are similar if we use the recommended financial incentive at the federal level instead of state-level incentives. Findings are similar at the tax office level (Table E.7), and robust to the exclusion of tax offices that were restructured in the late 1990s (Table E.8).

5.3   Capacity-building measures increase long-term output quality

We assess the causal effect of capacity building on output quality using the objections raised by taxpayers. Columns 1–3 in Table 8 show that capacity building does not affect the number of objections in the short term. This is remarkable given that capacity building increases tax office output quantity. If quality were unchanged, higher output quantity would mechanically lead to more objections. We therefore interpret the absence of an increase in objections as evidence for higher output quality.

Columns 4–6 show that capacity building reduces the number of objections in the long term. The IV coefficient is more negative than the OLS coefficient, although the difference is not statistically significant. The estimated impact is both statistically and economically meaningful: a one-SD increase in capacity-building measures–i.e., two more weeks of capacity-building during 1990–93 per FTE–reduces the number of objections by 0.28 SDs (IV, column 6). Tax offices with tax audit units receive fewer objections. As Table 6 shows, this likely results from the fact that they assess fewer tax declarations per employee, as part of their employees are assigned to other tasks. Tax offices in cities, with more (and more highly educated) people living in their tax district, receive a higher number of objections per employee, consistent with the idea that educated people are more likely to complain (Botero et al., 2013).[16]

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[16]Unreported regressions indicate heterogeneous effects of the capacity-building measures across urban and rural

Table 8: Capacity-building measures increase tax office output quality in the long term

| | # of objections per FTE | | | | | |
| | Short-term | | | Long-term | | |
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	-0.030 (0.099)	-0.048 (0.132)	0.034 (0.245)			
# days per FTE, 1990-93				-0.160** (0.070)	-0.151** (0.075)	-0.192* (0.116)
Audit unit (0/1)				-3.911** (1.666)	-5.653*** (1.728)	-5.907*** (1.608)
Population (in thsd.)	0.016** (0.007)	0.013* (0.007)	0.014** (0.006)	0.017** (0.008)	0.022*** (0.005)	0.021*** (0.006)
Constant	26.185*** (2.104)	6.322*** (2.231)	24.740*** (4.096)	51.646*** (3.932)	22.753*** (2.972)	33.743*** (3.690)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	153	120	120	386	276	276
R^2	0.537	0.456		0.646	0.427	
F-statistic			15.637			14.324

Notes: The table documents that the capacity-building measures increase tax office output quality in the long term (estimation equation (5)). *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Mechanisms. We leverage our data on the outcome of objections to understand why capacity building reduces the number of objections. Table 9 presents results separately for successful objections, in which the tax office revises its decision in favor of the taxpayer (objections granted, about 60% of objections raised), and for unsuccessful objections, which are rejected by the tax office (objections rejected, about 25% of objections raised). In line with the interpretation of the tax administration, we treat a decline in the number of successful objections as evidence of higher output quality, as the tax office makes fewer mistakes. We interpret a reduction in the number of unsuccessful objections as indicative of higher taxpayer trust in the tax offices, with fewer unfounded objections being filed.

The short-term estimates in Table 9 are small and insignificant for both types of objections. In the

tax offices. However, effects are imprecisely estimated and not significantly different.

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Table 9: Capacity-building measures decrease number of granted and rejected objections

| | # of objections per FTE | | | | | |
| | Short-term | | | Long-term | | |
	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
Panel A: Objections granted						
# days per FTE, same year	−0.017	−0.016	0.012			
	(0.084)	(0.113)	(0.227)			
# days per FTE, 1990-93				−0.092**	−0.121**	−0.112$^+$
				(0.044)	(0.049)	(0.085)
R^2	0.474	0.371		0.470	0.427	
F-statistic			15.637			14.324
Panel B: Objections rejected						
# days per FTE, same year	−0.009	−0.003	−0.021			
	(0.007)	(0.009)	(0.029)			
# days per FTE, 1990-93				−0.028*	−0.042**	−0.080**
				(0.016)	(0.019)	(0.031)
R^2	0.775	0.761		0.536	0.540	
F-statistic			15.637			14.324
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	153	120	120	330	276	276

Notes: The table documents that the capacity-building measures decrease both the number of granted and rejected objections in the long term (estimation equation (5)). *Dependent variable*: number of objections granted (panel A) and number of objections rejected (panel B), per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, unreported: presence of a unit for external company audits (years 1995–2000), population (in thds.), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. $^+$ $p < .20$, * $p < .10$, ** $p < .05$.
Sample: IV sample; columns 1, 4 include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Fewer observations than in Table 8 due to missing values for the composition of objections in Brandenburg in years 1997–1999 ($N = 19$ in 1997/1998, $N = 18$ in 1999). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

long term, however, capacity building significantly reduces the number of successful objections. A one-SD increase in capacity building lowers successful objections by 0.22 SDs. This pattern makes it unlikely that tax officials were initially overly lenient to avoid complaints (as suggested in the model by Prendergast, 2003). Instead, the improvement in output quality is consistent with the transfer of tacit knowledge as the main mechanism. Supporting this interpretation, we find somewhat stronger (albeit not significantly stronger) effects when proxying the qualification of the seconded tax officials by their salary group and weighting capacity-building days in sub-sample analyses for Saxony (see Appendix Table E.10). Taken together with the convergence in output

quantity over time, the results suggest that secondments are particularly effective in conveying tacit, experience-based knowledge. Officials appear to benefit most when making discretionary decisions in the assessment of idiosyncratic tax declarations, leading to fewer corrections at later stages.

The capacity building also reduces the number of unsuccessful objections, where a one-SD increase in capacity building leads to a reduction by 0.43 SDs. This suggests that taxpayers are not filing objections primarily as an expression of their (un)willingness to pay taxes (as suggested by Nathan et al., 2025). Instead, our results point to higher taxpayer trust in the tax offices. This interpretation aligns with prior literature documenting the importance of bureaucratic performance for citizens' attitudes towards the state (e.g., Becker et al., 2016).

Robustness.   To understand whether our results are affected by historical institutional quality, we include an indicator for East German tax offices located in former Prussian territory. Appendix Tables E.11 and E.12 show that our main coefficient estimates are virtually unchanged. In the OLS sample, tax offices from former Prussia receive and grant a lower number of objections, but this effect disappears in the IV sample (both OLS and IV specification).

For consistency with our analyses of output quantities, we normalize the number of objections by the number of employees (in FTEs). As objections can only be filed after assessment—and must be lodged within one month (see §355 *Abgabenordnung*)—we consider an alternative normalization by the number of declarations assessed by the office in the same year.[17] Appendix Tables E.13 and E.14 report the results. Using declarations as the denominator yields effects that are larger and estimated more precisely: a one-SD increase in capacity building reduces the number of objections filed by 0.4 SDs according ($p < 0.01$, IV estimate). Capacity building decreases both the number of successful (0.3 SDs, $p < 0.10$) and unsuccessful objections (0.5 SDs, $p < 0.01$). We prefer objections per FTE as our main specification because it yields a larger estimation sample (the alternative requires observing objections and declarations jointly, which reduces the number of observations). In addition, our main specification conditions on an input (FTEs) rather than on an output measure (declarations) that is itself affected by capacity building.

Results our robust to including distance to the inner-German border as a continuous control variable (Appendix Table E.15). Further, Table E.16 shows that the results remain robust when Saxony-Anhalt is included in the sample. Table E.17 demonstrates that the findings hold when using the federally recommended financial incentive in place of state-level incentives. The findings are similar when estimated at the tax office level (Table E.18) and when excluding tax offices that underwent restructuring in the late 1990s (Table E.19).

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[17]In unreported robustness checks, we scale by the number of declarations assessed in the previous year and obtain very similar results.

6 Design of capacity-building initiatives

The design of capacity-building initiatives involves several key choices: which offices or agencies should provide assistance, how long experts should be seconded, and what tasks they should perform.[18] We exploit variation in our setting and leverage rich individual-level data available for a subset of tax offices to provide insights into these design questions.

6.1 Support by offices with strong administrative traditions more effective

Our main results suggest that capacity building transfers tacit, experience-based knowledge needed for discretionary decisions during tax assessment. To understand which offices or agencies should provide assistance, we examine whether measures are more effective when support comes from West German partner offices that are more likely to hold such tacit knowledge.

Following Heldring (2020), we explore whether effects are larger if partner tax offices are located in historically Prussian areas with stronger administrative traditions. Table 10 shows that indeed fewer objections are raised if the partner office is located in historically Prussian areas. The baseline effect is around 2, both in the OLS sample in column 1 and in the OLS and IV specifications for the IV sample in columns 3 and 5. The estimated coefficients on the capacity-building measures are very similar to those in Table 8. When we interact the capacity-building measures with the indicator for partner location in former Prussia, the results in the OLS sample suggest that support from partner offices with stronger administrative traditions may be more effective (*p*-value 11%, column 2), but this finding is not robust in the IV sample.

Exploring the impact on granted and rejected objections in Appendix Table F.1, we find that having a partner tax office from former Prussia reduces both types of objections, although the effects are less significant for granted objections. The coefficients for capacity building are very similar to those reported in Table 9. In contrast, the location of the partner tax office in former Prussia has no effect on output quantity (see Table F.2).

These results indicate that capacity building is more effective when partner offices or agencies have stronger administrative traditions. Consistent with knowledge transfer as underlying mechanism, we find that administrative traditions matter more for output quality–where discretionary judgments play a larger role–than for output quantity. Importantly, the estimated effects of the capacity-building measures themselves remain very similar to our baseline results. This suggests that strong administrative traditions enhance the effectiveness of capacity building but are not a prerequisite for its success.

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[18]Another relevant question is which experts to select. As we lack information on non-seconded officials, we are unable to shed light on this issue.

Table 10: Support by offices with strong administrative tradition is more effective

| | # of objections filed per FTE | | | | |
| | OLS sample | | IV sample | | |
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	IV (5)
# days per FTE, 1990–93	−0.161**	−0.066	−0.142*	−0.131$^+$	−0.174$^+$
	(0.067)	(0.080)	(0.071)	(0.088)	(0.117)
WG partner office in former Prussia	−2.366*	3.131	−2.002$^+$	−1.171	−1.915$^+$
	(1.386)	(3.971)	(1.382)	(3.820)	(1.413)
# days per FTE × WG p. in Prussia		−0.176$^+$		−0.027	
		(0.108)		(0.100)	
Population (in thsd.)	0.017**	0.020***	0.022***	0.023***	0.022***
	(0.008)	(0.007)	(0.005)	(0.006)	(0.006)
Audit unit (0/1)	−4.356***	−4.623***	−5.820***	−5.848***	−6.008***
	(1.643)	(1.619)	(1.749)	(1.752)	(1.627)
Constant	53.836***	50.697***	24.357***	23.907***	25.252***
	(4.197)	(4.292)	(3.076)	(3.804)	(4.058)
EG state trend	✓	✓	✓	✓	✓
# observations	382	382	276	276	276
Share WG offices in former Prussia	0.583	0.583	0.483	0.483	0.483
R^2	0.642	0.649	0.438	0.438	
F-statistic					14.350

Notes: The table documents that secondments from tax offices with strong administrative tradition are more effective. *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee in 1990–93, indicator that West German tax office is located in former Prussia, interactions of indicator and number of workdays of capacity-building measures, population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices, all averaged across years 1990–93. OLS results in columns 1–4, IV results in column 5. P-values for capacity-building in columns 4, 5: 14%, for the Prussia dummy in column 3: 15%, in column 5: 18%.
Sample: OLS sample (columns 1–2), IV sample (columns 3–5). Years: 1995–2000. Clustered SE in parentheses. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$

Robustness. Appendix Table F.3 shows results from jointly including indicators for whether the East German and the West German partner office are located in former Prussia. The coefficients are similar in magnitude and significance to those in Tables 10 and E.11, suggesting that East and West German administrative traditions have distinct effects. We also explore alternative proxies for the partner office's ability to transfer tacit knowledge, such as tax office size (results available upon request), but find no systematic effects.

