

Labor Market Effects of Domestic Outsourcing: Evidence from Legalization in Brazil

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Abstract

We estimate the effect of domestic outsourcing on labor markets using Brazil's 1993 legalization, which sharply increased the outsourcing of security guards. We use a triple-differences design that leverages North-South variation in pre-legalization court permissiveness and compares guards to less affected occupations. We find that outsourcing legalization persistently increased total employment of security guards in more restrictive regions by 8% and reduced their average age by two years. The average wage of security guards did not fall in more restrictive regions, with some specifications showing a small positive effect. However, there was a wave of layoffs that reallocated incumbent security guards to other occupations and lower-wage firms. A simple model implies that the market-level efficiency gains from outsourcing legalization more than offset the earnings losses of incumbent workers.

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1 Introduction

Around the world and across industries, firms increasingly rely on outsourced workers to provide labor services once performed by direct employees, such as cleaning, security, logistics, HR, and IT.¹ How does the rise of outsourcing affect labor markets? Who are the winners and losers from outsourcing? Although the rise of outsourcing is often said to have fundamentally altered labor markets (Autor, 2009; Weil, 2014; Appelbaum, 2017; Stansbury and Summers, 2020), evidence about its effects is scarce (Bernhardt et al., 2016).² One strand of the literature shows that outsourced workers in low-wage occupations earn lower wages and worse benefits than comparable direct employees (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017; Drenik et al., 2020). Another documents that the use of intermediary firms is motivated by cost efficiencies arising from economies of scale and gains from specialization (Abraham and Taylor 1996; Espinosa 2020).³ To assess the overall welfare consequences of outsourcing, it is necessary to know the effects of outsourcing on the employment and wage levels in the relevant occupational labor markets. To date, however, these effects have not been measured using credible causal variation.

In this paper, we use an unexpected court ruling in Brazil to estimate the effects of domestic outsourcing on labor markets. In 1993, Brazil’s Superior Labor Court legalized outsourcing of all non-core activities by private-sector firms, generating an exogenous reduction in the legal cost of outsourcing. We focus on Brazil’s large market for security guards, because security guards are a licensed and mostly formal-sector occupation that is heavily regulated. As such, legal restrictions against outsourcing before legalization were particularly binding for security guards, who upon legalization experienced the largest rise in outsourcing among all major occupations.

To identify the market-level effects of outsourcing, we compare microregions in Brazil’s South, where labor court judges tended to forbid outsourcing prior to legalization, with microregions in the rest of Brazil, where judges tended to be more permissive. To control for confounding shocks in the microregion, we use a triple-differences regression specification that compares guards to less-affected occupations in restrictive versus permissive regions, before versus after legalization.

¹See, for example, Dey et al. (2010); Berlingieri (2014); Bloom et al. (2018); Katz and Krueger (2016, 2019).

²Kalleberg (2000) surveys relevant research in sociology. Autor (2009) discuss a broader literature on labor market intermediation. Weil (2014) offers a detailed and largely qualitative analysis of the business practices of domestic outsourcing in the United States. Bernhardt et al. (2016) discusses data challenges for measuring outsourced work.

³See also Lee (1996); Houseman (2001); Berlingieri (2014); Chaurey (2015).

We also reweigh permissive microregions to be similar to restrictive microregions in mean pre-legalization characteristics, such as crime rates, unemployment rates, and local exposure to concurrent tariff reductions.

Our results challenge the conventional view in recent literature that domestic outsourcing purely harms workers by reducing their wages and benefits. Although growing evidence shows that workers experience a loss in wages and benefits when they switch from direct employment to outsourced work (e.g., [Goldschmidt and Schmieder 2017](#); [Drenik et al. 2020](#)), these estimates do not capture the full effects of outsourcing in the labor market.⁴ First, these estimates are based on a selected sample of workers who experience transitions. In addition, they ignore market-level equilibrium effects that may affect both workers who transition and those who do not. Our estimates reveal that these labor market effects can be very large.

First, we find that Brazil’s outsourcing legalization persistently increased total employment of security guards by 8 percent. The increase is not due to pre-existing differences in the evolution of local occupational labor markets, since there are no differential pre-legalization trends, and did not coincide with changes in crime rates that may drive demand for security services. It is robust to using inverse propensity score weights, entropy-balancing weights, and regression adjustment to account for any potential confounding trends, with some robustness specifications suggesting an employment increase of as large as 15 percent. These positive employment gains are strongly suggestive of overall efficiency gains from outsourcing legalization.

Second, outsourcing legalization reallocated jobs from older incumbent workers to younger entrant workers. We estimate that outsourcing legalization caused the employment of security guards between the ages of 18-24 to persistently increase by roughly 50 percent and the employment of security guards between ages 55-64 to persistently decline by roughly 15 percent. The average age of security guards persistently declined by about two years. To our knowledge, this is the first paper to show that outsourcing altered the composition of an impacted occupation. The result suggests that while outsourcing harmed some workers, it benefited others, particularly the young.

Third and relatedly, even though on-site outsourcing events have been the focus of the existing literature (e.g., [Goldschmidt and Schmieder 2017](#)),⁵ we find that occupational layoffs are quanti-

⁴See also [Abraham \(1990\)](#); [Berlinski \(2008\)](#); [Dube and Kaplan \(2010\)](#); [Goldschmidt and Schmieder \(2017\)](#); [Drenik et al. \(2020\)](#).

⁵On-site outsourcing events are defined as large flows of workers from a direct employer to a contract firm.

tatively a more important mode of outsourcing in Brazil.⁶ While legalization led to a large wage effect on occupational layoffs—affecting 7-9 percent of incumbent security guards—it had a negligible effect on on-site outsourcing events, which are also rare throughout the period. These findings suggest that the primary way in which firms switched from direct hiring to outsourcing was by displacing incumbent workers via occupational layoffs) as opposed to keeping the same workers on the same jobs but switching contracting forms via on-site outsourcing. A full picture of the effects of outsourcing thus requires considering workers who were reallocated across jobs, in addition to those who switch contracting forms without changing jobs.

The effects of occupational-layoff outsourcing on incumbent workers were negative, large, and long-lasting. Occupational layoffs temporarily displaced incumbent workers from formal employment and persistently reduced their wages by roughly 10 percent. In present-value terms, affected incumbent workers lost 1.2 years of pre-outsourcing earnings. Firm-level outsourcing decisions therefore led to large and concentrated losses for the subset of incumbent workers who were laid off, many of whom exited the occupation altogether, even though there were overall positive effects on employment at the occupational level.

The decline in worker earnings following occupational layoffs is explained to a large extent by a loss of firm wage premia. Incumbents initially employed by higher-wage firms experience larger wage reductions, while incumbents in the bottom quartile of firms with occupational layoffs experienced little decline in wages. This loss of firm-specific wage premia explains about 46 percent of the total wage losses five years after an occupational layoff. High-wage firms were also more likely to outsource, suggesting that these firms outsourced at least in part to avoid paying wage premia. These findings are consistent with a growing literature documenting the importance of firm-specific components in wage setting (Card et al., 2013; Barth et al., 2016; Song et al., 2019) and the role of firm-specific wage premia in determining the cost of job loss and domestic outsourcing (Goldschmidt and Schmieder, 2017; Lachowska et al., 2020b; Schmieder et al., 2020).

However, outsourcing legalization did not reduce the composition-adjusted wage in the occupation of security guards as a whole. In some specifications, average wages even mildly increased. In other words, the effect of occupational-layoff outsourcing on the wages of incumbent workers

⁶Occupational layoffs are defined as sudden drops in security guard employment without corresponding drops in employment of other occupations at the establishment level.

was more negative than the market-level effect of outsourcing legalization on average wages. A reason why is that occupational layoffs only capture outsourcing decisions of firms that already employed security guards prior to legalization. This leaves out the many small firms for which directly hiring a security guard might not have been feasible prior to legalization due to high management costs (e.g., recruiting, training, and monitoring costs). The large employment effects we find at the occupation level imply that there was an increase in aggregate demand for guards, so some firms likely switched from not employing guards at all to contracting them via a contract firm. This increase in aggregate demand for guards raises wages for both directly hired and outsourced workers, even if a wage gap might still exist between the two forms of contracting.

We then use a simple quantitative model to understand the implications of outsourcing legalization in the security guard occupation. In the model, outsourcing legalization may both alter worker wage bargaining power and change management costs in the labor market. With assumed elasticities of labor supply and demand, this parametric model allows us to directly infer changes in bargaining power, management costs, as well as total surplus at the market-level from our reduced-form estimates. The estimates imply large net welfare gains from outsourcing legalization. We estimate that the per-annum increase in total surplus in security guard occupational market is equal to 1.6 to 6.7 percent of the initial security guard wage bill.

Combined, our findings present a different and more holistic view of the consequences of outsourcing than previous studies that focus on wage differentials (e.g., [Goldschmidt and Schmieder 2017](#)). First, Brazil's outsourcing legalization led to a large rise in the total employment of security guards, suggesting overall increases in economic efficiency. Second, legalization led to a reallocation of security guard jobs from older workers to younger workers, suggesting that outsourcing created both winners and losers among workers. Third, firm outsourcing decisions primarily took the form of occupational layoffs rather than on-site outsourcing. Fourth, legalization did not cause a decline in the average of wages in Brazil's security guard occupation, despite concentrated losses for incumbent security guards at high-wage firms who experienced occupational layoffs.

In addition, our study sheds light on the political economy of labor market reforms. Related studies have shown that labor market regulation is associated with lower output, employment, and productivity ([Besley and Burgess, 2004](#); [Botero et al., 2004](#); [Aghion et al., 2008](#)). However, partial labor market reforms in Europe, which lifted constraints on fixed-term employment but

maintained employment protection for workers under permanent contracts, had the perverse effect of increasing turnover among young workers without boosting employment ([Bentolila and Saint-Paul, 1992](#); [Cahuc and Postel-Vinay, 2002](#); [Blanchard and Landier, 2002](#); [Daruich et al., 2020](#)). We instead find that Brazil’s outsourcing legalization led to large losses for incumbent workers and large increases in employment, especially among the young. This counterpoint to the European experience suggests that policy design may critically alter the effects of labor market reform.⁷

Finally, our findings are consistent with insider-outsider theories of the labor market (e.g., [Lindbeck and Snower 1989](#); [Saint-Paul 2002](#)), which suggest that direct employees at high-wage firms have elevated wages at the expense of total employment and younger entrants. According to this theory, firm wage premia are not pure transfers to workers, but rather the result of labor market frictions that benefited employees at the expense of entrant workers. Consistent with this theory, we find that the rise of domestic outsourcing increased employment and displaced incumbent workers from high-wage firms. When considering the economics of domestic outsourcing and labor market institutions more broadly, economists and policymakers therefore should not simply study wage differentials, but also account for employment, reallocation, and displacement effects in the relevant labor markets.

The rest of the paper proceeds as follows. Section 2 provides institutional background. Section 3 documents the trends in and effects of firm-level outsourcing events. Section 4 estimates the market-level effects of outsourcing legalization. Section 5 presents a welfare analysis. Section 6 concludes.

2 Institutional Setting and Data

2.1 History of Outsourcing in Brazil

Outsourcing emerged as a new business practice of uncertain legality in Brazil during the second half of 20th century. In 1967, the Brazilian dictatorship issued Law-Decree 200, which allowed government bodies to outsource non-governmental functions, but had no provisions about the legality of outsourcing by private sector firms. This legislative vacuum posed a major problem for

⁷In complementary work, [Bertrand et al. \(2017\)](#) uses a model of creative destruction to quantify the aggregate effects of the rise of contract labor in India following a court-ordered relaxation of a ban against using contract labor.

lawsuits brought by workers who appeared to be outsourced, for which a key question was: who is the lawful employer—the contract firm or the client firm? The answer to this question is what determines which firm is the one responsible for compliance with Brazilian labor regulations regarding the outsourced worker’s pay, benefits, and employment protection.

As lawsuits involving third-party contracting emerged, in 1986 the Superior Labor Court issued *Enunciado 256*, a one-paragraph precedent stating that the Court understood the practice of outsourcing to be illegal except for cases permitted by legislation.⁸ Regional differences in judges’ stance on the legality of outsourcing nevertheless persisted, a phenomenon we discuss in Section 2.2 and leverage for our empirical strategy in Section 4.1.

The uncertain legality of most outsourcing practices finally came to an end on December 17, 1993. Following an unanticipated series of events, the Superior Labor Court issued *Súmula 331*,⁹ a detailed and sweeping precedent that declared outsourcing of all non-core activities by any firm to be legal. Henceforth, outsourced workers would be considered legal employees of the intermediary firm so long as the service provided by the worker was deemed a *non-core activity* of the client firm.¹⁰

As a consequence of *Súmula 331*, the *expected* legal cost of outsourcing workers sharply fell. Prior to legalization, a firm in a region where judges considered outsourcing illegal was discouraged from outsourcing because, shall an outsourced worker sue them for *any* reason, the firm could be found liable not only for the alleged damages, but also for any penalties related to the illegal practice of outsourcing. While some firms might have still found it profitable to outsource prior to legalization, the high *expected* legal costs of outsourcing likely discouraged many firms from doing so.

⁸The exceptions were: a) Outsourcing by government (Law-Decree 200); b) Temporary work of demonstrated need and no more than 3 months (Law 6.019 of 1974); and c) Banking security (Law 7.102 of 1983, which required banks to offer safe storage and operational facilities to its clients.)

⁹These events concerned a political crisis surrounding the investigation by the Labor Prosecution Office of the allegedly illegal outsourcing of typists by Banco do Brasil, the country’s largest bank. See [Biavaschi and Droppa \(2011\)](#) for a historical account of the events leading to *Súmula 331*.

¹⁰In terms of compliance with Brazilian regulations, the client firm would only be liable for these obligations in case the intermediary went bankrupt.

2.2 Regional Variation in Pre-legalization Interpretation

According to available records and the expert opinions of leading Brazilian jurists and scholars, there was a significant difference between Southern and other labor courts' interpretation of the legality of outsourcing prior to legalization by *Súmula 331*. Consider two example regional courts at each side of the legality debate: Rio Grande do Sul (restrictive) and São Paulo city (permissive).

On the restrictive side, judges interpreted *Enunciado 256* as establishing a principle of illegality on outsourcing. This implied that even some exceptions listed in *Enunciado 256*—such as banks being allowed to outsource security—were also illegal. According to a regional labor court justice at the time:

“Security guards were being replaced by guards contracted now via these firms... Our understanding was that the exceptions made under 256 were not applicable here... so I recognized the employment link directly with banks.”

On the permissive side, courts' understanding of outsourcing and general leniency towards it could not be more different. In the words of a union leader in the city of São Paulo:

“[T]he high frequency of lawsuit losses ended up wearing down the Unions, because as we could not win lawsuits the employers made sure to promulgate: 'you see! The labor court considers outsourcing legal!' ”

Appendix Tables [A.1](#) and [A.2](#) provide many more of these quotes, taken from transcripts of interviews with former regional court justices, judges, lawyers, and union leaders.¹¹

Southern courts' restrictiveness towards outsourcing is also reflected on its regional labor courts' legal precedents. The appeals concerning outsourcing made to the Superior Labor Court prior to *Súmula 331* show that Southern courts tended to recognize end-firms as the legal employer.¹² They also indicate that outsourcing tended to be more litigated in the South.

¹¹Transcripts were generously provided by Magda Biavaschi (former Regional Court Justice and jurist) and Alisson Droppa (a legal historian), who between 2008 and 2011 interviewed judges, lawyers, and other parties involved in key lawsuits about outsourcing at various regional courts, for a research project on regional differences in courts' stance on outsourcing prior to *Súmula 331* (i.e., [Barros Biavaschi and de Andrade Baltar 2013](#)). We also separately interviewed Dr. Biavaschi and a current Regional Court Justice a North region. Appendix [A](#) discusses how we learned of the regional differences in Courts' interpretation and gathered its supporting evidence.

¹²Appeals to the Superior Labor Court are rare, especially on a specific topic, such as outsourcing. That most appeals concerning outsourcing come from Southern courts indicates more active litigation of that topic in the region. Details on each appeal is provided in Appendix Table [A.3](#).

Combined, the interviews and legal precedents point to very restrictive interpretations in Brazil’s geographic South,¹³ including the states of Rio Grande do Sul (4th regional court), Paraná (9th), and Santa Catarina (12th), and a restrictive—though to a lesser extent—interpretation in the countryside of the state of São Paulo (15th region, Campinas),¹⁴ in contrast with the permissive city of São Paulo (2nd region). We therefore classify regional courts 4, 9, 12, and 15 as being restrictive towards outsourcing prior to legalization,¹⁵ and the remaining regional labor courts as permissive.

Table 1 summarizes our classification of Brazil’s 24 regional labor courts. Columns (5) and (6) summarize the information from legal precedents,¹⁶ while columns (7)-(9) summarize the information from available interview transcripts.¹⁷ Columns (10)-(12) then show the prevalence of outsourcing of security guards before and following legalization for each region.

Figure 1 Panel B shows that, as of December 1992 (the year prior to legalization), roughly 32% of security guards in restrictive regions were employed by contract firms, compared to 38% at permissive regions. By December 1999, this gap had been fully closed, with contract firms accounting for 55% of all security guard employment in restrictive regions, compared to 53% at permissive regions. The increase in the prevalence of outsourcing in restrictive regions was a stark break from an otherwise flat trend. This is different from the pattern seen in permissive regions, where outsourcing experienced secular growth throughout the period, with no apparent trend breaks following legalization. Appendix Figure C.3 displays regional-court-specific trends.

¹³While evidence that Southern courts were more restrictive abound, the reasons why are less clear. One possibility is the South’s leftist legal tradition, Rio Grande do Sul being the center of the Alternative Law Movement, an intellectual movement that emerged in the 1980s and was grounded on Marx’s critical theory of law (Barreto and de Lyra, 2016). Another possibility is the influence of Italian and German immigration on the region’s positive attitude towards labor unions (Batistella, 2009).

