

Preserving Jobs, Freezing Dynamics?

Employment Effects of Conditional Inheritance Tax Relief

Charlotte Bartels* Theresa Bührle[†] Kerstin Holzheu[‡] Gedeão
Locks[§] Duncan Roth[¶]

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Abstract

We analyze the employment effects of tying inheritance tax relief for family business succession to wage-bill preservation. Using linked ORBIS-IAB employer-employee data, we exploit Germany’s 2016 extension of this requirement to firms with 6–20 employees. We show that exposed firms forgo employment growth and shift toward cheaper labor. Point estimates suggest that this shift begins before succession. Five years after succession, exposed firms employ about 4 percent fewer workers and pay about 4 percent lower average wages than comparable firms transferred outside the family. These intention-to-treat estimates suggest that employment preservation clauses can constrain firm growth.

Keywords: Inheritance Tax, Gifts, Firms, Germany

JEL codes: J32, H26, H24, L25

*Leipzig University; SOEP/DIW; CEPR; CESifo; IZA@LISER. charlotte.bartels@uni-leipzig.de

[†]NHH – Norwegian School of Economics; ZEW Mannheim. theresa.buhrle@nhh.no

[‡]Sciences Po (CNRS); IZA@LISER; CESifo. kerstin.holzheu@sciencespo.fr

[§]DIW Berlin. glocks@diw.de

[¶]IAB; IZA@LISER; CESifo. duncan.roth@iab.de

1 Introduction

Governments forgo substantial revenue to exempt family business successions from inheritance taxation. The United States and more than 80 percent of EU member states grant preferential tax treatment to family business transfers ([Schratzenstaller, 2025](#); [Joulfaian, 2009](#)), on the grounds that taxing a succession strains the liquidity of the transferred firm and thereby endangers employment ([Brunetti, 2006](#); [Tsoutsoura, 2015](#)). In Germany, where family firms account for a large majority of enterprises and a substantial share of owners approaches succession ([Berghoff and Köhler, 2019](#); [KERN, 2017](#)), these provisions exempted business transfers worth 22 billion euros from inheritance and gift taxation in 2019 alone.

This relief, however, is rarely granted unconditionally. Conditioning public support on the preservation of employment is a widespread policy instrument: governments have attached employment guarantees to privatization contracts ([Akcigit et al., 2025](#)), granted pandemic loan forgiveness conditional on the maintenance of payroll, and linked subsidies and succession tax relief to employment commitments. Yet evidence on how such conditions affect the firms subject to them remains scarce. In Germany, the inheritance tax exemption for family firm successions is tied to conditions designed to preserve employment: the firm must remain in operation, and its wage bill must be maintained at a legally specified fraction of its pre-transfer level during the five to seven years following the succession. If the firm falls short of this requirement, the exemption is revoked pro rata. We refer to this condition as the employment preservation clause (EPC). Whether the clause preserves employment that would otherwise be lost, or instead constrains succeeding firms, is an open empirical question.

This paper studies the employment consequences of attaching such conditions to inheritance tax relief. Compliance with the EPC is benchmarked against the firm’s own average wage bill over the five years preceding the transfer; tax authorities enforce compliance through mandatory declarations and audits, and court records document challenges to exemptions for

wage-bill shortfalls as small as 3 percent ([Bundesfinanzhof, 2018](#)). Our estimates therefore capture the cost of the conditionality itself: we compare successions subject to the EPC with transfers that are not, rather than comparing taxed with untaxed successions. Because legal restrictions prevent linking inheritance tax records to firm data, we observe eligibility rather than take-up of the relief; our estimates are thus intention-to-treat effects of EPC exposure. To our knowledge, we provide the first quasi-experimental evidence on the employment effects of conditioning transfer tax relief on wage-bill preservation. We find that the clause has no detectable pre-transfer headcount effect, while point estimates suggest a shift in workforce composition toward marginal labor even before the transfer; after the transfer, an employment gap opens that reaches about 4 percent – half a worker on an 11-employee base – by the fifth year, alongside about 4 percent lower average wages.

To interpret these findings, we develop a simple model of firms’ employment choices under a payroll-preservation requirement. Hiring higher-cost regular workers requires advance preparation, whereas marginal workers can be hired after productivity is known. If productivity is low, a payroll shortfall adds a tax liability when profits are already low. A risk-averse owner may therefore limit expansion in regular jobs. Because the two types of labor are complementary, this also reduces demand for marginal workers when productivity is high. When payroll falls short, however, retaining workers reduces the associated tax liability. The model shows how these responses can lower employment while reducing both hiring and departures.

To empirically analyze firm dynamics before and after a succession event, we identify business transfers using company registers (ORBIS) and link the corresponding firms to employer–employee data from the Institute for Employment Research (IAB).¹ We classify own-

¹The German administrative inheritance and gift tax statistics cover the full universe of tax-assessed business transfers, but they report only the value of inheritances and gifts received by individuals and no further information about the firm. Legal restrictions prevent personal tax records, including the inheritance and gift tax statistics, from being linked to

ership changes as within-family or non-family transfers based on shared surnames of exiting and entering owners, validate the identified transfers against the public trade register (*Handelsregister*), and exclude transfers triggered by the death of the previous owner using large-scale data on death notices.² The resulting panel covers about 240,000 ownership transfers between 2009 and 2018, of which about 100,000 occur within families; about 150,000 of the transferred firms can be linked to the IAB records. The linked ORBIS-IAB data allow us to follow workforce size, composition, worker flows, and wages for up to five years around the transfer.

Our identification strategy exploits a 2016 policy change that lowered the threshold for unconditional inheritance tax relief from 20 to 5 employees. Before the reform, family firms with up to 20 employees qualified for tax exemption without meeting any employment conditions. After the reform, only firms with 5 or fewer employees kept this unconditional exemption, while firms with 6 to 20 employees became newly subject to the EPC. We implement two complementary research designs. The first is an event-study difference-in-differences model around the transfer that compares newly exposed within-family transfers (2016–2018) with three control groups, each eliminating a distinct confounder. Non-family transfers in the same years absorb macroeconomic conditions, including the pandemic years that fall within the post-transfer window. Within-family transfers before 2016 hold the nature of succession fixed, addressing the concern that post-succession underperformance reflects the managerial skills of the successors rather than the policy (Pérez-González, 2006). Never-transferred firms provide a transfer-free benchmark. The second design is a triple difference around the 20-employee threshold: it compares newly exposed family firms below the cutoff with

other sources such as firm-level tax data; such a link would be necessary to study firm dynamics.

²Misclassification runs in both directions: successions by in-laws or family members who changed their name may be recorded as non-family transfers, while unrelated owners who share a common surname may be recorded as family transfers.

transfers just above it, netting out succession dynamics and calendar-time shocks simultaneously. The comparison group consists of non-family transfers in our headline specification, with family firms already subject to the EPC since 2009 as a corroborating control. Our results are informed by about 7,000 newly exposed within-family transfers and about 9,200 contemporaneous non-family transfers.

The timing and form of succession are choices, so firms could in principle have avoided the EPC by retiming the transfer, selling outside the family, closing down, or downsizing below the threshold. We find no evidence of such responses: the family share of transfers, firm exit rates, and the size distribution of transferred firms all evolve smoothly through the reform, with no sign of retiming, differential survival, or reform-induced bunching at the 5- and 20-employee cutoffs. The pandemic years fall within the post-transfer window of exposed cohorts, but equally into that of the contemporaneous control groups; moreover, the triple difference yields the largest rather than the smallest effect.³

Our results show that the EPC changes how firms grow through succession. Before the transfer, the headcount of exposed firms evolves in parallel with that of contemporaneous non-family transfers: pre-transfer employment differences against this headline control group are not statistically distinguishable from zero. The point estimates suggest that adjustment during the succession-planning phase takes place within the wage bill: even before the transfer, exposed firms begin replacing regular jobs with marginal jobs, and their average wages begin to lag behind those of the control group. After the transfer, an employment gap opens and widens: five years after the transfer, exposed firms are about 4 percent smaller – 0.5 employees relative to an average firm size of about 11 employees – than comparable non-family transfers and pay about 4 percent lower average wages. Worker turnover at exposed

³Year fixed effects additionally absorb aggregate shocks. Temporary exemptions from the EPC for demonstrated pandemic-related shortfalls ([Finanzbehörden der Länder, 2021](#)) would, if anything, relax compliance pressure and attenuate our estimates.

firms falls: both inflows and outflows decline relative to the control group. In the second and third years after transfer, the decline in inflows exceeds that in outflows.

Across all three control groups, the estimated five-year employment reduction ranges from about 1 to 4 percent and it is similarly present across sectors, firm age, and regions. Our preferred estimate compares against non-family transfers, which hold calendar time fixed; the triple difference, which nets out succession dynamics and calendar-time shocks simultaneously, yields the larger effect of 10 percent, while the comparison with never-transferred firms – which display differential pre-event trends and serve as a descriptive benchmark – yields the smallest gap.

The employment gap is accompanied by suggestive evidence of lower sales. Using balance-sheet observations through 2019, we estimate a modest decline in operating revenue alongside lower employment, although the revenue effect is imprecisely estimated. The productivity estimate is close to zero. These findings suggest that lower hiring contributes to the employment gap. Exposed firms continue to grow on average, but more slowly than the control group. Conditions intended to preserve employment can thus limit firm growth.

Our paper speaks to three strands of the literature. First, we add to work on the impact of inheritance and gift taxes on business dynamics. While tax avoidance has been identified as the primary behavioral response to inheritance and gift taxation ([Kopczuk, 2007](#); [Bernheim et al., 2004](#); [Joulfaian and McGarry, 2004](#); [Erixson and Escobar, 2020](#); [Escobar et al., 2023](#); [Locks, 2026](#)), relatively little is known about the potentially negative externalities of inheritance and gift tax avoidance on real economic outcomes such as employment. [Tsoutsoura \(2015\)](#) finds that repealing inheritance taxes in Greece positively affected investment in firms transferred within families, while studies on Germany have mostly examined selection patterns or behavioral outcomes ([Hines et al., 2019](#); [Beznoska et al., 2020](#); [Houben and Maiterth, 2011](#); [Thiemann et al., 2021](#)). By tracking firms before and after succession, we capture the planning phase that previous papers often overlook, allowing us to isolate the

policy’s impact from confounding factors such as successor quality.

Second, we contribute to the broader literature on the effects of inheritances and gifts on entrepreneurship and family firms. Inheritance and gift taxes, by modifying available liquidity, likely influence entrepreneurship and firm survival ([Holtz-Eakin et al., 1994](#); [Brunetti, 2006](#)), potentially intensified by selection effects ([Hurst and Lusardi, 2004](#)), and transferring businesses within the family may diminish performance because of ability mismatch (see, for example, [Bloom and Van Reenen, 2007](#); [Villalonga and Amit, 2006](#); [Bennedsen et al., 2007](#); [Bertrand and Schoar, 2006](#); [Burkart et al., 2003](#)), despite family-specific know-how and its positive impact on firm success ([Anderson and Reeb, 2003](#); [Andres, 2008](#)). Relative to this literature, which asks whether family succession itself harms performance, our design holds the nature of succession fixed – comparing family transfers with and without the clause – and thereby separates the effect of the policy from the effect of the successor.

Finally, our paper relates to the literature on employment regulation and firm performance. [Akcigit et al. \(2025\)](#) show that firms grow in anticipation of mandated employment targets following German reunification; we find lower post-transfer employment when succession tax relief is conditional on wage-bill preservation. [Aghion et al. \(2023\)](#) document similar growth restraint at fixed regulatory size thresholds; in our setting, the hurdle is the firm’s own pre-transfer wage bill rather than a statutory cutoff, so the distortion operates against the firm’s own history rather than across the size distribution. Consistent with our findings, [Saez et al. \(2023\)](#) document that reducing employment protection in Sweden led to excess separations without productivity losses, suggesting that lower-productivity workers were most affected.

Section 2 describes the institutional setting and data, Section 3 lays out the research designs and results, Section 4 discusses their interpretation, and Section 5 concludes.

2 Institutional setting and data

2.1 Inheritance and gift taxation in Germany

In Germany, inheritances and inter vivos gifts (hereafter, transfers) are taxed at the time of transfer from donor to recipient, that is, at the time of death or gift. Both types of transfers are subject to the same tax rules, including allowances and rates. Generous exemptions are granted for the transfer of businesses in Germany. Proponents of the relief argue that (1) ensuring the stability of production and employment in private businesses, where the majority of German workers are employed,⁴ is of public interest and that (2) inheritance or gift taxes reduce firms' liquidity, thus endangering the operation of the firm (Kirchdörfer, 2014).

Business gifts represent the majority of total inter vivos gifts in Germany each year. Figure 1 shows the value of potentially tax-relevant transfers assessed by the inheritance and gift tax authorities in Germany, ordered by assessment date.⁵ For example, in 2019, tax authorities registered transfers worth 80 billion euros (blue line), of which half, or about 36 billion euros, were gifts (blue dashed line). The graph also reveals the particular importance of tax exemptions for businesses: At transferred business assets valued at 25 billion euros,⁶ 23 billion euros of business *transfers* were tax-exempt (green dotted line), of which 20 billion euros in exemptions were claimed for business *inter vivos gifts* (green dashed line). Valued at the tax-class-I rate of 19 percent that applies to taxable amounts between 0.6 and 6 million euros (Appendix Table B.2), the exempt business transfers of 2019 correspond to forgone

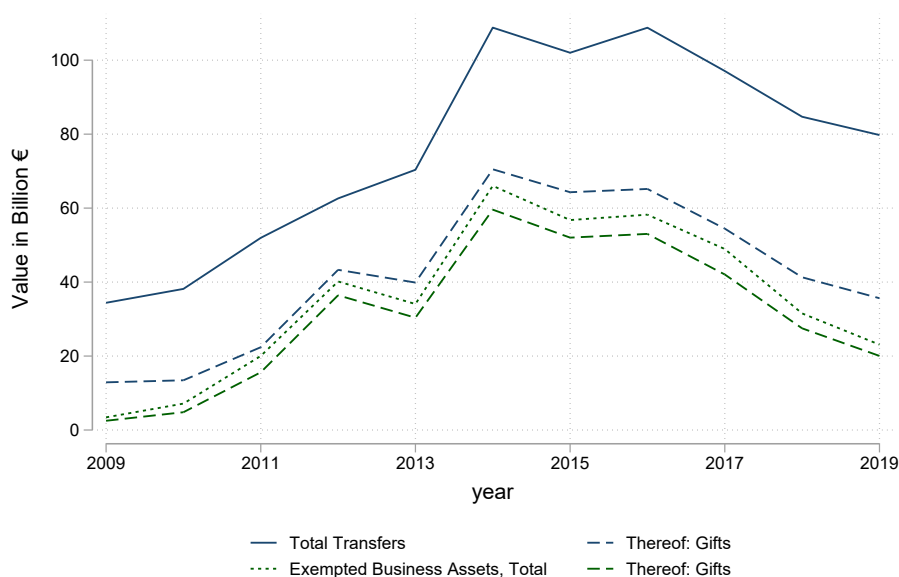
⁴90% of all German private companies are family firms, accounting for 57% of overall employment and 55% of turnover of private companies (ZEW Mannheim and ifm Mannheim, 2023).

⁵Transfer date and tax assessment date can differ. Asset transfers that occurred several years ago might also be included in a given year if the tax was only assessed with a time lag.

⁶Calculated as sum of agricultural assets, business assets, and shares in corporations.

revenue of roughly 4 billion euros, absent behavioral responses.⁷ The large share of inter vivos gifts, particularly tax-exempt business gifts, shows the importance of exemptions for the succession planning of companies: the transfer recipients, that is, the new owners of the firm, claim these exemptions. Thus, the requirements to obtain such exemptions likely affect the employment decisions of firms undergoing succession. Firm survey data confirm the relevance of inter vivos business gifts. A change of ownership in family firms most often results from an inter vivos gift rather than an inheritance (Appendix Figure A.1a).

Figure 1: **The importance of preferential treatment of business gifts, 2009–2019**



Notes: Total transfers is the sum of inheritances and gifts. The distribution is based on the assessment date.
Source: Inheritance and gift tax returns available through the federal statistical office.

In 2009, a sweeping tax reform introduced market values for all assets, which substantially increased the tax values of non-listed firms and real estate.⁸ Personal allowances and preferential treatment of business transfers were expanded to offset the increase in the tax base.

⁷This is consistent with static microsimulation evidence. [Thiemann et al. \(2021\)](#) estimate that abolishing all exemptions, of which the preferential treatment of business assets is the main component, would raise annual inheritance and gift tax revenue by 9–12.6 billion euros, likewise absent behavioral responses, against baseline revenues of about 6 billion euros.

⁸Previously, tax-assessed values were based on book values for non-listed firms, on out-

At first glance, comparing pre- and post-2009 trends might appear to be an obvious setting for analyzing firms’ responses to inheritance and gift tax legislation. However, a closer look at the complexity of the 2009 reform reveals that the direction of firms’ reactions is theoretically unclear, even with time to anticipate the reform. On the one hand, the reduction or elimination of the tax burden could have improved their outlook and induced firms to, for example, hire more employees. On the other hand, the newly introduced EPC might have offset the benefits, inducing firms to hire less or even cut employment before the ownership transfer. In sum, the overall expected effect of the 2009 reform on firms’ decisions is ambiguous; we therefore focus our analysis on the period after 2009.

Our analysis exploits time-varying coverage of the EPC, which was first introduced with the reform in 2009 and modified in 2016. Under the EPC, inheritance tax relief is granted only if the firm whose ownership was transferred to the tax filer keeps the wage bill stable (*Lohnsummenregelung*). Table 1 provides a summary of the EPC since 2010. Tax filers can choose between the partial exemption (85%, upper panel) and the full exemption (100%, lower panel).⁹ An excessive share of “administrative assets” (*Verwaltungsvermögen*) – unproductive assets like securities, excessive cash reserves and receivables, leased real estate, corporate shareholdings up to 25%, and art – disqualifies a firm from any inheritance tax

dated cadastral values for real estate (the so-called *Einheitswerte* were last updated in 1964) and on highly standardized valuation methods for agricultural assets. As a result of these regulations, tax-assessed values were far below market values.

⁹Tax filers are eligible for exemption from the inheritance and gift tax depending on the legal form of the business and on the share of ownership that they receive as inheritance or gift. Sole proprietors can qualify for the business exemption if the whole business (*Betrieb*), or at least an independent part of the business (*Teilbetrieb*), is transferred. The business exemption is also available for transfers of corporate shares if the transferring stockholder held at least 25% in the corporation, or a share in a partnership if it carries out a trade, that is, the business exemption cannot be invoked for asset management partnerships.

relief.

The inheritance tax relief is granted only if the business has maintained the wage bill at a defined fraction over the retention period, which is five years for the partial exemption and seven years for the full exemption. The wage bill requirement is calculated and enforced as follows. First, the baseline is defined as the average annual wage bill recorded in the income statement during the five years *prior* to the transfer year (i.e., the current year counts only if the firm is transferred exactly at the end of the fiscal year). Second, compliance is assessed only once, at the *end* of the 5–7-year retention period, rather than annually. Heirs submit a formal declaration comparing their average post-succession wage bill across all retention years to the baseline. This averaging allows temporary shortfalls to be offset by higher wages in other years. Three mechanisms enforce compliance: (i) the declaration is mandatory under § 13a Abs. 7 ErbStG; (ii) heirs must notify authorities within six months if they anticipate not complying with the requirement; and (iii) declared values are verified during tax audits. Enforcement is strict: court records document challenges to exemptions for wage bill shortfalls as small as 3% ([Bundesfinanzhof, 2018](#)).

Generally, all workers’ wages are included: those of employees subject to social security (*sozialversicherungspflichtig Beschäftigte*), of the marginally employed (*geringfügig Beschäftigte*), and of top earners with wages exceeding the social security ceiling.¹⁰ Since 2016, apprentices, employees on parental leave or sick leave, seasonal workers with a contract of at most six months, and temporary workers (*Leiharbeiter*) are excluded from the wage bill.