Table 11: Secondments of intermediate duration are most effective

	Log # declarations per FTE	# objections per FTE
	Short-term	Long-term
	(1)	(2)
	OLS	OLS
# days per FTE, same year	0.018***	
	(0.004)	
# WG tax officials, same year	−0.003**	
	(0.001)	
# days per FTE, 1990-93		−0.108[+]
		(0.069)
Ratio < 3 months to > 3 months, 1990-93		−9.136*
		(4.539)
R^2	0.882	0.368
Number of observations	82	224

Notes: The table documents that secondments of intermediate duration are most effective. *Dependent variable*: number of tax declarations assessed per East German tax office employee and year, 1992–93 (column 1); number of objections raised per East German tax office employee and year, 1995–2000 (column 2). *Independent variables*: column 1: number of workdays of capacity-building measures per East German tax office employee, number of West German tax officials involved in capacity-building (unreported: log population); column 2: number of workdays of capacity-building measures per East German tax office employee in 1990–93, ratio of short-term (< 3 months) vs. long-term secondments (unreported: population (in thds.), presence of a unit for external company audits), both columns: federal-state-specific time trends. OLS results.
Sample: tax offices in Saxony, Thuringia supported by Bavaria, Mecklenburg-Western Pomerania supported by Hamburg. Years: 1992–1993 (column 1) and 1995–2000 (column 2). Clustered SE in parentheses [+] $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$

6.2 Intermediate secondment duration most effective

The amount of knowledge transferred may depend on the duration of secondments. Anecdotal evidence suggests that very short stays by many West German officials reduced effectiveness, as officials needed time to familiarize themselves with the situation in the East German tax offices and faced coordination challenges (see Appendix F.2). Very long secondments likely exhibit decreasing returns, because individual expertise is finite.

We obtained secondment-level information from the West German states of Bavaria, Baden-Württemberg, and Hamburg. The smaller sample size precludes using an IV approach, so regressions are correlational in nature. In the short-term regressions, we include the number of West German tax officials as an additional regressor in equation (4) to investigate whether a given amount of capacity building is less effective when provided by a higher number of seconded individuals. For the long-term effects, secondment durations may vary substantially, from a few days to 39 months, so the number of individuals is less informative. We therefore distinguish between short secondments (up to three months) and long secondments (more than three months) and include the ratio of short

to long secondments as a regressor in equation (5).[19] Table 11 presents the regression results.

Column 1 shows that, conditional on the total number of capacity-building days per employee, the number of tax declarations assessed is negatively correlated with the number of West German tax officials. The effect is economically meaningful: a one-SD increase in the number of tax officials reduces the number of tax declarations assessed by 5%. Column 2 documents that a higher ratio of short-term to long-term secondments is associated with fewer objections, indicating higher output quality. At the mean of 30.5 days per employee, a one-SD increase in this ratio is equivalent to shifting 2.9 days from the long-term to the short-term category and is associated with 2.1 fewer objections per employee.

Taken together, these findings indicate that secondments of intermediate duration are most effective. Such durations plausibly balance, on the one hand, the coordination challenges and the time needed for officials to familiarize themselves with the local conditions, and, on the other hand, the finite amount of expertise each individual can transfer.

6.3   Both task-specific and broader institutional support required

We use rich secondment-level data on assigned tasks, available for Saxony only, to examine whether task-specific or broader institutional capacity-building measures are more effective. Since our main measure of output quantity is the number of tax declarations assessed, we distinguish between secondments focused on assessment and those targeting other functions. Column 1 of Table 12 shows that, in the short term, both assessment-specific measures and those not targeted at assessment are positively correlated with the number of tax declarations assessed. For measures not targeted at assessment, tax office management, organization, coordination, and "general support" are among the most frequent tasks assigned to seconded officials.[20] Inspired by the literature emphasizing the importance of management for organizational performance (e.g., for the public administration Rasul and Rogger, 2018), we further decompose secondments into managerial and non-managerial categories. We classify a secondment as managerial if the seconded official served as head of tax office or as head of a department. Column 2 shows that all coefficients are positive and not significantly different from one another; we cannot detect a distinct managerial effect. This likely reflects limited variation in managerial capacity building: all Saxon tax offices had a seconded West German tax official as head of office in the early 1990s, so variation arises mainly from differences in the number of seconded department heads.

In the long term, measures targeted at assessment are significantly negatively associated with the

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[19]We treat two secondments separated by a break of up to five workdays as a single continuous secondment to avoid artificially inflating short secondments.

[20]Other frequent tasks include measures directed at tax revenue collection and enforcement.

Table 12: Both task-specific and broader institutional support required

	Log # of tax declarations per FTE Short-term		# of objections filed per FTE Long-term	
	(1)	(2)	(3)	(4)
# days per FTE, assessment	0.014**	0.014**		
	(0.006)	(0.006)		
# days per FTE, not ass.	0.016**			
	(0.007)			
# days per FTE, management		0.013		
		(0.019)		
# days per FTE, other		0.017*		
		(0.008)		
# days per FTE, ass., 1990–93			−0.286***	−0.286***
			(0.091)	(0.093)
# days per FTE, not ass., 1990–93			−0.150	
			(0.122)	
# days per FTE, mgmt., 1990–93				−0.222
				(0.495)
# days per FTE, other, 1990–93				−0.119
				(0.152)
Time trend	✓	✓	✓	✓
# observations	60	60	176	176
R^2	0.905	0.905	0.366	0.367

Notes: The table shows that both task-specific and broader support are related to tax office performance. *Dependent variable*: number of tax declarations assessed per East German tax office employee and year, 1992–93 (column 1–2); number of objections raised per East German tax office employee and year, 1995–2000 (column 3–4). *Independent variables*: column 1–2: number of workdays of capacity-building measures per East German tax office employee in assessment, managerial tasks and other tasks (unreported: log population); column 3–4: total number of workdays of capacity-building measures per East German tax office employee in assessment, managerial tasks, and other tasks in 1990–93 (unreported: population (in thds.), presence of a unit for external company audits), both columns: time trends. OLS results.
Sample: Tax offices in Saxony. Years: 1992–1993 (column 1–2) and 1995–2000 (column 3–4). Clustered SE in parentheses.
$^*\ p < .10$, $^{**}\ p < .05$, $^{***}\ p < .01$

number of objections, consistent with capacity building transferring the tacit knowledge needed for discretionary decisions during assessment. Measures not targeted at assessment show no significant relationship with objections, although the coefficient is not statistically different from that of assessment-focused measures. Column 4 shows similar patterns: the coefficient for management support is larger in magnitude than the one for other support but remains statistically insignificant.

Taken together, our results indicate that both task-specific and broader institutional measures contribute to successful capacity building.

Robustness. Results are similar when we disaggregate objections into granted and rejected objections. One might worry that these findings simply reflect that more capacity building is better,

irrespective of task alignment. To address this concern, we conduct placebo tests in which we randomly split the overall capacity-building measures into two groups. We find no significant effects, suggesting that it is the specific task composition, and not the overall amount of capacity building, that drives the results (results available upon request).

7 Conclusion

This paper provides the first causal estimates of how secondments affect administrative performance. An effective public administration is central to state capacity and economic prosperity, making it crucial to understand whether widely used capacity-building instruments deliver measurable improvements. Secondments are a key capacity-building instrument, but their endogenous, needs-driven deployment and the lack of data have prevented rigorous empirical evaluation.

We overcome these limitations by exploiting a unique quasi-experimental setting: the capacity building in the East German tax administration after reunification. To capture the multi-dimensional nature of administrative performance, we analyze both output quantity and quality. We find that secondments significantly increase output quantity, with returns on investment of 1.5–3.1. They generate persistent improvements in output quality, reflected in fewer erroneous tax office decisions and consistent with higher taxpayer trust. Our results indicate that the transfer of tacit knowledge is the central mechanism, underscoring the importance of investing in the human capital of back-office bureaucrats. These findings imply that future capacity-building initiatives should be designed to foster knowledge transfer. Our analyses show that this can be achieved by drawing support from offices with stronger administrative traditions, adopting intermediate secondment durations, and providing both task-specific and broader institutional measures.

This study rests on a major data collection effort and was only possible with generous support by numerous officials from the tax administration. It thus illustrates the value of sustained collaboration between research and public administration (Pomeranz and Vila-Belda, 2019, survey other collaborations). Our findings suggest that secondments can facilitate institutional change within a relatively short time frame. As such, secondments may constitute a powerful instrument in broader institutional reform strategies, including post-conflict reconstruction, the implementation of digital government initiatives, and the integration of artificial intelligence into public administration.

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Building Capacity in the Public Administration
Evidence from German Reunification
Online Appendix

A   Qualitative interviews

We conducted more than 50 interviews to understand the specific situation in each federal state and to locate the capacity-building records. These qualitative interviews proved to be a valuable complement to the written documents, as they provided important personal impressions, experiences, and reflections that are not captured in official sources. We are deeply grateful to our interview partners for their insights and for taking the time to speak with us personally. Specifically, we interviewed or received valuable input from the following individuals (positions refer to the time of the interaction; positions held during the capacity-building initiative are indicated with "former"):

Baden-Württemberg

1. Head of Division, State Ministry of Finance Baden-Württemberg
2. Head of the Tax Department, State Ministry of Finance Baden-Württemberg
3. Finance President for Organization, Personnel and Budget, Higher Financial Directorate of Baden-Württemberg
4. Head of tax office, Tax Office in Baden-Württemberg

Bavaria

5. Head of the Tax Department, State Ministry of Finance Bavaria
6. Judge, Higher Regional Court Munich
7. President, Higher Financial Directorate of Bavaria
8. Administrative Officer, Personnel Division, Higher Financial Directorate of Bavaria
9. Administrative Officer, Organization Division, Higher Financial Directorate of Bavaria

Berlin

10. Klaus Feiler, State Secretary, State Ministry of Finance Berlin

Brandenburg

11. Henning Heidemanns, Former State Secretary, State Ministry of the Economy and Energy Brandenburg
12. Dr. Jürgen Linde, Former State Secretary and Former State Minister for Extraordinary Duties, State Chancellery Brandenburg
13. Head of the Tax Department, State Ministry of Finance Brandenburg
14. Head of the Investment Promotion Department, State Ministry of the Economy and Energy Brandenburg
15. Dr. Wilma Simon, Former State Minister of Finance, State Ministry of Finance Brandenburg
16. Instructor, Brandenburg Training Academy for the Tax Administration

Bremen

17. Karoline Linnert, State Minister of Finance, State Ministry of Finance Bremen

Hamburg

18. Administrative Officer, Personnel Division, State Ministry of Finance Hamburg

Hessen

19. Norbert Kartmann, President of the Parliament, Parliament of Hesse

Lower Saxony

20. Former Finance President, Higher Financial Directorate of Lower Saxony
21. Former Finance President, Higher Financial Directorate of Lower Saxony