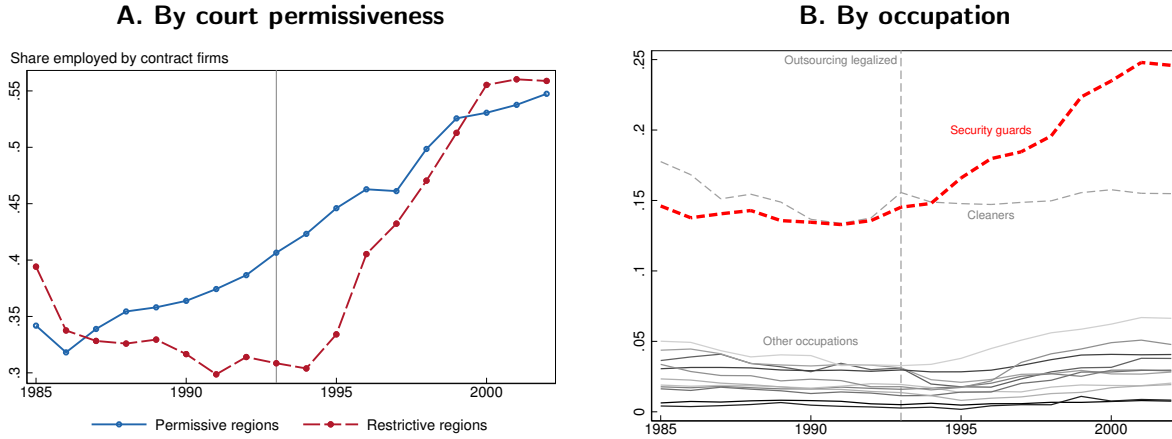
¹⁴Legal historian Alisson Droppa reported that the “15th region had a more flexible view [than the 4th region]... but even so, in ... pre-331 period, [it] had a very strong focus on resist[ing] outsourcing.” A lawyer from the 15th region at the time reported that the increase in outsourcing in the region “was intensified starting in 1994, at time of the Real Plan, but also the time when there was a change in the Superior Court’s understanding of the topic. (...) [O]ne cannot underestimate the ability that legal decisions have to influence how firms behave”. See Appendix Table A.1.

¹⁵Given our uncertainty about the correct classification of the 15th region, we show that our market-level results are robust to (and, if anything, larger when) dropping observations from the São Paulo state (see Table F.5).

¹⁶Based on our review of individual cases appealed to the Superior Court and cited by Súmula 331, which are publicly available. We petitioned all regional labor courts to obtain copies of individual case records concerning outsourcing and ruled in the years preceding legalization (1986-1993), but we could not obtain the records. For some courts the records no longer exist, for others they exist but are neither indexed by topic nor are they digitized. See Appendix A for details.

¹⁷We found little scholarship and written record about the legality of outsourcing during the pre-legalization period for most regions ultimately classified as permissive. The lack of written record is likely driven by outsourcing being less contested/litigated outside Brazil’s South or major urban centers, like the city of São Paulo (2nd region).

Figure 1: Trends in contract-firm share



Note: Panel A plots the trend in the share of private-sector security guards in the formal sector working for contract firms, separately for permissive and restrictive regions. Each line in Panel B shows the share of private-sector workers employed in contract firms, averaged across microregions, for an occupation. We include only major occupations and microregions that are in our estimation sample, which is described in Section 4 and tabulated in Table B.1.

2.3 Our Focus: Security Guards

We focus on security guards because restrictions on outsourcing were particularly binding for guards prior to its legalization. Relative to other occupations, guards are primarily formal,¹⁸ face stricter licensing,¹⁹ and have strict training requirements.²⁰ These factors facilitate monitoring of the occupation and ultimately the enforcement of local courts' decisions on security outsourcing.

Consistent with particularly binding restrictions, guards were the only major occupation to experience a large rise in outsourcing after legalization, as shown in Figure 1 Panel B. Each line shows the trend in the share of private-sector workers employed in contract firms (i.e., the “contract-firm share”) for each occupation,²¹ averaged across microregions. Before 1993, there

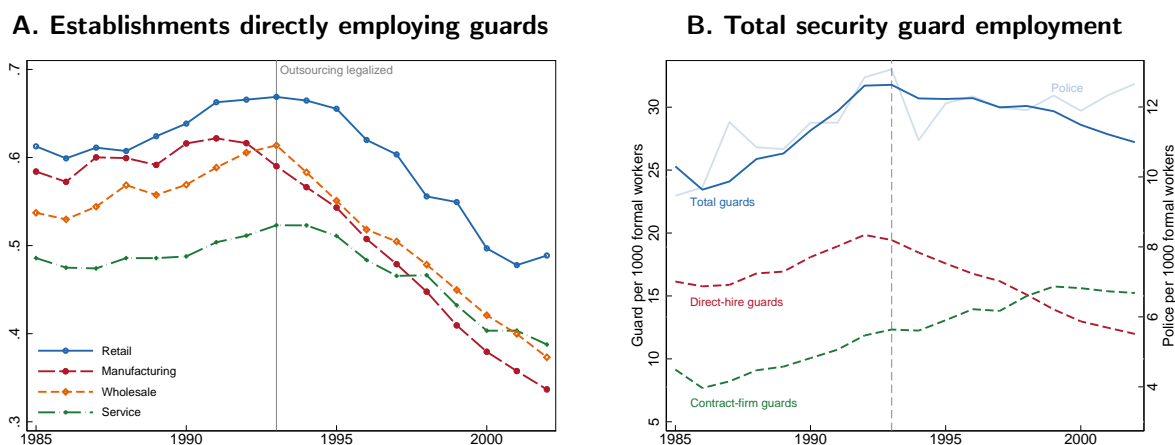
¹⁸Roughly 80% of all guards were formal during this period, versus 50% of all workers. See Appendix Figure C.1.

¹⁹Guards must have no criminal records, be Brazilian and at least 21 years of age, have studied at least up to 4th grade, and present proof of no pending obligations with either the electoral court (as voting is mandatory in Brazil) or with the military (as men are required to report to the military at age 18 for enlistment, but most are dismissed).

²⁰Guards must complete mandatory security services training administered by Brazil's *Polícia Federal* (equivalent to the Federal Bureau of Investigations in the United States).

²¹We use 2-digit occupation codes to identify broad occupational groups. Security guards are identified as private sector workers under CBO 2-digit occupation code 58, “Security and public safety workers.” We exclude police officers (CBO 3-digit code 583) from our definition security guards as police officers are public sector workers. We use the CBO and CBO94 occupation codes that are consistent for the period 1985-2002, prior to a major revision in occupation codes in 2003 (CBO02 codes). See Appendix Table B.1 for the list of 2-digit large occupations included

Figure 2: Trends in security guard employment



Note: Panel BA plots the share of establishments with at 50 employees in the respective sectors that employ at least one security guard. Panel B plots the total number of guards, the number of contract-firm guard, the number of direct-hire guards, and the number of police (aged 18-64) per 1000 formal-sector workers in Brazil over time.

are two occupations – security guards and cleaners – whose contract-firm share far exceeds that of other occupations. In the years immediately following legalization, the contract-firm share indeed rose by almost 10 p.p for security guards, from an average of 15 p.p. By contrast, the contract-firm share for cleaners hardly changed.²²

Guards are also an economically important occupation in Brazil. An overwhelmingly male and relatively high-paid occupation,²³ guards accounted for 3.1 percent of total private-sector formal employment in 1993, being employed across various sectors. Figure 2 shows that all of these sectors appear to have been affected by the rise of security service outsourcing.

Panel A of Figure 2 plots the trend in the share of establishments with at 50 employees that employ at least one security guard, separately for the manufacturing, services, wholesale, and retail sectors. Across all four sectors, the share was generally steady before 1993, but began to fall sharply beginning around 1993.²⁴ In 1992, about 60 percent of wholesale establishment had

as comparison occupations in market-level analyses.

²²Section 3 documents a large and long-lasting increase in the frequency of occupational layoffs for security guards after legalization, but the analogous increase for cleaners was smaller and short-lived. This could be due to cleaners being primarily employed in the informal sector, where regulatory changes are less binding.

²³The vast majority security guards in our data are also in indefinite-duration (as opposed to temporary) full-time contracts. See Appendix Table C.2 for more descriptive statistics of the occupation.

²⁴An exception is manufacturing, whose contract-firm share begins to decline just before 1993. This is likely

at least one security guard on staff. By 2002, less than 40 percent did. Since Panel B shows a concurrent increase in contract-firm employment, many of these firms must have contracted out their needed security services, and thus no longer directly employed security guards.

2.4 Data and Measurement of Outsourcing

We use Brazil’s employee-employer matched administrative data, *Relação Anual de Informações Sociais* (RAIS), covering 1985-2002, which track the universe of Brazil’s formal-sector workers. For each matched worker-establishment pair, RAIS contains annual information on the duration of employment, the average monthly wage over that period, a number of demographic variables (such as education, gender, and age), as well as detailed industry and occupation codes. Following standard practice in the literature, we focus on full-time private-sector workers aged 18-64.

Our measurement of outsourcing uses the fact that RAIS includes specific industry codes for contract firms.²⁵ This allows us to identify outsourced workers as those employed by contract firms, and direct-hires as those employed by any other private-sector firm. Finally, the high degree of formality among security guards allows us to track both incumbents and newcomers using employer-employee links.

Despite its richness, RAIS has three important limitations. First, while our analysis focuses on a primarily formal occupation—security guards—RAIS lacks information on workers who are not formally employed. Thus, while we test whether outsourcing pushed incumbent workers out of the formal sector, we cannot discern whether this transition was to unemployment or to informality. Second, RAIS does not include information on where outsourced workers are posted. As a result, we cannot and do not focus on estimating “outsourcing premia,” that is, the wage difference between being outsourced versus directly hired for the same worker performing the same job at the same firm.²⁶ Finally, RAIS lacks information on non-wage components of compensation (such as access to employer-based private health insurance). As these limitations might be important for

related to concurrent trade liberalization, which disproportionately affected manufacturing establishments.

²⁵See Appendix B for the 5-digit codes of contract firms, all of which fall under occupational class 74 “Serviços prestados principalmente às empresas.” To consistently classify the industry of establishments over time, we use crosswalks along with our best judgement.

²⁶Recent estimates of this kind for the Argentinian context have been reported by [Drenik et al. \(2023\)](#), however, who estimate that firms that typically pay 10% wage premia to its workers pay only 4.9% premia when the same worker is under a temp-agency contract instead.

quantifying welfare effects, we return to them in Section 4.3.

3 Firm-level Outsourcing Events

In this section, we present three findings on firm-level outsourcing events in Brazil. First, outsourcing legalization in 1993 led to a large wave of occupational layoffs, while on-site outsourcing was rare throughout the study period. Second, occupational layoffs temporarily reduced the employment of incumbent security guards and persistently reduced their wages, resulting in an average loss equal to slightly more than one year of earnings. Most of these workers do not return to formal employment as security guards, being reallocated to other occupations. Third, high-wage firms were more likely to have occupational layoffs following legalization and the loss of firm wage premia substantially explains the decline in wages for incumbent workers affected by the layoffs. These findings are broadly consistent with existing literature, which suggests that outsourcing has negative effects on workers due to the loss of firm wage premia. In addition, they suggest that outsourcing likely had reallocation effects that the previous literature has not documented.

3.1 Incidence of Occupational Layoffs and On-site Outsourcing

Since the existing evidence on outsourcing is based on firm-level outsourcing events,, we first ask: Did outsourcing legalization lead to a rise in firm-level outsourcing events? To identify outsourcing events from the data, we follow [Goldschmidt and Schmieder \(2017\)](#) and examine both *on-site outsourcing events*, wherein a large number of workers flow from a direct employer to a contract firm but presumably continued to perform the same job, and *occupational layoffs*, wherein an establishment drastically reduces their number of direct employees in a given occupation, while other occupations are seemingly unchanged.

We find that on-site outsourcing events were very rare in Brazil. Between 1990 and 2000, we identify a total of 107 on-site outsourcing events in the security guard occupation, defined as the flow of at least three security guards from a direct employer to a security services establishment.²⁷

²⁷Appendix D.1 details our definition, which ensures that the outsourcing event did not coincide with firm-wide layoff. Our definition is less stringent than [Goldschmidt and Schmieder \(2017\)](#). Using their definition, we identify only 27 on-site outsourcing events in the security service industry between 1990 and 2000. These events affected only 1,061 security guards, less than 0.25 percent of the security guards in the nation.

These events affected 2,842 security guards, about 0.7 percent of the nearly half a million security guards in the country.

The rarity of on-site outsourcing is noteworthy, since prior literature uses on-site outsourcing events to measure wage differentials (e.g. [Goldschmidt and Schmieder 2017](#)). A potential reason for the rarity of on-site outsourcing events is that Brazil prohibits nominal wage reductions for continuing workers, which is generally understood to include the firing and rehiring workers through an intermediary to perform the same job but at a lower wage.²⁸

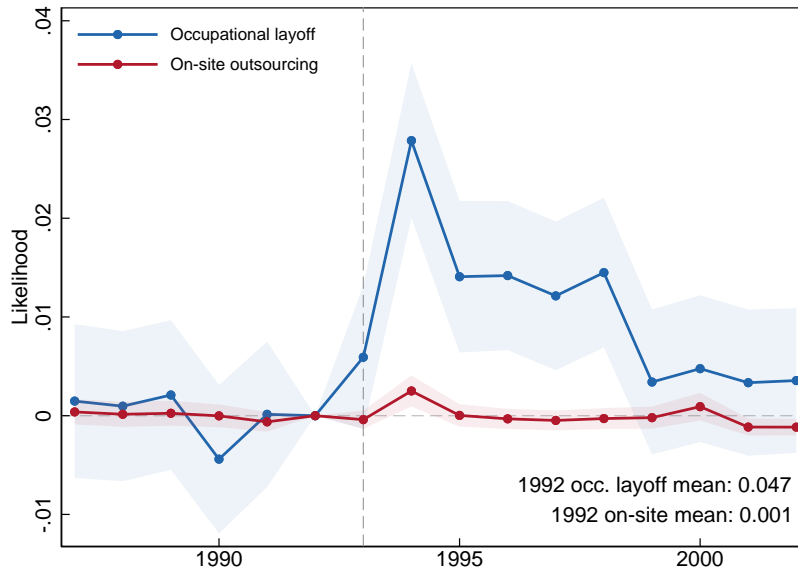
Occupational layoffs are much more common and can account for a large share of the decline in direct-hire employment after outsourcing legalization. We define occupational layoffs as a two-thirds reduction in the number of workers in a specific occupation from an establishment with at least three workers in the occupation, excluding establishments where non-guard employment fell by more than 10 percent, as detailed in Appendix [D.1](#).²⁹ Between 1990 and 2000, the number of occupational layoffs averaged 471 per year and affected a total of 35,544 security guards, about 8.4 percent of the security guards in the nation, and about 72 percent of the decline in direct-hire security guard employment during this time.

Figure [3](#) shows that there was a large wave of occupational layoffs immediately after legalization and no detectable increase in on-site outsourcing. It plots estimates of the establishment-level likelihoods of an occupational layoff or an on-site outsourcing event in each year. The likelihood of both are stable prior to 1993, the year of outsourcing legalization. The incidence of on-site outsourcing does not detectably change after legalization. However, the incidence of occupational layoff rises sharply by 2.5 p.p. in 1994, the year after legalization. This increase is more than half the pre-legalization level. The elevated level persists for several years before slowly falling back towards baseline. As shown in Appendix Figure [E.1](#), the increase was larger in Brazil's South, where courts were more restrictive towards outsourcing prior to legalization, than in the rest of Brazil.

²⁸See Articles 453 and 468 of *Consolidação das Leis do Trabalho*. See also *Portaria MTB 384/1992* and Law 6.019 Article 5⁰-D.

²⁹See Appendix Figure [D.1](#) for the establishment-level employment of guards (Panel A) and other occupations (Panel B) in the years leading to and following an outsourcing event.

Figure 3: Occupational layoffs vs. On-site Outsourcing events following legalization



Notes: This figure plots coefficients from a linear probability model where we regress a dummy indicating the occurrence of an occupational layoff or an on-site outsourcing event on year fixed effects, relative to the omitted year of 1992, with controls for microregion fixed effects. Our sample includes all establishment-years where the establishment had at least 10 employees and 3 security guards and its non-guard employment fell by less than 10 percent in the subsequent year. We exclude manufacturing establishments, because they are heavily affected by trade liberalization in the early 1990s. We cluster standard errors at the establishment level.

3.2 Effects of Occupational Layoffs on Incumbent Workers

Since outsourcing in Brazil primarily takes the form of occupational layoffs, we next ask: How do occupational layoffs affect the employment and earnings of incumbent security guards? To answer this question, we compare long-tenured security guards who were directly affected by an occupational layoff between 1990 and 2000 to similar security guards who were unaffected by such events. Our treatment group includes all security guards who did not continue their jobs as direct-hire security guards when their employer eliminated a large portion of such jobs. These treated workers could either separate from the establishment or be reassigned to another occupation within the establishment.³⁰ We construct a control group consisting of similar security guards in a

³⁰While this definition is natural for our study of occupational layoffs, note that it is different from the typical definition in the mass layoff literature, wherein the treated workers necessarily separate from the employer (e.g. [Jacobson et al. 1993](#); [Couch and Placzek 2010](#); [Davis and von Wachter 2011](#); [Lachowska et al. 2020b](#); [Schmieder et al. 2020](#)). Furthermore, we do not condition on treated workers being transferred to a contract firm, so our estimates are also conceptually different from those in [Goldschmidt and Schmieder \(2017\)](#).

similar non-outsourcing establishment using a matching algorithm, as described in Appendix D.2.