Small firms are fully tax-exempt irrespective of their employment dynamics. However, the definition of *small* firms changed in 2016, and we use this change in our analysis: while firms with fewer than 21 employees transferred between 2010 and 2015 were exempted from the

¹⁰Wages paid by connected firms must be included proportionately if the company holds shares in partnerships resident in Germany or in other EU/EEA countries, or in corporations resident in Germany or in other EU/EEA countries with a shareholding of over 25%.

tax without further requirements, firms with 6 to 20 employees transferred since 2016 must adhere to the EPC to qualify for a tax exemption.¹¹

The relevant firm size for the application of the EPC is determined at the time of transfer. To prevent short-term labor force adjustments aimed at bunching below the firm size thresholds, the law guidelines explicitly state that a reduction in employment shortly before the transfer will be considered under the general anti-abuse rule. In Appendix B, we detail the calculation of employment counts and wage bill as well as the tax liability and the pro-rata revocation of the tax exemption if firms fail to meet the EPC.

¹¹In addition to the wage bill requirement, the exemption is conditional on continuing the business over the same retention period (*Behaltensfrist*, § 13a Abs. 6 ErbStG): selling or discontinuing the business or essential business assets, as well as withdrawals exceeding contributions and profit shares by more than 150,000 euros, trigger a pro-rata revocation.

Table 1: **Employment preservation clause (EPC), 2010–present**

		Pre-reform 2010-2015	Post-reform 2016-current
Panel A: 85% Tax Break			
Firm Size (Employees)	Retention (Years)	Annual Wage Sum Requirement	Annual Wage Sum Requirement
0-5	-	None	None
6-10	5	None	50%
11-15	5	None	60%
16-20	5	None	80%
21+	5	80%	80%
Panel B: 100% Tax Break			
Firm Size (Employees)	Retention (Years)	Annual Wage Sum Requirement	Annual Wage Sum Requirement
0-5	-	None	None
6-10	7	None	70%
11-15	7	None	80%
16-20	7	None	100%
21+	7	100%	100%

Notes: Development of the EPC as defined in the German inheritance and gift tax code (§ 13a Abs. 3 ErbStG). Partial exemption: 85%; full exemption: 100%. To benefit from the exemption, a company must preserve the wage bill at a specified percentage over the retention period. If the wage bill is undercut, the exemption is revoked pro rata (see Figure [B.1](#)).

2.2 Data and analysis sample

We combine data from different sources to create our analysis sample of German family firms undergoing succession. Appendix Section C.1 provides more detail on each data source. We explain the sample selection steps and provide a more detailed description of the identification of ownership transfers in Appendix Sections C.2 and C.3.

Company register data (ORBIS) We use the ORBIS database from Bureau van Dijk (BvD), which provides comprehensive financial and ownership information on firms worldwide, including privately held entities, which represent the majority of German firms. The ORBIS panel structure enables us to identify firms transferring ownership to either family members or non-family investors between 2008 and 2018.

IAB employer-employee data We link our list of ownership changes from ORBIS to employer-employee data from the Institute for Employment Research (IAB) via the BvD-ID of the transferred firm. We refer to this linked dataset as ORBIS-IAB. We use the establishment-firm crosswalk developed by Diekmann et al. (2024) to identify establishments belonging to a transferred firm for every year of the sample period from 2008 to 2024. Aggregating employee-level employment spells from the Employment Biographies (BeH) to the firm level allows us to construct the number of workers, various measures of workforce composition, and employment flows measured by the number of incoming and outgoing employees from one year to the next. The BeH contains spell-based employment records for the (near) universe of employees in Germany, including establishment identifiers, but does not cover civil servants or the self-employed. As wages above the social security contribution ceiling are right-censored, we use imputed top wages based on Stüber et al. (2023). We also compute the firm-level wage bill from the (average) daily wages of all workers. We use information recorded on 30 June of a given year so that we can supplement our dataset with establishment-level information, such as sector or location, from the Establishment History

Panel (BHP), which records variables in June.

Supplementary data To validate our list of ownership changes, we check death data and use the online search function of the trade register. We scrape publicly available website data on tombstones and death notices of about 1,000,000 deceased individuals since 2009. The aim is to exclude transfers due to the death of the previous owner (that is, inheritances) from our list of ownership changes. We omit all firm transfers from our list where the name of the exiting owner and the federal state of the company’s headquarters coincide with a name and federal state in the death data.

As a supplementary data source that validates relevant magnitudes and trends observed in our main dataset, we draw on the Inheritance and Gift Tax Survey (IGTS). The IGTS was carried out in early 2014 by the ifo Institute and targeted family firms within the ifo business survey’s regular pool of 7,000 firms, of which 4,660 are family firms ([Hines et al., 2019](#)). For every year between 2000 and 2014, the IGTS collected data on the year of ownership transfer – either due to inheritance or gift – and the type of tax payments (e.g., tax exemption), though it did not collect specifics on amounts or recipients.

Analysis sample We start our sample selection process with the universe of German firms recorded in ORBIS between 2009 and 2019, which encompasses about 6 million firms. Trade register data show a lag of one year for the transfers to be recorded in ORBIS so that we move the observation window back by one year to 2008 and 2018. We drop firms with more than five shareholders (less than 10% of the sample) to arrive at a sample of closely held family firms, where owners are likely to influence the decisions of the firm. We further restrict the sample to firms where information on shareholdings is complete, that is, shareholders are reported with non-missing stakes.

We identify ownership transfers from one year to the next by comparing the individuals listed

as ultimate owners in each year.¹² We classify the ownership change as a family transfer if the new and the previous owners share the last name. Otherwise, we classify the change as a non-family transfer. To ensure that the new owner is likely to influence firm decisions in the future, in particular to tailor firm decisions to minimize the gift tax burden, we consider only ownership transfers where the new shareholdings exceed 25%.

We further restrict our sample to firms with only one ownership transfer in the sample period (83% of transfers). In addition, we omit all firm transfers where the previous owner is listed as dead in our death data or where owners are underage.

After the cleaning process, we obtain a final sample starting in 2008, with about 240,000 transferred firms between 2009 and 2019. About 100,000 firms are transferred to family members and about 140,000 firms are sold to non-family investors; that is, slightly less than half of the ownership changes take place within families (Appendix Figure A.1b). Two-thirds of ownership changes reflect the entry of a new shareholder; in one third of the cases, an existing shareholder increases her or his share (Appendix Table C.5). Merging these firms with IAB employer-employee data via the BvD firm identifier yields our ORBIS-IAB firm panel with about 150,000 transferred firms (Appendix Table C.3).

Summary statistics Appendix Table C.1 shows summary statistics for firms with ownership changes that we were either able to match with IAB (ORBIS-IAB) or not (ORBIS-only). For the period 2008–2019, approximately 55% of firm-year observations can be matched. ORBIS-only firms are mostly very small (1–3 employees), consisting exclusively of self-employed individuals or freelancers, and are therefore not part of the IAB employer-employee data. ORBIS-IAB and ORBIS-only observations are similar, on average, with respect to the share of family transfers, number of shareholders, and location in East Germany. ORBIS-IAB

¹²ORBIS data record the date when ownership information was obtained, not the date of change in ownership. Hence, we compare the names of owners in one year with the names in the following year.

firms are, on average, larger and more often from the manufacturing sector than ORBIS-only firms.

2.3 Succession decisions and the 2016 reform

Firms undergoing succession face decisions ranging from the usual decisions on employment and investment to succession-specific choices such as the form and timing of the transfer. Before estimating the impact of the EPC on employment dynamics, we therefore discuss these succession-specific decisions and collect evidence on whether any of them were likely affected by the 2016 reform that we use for our identification strategy.

Form of transfer The form of transfer ranges from (1) closing the firm and exiting, through (2) selling the firm to an external (non-family) investor, to (3) transferring ownership to one or more family members. Exemptions from the inheritance tax should matter mainly for employment decisions in firms whose owner chooses to transfer to family members. The 2016 EPC reform could have induced firm owners to choose (1) or (2) instead of a family transfer. Firm exit rates (option 1) show a stable pattern over time across different data sources (Appendix Figure [A.2](#)). In addition, sales to external investors (option 2) compared to family transfers (option 3) show no detectable shift (Appendix Figure [A.3](#)). We conclude that the 2016 reform is unlikely to have shifted the form of transfer toward more firm exits (option 1) or sales to non-family investors (option 2).

Timing of transfer The timing of the transfer is a choice that might have been affected by the EPC. More specifically, firms anticipating the 2016 expansion of the EPC to firms with fewer than 21 employees might have accelerated the transfer to escape the EPC. However, the stable proportion of non-family to family transfers between 2009 and 2019 argues against a pronounced response (Appendix Figure [A.3](#)).

Manipulation of pre-transfer employment Manipulating pre-transfer employment is a potential strategy for firms to escape the EPC altogether. If firms systematically downsized to avoid the EPC, we would see abnormal spikes in the firm size distribution. We check for bunching or missing mass around 5 and 20 employees pre- and post-2016. Appendix Figure A.4 shows no differences between our periods. Instead, we see the same small bunching at round numbers (e.g., 15, 20, 30). The general anti-abuse clause (§42 AO) explicitly targets employment reductions immediately before the transfer.

Based on the evidence presented above, we conclude that the EPC did not meaningfully change the decision of how and when to transfer. In what follows, we investigate how the EPC affected employment dynamics in firms undergoing succession.

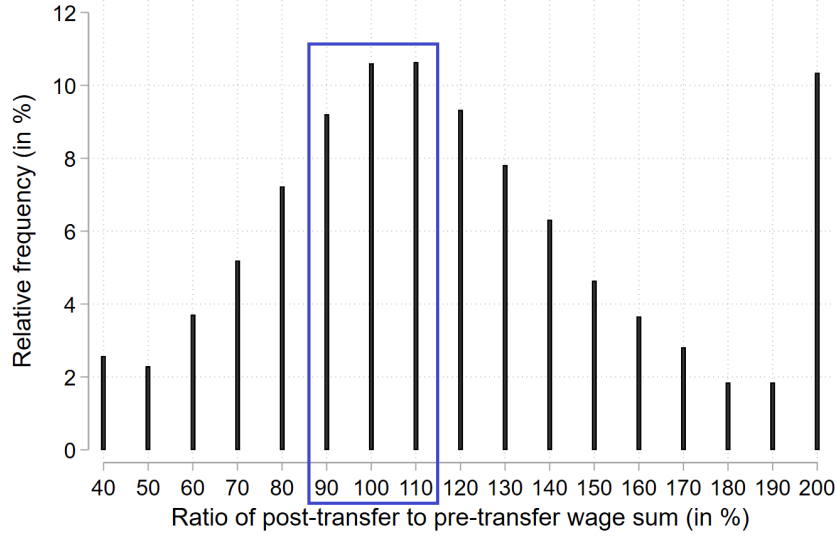
3 The effects of the employment preservation clause

3.1 Employment dynamics

The EPC requires firms to maintain a fraction of their pre-transfer wage bill to retain the inheritance tax relief. The fraction depends on firm size and the exemption chosen (Table 1). Figure 2 reports post-to-pre-transfer wage-bill ratios for within-family transfers in the balanced sample. About 30% of these firms have ratios of at least 90% and below 120%; roughly half have ratios of at least 80% and below 130%. Few firms have measured ratios below the size-specific thresholds for the partial exemption (Appendix Figure A.5). Among firms with 6–10 employees, for example, 3% have a ratio below 50%.

Empirically isolating the causal impact of Germany’s EPC on firms’ employment decisions is challenging because the probability of being transferred is likely endogenous to both the firm’s observable and unobservable characteristics (Berghoff and Köhler, 2019; Hines et al., 2019). To address this potential bias, we adopt two identification strategies, both exploiting the 2016 reform, which expanded the coverage of the EPC regulation to small firms (6 to

Figure 2: **Share of preserved wage bill**



Notes: This figure shows the ratio of the mean wage bill in years 1–5 after transfer to the mean in the five years before transfer in relative frequencies for family transfers with 6–20 initial employees observed in every year from five years before to five years after transfer. The category 200 includes ratios of at least 200%. The blue box indicates the frequency of firms with a post-to-pre ratio of at least 90% and below 120%. Appendix Figure A.5 shows the equivalent figure by size (6–10, 11–15 and 16–20 employees) given that the required share of the pre-transfer wage bill to be preserved is determined by firm size (see Table 1). *Source:* ORBIS-IAB.

20 employees). In the first strategy, we compare small firms transferred before and after the expansion of the EPC in 2016. We focus on the subsample of small firms (6 to 20 employees) that were transferred between 2013 and 2018, three years before and after the change in legislation.¹³ In the second strategy, we exploit the local quasi-random assignment generated by the EPC’s sharp employment cutoff at 5 and 20 employees and compare employment dynamics on both sides of the cutoffs. We observe employment dynamics in the IAB data until 2024, which allows us to estimate post-transfer effects up to five years after the transition.

¹³We exclude observations before 2013 to rule out avoidance behavior related to the Cash GmbH scheme, which was abolished in 2013. Additionally, we exclude firms with fewer than six employees from our main estimations, since these very small firms were more frequently used for intra-family cash transfers under that scheme.

Comparing small firms by transfer type and time Our first identification strategy compares small firms by transfer type and time. Table 2 summarizes our treatment and control groups. Our treatment group is composed of small firms transferred within family after 2016, which are newly exposed to the EPC requirement to receive tax relief. We use three different control groups. Control A consists of small firms that were transferred to non-family investors. These transfers were not subject to any inheritance and gift legislation, but share the same business cycle that could affect firms transferred within family. Control B consists of small firms that were transferred within family before 2016; this comparison eliminates effects linked with within-family transfers. Control C uses never-transferred firms, following an intention-to-treat approach, as these firms may plan a succession in the future.

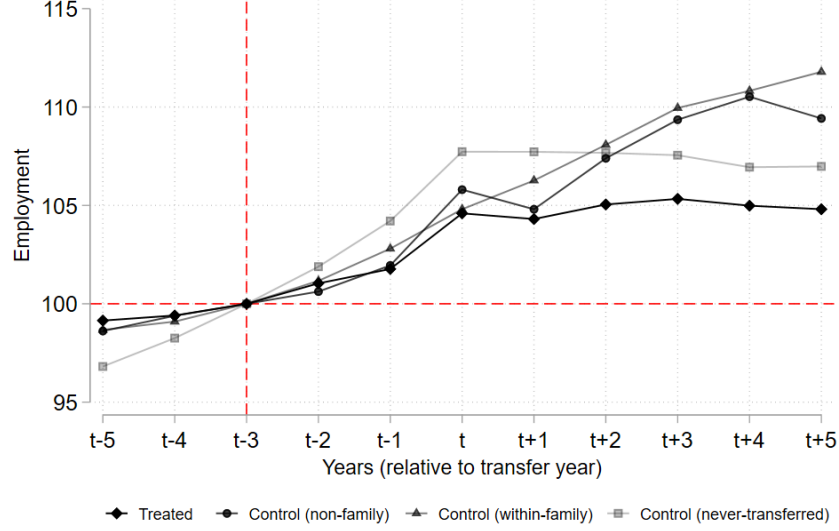
Table 2: **Comparing small firms: treatment and control groups**

Group	Firm size	Transfer year	Transfer type	EPC requirement
Treatment	6–20	2016–2018	Within family	Yes
Control A (type)	6–20	2016–2018	Non-family	No
Control B (time)	6–20	2013–2015	Within family	No
Control C (transfer)	6–20	-	Never transferred	No

Notes: The treatment group consists of firms with 6–20 employees that are transferred within family in the post-reform period (2016–2018) and are exposed to the EPC. Control A holds time fixed and uses non-family transfers in 2016–2018. Control B holds transfer type fixed and uses within-family transfers in the pre-reform period (2013–2015), when these firms are not subject to the EPC. Control C uses the universe of firms that were not transferred between 2013 and 2018.

Figure 3 shows average employment growth in our treatment group compared to the three control groups. We index employment growth to three years before the transfer ($t-3$) as this year usually marks the start of the transfer planning period. We follow firms’ trajectories up to five years after the transfer, which is the EPC-relevant period for inheritance tax relief. Family firms with 6–20 employees that were transferred after 2016 (treatment group) grow by about 5%, while firms transferred to non-family members (control A) grow by about 10%. Family firms transferred before 2016 (control B) grow by about 12%, and never-transferred firms by about 7%.

Figure 3: **Employment dynamics: EPC-exposed vs. control firms**



Notes: This figure shows the evolution of employment relative to employment three years before the transfer ($t - 3$). Treatment and control group definitions as in Table 2. *Source:* ORBIS-IAB.

We estimate the average effect of the EPC reform on family firms using a DiD specification of the following event-study form¹⁴:

$$Y_{it} = \alpha + \sum_{\substack{k=-5 \\ k \neq -3}}^{k=5} (\delta_k + \beta_k \text{Treat}_i) \mathbb{1}[\tau_{it} = k] + \mu_i + \lambda_t + \epsilon_{it} \quad (1)$$

where Treat_i is a dummy equal to 1 if the small family firm i was transferred after 2016. t denotes calendar year, and $\tau_{it} = t - T_i$ denotes years relative to firm i 's transfer year T_i , ranging from -5 to $+5$. The δ_k capture common event-time effects. The coefficients β_k measure the difference in employment outcomes between treated and control firms before and after the transfer, controlling for firm, calendar-year, and common event-time effects.¹⁵

¹⁴The preferred sample selects firms observed before transfer and without gaps through year $+5$ in the underlying panel. Estimation then retains firm-year observations with fewer than 50 employees and nonmissing outcomes.

¹⁵Year fixed effects control for shocks such as the Covid pandemic, when exemptions from the EPC were granted if firms could prove the link between the pandemic and failing to meet

All coefficients are normalized relative to the first year of the transition period ($\tau_{it} = -3$), which is, on average, when firms in Germany start a transition, according to surveys from FamData (German Family Firms Survey) and the KfW succession monitoring (ifo Institute, 2024; Schwartz, 2019).

Figure 4 shows the results from estimating Eq. 1 using non-family transfers as the control group (control A). Employment trends are parallel before firms enter the transition phase in $t = -3$, supporting the parallel trends assumption. Five years after the transfer, EPC-exposed firms have 0.5 fewer employees (panel a)) or 4% lower employment (panel b)).