Mecklenburg-Western Pomerania

22. Wilhelm Burke, Former State Secretary, State Ministry of the Economy and Ministry of Finance
23. Former tax official on secondment, at the time of the interview: official in the State Chancellery Mecklenburg-Western Pomerania
24. Dr. Merten Drevs, Former State Secretary, State Ministry of Finance Mecklenburg-Western Pomerania
25. Sigrid Keler, Former State Minister of Finance, State Ministry of Finance Mecklenburg-Western Pomerania, and Former Member of Parliament of Mecklenburg-Western Pomerania
26. Former Head of the Tax Department, State Ministry of Finance Mecklenburg-Western Pomerania
27. Former Responsible for Advanced Training, State Ministry of Finance Mecklenburg-Western Pomerania
28. Dr. Jost Mediger, Former State Secretary, State Ministry of Finance Mecklenburg-Western Pomerania
29. Former Head of Division, Higher Financial Directorate of Mecklenburg-Western Pomerania
30. Former Chief President, Higher Financial Directorate of Mecklenburg-Western Pomerania
31. Head of the Tax Department, State Ministry of Finance Mecklenburg-Western Pomerania

North Rhine-Westphalia

32. Head of the Department for Personnel, Organization and Budget, State Ministry of Finance North Rhine-Westphalia
33. Former Chief President, Higher Financial Directorate of North Rhine-Westphalia
34. Administrative Officer, Personnel Division, Higher Financial Directorate of North Rhine-Westphalia

Rhineland-Palatine

35. Former Chief President, Higher Financial Directorate of Rhineland-Palatine

Saxony

36. Head of Division, State Ministry of Finance Saxony
37. Hansjörg König, State Secretary, State Ministry of Finance Saxony

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38. Prof. Dr. Georg Milbradt, Former State Premier Saxony and Former State Minister of Finance Saxony
39. Head of Division, Higher Financial Directorate of Saxony

Saxony-Anhalt

40. Jens Bullerjahn, Deputy State Premier and State Minister of Finance, State Ministry of Finance Saxony-Anhalt
41. Chief President, Higher Financial Directorate of Saxony-Anhalt
42. Former Head of Department and Former Treasurer, State Ministry of Finance Saxony-Anhalt
43. Former Head of Department, Higher Financial Directorate of Saxony-Anhalt
44. Former Chief President, Higher Financial Directorate of Saxony-Anhalt
45. Administrative Officer, Organizational Division, State Ministry of Finance Saxony-Anhalt

Schleswig-Holstein

46. Former tax official on secondment, then External Audit Official, Tax Office in Schleswig-Holstein
47. Former tax official on secondment, then Department Head, Tax Office in Schleswig-Holstein
48. Former tax official on secondment, Tax Office in Schleswig-Holstein
49. Former Head of the State School for the Tax Administration Schleswig-Holstein

Thuringia

50. Dr. Andreas Birkmann, Former State Secretary, State Ministry of Finance Thuringia and Former State Minister of Justice Thuringia
51. Former Chief President, Higher Financial Directorate of Thuringia
52. Chief President, Higher Financial Directorate of Thuringia
53. Prof. Dr. Bernhard Vogel, Former State Premier of Rhineland Palatine and Former State Premier of Thuringia
54. Wolfgang Voß, State Minister of Finance, State Ministry of Finance Thuringia
55. Human Resources Officer, State Ministry of Finance Thuringia
56. Head of Division, Human Resources, State Ministry of Finance Thuringia

Federal Level

57. Designated Head of the Financial History Collection, State School for the Tax Administration, Federal Ministry of Finance
58. Head of Division, Federal Ministry of Finance

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B Institutional setting

B.1   List of East German tax offices and their partners

Table B.1: Tax office partnerships

EG tax office	Partner no.	WG tax office	Partner state
Brandenburg (BB)			
Angermünde	1	OFD Köln	NW
Brandenburg	1	OFD Münster	NW
Calau	1	OFD Münster	NW
Cottbus Mitte	1	OFD Münster	NW
Cottbus Ost	1	OFD Münster	NW
Eberswalde	1	OFD Köln	NW
Finsterwalde	1	OFD Münster	NW
Frankfurt/Oder	1	OFD Köln	NW
Fürstenwalde	1	OFD Köln	NW
Herzberg	1	OFD Münster	NW
Königs Wusterhausen	1	OFD Düsseldorf	NW
Luckenwalde	1	OFD Düsseldorf	NW
Nauen	1	OFD Düsseldorf	NW
Neuruppin	1	OFD Düsseldorf	NW
Oranienburg	1	OFD Düsseldorf	NW
Perleberg			NW
Potsdam I	1	OFD Düsseldorf	NW
Potsdam II	1	OFD Münster	NW
Prenzlau	1	OFD Münster	NW
Pritzwalk	1	OFD Düsseldorf	NW
Strausberg	1	OFD Köln	NW

EG tax office	Partner no.	WG tax office	Partner state
Mecklenburg-Western Pomerania (MV)			
Güstrow	1	Barmbek-Uhlenhorst	HH
Hagenow	1	Bergedorf	HH
Ludwigslust	1	Harburg	HH
Parchim	1	Wandsbeck	HH
Schwerin	1	Hansa	HH
Malchin	1	Hagen	NW
Neubrandenburg	1	Iserlohn	NW
Pasewalk	1	Siegen	NW
Waren	1	Beckum	NW
Bergen	1	Stormarn	SH
Greifswald	1	Elmshorn	SH
Ribnitz-Damgarten	1	Itzehoe	SH
Rostock	1	All tax offices in Bremen	HB
	2	Itzehoe	SH
Stralsund	1	Kiel-Süd	SH
Wismar	1	Lübeck	SH
Wolgast	1	Bad Segeberg	SH

EG tax office	Partner no.	WG tax office	Partner state	EG tax office	Partner no.	WG tax office	Partner state
Saxony (SN)				Leipzig I	1	Neu-Ulm	BY
Bautzen	1	Heidelberg	BW	Leipzig II	1	Straubing	BY
	2	Schwetzingen	BW	Leipzig III	1	Ingolstadt	BY
Bischofswerda	1	Bietigheim-Bissingen	BW	Leipzig IV	1	Deggendorf	BY
	2	Ludwigsburg	BW	Mittweida	1	Bayreuth	BY
Borna	1	Esslingen	BW	Plauen	1	Hof	BY
	2	Kirchheim	BW	Stollberg	1	Fürth	BY
Dresden I	1	Heilbronn	BW	Werdau	1	Erlangen	BY
	2	Öhringen	BW	Zwickau Land	1	Würzburg	BY
Dresden II	1	Ulm	BW	Zwickau Stadt	1	Würzburg	BY
	2	Biberach	BW				
Dresden III	1	Böblingen	BW				
	2	Leonberg	BW				
Döbeln	1	Karlsruhe	BW				
	2	Rastatt	BW				
	3	Baden-Baden	BW				
Eilenburg	1	Ravensburg	BW				
Freital	1	Villingen-Schwenningen	BW				
Grimma	1	Singen	BW				
Görlitz	1	Offenburg	BW				
Hoyerswerda	1	Heidenheim	BW				
	2	Schwäbisch Gmünd	BW				
Löbau	1	Mosbach	BW				
	2	Walldürn	BW				
	3	Sinsheim	BW				
Meißen	1	Backnang	BW				
	2	Waiblingen	BW				
	3	Schorndorf	BW				
Pirna	1	Nürtingen	BW				
	2	Reutlingen	BW				
Riesa	1	Mannheim-Stadt	BW				
	2	Mannheim-Neckarstadt	BW				
Zittau	1	Lörrach	BW				
Annaberg	1	Bamberg	BY				
Aue	1	Bamberg	BY				
Auerbach	1	Bad Neustadt/Saale	BY				
Chemnitz Land	1	Hof	BY				
Chemnitz Mitte	1	Schweinfurt	BY				
Chemnitz Süd	1	Weiden	BY				
Freiberg	1	Bayreuth	BY				
Hohenstein-Ernstthal	1	Fürth	BY				

EG tax office	Partner no.	WG tax office	Partner state	EG tax office	Partner no.	WG tax office	Partner state
Saxony-Anhalt (ST)				Salzwedel	1	Uelzen	NI
Bitterfeld	1	Herzberg	NI		2	Buchholz	NI
	2	Cloppenburg	NI		3	Lüchow	NI
	3	Delmenhorst	NI	Sangerhausen	1	Hildesheim	NI
Dessau	1	Wolfenbüttel	NI	Staßfurt	1	Burgdorf	NI
	2	Osnabrück-Stadt	NI		2	Hannover-Land II	NI
	3	Quakenbrück	NI	Stendal	1	Stade	NI
Eisleben	1	Hannover-Mitte	NI		2	Cuxhaven	NI
	2	Hannover-Land I	NI		3	Osterholz-Scharmbeck	NI
Genthin	1	Soltau	NI	Wernigerode	1	Goslar	NI
	2	Winsen (Luhe)	NI		2	Norden	NI
	3	Zeven	NI		3	Nordenham	NI
Halberstadt	1	Celle	NI	Wittenberg	1	Peine	NI
	2	Hannover-Nord	NI		2	Osnabrück-Land	NI
Haldensleben	1	Helmstedt	NI		3	Bad Bentheim	NI
	2	Aurich	NI	Zeitz	1	Bad Gandersheim	NI
	3	Emden	NI		2	Stadthagen	NI
Halle I/Halle-Süd	1	Göttingen	NI				
	2	Hannover-Süd	NI				
	3	Lingen	NI				
	4	Oldenburg	NI				
Halle II/Halle-West	1	Göttingen	NI				
	2	Westerstede	NI				
Köthen	1	Gifhorn	NI				
	2	Syke	NI				
Magdeburg I	1	Braunschweig-Wilhelmstraße	NI				
	2	Leer (Ostfriesl.)	NI				
	3	Papenburg	NI				
	4	Wilhelmshaven	NI				
Magdeburg II	1	Braunschweig-Altewiekring	NI				
	2	Hannover-Nord	NI				
	3	Rotenburg (Wümme)	NI				
	4	Wesermünde	NI				
Merseburg	1	Holzminden	NI				
	2	Alfeld (Leine)	NI				
	3	Vechta	NI				
Naumburg	1	Northeim	NI				
	2	Sulingen	NI				
	3	Verden (Aller)	NI				
Quedlinburg	1	Hameln	NI				
	2	Nienburg (Weser)	NI				
	3	Wittmund	NI				

EG tax office	Partner no.	WG tax office	Partner state
Thuringia (TH)			
Altenburg	1	Wunsiedel	BY
Gera	1	Erlangen	BY
Greiz	1	Bad Kissingen	BY
Jena	1	Coburg	BY
Rudolstadt	1	Coburg	BY
Schleiz	1	Kronach	BY
Arnstadt	1	Rotenburg a. d. Fulda	HE
	2	UnterstützungsFA Gelnhausen	HE
Eisenach	1	Kassel-Spohrstraße	HE
Erfurt I	1	Kassel-Goethestraße	HE
Erfurt II	1	Fritzlar	HE
	2	UnterstützungsFA Dillenburg	HE
Gotha	1	Bad Hersfeld	HE
	2	UnterstützungsFA Wetzlar	HE
Mühlhausen	1	Eschwege	HE
	2	UnterstützungsFA Gießen	HE
Nordhausen	1	Hofgeismar	HE
	2	UnterstützungsFA Korbach	HE
Sondershausen	1	Alsfeld	HE
	2	UnterstützungsFA Nidda	HE
Weimar	1	Fulda	HE
	2	UnterstützungsFA Hanau	HE
Worbis	1	Witzenhausen	HE
	2	UnterstützungsFA Marburg	HE
Bad Salzungen	1	Montabaur	RP
	2	Bad Neuenahr-Ahrweiler	RP
Meiningen	1	Neuwied	RP
Sonneberg	1	Bad-Kreuznach	RP
	2	Idar-Oberstein	RP
	3	Daun	RP
	4	Simmern	RP
	5	Kusel	RP
	6	Bingen	RP
Suhl	1	Koblenz	RP
	2	Altenkirchen	RP
	3	Landau	RP

Sources: Finanzministerium Baden-Württemberg (1991). Handwritten comments remove the erroneously listed Bötzow and Sternberg; Oranienburg is mistakenly missing. BB: Landesarchiv Nordrhein-Westfalen, 0728, Aufbau der Steuerverwaltung im Bundesland Brandenburg; MV: Landesarchiv Nordrhein-Westfalen, 0728, Liste der von NRW in der DDR beratenen Finanzämter und ihrer NRW-Betreuungsfinanzämter; ST: Oberfinanzdirektion Hannover, 4.12.1990, O 1002 - 1 - StH 17 (Stendal); TH: Landesarchiv Thüringen Weimar/TFM Nr. 3436 Bl 249, Kartmann/Schipanski, 2009, Hessen und Thüringen - Wege zur Partnerschaft, S. 223.