We use the following worker-level difference-in-differences specification to estimate the effects of occupational layoffs on incumbent security guards:

$$y_{it} = \sum_{k=-4, k \neq -1}^8 \delta_k (D_i \times I_{t=t^*+k}) + \alpha_i + \tau_t + X_{it}\beta + \varepsilon_{it} \quad (1)$$

where y_{it} is the outcome of security guard i in year t (e.g., employment status or wage), D_i indicates if the security guard was outsourced in year t^* ,³¹ X_{it} are demographic controls, and ε_{it} is a residual term. Each coefficient δ_k is the effect of an occupational layoff on an incumbent direct-hire worker k years since the layoff, relative to their matched pair at a non-outsourcing firm. Note, therefore, that these do not capture the equilibrium effects of outsourcing legalization for the security guard occupation as a whole (which includes both non-outsourced incumbents and new workers entering the occupation), which we investigate in Section 4.

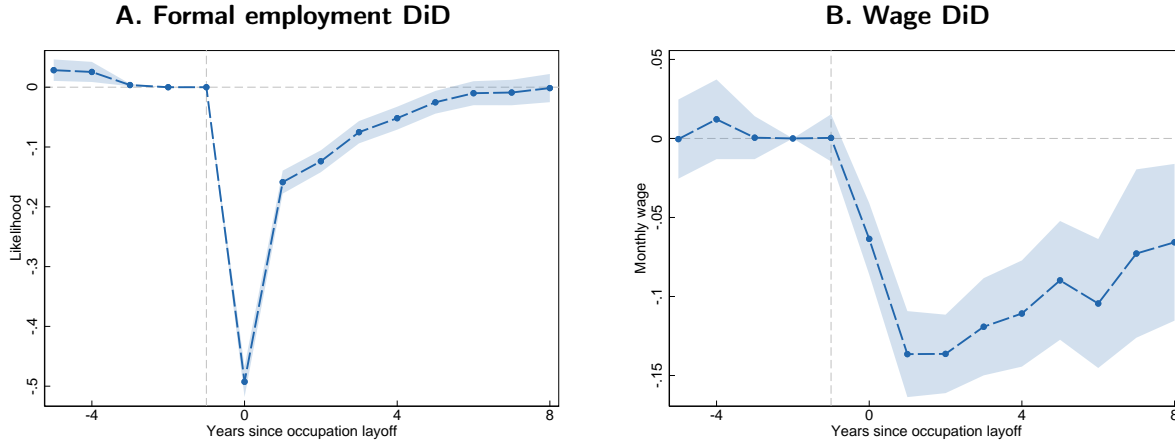
Figure 4 Panel A shows that outsourcing decisions significantly displace incumbent security guards from formal employment. In the year after an occupational layoff, an affected security guard is 49 p.p. less likely to be formally employed. However, the reduction in formal employment is transitory. Five years after an occupational layoff, there is no detectable effect on the likelihood of formal employment.

Panel B shows that occupational layoffs also persistently reduce the wages of incumbent security guards. Wages are hardest hit in the year following occupational layoffs, by 18 percent, and never recover to pre-layoff levels. Five years following an occupational layoff, security guards are still paid 12 percent less than they would have been counterfactually paid had the occupational layoff event not happened. Since by this time, the formal employment rates of the treated and control groups no longer exhibit any detectable differences, worker selection is unlikely to explain the drop in wages. As shown in Appendix Figures E.5 and E.6, these results are robust to alternative matching strategies and definitions of an occupational layoff. Finally, while legalization increased the frequency of outsourcing in Brazil's restrictive South by more than in the permissive North (e.g., see Appendix Figure E.1), Appendix Figure E.4 shows that outsourcing events have similar effects on incumbents' likelihood of employment and wages in either region.³²

³¹Measured by an occupational layoff occurring at the guard i 's firm in year t^* .

³²See Appendix Figures E.5 through E.8 for event study effects using alternative matching strategies, alternative

Figure 4: Impact of occupational layoffs on incumbent workers



Note: Panels A and B plots coefficients γ_t from a difference-in-differences regression measuring the impact of an occupational layoff on incumbent direct-hire security guards, where the control group are similar workers in establishments that did not have an occupational layoff. Our sample includes all occupational layoffs, as identified by sudden drops in an establishment security guard count, between 1990 and 2000. We include controls for individual and year fixed effects, and time-varying demographics. Shaded bands indicate 95% confidence intervals, with standard errors clustered at the establishment level.

Table 2 shows that a large fraction of affected workers transition to other occupations, while only a small proportion end up in contract-firm employment. Immediately after an occupational layoff, impacted workers are 76 p.p. less likely to be formally employed in the same occupation. Even five years later, impacted workers are less likely to formally employed in the same occupation (by 12 p.p), though they are no longer less likely to be formally employed. By contrast, impacted workers are only 0.2 p.p more likely to be formally employed by a contract firm immediately after an occupational layoff. The effect of occupational layoffs on contract-firm employment rises to 7.7 p.p in the following year, and is 11.7 p.p five years after. Despite the large number of workers leaving the occupation, our finding of a persistent wage decline for incumbents is nearly all driven by workers who stay within the occupation, as shown in Appendix Figure E.2.

Table 5 Panel B shows that the implied present discounted value (PDV) of earnings losses from experiencing an occupational layoff is roughly 1-1.4 years.³³ If we assume that workers earn nothing if unobserved, as described in Appendix D.3, then the workers lose 1.40 years of earnings of average pre-occupational-layoff earnings. If instead we assume they have the same earnings

definitions of occupational layoffs, and effects of occupational layoffs on employment and wages of other occupations.

³³Based on security guards with at least 3 years of positive earnings at an employer with at least 10 workers.

as observed workers, then they lose roughly 1.06 year of earnings. Regardless of the imputation method, the PDV of earning losses appear to be substantial. This suggests that the persistent wage reductions account for much of the total earnings losses. The magnitude of earnings losses is similar to that of job displacement in the U.S. provided by [Davis and von Wachter \(2011\)](#), who report earnings losses equivalent to 1.4 years of pre-displacement earnings in non-recession years.

3.3 The Role of Firm-specific Wage Premia

A prominent idea in recent economic literature is that firms outsource in order to exclude workers from the wage premia they share with direct employees ([Dube and Kaplan 2010](#); [Weil 2014](#); [Goldschmidt and Schmieder 2017](#)). For example, some firms may be required by collective bargaining agreements, which are typically negotiated by sector and region in the Brazilian economy, to pay high wages to employees. Highly profitable firms may also face pressure to pay workers a wage premium in the interest of fairness or equity. A firm may avoid these requirements and pressures by moving workers outside its boundary.³⁴

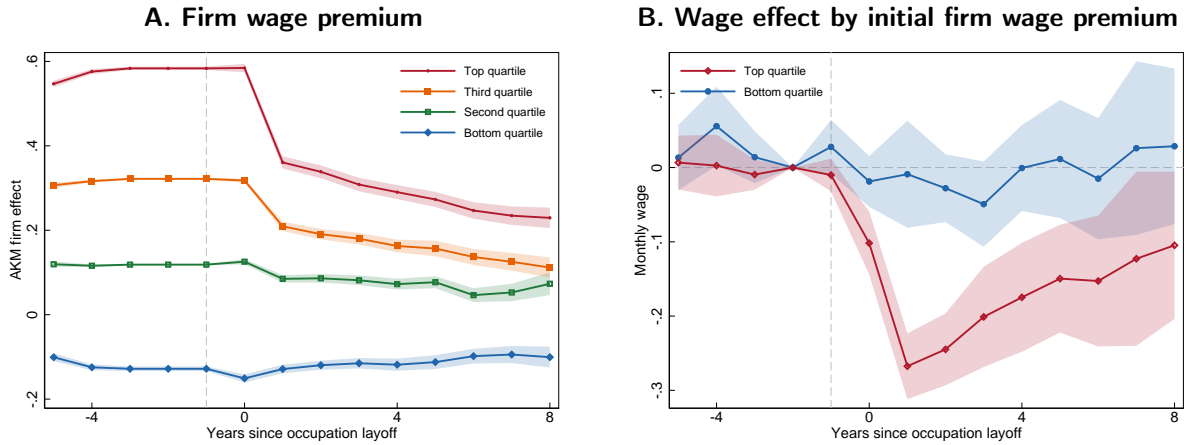
To investigate whether the desire to reduce firm-level worker rents drive firm outsourcing decisions, we first estimate firm-level wage premia using by decomposing log wages into worker and firm fixed effects following [Abowd et al. \(1999\)](#) (henceforth, AKM), as detailed in Appendix [D.4](#). Then, we use the estimated firm fixed effects to answer three questions: Do workers experiencing outsourcing decisions transition to lower-wage firms? Do workers initially at high-wage firms experience larger wage declines when their employer decides to outsource? Are high-wage firms more likely to outsource?

Figure [5](#) Panel A shows that that incumbent workers earn generally stable AKM firm effects prior to occupational layoffs, but this changes after occupational layoffs. Incumbent workers initially at the top quartile transition to firms with much lower firm wage premia. Their average AKM firm effect falls by almost 20 percent. By contrast, workers initially at lower-wage firms do not experience a significant change in the firm wage premia they are paid.

Panel B shows that workers initially employed by the top quartile firms experience a large level

³⁴Larry Katz articulates this view as follows: “When janitors work at Goldman Sachs as Goldman Sachs employees, they tend to share in the firm’s huge productivity benefits and huge rents. But if they work for Joe’s Janitorial Services, they no longer share in those rents” ([Clement 2017](#)).

Figure 5: Incumbent wage reduction is related to loss of firm wage premia



Note: Panel A plots the average AKM firm effect of an incumbent direct-hire security guards in the years before and after firm outsourcing decisions, conditional on their remaining formally employed. Panel B shows difference-in-differences regression estimates for the effect of outsourcing decisions on incumbent monthly wage (as a fraction of wage two years prior to the outsourcing event) conditional on formal employment, separately for high-wage and low-wage outsourcing establishments. In the red series of Panel B, we include only workers initially employed at a firm in the top quartile of the AKM firm effect distribution among impacted workers; in the blue, we include only those employed in the bottom quartile.

decline in wages following occupational layoffs.³⁵ We detect no statistically significant effect on wages for workers initially at establishments in the bottom quartile of the AKM firm effects distribution. The loss of firm-specific wage premia explains 42 percent of the total wage losses in the year of the occupational layoff, 43 percent one year after the occupational layoff, and 46 percent five years after (see last line of Table 2). These numbers suggest that changes in firm wage premia explain a substantial fraction of incumbent wage losses.³⁶

High-wage establishments were also more likely to outsource. As shown in Appendix Table E.1, outsourcing decisions are more likely to be taken by firms with higher AKM firm effects, higher mean wage in 1993, and higher mean security-guard wage in 1993. These findings are broadly consistent with Goldschmidt and Schmieder (2017).

³⁵See Appendix Figure E.3 for effects on the likelihood of employment. Workers who were in the top quartile of the AKM fixed effect distribution at baseline are more likely to be disemployed (i.e., leave the data, either to informality or unemployment) on impact, but return to the formal sector at similar rates as workers who were in the bottom quartile at baseline.

³⁶By comparison, Lachowska et al. (2020b) estimate that firm effects explain 17 percent of wage losses from job displacement in the U.S., while Schmieder et al. (2020) estimate that firm effects account for 75 percent of wage losses from job displacement in Germany. The underlying sources of differences in the importance of firm wage premia across countries remains an open question in the literature.

However, outsourcing legalization did not reduce the average firm wage premia in the security guard occupation. As shown in Appendix Figure E.9, the average firm effect among security guards was falling both before and after outsourcing legalization in both regions, but we do not detect any trend break in 1993, when outsourcing was declared legal. In fact, the fall in mean firm wage premia is larger in permissive regions than in restrictive regions. This finding is consistent with our empirical results in the next two sections that shows weakly positive market-level wage increases and suggests that outsourcing legalization did not significantly alter the wage premia of security guards who did not experience occupational layoffs.

4 Market-level Effects of Outsourcing

This section presents our empirical strategy for and estimates of the market-level effects of outsourcing legalization. We find that legalization (i) increased the prevalence of outsourcing, (ii) reallocated jobs from the old to the young, and (iii) substantially increased employment. We also find suggestive evidence of a small increase in wages. All effects are long-lasting.

4.1 Empirical Strategy

We exploit the fact that legalization was most binding for guards in restrictive regions—see Sections 2.2 and 2.3—to implement a triple-differences research design (DDD). That is, we compare the outcomes of guards versus those for other occupations in restrictive versus permissive regions before versus after legalization. Our main regression specification is

$$y_{ort} = \sum_{\tau=1985; \tau \neq 1992}^{2002} \beta_{\tau} (T_{or} \times 1_{t=\tau}) + \delta_{or} + \delta_{ot} + \delta_{rt} + \epsilon_{ort}, \quad (\text{DDD}) \quad (2)$$

where y_{ort} denotes the outcomes of interest (e.g., mean log wage in occupation o in microregion r in year t), T_{or} is indicator variable equal to one if occupation o is guards and microregion r is under the jurisdiction of a restrictive regional labor court, δ_{or} are microregion-year fixed effects, δ_{ot} are occupation-year fixed effects, and δ_{rt} are microregion-year fixed effects.³⁷ We cluster standard

³⁷Regressions inclusive of microregion-occupation-specific linear time trends are presented as robustness.

errors at the regional court level and report randomization inference p -values as robustness.³⁸

The coefficients β_τ from equation (2) measure how the evolution of the outcome variable y_{ort} differed between the guards and non-guards in restrictive microregions, relative to the analogous difference in permissive microregions, with the pre-legalization year of 1992 normalized to zero. Equation (2) yields estimates of the effect of outsourcing legalization under the assumption that, but for legalization, outcome differences between guards and other occupations would have followed the same trends in restrictive as in permissive regions. To facilitate interpretation, in Table 3 we report pooled (as opposed to year by year) effects, separately for the short-run (1-4 years post) and long-run (5-9 years post), with additional microregion-occupation-specific linear trends.³⁹

The main threats to causal identification are contemporaneous reforms in Brazil, such as trade liberalization (1990-1994) and the “Real” price stabilization plan (1994), which induced large sectoral shifts in labor demand (Baumann 2001). As shown in Figure 2 Panel B, both the employment of security guards and police as a share of formal sector employment slowed down around 1994. At the same time, growth in total formal-sector employment accelerated (see Appendix Figure C.2). These contemporaneous changes are not attributable to outsourcing legalization.⁴⁰ They instead reflect national-level confounding influences that our triple-difference approach attempts to eliminate from our estimates.

While δ_{rt} absorbs the effects of any confounding policies that might have differentially affected restrictive regions, and δ_{ot} does the same for policies that might have differentially affected guards, a potential concern are concomitant policies that differentially affected guards in restrictive regions. In particular, trade liberalization *reduced* employment and wages in regions more exposed to import competition, as measured by their pre-liberalization sectoral composition (e.g., see Kovak 2013). Many of these regions were in the Southeast and South, overlapping with the jurisdiction of restrictive labor courts. While our findings suggest that outsourcing legalization *increased* employment and wages for guards in the South, some of this effect might have been

³⁸Computed by permuting treatment assignment (i.e., restrictiveness status) across the 24 regional courts.

³⁹We use the following regression, where γ_{SR} and γ_{LR} are the short-run and long-run pooled regression coefficients, respectively: $y_{ort} = \gamma_{SR} (T_{or} \times 1_{t \in [1994, 1997]}) + \gamma_{LR} (T_{or} \times 1_{t \in [1998, 2002]}) + \delta_{or} + \delta_{ot} + \delta_{rt} + (\delta_{or} \times t) + \varepsilon_{ort}$.

⁴⁰Consistent with this view, Appendix Figure F.2, shows that both restrictive and permissive regions experienced increases in security guard employment relative to other occupations before legalization and a relative decline in security guard employment thereafter. There was also a run-up in security guards wages relative to other occupations in both regions before legalization and much slower wage growth thereafter.

driven by trade instead.⁴¹

To address this issue, our main specification balances restrictive and permissive regions on their pre-liberalization exposure to import competition, as well as on several baseline labor market characteristics.⁴² We do this by first estimating entropy-balancing weights, following the method proposed by Hainmueller (2012),⁴³ and then weighing each observation in regression equation 2 by their corresponding weight. Our method follows other empirical papers where identification relies on parallel *trends*, but treated and control units differ on baseline *levels* on variables potentially correlated with treatment assignment (e.g., see Basri et al. 2021).⁴⁴ We then report robustness to alternative weights (including uniform) and/or baseline covariate control schemes.⁴⁵

Finally, because security guards are not employed in all microregions—many of which are rural—we estimate equations (2) on a balanced estimation sample of 266 microregions and other similarly large 2-digit occupations.⁴⁶ Appendix Table B.1 lists these 11 comparison occupations and their characteristics. Our estimation sample includes 98.6 percent of all formal-sector security guards in the country, while the comparison occupations account for roughly 50 percent of total national formal employment.

⁴¹For example, trade liberalization might have contributed, at least in the short-run, to the increase in demand for security guards in the South because, by worsening local labor market conditions, it temporarily increased crime (e.g., see Dix-Carneiro et al. 2018).

⁴²We match on baseline local log employment, unemployment rate, homicide rate (provided by Dix-Carneiro et al. 2018), as well as three covariates that capture local exposure to international trade shocks: share of employment in tradable industries, log formal employment of importers, local import tariff competition exposure (provided by Felix 2021).