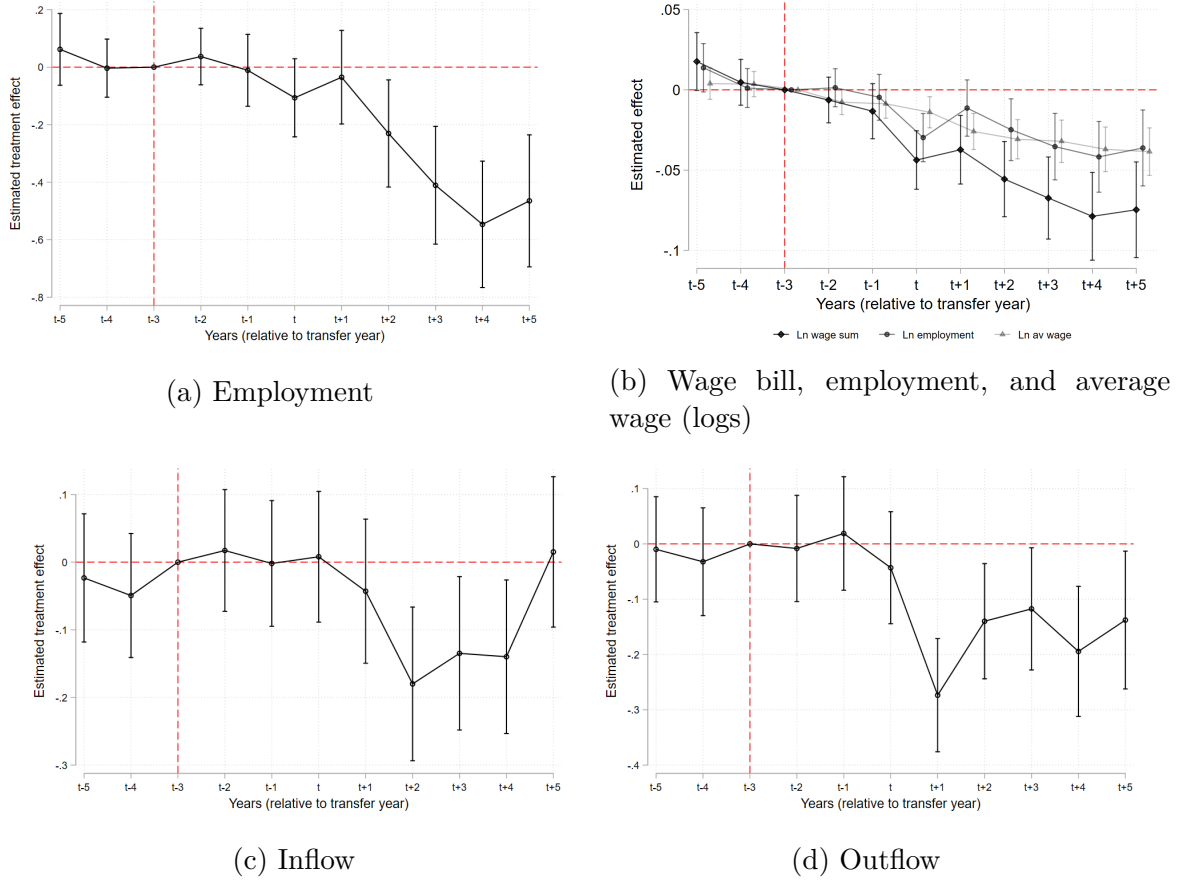
As panel b) of Figure 4 shows, the overall lower wage bill (about 7.5% five years after the transfer) results from both lower average wages and lower employment in EPC-exposed firms. Average wages slow relative to the control group even before the transfer in t and reach about 4% below the control group five years after the transfer.

Both worker inflows (panel c)) and outflows (panel d)) decline in EPC-exposed firms. In the second and third years after transfer, the estimated decline in inflows exceeds that in outflows. The larger decline in hiring is consistent with the employment gap, even though fewer workers leave exposed firms. Section 4 relates this pattern to firms' choices before the transfer and to the incentive to retain workers when payroll falls below the target.

The growth slowdown in EPC-exposed firms is confirmed by the other two control groups. Using pre-2016 family transfers (control B) reveals a negative coefficient of slightly smaller magnitude (about 0.3 fewer employees), yet the effect is not precisely estimated (Appendix Figure A.6 a)). Using never-transferred firms (control C) shows a smaller employment gap throughout (about 0.1–0.2 fewer employees) (Appendix Figure A.6 b)). The effect builds up during the transition phase from $t - 3$ to t and is statistically significant in the two years after the transfer. However, we observe pre-trends for both controls B and C.

There are two potential threats to this identification strategy, which we address in turn. The the EPC (Finanzbehörden der Länder, 2021).

Figure 4: **The effect of the EPC on employment dynamics**



Notes: This figure shows leads and lags from Equation 1 using non-family transfers as the control group (control A). Data are binned by year relative to the transfer year, and the omitted category is the difference between treated and control groups three years before the transfer ($t = -3$), the first year of the transition period. Results for control groups B and C are given in Appendix Figure A.6. Difference-in-differences results analogously to estimation (a) and (b) are depicted in Appendix Tables A.2 and A.3, respectively. *Source:* ORBIS-IAB.

first concern is the potential manipulation of firm size: selection *out of* treatment (the EPC) into tax exemption. Manipulations aimed at escaping the EPC would reduce the magnitude of our estimated coefficient and thus create a downward bias. Still, we check whether we find evidence of such behavior. First, some of our control-group firms (transferred pre-2016) could have been larger than 20 initially and then moved into our control group by downsizing to ≤ 20 to escape the EPC. Second, some potentially treated firms (transferred post-2016) might have moved out of the treatment group by downsizing to ≤ 5 to escape the EPC. As discussed in Section 2.3, we see no bunching or missing mass around 5 and 20 employees pre-

and post-2016, but the same small bunching at round numbers (e.g., 15, 20, 30) (Appendix Figure A.4).

The second concern is the timing of transfers. Owners of firms with 6–20 employees may have accelerated transfers to the next generation before 2016 to escape the EPC. Timing transfers to reduce compliance costs would invalidate our parallel trends assumption. We rule out this concern by comparing annual transfers within and outside the family. We expect that owners transferring to non-family members will not seek to minimize the tax burden to the same extent, but these firms should be affected by the business cycle in the same way. Appendix Figure A.3 displays the difference between the number of family and non-family transfers in each year from 2009 to 2020. We find no differences in transfer patterns across years between family-owned and non-family-owned firms and no spike before the reform in 2016.

The absence of bunching around the EPC thresholds, together with the stable pattern of within-family versus non-family transfers, suggests that neither firm-size manipulation nor timing effects bias our design.

Robustness checks further support our main result of slower employment growth in EPC-exposed firms. In-group placebo tests for firms with 30–50 employees and 50–100 employees show no responses (Appendix Figure A.7). Our findings remain robust to excluding observations from the COVID-19 years (2020 onward). As the earliest transfer year is 2016, this leaves at most three post-treatment periods, rather than the five post-treatment periods shown in the main event study specifications (Appendix Figure A.8). We next turn to the second identification strategy, which compares firms below and above the employment threshold N_x that assigns firms to EPC exposure.

Comparing firms around the employment cutoff Our second identification strategy compares firms around the employment cutoff, exploiting the legislative discontinuity. As shown in Table 3, our treatment group consists of within-family transfers of firms with 6–

18 employees in the reform year 2016. Because employment may be measured with error, observations whose recorded values are very close to the cutoff of 20 may be misclassified. We therefore exclude firms with 19–21 employees and compare firms with 6–18 and 22–26 employees. We assign firms to the treatment and control groups based on their employment in the reform year 2016 and anchor our analysis in $t - 1$. We consider only firms transferred after the reform in 2016.

Table 3: **Comparing firms around the employment cutoff: treatment and control groups**

Group	Firm size	Transfer year	Transfer type	EPC requirement
Treatment	6–18	2016–2018	Within family	Since 2016
Control A (type)	6–18 and 22–26	2016–2018	Non-family	-
Control B (size)	22–26	2016–2018	Within family	Since 2009

Notes: The treatment group consists of firms with 6–18 employees in 2016 that are transferred within family in 2016–2018 and become newly subject to the EPC after the 2016 reform. Control A uses non-family transfers in both size groups (6–18 and 22–26 employees). Control B holds transfer type fixed and uses larger firms that had been exposed to the EPC since 2009. The DDD specification jointly uses these groups to compare changes in the employment gap between small and large firms across family and non-family transfers. Descriptive statistics on the different samples are displayed in Appendix Table [A.1](#).

We examine whether employment growth differs between firms below and above the employment threshold N_x . Figure 5 compares differences in average employment (upper panel) and employment growth (lower panel) between the reform year 2016 and the transfer year to motivate the subsequent analysis. The two left-hand graphs take a one-sided perspective, comparing firms below and above the 20-employee cutoff. The two right-hand graphs add firms below the lower threshold to the control group, taking a two-sided perspective. Larger firms (20+) had been subject to the EPC since 2009, while firms with five or fewer employees were exempt from the EPC requirement. The results indicate that firms with more than 20 employees have increased employment by about one employee since the reform in 2016, on average. In contrast, firms below the cutoff remain broadly stable in size and show lower average employment growth (Figures 5a) and c), respectively). Adding firms below the lower cutoff to the comparison yields a qualitatively similar pattern (Figures 5b) and d), respectively).

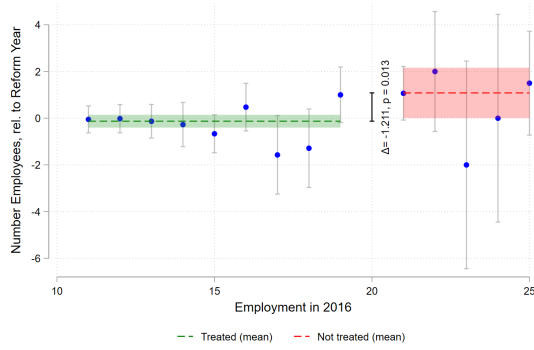
We estimate the average effect of the EPC reform in 2016 on family firms around the employment threshold N_x using a DDD specification of the following form:

$$Y_{it} = \alpha + \sum_{\substack{k=-5 \\ k \neq -1}}^{k=5} \mathbb{1}[\tau_{it} = k] (\delta_k + a_k \text{Treat}_i + b_k S_i + \beta_k \text{Treat}_i S_i) + \mu_i + \lambda_t + \phi_t \text{Treat}_i + \epsilon_{it}. \quad (2)$$

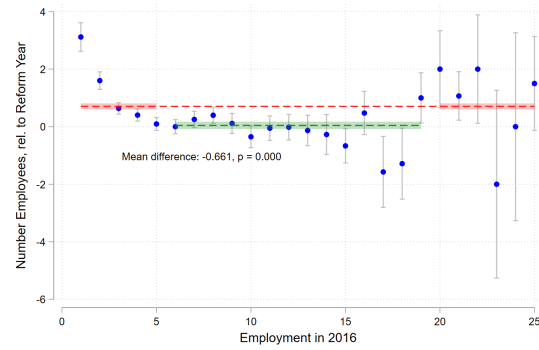
where Y_{it} is the employment outcome for firm i in calendar year t , and $\tau_{it} = t - T_i$ is time relative to transfer. Treat_i indicates a within-family transfer, and S_i indicates the group below the employment threshold $N_x = 20$. Both size groups include family and non-family transfers. μ_i are firm fixed effects, λ_t are year fixed effects, ϕ_t allows year effects to differ by family-transfer status, and ϵ_{it} is the error term. The δ_k , a_k , and b_k capture the lower-order event-time terms. The omitted event year is -1 .

The results from estimating Eq. 2 are presented in Figure 6 and confirm our previous

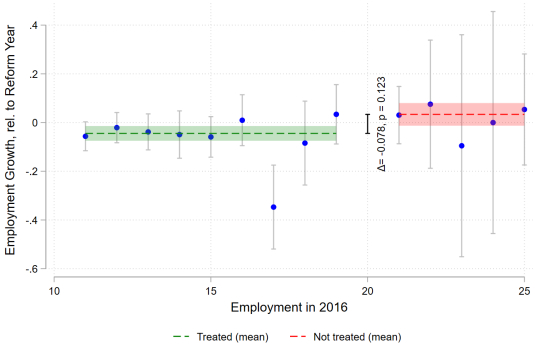
Figure 5: **Employment around the cutoff: descriptive comparisons**



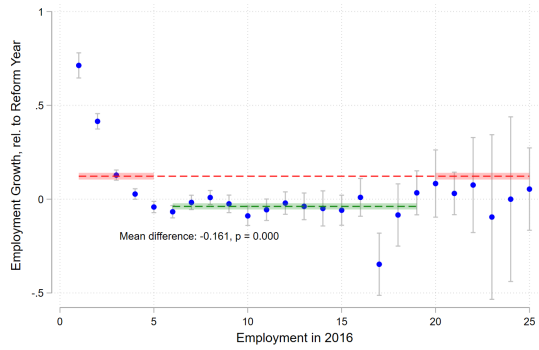
(a) Employees, one-sided



(b) Employees, two-sided



(c) Emp. growth, one-sided

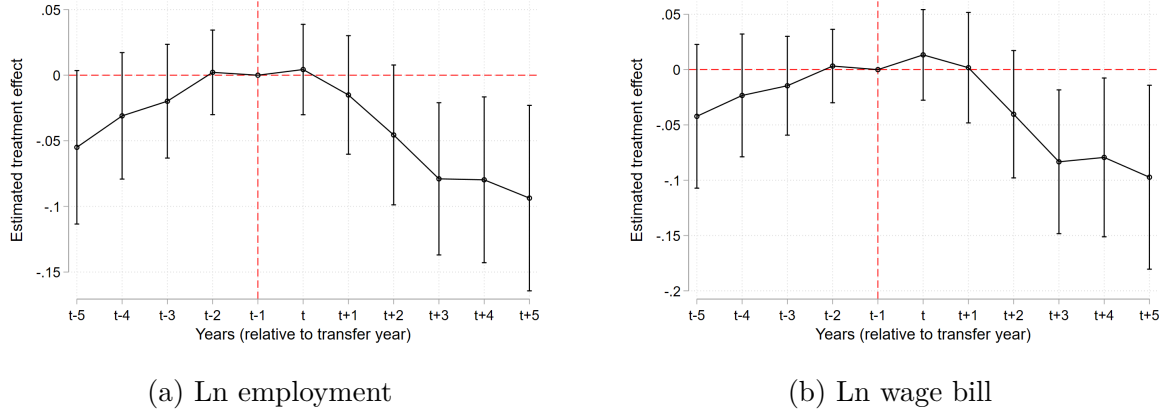


(d) Emp. growth, two-sided

Notes: This figure compares the difference in average employment (upper panel) and employment growth (lower panel) in the transfer year relative to the reform year 2016 between firms on the two sides of the employment threshold. Figures a) and c) use the threshold at 20 employees (one-sided), while figures b) and d) use both cutoffs at 5 and 20 employees (two-sided). *Source:* ORBIS-IAB.

evidence. The DDD specification now measures how much the post-reform change in firms below vs. above the employment threshold differs for family transfers compared with non-family transfers. Pre-trends do not differ significantly, which matches the event-study trends in Figure 4. Five years after their transfer, the employment and wage bill gap between firms below vs. above the employment threshold grew by ca. 10% more for family transfers than it did for non-family transfers. I.e., family-transferred firms below the employment threshold (=newly exposed to the EPC) show less employment dynamics.

Figure 6: **The effect of the EPC above vs. below threshold**



Notes: This figure shows leads and lags from Equation 2 using non-family transfers as the control group (control A). Data are binned by year relative to the transfer year, and the coefficients are normalized to the year before the transfer ($\tau_{it} = -1$). *Source:* ORBIS-IAB.

3.2 Mechanisms

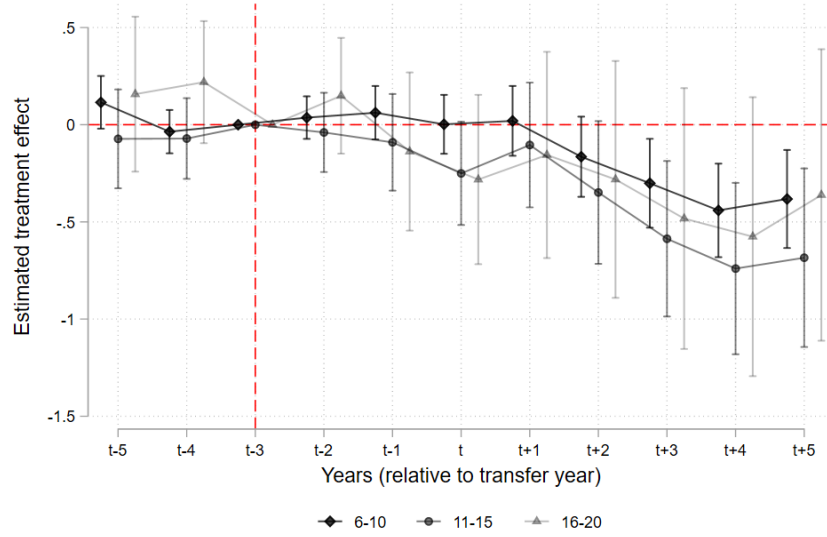
We examine employment effects by initial firm size and changes in the shares of regular and marginal employment. Firm size determines the applicable payroll requirement and is associated with differences in employment protection. Workforce composition determines how a change in headcount translates into a change in payroll.

Figure 7 reports employment effects by initial firm size. Firms with 10 or fewer employees are exempt from German dismissal protection (§ 23 *KSchG*). The payroll requirement also varies with size: under the partial exemption, firms with 6–10, 11–15, and 16–20 employees must preserve 50%, 60%, and 80% of baseline payroll, respectively (Table 1). A persistent employment gap appears in all three groups.

Figure 8 reports effects on workforce composition. The share of regular jobs declines by almost 2 percentage points from an average of about 75% (Appendix Table A.1), with a corresponding increase in the marginal employment share.¹⁶ This change is driven by a reduction in regular employment (Appendix Figure A.9). The pre-transfer point estimates also

¹⁶Marginal employment refers to mini-jobs, whose earnings are subject to a statutory ceiling.

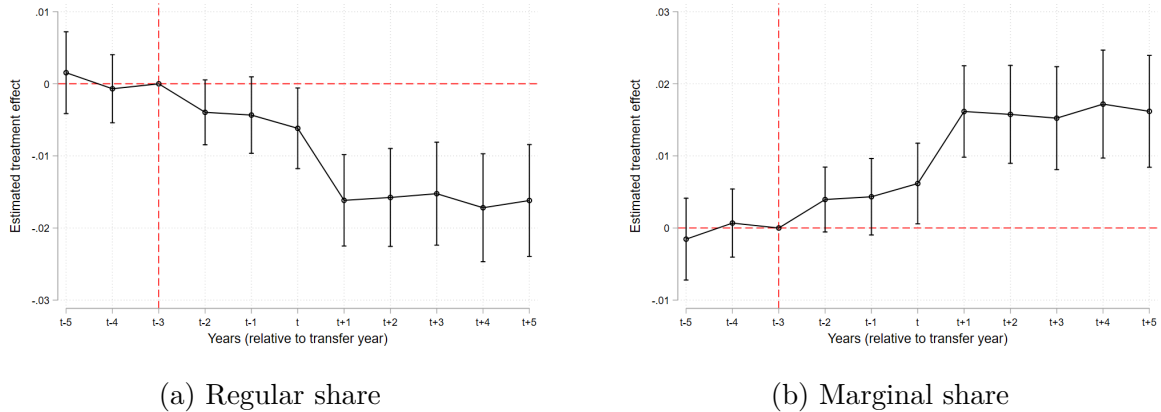
Figure 7: **Mechanism I: Employment effects by initial firm size.**



Notes: This figure shows leads and lags from Equation 1 using non-family transfers as the control group (control A). Data are binned by year relative to the transfer year, and the omitted category is the difference between treated and control groups three years before the transfer ($t = -3$), the first year of the transition period. *Source:* ORBIS-IAB.

suggest a shift toward marginal employment. Substitution toward lower-cost workers would reduce both the pre-transfer wage bill and the subsequent payroll target. Section 4 relates this pattern to firms' greater scope to change workforce composition than total headcount.

Figure 8: **Mechanism II: Effects on the shares of regular and marginal employment.**



Notes: This figure shows leads and lags from Eq. 1 using non-family transfers as the control group (control A). Data are binned by year relative to three years before the transfer year, and the omitted category is the difference between treated and control groups three years before the transfer ($t = -3$), the first year of the transition period. *Source:* ORBIS-IAB.

3.3 Heterogeneity

The overall results might still conceal important differences between firms. In this section, we examine additional heterogeneity, dividing firms by age, sector, and region. This shows whether the EPC has stronger effects in younger versus more mature businesses, in industries with different labor-to-capital ratios, or in East Germany. Results for these types of heterogeneity are presented in Table 4. Younger firms, which are often more financially constrained and on more volatile growth paths, may respond more strongly to the EPC. Services may also respond more strongly to the EPC. Manufacturing has greater scope for automation via capital-labor substitution, while services are typically more labor-intensive, often relying on lower-skilled or customer-facing workers, so that output is harder to automate. However, we do not detect differences between sectors (column 2). We also do not find differences between young and old firms (column 1) or firms in East and West Germany (column 3).