B.2 No evidence of systematic matching

A potential concern related to our identification strategy is that the West German tax administrations took into account the expected needs of the East German tax offices when forming the tax office level partnerships. We therefore investigate whether we can detect signs of systematic matching between East German tax offices and their West German partners. We explore whether East German tax offices were systematically matched to their most similar West German potential partners. We quantify the similarities using a *k*-nearest neighbors algorithm and various sets of tax office and locality characteristics.

Approach. The tax office level partnerships were determined within the federal state level partnerships. For an East German tax office, only a subset of Western tax offices were potential partners. We take this into account by looking at each East German tax office individually and assigning all potential West German partner tax offices from the respective federal partner states to them. This ensures that only actually possible partners are included in the similarity calculation.

After standardizing all variables, except from binary ones, we calculated both the Euclidean and Manhattan distance for the following characteristic sets:

- population

- population, tax office personnel

- population, firms, and their employees

- all of the above combined

For each East German tax office, distance method and characteristic set, we determined the five and ten most similar tax offices from the West German partner tax office set and compare these to the actual partnerships. We compare the number of East German tax offices that were matched with a West German tax office from the set of five or ten most similar offices to the number that we would expect under random matching without setting back. We scale the number of matches under random matching by the average number of partners per East German tax office to account for the fact that some East German tax offices had several partners. As explained in the main text, we cannot detect signs of systematic matching. Tables B.2 and B.3 document that results are similar for alternative sets of characteristics.

Table B.2: Partner similarity: population, plants, employees

	EG tax offices		WG tax offices		partner among 5 NN		partner among 10 NN	
	Total	Used	Total	Used	Random	Actual	Random	Actual
MV	16	10	155	130	0.4	0	0.8	0
SN	35	35	160	160	2.0	2	4.1	6
ST	21	21	57	57	6.4	4	12.8	10
TH	20	20	160	160	1.2	1	2.4	3

Note: Euclidean distance. Population as of 1989 (West), 1990 (East); # plants, employees as of 1989 (West), 1996 (East, earliest year available). Tax offices in MV with partners in HH or HB excluded due to missing observations.

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Table B.3: Partner similarity: population, tax office personnel, plants, employment

	EG tax offices		WG tax offices		partner among 5 NN		partner among 10 NN	
	Total	Used	Total	Used	Random	Actual	Random	Actual
MV	16	10	155	130	0.4	0	0.8	0
SN	35	35	160	160	2.0	3	4.1	7
ST	21	21	57	57	6.4	9	12.8	11
TH	20	20	160	160	1.2	3	2.4	4

Note: Euclidean distance. Population as of 1989 (West), 1990 (East); tax office personnel as of 1989/1990/1993 (West), 1990 (target tax office personnel, East); # plants, employees as of 1989 (West), 1996 (East, earliest year available). Tax offices in MV with partners in HH or HB excluded due to missing observations.

Details. When we standardize the characteristics, we consider only the East German tax offices and all potential West German partner tax offices. This ensures that the mean and standard deviation are not biased by cases that are not used for the similarity check. There are cases with exactly the same similarity. We choose a conservative approach and keep all West German tax offices in this case rather than the first five or ten observations.

C   Conceptual framework

C.1   Tax types differ in their complexity

In contrast to the self-assessed value added tax (VAT), the corporate income tax, personal income tax, and wage tax all require administrative assessment by tax officials. Assessing tax declarations for the corporate income tax and the personal income tax is the most complex assessment task for tax officials, compared to the assessment of the wage tax.

The **corporate income tax** requires profound knowledge of the tax code as each taxpayer's situation can be unique, with intricate financial structures, investments, and transactions that businesses often engage in. Corporations may have multiple revenue streams, complex asset portfolios, and diverse expense categories, all of which require thorough examination and verification, making the corporate income tax a highly demanding area for tax officials.

The **personal income tax** involves a wide range of deductions, exemptions, and varying sources of income that must be accounted for. Similar to the corporate income tax, assessing personal income tax declarations requires case-by-case decisions.

The **wage tax** is a withholding tax on employment income, deducted directly from an employee's wages or salary by the employer and paid to the tax authorities on the employee's behalf. The employer deducts the wage tax from the total earnings of all employees and remits it to the appropriate tax office on specific due dates together with a standardized payroll tax declaration to the tax office. Due to its high level of standardization, the determination of wage tax is considerably less complex than the corporate and personal income taxes are.

C.2   Objection handling is informative

The federal state of Saxony-Anhalt records both the type of objection resolution (rejection, approval, or court decision) and the outcome from the taxpayer's perspective (fully unsuccessful, partly successful, or fully successful). The figure below shows that unsuccessful objections from the taxpayer's perspective are usually rejected by the tax office, while partly or fully successful objections are usually granted by the tax office.

Figure C.1: Type of objection resolution indicates objection success from the taxpayer's perspective
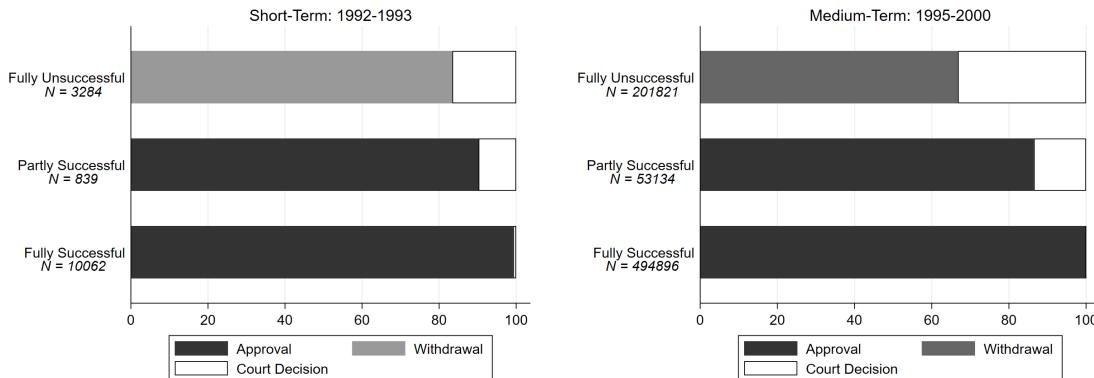
Notes: The figure illustrates the percentage of objections resolved through rejections, approval, and court decision, distinguishing between objections that are fully unsuccessful, partly successful, or fully successful from the taxpayer's perspective. All objections are from Saxony-Anhalt.

C.3 Composition of capacity-building measures

German civil service positions belong to tiers that differ in their entry conditions and pay. The Lower Service (*Einfacher Dienst*, pay grades A1-A6) requires basic school education. The Intermediate Service (*Mittlerer Dienst*, pay grades A6-A9) requires vocational training. The Upper Intermediate Service (*Gehobener Dienst*, pay grades A9-A13) requires studies at specialized Universities of Applied Sciences for Public Administration. The Higher Service (*Höherer Dienst*, pay grades A13-A16) requires a university degree, often in legal studies. Only tax officials from the Intermediate, Upper Intermediate, and Higher Service participated in capacity building.

Table C.1: Little correlation of IVs and composition of capacity-building measures

	City level		
	Highest	Higher interm.	Intermediate
	(1)	(2)	(3)
Mean real financial incentive (in sqm land)	−0.008	−0.026	0.036
	(0.031)	(0.046)	(0.032)
Mean distance to partner (in km)	0.000*	−0.000	−0.000*
	(0.000)	(0.000)	(0.000)
Relative tax office size	−0.004	0.003	−0.000
	(0.015)	(0.016)	(0.014)
Constant	0.152**	0.543***	0.298***
	(0.057)	(0.058)	(0.067)
Number of Observations	90	90	90
R^2	0.176	0.047	0.219

Notes: The table documents that our IVs financial incentive and relative tax office size are uncorrelated with the composition of capacity-building measures by qualification, and the IV distance is only correlated with the share of officials in the highest and intermediate tiers. *Dependent variable:* share of days of capacity building provided by officials in the highest (col. 1), higher intermediate (col. 2) and intermediate (col. 3) tiers. *Independent variables*: daily financial incentive for West German tax officials (in square meters of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Average incentive, distance, and relative size for East German tax offices with several partner tax offices. All columns estimated at city level.

Figure C.2: Financial incentive uncorrelated with composition of capacity building

(a) Higher   (b) Higher intermediate   (c) Intermediate
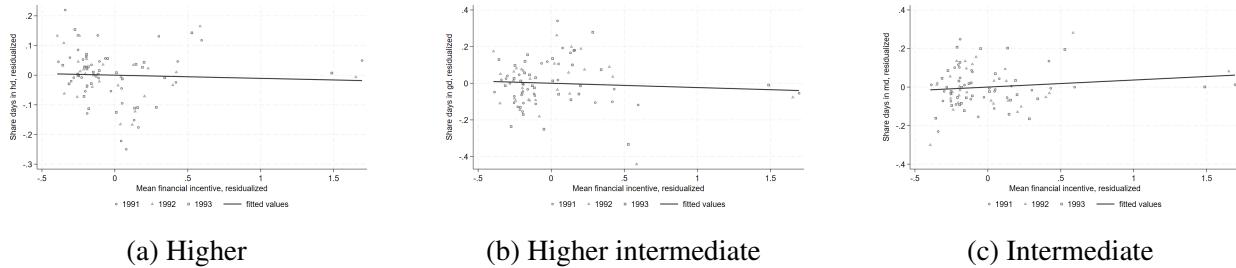
The figure shows that the real financial incentive is uncorrelated with the share of days of capacity-building measures in the higher (a), higher intermediate (b) and intermediate (c) service tier. Variables are residualized, using distance, relative tax office size and year fixed effects as covariates.