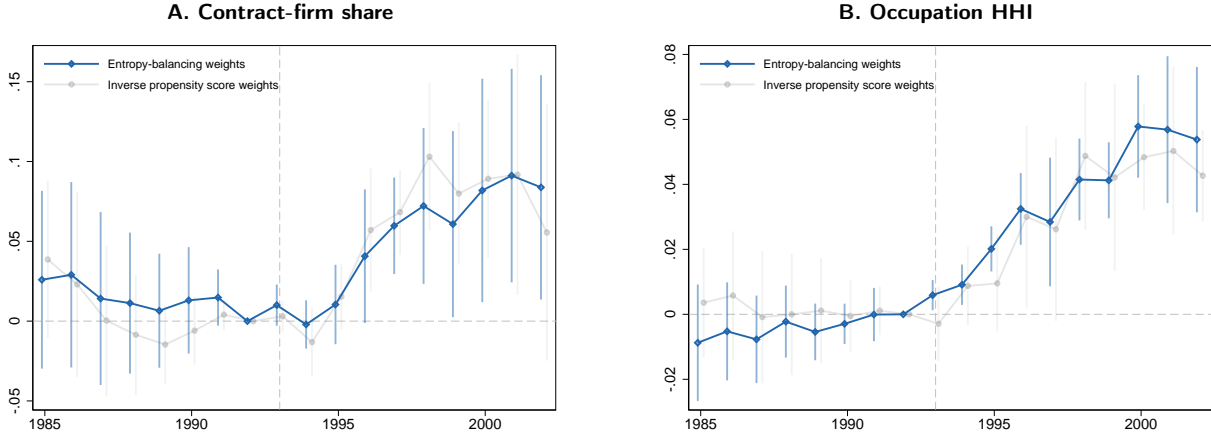
⁴³See Appendix Figure F.1 for a display of the entropy-balancing weights on a map.

⁴⁴Reweighting using entropy-balancing reduces differences between restrictive and permissive microregions even for characteristics that are not directly targeted (see Appendix Table F.1).

⁴⁵We also report estimates using a combination of reweighting and regression adjustment, which are known to be “doubly robust” to misspecification (Glynn and Quinn 2010).

⁴⁶We construct our estimation sample as follows. We select all microregions with employment greater than 25 for both security guards and cleaners in every year. We then select all occupations with at least two workers in every year for all selected microregions. We exclude managerial, public sector, and agricultural occupations, which are likely to follow different trends than a private-sector, urban, production occupation like security guards. Finally, we exclude cleaners, because they had a high contract-firm share prior to legalization, but did not experienced a significant increase in outsourcing following legalization (as shown in Figure 1).

Figure 6: Effect of outsourcing legalization on the prevalence of outsourcing



Note: Figure plots the coefficients α_τ from the occupation-level difference-in-differences regression specification equation (2), separately estimated using restrictive and permissive regions. Panels B and D plot the coefficients β_τ from the triple-difference regression measuring the impact of outsourcing legalization in equation (2). The omitted year is 1992. Sample is weighted by entropy balancing weights. Standard errors for 95% confidence intervals are clustered at the regional labor court level.

4.2 Findings

Effect on Prevalence of Outsourcing

Figure 6 plots our estimates for the effects of outsourcing legalization on the prevalence of outsourcing, measured either as the contract-firm share of employment (top panels) or the occupational HHI (bottom panels), as given by the β_τ coefficients from equation (2).,

We find that outsourcing prevalence sharply rose following legalization. Panel A shows that the contract-firm share of security guards did not significantly change relative to the comparison categories during the years prior to legalization, but began to grow immediately after outsourcing legalization. The effect of outsourcing legalization on contract-firm share plateaued at roughly 7 p.p. higher. To understand the sensitivity of our estimates to entropy-balancing weights, we include coefficients from a regression with both entropy-balancing weights (in blue) and inverse propensity score weights (in light gray). As shown in the figure, these effects are similar whether entropy-balancing weights or inverse propensity score weights are used.

The effects on outsourcing prevalence as measured by occupation concentration are shown in Panel B. Since contract firms provide workers to multiple clients and require a minimum scale to

operate, a rise in outsourcing should increase the concentration of workers among firms within an occupation. The data confirms this prediction. We find a very gentle differential upward trend in the pre-legalization period, followed by a much steeper increase in the post-legalization period. The effect of outsourcing legalization on contract-firm share plateaus at roughly 5 p.p. higher after five years. These effects are also similar whether entropy-balancing weights or inverse propensity score weights are used.⁴⁷

To facilitate the interpretation of magnitudes, Table 3 reports summarizes these effects by splitting them into short-run (1-4 years) and long-run (5-9 years) effects of outsourcing legalization. Each column shows coefficients according to different weighing schemes (i.e., entropy-balancing weights, inverse propensity score weights, and uniform weights with regression adjustment). All columns include controls for microregion-occupation linear trends. Table 3 shows that outsourcing legalization had a large, positive, and robust effect on the contract-firm share. According to our main specification, using entropy-balancing weights, the long-run effects of outsourcing legalization on contract-firm share vary between 6.2 and 7.1 percentage points. This is a 55-60 percent increase in the firm contract share relative to the pre-legalization 1992 mean in restrictive microregions of 11.7 percent. Effects based on alternative specifications are similar.⁴⁸

Effect on Age Composition

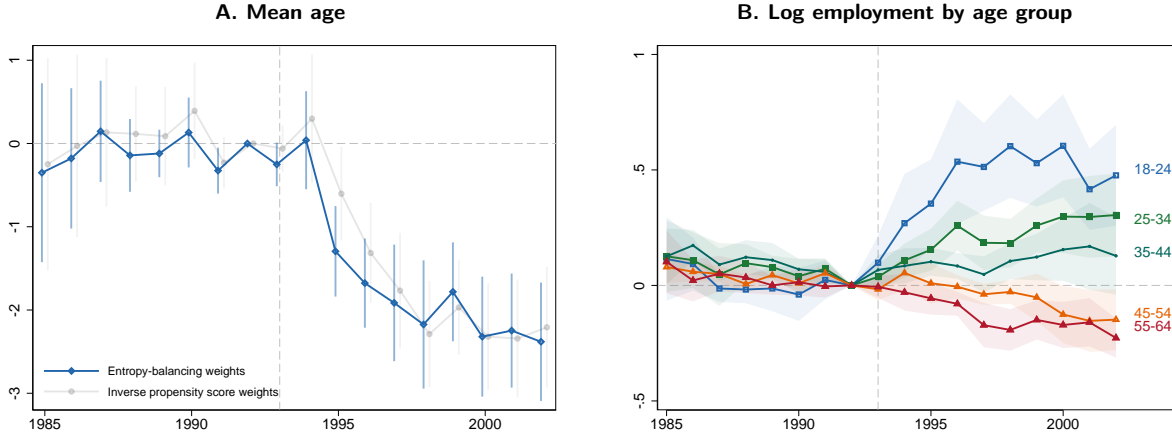
We find that outsourcing *reallocated* security guard employment away from older security guards to younger entrants. Figure 7, Panel A visualizes triple-difference estimates of the effect of outsourcing legalization on the mean worker age. It shows no differential trend in workers' mean age prior to legalization. However, workers' mean age fell immediately after outsourcing legalization, eventually plateauing at roughly 2 years lower, relative to the pre-legalization mean of 43 years. These effects are similar whether entropy-balancing or inverse propensity score weights are used.

Table 3, Panel B shows that including controls for microregion-occupation-specific linear trends

⁴⁷Table F.2, Panel B shows that the magnitude of the increase in occupation concentration is only somewhat weakened by the inclusion of controls for microregion-occupation-specific linear trends. The pooled long-run (5-9 years) effects of outsourcing legalization on occupation concentration, estimated using entropy-balancing weights, is 2.9 - 3.7 p.p. with linear trend controls and is statistically significant.

⁴⁸Note that, perhaps because most security guards and most contract firms are in urban centers, we find no discontinuities in the prevalence of outsourcing at the (predominantly rural) border between the restrictive South and the permissive North, as shown in Appendix Figure F.4.

Figure 7: Impact of outsourcing legalization on employment composition



Note: Figure plots the coefficients β_τ from the triple-difference regression measuring the impact of outsourcing legalization in equation (2). Panel A shows the mean age as the outcome variable; Panel B shows the log employment in respective age groups. The omitted year is 1992. Sample is weighted by entropy balancing weights. Standard errors are clustered at the regional labor court level.

only somewhat attenuates the estimated decline in mean age. Furthermore, this finding is highly robust to alternative specifications, since all columns show that outsourcing legalization decreased the mean age by 1.5 - 1.9 years.

Figure 7, Panel B presents triple-difference estimates of the effect on log employment by age group. The figure shows little pre-legalization trends for employment for all age groups. Immediately after legalization, however, there is a very large increase in employment of younger workers. Employment between the ages of 18-24 grew by almost 50 percent. Employment of workers in the 25-34 and 35-45 age groups increased by about 20 and 10 percent, respectively. By contrast, employment of workers in the 45-54 and 55-64 age group both declined. The decline is larger for the oldest age group of 55-64, at 15 percent.

These estimates suggest that there was a large influx of young security guards into the occupation that coincided with increased exit of older workers. This result enriches our findings in Section 3. Previously, we documented a large wave in occupational layoffs following legalization, which substantially displaced incumbent workers. The market-level specification here additionally reveals that outsourcing created not only losers, but also winners. Though the employment and wages of incumbents falls, the employment of younger workers grew as a consequence of job

reallocation.

Market-level Employment Effects

We find that outsourcing legalization increased total security guard employment by 8 percent. Figure 8, Panel A plots the estimated effect from equation (2) with log employment as the outcome variable. The divergence in log employment across regions survives this more demanding specification. Since we find a slight downward differential trend prior to legalization, the estimated rise in log employment is unlikely to be the result of pre-existing differences in the evolution of local occupational labor markets.

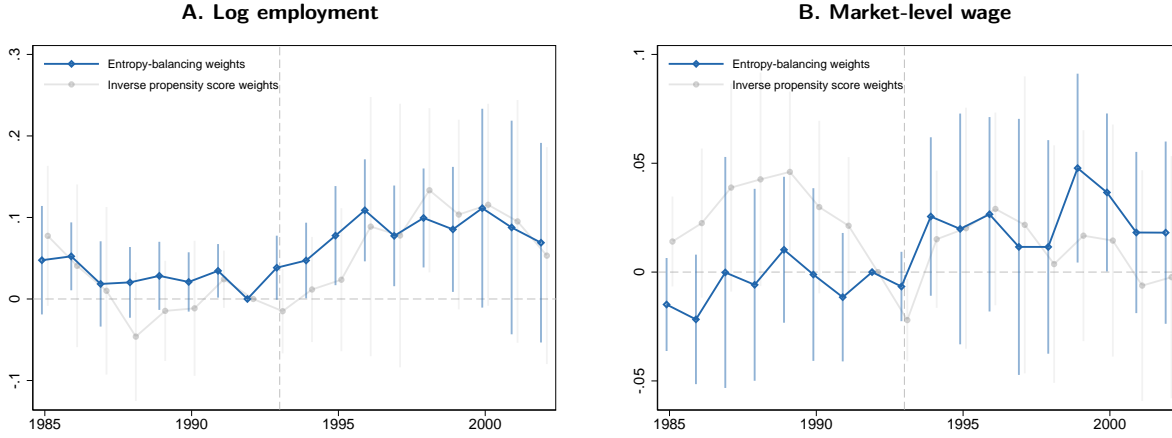
Table 3, Panel C shows that the positive effect of outsourcing legalization on employment survives controls for microregion-occupation-specific linear trends. It also shows that the large positive effect we find is robust to alternative weighing schemes, with some specifications—specifically, those using inverse probability weights, which place higher weight on regions with higher baseline crime rates (see Appendix Table F.1)—showing effects as large as 15 percent. The large and positive employment effect is therefore very robust to alternative specifications.

Market-level Wage Effects

Finally, we find suggestive evidence that outsourcing legalization increased market-level wages by 2-4 percent. To measure the market-level wage, we first estimate a worker-level regression of log monthly wage on microregion-occupation-year fixed effects with controls for observable worker demographics (including age, age squared, and age cubed interacted with four education levels and gender). The estimated microregion-occupation-year fixed effects are our measures of the demographic-adjusted wage.

Figure 8, Panel Panel B shows that there was no differential trend in demographic-adjusted wages prior to legalization. Immediately after, there is an increase in the demographic-adjusted wage of about 2 percent, beginning in 1994. This increase persists even after nine years. However, unlike our findings for employment and contract-firm share, the precision of the effect of legalization on market-level wage are sensitive to the choice of weighting schemes. As shown in the light gray series in Figure 8, Panel B, we observe substantial pre-trends when inverse propensity score weights are used instead.

Figure 8: Impact of outsourcing on market-level employment and demographic-adjusted wages



Note: Figure plots the coefficients β_τ from the triple-difference regression measuring the impact of outsourcing legalization in equation (2). The outcome variable in Panel A is log private-sector formal employment. The wage outcome variable in Panel B is the estimated microregion-year fixed effect from a worker-level wage equation that includes worker demographic controls. The omitted year is 1992. Sample is weighted by entropy balancing weights. Standard errors are clustered at the regional labor court level.

One potential reason why wage effects might be less precise is that there is more room for measurement error and for heterogeneity in wage data than in employment status. We address that by presenting in Table 3, Panel D, estimates inclusive of regression-adjustment demographic controls in addition to our baseline estimates. As shown in Column (1), without regression-adjustment controls, the estimated long-run effect using entropy-balancing weights alone is 2.5 percent and is marginally significant at the 10 percent level. The coefficients in Columns (2) and (3) are similar in magnitude, at 2.0 and 1.7 percent, respectively, but they are statistically indistinguishable from zero. In Columns (4) and (5), which combine regression adjustment and reweighing to be “doubly robust” to misspecification, the long-run effects are both statistically significant and sizable, at 4.7 and 3.9 percent, respectively.⁴⁹

⁴⁹Estimates using alternative measures of the market-level wage generate similar results. Table F.3 reports the effects of outsourcing legalization on (unadjusted) mean log wage and on within-worker wage, which is computed analogously to the demographic-adjusted wage but with added controls for worker fixed effects. The corresponding long-run estimates using the combination of regression adjustment and entropy-balancing are 3.6 and 3.8 percent. Both are statistically significant at the 5 percent level.

4.3 Discussion

The market-level effects in Section 4.2 show that outsourcing legalization (i) increased the prevalence of outsourcing, (ii) reallocated jobs from the old to the young, (iii) substantially increased employment, and (iv) did not reduce market-level wages, with some specifications showing small wage increases.⁵⁰ Combined, these findings suggest that—despite the negative effects of outsourcing events on incumbent workers documented in Section 3, legalization might have generated efficiency gains that were enough to increase aggregate demand for security guards. Section 5 next examines this hypothesis through the lens of a simple model.

The effects of outsourcing legalization measured in this section are unlikely to be due to differential crime rates across regions. As shown in Appendix Figure F.5, we find no differences in the trend in homicide rates between permissive and restrictive regions before outsourcing legalization. We also do not detect any differences in trend after outsourcing legalization, suggesting that legalization had no causal effect on homicide rates. However, we lack data to measure other crime outcomes such as thefts, burglaries, and robberies. We leave data collection and further analysis of crime outcomes for future research.⁵¹

A second limitation of our study is that, like recent studies (e.g., [Goldschmidt and Schmieder 2017](#); [Drenik et al. 2023](#)), we do not account for non-wage components of worker compensation. Since a growing literature shows that non-wage compensation is positively correlated with wages (e.g., [Taber and Vejlín 2020](#); [Lamadon et al. 2022](#)), our conclusions regarding the welfare implications are not likely to change if data on these outcomes were available. We expect that incumbent guards experiencing occupational layoffs would have not only lost wage premia, but also access to better workplace amenities. At the same time, young men who benefitted from legalization due to increased employment would likely have benefitted from better amenities relative to their counterfactual, which would likely be either unemployment or informal employment.

⁵⁰See Appendix F for additional robustness for all market-level effects, including robustness estimates to alternative measures of outsourcing prevalence, alternative wage measures, alternative entropy-balancing targets, alternative samples (e.g., excluding São Paulo State or São Paulo metro), and exclusion of microregion-occupation linear trend controls.

⁵¹Crime outcomes other than homicides are separately and not necessarily consistently reported by each state’s police department and at different levels of geographic granularity.

5 Welfare Implications

Did the benefits of outsourcing legalization outweigh its costs? As shown previously, outsourcing legalization raised market-level employment, but led to a wave of occupational layoffs that hurt incumbent workers. In this final section, we combine our reduced-form findings with a simple model to quantify the welfare effects of outsourcing legalization.