3.4 Firm performance

Finally, we examine whether the choice of lower employment in exposed firms translates into lower performance and is reflected in balance-sheet metrics. Since balance-sheet information is only available for a subset of firms, we construct two separate samples based on the financial data from ORBIS, requiring the coverage of turnover (turnover sample) or asset variables (asset sample). Table 5 displays pooled difference-in-differences estimates using financial observations through 2019. To assess sensitivity to subsample selection, we estimate employment effects using the IAB employment data within each sample. In both cases, we continue to find negative employment effects that are consistent with our baseline estimates (columns 1 and 4).

We find no statistically significant effects on core performance indicators such as turnover and productivity (columns 2–3). The estimates are nevertheless informative about magnitudes. For turnover, the point estimate of -1.5 percent is quantitatively close to the reduction in employment in the sample, consistent with a pro-rata decline. In line with this interpretation,

Table 4: **Heterogeneity: Age, sector, and region**

	(1)	(2)	(3)
	<u>Age</u>	<u>Sector</u>	<u>Region</u>
	Employment		
Treat $\times$ Post	-0.0085 (0.0875)	-0.3169*** (0.1089)	-0.3349*** (0.0834)
Treat $\times$ Post $\times$ Young firm	-0.2327 (0.1623)		
Treat $\times$ Post $\times$ Manufacturing		0.0866 (0.1542)	
Treat $\times$ Post $\times$ Other		0.0568 (0.6186)	
Treat $\times$ Post $\times$ East Germany			0.0394 (0.2046)
Obs	129676	128117	129169
Firms	12350	12204	12299
Treated firms	5908	5816	5887
Year FE	X	X	X
Firm FE	X	X	X

Notes: Results from estimating Eq. 1 using non-family transfers as the control group (control A). Young firms are defined as age at transfer at or below the median (13 years). For sectors, commerce and services are the base category; *other* includes finance and agriculture. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ *Source:* ORBIS-IAB.

the productivity estimate is economically close to zero. As productivity is calculated as turnover divided by employment to the power 0.8, this result suggest a mechanical decline in turnover and no meaningful change in operating efficiency.

In contrast, the asset sample reveals significant positive effects on total assets, tangible assets, and cash holdings (columns 5–7). This indicates that EPC-exposed firms under succession build up more assets within the firm. One possible interpretation of the positive asset effects is tax planning. Under the German inheritance tax regime, owners have incentives to hold assets within the operating company rather than privately, as business assets may qualify for preferential inheritance tax treatment.¹⁷ Consequently, the observed increases in assets may

¹⁷This incentive was particularly visible in the so-called Cash GmbH scheme, which allowed cash holdings to be deposited in corporations and transferred under the business exemption. The scheme was disallowed in 2013 through a limitation of the share of non-operational ("ad-

reflect succession-related tax planning rather than changes in the firm’s production function. At the same time, the accumulation of tangible assets is also consistent with substitution away from labor toward capital. Given the available data, we cannot distinguish between these mechanisms, and the positive asset effects should therefore be interpreted with caution.

Table 5: **Firm performance: balance-sheet outcomes**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Turnover sample			Asset sample			
	Emp.	Turn.	Prod.	Emp.	Tot. Assets	Tang.	Cash
Treat $\times$ Post	-0.0196* (0.0108)	-0.0151 (0.0117)	0.0006 (0.0110)	-0.0213*** (0.0077)	0.0544*** (0.0106)	0.0910*** (0.0225)	0.1577*** (0.0338)
Obs	25,356	25,356	25,356	51902	51,902	51,902	51,902
Firms	4,115	4,115	4,115	7012	7,012	7,012	7,012
Treated firms	1,946	1,946	1,946	3432	3,432	3,432	3,432
Year FE	X	X	X	X	X	X	X
Firm FE	X	X	X	X	X	X	X

Notes: Pooled difference-in-differences estimates using non-family transfers as the control group (control A), with firm and year fixed effects. The post-transfer period begins in the transfer year, and financial observations are restricted to years through 2019. All outcome variables are in logs. The turnover sample (columns (1)-(3)) contains observations for which information on employment, turnover and productivity are available. The asset sample (columns (4)-(7)) contains observations for which information on employment, total assets, tangible assets and cash assets is available. Turnover is operating revenue. Productivity is defined as $turnover/employment^{0.8}$. The asset variables follow standard balance-sheet definitions. Standard errors clustered at the firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ *Source:* ORBIS-IAB.

Taken together, the results indicate that the policy affects employment in exposed firms, irrespective of region and sector. Simultaneously, exposed firms increase asset holdings and show no statistically significant change in productivity.

Our estimates capture the employment response to EPC conditionality. Five years after the transfer, exposed successions have forgone about 0.5 jobs of employment growth. To the extent that employment gains at other firms offset this loss, the aggregate employment cost is smaller. A full assessment of succession tax relief also requires evidence on the successions ministrative”) assets that can be held within the firm without jeopardizing eligibility for the exemption. Nevertheless, firms with active business operations typically retain some scope to increase ”administrative” asset holdings while remaining below the relevant thresholds.

and jobs that the relief itself makes possible.

4 Interpretation

To interpret these findings, we develop a simple model in which a payroll-preservation requirement can discourage expansion while encouraging retention. The employment patterns of interest are little change in employment before succession, a shift toward marginal employment, lower employment and average wages after succession, and fewer hires and departures. Appendix [E](#) presents the model.

The model has three elements. First, a risk-averse owner bears the firm's profit risk, and productivity after succession is uncertain. Second, the firm employs regular and marginal workers. Regular workers cost more and require hiring preparations before productivity is known; marginal workers can be hired afterwards. The two types are complementary: employing more of either raises the productivity of the other. Total employment is costly to adjust before succession, but workforce composition can change more easily. Third, the firm incurs a tax liability if payroll after succession falls below a specified fraction of its pre-transfer payroll.

We first consider plans for expansion, then workforce composition before and after succession, and finally worker departures. When productivity is low, the firm would otherwise reduce employment and payroll. If payroll falls below the target, the firm incurs a tax liability when profits are already low. For a risk-averse owner, the gains from expansion when productivity is high become less valuable relative to the costs of preparing for it. Expansion in that state requires additional regular workers, so the firm provides for a smaller regular workforce.

Workforce composition can also respond before succession. The firm can reduce its potential liability by lowering the payroll benchmark. When total headcount is costly to adjust, it does so mainly by substituting marginal for regular workers. Employment then changes

little, while the regular employment share and average wage decline. This reduces the regular workforce available after natural attrition.

After succession, the smaller regular workforce limits expansion when productivity is high. Complementarity means that fewer regular workers also reduce the demand for marginal workers in that outcome. The firm partly offsets the loss of regular workers by employing more marginal workers per regular worker. Regular employment therefore falls proportionately more, reducing its workforce share. The change in composition lowers average wages even though pay within each worker type is unchanged.

Finally, the effect on departures reflects a related retention incentive. When productivity is low and payroll falls short of the target, retaining a worker reduces the tax liability. Firms may therefore retain workers they would otherwise dismiss. The requirement can consequently dampen both hiring in high-productivity states and departures in low-productivity states. For a given pre-transfer workforce, expected employment is lower when the reduction in hiring outweighs the reduction in departures. This is a difference relative to otherwise identical unexposed firms and need not entail an absolute employment decline after succession. The model thus shows how payroll-preservation requirements can slow employment growth, providing an interpretation of the empirical findings.

5 Conclusion

We study the employment effects of conditioning inheritance tax relief on payroll preservation. Germany's 2016 reform extended this condition to family firms with 6 to 20 employees. We follow firms from five years before to five years after succession and compare exposed transfers with transfers outside the scope of the reform. The payroll requirement is based on the firm's average wage bill over the five years preceding the transfer.

Five years after succession, exposed firms employ about 4 percent fewer workers and pay

about 4 percent lower average wages than comparable non-family transfers. The estimated employment reduction ranges from about 1 to 4 percent across control groups and is about 10 percent in the threshold design. Pre-transfer employment effects are not statistically distinguishable from zero, while the point estimates suggest an earlier shift toward marginal employment and lower average wages. Both worker inflows and outflows decline. In the second and third years after transfer, the estimated decline in inflows is larger, consistent with lower hiring contributing to the employment gap. Results are similar across sectors, regions, and firm age. In the shorter balance-sheet sample, the revenue estimate is negative but imprecise, and the productivity estimate is close to zero. The estimates are intention-to-treat effects because we observe eligibility for relief rather than take-up.

We interpret these findings as a sign that payroll condition can discourage expansion while encouraging retention. A payroll shortfall adds a tax liability when productivity and profits are low. A risk-averse owner may respond by limiting expansion in regular jobs that require advance hiring arrangements. Complementarity also restrains expansion in marginal jobs. At the same time, the requirement encourages retention when payroll falls below the target. For a given pre-transfer workforce, employment is lower if hiring falls by more than departures.

These findings identify an employment cost of attaching payroll conditions to succession tax relief. A full welfare assessment would also require the benefit side of the policy – the successions and jobs that the relief itself makes possible – which our design cannot measure; we leave this question to future research.

Acknowledgments

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Online Appendices

A Appendix Figures and Tables

Table A.1: Summary statistics

	(1) Sample A	(2) Sample B	(3) Sample C
Employment	10.768 (5.337)	11.031 (5.237)	10.032 (5.105)
Daily wage sum (winsorised)	735.475 (517.219)	715.075 (478.447)	
Share high skill	0.118 (0.178)	0.091 (0.144)	0.133 (0.192)
Share middle skill	0.753 (0.233)	0.804 (0.197)	0.693 (0.242)
Share low skill	0.080 (0.119)	0.072 (0.108)	0.116 (0.138)
Share of regular employees	0.749 (0.234)	0.748 (0.228)	0.691 (0.269)
Share of marginal employees	0.251 (0.234)	0.252 (0.228)	0.309 (0.269)
Number of establishments	1.052 (0.286)	1.051 (0.263)	1.126 (0.497)
Obs	129,969	138,577	4,344,846
Firms	12,377	12,947	408,465
Treated firms	5,919	5,919	5,919

Notes: Samples are constructed based on the definition of different control groups as summarized in Table 3 in the paper (A = non-family transfers, B = pre-reform within family transfers, C = never transferred). Mean coefficients; standard deviation in parentheses. Employment is number of employees. Average daily wage sum in euros. High skill = completed tertiary. Middle skill = completed apprenticeship. Low skill = without completed education. Regular employment = jobs that are subject to social security contributions. Marginal employment = mini-jobs (part-time jobs with monthly income of 450 euros or less).

Table A.2: The effect of the EPC on employment dynamics, employment

	(1)	(2)	(3)	(4)	(5)	(6)
	<u>Full</u>		<u>No gaps</u>		<u>No gaps (+post)</u>	
	<u>Employment</u>					
Treat $\times$ Post	-0.2256*** (0.0773)	-0.2486*** (0.0716)	-0.2296*** (0.0760)	-0.2454*** (0.0722)	-0.3076*** (0.0784)	-0.3148*** (0.0757)
Obs	152,863	152,863	143,000	143,000	129,969	129,969
Firms	16,292	16,292	14,193	14,193	12,377	12,377
Treated firms	7,050	7,050	6,514	6,514	5,919	5,919
Year FE	X	X	X	X	X	X
Firm FE		X		X		X

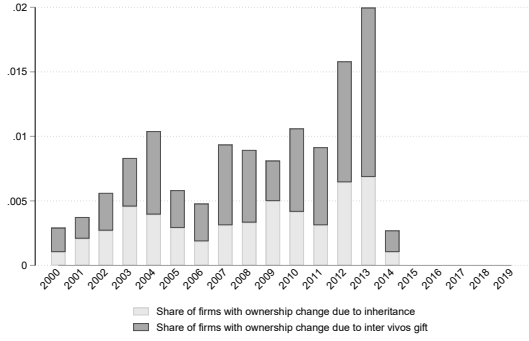
Notes: Results from estimating Eq. 1 using non-family transfers as the control group (control A). Full = Sample where firms are observed at least once before and after transfer. No gaps = Sample where firms are continuously observed between first and last appearance in the data. No gaps (+post) = Sample where firms are additionally observed in each treatment year until five years after transfer. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Source:* ORBIS-IAB. Event study results for specification (6) are depicted in Panel (a) of Figure 4 in the paper.

Table A.3: The effect of the EPC on employment dynamics, wage bill

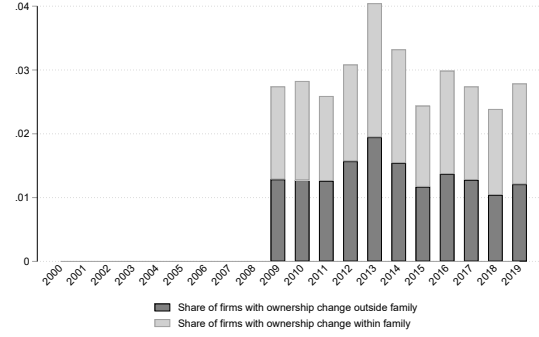
	(1)	(2)	(3)	(4)	(5)	(6)
	<u>Full</u>		<u>No gaps</u>		<u>No gaps (+post)</u>	
	<u>ln wage bill</u>					
Treat $\times$ Post	-0.0208** (0.0104)	-0.0541*** (0.0095)	-0.0358*** (0.0099)	-0.0521*** (0.0094)	-0.0419*** (0.0100)	-0.0586*** (0.0096)
Obs	152,863	152,863	143,000	143,000	129,969	129,969
Firms	16,292	16,292	14,193	14,193	12,377	12,377
Treated firms	7,050	7,050	6,514	6,514	5,919	5,919
Year FE	X	X	X	X	X	X
Firm FE		X		X		X

Notes: Results from estimating Eq. 1 using non-family transfers as the control group (control A). Full = Sample where firms are observed at least once before and after transfer. No gaps = Sample where firms are continuously observed between first and last appearance in the data. No gaps (+post) = Sample where firms are additionally observed in each treatment year until five years after transfer. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Source:* ORBIS-IAB. Event study results for specification (6) are depicted in Panel (b) of Figure 4 in the paper.

Figure A.1: Share of firms with ownership change



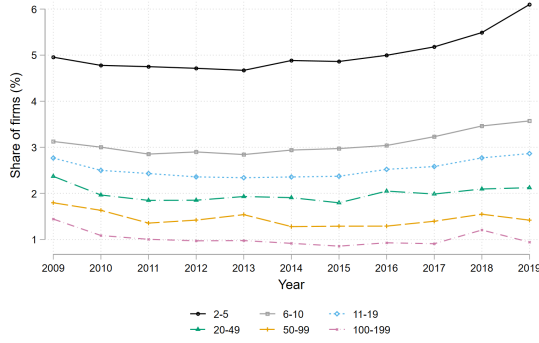
(a) Inheritances vs. gifts (IGTS)



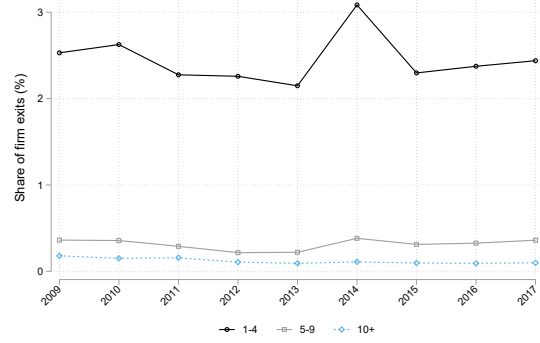
(b) Within-family vs. non-family transfers (ORBIS)

Notes: Panel a) displays in each year the share of firms that record a transfer in ownership due to either inheritance or inter vivos gift. Panel b) displays in each year the share of firms that record a transfer in ownership to a family member or a non-family investor. *Sources:* IGTS and ORBIS.

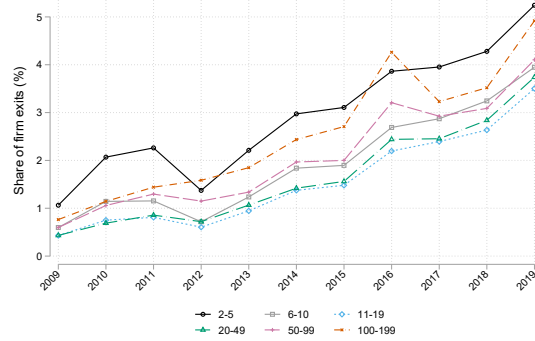
Figure A.2: Firm exits by firm size, 2009-2019



(a) IAB



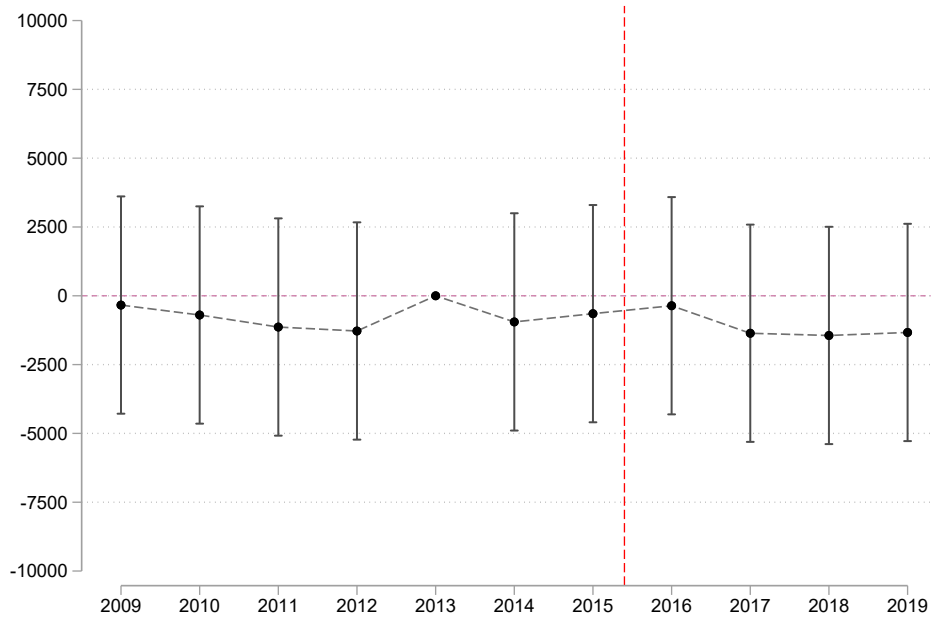
(b) EUROSTAT



(c) ORBIS

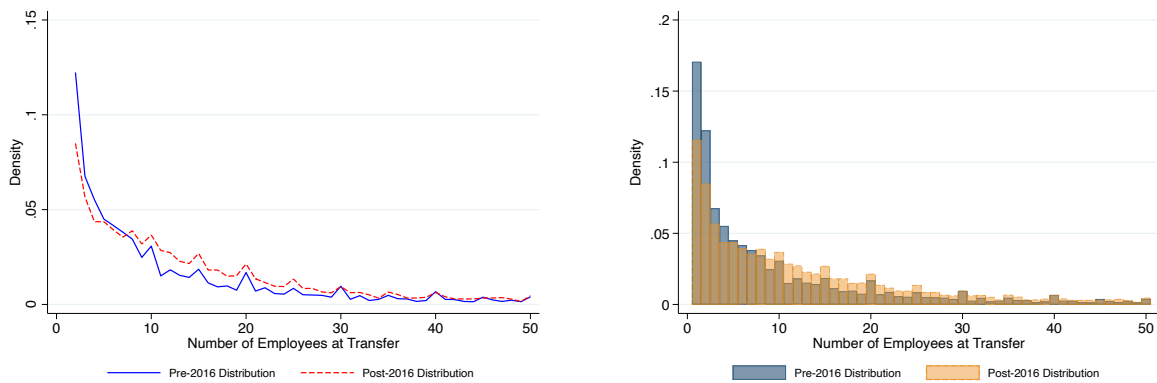
Notes: Share of firms exiting in each year by average firm size (number of employees) based on IAB (a), Eurostat (2024) (b) that publishes only size categories 1-4, 5-9 and 10+ and ORBIS (c). The IAB data does not record explicitly when a firm ceases to exist. Instead, we define a firm exit as occurring when the establishment-firm crosswalk no longer assigns any establishments to that firm ID. For the Eurostat series, a new company definition introduced in 2018 creates a break so that we refrain from reporting the series since 2018. Exit rates based on ORBIS should be interpreted with caution. ORBIS does not reliably capture firm entry and exit, as firms may disappear from the dataset due to reporting lags, coverage changes, missing filings, or structural events (e.g., M&A or shifts from unconsolidated to consolidated reporting) rather than true market exit (Bajgar et al., 2020). In addition, financial accounts are reported with a lag of roughly two years, and firms that do not report for several years may be removed from the database even if they continue operating, leading to fewer firms observed in the most recent years (Kalemli-Özcan et al., 2024). *Sources:* IAB, Eurostat (2024), and ORBIS.