Figure C.3: Distance uncorrelated with higher intermediate share

| (a) Higher | (b) Higher intermediate | (c) Intermediate |
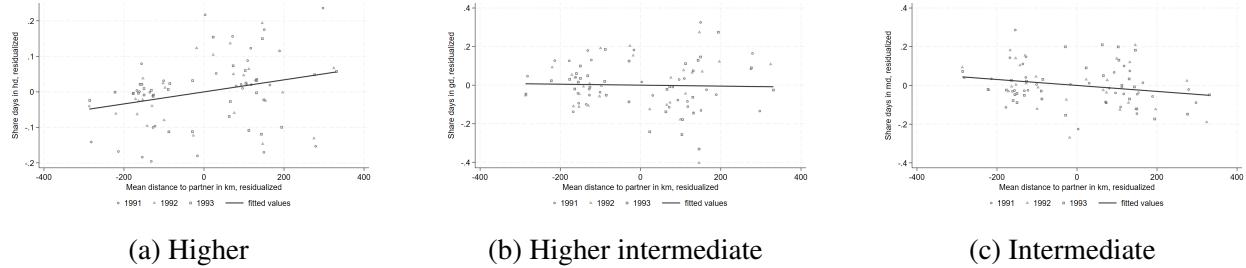
The figure shows that the distance between tax offices is uncorrelated with the share of days of capacity-building measures in the higher intermediate (b) service tier. It is slightly positively correlated with the share of days in the higher tier (a) and slightly negatively correlated with the share of days in the intermediate tier (c). Variables are residualized, using the real financial incentive, relative tax office size and year fixed effects as covariates.

Figure C.4: Relative tax office size uncorrelated with composition of capacity building

| (a) Higher | (b) Higher intermediate | (c) Intermediate |
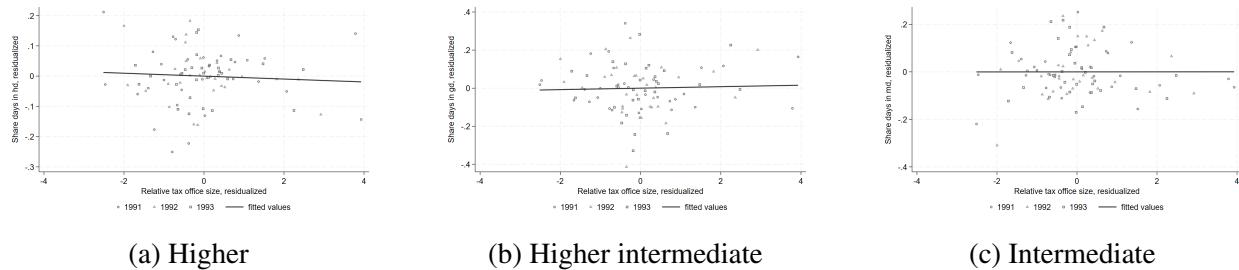
The figure shows that the relative tax office size is uncorrelated with the share of days of capacity-building measures in the higher (a), higher intermediate (b) and intermediate (c) service tier. Variables are residualized, using the real value of the financial incentive, distance, and year fixed effects as covariates.

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C.4 Placebo test

Table C.2: Likelihood of pre-reunification requests to administration uncorrelated with our instruments

	# of requests per EG inhabitant	
	1989	1988
	(1)	(2)
Mean real financial incentive (in sqm land)	0.000	−0.003
	(0.004)	(0.003)
Mean distance to partner (in km)	0.000	0.000
	(0.000)	(0.000)
Relative tax office size	−0.001	0.000
	(0.001)	(0.001)
Constant	0.016***	0.012***
	(0.006)	(0.005)
EG fixed effect	✓	✓
Number of Observations	52	58
R^2	0.182	0.219
F-statistic	1.399	1.997

Notes: The table documents that the likelihood of complaints and requests directed toward the general administration prior to reunification is uncorrelated with our instrument. *Dependent variable:* number of letters directed to the administration per East German inhabitant. The statistics on the number of letters partly span multiple years in the Potsdam Grievance Statistics File; in these cases, we break down the data by year, under the assumption that letters are evenly distributed over time. *Independent variables*: average daily financial incentive for West German tax officials 1990–93 (in sqm of building land), distance between West and East German partner tax offices, average relative size of West and East German partner tax offices 1990–93. Average incentive, distance, and relative size for East German tax offices with several partner tax offices. All columns estimated at the level of the tax office.

Sample: The Potsdam Grievance Statistics File (Class et al., 2018) contains letters for a subsample of East German districts (*Kreise*), which we matched to tax office districts. The estimation sample contains all East German tax offices in 1988 and 1989, respectively, whose tax office districts are fully covered by the Grievance files.

D Descriptives

Figure D.1: Capacity building over time, OLS sample
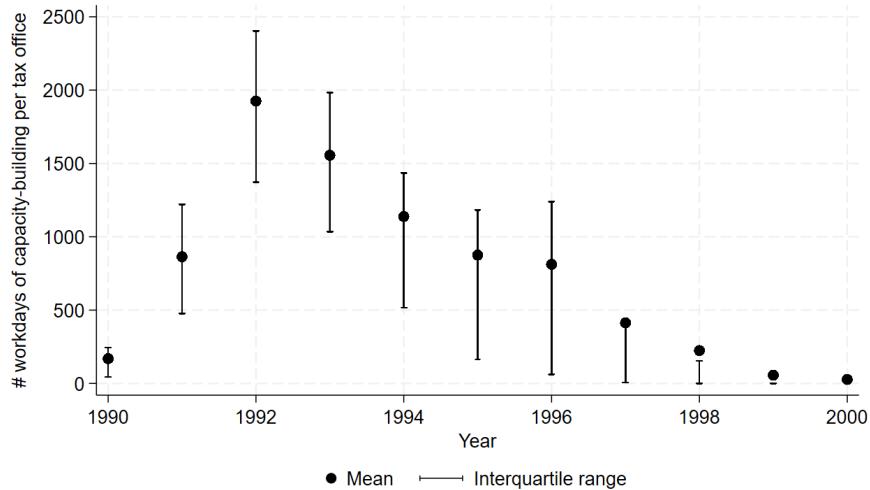
(a) Panel A: Number of days, by year
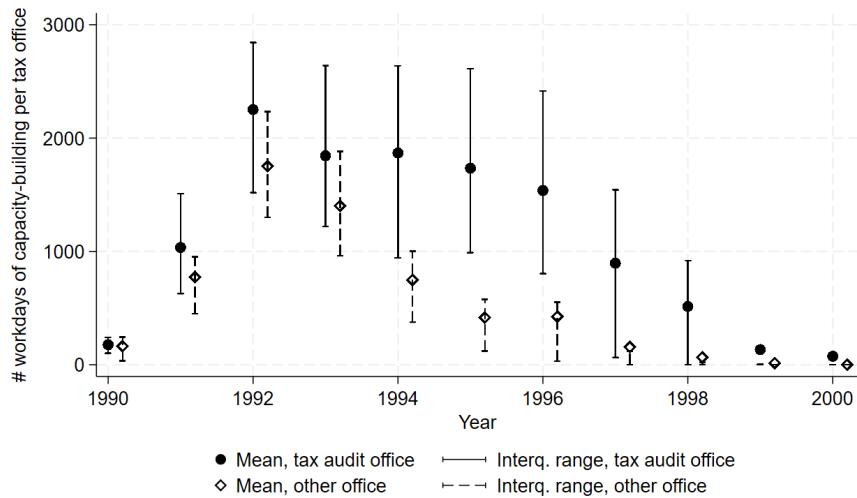
(b) Panel B: Number of days, by year and audit unit

This figure plots the mean and interquartile range of the amount of the capacity-building measures per East-German tax office over time. Panel A pools statistics across all tax offices; Panel B provides statistics separately for tax offices with and without unit for external tax audits. The figure includes tax offices in our OLS sample, i.e., offices in Brandenburg, Mecklenburg-Western Pomerania, Saxony and Thuringia.

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Table D.1: Summary statistics, OLS sample

	1992–1993		1995–2000	
	Mean	SD	Mean	SD
Capacity-building measures				
# days per FTE, same year	13.942	7.158	.	.
# days per FTE, 1990-93	.	.	27.876	11.203
Performance measures				
# cases assessed per employee				
all tax types (weighted)	263.226	98.470	402.233	80.302
corporate income tax	2.663	2.118	7.074	3.143
personal income tax	35.174	16.205	60.707	17.626
wage tax	136.711	52.908	172.571	43.082
# objections per employee				
raised	15.718	11.339	29.771	10.477
rejected	2.487	1.526	6.620	2.051
granted	9.981	8.810	16.967	5.791
Instruments and controls				
Mean financial incentive (in sqm land)	0.603	0.442	0.616	0.469
Mean distance to partner (in km)	283.359	162.276	285.317	162.356
Relative tax office size	2.043	1.047	2.209	1.121
Audit unit (0/1)			0.252	0.435
Population (in thsd.)	132.851	74.544	135.724	72.677
Observations	174		448	

Summary statistics, OLS sample. No information on financial incentive and relative tax office size for tax offices partnered with Hamburg and Bremen. The number of observations is lower for corporate income tax (CIT) cases assessed (1992–93: 142; 1995–2000: 356) as only a subset of tax offices in Thuringia is responsible for CIT. For the number of filed objections per employee, the number of observations is reduced in 1992–1993 (153) due to missing data for Brandenburg (1992) and in 1995–2000 (386) due to missing data for Brandenburg (1995/96) and Thuringia (1995–1997, 2000). The sample size is further reduced for rejected and granted objections per employee, owing to missing data on objection outcomes for Brandenburg in 1997–1999.

E Results

E.1 Robustness: Output quantity

Table E.1: Stronger effects for urban than rural tax offices

	Log # of tax declarations per FTE			
	Rural offices	Urban offices	Rural offices	Urban offices
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
# days per FTE, same year	0.008***	0.012***	0.009***	0.018***
	(0.002)	(0.004)	(0.002)	(0.005)
Log population	0.191***	−0.020	0.164***	0.027
	(0.056)	(0.058)	(0.051)	(0.055)
Constant	2.817***	5.189***	3.292***	4.809***
	(0.651)	(0.722)	(0.604)	(0.674)
EG state trend	✓	✓	✓	✓
# observations	132	42	90	30
R^2	0.872	0.894	0.904	0.916
P-value coeff. equal		0.423		0.047

Notes: The table shows that OLS results are stronger for urban than rural tax offices, significantly so for the IV sample. *Dependent variable*: log number of declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, federal-state-specific time trends. OLS results.
Sample: OLS sample in columns 1–2, IV sample in columns 3–4. Years: 1992–1993 (short-term effects).

Table E.2: Robustness of output quantity estimates to the location of EG tax office in former Prussia

| | Log # of tax declarations per FTE | | | | |
| | OLS sample | | IV sample | | |
	(1)	(2)	(3)	(4)	(5)
# days per FTE, same year	0.009***	0.008***	0.011***	0.011***	0.017***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.006)
EG tax office in former Prussia	0.055[+]	0.015	0.018	0.040	0.024
	(0.039)	(0.049)	(0.037)	(0.044)	(0.035)
# days per FTE $\times$ EG office in Prussia		0.003		−0.002	
		(0.004)		(0.005)	
Log population	0.130***	0.126***	0.112***	0.114***	0.133***
	(0.038)	(0.038)	(0.036)	(0.036)	(0.039)
Constant	3.449***	3.486***	3.888***	3.862***	3.566***
	(0.444)	(0.437)	(0.430)	(0.426)	(0.505)
EG state trend	✓	✓	✓	✓	✓
# observations	174	174	120	120	120
Share EG offices in former Prussia	0.402	0.402	0.233	0.233	0.233
R^2	0.865	0.866	0.895	0.895	
F-statistic					15.583

Notes: The table documents that the estimates on output quantity, as reported in Table 6, are robust to controlling for location of the EG tax office in former Prussia. *Dependent variable*: number of declarations assessed per East German tax office employee and year (in logs). *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population. Columns 1–4: OLS results; column 5: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices.
Sample: OLS sample (columns 1–2), IV sample (columns 3–5). Years: 1992–1993.