5.1 A Right-to-Manage Union Bargaining Model

We use a deliberately simple model to analyze the welfare effects of outsourcing legalization. We assume that workers are organized into a representative union, since wages in Brazil are determined partly through a sectoral bargaining system. A representative firm and a representative union bargain over the wage w , with the disagreement outcome being the competitive wage w_c . The firm then chooses employment L to maximize profits.⁵²

The firm's chosen employment is

$$L^D(w) = \arg \max_L pF(L) - (w + c)L, \quad (3)$$

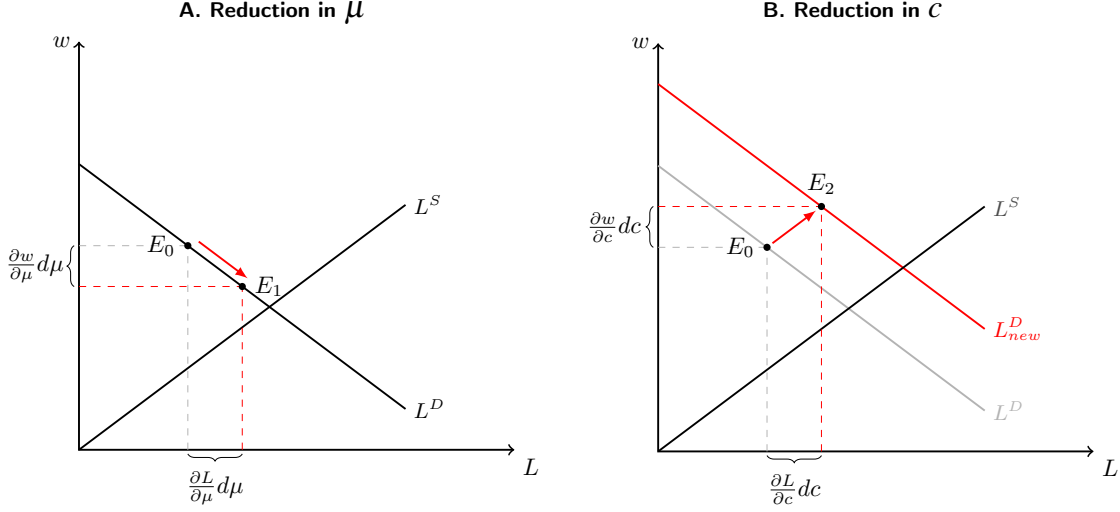
where F is the firm's increasing and concave production function, p is the firm's product price, and the firm's unit labor cost consists of the wage w and management cost c . L^D denotes the firm's derived labor demand of security guards as a function of the wage w . When the union possesses nonzero bargaining power, the wage is set above the competitive wage, with a markup $\mu > 1$ such that

$$w = \mu w_c, \quad (4)$$

where μ increases in the union's bargaining power. The counterfactual competitive wage w_c is

⁵²This model is referred to in the literature as the “right-to-manage” model, since bargaining is only over wages and the firm has the authority to unilaterally set the level of employment. See [Kaufman \(2004\)](#) for a review of union bargaining models. Also see [Oswald \(1985\)](#); [Farber \(1986\)](#). For analytic simplicity, at least two features are deliberately left out of this model. First, the model does not explicitly consider the “employ or outsource” decision of the firm. Second, it does not feature worker heterogeneity and therefore cannot explain the observed effect on workforce composition. [Guo et al. \(2023\)](#) provide a fuller model wherein both contractual arrangements and separation patterns are endogenous.

Figure 9: Equilibrium effects in a right-to-manage union bargaining model



Note: Panel A and B plot the effects of reduced wage markup μ and reduced management cost c on equilibrium wage and employment in the right-to-manage union bargaining model.

determined by the labor market clearing condition, given by

$$L^D(w_c) = L^S(w_c) \quad (5)$$

where L^S denotes the market-level labor supply of security guards as a function of wage w . Since labor demand is downward sloping and the union wage is elevated above the competitive wage, equilibrium employment is depressed below the competitive level. Together, equations (3), (4), and (5) fully describe the determination of w_c , w , and L in our model.

In this model, the first effect of outsourcing legalization to alter the worker wage markup μ . There are three potential reasons for this effect. First, outsourcing legalization may reduce union bargaining power by allowing firms to circumvent the requirements of collective bargaining agreements. Second, outsourcing may weaken within-firm fairness norms by moving workers outside the boundary of the firm. Third, outsourcing may eliminate the need to pay efficiency wages due to improved monitoring technologies. As shown in Figure 9 Panel A, a decline in worker bargaining power leads to a movement along the labor demand curve, so it increases employment but reduces wages.

The second effect is that outsourcing legalization may change management cost c . Since intermediaries have economies of scale from aggregating demand across clients, they face lower

recruiting, retention, training, administration, monitoring, and firing costs, as well as costs associated with absences and demand fluctuations (Prahalad and Hamel 1990; Abraham and Taylor 1996; Lee 1996; Segal and Sullivan 1997; Houseman 2001; Autor 2003). Intuitively, outsourcing legalization allowed firms that would have wanted to hire security guards---but couldn't afford to directly hire them given the large costs entailed in recruiting, training, and managing guards--to finally hire them through an intermediary. As shown in Figure 9 Panel B, a reduction in management cost effectively shifts out the labor demand curve, and therefore raises both wages and employment.

5.2 Quantification

Using the above model, we can use first-order approximations to infer the changes in management cost and wage markup ($dc, d\mu$) from the estimated changes in employment and average wage (dL, dw) in Section 4.2. Specifically, suppose that all primitives in our model are held constant except for L, w, c and μ . By differentiating equations (3), (4), and (5), we can show that ($dc, d\mu$) are linearly related to (dL, dw) as follows:

$$\begin{aligned}\frac{dw}{w} &= \frac{d\mu}{\mu} + \mu\phi \frac{dc}{w} \\ \frac{dL}{L} &= \varepsilon_D \frac{d\mu}{\mu} + \varepsilon_D \mu (1 - \mu\phi) \frac{dc}{w},\end{aligned}$$

where ε_D is the wage elasticity of occupational labor demand, ε_S is the wage elasticity of occupational labor supply, and $\phi = \varepsilon_D / (\varepsilon_D - \varepsilon_S)$ denotes the pass-through of management cost to the competitive wage. Given the parameters ($\varepsilon_D, \varepsilon_S, \mu$) and the observed changes in employment and wage (dL, dw), we can solve this system of two linear equations for two unknowns ($dc, d\mu$).

To measure ($dL/L, dw/w$), we use the estimated changes in log employment and log wage in Table 3 Column (1), which are the most conservative. For the unknown structural parameters, we use values that previous research has considered plausible. For the labor demand elasticity ε_D , we consult the survey of Hamermesh (1996), which reports estimates ranging from -0.5 to -2 . Since a more negative ε_D implies a smaller reduction in management cost, we follow Kleiner and Soltas (2019) and made the conservative choice to set $\varepsilon_D = -3$. Following estimates in Cortes

and Gallipoli (2017), Traiberman (2019), and Hsieh et al. (2019) of the elasticity of substitution across occupations, we set the labor supply elasticity to $\varepsilon_S = 3$. We set the wage markup to be $\mu = 1.1$, since our reduced-form estimates shows that incumbent wages fall by roughly 10 percent after occupational layoffs.⁵³

This exercise reveals that the efficiency-enhancing effect of outsourcing legalization was large relative its rent-stripping effect. Outsourcing legalization reduced the per-worker management cost in the labor market by the equivalent of 5.1 percent of the worker’s initial wage. By contrast, outsourcing only reduced the market-level wage markup by 0.3 p.p.. This reduction is statistically indistinguishable from zero. As we show in Appendix G.2, our results are not very sensitive to alternative choices of parameters.

5.3 Cost-Benefit Analysis

To assess the net efficiency effects of outsourcing legalization, we compare the annual increase in total surplus at the occupational market level with the present-value of total earning losses of incumbent workers whose firms decided to outsource and subsequently decided to leave the occupation. As shown below, the economic benefit of outsourcing legalization exceeded its harm to displaced incumbent workers within one to five years.

The welfare calculation proceeds in two steps. First, we compute the market-level change in worker, firm, and total surplus by combining the above assumed structural parameters and reduced-form estimates with first-order approximations. The change in total surplus depends on whether management cost are dissipated as pure waste or redistributed in the economy. management costs are dissipated if, for example, they arise from economies of scale or specialized capabilities at the contract firm. In this case, the change in total surplus is equal to the sum of the changes in worker and firm surpluses. Alternatively, the management cost may function as a redistributive tax that is transferred to outside parties (such as to labor lawyers or managers). A reduction in management cost would therefore harm those parties. In this case, the change in total surplus equals the change in deadweight loss. Appendix G.1 provides the derivations.⁵⁴

⁵³We also consult a large literature on the union wage effect, which estimates a 10-25 percent union wage effect (Blanchflower and Bryson 2004)

⁵⁴Non-wage benefits can also be thought of a management cost for firms that is redistributed to workers. If non-wage benefits fall as a consequence of outsourcing legalization, then the model would overestimate the increase in

As shown in Table 5, Panel A we find that firm surplus increased by 2.7 percent of the initial security guard wage bill, while worker surplus increased by 4.1 percent of the initial security guard wage bill. Both of these increases are almost entirely attributable to reduced management cost. If we assume that management costs are dissipated, then total surplus rose by 6.7 percent of the initial security guard wage bill. If instead they were redistributed, then outsourcing legalization increased total surplus by 1.6 percent of the initial security guard wage bill.⁵⁵

Second, Panel B accounts for the losses of the incumbent workers who experienced occupational layoffs and exited the occupation, since their losses are not included in the calculations above. As shown in section 4.2, direct employment fell by roughly 6.8% of initial total guard employment. Section 3 showed that firm outsourcing decisions reduced the earnings of incumbent workers by 1.24 years of their pre-outsourcing earnings, assuming that unobserved workers earn the minimum wage. Multiplying these two numbers yields a total earnings losses for incumbent workers of roughly equal to $1.24 \times 6.8\% = 8.4\%$ of the initial security guard wage bill.

Combining these numbers, we find that the benefits of outsourcing legalization are large relative to its costs. If the management cost is entirely dissipated as pure waste, then the total earnings losses is equivalent to $8.4\%/6.7\% = 1.3$ years of the annual long-run increase in total surplus from legalization. If the management cost is instead entirely redistributed, then the total earnings losses is equivalent to $8.4\%/1.6\% = 5.2$ years of the annual long-run increase in total surplus from outsourcing.

5.4 External Validity

Overall, we find that Brazil's outsourcing legalization raised the total employment of security guards in restrictive regions and had little effect on their average wages, suggesting that a reduction in the cost of outsourcing generated large efficiency gains in the labor market for security guards. Are these findings generalizable to other occupations and settings?

Since we focus on an occupation with a small outsourcing wage differential, we are likely

worker surplus.

⁵⁵Importantly, our model assumes away the existence of non-wage benefits for workers, since data on non-wage benefits is not available. Non-wage benefits can be thought of a management cost for firms that is redistributed to workers. If non-wage benefits fall as a consequence of outsourcing legalization, then the model would overestimate the increase in worker surplus.

to have found a smaller reduction in wage markup than would be true of other occupations and settings. As documented by [Guo et al. \(2023\)](#), contract-firm guards in Brazil earn only 1.3 percent less than direct hires after controlling for both observed and unobserved worker heterogeneity, while the wages of outsourced cleaners are 11 percent lower than similar direct hires. Outsourcing wage differentials estimated for low-wage occupations in high-income countries are also larger in magnitude, typically range from negative 10-25 percent ([Dube and Kaplan 2010](#); [Goldschmidt and Schmieder 2017](#)).

However, we expect the reduction in management cost from outsourcing to be similarly large in other occupations and settings, since the cost efficiencies from economies of scale in human resource management are not specific to the security guard occupation in Brazil. A firm with limited and occasional need for any specialized service outside its core competency is unlikely to have an HR department that can properly recruit, license, train, and/or monitor such workers. Economies of scale allow the intermediary firm to aggregate demand for specialized service and thereby incur lower management costs per worker.

6 Conclusion

This paper is the first to estimate the labor market effects of domestic outsourcing using a natural experiment, namely Brazil's unexpected 1993 court ruling that legalized outsourcing. To date, the relevant literature has primarily focused on the loss in wages and benefits for low-wage workers who switch from direct employment to outsourced work. Our approach instead estimates the effect of outsourcing on employment and wage levels in relevant occupational labor markets. Since for institutional reasons legalization disproportionately affected the higher-wage occupation of security guards in Brazil's South, our main specification uses both cross-occupation variation and North-South variation in pre-legalization court permissiveness. We further use a reweighing method to adjust for differential regional exposure to concomitant economic shocks such as trade liberalization.

The results shed new light on the growing phenomenon of domestic outsourcing. We find that outsourcing legalization persistently increased total employment of security guards and did not reduce their average wages in the relevant occupational markets. Furthermore, legalization caused a

substantial reallocation of security guards across jobs; the employment of younger security guards persistently increased, while the employment of older security guards persistently declined. There was also a large wave of occupational layoffs, which persistently lowered the wages of the affected incumbent security guards partly due to a loss of firm wage premia. Together, these findings reveal that a reduction in the cost of outsourcing generated large market-level efficiency and reallocation effects that were not captured by prior studies.

There are two important caveats to our findings. First, data on worker benefits are not available, so we are unable to evaluate the effects of outsourcing on this important component of worker welfare. Second, we focus on a professionalized and relatively high-paying occupation without a substantial outsourcing wage differential. Recent studies tend to find that outsourcing wage differentials are larger in low-wage occupations than in high-wage occupations ([Dube and Kaplan 2010](#); [Goldschmidt and Schmieder 2017](#); [Drenik et al. 2020](#)). We therefore expect that the effects of outsourcing on the average wages and welfare of low-wage workers to be more negative than suggested by our estimates. We also expect the employment and reallocation effects of domestic outsourcing in other empirical settings to be substantial, given the magnitudes we measure, and since the sources of efficiency gains from outsourcing are unlikely to be specific to the Brazilian setting.

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Table 1: Classification of regional labor courts: count summary of qualitative classification materials

Regional Labor Court		States under jurisdiction (1)	Classification (2)	Geographic Region (3)	Count summary of Regional Labor Court classification materials					Prevalence of security guard outsourcing across Regional Labor Court's jurisdictions			
					Total appeals (4)	Apeals where Regional Labor Court ruled the end-firm as the employer (5)	Regional Labor Court rulings on outsourcing appealed to Superior Labor Court before Súmula 331		Interviews about Regional Labor Courts' rulings on outsourcing before Súmula 331		1992 contract-firm share of guard employment (6)	1992-1999 change in contract-firm share (7)	Chow test p-value (8)
									Total Interviews (9)	Interviews where legality of outsourcing is discussed (10)			
4	Rio Grande do Sul	Restrictive	South	3	2	8	7	7	0.36	0.19	0.00		
9	Paraná	Restrictive	South	3	3	6	4	4	0.31	0.13	0.00		
12	Santa Catarina	Restrictive	South	1	0	1	1	1	0.36	0.20	0.00		
15	Campinas (São Paulo state, excl. capital)	Restrictive	Southeast	0		5	4	3	0.30	0.23	0.00		
1	Rio de Janeiro	Permissive	Southeast	1	0	0			0.45	0.12	0.32		
2	São Paulo (capital)	Permissive	Southeast	2	1	3	3	0	0.36	0.20	0.29		
3	Minas Gerais	Permissive	Southeast	0		0			0.32	0.14	0.02		
5	Bahia	Permissive	Northeast	0		0			0.41	0.22	0.09		
6	Pernambuco	Permissive	Northeast	0		1	1	0	0.41	0.06	0.74		
7	Ceará	Permissive	Northeast	1	1	0			0.42	0.07	0.04		
8	Amapá and Pará	Permissive	North	0		0			0.50	0.09	0.07		
10	Distrito Federal and Tocantins	Permissive	Central-West	0		0			0.51	0.09	0.01		
11	Amazonas and Roraima	Permissive	North	0		0			0.41	0.23	0.89		
13	Paraíba	Permissive	Northeast	0		0			0.35	0.08	0.00		
14	Acre and Rondônia	Permissive	North	0		1	1	0	0.54	-0.03	0.00		
16	Maranhão	Permissive	Northeast	0		0			0.49	0.03	0.34		
17	Espírito Santo	Permissive	Southeast	0		0			0.42	0.02	0.02		
18	Goiás	Permissive	Central-West	0		0			0.35	0.15	0.48		
19	Alagoas	Permissive	Northeast	0		0			0.39	0.10	0.29		
20	Sergipe	Permissive	Northeast	0		0			0.33	0.12	0.00		
21	Rio Grande do Norte	Permissive	Northeast	0		0			0.40	0.04	0.21		
22	Paiuí	Permissive	Northeast	0		0			0.35	-0.01	0.02		
23	Mato Grosso	Permissive	Central-West	0		0			0.36	0.09	0.09		
24	Mato Grosso do Sul	Permissive	Central-West	0		0			0.43	-0.07	0.52		

Notes: Column (5) lists the number of regional court rulings on outsourcing brought to the Supreme Labor Court between 1986 (Súmula 256 in place) and December 1993 (Súmula 331 in place). See Appendix Table A1 for a summary of each ruling. Column (7) lists the number of interviews (with regional labor court justices, jurists, lawyers, circuit court judges, and union leaders) conducted by the authors and/or by Brazilian jurist and former regional labor court justice Magda Biavaschi and legal historian Alisson Droppa, concerning Regional Courts' interpretation of the legality of outsourcing prior to Súmula 331. See Appendix Tables A.1 and A.2 for summary quotes, and Barros Biavaschi and de Andrade Baltar (2013) for the legal research documenting regional disparities across regional labor courts' rulings on outsourcing prior to Súmula 331. Columns (10)-(12) show the prevalence of security guard outsourcing in each regional labor court's jurisdiction, as measured by the baseline share of all guards that are employed by contract-firms in column (10), the 1992-1999 change in that share in column (11), and the p-value on the chow-test detecting a trend break in that share after 1993.

Table 2: Effects of occupational layoffs on incumbent workers

	Years since occupational layoff		
	Y0	Y1	Y5
Formally employed	-0.493 (0.013)	-0.159 (0.010)	-0.025 (0.010)
Formally employed in same occupation	-0.761 (0.007)	-0.399 (0.011)	-0.117 (0.010)
Formally employed in contract firm	0.002 (0.001)	0.077 (0.005)	0.041 (0.005)
Monthly wage (relative to base year)	-0.064 (0.012)	-0.136 (0.014)	-0.090 (0.019)
Log monthly wage	-0.078 (0.010)	-0.185 (0.011)	-0.112 (0.017)
Firm wage effect	-0.032 (0.005)	-0.080 (0.006)	-0.052 (0.011)
As fraction of wage losses	0.415	0.433	0.462

Notes: Entries give estimated effects of occupational layoff on the indicated outcome in Y0, Y1 and Y5 following the event. While employment outcomes are estimated on a balanced sample, wage effects are computed conditional on observation. Wage losses due to firm effects shown both as log points and as a percentage of wage losses (e.g., $-0.032/-0.78=0.415$ in Y0). Standard errors are provided in parentheses.