Figure A.3: Yearly transfers - family vs. non-family firms



Notes: This figure presents estimates of the parameters in Equation 1. The omitted category is the difference between family and non-family firms in 2012. The regression does not include any additional controls. Source: ORBIS.

Figure A.4: Distribution of firm size, pre and post 2016

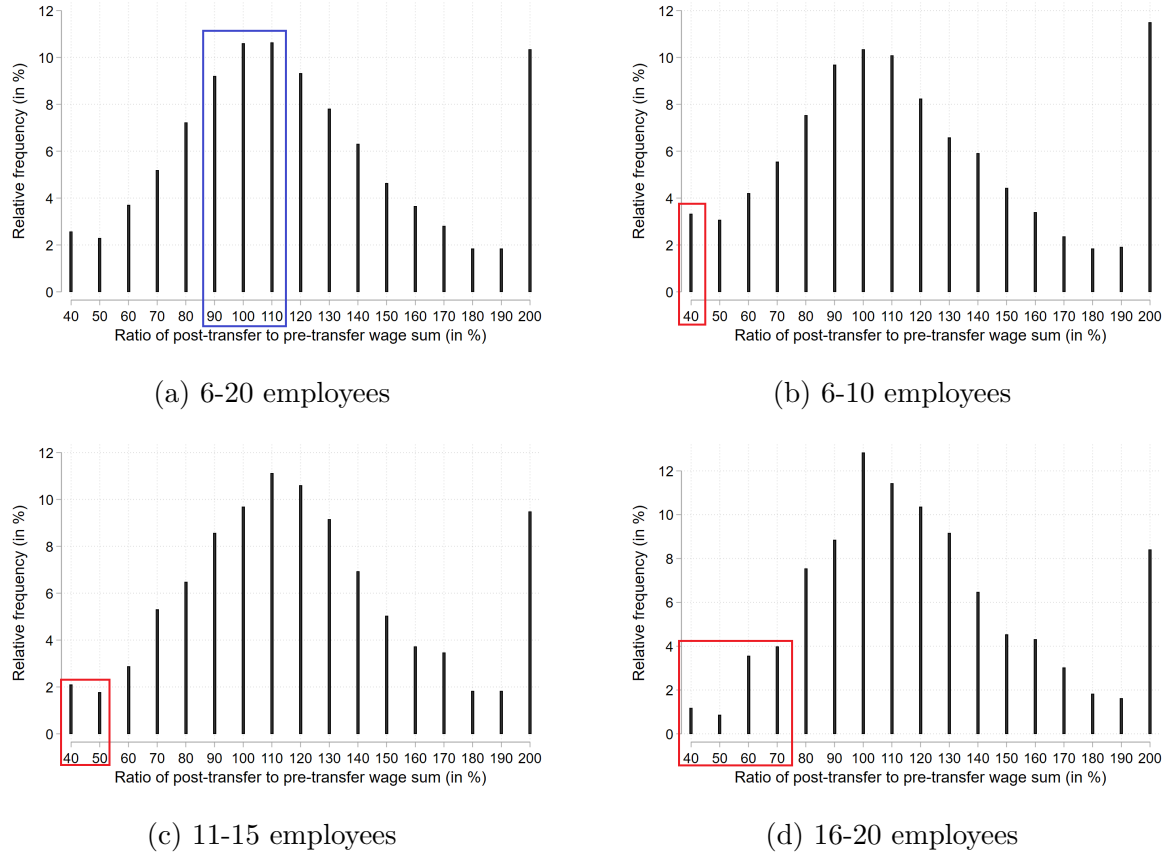


(a) Density of firms transferred pre and post 2016

(b) Histogram of firms of transferred pre and post 2016

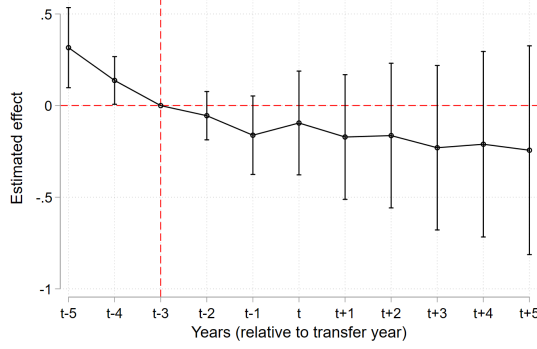
Notes: Panel a) shows a density plot of the distribution of the number of transferred firms by firm size by groups: pre-2016 and post-2016. Panel b) plots the histogram of the distribution of transferred firms by size by groups: pre-2016 and post-2016. Source: ORBIS.

Figure A.5: Share of preserved wage bill

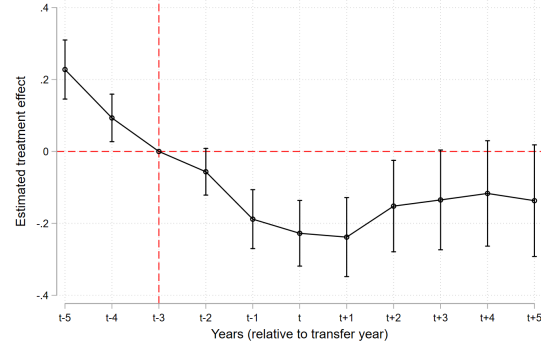


Notes: This figure shows the ratio of the mean wage bill in years 1–5 after transfer to the mean in the five years before transfer in relative frequencies for family transfers with 6–20 initial employees observed in every year from five years before to five years after transfer. The required share of the pre-transfer wage bill to be preserved is determined by firm size (see Table 1). The blue box indicates the frequency of firms recording a post-to-pre-ratio of at least 90% and below 120%. The red box highlights the frequency of firms recording a post-to-pre-ratio of below 70/50%, respectively. *Source:* ORBIS-IAB.

Figure A.6: The effect of the EPC on employment - control B and C



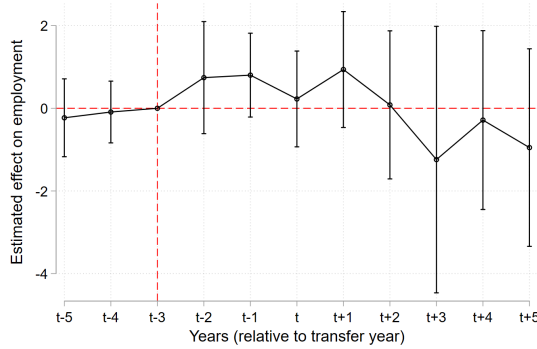
(a) Within-family before 2016 - control B.



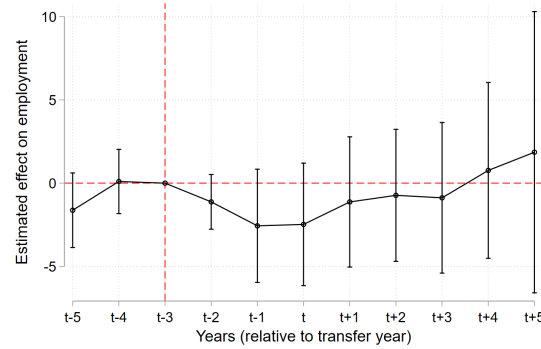
(b) Never transferred - control C

Notes: This figure shows leads and lags from the DiD regression using within-family transfers pre-2016 (control B) and never transferred firms as control group (control C). Data are binned by year relative to the transfer year, and the omitted category is the difference between treated and control groups in the year before entering the transition period ($t = -3$). *Source:* ORBIS-IAB.

Figure A.7: The effect of the EPC on employment - in-group placebo tests



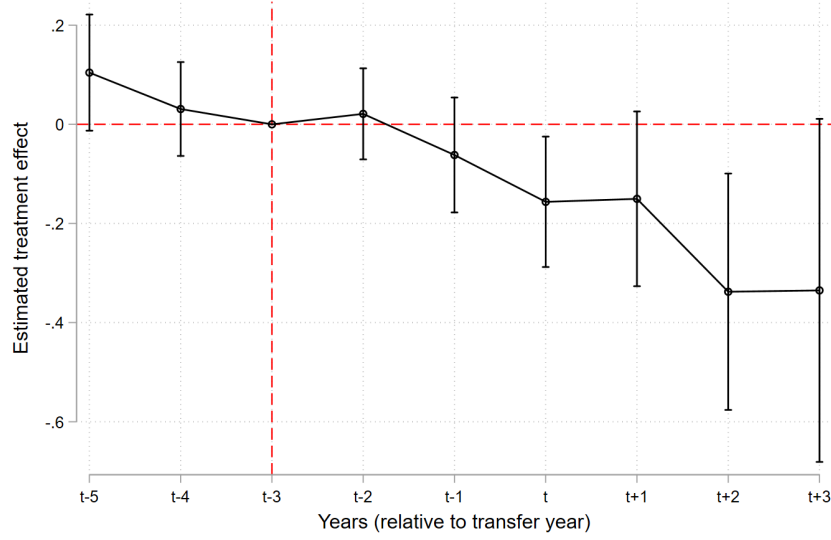
(a) Placebo: firms with 30-50 emp.



(b) Placebo: firms with 50-100 emp.

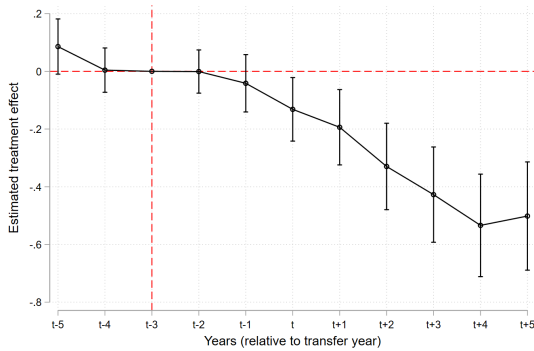
Notes: This figure shows leads and lags from Equation 1 using non-family transfers with either 30-50 (a) or 50-100 (b) employees as control group. Data are binned by year relative to the transfer year, and the omitted category is the difference between treated and control groups in the year before entering the transition period ($t = -3$). *Source:* ORBIS-IAB.

Figure A.8: The effect of the EPC on employment - excluding COVID-19

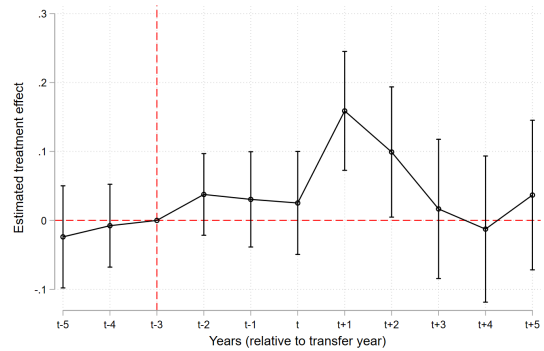


Notes: This figure shows leads and lags from Equation 1 using non-family transfers as the control group (control A). Data are binned by year relative to the transfer year, and the omitted category is the difference between treated and control groups three years before the transfer ($t = -3$), the first year of the transition period. Years including and after 2020 are dropped from the sample. *Source:* ORBIS-IAB.

Figure A.9: Mechanism II: Workforce composition shift to cheaper labor



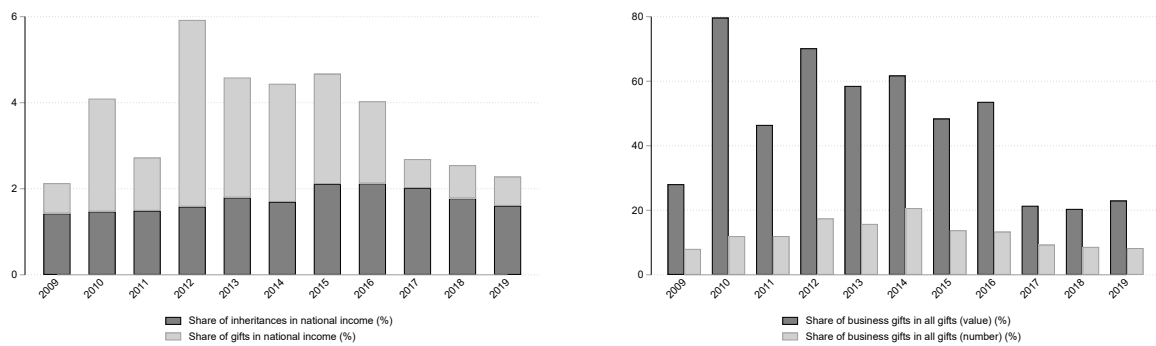
(a) Regular employment



(b) Marginal employment

Notes: This figure shows leads and lags from Eq. 1 using non-family transfers as the control group (control A). Data are binned by year relative to three years before the transfer year, and the omitted category is the difference between treated and control groups three years before the transfer ($t = -3$), the first year of the transition period. *Source:* ORBIS-IAB.

Figure A.10: Inheritances and gifts in Germany, 2009-2019

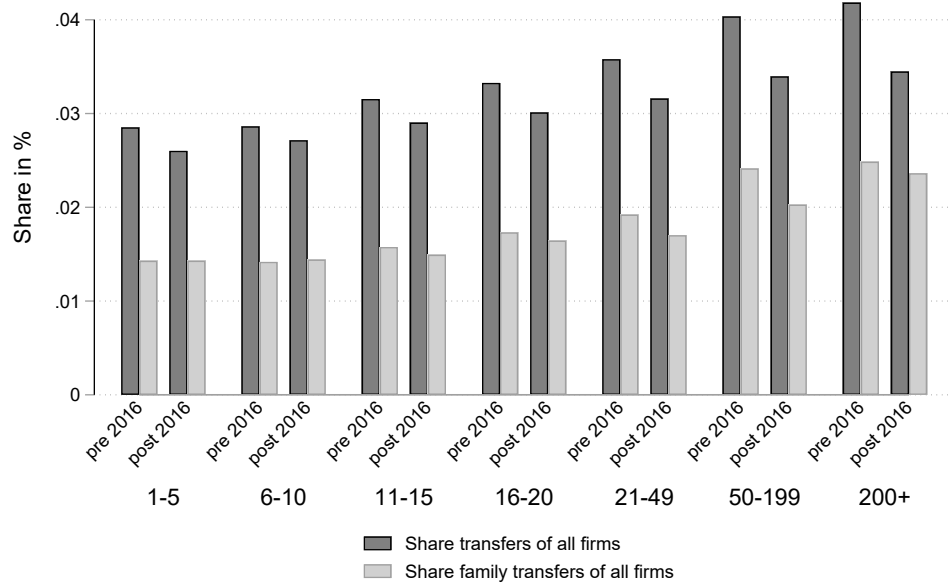


(a) Value of tax-assessed transfers

(b) Business gifts in all gifts

Notes: Panel a) displays the share of inheritances and gifts, that are recorded by the tax authorities, in national income. Inheritances and gifts are recorded if they exceed the exemption thresholds or if repeated receipts jointly exceed the threshold. Panel b) shows business gifts as a share of total gifts when counting the gifts (light grey) and adding up the value of gifts (dark grey). Between 2009 and 2019, total tax-assessed transfers fluctuate between 2 and 6% of national income (panel a). The value share of business gifts in all gifts averages roughly one half between 2009 and 2016 and declines to about 20% thereafter (panel b). The drop in the gifts in 2017 is likely due to the melt-down of exemptions for large transfers exceeding 26 million € introduced in 2016. Recipients of inheritances and gifts valued above the threshold can still obtain a full tax relief if they prove that they are personally unable to pay the tax from their available assets, which however requires them to disclose their private wealth. Note that our analysis focuses on small firms up to 20 employees with market values likely below 26 mio. and, hence, not affected by this change in legislation. *Source:* Inheritance and gift tax returns available through the federal statistical office.

Figure A.11: Transfer share by firm size (family vs. non-family firms), pre and post 2016



Notes: The figure displays the share of all transfers and family transfers as a ratio of all firms observed in our sample in different firm size bins (measured by the average number of employees across all years), comparing the periods 2012-2015 and 2016-2018. *Source:* ORBIS.

B Inheritance and gift tax legislation in Germany

In Germany, inheritances and inter vivos gifts are taxed at the time of transfer from donor to recipient, i.e., at time of death or gift. Both types of transfers are subject to the same tax rules, including allowances and rates. The taxable amount is calculated by subtracting any liabilities from the total gross assets involved in the transfer. Tax allowances vary based on the relationship between donor and recipient, ranging from €20,000 for unrelated parties to €500,000 for spouses. The taxation is progressive, with rates decreasing as the familial relationship between donor and recipient becomes closer (see Appendix Tables B.1 - B.3). The law also offers exemptions for certain asset types, with the exemptions for private businesses being particularly generous.

Table B.1: Tax rates (§§ 15, 19 ErbStG)
01.01.2009 - 31.12.2009

Value up until including ... €	% in tax class		
	I	II	III
<i>75,000</i>	7	<i>30</i>	<i>30</i>
<i>300,000</i>	11	<i>30</i>	<i>30</i>
<i>600,000</i>	15	<i>30</i>	<i>30</i>
<i>6,000,000</i>	19	<i>30</i>	<i>30</i>
<i>13,000,000</i>	23	<i>50</i>	<i>50</i>
<i>26,000,000</i>	27	<i>50</i>	<i>50</i>
<i>>26,000,000</i>	30	<i>50</i>	<i>50</i>

^I Spouse/*life partner*, children/stepchildren, grandchildren, great-grandchildren, parents and foreparents (if acquired due to death)

^{II} Parents and foreparents (in the case of gifts), siblings, nieces/nephews, stepparents, children-in-law, parents-in-law, divorced/*repealed* spouses/*life partners*

^{III} Others, donations

Table B.2: Tax rates (§§ 15, 19 ErbStG)
01.01.2010 - today

Value up until including ... €	% in tax class		
	I	II	III
75,000	7	15	30
300,000	11	20	30
600,000	15	25	30
6,000,000	19	30	30
13,000,000	23	35	50
26,000,000	27	40	50
>26,000,000	30	43	50

^I Spouse/life partner, children/stepchildren, grandchildren, great-grandchildren, parents and foreparents (if acquired due to death)

^{II} Parents and foreparents (in the case of gifts), siblings, nieces/nephews, stepparents, children-in-law, parents-in-law, divorced/repealed spouses/life partners

^{III} Others, donations

Table B.3: Tax allowances (§ 16 ErbStG)
01.01.2009 - today

Group		Allowance in €
I	Spouse/ Life partner	500,000
II	Children/stepchildren + their orphaned children, i.e. grandchildren	400,000
III	Non-orphaned grandchildren	200,000
IV	Great-grandchildren, parents and foreparents (if acquired due to death)	100,000
V	Parents and foreparents (in the case of gifts), siblings, nieces/nephews, stepparents, children-in-law, parents-in-law, divorced/repealed spouses/life partners	20,000
VI	Others, donations	20,000

B.1 Preferential treatment of business transfers

The employment preservation criterion (EPC) introduced in 2009 rules that tax exemptions are only granted if the firm, of which ownership was transferred to the tax filer, kept the wage bill stable (*Lohnsummenregelung*). Tax filers can choose between partial exemption (85% tax break) and full exemption (100% tax break). The tax exemption is only granted if the business has maintained the wage bill at a defined % over the defined retention period, which is five years for the partial exemption and seven years for the full exemption.