Table E.3: Robustness of output quantity estimates to normalization using a broader labor-supply measure (including capacity-building days)

	Log # of tax declarations per FTE					
	Short-term			Long-term		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
# days per FTE, same year	0.005**	0.007***	0.013**			
	(0.002)	(0.002)	(0.006)			
# days per FTE, 1990-93				-0.001	-0.000	0.001
				(0.001)	(0.001)	(0.003)
Audit unit (0/1)				-0.211***	-0.243***	-0.236***
				(0.033)	(0.036)	(0.040)
Log population	0.131***	0.112***	0.134***	0.078*	0.078*	0.088**
	(0.040)	(0.037)	(0.040)	(0.041)	(0.040)	(0.044)
Constant	3.495***	3.892***	4.250***	5.114***	5.060***	5.100***
	(0.465)	(0.437)	(0.487)	(0.498)	(0.475)	(0.554)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	174	120	120	448	326	326
R^2	0.867	0.897		0.355	0.408	
F-statistic			15.683			8.415

Notes: The table documents that the estimates on output quantity, as reported in Table 6, are robust to normalization with a broader labor-supply measure (including capacity-building days). *Dependent variable*: number of declarations assessed per East German tax office employee and year (in logs). *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.4: Robustness of output quantity estimates to including the distance to the inner-German border

	Log # of tax declarations per FTE					
	Short-term			Long-term		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
# days per FTE, same year	0.009***	0.011***	0.018**			
	(0.002)	(0.002)	(0.007)			
# days per FTE, 1990-93				-0.001	-0.001	-0.001
				(0.001)	(0.001)	(0.003)
Audit unit (0/1)				-0.198***	-0.228***	-0.233***
				(0.033)	(0.036)	(0.042)
Log population	0.130***	0.112***	0.140***	0.077*	0.073*	0.066
	(0.039)	(0.037)	(0.044)	(0.040)	(0.039)	(0.041)
Distance to inner-German border (km)	0.000	-0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	3.473***	3.902***	4.159***	5.202***	5.167***	5.412***
	(0.468)	(0.456)	(0.552)	(0.496)	(0.472)	(0.533)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	174	120	120	448	326	326
R^2	0.864	0.895		0.342	0.385	
F-statistic			9.496			7.018

Notes: The table documents that the estimates on output quantity, as reported in Table 6, are robust to controlling for the distance to the inner-German border. *Dependent variable*: number of declarations assessed per East German tax office employee and year (in logs). *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, airline distance to the inner-German border (in km), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.

Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.5: Sample robustness of long-term effects on output quantity

	Log # of tax declarations per FTE		
	OLS	OLS	IV
	(1)	(2)	(3)
# days per FTE, 1990-93	-0.000	0.000	0.000
	(0.001)	(0.001)	(0.003)
Audit unit (0/1)	-0.191***	-0.216***	-0.215***
	(0.030)	(0.033)	(0.035)
Log population	0.069**	0.065*	0.068*
	(0.035)	(0.034)	(0.040)
Constant	5.226***	5.208***	5.332***
	(0.422)	(0.410)	(0.518)
EG state trend	✓	✓	✓
Number of Observations	524	402	402
R^2	0.357	0.432	
F-statistic			6.306

Notes: The table shows the robustness of our main results on long-term output quantity, as reported in Table 6, to the inclusion of Saxony-Anhalt (estimation equation (4)). Data on tax declarations assessed for Saxony-Anhalt is only available starting in 1997 so that we focus on long-term effects. *Dependent variable*: log number of declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, presence of a unit for external company audits, federal-state-specific time trends. Columns 1, 2: OLS results; column 3: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices. Aggregate capacity-building measures instrumented with average values in years 1990–93.
Sample: IV sample, additionally including Saxony-Anhalt; column 1 additionally includes Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen. Years: 1995–2000 (long-term effects). Information on tax offices in Saxony-Anhalt only available in 1997–2000.

Table E.6: Robustness of output quantity estimates using federal allowance recommendations

	Log # of tax declarations per FTE	
	Short-term	Long-term
	IV	IV
	(1)	(2)
# days per FTE, same year	0.016***	
	(0.006)	
# days per FTE, 1990-93		0.001
		(0.003)
Audit unit (0/1)		-0.220***
		(0.038)
Log population	0.133***	0.085**
	(0.040)	(0.043)
Constant	4.257***	5.124***
	(0.489)	(0.542)
EG state trend	✓	✓
Number of Observations	120	326
R^2		
F-statistic	15.400	8.199

Notes: The table demonstrates the robustness of the tax office output quantity results, as reported in Table 6, with respect to the used financial incentive instrument. The federal government issued a recommendation for monthly allowances by rank of public civil servants. Instead of using federal-state specific financial incentives as in the main regressions, we use the real value of this recommendation as an instrument (estimation equation (4)). *Dependent variable*: log number of declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Both columns: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials recommended by the federal government (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample. Years: 1992–1993 (column 1, short-term effects) and 1995–2000 (column 2, long-term effects).

Table E.7: Robustness of output quantity estimates with respect to level of aggregation

	Log # of tax declarations per FTE					
	Short-term			Long-term		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
# days per FTE, same year	0.009***	0.012***	0.017***			
	(0.002)	(0.002)	(0.005)			
# days per FTE, 1990-93				0.001	0.001	0.000
				(0.001)	(0.001)	(0.003)
Audit unit (0/1)				-0.234***	-0.267***	-0.271***
				(0.044)	(0.050)	(0.052)
Log population	0.187***	0.191***	0.222***	0.142***	0.137**	0.126**
	(0.043)	(0.039)	(0.048)	(0.052)	(0.053)	(0.060)
Constant	2.831***	2.969***	3.217***	4.363***	4.369***	4.674***
	(0.505)	(0.476)	(0.581)	(0.628)	(0.626)	(0.744)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	184	130	130	478	356	356
R^2	0.868	0.897		0.340	0.390	
F-statistic			17.248			10.712

Notes: The table demonstrates the robustness of the tax office output quantity results, as reported in Table 6, with respect to the level of aggregation. While the regressions are at the city level in the main text, this table reports the results of regressions at the level of the individual tax offices (estimation equation (4)). *Dependent variable*: log number of declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, log population, presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by tax office in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.8: Robustness of output quantity estimates to the exclusion of restructured tax offices

	Log # of tax declarations per FTE		
	OLS (1)	OLS (2)	IV (3)
# days per FTE, 1990-93	-0.001	-0.000	-0.002
	(0.001)	(0.001)	(0.002)
Audit unit (0/1)	-0.197***	-0.222***	-0.233***
	(0.031)	(0.035)	(0.035)
Log population	0.112***	0.100**	0.086**
	(0.040)	(0.038)	(0.040)
Constant	4.757***	4.818***	5.190***
	(0.504)	(0.461)	(0.503)
EG state trend	✓	✓	✓
Number of Observations	412	306	306
R^2	0.386	0.430	
F-statistic			8.152

Notes: The table documents that the estimates on output quantity, as reported in Table 6, are robust to the exclusion of restructured tax offices. In the short term, no tax offices were restructured so that the table only displays the long-term estimates (estimation equation (4)). *Dependent variable*: number of declarations assessed per East German tax office employee and year (in logs). *Independent variables*: number of work-days of capacity-building measures per East German tax office employee, presence of a unit for external company audits (only long-term analyses), log population. Columns 1, 2: OLS results; column 3: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices. Aggregate capacity-building measures instrumented with average values in years 1990–93.
Sample: IV sample, excluding all tax offices that underwent any restructuring (merger, closure, take-over) in the considered or previous year(s); column 1, 4 additionally includes Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1995–2000 (long-term effects).

Table E.9: Absence of long-term output quantity differences, by tax type

	Log # of declarations per FTE		
	OLS (1)	OLS (2)	IV (3)
Panel A: Corporate income tax			
# days per FTE, 1990-93	0.002	0.001	0.001
	(0.002)	(0.003)	(0.003)
EG state trend	✓	✓	✓
Number of Observations	356	234	234
R^2	0.708	0.799	
F-statistic			8.508
Panel B: Personal income tax			
# days per FTE, 1990-93	0.001	0.002	0.004
	(0.001)	(0.001)	(0.004)
EG state trend	✓	✓	✓
Number of Observations	496	356	356
R^2	0.621	0.570	
F-statistic			11.456
Panel C: Wage tax			
# days per FTE, 1990-93	-0.001	-0.001	-0.003
	(0.002)	(0.002)	(0.004)
EG state trend	✓	✓	✓
Number of Observations	496	356	356
R^2	0.251	0.296	
F-statistic			11.456

Notes: The table shows the absence of long-term quantity differences across tax types (estimation equation (4)). *Dependent variables*: log number of declarations assessed per East German tax office employee and year. The corporate income tax (CIT) is more complex than the personal income tax (PIT), and PIT is more complex than the wage tax (WT), see Appendix C.1. Only a subset of tax offices has CIT responsibilities in Thuringia, resulting in a lower number of observations in panel A. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee; unreported: presence of a unit for external company audits, log population, federal-state-specific time trends. Columns 1, 2: OLS results; column 3: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices. Aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses. *Sample:* IV sample; column 1 additionally includes Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1995–2000 (long-term effects).

E.2 Returns to capacity building

To assess the return on investment of the capacity-building measures, we follow a three-step approach for each of the years 1992 and 1993. First, we estimate the impact of a one-year secondment on the number of tax declarations assessed in an East German tax office. Second, we determine the average number of tax declarations assessed by a typical tax official in West Germany. Third, we compare these figures to compute the magnitude of the returns to capacity building. Additionally, in a supplementary analysis, we incorporate a fourth step, accounting for the costs associated with the financial incentive. Below, we outline the calculations for each step.

1. Capacity-building impact on tax declarations in East Germany

- In 1992 (1993), the average East German tax office assessed 173.22 (367.13) tax declarations.
- Using the short-term estimate (IV, Table 6) of the impact of capacity-building on output quantity, we calculate that each additional day of capacity-building per full-time equivalent (FTE) increases the number of tax declarations assessed by 2.77 declarations per FTE (=0.016 x 173.22 declarations) in 1992 and 5.87 declarations per FTE in 1993.
- The average size of an East German tax office (L_t) in 1992 (1993) is 137.37 and 157.95 FTEs, respectively.
- In the average tax office, an additional secondment year with 260 working days increases the number of capacity-building days per FTE ($\#days/L_i$) by 1.89 (=260 days/137.37 FTE) in 1992 (1.65 in 1993).
- In an average East German tax office, this corresponds to an increase in the number of tax declarations assessed per head by 5.24 in 1992 (1993: 9.69).
- This corresponds to an overall increase of 720 (1,531) tax declarations assessed in 1992 (1993) for the average East German tax office.