Table 3: Effect of outsourcing legalization on market-level outcomes

	(1)	(2)	(3)	(4)	(5)
A. Contract-firm share					
Short run effect	0.012 (0.014) [0.623]	0.043* (0.022) [0.298]	0.033** (0.012) [0.200]	0.013* (0.007) [0.626]	0.037* (0.020) [0.304]
Long run effect	0.062** (0.029) [0.106]	0.105*** (0.031) [0.157]	0.081*** (0.022) [0.068]	0.071*** (0.009) [0.083]	0.100*** (0.025) [0.165]
B. Mean age					
Short run effect	-0.767** (0.305) [0.128]	-0.684** (0.258) [0.146]	-0.706** (0.310) [0.138]	-0.815** (0.355) [0.130]	-0.680** (0.292) [0.251]
Long run effect	-1.512*** (0.460) [0.114]	-1.948*** (0.573) [0.125]	-1.675*** (0.491) [0.068]	-1.705** (0.616) [0.098]	-1.887*** (0.578) [0.161]
C. Log employment					
Short run effect	0.063* (0.036) [0.423]	0.075 (0.064) [0.363]	0.071* (0.037) [0.297]	0.064 (0.039) [0.431]	0.071 (0.056) [0.396]
Long run effect	0.085*** (0.029) [0.459]	0.144** (0.066) [0.287]	0.119** (0.049) [0.265]	0.104*** (0.035) [0.371]	0.151** (0.056) [0.269]
D. Demographic-adjusted wage					
Short run effect	0.023 (0.020) [0.497]	0.023 (0.022) [0.557]	0.023 (0.018) [0.479]	0.030 (0.018) [0.337]	0.028 (0.017) [0.401]
Long run effect	0.025* (0.014) [0.395]	0.020 (0.020) [0.570]	0.017 (0.019) [0.497]	0.047*** (0.016) [0.157]	0.039** (0.015) [0.263]
1990 mreg features X occ X yr			X	X	X
	Entropy balancing weights	Propensity score weights	Uniform weights	Entropy balancing weights	Propensity score weights
Observations	57456	57456	57456	57456	57456

Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). 1990 microregion features include log employment, unemployment rate, employment share in tradeable industries, import tariff reduction exposure, log employment of importers, and homicide rate (per 100K population). These same variable are used to compute propensity score and entropy balancing weights. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level. All specifications include microregion-occupation linear trends. Randomization inference p-values using 1000 draws are reported in brackets.

Table 4: Effects of outsourcing legalization on labor market structure

	Estimate	S.E.
Pooled DDD estimates		
Change in guard wage (dw/w_0)	2.5%	(1.4%)
Change in guard employment (dL/L_0)	8.5%	(2.9%)
Assumed parameters		
Elasticity of occupational labor supply (ε_s)	3	
Elasticity of occupational labor demand (ε_D)	-3	
Initial wage markup (μ)	1.1	
Implied change in labor market structure		
Change in transactions cost (dc/w_0)	-5.1%	(1.5%)
Change in wage markup ($d\mu$)	-0.3%	(1.0%)

Notes: The first two rows repeats estimates from Table 6 Column (1). The middle three rows show the assumed values of structural parameters. The final two rows show the implied changes in transaction cost and wage markup.

Table 5: Welfare effects of outsourcing legalization

A. Long-run per-annum welfare change in security guard occupation

	% of initial guard wagebill	
Firm surplus	2.7%	(1.0%)
Due to reduced transactions cost	2.4%	(0.7%)
Due to reduced markup	0.3%	(0.9%)
Worker surplus	4.1%	(1.5%)
Due to reduced transactions cost	4.2%	(1.3%)
Due to reduced markup	-0.1%	(0.4%)
Total surplus		
Assume transactions cost is dissipated	6.7%	(1.9%)
Assume transactions cost is redistributed	1.6%	(0.6%)

B. PDV of losses of incumbent guards due to occupational layoffs

	Years of earnings per laid-off worker	% of initial guard wagebill
Assume no earnings for unobserved workers	-1.40	-9.5%
Assume unobserved earn half min wage	-1.32	-9.0%
Assume unobserved earn min wage	-1.24	-8.4%
Use wage estimates from observed workers	-1.06	-7.2%

Notes: Panel A reports the changes in firm, worker, and total surplus in the security guard occupation due to outsourcing legalization, as a percentage of the initial wagebill, with standard errors in parentheses. The left column of Panel B reports estimated present-discounted values (PDVs) of per-worker earnings losses of incumbent security guards who experienced occupational layoffs, using a real interest rate of 5 percent, and summing the discounted losses over a 20-year period starting with the year of the occupational layoff, as a multiple of initial annual earnings. The four rows use alternative assumptions about earnings if the worker is unobserved. The right column reports the per-worker losses multiplied by the estimated fraction of incumbent workers that were laid off due to legalization.

Online Appendices

A Classifying Regional Labor Courts

In this section, we describe our efforts to construct a measure of pre-legalization court permissiveness and the rationales for our eventual classification.

We discovered that Brazil's regional courts differed in their permissiveness to outsourcing prior to *Súmula* 331 during a field trip in September 2019. During this trip, we conducted interviews with managers of security service firms, managers of businesses that either employed or outsourced security services, numerous security guards, labor lawyers, and staff of a security guard union in Recife. In one interview, we asked the CEO of a family-run security service firm incorporated in the 1970s how the legalization of outsourcing by *Súmula* 331 in 1993 affected her firm. To our surprise, she insistently responded that outsourcing had never been considered illegal. This response contradicted various legal articles that suggest outsourcing had been declared illegal by *Súmula* 256 in 1985 (da Cruz 2009; Biavaschi and Droppa 2011; Cooney et al. 2015). Puzzled, we consulted several labor lawyers, who informed us that local courts in Brazil's South, which had historically been friendlier to labor, likely enforced the ban on outsourcing much more vigorously than courts in the rest of Brazil.

This finding motivated us to seek legal records in order to construct a finer and more comprehensive measure of local court permissiveness towards outsourcing. We submitted formal requisitions to all 24 regional labor courts asking if: (1) lawsuits from 1985-1993 were available, (2) it would be possible for us to have a list of all lawsuits concerning outsourcing, and (3) they still had the cases listed as precedents for *Súmula* 256 and 331. We received answers in the negative for almost all local courts. Most no longer kept cases before 1993. Given the obstacles in obtaining individual rulings within each regional labor court, we gathered available primary and secondary sources to glean as much information on the stances of regional courts as possible.

First, we were able to retrieve and review all regional labor court precedent rulings that were appealed to the Superior Labor Court between 1986 (when *Súmula* 256 was in place) and 1993 (when *Súmula* 331 took place), as these were centrally stored at the Superior Labor Court's archives. Appendix Table A.3 summarizes the key decisions in each ruling. It shows that Southern regional

labor courts tended to find a direct employment link with the end-firm, meaning that it did not recognize the legality of the outsourcing arrangement. In contrast, Column (7) in Appendix Table [A.3](#) shows that the Superior Labor Court tended to reverse these regional courts' decisions, finding the direct employment link with the contract-firm instead.

Finally, we relied heavily on research performed by Magda Biavaschi and Alisson Droppa, two Brazilian legal historians who interviewed prominent judges and lawyers regarding the history surrounding Súmula 331, as well as a set of 28 interview transcripts that they generously provided. We also studied a set of publicly available legal cases cited by Súmula 331. Appendix Tables [A.1](#) and [A.2](#) display all quotes from these interviews concerning Courts' interpretation on the legality of outsourcing.

Table A.1: Quotes from interviewees who worked prior to Súmula 331's issuance at regional labor courts classified as Restrictive

Interviewee's position at the time (1)	Regional Labor Court (2)	Original quote (3)	English translation (4)	Interpretation (5)	Interview date (6)	Source (7)
Regional Labor Court Justice	4	"Na época, os juizes da 4ª Região aplicavam - seguindo a linha do magistério do mestre de todos nós, João Antônio Guillembernard Pereira Leite - o entendimento da Súmula 256 do TST que levava ao reconhecimento da relação de emprego direta entre trabalhador e tomador dos serviços, seu real beneficiário. E, dessa forma, reconhecia-se a produção dos efeitos jurídicos que a fraude visava a impedir, retirando-se a máscara e responsabilizando-se diretamente a empresa tomadora dos serviços."	"At the time, judges at the 4th Regional Labor Court upheld - in line with the juridical practice of our master João Antônio Guillembernard Pereira Leite - the understanding that the Superior Court's Súmula 256 recognized a direct employment relationship between the worker and the services-contracting firm, which is the actual beneficiary [of the employment relationship]. And, in this way, we accepted as valid the legal consequences that the fraud[lent] [outsourcing relationship] aimed to avoid, taking off its mask and ruling the services-contracting firm to be directly responsible [for such legal consequences]."	Restrictive	Feb 2008	2
Prosecutor for the District Attorney's Labor Office	4	"E o entendimento era o stricto sensu do Enunciado 256: [a terceirização] só era permitida no serviço de vigilância bancária e no trabalho temporário. Adotava-se integralmente esse entendimento."	"And the interpretation of Enunciado 256 was stricto sensu: [outsourcing] was only allowed in the case of security services for banks and for temporary work. That interpretation was wholeheartedly adopted."	Restrictive	Jul 2008	2
Regional Labor Court Justice	4	"... naquele momento tínhamos o Enunciado 256 do TST que só excluía aquele trabalho temporário e, depois, os vigilantes [bancários]."	"... at that time we had Enunciado 256 from the Superior Labor Court which only made exceptions for temporary work and, afterwards, for [banking] security."	Restrictive	Jul 2008	2
Regional Labor Court Justice	4	"Os vigilantes do quadro estavam sendo substituídos por vigilantes contratados via agora essas empresas... Nós entendíamos que aqui a legislação ressaltada pela 256 não se aplicava... Então eu conhecia a natureza do vínculo de emprego diretamente com os bancos. Muitas dessas minhas decisões foram confirmadas pelo Tribunal e depois no Tribunal Superior do Trabalho, que era quem editava a súmulas. Se foram reformadas, eu não sei porque não acompanhava... nós não nos preocupávamos muito em acompanhar o andamento das nossas decisões, mas não eu não julgava sozinha."	"Security guards were being replaced by guards contracted now via these firms... Our understanding was that the exceptions made under 256 were not applicable here... so I recognized the employment link directly with banks. Many of my decisions were upheld by the Regional Labor Court and then by the Superior Labor Court, which edited súmulas. If they were revised, I do not know because I did not follow... we did not concern ourselves with what happened after our decisions, but no I did not rule alone."	Restrictive	Apr 2020	1
Labor judge	4	"Nas minhas decisões, eu não me apego muito à teoria, à doutrina... Gosto de analisar o caso concreto. E naquele processo [de 1991], ao analisar a forma pela qual havia sido feita a terceirização, (...) o que me levou a entender que o que estava sendo praticado (...) não era correto (...) é o fato de que não poderia admitir que um empregado que estava integrado no corpo da empresa, galgando uma carreira, com esperança de subir na vida, fosse, de repente, excluído daquele processo. Uma empresa deve crescer, mas é obrigatório que leve seus empregados a crescer junto com ela. Não aceito outra forma de empresariado. (...) Colocava-me na pele de um empregado, por exemplo, na pele do chefe do departamento de pessoal. Que havia, enfim... Era um excelente empregado, merecia estar no quadro de empregados, com todas as vantagens decorrentes, sendo um bom empregado."	"In my decisions, I don't cling much to theory, to doctrine... I like to analyze each specific case. And that [1991] case, in analyzing the way in which outsourcing had been done, (...) what made me understand that what was actually being practiced (...) was not right (...) is the fact that I could not accept that an employee who had been part of the staff, who was building a career, with hopes to ascend in life, could, out of a sudden, be excluded from that process. A company needs to grow, but it is compulsory that it allows it brings its employees to grow with it. I cannot accept any other form of business. (...) I put myself in the employee's shoes, for example, (...) in the shoes of the human resources department's head. That had, anyway... He was an excellent employee, he deserved to be in the employee roster, with all its advantages, being a good employee."	Restrictive	May 2008	2
		"Então, não posso dizer que no meu íntimo seja favorável à terceirização. Não sou. A empresa deve ser uma grande família em que todos evoluam juntos. Todos."	"So, I cannot say that deep inside I am favorable to outsourcing. I am not. The firm must be a great family in which all grow together. All."			

Notes: Source 1 in Column (5) are interviews conducted by authors, whereas Source 2 are transcripts from interviews conducted by (now retired) Regional Labor Court Justice Magda Biavaschi and legal historian Alisson Droppa.

Table A.1: Quotes from interviewees who worked prior to Súmula 331's issuance at regional labor courts classified as Restrictive (Cont.)

Interviewee's position at the time (1)	Regional Labor Court (2)	Original quote (3)	English translation (4)	Interpretation (5)	Interview date (6)	Source (7)
Journalist and lawyer. Representative for Worker Syndicates at RS court (1985-1991), Representative of Worker Syndicates at Superior court (1993 onwards)	4	"Mas penso que no Rio Grande do Sul (e aqui não tem bairrismo ou gauchismo) temos uma visão mais esclarecida sobre a questão. Até sobre o papel da Justiça do Trabalho. Esta existe justamente para assegurar aos trabalhadores os direitos previstos na CLT, para que a lei seja cumprida. Se querem modificar a decisão da Justiça do Trabalho, mudem-se as leis, no Congresso Nacional, democraticamente. Mas o que não pode acontecer é que determinadas interpretações sejam complacentes." "Pessoalmente, como advogado e como pessoa que conhece a Justiça do Trabalho, como eu conheci, que conhece as relações de trabalho, não vejo como alguém pode se beneficiar com a locação de mão-de-obra, com a terceirização. Algum passe mágico nessa contratação acontece. Não posso compreender que uma empresa que deixa de contratar telefonistas para contratá-las por uma terceira, locadora de mão-de-obra, pague para essa locadora X e ela pague o seu empregado. O que ela vai pagar ao empregado seu? Qual o lucro? Por evidente, há lucro nessa intermediação. Mas quem ganha? Quem perde? Alguém sai lesado. O trabalhador, possivelmente. (...) É uma matemática que não fecha. É a minha conclusão. Por isso, não consigo entender, ainda, a razão de ser da terceirização."	"But I think that in Rio Grande do Sul (and here I mean no state chauvinism) we have a much clearer understanding of this topic. Even of the role of Labor Courts. The courts exist precisely to assure workers of their rights according to labor laws, so that the law be followed. If they want to change the Labor Courts' decision, then they must change the laws, in Congress, democratically. But what cannot happen is that certain interpretations be complacent." "Personally, as a labor lawyer and as someone who understands the Labor Courts as I do, that knows labor relationships, I don't see how someone can benefit from the contracting of labor, from outsourcing. Some magical step in this form of contracting must happen. I cannot understand how one firm that stops to directly hire phone operators to outsourcing them from an outsourcing firm instead, can pay this outsourcing firm X and then this firm pays its employee. What is the outsourcing firm going to pay its employee? What is the profit? Evidently, there is profit in this intermediation. But who wins? Who loses? Someone gets hurt. The worker, possibly. (...) This is math that doesn't make sense. This is my conclusion. For that reason, I cannot understand, still, outsourcing's <i>raison-d'être</i> ."	Restrictive	Jul 2008	2
Jerônimo Leiria, lawyer for large end-firm in Rio Grande do Sul; Creator of word "terceirização" to denote outsourcing, with the goal of avoiding explicit violations of Súmula 256	4	"E como havia o entendimento da Súmula 256 do TST, que proibia a contratação de serviços, era necessário que houvesse uma nomenclatura para essas atividades contratadas que não recebesse o título de prestação de serviços. E, ainda, que não tivesse uma tradução em qualquer outra língua. Era necessário achar uma palavra oca, que não tivesse significado nenhum... Aí eu criei umas 40 palavras: [dentre elas a] terceirização (a partir da idéia de que se contrato uma empresa, vêm os empregados de outra empresa, eles são alheios, terceiros)... Então se procedeu a uma votação... Daí a palavra mais simpática e mais "nada a ver" foi terceirização. "O que é que vocês estão fazendo?", perguntariam. E responderíamos: "Estamos fazendo terceirização". Como a fábula roupa nova do rei (...) Como era uma palavra nova, que não estava registrada em lugar nenhum, eu media os centímetros quadrados quando a mesma era publicada, pois tinha sido inventada por nós. Tenho o registro de que ela [a palavra] foi publicada pela primeira vez em 23 de janeiro de 1991, pela revista Exame." "Pergunta: Mas havia resistências internamente a Justiça do Trabalho, não? Resposta: Sim. Pergunta: Eram importantes, eram significativas essas resistências na época? Resposta: Sim, era a totalidade."	"Because there was an understanding from Súmula 256, which forbade the contracting of services, it was necessary for that to be a nomenclature for contracted activities that did not use that [exact] term. And, still, it had to be a term that did not have a translation from any other language. It was necessary to find a hollow word, devoid of meaning... So I created 40 words: [among which was <i>terceirização</i> (starting from the idea that if I contract with a company, the employees from that company are the ones who come, they are third-parties)... Then we voted... and the more sympathetic word and the one that had 'nothing to do with anything' was <i>terceirização</i> [, which can be translated as outsourcing]. They would ask: 'What are you guys doing?', and we would answer 'We are outsourcing'. It is like the fable of the Emperor's New Clothes (...) Because it was a new word, that was not registered anywhere, I was able to track whenever it was published, as the word had been created by us. I have records that show that the first time it [the word] was published was on January 23, 1991, by the Exame magazine." "Question: But was there important internal resistance from the Labor Courts? Answer: Yes. Question: Were they important, were this resistance significant at the time? Answer: Yes, they were all there was."	Restrictive	Sep 2008	2
Regional Labor Court Justice	9	"A Terceirização é um processo que veio para ficar, em que a classe trabalhadora se subdividiu e se fracionou, dificultando a ação sindical... buscando uma acomodação com o movimento do capital que continua avançando em seu sistema de exploração... Pela análise daquele processo, cuja cópia digital vocês me enviaram antes da entrevista, percebi que a Juíza de primeiro grau... concluiu pela ilegalidade da Terceirização... No Tribunal, mantínhamos a ilegalidade e [reconhecíamos] o vínculo de emprego."	"Outsourcing is a process that is here to stay, in which the working class got subdivided and fractioned, making it harder for unions to operate... searching for its place with the capital movement that keeps advancing in its exploitation system... According to [my] analysis of that case, whose three digital copies you sent me before this interview, I noticed that the district judge... ruled that outsourcing was illegal. At the Regional Court, we would uphold this illegality and [recognized] the employment link with the end employer."	Restrictive	May 2011	2

Notes: Source 1 in Column (5) are interviews conducted by authors, whereas Source 2 are transcripts from interviews conducted by (now retired) Regional Labor Court Justice Magda Biavaschi and legal historian Alisson Droppa.