The conditions for the partial exemption (85% tax break) are less strict than for the full exemption. First, only 80% of the wage bill must have been preserved five years after transfer; for the 100% tax break. Second, administrative assets may not exceed 50% of the sum of assets; for the 100% tax break, administrative assets may not exceed 10%.¹⁸

The tax liability is calculated retroactively based on originally assessed values of the operational assets O . As mentioned above, the tax rate τ is progressive and decreases with the degree of kinship. The tax allowance A increases with the degree of kinship. Any tax previously paid is credited. Granted exemptions are forfeited on a pro-rata basis if the employment preservation criterion is not met.¹⁹ Formally, the tax liability T is defined as

¹⁸While small firms do not have to adhere to the EPC, the administrative asset share still matters for the eligibility for the 85% or 100% exemption.

¹⁹The 2016 reform introduced a melt-down of exemptions for transfers greater than 26 million € (with no exemption for transfers above 90 million €). At the same time, a means test of the recipient (*Verschonungsbedarfsprüfung*) allowed the possibility for a tax abatement up to 100% even for transfers above the 26 million € threshold. The changes apply for transfers from July 1, 2016.

$$T = \begin{cases} \tau \cdot \left(\left(1 - \underbrace{(85\% \cdot 400\% \cdot \frac{W_{t+5}}{\sum_{t-4}^t W_t})}_{=0.8} \right) \cdot O \right) - A & \text{if 85\% exemption chosen in } t = 0 \\ \tau \cdot \left(\left(1 - \underbrace{(100\% \cdot 700\% \cdot \frac{W_{t+7}}{\sum_{t-6}^t W_t})}_{=1} \right) \cdot O \right) - A & \text{if 100\% exemption chosen in } t = 0 \end{cases} \quad (\text{B.1})$$

The pro-rata revoking of the tax exemption if the wage bill is too low is illustrated in Figure B.1. The 85% tax break shown in the left graph requires partial preservation of the wage bill at 80% (dashed vertical line), below which the tax rate linearly increases. If the 85% tax break is selected and the wage bill exceeds 80%, then the tax rate is $\tau \cdot 0.85$. The 100% tax break shown in the right graph requires partial preservation of the wage bill at 100% (dashed vertical line).

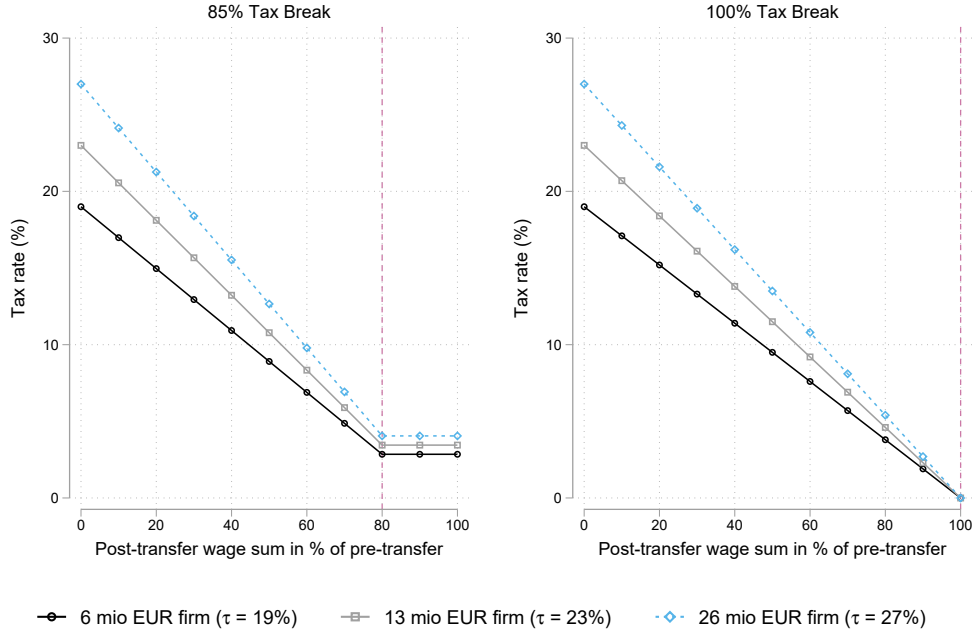
B.2 Determination of employment for EPC

The employment preservation criterion (EPC) was part of the 2009 reform package to justify the generous business exemption with the securing of jobs after firm transfers.

The EPC is mandated only for firms above a specified employment level to relax requirements for small firms. This level is defined based on the number of employees in a firm at the time of transfer (independent of the transferred shareholding, i.e., the employment count for a 10-employee firm is always set as 10, whether the recipient receives 50% or 100%). To prevent firms from cutting their employment shortly before transfer to bunch below the threshold, law guidelines explicitly dismiss the threshold in these cases, referring to the general anti-abuse clause in German tax law.²⁰ The employment count calculation is done on a head-by-head basis, i.e., part-time employees fully contribute.

²⁰See guidelines to the inheritance tax law, ErbStR R E 13a.4 (2) 4.

Figure B.1: **Pro-rata revoking of tax break**



Notes: Illustrative tax rate calculation for a firm with 16+ employees for three different firm values (6, 13 and 26 million Euros). The left graph shows the tax rate if the firm opted for the 85% tax break and the right graph shows the tax rate if the firm opted for the 100% tax break. If the 85% tax break is selected and the post-transfer wage bill undercuts 80% of the pre-transfer wage bill (dashed vertical line), then the tax rate is $\tau \cdot 0.85$. Personal allowances are neglected for simplicity. *Source:* German inheritance tax code (§ 13a Abs. 3 ErbStG).

If more than one legally and economically independent company is transferred to a recipient, employment has to be determined separately for each business. Employment numbers and wage bills are fully counted per individual business, independent of the transferred share. Businesses with employment count below the threshold are disregarded.²¹ The minimum wage bill is then determined by adding up the individual EPC for all transferred firms, i.e., reductions in the wage bill in one firm can be balanced by increases in the wage bill in

²¹Please note that transferred businesses only benefit from the exemptions if they are transferred as a whole and functional entity, i.e., donors cannot arbitrarily divide up firms to transfer several businesses with individual employment levels below the threshold. Furthermore, if the division of firms shortly before transfer cannot be economically justified, tax authorities might deem the restructuring as an abuse of law.

another firm in the portfolio.

Within each business, employment is determined at the group level: If a firm holds shares in partnerships (with any shareholding) or corporations (with more than 25% shareholding) within the EU, the number of employees and wage bill has to be included in the employment count and wage bill of the individual business on a pro-rata basis.

B.3 Legislative process

The German inheritance tax law has substantially changed over time. Two prominent reform occurred in 2009 and 2016, each catalyzed by decisions from the German Constitutional Court. Figure [B.2](#) depicts the legislative timeline.

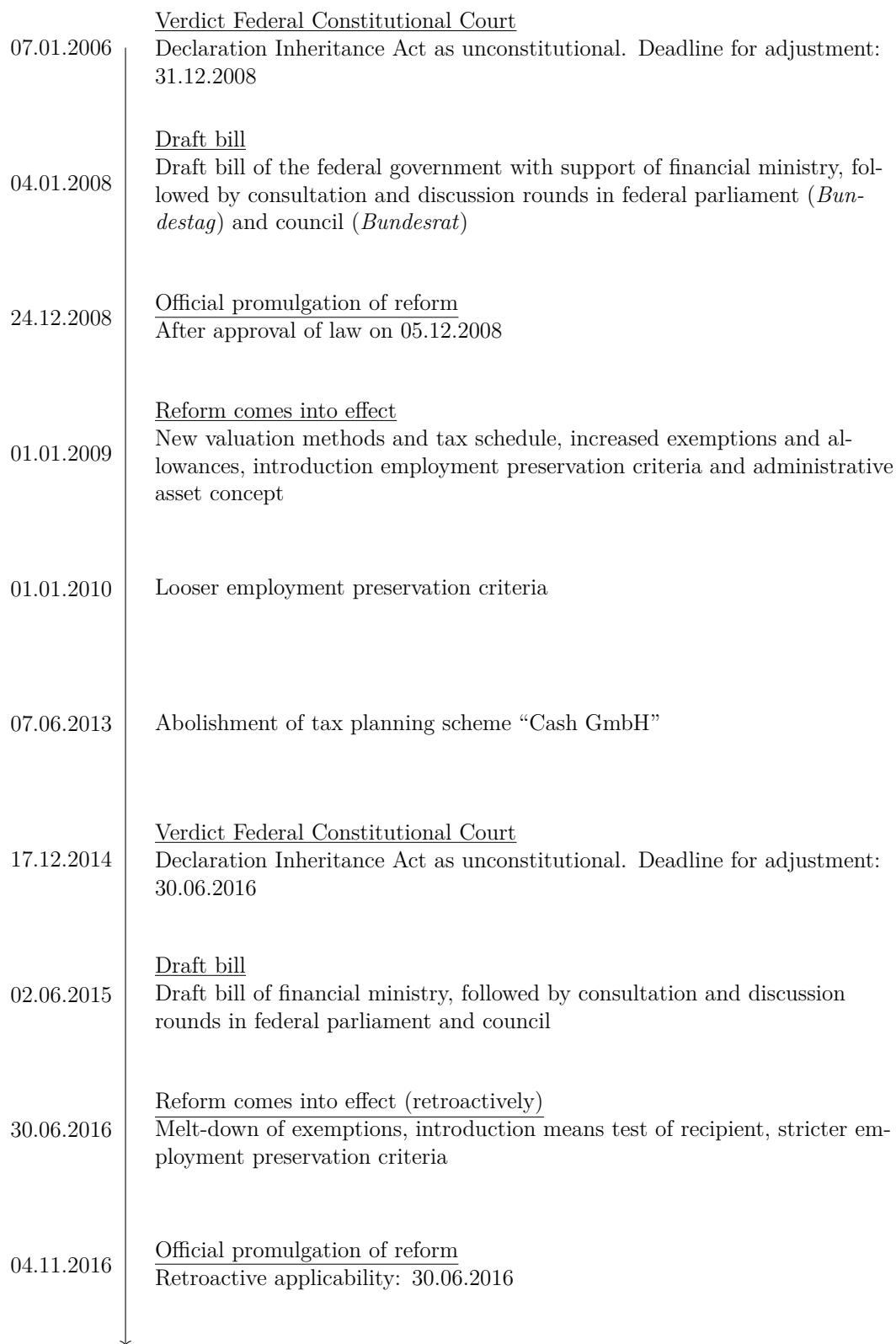
Prior to the 2009 reform, the inheritance tax system lacked granularity in its treatment of inheritances and gifts, leading to constitutional concerns. Business and agricultural assets were only assessed at 65% of their value (i.e., 35% exempted) and additionally benefited from a basic deduction of 225,000€. The exemption was revoked if the business was sold or discontinued. The valuation rules embedded in the inheritance tax law lead to very different valuation results depending on the type of asset, where especially non-listed firms and real estate were substantially undervalued. A pivotal 2006 ruling by the Constitutional Court underscored the system’s deficiencies, prompting calls for changes. The 2009 reform sought to modernize the tax regime by introducing new valuation rules, expanding tax-free allowances, and adjusting tax rates. This aimed to address criticisms of inequity, particularly concerning family businesses. The reform required assets to be valued at market prices instead of balance sheet values for inheritance tax purposes, leading to large increases in the assessment basis. To counter the resulting inheritance tax increase, exemptions were increased or introduced, notably the exemption for business assets from 85% up to 100%. Exemptions are only granted for “productive” operational assets. If a company holds too many administrative assets (e.g., properties leased to third parties, art, coins), the recipient might not be eligible for the exemption. For firms with more than 10 employees, an exemption additionally

required the preservation of employment levels after transfer to tie the exemption to the securing of jobs. The firm size threshold was increased to 20 employees in 2010.

In 2012, German legislators were discussing the abolishment of a tax planning scheme, the so-called “Cash GmbH”, where corporations were set up with cash assets to benefit from the business exemptions. The scheme was ultimately abolished in 2013 by deeming excessive cash holdings as non-exempted administrative assets.

Subsequent to a 2014 Constitutional Court decision, which deemed certain aspects of the tax law unconstitutional due to overly generous exemptions for business assets, the 2016 reform was enacted. Employment preservation was now already required for firms with 6 or more employees. Business asset exemptions were melted down for large transfers. Simultaneously, a means test of the recipient was introduced, allowing for a full tax abatement even for large transfers if the recipient had insufficient assets to bear the tax burden.

Figure B.2: **Legislative process**



Notes: The figure displays the legislative timeline for the German inheritance and gift tax law.

C Data and analysis sample

We combine data from different sources to create our firm-level sample of German company transfers. The different data sources are described in Section C.1, followed by detailed information on the identification of family transfers in Section C.2 and a summary of the sample selection process in Section C.3.

C.1 Data sources

C.1.1 Orbis ownership data

We use the historical ORBIS database by Bureau van Dijk (BvD), which provides comprehensive financial and ownership information on firms worldwide. The so-called historical Orbis database is more encompassing than the so-called online version, which only provides the most recent snapshot of ownership information and only covers financial data for the past ten years. Compared to other firm data like Amadeus or Daphne, ORBIS also includes privately held entities, which represent the majority of German firms.

The longitudinal ORBIS database enables us to track the ownership structure over time and the evolution of a firm’s performance. Specifically, we obtain employment and financial data (e.g., assets, liabilities, turnover, profits) as well as firm data on, e.g., date of incorporation or legal form spanning from 2008 to 2019, accessed from the database update in June 2021. Financial information covers a wide range of balance and profit and loss statement data as reported under Germany’s Generally Accepted Accounting Principles (GAAP). Note that due to size-based exemptions from publication obligations for financial statements, the coverage of financial data for small firms is very limited. On rare occasions, where local filings are absent—accounting for less than 1% of cases—we resort to International Financial Reporting Standards (IFRS) accounts. Our cleaning process for the financial data aligns with methodologies applied in recent work by [De Simone and Olbert \(2022\)](#), [Glaeser et al. \(2023\)](#) and [Olbert \(2025\)](#), ensuring the reliability of our analysis. We further link the companies to

a manager dataset, covering names, gender, and date of birth, appointment, and exit. This match allows us to identify owner-managers and obtain additional personal information.

C.1.2 Death data

We scrape publicly available website data on tombstones and death notices to build a comprehensive dataset of deaths of German individuals covering names, date of birth and death, and location at the state level.

First, we obtain death notices from the CompGen family announcement project.²² Volunteers collect and digitalize birth, marriage, and death notices from regional and supra-regional newspapers. We generate a list of shareholder last names and collect all death reports connected to one of the last names. We obtain the full name, birth and death years, and locations. We run the same name-cleaning algorithm on the names as for our ownership data and extract the year of death. The detail of the geographical information varies, ranging from the respective municipalities being recorded up to federal states only. We determine the federal state for the death reports. We drop duplicate observations with the same name, birth year, death year, and federal state, leaving us with 565,786 observations for deceased individuals.

Second, we obtain tombstone data in all federal states from "Find a Grave", an international community that collects pictures, GPS locations, and biographical information from tombstones.²³ We collect all available data and again run our name-cleaning algorithm. We drop duplicate observations with the same name, birth year, death year, and federal state, leaving us with 491,528 observations for deceased individuals.

Finally, we combine the death notices and tombstone data. The overlap between the two datasets is only marginal, with only 1% duplicate observations for each name - birth year - death year - state combination. We keep unique observations with death years after 2008

²²Available online at <http://familienanzeigen.genealogy.net/>

²³Available online at <https://de.findagrave.com/memorial>

and obtain a final sample with 841,421 observations. The coverage of deaths is slightly declining across time, with around 86,000 deaths in 2008 to 50,000 deaths in 2018 a drop in observations to below 15,000 deaths from 2019 onwards.

We match the combined death data to our identified firm transfers by year, name, and location and then exclude 801 potential inheritances from our analysis sample (less than 0.5% of all transfers, see section C.3).

C.1.3 IAB employer-employee data

We link our list of ownership changes to employer-employee data from the Institute for Employment Research (IAB) via the BvD-ID of the transferred firm. We refer to this linked dataset as ORBIS-IAB. We use the establishment-firm crosswalk developed by [Diegmann et al. \(2024\)](#) to identify establishments belonging to a transferred firm for every year of the sample period 2006-2019.

Aggregating employee-level employment spells from the Employment Biographies (BeH) to the firm-level allows us to construct the number of workers as well as various measures of workforce composition, such as shares by gender, age or skill as well as employment flows measured by the number of incoming and outgoing employees from one year to the next.

The BeH contains spell-based employment records for the (near) universe of employees in Germany including establishment identifiers, while it does not cover civil servants nor self-employed. As wages above the social security contribution ceiling are right-censored, we impute top wages following [Stüber et al. \(2023\)](#). We also compute the firm-level wage bill, which is defined as the sum of the (average) daily wages of all workers. We define the firm's average wage as the ratio of the former variable and the number of workers that are employed at the firm. Finally, the worker-level data allows us to compute firm-specific measures of worker flows consisting of the number of workers entering (leaving) the firm from one year to the next. We use information recorded on 30 June of a given year so that we can supplement our dataset with establishment-level information such as sector or location recorded in the

Establishment History Panel (BHP).

Table C.1 provides evidence on the characteristics of transferred firms for which a firm-establishment link can be identified, which subsequently allows combining firm-level data from ORBIS with worker-level data from the Employment Biographies (BeH). For the period 2009-2019, about 1.2 million firm-year observations (56%) can be matched. Matched and non-matched observations are similar, on average, with respect to the share of family transfers, number of shareholders and location in East Germany. However, both sets of firms differ in terms of employment size. Conditional on the number of employees being observed in ORBIS, matched observations have, on average, about twice as many workers as non-matched observations (23 compared to 12 workers, respectively). This difference is reflected in a larger share of observations of small firms (1-3 employees): these account for about 65% of observations among the non-matched compared to 23% among the matched. The high share of small firms may be due to ORBIS firms consisting exclusively of self-employed individuals or freelancers. In this case, a match cannot be expected as such firms are not included in the administrative IAB data that record employees subject to social security contributions. By contrast, the share of firms with at least 6 employees stands at about two thirds in the matched sample compared to less than 30% in the non-matched sample.

Matched and non-matched observations also differ with respect to the sector affiliation of firms. Matched observations can more often be ascribed to firms from the manufacturing sector and less often to services. Given the difference in employment size, it is not surprising that financial outcomes also differ with matched observations being associated with firms reporting to have, on average, greater assets, turnover and sales.

Table C.1: Firm characteristics by match status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ORBIS only			ORBIS-IAB			Difference ((5)–(2))	
	N	mean	sd	N	mean	sd	estimate	se
Family transfer	927,139	0.479	0.500	1,199,100	0.470	0.499	-0.009***	(0.001)
Yearly shareholder count	820,151	1.593	0.807	1,179,561	1.627	0.796	0.034***	(0.001)
East Germany	890,208	0.142	0.349	1,179,134	0.177	0.382	0.035***	(0.001)
<i>Employment</i>								
Number of employees	116,112	12.415	129.162	348,932	23.046	186.239	10.632***	(0.493)
1–3 employees	116,112	0.651	0.477	348,932	0.225	0.418	-0.425***	(0.002)
4–5 employees	116,112	0.067	0.250	348,932	0.115	0.319	0.048***	(0.001)
6–20 employees	116,112	0.169	0.375	348,932	0.411	0.492	0.241***	(0.001)
21 or more employees	116,112	0.113	0.317	348,932	0.249	0.433	0.136***	(0.001)
<i>Sector</i>								
Agriculture	921,828	0.004	0.065	1,194,227	0.007	0.084	0.003***	(0.000)
Commerce	921,828	0.248	0.432	1,194,227	0.266	0.442	0.018***	(0.001)
Finance	921,828	0.023	0.150	1,194,227	0.017	0.130	-0.006***	(0.000)
Industry	921,828	0.166	0.373	1,194,227	0.330	0.470	0.164***	(0.001)
Services	921,828	0.559	0.497	1,194,227	0.380	0.485	-0.179***	(0.001)
<i>Financial outcomes (in million euro)</i>								
Total assets	299,698	1.316	14.272	568,841	1.660	16.223	0.344***	(0.034)
Turnover	73,196	2.123	36.565	239,337	2.788	17.492	0.665***	(0.140)
Sales	33,009	3.464	14.240	132,835	4.306	16.760	0.841***	(0.091)
Obs	927,139			1,199,100				

Notes: The unit of observation is firm-year. Observations cover 2009–2019. Columns (1)–(3) report the number of observations, mean, and standard deviation for ORBIS firm-years that cannot be matched to the firm–establishment crosswalk. Columns (4)–(6) report the same for matched observations. Columns (7)–(8) report the difference in means between matched and non-matched observations and its standard error. Robust standard errors are used. ***, **, and * denote significance at the 1%, 5%, and 10% levels. *Sources:* ORBIS, ORBIS-IAB.