2. Counterfactual average number of tax declarations assessed per FTE in West Germany

- In West Germany, tax offices collectively assessed 150,090 corporate income tax declarations, 17,436,286 wage tax and personal income tax declarations, and processed 327,460 profit determinations (Bundesministerium der Finanzen, 1999).
- To ensure consistency with the aggregation method used for East Germany, we must separate wage tax and personal income tax declarations, as they differ in complexity and processing time for tax officials. Using micro data from the 1998 personal income tax statistics (accessible via the Research Data Centers of the German Statistical Offices: https://www.forschungsdatenzentrum.de/en), we determine that 52.56% of cases are pure wage tax declarations, while the remaining 47.44% are personal income tax declarations. Based on this breakdown, the total number of tax declarations in West Germany, expressed in terms of wage tax declarations, is 37,789,303 (see Section 3 in the Data Appendix).
- In 1990, prior to German reunification, West German tax offices employed 75,876 FTEs, calculated as the average of 75,571 staff on January 1, 1990, and 76,181 staff on December 31, 1990, (Bundesministerium der Finanzen, 1991, Blatt 4 (Finanzämter)).
- Based on these figures, the average number of tax declarations assessed per FTE was 498.

3. Returns to capacity building

- We calculate the returns to capacity building by comparing the additional tax declarations assessed in East Germany to the foregone tax declarations in West Germany. This yields a multiplier of 1.45 in 1992 (= 720/498) and 3.07 in 1993 (= 1,531/498).

4. Accounting for the costs of financial incentives

- The most common pay rank among West German tax officials was A11 in 1990 (Bundesministerium der Finanzen, 1991, Blatt 4 (Finanzämter)).

- Financial incentives varied across federal states. To ensure a conservative estimate, we base our calculations on the financial incentive provided by the federal government, which served as the upper benchmark for state-level incentives. In 1992, the federal financial incentive for pay rank A11 was DM 1,460 per month, amounting to DM 17,520 per year. In 1993, the corresponding figures were DM 1,300 per month and DM 15,600 per year.

- These financial incentives represented 31% of the total wage for an A11-ranked official with mid-level seniority in 1992, and 27% in 1993.

- To incorporate these costs, we adjust the foregone number of tax declarations in West Germany. Specifically, we assume that a seconded tax official, receiving 1.31 (1992) or 1.27 times (1993) the basic salary, would have assessed 1.31 (1992) or 1.27 times (1993) the average number of tax declarations assessed per FTE in West Germany.

- Adjusting for these higher costs results in a cost-adjusted multiplier of 1.1 for 1992 (= 720/(1.31 x 498)) and 2.4 for 1993 (= 1,531/(1.27 x 498)).

E.3 Robustness: output quality

Table E.10: Stronger effects of salary-weighted capacity-building measures on long-term output quality (Saxony)

	Quality (long-term)	
	Observed	Weighted
	(1)	(2)
# days per FTE, 1990–93	−0.224**	
	(0.092)	
# days per FTE, 1990–93, weighted		−0.267**
		(0.108)
Number of Observations	176	176
R^2	0.358	0.383

Notes: The table shows that long-term effects on output quality are stronger if capacity-building measures are weighted with the salary of the seconded tax officials. *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, unweighted (column 1), salary-weighted (column 2), population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. OLS results. $^+$ $p < .20$. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: Saxony, 1995–2000.

Table E.11: Robustness of output quality estimates to the location of EG tax office in former Prussia

| | # of objections per FTE | | | | |
| | OLS sample | | IV sample | | |
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	IV (5)
# days per FTE, 1990–93	−0.178**	−0.125*	−0.156**	−0.173**	−0.190+
	(0.072)	(0.069)	(0.075)	(0.079)	(0.118)
EG tax office in former Prussia	−2.610+	3.605	−1.370	−5.052	−1.441
	(1.624)	(4.831)	(1.559)	(5.601)	(1.520)
# days per FTE × EG o. in Prussia		−0.238+		0.150	
		(0.166)		(0.192)	
Population (in thsd.)	0.017**	0.020***	0.022***	0.022***	0.021***
	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)
Audit unit (0/1)	−4.255**	−4.322***	−5.767***	−5.729***	−5.980***
	(1.641)	(1.576)	(1.735)	(1.741)	(1.656)
EG state trend	✓	✓	✓	✓	✓
# observations	386	386	276	276	276
Share EG offices in former Prussia	0.388	0.388	0.233	0.233	0.233
R^2	0.653	0.661	0.433	0.436	
F-statistic					12.870

Notes: The table documents that the long-term estimates on output quality, as reported in Table 8, are robust to controlling for location of the EG tax office in former Prussia. *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures in 1990–93 per East German tax office employee, indicator for location of East German tax office in former Prussia, interaction of capacity-building measures and Prussia indicator, population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. Columns 1–4: OLS results; column 5: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices, all average values in years 1990–93. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: OLS sample (columns 1–2), IV sample (columns 3–5). Years: 1995–2000.
P-value for capacity-building measures in column 5: 10.9%.

Table E.12: Robustness of output quality estimates to the location of EG tax office in former Prussia (objection outcomes)

	# of objections granted per FTE			# of objections rejected per FTE		
	OLS	OLS	IV	OLS	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
# days per FTE, 1990–93	−0.109**	−0.126**	−0.111$^+$	−0.027*	−0.040**	−0.080***
	(0.045)	(0.049)	(0.085)	(0.016)	(0.019)	(0.031)
EG tax office in former Prussia	−2.013*	−1.336	−1.305	0.125	0.352	0.269
	(1.150)	(1.192)	(1.134)	(0.484)	(0.472)	(0.448)
EG state trend	✓	✓	✓	✓	✓	✓
# observations	330	276	276	330	276	276
Share EG offices in former Prussia	0.381	0.233	0.233	0.381	0.233	0.233
R^2	0.486	0.436		0.537	0.545	
F-statistic			12.870			12.870

Notes: The table documents that the long-term estimates on output quality, as reported in Table 9, are robust to controlling for location of the EG tax office in former Prussia. *Dependent variable*: number of objections granted (columns 1–3) or rejected (columns 4–6) per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures in 1990–93 per East German tax office employee, indicator for location of East German tax office in former Prussia, population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; column 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices, all average values in years 1990–93. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: OLS sample (columns 1, 4), IV sample (columns 2–3, 5–6). Years: 1995–2000.

Table E.13: Robustness of output-quality estimates to the normalization choice

| | # of objections per 1,000 declarations assessed | | | | | |
| | Short-term | | | Long-term | | |
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	-0.437	-0.668	-0.628			
	(0.334)	(0.421)	(0.741)			
# days per FTE, 1990-93				-0.296**	-0.383***	-0.577***
				(0.127)	(0.135)	(0.219)
Audit unit (0/1)				2.889	1.742	0.563
				(3.133)	(3.328)	(3.304)
Population (in thsd.)	0.029	0.023	0.023	0.038***	0.037***	0.031**
	(0.019)	(0.021)	(0.021)	(0.014)	(0.013)	(0.014)
Constant	87.637***	40.478***	72.804***	133.118***	58.410***	82.911***
	(7.365)	(7.976)	(12.879)	(6.267)	(5.352)	(7.277)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	153	120	120	337	246	246
R^2	0.344	0.257		0.810	0.531	
F-statistic			15.637			10.117

Notes: This table shows that the output–quality estimates in Table 8 are robust to alternative normalizations of the dependent variable (estimation equation (5)). *Dependent variable*: number of objections raised per 1,000 tax declarations assessed in the same year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. * $p < .10$, ** $p < .05$, *** $p < .01$.

Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects). The sample is smaller than in Table 8 because declaration counts are unavailable for Mecklenburg–Western Pomerania in 1998–2000.

Table E.14: Robustness of objection-outcome estimates to the normalization choice

| | # of objections per 1,000 declarations assessed | | | | | |
| | Short-term | | | Long-term | | |
	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
Panel A: Objections granted						
# days per FTE, same year	−0.295	−0.373	−0.484			
	(0.255)	(0.337)	(0.644)			
# days per FTE, 1990-93				−0.223**	−0.286***	−0.317*
				(0.092)	(0.098)	(0.174)
R^2	0.347	0.221		0.632	0.489	
F-statistic			15.637			10.117
Panel B: Objections rejected						
# days per FTE, same year	−0.076**	−0.075**	−0.139$^+$			
	(0.030)	(0.036)	(0.089)			
# days per FTE, 1990-93				−0.064**	−0.091**	−0.184***
				(0.030)	(0.036)	(0.059)
R^2	0.518	0.441		0.630	0.545	
F-statistic			15.637			10.117
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	153	120	120	282	246	246

Notes: This table shows that our estimates on the outcome of objections in Table 9 are robust to alternative normalizations of the dependent variable (estimation equation (5)). *Dependent variable*: number of objections granted (panel A) and number of objections rejected (panel B), per 1,000 tax declarations assessed in the same year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, unreported: presence of a unit for external company audits (years 1995–2000), population (in thds.), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.

Sample: IV sample; columns 1, 4 include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Fewer observations than in Table 8 due to missing values for the composition of objections in Brandenburg in years 1997–1999 ($N = 19$ in 1997/1998, $N = 18$ in 1999). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects). The sample is smaller than in Table 8 because declaration counts are unavailable for Mecklenburg–Western Pomerania in 1998–2000.

Table E.15: Robustness of output quality estimates to including the distance to the inner-German border

	# of objections per FTE					
	Short-term			Long-term		
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	-0.027 (0.101)	-0.050 (0.131)	0.074 (0.273)			
# days per FTE, 1990-93				-0.218*** (0.081)	-0.167** (0.081)	-0.276* (0.141)
Audit unit (0/1)				-4.279** (1.637)	-5.732*** (1.741)	-6.411*** (1.791)
Population (in thsd.)	0.016** (0.007)	0.013* (0.007)	0.015** (0.006)	0.016** (0.007)	0.022*** (0.005)	0.019*** (0.006)
Distance to inner-German border (km)	0.002 (0.009)	-0.001 (0.011)	0.002 (0.011)	-0.031** (0.012)	-0.011 (0.011)	-0.016 (0.012)
Constant	25.887*** (2.292)	6.490** (2.609)	24.302*** (3.922)	58.301*** (4.897)	24.610*** (3.982)	36.617*** (4.558)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	153	120	120	386	276	276
R^2	0.537	0.456		0.666	0.433	
F-statistic			9.894			13.149

Notes: The table documents that the long-term estimates on output quality, as reported in Table 8, are robust to controlling for the distance to the inner-German border. *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), airline distance to the inner-German border (in km), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.16: Sample robustness of long-term effects on output quality

| | # of objections per FTE | | | | | |
| | Short-term | | | Long-term | | |
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	-0.016 (0.082)	-0.023 (0.102)	0.084 (0.256)			
# days per FTE, 1990-93				-0.104* (0.060)	-0.079 (0.064)	-0.166$^+$ (0.118)
Audit unit (0/1)				-3.915*** (1.471)	-5.254*** (1.524)	-5.712*** (1.433)
Population (in thsd.)	0.016*** (0.006)	0.014** (0.006)	0.015*** (0.005)	0.018** (0.007)	0.023*** (0.006)	0.020*** (0.007)
Constant	25.962*** (1.891)	5.902*** (1.752)	24.298*** (3.964)	49.756*** (3.572)	20.742*** (2.655)	33.213*** (3.590)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	172	139	139	481	371	371
R^2	0.551	0.467		0.697	0.716	
F-statistic			9.060			8.496

Notes: The table shows the robustness of our main results on output quality, as reported in Table 8, to the inclusion of Saxony-Anhalt (estimation equation (5)). *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. $^+$ $p < .20$. * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample additionally including Saxony-Anhalt; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen. Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.17: Robustness of output quality estimates using federal allowance recommendations

	# of objections per FTE	
	Short-term	Long-term
	IV	IV
	(1)	(2)
# days per FTE, same year	0.012	
	(0.264)	
# days per FTE, 1990-93		-0.207*
		(0.121)
Audit unit (0/1)		-6.001***
		(1.627)
Population (in thsd.)	0.014**	0.021***
	(0.007)	(0.007)
Constant	24.936***	34.163***
	(4.273)	(3.955)
EG state trend	✓	✓
Number of Observations	120	276
R^2		
F-statistic	15.680	20.794

Notes: The table demonstrates the robustness of the tax office quality results, as reported in Table 8, with respect to the used financial incentive instrument. The federal government issued a recommendation for monthly allowances by rank of public civil servants. Instead of using federal-state specific financial incentives as in the main regressions, we use the real value of this recommendation as an instrument (estimation equation (5)). *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Both columns: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials recommended by the federal government (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by city in parentheses.
* $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample. Years: 1992–1993 (column 1, short-term effects) and 1995–2000 (column 2, long-term effects).