Table A.1: Quotes from interviewees who worked prior to Súmula 331's issuance at regional labor courts classified as Restrictive (Cont.)

Interviewee's position at the time (1)	Regional Labor Court (2)	Original quote (3)	English translation (4)	Interpretation (5)	Interview date (6)	Source (7)
Labor judge	9	"Então a terceirização, a meu ver, não deixa de ser uma precarização fruto dessa modernização onde se abrem as portas para um novo formato da prestação de serviço. (...) [E]u diria que 99% das ações questionavam sim a terceirização e buscavam vínculo com a [tomadora de serviços]... bom, não preciso nem te dizer que todas as sentenças foram no sentido de reconhecer o vínculo e a responsabilização ali eu acho que dei solidariedade em todos, devido ao ato ilícito, a fraude, eu 'canetiei' pesado, as sentenças foram confirmadas pelo Tribunal, não sei se chegou ao TST, mas eu lembro que não teve nenhuma dúvida"	"Outsourcing, in my view, is nothing but a worsening of working conditions that is a product of this modernization where doors are open to a new way of services contracting (...) [I] would say that 99% of cases did question outsourcing and wanted a direct employment link with [the end-firm]... well, I don't even need to say that all of our rulings were to recognize the direct employment link and find the end-employer jointly liable ['responsabilidade solidária'], I think I found joint liability on all cases, due to the illicit nature, the fraud, I 'ruled' heavily, the rulings were upheld by the Regional Court, not sure if they were brought to the Superior Court, but I remember we had no doubts about it."	Restrictive	Nov 2011	2
Labor lawyer	9	"Nos idos de 1979, 1980, assessorava a categoria dos vigias e vigilantes que, à época, não tinha legislação específica... Nessa época, os vigilantes trabalhavam nas portas dos bancos como vigilantes e exerciam diversas funções. Na verdade, eles eram porteiros: davam informações, ajudavam a abrir conta bancária, fichários, arquivos. Então, comeci a ajuizar reclamações... invocando que quem exercia serviços de portaria [em bancos] era bancário... Em decorrência desse trabalho, as serventes que trabalhavam em bancos começaram a me procurar. Comecei, assim, a ajuizar reclamações contra os bancos advogando a tese de que, na realidade, essas serventes eram bancárias e não "locadas". Sendo a locação de mão de obra ilegal, essas ações começaram a ser vitoriosas."	"Around 1979, 1980, I assisted security guards, for which, at the time, there was no specific legislation... At that time, security guards worked in front of banks as security guards and took on a variety of tasks. In truth, they were doormen: they gave out information, helped customers open accounts, filing, archival. So, I began filing lawsuits... arguing that who exercised doorman services [at banks] was a bank employee... Because of this work, servers who worked in banks started seeking me out. I started, then, filing lawsuits against banks arguing that, in reality, these servers were bank employees and not "outsourced". Given that outsourcing was illegal, I started winning these lawsuits."	Restrictive	Dec 2012	2
Laywer and Congressman. Helped found Workers Party with Lula.	9	" <u>Pergunta:</u> Então, vimos que nas sentenças da Vara, da Junta, eram nesse sentido. Reconheciam o vínculo direto com [uma grande empresa do Paraná]. O Tribunal, em regra, a mantinha. Mas [essa empresa] recorria para o TST, não mais questionando sua condição de empregadora, mas o mérito. [Por quê?] <u>Resposta:</u> Não adiantava, porque ela ia perder."	" <u>Question:</u> So, we saw that the District Court rulings were in line with this. They would recognize the direct link with [a large firm in Paraná]. The Regional Court, in general, upheld that decision. But [the firm] would appeal to the Superior Court, no longer questioning that it was the direct employer, but only [questioning] the alleged damages. [Why?] <u>Answer:</u> Because it was to no avail, the firm knew it would lose."	Restrictive	May 2011	2
Layer of large end-firm in Paraná and Santa Catarina	12	"[A empresa] passou nesse tempo por processos de terceirização, nessa década de 1980 e início de 2000, mas verificasse o seguinte as terceirizações que foram para baratear não deram certo, as terceirizações que foram para adquirir tecnologia, essa deram certo e estão ai até hoje... [T]emos [essa discussão sobre terceirização] em Santa Catarina... porque [lá houveram] várias terceirizações anuladas, é um problema isso."	"[The firm] went over a process of outsourcing during this time, between the 1980s and early 2000, but we found out the following: the outsourcing decisions made to cut costs didn't work out, the outsourcing made to acquire technology did and are here through today... [W]e have [this discussion about outsourcing] in Santa Catarina... because [there, there were] many nullled outsourcing decisions, this is a problem."	Restrictive	Aug 2011	2
President of worker syndicate	15	"Depois da regulamentação... [p]ode-se terceirizar em algumas atividades. Por exemplo, a vigilância que, hoje, é legal; não era. A vigilância, a alimentação, a limpeza, todas atividades da nossa categoria. (...) Terceirização, eu acho, é uma fraude nas relações de trabalho. Ela maquia a relação. As empresas dela fazem uso para reduzir custo e, também, para se eximirem da responsabilidade trabalhista frente àqueles funcionários. (...) Em todas as convenções reivindicamos o fim da terceirização..."	"After legalization...we could outsource in some activities. For example, security services which, today, is legal, was not. Security services, food services, cleaning, all activities our our syndicate. (...) Outsourcing, I think, is a fraud to work relationships. It masks the relationship. Its firms make use of it to reduce costs and, also, to bypass labor laws for those workers. (...) In all conventions we pushed for the end of outsourcing..."	Restrictive	Apr 2009	2
Prosecutor for the state of São Paulo from 1990 to 1993	15	"O 256 era perfeito. Havia dois tipos de trabalho que poderiam ser terceirizado: vigilância [bancária] e de caráter temporário, em casos excepcionais, tudo documentado, fundamentado, perfeito. Quanto veio a Súmula 331 ela abriu "a porteira" para o empregador usar um instrumento de administração e de excelência, como se fosse uma ferramenta de precarização[.]"	"256 was perfect. There were two types of jobs that could be outsourced: [banking] security and temporary work, in exceptional cases, everything documented, argued, perfect. When Súmula 331 arrived it opened the "flood gates" for the employer to use an exceptional administrative provision as a tool for worsening labor conditions[.]"	Restrictive	Jun 2009	2

Notes: Source 1 in Column (5) are interviews conducted by authors, whereas Source 2 are transcripts from interviews conducted by (now retired) Regional Labor Court Justice Magda Biavaschi and legal historian Alisson Droppa.

Table A.1: Quotes from interviewees who worked prior to Súmula 331's issuance at regional labor courts classified as Restrictive (Cont.)

Interviewee's position at the time (1)	Regional Labor Court (2)	Original quote (3)	English translation (4)	Interpretation (5)	Interview date (6)	Source (7)
Labor judge	15	"Na carreira de magistrado deparei-me com... pouquíssimos processos questionando a terceirização, buscando o reconhecimento do vínculo com a tomadora do serviço. Isso é muito raro. Nem me recordava, aliás, do processo em que atuei, cujas cópias vocês me encaminharam previamente e, muito menos, da decisão que então prolatei. Não me recordava porque são muito esporádicos."	"In my career as a judge I encountered very few lawsuits questioning outsourcing, asking for recognition of the employment link with the end firm. That is very rare. In fact, I did not even remember the lawsuit I ruled on, whose copies you previously forwarded me, let alone the decision I ruled on it then. I did not remember because they are very few and far-between."	Unclear	Apr 2009	2
Clerk (1987-1991), lawyer (1991-1995), judge (1995 onwards)	15	"Por princípio, penso que a terceirização é negativa, porque descategoriza e precariza os trabalhadores, além de prejudicar a própria dimensão da responsabilidade patrimonial pelos créditos trabalhistas."	"In principle, I think that outsourcing is negative, because it makes worker groups more disconnected and fragile, in addition to harming the very dimension of employer responsibility for labor claims."	Restrictive	Jul 2007	2
		"Por aqui na 15ª, a impressão que eu tenho é que, com a mudança da Súmula (da 256 para 331), as pessoas passaram a assimilar a ideia de que a terceirização era sempre lícita, sem atentar para as próprias ressalvas feitas pelo TST."	"Here at the 15th, the impression I have is that, once the Súmula changed (from 256 to 331), people started to accept the idea that outsourcing was always licit, even disregarding the exceptions made by the Superior Labor Court."			
		"[E]m 1985, o Estado de São Paulo contava com 60.476 trabalhadores terceirizados, número que ampliado para 129.951 em 1993 e saltou para 179.836 em 1994... Esse aumento foi intensificado a partir de 1994, quando da implantação do Plano Real mas também época em que houve a modificação do entendimento predominante no TST a respeito do tema. (...) É claro que esse não foi o único fator que levou a esse fenômeno amplificador da terceirização, mas não se pode subestimar a capacidade que as decisões judiciais possuem de influenciar as diretrizes de atuação empresarial."	"[I]n 1985, the State of São Paulo had 60.476 outsourcing workers, a number that expanded to 129.951 in 1993 and jumped to 179.836 in 1994... This increase was intensified starting in 1994, at time of the Real Plan, but also the time when there was a change in the Superior Court's understanding of the topic. (...) Of course this was not the only factor that led to the expansion of outsourcing, but one cannot underestimate the ability that legal decisions have to influence how firms behave."			

Notes: Source 1 in Column (5) are interviews conducted by authors, whereas Source 2 are transcripts from interviews conducted by (now retired) Regional Labor Court Justice Magda Biavaschi and legal historian Alisson Droppa.

Table A.2: Quotes from interviewees who worked prior to Súmula 331's issuance at regional labor courts classified as Permissive

Interviewee's position at the time (1)	Regional Labor Court (2)	Original quote (3)	English translation (4)	Interpretation (5)	Interview date (6)	Source (7)
Regional Labor Court Justice	6	"The parameter we would use (to judge outsourcing cases) was [that] a bank could have as an employee, an armed guard, but we would consider in terms of outsourcing it to legal or not if the company, the intermediate company was a company specialized in armed security. So he could be outsourcing to a bank or to any other sort of company and it would be legal."	N/A	Permissive	May 2020	1
Public Prosecutor's Labor Office	14	"Para mim, o problema não está na terceirização em si, como disse antes, há hipótese em que ela é admissível e, até certo ponto, necessária em momentos muito específicos da atividade empresarial. O problema está na terceirização da atividade fim, o que acontece com muita frequência."	"To me, the problem is not with outsourcing per se, as I said before, there are cases in which it is admissible and, up to a certain point, needed at very specific moments of firms' [lifecycles]. The problem is with outsourcing of end-activities, which happens frequently."	Permissive	Mar 2011	2
Labor judge	2	"Na verdade, isso começou em 1974 com a lei do trabalho temporário, alastrando-se, depois, para a vigilância [bancária], o que possibilitou a 'Terceirização' no trabalho bancário dos vigilantes. A ideia era exatamente essa e ela não se vinculou apenas aos bancos. Acabou se estendendo para outras atividades [econômicas]."	"Actually, this started in 1974 with the temporary law work, spreading, afterwards, to [banking] security, which allowed 'Outsourcing' of security services for banks. The idea was exactly this and it did not restrict itself just for banks. It ended up spreading to other [economic] activities."	Permissive	Sep 2009	2
Regional Labor Court Justice	2	"[A] terceirização é importante para maior eficiência da empresa, para maior produtividade da empresa, para baratear custo... É preciso haver uma justificativa para a terceirização: a busca da maior produtividade, da maior eficiência e não do menor custo da mão de obra... O gaúcho tem uma postura mais contenciosa mesmo em relação à vida e as coisas... O paulista tem talvez uma visão mais econômica, mais pragmática..."	"Outsourcing is important for firm efficiency, for more productivity, for cutting costs... There must be a justification for the outsourcing: a search for productivity, for more efficiency and not cutting labor costs [specifically]... the Southerner has a more contentious view even with regards to other things in life... The <i>paulista</i> perhaps has a more economical, more pragmatic view..."	Permissive	May 2009	2
Union leader	2	"Quando o Sindicato questionava, a empresa dizia que precisava de pessoas especializadas em determinadas atividades... O mesmo diziam para a vigilância, treinar guardas, ter problemas com porte de arma, então seria ideal que tivesse uma empresa de segurança... Houve sim questionamentos na Justiça do Trabalho em alguns momentos, mas as sucessivas derrotas judiciais serviram para desanimar os Sindicatos, uma vez que nós não conseguimos êxito nas ações que sindicatos ingressavam e os patrões faziam questão de propagandear isso – 'está vendendo! A Justiça do Trabalho considera legal a terceirização'."	"When the Union questioned, the firm said it needed specialized people in certain activities... They said the same for security, train guards, face issues with gun licensing, so it would be ideal if there was a security services firm... Yes, the Labor Court questioned this at times, but the high frequency of lawsuit losses ended up wearing down the Unions, because as we could not win lawsuits the employers made sure to promulgate -- 'you see! The Labor Court considers outsourcing legal!'"	Permissive	Apr 2009	2

Notes: Source 1 in Column (5) are interviews conducted by authors, whereas Source 2 are transcripts from interviews conducted by (now retired) Regional Labor Court Justice Magda Biavaschi and legal historian Alisson Droppa.

Table A.3: Variation in dissent over legality of outsourcing across regional labor court precedents appealed to the Superior Labor Court prior to Súmula 331

Regional Precedent Number	Regional Court (1)	Year of Superior Court ruling (2)	Parties involved			Rulings: Which firm was found to have the direct employment link?	
			What type of job did the plaintiff worker do? (3)	Party that appealed Regional Court's ruling to Superior Court		Regional Court (6)	Superior Court (7)
				End employer type (5)			
Panel A: Precedents by Regional Labor Courts classified as Restrictive							
RR 35607-78.1991.5.04.5555	4	1992	Cleaning services	End employer	Federal Agency	End employer	Outsourcing Firm
RR 45956-68.1992.5.09.5555	9	1992	Security services	End employer	Federal Agency	End employer	Outsourcing Firm
RR 41486-28.1991.5.09.5555	9	1992	Cleaning services	End employer	Federal Government	End employer	Outsourcing Firm
RR 24086-98.1991.5.09.5555 ¹	9	1992	Cleaning services	Outsourcing firm	Bank	End employer	Outsourcing Firm
RR 41974-21.1991.5.04.5555	4	1993	Cleaning services	End employer	State Government	End employer	Outsourcing Firm
RR 43279-06.1992.5.04.5555	4	1993	Security services	Worker	Federal Agency	Outsourcing Firm	Outsourcing Firm
ERR 211-52.1990.5.12.5555	12	1993	Cleaning services	Worker	Bank	Outsourcing Firm	Outsourcing Firm
Panel B: Precedents by Regional Labor Courts classified as Permissive							
RR 226-34.1989.5.02.5555	2	1989	Cleaning services	Worker	Bank	Outsourcing Firm	Outsourcing Firm
RR 42286-78.1991.5.01.5555	1	1992	Cleaning services	End employer	Federal Agency	Outsourcing Firm	Outsourcing Firm
RR 44058-74.1992.5.07.5555	7	1992	Not mentioned	End employer	State-owned firm	End employer	Outsourcing Firm
RR 62835-48.1992.5.02.5555	2	1993	Not mentioned	End employer	City Government	End employer	Outsourcing Firm

Notes: [1] The outsourcing firm appealed this case to the Superior Labor Court because the regional labor court found the outsourcing firm, Orbram Organizacao E Brambilla Ltda, jointly liable for damages the worker was suing for, despite the fact that the court established a direct employment link was established with the end employer. The Superior Court found the outsourcing firm solely liable as it dissented from the regional labor court's decision on which firm had the direct employment link with the worker.

B Data Appendix

Microregion definition. We use the “microregion” definition of the Brazilian Statistical Agency (IBGE), which groups together economically integrated contiguous municipalities (counties) with similar geographic and productive characteristics (IBGE 2002), to define the boundaries of local labor markets. To ensure that we consistently define microregions over time, we combine microregions whose boundaries changed during our sample period, following Kovak (2013). This process leads to a set of 494 consistently identifiable microregions within the period 1985-2006.

Sample restrictions. Our worker sample includes all individual between the ages of 18 and 64 who were employed as of January 1 of the reference year. We omit those working in public administration and those without valid information on their industry of employment. For our market-level analysis, we restrict our sample to the large occupational groups listed in Table B.1, and only include local labor markets with at least 25 security guards and 25 cleaners in every year between 1985-2002, yielding an analysis sample of 266 local labor markets, covering 98.6 percent of all security guards. Given the high prevalence of outsourcing among cleaners, we exclude them from estimation of treatment effects for security guards, but present treatment effects for cleaners and other occupations in Appendix F.