Table C.2: Differences in financial outcomes by match status

	(1)	(2)	(3)	(4)	(5)	(6)
	Log assets		Log turnover		Log sales	
	6–10	11–20	6–10	11–20	6–10	11–20
Matched observation	0.198*** (0.025)	0.066*** (0.020)	0.006 (0.022)	0.029 (0.024)	0.084*** (0.031)	0.018 (0.022)
Obs	55,254	71,887	47,708	36,649	21,962	28,978
R^2	0.068	0.079	0.145	0.190	0.136	0.185

Notes: The unit of observation is firm-year. Observations cover 2009–2019. Odd-numbered (even-numbered) columns refer to firms with employment between 6–10 (11–20) employees. Controls include sector fixed effects (5 categories), federal-state fixed effects (16 categories), employment, and employment squared. Standard errors are robust to heteroskedasticity and clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels. *Sources:* ORBIS, ORBIS-IAB.

We further assess the existence of systematic differences between matched and non-matched observations after differences in employment size are accounted for. To do so, we construct two subsamples of observations for which employment size can be observed in ORBIS focussing on 6 and 10 employees and 11 and 20 employees. For each of these samples, we regress the natural logarithm of different financial outcomes on an indicator for whether an observation can or cannot be matched, while also controlling for the sector of the firm, the federal state in which the firm is located, the firm’s number of employees and its square. Table C.2 summarizes the results of this analysis: Within each size category matched firms have significantly larger assets, but do not differ significantly in terms of turnover. Smaller firms, on average, also record significantly higher sales, while we estimate no significant difference for larger firms. With the caveat that ORBIS data do not contain information about employment size in every year, we interpret this finding as evidence that matched observations do not, on average, consist of better-performing firms once observable characteristics are accounted for.

In the following, we provide a detailed description of how sample size develops through the process of merging information from ORBIS with the administrative data from the IAB. Table C.3 reports the size of the sample in terms of the number of matched firms and firm-year observations for each step of the process.

Step 0: ORBIS data. The ORBIS data set contains information on 239,686 transferred firms. It covers the sample period 2009-19 and comprises a total of 2,126,239 firm-year observations.

Step 1: Merging ORBIS data into the establishment-firm data set. To identify the transferred firms in the administrative data, we start by merging the ORBIS data set into a data set containing an annual assignment of establishments to firms. This link is crucial as the administrative worker-level data that is contained in the Employment Histories (BeH) contains the establishment at which a person is employed. The assignment of establishments to firms allows us to compute total employment and workforce composition at the firm level. This procedure allows us to identify the link between firms and establishments for 158,067 firms and 1,199,100 firm-year observations.

Step 2: Expanding the set of observations. The ORBIS data set is not an annual panel in as far as a transferred firm is not necessarily observed in each year that it is in existence. For the set of 158,067 matched firms, we retain all observations that are available in the establishment-firm data set during the period 2009-19. Doing so, increases sample size to 1,247,040 firm-year observations.

Step 3: Adding worker-level data We use the Employment Histories (BeH) to construct information about employment size and composition of the transferred firms. At the worker level, we restrict the sample to workers who are either employed subject to social security contributions (*sozialversicherungspflichtig Beschäftigte ohne weitere Merkmale*) or

Table C.3: Construction of estimation sample

	Unit of observation	
	Firm	Firm-year
Step 0	239,686	2,126,239
Step 1	158,067	1,199,100
Step 2	158,067	1,247,040
Step 3	150,108	1,110,315

Notes: The table displays the change in observations when linking ORBIS firms with ownership changes to IAB data and undertaking further data adjustments.

Source: ORBIS-IAB.

marginally employed (*geringfügig Beschäftigte*). We further restrict the sample to one observation per worker and year by choosing 30 June of a given year as the reference date. This procedure yields 150,108 firms and 1,110,315 firm-year observations for which employment size and composition can be added.

C.1.4 Inheritance and gift tax survey (IGTS)

As a supplementary data source that validates relevant magnitudes and trends observed with our main dataset, we draw on the Inheritance and Gift Tax Survey (IGTS). IGTS was carried out in early 2014 by the ifo institute and targeted family firms within the ifo business survey's regular pool of 7,000 firms (Hines et al., 2019). Of these, 4,660 are family firms. The IGTS, which focused on inheritances and gifts gathered data on the year of the transfer, the type of tax payments (e.g., tax exemption), though specifics on amounts and recipients were not detailed.

The IGTS records for every year between 2000 and 2014 if an ownership transfer due to inheritance or gift occurred within the firm and if taxes were paid. The questionnaire is displayed in Appendix Section D. IGTS data are then merged with the Ifo business survey, which provides information on variables such as current and future business conditions, future employment expectations, and liquidity. These subjective variables provide up-to-

date information and a comprehensive view on financial constraints, which is crucial for non-traded firms. The merged data also include firm characteristics, like total assets, equity, sales, industry sector, the founding year, and the legal form of each firm from databases such as Amadeus Bureau van Dijk and Hoppenstedt Firmeninformationen GmbH.

C.2 Identification of ownership changes within families

We approximate any changes in the ownership structure by comparing all individuals listed as ultimate owners between one year and the next. We utilize their unique identifier and recorded shareholding to identify changes in the shareholder structure, and their name to identify family transfers.

Owner names are provided as a single text variable, i.e., Orbis does not differentiate between given and last name. Names are usually recorded in the order of last name - given names, but the order is reversed in a small share of cases. Last and first name are not always partitioned by a comma. Ownership names can also include titles and (in rare cases) job descriptions. Thus, as described below, we first extract last names in a two-step procedure, accompanied by several manual validity checks along the process. We then use the last names to determine whether owners that decrease their shareholding or exit are likely related to owners that increase their shareholding or enter the same year.

First, we clean the data. We remove any job descriptions (e.g., Kaufmann (merchant), Volkswirt (economist)), salutations (Mr, Mrs, Ms), academic titles (e.g., dipl. (diploma), Dr. (PhD), Prof. (professor)), and titles of nobility (e.g., Prinz (prince), Prinzessin (princess), Baron, Baronin (baroness), Graf (count), Gräfin (countess), Ritter (knight)). We combine composite names into one name by deleting prefixes and empty spaces (e.g., von (from), zu (to), von und zu (from and to), de, dos, van der, Mc). We drop referenced nick and maiden names. Further, we remove any special characters. We also drop any observations referring to groups rather than an individual (indicated by, e.g., Erbengemeinschaft (community of

heirs), Familie (family), Mitglieder (members), employees, Aktionäre (shareholders)).

Second, we parse the cleaned ownership names. We define the first part as *last name* and subsequent names as first up to third *given names*. We match each name part to first name registers in Germany, Austria and Switzerland, covering almost 77,000 baby names in these countries up to the 1980s. We manually add names based on the most frequent first names that occur in our data but not the registers. We define *last name* as the "true" last name if we do not find a match in the first name registers for *last name*, but match at least one of the *given names* (15% of cases). We define the first *given name* as the "true" last name if we find no match in the registers for any of the *given names*, but match the *last name* (2%). To cover cases such as, e.g., Jonas or Adam, where last names can also be common first names, we define *last name* as the "true" last name if we match both *last name* and at least one of the *given names* (9%). This simplification will result in a low error rate, given that the large majority of names is recorded in the order of last name - given name(s). Based on the same reasoning, we define *last name* as the "true" last name if we match neither *last name* nor any *given names* (4% of cases). These cases appear due to uncommon (double) names (e.g., Jurijus, Erlfried, Paul-Eckhard).

To correct for remaining mistakes due to the abbreviation of some middle or first names in our data and the salutation "M.", we replace any "true" last names containing only one character by the second word in the name (less than 0.0%).

In contrast to the owner data, the manager data provided by Orbis is more structured and differentiates between last and given names. We use this data to refine our appointed last name. We combine all managers with all owners by firm and insert the manager's last name as the owner's last name if the manager's last name is contained in the owner's full name. We identify an additional 6% last names with this approach.

As described above, we can observe two cases of changes in ownership, increases in shareholding, and new owners. Both changes can originate from other shareholders exiting or

decreasing their share, but remaining with the company. We determine *exiting shareholders* by comparing current shareholders to shareholders in the previous period and identifying missing shareholders. *Decreasing shareholders* are shareholders that are still present, but hold a lower share in the company as compared to the previous period. Vice versa, we identify *entering* and *increasing shareholders* as shareholders not previously present and increasing their shareholding as compared to the previous period, respectively.

We compare the last names of *exiting* and *decreasing shareholders* with *entering* and *increasing shareholders*. In case of double last names (e.g., Schneider-Müller), we also compare each part of the last name. As for the general transfers, we only consider cases with a share change of at least 25%.

We might mistakenly flag changes in ownership as family transfers if non-related shareholders share the same last name. Thus, we scrape the number of times any of our family owners' last names are recorded in the German phone book.²⁴ The data is top-censored at 999, which we take as the threshold for a frequent last name. On average (in the median), a last name appears 84 (22) times in the phone book if recorded at all. Only 2% of our names appear at least 999 times. This applies to "classical" frequent names such as, e.g., Müller, Schneider, or different writing styles of Maier, but also to less obvious names such as, e.g., Adler, Jahnke, or Zeller. In our family transfer sample, one-third are connected to families with frequent last names.

C.3 Sample selection process

The sample selection process is summarized in Table C.4. We start by extracting ownership information from Orbis covering the years 2008 to 2019. We observe more than 60 million owner-firm-years for owners located in Germany, for around 8 million individual firms.

First, we generate our initial sample to identify ownership changes at the firm-owner-year

²⁴Available online from <https://www.dastelefonbuch.de/Suche>

level. We drop firm establishments. The ownership structure is identical for these establishments and the main company. We also drop foreign firms for simplicity. While transfers of foreign assets to German residents are, in principle, also liable to German inheritance and gift taxes, the recipients could claim tax credits for foreign inheritance and gift taxes. We continue to drop companies reporting more than five individual shareholders in any year, as we are interested in closely held companies with a concentrated ownership structure where owners can potentially influence firm-level decision-making. We also drop firms where total shareholding does not sum to 100%.

We then restrict the sample to companies with full coverage of the shareholder's direct or indirect stake in the company. If we observe a change in shareholders without information on the current and previous distribution of shareholdings, we are unable to differentiate small from larger changes in shareholdings. Importantly, we do not require an uninterrupted series of ownership info, but recorded ownership stakes if shareholder info is available. Orbis collects the ownership data from the German trade register, where ownership does not have to be reported annually but only in case of events that mandate changes in the entries. Thus, there are gaps of up to five years between ownership records in our data. In case of a data gap in the years before an ownership change (around 10% of transfers), we assume that the change took place in the year when the ownership information is updated. We generate an indicator for missing years prior to transfer for robustness. After these first steps, we are left with 5,6 million firms with concentrated ownership and full information on their shareholders' participation quotas.

Second, we identify changes in ownership. We define a transfer in ownership as a change in the shareholding of an individual owner, where

- an existing shareholder increases their stake by at least 25%, or
- a new shareholder enters the firm with a stake of at least 25 %.

We focus on the threshold of 25%²⁵ to only capture business transfers that can potentially benefit from the tax exemption. Eligible business assets include shares in partnerships (without minimum percentage), and substantial shares in corporations with at least 25%. Furthermore, we assume that only recipients with substantial shareholdings can adjust firm-level decisions according to their personal preferences. We exclude years before the introduction of the employment preservation criterion in 2009. To avoid confounding trends from repeated treatments, we exclude firms with multiple transfers. We keep all remaining transferred firms and determine whether the share changes can be attributed to family members based on the owners' last names, as described below in section C.2. Next, we drop all firms with transfers where we observe a person with the same name (first and last name) as the exiting shareholder who died in the residency state of the company in the year before the new shareholder entered (see section C.1.2. With this strategy, we aim to exclude transfers upon death, as we are interested in the anticipation effects leading up to a planned transfer in ownership. Any inheritances that remain in our transfer sample likely bias our results toward zero if the death was not anticipated. To ensure the comparability of our transfers, we also exclude all firms with shareholders aged below 18 years (51 individuals aged 8 to 17 in 65 firms). While children between the ages of 7 to 18 have limited legal capacity, they generally require the consent of their parents or guardians to effectively conclude legal transactions. These second steps leave us with 253,716 firms.

Third, we aggregate our sample at the firm-year level. For our empirical analysis, we drop firms with transfers before 2009. This reduces our sample to 239,686 firms.

²⁵65% of the increases in shareholding in our sample exceed the threshold.

Table C.4: **Sample selection**

Step	Total # of obs	Unique firms	Transfers	Family Transfers
German ownership data	60,983,009	8,176,208		
Drop branches and foreign firms	55,687,132	6,621,855		
Drop if > 5 shareholders in any year	50,676,391	6,485,041		
Drop if total shareholding observed $\neq$ 100%	42,325,955	5,631,909		
Create transfer variable for share change > 25%	42,325,955	5,631,909	307,985	
Drop if year < 2009	40,414,294	5,616,499	307,985	
Drop firms with multiple transfers	39,485,853	5,563,077	254,563	
Keep transferred firms	3,720,079	254,563	254,563	109,646
Drop transfers upon death	3,706,421	253,781	253,781	109,177
Drop firms with owners aged < 18	3,705,071	253,716	253,716	109,125
Aggregation at firm-year level	2,320,618	253,716	253,716	109,125
Drop firms with transfer before 2009	2,126,239	239,686	239,686	102,814

Notes: Sample selection process for ownership changes in German firms, 2009–2019. *Source:* ORBIS.

By design, we observe a concentrated ownership structure in our sample. The average and median firm has only one shareholder in a given year, with four shareholders at the 99th percentile. Most owners hold majorities; across the sample period less than a third of owners report a shareholding below 50%. Table C.5 displays the distribution of ownership transfers in our sample, differentiating between share increases of existing shareholders and the entrance of new shareholders.²⁶ Around two-thirds of the transfers can be attributed to a new shareholder entering, while one-third consists of existing shareholders increasing their stake. Almost half the transfers identified are conducted within families.

Table C.5: **Distribution of ownership changes by type**

	All transfers	Outside family	Within family
Share change	79,455	47,452	32,003
New shareholder	161,887	90,076	71,811
All changes	239,686	136,872	102,814

Notes: A share change is denoted if exceeding 25% of total shares. *Source:* ORBIS.

²⁶Some transfers combine the entrance of new shareholders while existing shareholders conjointly increase their stake, so the sum of both types sum exceeds the total number of transfers.

D IGTS Questionnaire

Questions on Inheritance and Gift Tax

1. Were company shares/participations transferred through **inheritance** in your company after the year 2000?
☐ Yes, in the year -----
☐ No
2. Have you paid **inheritance tax** since the year 2000?
☐ Yes, in the year -----
☐ No
3. Were company shares/participations transferred through **donation** since the year 2000?
☐ Yes, in the year -----
☐ No
4. Have you paid **gift tax** since the year 2000?
☐ Yes, in the year -----
☐ No
5. What estimated impacts would it have on your company if the exemption of business assets was repealed in the case of inheritance/donation?
☐ The amount of your investments? increase / remain unchanged / decrease
☐ Your employment numbers? increase / remain unchanged / decrease
6. The legal requirements for the allowance for business assets are ...
☐ too high
☐ appropriate
☐ too low

7. If you answered 'Yes' to question 1 and/or 3, please answer the following questions as well:

- ☐ Was the allowance for business assets utilized?
 - ☐ Yes
 - ☐ No
- ☐ If yes: Which allowance for business assets was utilized?
 - ☐ Valuation discount (35 or 40%)
 - ☐ Regular exemption (85%)
 - ☐ Option exemption (100%)

8. Is the retention period (maintenance of the company's wage sum) still ongoing?

- ☐ Yes
- ☐ No

9. How does the allowance for business assets affect ...

- ☐ the amount of your investments? will increase / remain unchanged / will decrease
- ☐ Your employment numbers? will increase / remain unchanged / will decrease

10. If there were no allowance for business assets, would the company, a part of the company, or company shares have had to be sold as part of the succession planning?

- ☐ Yes
- ☐ No

Thank you for your cooperation!

E Theoretical Framework

We develop a two-period model of labor demand around a pre-announced firm transfer. A payroll-preservation requirement gives firms an incentive to lower the pre-transfer payroll benchmark and to retain workers afterwards when payroll would otherwise fall short. With uncertain productivity and advance hiring commitments, the requirement can also discourage expansion. We derive conditions under which these responses produce lower post-transfer employment, a lower share of high-cost workers and lower average wages, and fewer hires and departures than in otherwise identical unexposed firms.

E.1 Setting

The economy is set in two periods, $t = 1$ before and $t = 2$ after the transfer. For simplicity, time is not discounted. We study the firm's problem in partial equilibrium and suppress the firm index. Firms take wages as given and employ two types of imperfectly substitutable labor. Let A denote low-cost labor and B high-cost labor, with per-worker wages

$$w^A = w, \quad w^B = \zeta w, \quad w > 0, \quad \zeta > 1.$$

The cost differential may reflect differences in hours, skills, or employment arrangements. In the empirical application, regular employment provides a counterpart to type B , and marginal employment to type A . In each period, total headcount, composition, and payroll are

$$l_t = l_t^A + l_t^B, \quad x_t = \frac{l_t^B}{l_t}, \quad C_t = w l_t^A + \zeta w l_t^B = w l_t [1 + (\zeta - 1)x_t]. \quad (\text{E.1})$$

Output depends on a CES labor aggregate,

$$y_t = z_t^{1-\alpha} L_t^\alpha, \quad L_t = [\phi (l_t^A)^\rho + (1 - \phi)(l_t^B)^\rho]^{1/\rho}, \quad (\text{E.2})$$

where $z_t > 0$, $0 < \alpha < 1$, $0 < \phi < 1$, and $\rho < \alpha$, with the Cobb–Douglas limit at $\rho = 0$. The elasticity of substitution is $(1 - \rho)^{-1}$. Production is strictly concave. The restriction $\rho < \alpha$ also implies that the marginal product of either type increases with employment of the other type.

Pre-transfer productivity z_1 is known. Post-transfer productivity is $z_{2,L} < z_{2,H}$, with probabilities $p \in (0, 1)$ and $1 - p$. The index $j \in \{L, H\}$ denotes the post-transfer state. We write $l_{2,j}^A, l_{2,j}^B, x_{2,j}$, and $C_{2,j}$ for its employment, composition, and payroll. For the derivations, let F_1 and F_j denote the production function in (E.2) evaluated at z_1 and $z_{2,j}$, respectively. Subscripts A and B on F denote derivatives with respect to employment of the corresponding type.