Table E.18: Robustness of output quality estimates with respect to level of aggregation

| | # of objections per FTE | | | | | |
| | Short-term | | | Long-term | | |
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, same year	-0.030 (0.095)	-0.037 (0.130)	-0.031 (0.244)			
# days per FTE, 1990-93				-0.053 (0.056)	-0.103^{+} (0.062)	-0.147^{+} (0.105)
Audit unit (0/1)				-4.873*** (1.350)	-6.084*** (1.410)	-6.321*** (1.303)
Population (in thsd.)	0.044** (0.021)	0.043^{+} (0.031)	0.043^{+} (0.030)	0.085*** (0.012)	0.077*** (0.017)	0.071*** (0.023)
Constant	22.856*** (3.277)	2.774 (4.629)	21.529*** (6.475)	37.549*** (3.468)	15.515*** (3.244)	26.760*** (5.305)
EG state trend	✓	✓	✓	✓	✓	✓
Number of Observations	163	130	130	408	306	306
R^2	0.546	0.471		0.650	0.465	
F-statistic			16.993			13.832

Notes: The table demonstrates the robustness of the tax office quality results, as reported in Table 8, with respect to the level of aggregation. While the regressions are at the city level in the main text, this table reports the results of regressions at the level of the individual tax offices (estimation equation (5)). *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1, 2, 4, 5: OLS results; columns 3, 6: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. Contemporaneous capacity-building measures instrumented with contemporaneous variables, aggregate capacity-building measures instrumented with average values in years 1990–93. Standard errors clustered by tax office in parentheses. $^{+}$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample; columns 1, 4 additionally include Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1992–1993 (columns 1–3, short-term effects) and 1995–2000 (columns 4–6, long-term effects).

Table E.19: Robustness of output quality estimates to the exclusion of restructured tax offices

	# of objections per FTE		
	OLS	OLS	IV
	(1)	(2)	(3)
# days per FTE, 1990-93	-0.143**	-0.136*	-0.174$^+$
	(0.069)	(0.069)	(0.110)
Audit unit (0/1)	-3.649**	-5.374***	-5.621***
	(1.591)	(1.610)	(1.494)
Population (in thsd.)	0.018**	0.024***	0.023***
	(0.008)	(0.005)	(0.006)
Constant	51.669***	22.147***	33.072***
	(3.870)	(2.817)	(3.447)
EG state trend	✓	✓	✓
Number of Observations	354	256	256
R^2	0.680	0.458	
F-statistic			12.906

Notes: The table documents that the estimates on output quality, as reported in Table 8, are robust to the exclusion of restructured tax offices (estimation equation (5)). In the short term, no tax offices were restructured so that the table only displays the long-term estimates. *Dependent variable*: number of objections raised per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee, population (in thds.), presence of a unit for external company audits (only long-term analyses), federal-state-specific time trends. Columns 1,2: OLS results; column 3: 2SLS results. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German partner tax offices. Aggregate capacity-building measures instrumented with average values in years 1990–93. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: IV sample, excluding all tax offices that underwent any restructuring (merger, closure, take-over) in the considered or previous year(s); column 1, 4 additionally includes Brandenburg and tax offices partnered with tax offices in Hamburg and Bremen (OLS sample). Years: 1995–2000 (columns 1–3, long-term effects).

F Design

F.1 Support by offices with strong administrative traditions more effective

Table F.1: Support by offices with strong administrative tradition is more effective: objection outcomes

	# of objections granted per FTE			# of objections rejected per FTE		
	OLS (1)	OLS (2)	IV (3)	OLS (4)	OLS (5)	IV (6)
# days per FTE, 1990–93	−0.095**	−0.116**	−0.102	−0.029**	−0.040**	−0.076**
	(0.042)	(0.049)	(0.085)	(0.014)	(0.018)	(0.032)
WG partner office in former Prussia	−1.869*	−1.047	−1.085	−0.643**	−0.485*	−0.385
	(0.979)	(1.195)	(1.179)	(0.269)	(0.287)	(0.334)
EG state trend	✓	✓	✓	✓	✓	✓
# observations	329	276	276	329	276	276
Share WG offices in former Prussia	0.578	0.483	0.483	0.578	0.483	0.483
R^2	0.479	0.432		0.547	0.548	
F-statistic			14.350			14.350

Notes: The table documents that secondments from tax offices with strong administrative traditions reduce both the number of granted and rejected objections. *Dependent variable*: number of objections granted (columns 1–3) and rejected (columns 4–6) per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee in 1990–93, indicator that West German tax office is located in former Prussia, interactions of indicator and number of workdays of capacity-building measures, population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices, all averaged across years 1990–93. OLS results in columns 1, 2, 4, 5, 2SLS results in columns 3, 6. Standard errors clustered by city in parentheses. $^+ p < .20$, $^* p < .10$, $^{**} p < .05$, $^{***} p < .01$.
Sample: OLS sample (columns 1, 4), IV sample (columns 2–3, 5–6). Years: 1995–2000.

Table F.2: Support by offices with strong administrative tradition does not affect output quantity

| | Log # of tax declarations per FTE | | | | |
| | OLS sample | | IV sample | | |
	(1)	(2)	(3)	(4)	(5)
# days per FTE, same year	0.009***	0.012***	0.011***	0.014***	0.017***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.006)
WG partner office in former Prussia	0.008	0.077	−0.022	0.071	−0.022
	(0.034)	(0.065)	(0.033)	(0.064)	(0.038)
# days per FTE × WG p. in Prussia		−0.005		−0.007$^+$	
		(0.004)		(0.004)	
EG state trend	✓	✓	✓	✓	✓
# observations	172	172	120	120	120
Share WG offices in former Prussia	0.593	0.593	0.483	0.483	0.483
R^2	0.863	0.865	0.895	0.898	
F-statistic					15.680

Notes: The table documents that secondments from tax offices with strong administrative traditions do not affect output quantity. *Dependent variable*: log number of tax declarations assessed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee and year, indicator that West German tax office is located in former Prussia, interactions of indicator and number of workdays of capacity-building measures, population (in logs), federal-state-specific time trends. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices. OLS results in columns 1–4, 2SLS results in column 5. Standard errors clustered by city in parentheses. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$.
Sample: OLS sample (columns 1–2), IV sample (columns 3–5). Years: 1992–1993.

Table F.3: Similar effects if indicators for EG and WG tax office location in former Prussia jointly included

	# of objections filed per FTE		
	OLS sample	IV sample	
	OLS (1)	OLS (2)	IV (3)
# days per FTE, 1990–93	−0.177**	−0.147**	−0.178+
	(0.069)	(0.071)	(0.118)
EG tax office in former Prussia	−2.301+	−1.214	−1.285
	(1.571)	(1.521)	(1.486)
WG partner office in former Prussia	−2.067+	−1.888+	−1.799+
	(1.370)	(1.356)	(1.374)
EG state trend	✓	✓	✓
# observations	382	276	276
Share EG offices in former Prussia	0.381	0.233	0.233
Share WG offices in former Prussia	0.583	0.483	0.483
R^2	0.648	0.442	
F-statistic			12.712

Notes: The table documents that the estimated coefficients are similar in magnitude and significance to those in Tables 10 and E.11 if indicators for the location of the East German and West German tax office in former Prussia are jointly included. *Dependent variable*: number of objections filed per East German tax office employee and year. *Independent variables*: number of workdays of capacity-building measures per East German tax office employee in 1990–93, indicators that East German tax office and West German partner tax office is located in former Prussia, population (in thds.), presence of a unit for external company audits, federal-state-specific time trends. *Instrumental variables*: daily financial incentive for West German tax officials (in sqm of building land), distance between West and East German partner tax offices, relative size of West and East German tax offices, all averaged across years 1990–93. OLS results in columns 1–2, 2SLS results in column 3. Standard errors clustered by city in parentheses. $^+$ $p < .20$, * $p < .10$, ** $p < .05$, *** $p < .01$. *Sample:* OLS sample (column 1), IV sample (columns 2–3). Years: 1995–2000.

F.2   Heterogeneity of effectiveness by secondment duration

Minutes of a meeting on the support for the tax administration in Saxony-Anhalt by tax officials from the tax administration in Lower Saxony, 24 July 1991:

- *Die Betreuer aus Niedersachsen sind bemüht, die Rückstände in Grenzen zu halten. Trotzdem ist bei dem überwiegend laufenden Wechsel der Betreuer, verbunden mit einer jeweils neuen Einarbeitung, dem Einsatz von Betreuern in ihnen nicht bzw. nicht mehr geläufigen Arbeitsbereichen und der vielfach nicht möglichen Absprache im Falle des Wechsels der Betreuer eine wesentliche Besserung des Arbeitsstandes nicht zu erwarten.*
  The mentors from Lower Saxony are making efforts to keep the backlogs within limits. However, the work progress is unlikely to improve, due to the frequent turnover of mentors, the need for each new mentor to familiarize themselves with the tasks, the assignment of mentors to areas with which they are unfamiliar, and the often impossible coordination during transitions.

- *Bei kurzfristigem Wechsel der niedersächsischen Betreuer entsteht ein krasses Mißverhältnis zwischen dem Personalaufwand des Landes Niedersachsen und dem damit erzielten Arbeitserfolg.*
  With the frequent turnover of mentors from Lower Saxony, a stark imbalance arises between the personnel effort expended by the state of Lower Saxony and the work results.

Minutes of a meeting with representatives of the Oberfinanzdirektion Magedburg in the Ministry of Finance, 31 July 1991

Die bisherige personelle Unterstützung durch Niedersachsen im rotierenden Verfahren ist nicht effektiv. Wechselnde Betreuer sind – bis auf Fachgebiete, in denen steuerliche Einzelfallbearbeitung erfolgt – eher hinderlich. MF wie auch OFD Magdeburg müssen darauf hinwirken, daß niedersächsische Betreuer in den Finanzämtern langfristig tätig sind.

The current personnel support provided by Lower Saxony through a rotating system is not effective. Changing mentors, except in areas with individual tax case handling, tend to be more of a hindrance. The Ministry of Finance and the Regional Tax Office of Magdeburg must work to ensure that mentors from Lower Saxony are present long-term in the tax offices. (Translation by the authors)