At the start of the planning window, the firm inherits a workforce of size l_0 . Firms face two adjustment frictions. First, changing total headcount before transfer entails the cost

$$C^\kappa(l_1) = \frac{\kappa}{2}(l_1 - l_0)^2, \quad \kappa \geq 0.$$

The parameter κ measures the cost of changing total employment during the planning win-

dow; workforce composition can adjust freely. Second, high-cost hiring requires advance preparation. A fraction $s \in (0, 1)$ of each worker type leaves between periods. Absent hiring or additional dismissals, employment of type $k \in \{A, B\}$ would be $(1-s)l_1^k$. Before observing post-transfer productivity, the firm prepares to recruit up to $\bar{H} \geq 0$ high-cost workers at cost

$$\mathcal{C}^H(\bar{H}) = \frac{\eta}{2}w\bar{H}^2, \quad \eta > 0.$$

Retained workers and prepared positions place an upper bound on high-cost employment:

$$K = (1-s)l_1^B + \bar{H}, \quad l_{2,j}^B \leq K, \quad j \in \{L, H\}. \quad (\text{E.3})$$

Positions need not be filled, and retained workers can be dismissed. Recruiting services are purchased externally and do not enter payroll. Low-cost labor adjusts after productivity is observed without prior commitments. Prepared recruitment $\bar{H}$ differs from realized gross hiring, denoted $H_{2,j}$ below.

Let $q \in (0, 1]$ denote the required payroll fraction. In state j , an exposed firm incurs the liability

$$T_j = \gamma(qC_1 - C_{2,j})^+, \quad \gamma \geq 0, \quad u^+ = \max\{u, 0\}. \quad (\text{E.4})$$

This simplified liability assigns a tax cost γ to each unit of payroll shortfall. Exposure and the choice of relief option are taken as given. We compare exposed firms ($\gamma > 0$, indexed by E) with otherwise identical unexposed firms ($\gamma = 0$, indexed by U). The comparison isolates the employment response of a firm subject to the requirement.

The owner bears uninsured profit risk and has constant absolute risk aversion $\chi > 0$. The firm chooses pre-transfer employment, prepared recruitment, and state-contingent employment to maximize

$$F_1 - C_1 - \mathcal{C}^\kappa(l_1) - \mathcal{C}^H(\bar{H}) - \frac{1}{\chi} \log \left[p e^{-\chi\pi_L} + (1-p) e^{-\chi\pi_H} \right],$$

$$\pi_j = F_j - C_{2,j} - T_j. \quad (\text{E.5})$$

We first hold pre-transfer headcount fixed at $l_1 = l_0$, the limiting case of large κ . Section E.3.5 allows headcount to adjust at a finite cost. The firm's problem is concave and has a unique solution under the maintained assumptions.

Relation to the empirical setting. We interpret C_1 as historical average annual payroll and $C_{2,j}$ as average annual payroll over the assessment period: five years for the standard exemption and seven for the full exemption. Under the post-2016 rules, q equals 0.50, 0.60, or 0.80 for firms with 6–10, 11–15, or at least 16 employees under the standard exemption; the corresponding fractions under the full exemption are approximately 0.714, 0.807, and 1. These payroll fractions are distinct from the exemption rates.²⁷

²⁷Pre-transfer choices represent persistent changes in historical payroll. The requirement concerns cumulative payroll; s is attrition over the modeled transition.

E.2 Employment responses

The analysis proceeds in three steps. We first examine how the payroll requirement can reduce employment by discouraging expansion, despite encouraging retention when productivity is low. We then consider workforce composition and average wages. Finally, we establish conditions under which lower employment is accompanied by fewer hires and departures. Proofs are collected in Section E.3.

All effects are relative to the unexposed firm: lower employment after transfer is consistent with continued, but slower, growth. If the firm would satisfy the target in every state without the requirement, its choices do not change.

E.2.1 Employment after transfer

The payroll requirement affects employment through two opposing incentives. A shortfall lowers profits in the adverse state, increasing the weight the risk-averse owner places on that outcome. When additional capacity earns a return only in the favorable state, this reduces its value relative to the cost of preparing for expansion. The firm reduces capacity, and complementarity lowers favorable-state employment of both types. In the adverse state, however, retaining workers reduces the tax liability. Expected employment falls when reduced expansion outweighs increased retention.

We consider a positive unexposed optimum at which payroll would fall below the proposed target in the adverse state and exceed it in the favorable state:

$$\begin{aligned} 0 < l_1^B < l_0, \quad K > (1-s)l_1^B, \quad l_{2,L}^B < K = l_{2,H}^B, \\ C_{2,L} < qC_1 < C_{2,H}. \end{aligned} \tag{E.6}$$

The firm employs both types before transfer and prepares to hire additional high-cost workers. Some high-cost capacity is unused in the adverse state; it is fully used in the favorable state. We examine the response to introducing a small positive penalty γ , holding the target q fixed. All quantities below are evaluated at the unexposed optimum, with the superscript U suppressed; primes denote right derivatives with respect to γ at zero.

Write $n(q) = -(l_1^B)'$ and $m(q) = -K'$ for the reductions in pre-transfer high-cost employment and capacity per unit increase in the penalty. Let $\theta_H = F_{H,AB}/(-F_{H,AA}) > 0$ denote the response of low-cost employment to capacity in the favorable state. A unit reduction in capacity therefore lowers total employment in that state by $1 + \theta_H$. Section E.3.2 derives these responses.

Proposition E.1 (Employment after transfer). *In regime (E.6), pre-transfer high-cost employment and high-cost capacity decline: $(l_1^B)' = -n(q) < 0$ and $K' = -m(q) < 0$. Both worker types decline in the favorable state and expand proportionately in the adverse state. Expected post-transfer employment declines in both levels and logs if*

$$m(q) > \frac{p l_{2,H}}{(1-p)(1-\alpha)(1+\theta_H)}. \tag{E.7}$$

Condition (E.7) requires the probability-weighted employment loss in the favorable state to exceed the gain in the adverse state in proportional terms. It therefore ensures a decline in

expected log employment. Because the unexposed workforce is larger in the favorable state, the condition also ensures a decline in expected employment in levels.

To compare payroll targets, hold the unexposed allocation fixed and vary q within regime (E.6). A higher target raises the potential liability in the adverse state and the tax saving from lowering pre-transfer payroll. Both effects increase $n(q)$ and $m(q)$, strengthening the response of high-cost employment and capacity to a small penalty. The retention incentive is unchanged: below the target, each additional unit of payroll reduces liability by γ , irrespective of q . Thus a higher target strengthens the favorable-state contraction without increasing the adverse-state employment gain. In (E.7), $m(q)$ rises while the right-hand side is unchanged, making the condition easier to satisfy.

E.2.2 Workforce composition and wages

Before transfer, the firm lowers payroll by substituting low-cost for high-cost workers at fixed headcount. Each replacement saves $(\zeta - 1)w$. After transfer, the capacity reduction also changes workforce composition. In the favorable state, reducing both types proportionately would raise the marginal product of low-cost labor because production has diminishing returns. At an unchanged wage, the firm therefore employs more low-cost labor per high-cost worker, although complementarity reduces employment of both types. In the adverse state, the requirement lowers both effective wages proportionately, leaving their employment ratio unchanged. The high-cost share thus falls in expectation, lowering average wages.

Let S denote the increase in the favorable-state high-cost share from an additional unit of capacity, allowing low-cost employment to adjust:

$$S = \frac{l_{2,H}^A - \theta_H K}{l_{2,H}^2} > 0. \quad (\text{E.8})$$

Proposition E.2 (Workforce composition and wages). *In regime (E.6), the high-cost share falls before transfer and in expectation afterwards. The post-transfer decline exceeds the pre-transfer decline if*

$$(1 - p)Sm(q) > \frac{n(q)}{l_0}. \quad (\text{E.9})$$

Average wages fall before transfer and in expectation afterwards. Under (E.7), expected post-transfer payroll declines in levels and logs. Expected log high-cost employment responds more negatively than expected log low-cost employment.

Condition (E.9) compares the expected post-transfer share decline, $(1 - p)Sm(q)$, with the pre-transfer decline, $n(q)/l_0$.

E.2.3 Hiring and departures

The two state responses operate through different worker flows when the firm dismisses both types in the adverse state and hires both types in the favorable state. With pre-transfer headcount fixed, the adverse-state employment increase then means fewer departures, and the favorable-state decrease means fewer hires.

Worker flows include natural attrition and any additional dismissals. For either state, define

departures and realized gross hiring by

$$\begin{aligned} D_{2,j} &= sl_0 + [(1-s)l_1^A - l_{2,j}^A]^+ + [(1-s)l_1^B - l_{2,j}^B]^+, \\ H_{2,j} &= [l_{2,j}^A - (1-s)l_1^A]^+ + [l_{2,j}^B - (1-s)l_1^B]^+. \end{aligned} \quad (\text{E.10})$$

These expressions apply on either side of the hiring and dismissal thresholds and satisfy

$$l_{2,j} - l_0 = H_{2,j} - D_{2,j}. \quad (\text{E.11})$$

Gross hiring sums hires of each type, so it can coexist with dismissals of the other type. Prepared recruitment $\bar{H}$ bounds realized high-cost hiring $[l_{2,j}^B - (1-s)l_1^B]^+$.

Proposition E.3 (Lower hiring and departures). *Suppose (E.6) holds and the adverse state dismisses both worker types beyond natural attrition, while the favorable state hires both types:*

$$l_{2,L}^A < (1-s)l_1^A < l_{2,H}^A, \quad l_{2,L}^B < (1-s)l_1^B < K. \quad (\text{E.12})$$

Then expected departures and hiring both decline locally. If (E.7) also holds, the hiring decline exceeds the departure decline in absolute value.

Under (E.6), (E.7), and (E.12), Propositions E.1–E.3 jointly imply lower expected post-transfer employment and payroll in levels and logs, a lower expected high-cost share and average wage, and fewer hires and departures. Pre-transfer headcount is unchanged, while the high-cost share, average wage, and payroll fall. These finite comparisons hold for sufficiently small positive γ by the strict local inequalities and smoothness within the maintained regime. If (E.9) also holds, the expected post-transfer share declines by more than the pre-transfer share.

These results also hold when firms can adjust employment before transfer at a sufficiently high finite cost. For the small positive penalties considered above, pre-transfer headcount changes little, while the strict employment, composition, and worker-flow effects persist (Section E.3.5).

E.3 Derivations and proofs

E.3.1 Derivation of the employment conditions

With pre-transfer headcount fixed at $l_1 = l_0$, maximizing (E.5) gives the following employment conditions at any given $\gamma \geq 0$, including when payroll reaches the target or employment reaches the capacity constraint. Let τ_j denote the marginal reduction in liability from additional payroll: γ below the target, zero above it, and an element of $[0, \gamma]$ at $C_{2,j} = qC_1$. For positive state employment, the conditional optimality conditions are

$$\begin{aligned} F_{j,A} &= (1 - \tau_j)w, & F_{j,B} &= (1 - \tau_j)\zeta w + \mu_j, \\ \mu_j &\geq 0, & \mu_j(K - l_{2,j}^B) &= 0. \end{aligned} \quad (\text{E.13})$$

Here μ_j is the capacity multiplier. With $0 < l_1^B < l_0$ and positive prepared recruitment, the remaining conditions are

$$\begin{aligned} F_{1,B} - F_{1,A} - (\zeta - 1)w + \eta w(1 - s)\bar{H} &= q(\zeta - 1)w \sum_j \omega_j \tau_j, \\ \sum_j \omega_j \mu_j &= \eta w \bar{H}, \end{aligned} \quad (\text{E.14})$$

where $\omega_j = p_j e^{-\chi \pi_j} / \sum_k p_k e^{-\chi \pi_k}$, $p_L = p$, and $p_H = 1 - p$. The objective remains concave. These conditions, with feasibility and the corresponding boundary conditions, characterize the allocation. At $\gamma = 0$ and in regime (E.6), they reduce to the unexposed first-order conditions used in the proof of Proposition E.1 below.

If an optimum satisfies the target in every state, further increases in γ leave choices unchanged: its liability remains zero, while every alternative allocation becomes weakly less attractive. Any strict employment, composition, or worker-flow differences attained at that point therefore persist at higher penalties.

E.3.2 Proof of Proposition E.1

Proof. Let $e = \eta w$ and $d = (\zeta - 1)w$. The adverse-state marginal-utility weight is

$$\omega = \frac{p e^{-\chi \pi_L}}{p e^{-\chi \pi_L} + (1 - p) e^{-\chi \pi_H}}. \quad (\text{E.15})$$

The unexposed first-order conditions are

$$\begin{aligned} F_{1,B} - F_{1,A} - d + e(1 - s)\bar{H} &= 0, \\ F_{L,A} &= w, \quad F_{L,B} = \zeta w, \\ F_{H,A} &= w, \quad (1 - \omega)\lambda = e\bar{H}, \quad \lambda = F_{H,B} - \zeta w > 0. \end{aligned} \quad (\text{E.16})$$

Define the curvature terms

$$\begin{aligned} c &= -F_{1,AA} + 2F_{1,AB} - F_{1,BB} > 0, & u_H &= -F_{H,AA} > 0, \\ \theta_H &= F_{H,AB}/u_H > 0, & J_H &= -F_{H,BB} - F_{H,AB}^2/u_H > 0, \\ \mathcal{A} &= c + e(1 - s)^2, & \mathcal{D} &= e + (1 - \omega)J_H + \chi\omega(1 - \omega)\lambda^2, \\ \Delta &= \mathcal{A}\mathcal{D} - e^2(1 - s)^2 > 0. \end{aligned} \quad (\text{E.17})$$

The incentive to reduce the payroll benchmark and the effect of the shortfall on the return to capacity are, respectively,

$$Q(q) = \omega q d, \quad Z(q) = \chi\omega(1 - \omega)\lambda(qC_1 - C_{2,L}). \quad (\text{E.18})$$

Both are positive in (E.6).

At fixed (l_1^B, K) , the state-profit envelope gives $\partial \pi_L / \partial \gamma = -(qC_1 - C_{2,L})$ and $\partial \omega / \partial \gamma =$

$\chi\omega(1-\omega)(qC_1 - C_{2,L})$. Differentiating the reduced first-order conditions yields

$$\begin{pmatrix} \mathcal{A} & -e(1-s) \\ -e(1-s) & \mathcal{D} \end{pmatrix} \begin{pmatrix} (l_1^B)' \\ K' \end{pmatrix} = - \begin{pmatrix} Q(q) \\ Z(q) \end{pmatrix}. \quad (\text{E.19})$$

Inverting this system gives $(l_1^B)' = -n(q)$ and $K' = -m(q)$, where

$$n(q) = \frac{\mathcal{D}Q(q) + e(1-s)Z(q)}{\Delta}, \quad m(q) = \frac{e(1-s)Q(q) + \mathcal{A}Z(q)}{\Delta}. \quad (\text{E.20})$$

Both expressions are positive. In the adverse state, the liability reduces both effective wages proportionately. Homogeneity of production therefore gives $(l_{2,L}^A)' = l_{2,L}^A/(1-\alpha)$ and $(l_{2,L}^B)' = l_{2,L}^B/(1-\alpha)$. In the favorable state, $(l_{2,H}^B)' = K'$ and differentiation of $F_{H,A} = w$ gives $(l_{2,H}^A)' = \theta_H K'$. Consequently,

$$\begin{aligned} \mathbb{E}[l_2]' &= \frac{p l_{2,L}}{1-\alpha} - (1-p)(1+\theta_H)m(q), \\ \mathbb{E}[\log l_2]' &= \frac{p}{1-\alpha} - (1-p)\frac{1+\theta_H}{l_{2,H}}m(q). \end{aligned} \quad (\text{E.21})$$

Complementarity and $z_{2,H} > z_{2,L}$, together with $K > l_{2,L}^B$, imply $l_{2,H}^A > l_{2,L}^A$ and hence $l_{2,H} > l_{2,L}$. Thus (E.7) suffices for both employment inequalities. $\square$

E.3.3 Proof of Proposition E.2

Proof. Using the employment derivatives in the proof of Proposition E.1,

$$x_1' = -\frac{n(q)}{l_0}, \quad x_{2,L}' = 0, \quad \mathbb{E}[x_2]' = -(1-p)Sm(q). \quad (\text{E.22})$$

Euler's identity applied to $F_{H,A}$ gives $l_{2,H}^A - \theta_H K = (1-\alpha)w/u_H > 0$, establishing $S > 0$. Average wages equal $w[1 + (\zeta - 1)x_t]$, so they follow composition. Pre-transfer payroll also falls because headcount is fixed.

For post-transfer payroll, the adverse-state proportional response is $1/(1-\alpha)$, whereas the favorable-state level response is $-w(\theta_H + \zeta)m(q)$. Moreover,

$$\frac{l_{2,H}^A + \zeta K}{\theta_H + \zeta} < \frac{l_{2,H}}{1 + \theta_H}, \quad C_{2,L} < C_{2,H}.$$

These inequalities show that (E.7) also suffices for negative expected payroll responses in levels and logs. Finally,

$$\mathbb{E}[\log l_2^B - \log l_2^A]' = -(1-p)m(q) \left(\frac{1}{K} - \frac{\theta_H}{l_{2,H}^A} \right) < 0.$$

This ranking does not require expected low-cost employment to decline. $\square$

E.3.4 Proof of Proposition E.3

Proof. In (E.12), adverse-state departures are $l_0 - l_{2,L}$, favorable-state departures are sl_0 , adverse-state hiring is zero, and favorable-state hiring is $l_{2,H} - (1 - s)l_0$. Hence

$$\mathbb{E}[D_2]' = -\frac{pl_{2,L}}{1 - \alpha} < 0, \quad \mathbb{E}[H_2]' = -(1 - p)(1 + \theta_H)m(q) < 0. \quad (\text{E.23})$$

The final claim follows from $\mathbb{E}[l_2]' = \mathbb{E}[H_2]' - \mathbb{E}[D_2]'$ and Proposition E.1. $\square$

With fixed pre-transfer headcount, natural attrition sl_0 is the lower bound on departures. Eliminating all additional dismissals reaches this bound while preserving lower expected departures than in the unexposed allocation in (E.12).

E.3.5 Proof of the extension to costly headcount adjustment

To establish the extension stated at the end of Section E.2, allow $l_1 = l_1^A + l_1^B$ to vary and retain the cost $\mathcal{C}^\kappa(l_1) = \kappa(l_1 - l_0)^2/2$ in (E.5). Worker flows are given by (E.10) with attrition sl_1 in place of sl_0 , so $l_{2,j} - l_1 = H_{2,j} - D_{2,j}$. For any fixed finite $\gamma > 0$, the exposed and unexposed optima converge to their fixed-headcount counterparts as $\kappa \rightarrow \infty$. Every strict difference in a continuous outcome thus persists for sufficiently large finite κ , with each exposed firm compared with an unexposed firm facing the same adjustment cost. In particular, this applies to the joint results for sufficiently small positive γ .

For local responses at a regular unexposed optimum satisfying (E.6), we also establish $l_1 - l_0 = O(\kappa^{-1})$, $l_1' = O(\kappa^{-1})$, and convergence of the remaining local derivatives to their fixed-headcount values.

Proof. Sublinear production, positive wages, and the quadratic recruitment cost bound maximizers uniformly. Nonnegative liabilities cannot raise the objective above its unexposed value. Comparison with a feasible fixed-headcount optimum bounds $\kappa(l_1 - l_0)^2$ and therefore forces $l_1 \rightarrow l_0$. Every convergent subsequence has a limit that maximizes the fixed-headcount problem; uniqueness establishes convergence of the allocation. Applying this argument at zero and at the specified positive intensity proves the finite-difference statement, including at payroll kinks.

For the local rates, optimize flexible state inputs and write the negative reduced Hessian in the headcount and (l_1^B, K) coordinates as

$$M_\kappa = \begin{pmatrix} \kappa + a & h^\top \\ h & M \end{pmatrix}, \quad M = \begin{pmatrix} \mathcal{A} & -e(1 - s) \\ -e(1 - s) & \mathcal{D} \end{pmatrix} + O(\kappa^{-1}).$$

The headcount first-order condition implies $l_1 - l_0 = O(\kappa^{-1})$. Bounded remaining curvatures and policy forcing, together with the Schur complement of M_κ , give $l_1' = O(\kappa^{-1})$ and convergence of the remaining derivatives to (E.19). $\square$