Variable definitions. We use the establishment’s geographic location (municipality) and industry, and worker-level information including gender, age, education (nine categories), occupation, average monthly wages, and separation reasons. We measure worker wages using their average monthly wages during employed months in the reference year. Reported wages are gross and include regular salary payments, holiday bonuses, tips, performance-based bonuses, commission, and profit-sharing agreements. Worker transition rates are computed by comparing labor market statuses (e.g. formal employment, occupation, and so on) as of January 1 in adjacent years. Separation rates are calculated by examining whether an existing employment contract as of January 1 of the reference year terminates within the year.

Measuring outsourcing using industry and occupation codes We use the 1994 *Código Brasileiro de Ocupações* (CBO 94) at the two-digit level to define occupations, which is consistent with pre-

Table B.1: Included occupations

Occupation	Contract-firm share	Mean log wage	Mean age	Mean schooling	Male	National employment
Security guards	0.37	7.05	41	5	0.99	458134
Technicians	0.03	7.92	33	10	0.87	370990
Electricians and electronics workers	0.03	7.51	33	6	0.96	254057
Cashiers and tellers	0.03	7.30	29	10	0.45	459240
Machine installers and mechanics	0.02	7.26	32	6	0.99	367353
Office administration	0.05	7.22	29	10	0.56	1849524
Drivers, sailors, conductors	0.02	7.22	37	5	1.00	630666
Secretaries and typists	0.05	6.88	29	11	0.15	163004
Food and beverage processing workers	0.00	6.80	31	5	0.80	294391
Other manual or uncommon occupations	0.05	6.70	32	5	0.83	1398107
Salesmen	0.01	6.59	28	8	0.60	781809
Cooks, waiters, bartenders	0.03	6.57	35	5	0.33	359621
Cleaners (excluded)	0.30	6.57	37	4	0.42	715719
National	0.06	7.13	33	8	0.74	14447147

Note: Table lists all 2-digit CBO occupations included in our main triple-difference specification and their mean characteristics in 1992.

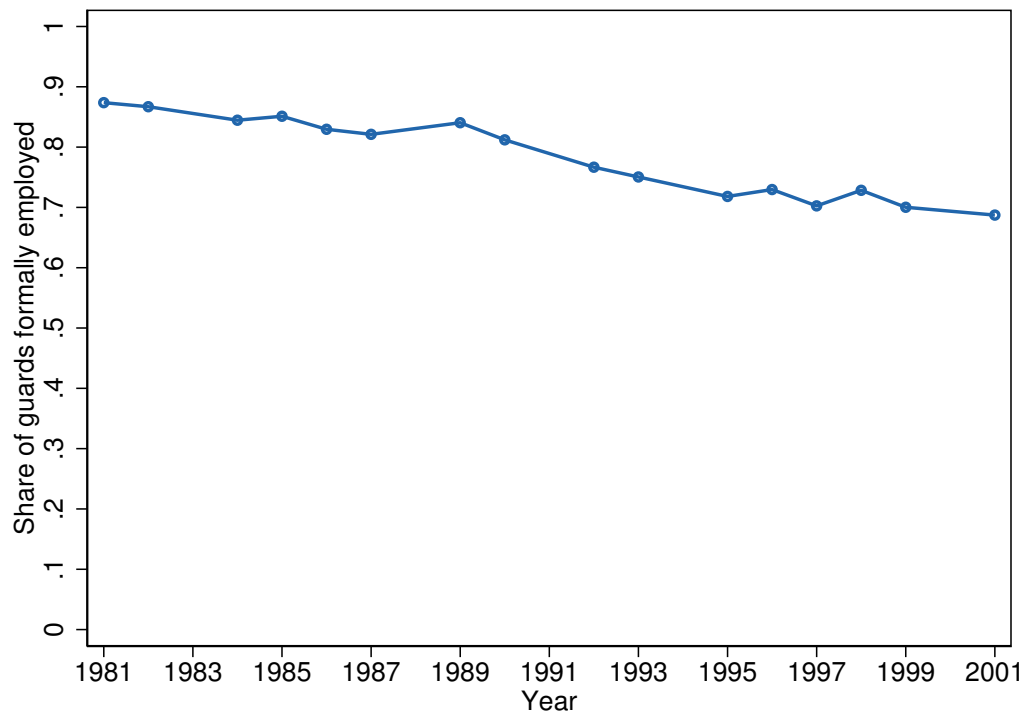
decessor (CBO) occupational codes. We identify whether an establishment in the RAIS dataset is part of an contract firm based on the establishment’s economic activity code, which follows the *Classificação Nacional de Atividades Econômicas* (CNAE) system. We identified contract firms as those with CNAE95 numbers 74608 (“Atividades de investigação, vigilância e segurança”), 74160 (“Atividades de assessoria em gestão empresarial”), 74500 (“Seleção, agenciamento e locação de mão-de-obra”), 74705 (“Atividades de limpeza em prédios e domicílios”), and 74993 (“Outras atividades de serviços prestados principalmente às empresas”), which fall under occupational class 74 “Serviços prestados principalmente às empresas.” For firms that exited prior to 1995 and therefore do not have a CNAE code, we used a concordance between “IBGESUBATIVIDADE” codes (reported prior to 1995) and CNAE codes, constructed using firms that are present in the data before and after 1995 and report the former code before, the latter after.

Crime data. We use homicide rates available from the replication files of [Dix-Carneiro et al. \(2018\)](#).

PNAD household survey. We compute the share of security guards that are formally employed using PNAD household survey.

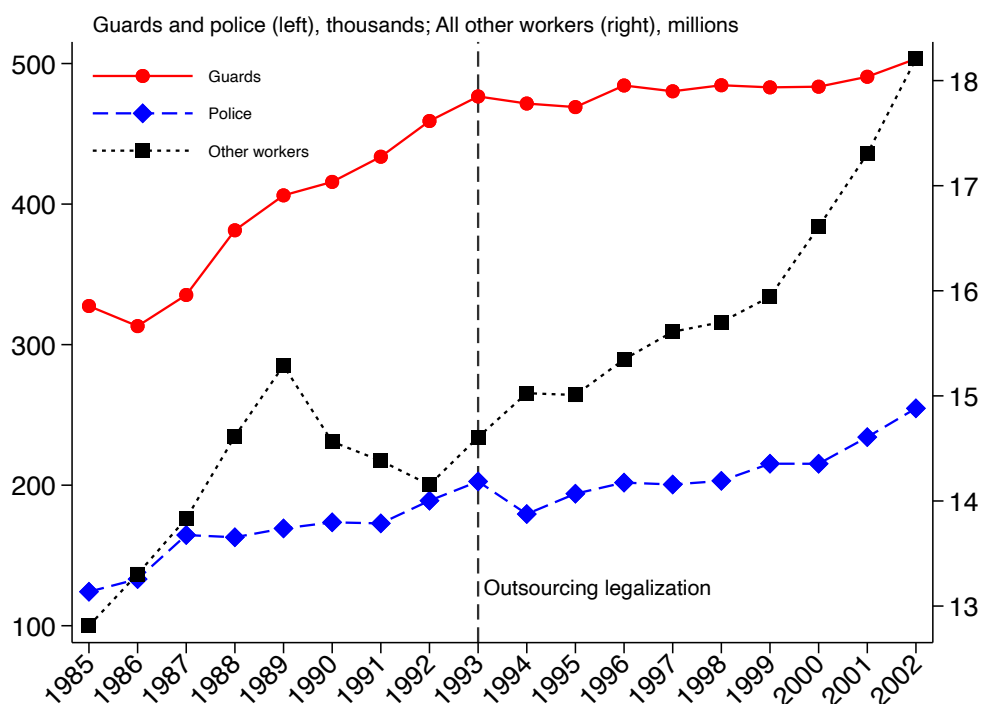
C Descriptive Statistics and Trends

Figure C.1: Share of security guards formally employed



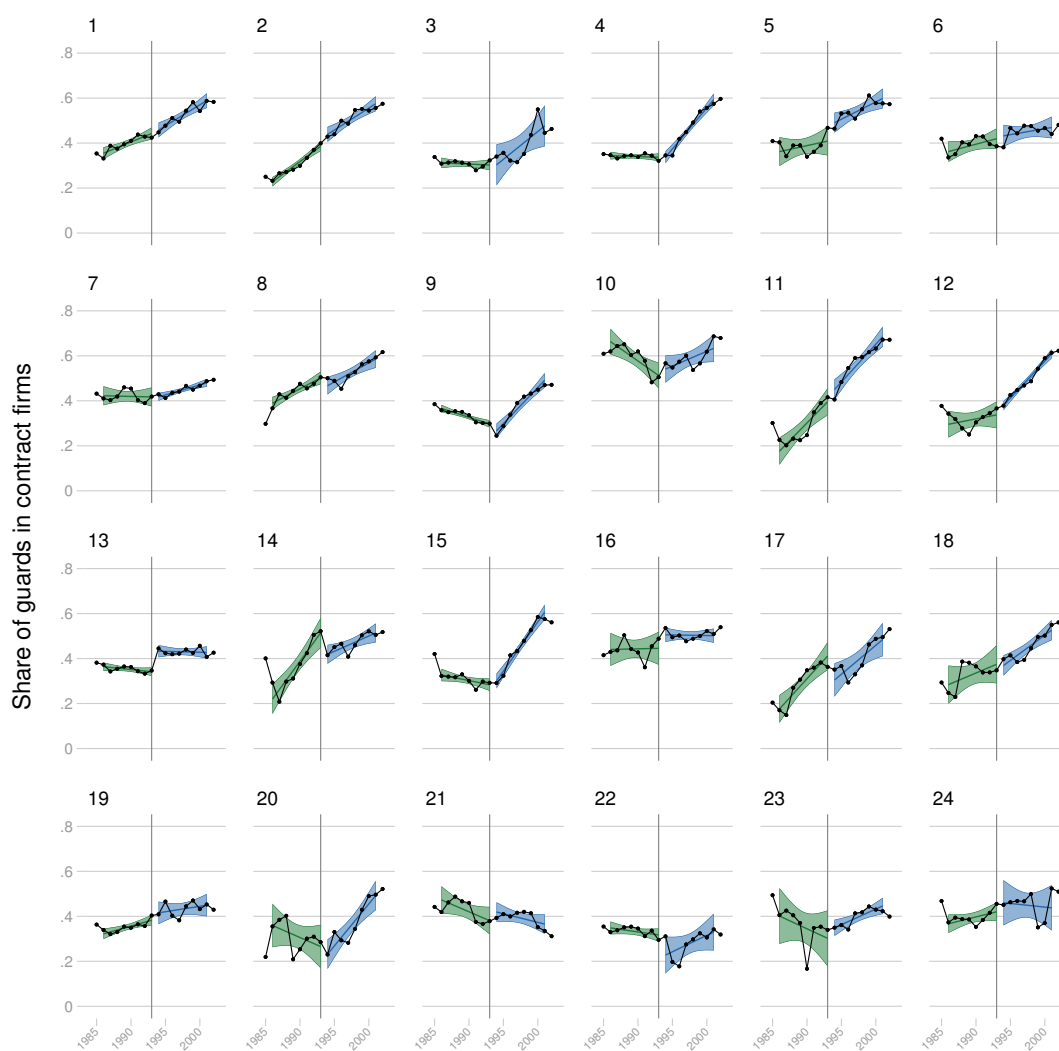
Note: This figure plots the share of guards (aged 18-65) that are formally employed based on Brazil's Pesquisa Nacional por Amostra de Domicílios (PNAD) household survey.

Figure C.2: Total formal employment of security guards, police, and other private-sector occupations



Note: This figure plots total formal employment of security guards (CBO 2-digit code 58, excluding CBO 3-digit code 583), police officers (CBO 3-digit code 583), and other formal sector occupations based on RAIS.

Figure C.3: Trends in security outsourcing, by regional labor court



Note: Figure plots the trend in outsourcing prevalence, as measured by the share of security guards in the formal sector working for contract firms, separately for each jurisdiction of the 24 regional labor courts. Courts 4, 9, 12, and 15 are classified as restrictive.

Table C.1: Predictors of outsourcing prevalence in a microregion, 1992 and 1999

Dependent variable: Microregion security guard contract-firm share in year t				
	$t = 1992$		$t = 1999$	
Log(mkt size in year t)	0.090*** (0.007)	0.090*** (0.007)	0.129*** (0.007)	0.130*** (0.007)
Restrictive region		-0.037* (0.020)		0.045** (0.021)
<i>Obs</i>	266	266	266	266
R^2	0.38	0.39	0.55	0.56

Notes: Sample is all microregions with at least 25 security guards and 25 cleaners, weighted by average microregion formal-sector employment between 1985-2006. Market size is measured by the number of private-sector security guards in the formal sector. Standard errors are clustered at the microregion level and presented in parentheses, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level.

Table C.2: Descriptive statistics of security guards by contract type

	Direct hire				Contract-firm			
	1985-1993	1994-1996	1997-2002	1985-1993	1994-1996	1997-2002	1985-1993	1994-1996
Male	0.98	0.98	0.97	0.98	0.97	0.97	0.97	0.97
Age	40	40	40	34	34	35	34	35
Years of schooling	4.9	5.4	6.2	5.1	5.9	6.8	5.1	6.8
CLT urban indeterminate contract	0.98	0.95	0.96	0.99	0.98	0.99	0.99	0.99
Tenure	2.5	2.8	2.9	1.5	1.5	1.7	1.5	1.7
New hire (Tenure<1 years)	0.46	0.43	0.41	0.52	0.55	0.48	0.52	0.48
Real monthly earning (2017 \$R)	1995	1753	1694	1481	1573	1665	1481	1573
	(1612)	(1476)	(1382)	(822)	(814)	(796)	(822)	(814)
	[1511]	[1321]	[1312]	[1285]	[1390]	[1525]	[1285]	[1390]
Contract hours		42.4	42.4		43.5	43.7		43.5
		[44]	[44]		[44]	[44]		[44]
Real wage (2017 \$R)		43.5	41.8		37.1	38.4		37.1
		(55.9)	(49.3)		(34.6)	(23.2)		(34.6)
		[31]	[31]		[32]	[35]		[32]
Has multiple jobs	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.01
Employer size	885	692	568	1024	954	1729	1024	954
	[146]	[83]	[59]	[586]	[460]	[478]	[586]	[460]
AKM firm effect	0.15	0.04	-0.02	0.12	0.11	0.10	0.12	0.11
	(0.366)	(0.365)	(0.359)	(0.202)	(0.205)	(0.206)	(0.202)	(0.205)
Number of guards at employer	67	66	54	822	781	808	822	781
	[8]	[5]	[4]	[490]	[422]	[432]	[490]	[422]
N	2220357	796814	1364634	1242514	596325	1506231	1242514	596325

Notes: Sample includes all security guards aged 18-64 between 1985 and 2002. Standard deviations are presented in parentheses; medians are in brackets.

D Firm-level Outsourcing Events: Definitions

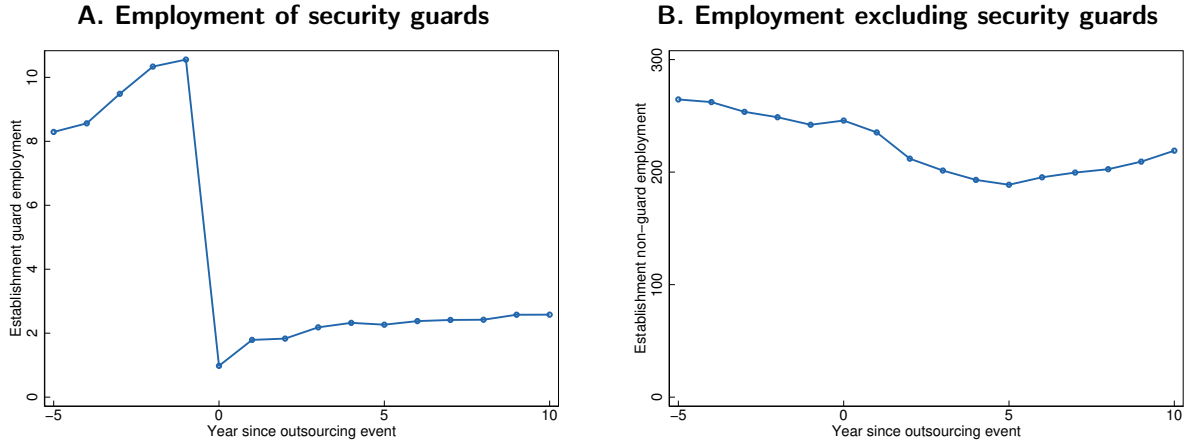
D.1 On-site and Occupational Layoff Outsourcing Events

We define an “on-site outsourcing” event as a situation where a group of 3 security guards were all employed in a non-business service establishment with at least 10 employees in one year and then in the following year were all employed in a business service establishment. To avoid misclassifying mass layoffs, we exclude establishments who non-guard employment fell by more than 10 percent. These events are called *on-site* outsourcing events, because the workers were presumably transferred to a contract firm but continued to perform the same job.

[Goldschmidt and Schmieder \(2017\)](#) use a more stringent definition for on-site outsourcing. In their definition, the predecessor establishment must have at least 50 employees in the year prior to the event, continue to exist in the following year, and not shrink by more than 50%. The flow must also represent less than 30% of employment in the predecessor in the previous year, such that outsourced workers represent only a small part of the predecessor’s business.

We say that establishment j had an “occupational layoff” in year t if: (1) establishment j had at least 10 total employees; (2) establishment j employed at least three guards in years $t - 1$ and $t - 2$; (3) the number of guards at establishment j in year t fell by at least two-thirds compared to year $t - 1$; (4) the number of guards fell to zero in year t if j employed fewer than six guards in year $t - 1$; (5) establishment j ’s non-guard employment shrinks by less than 10 percent between $t - 1$ and t ; and (6) establishment j was not a contract firm nor government entity in year $t - 1$. Note that to avoid misclassifying normal fluctuations in headcount, we require that the number of security guards must fall to zero for establishments initially with 5 or fewer guards. To avoid misclassifying mass layoffs, we also exclude establishments who non-guard employment fell by more than 10 percent. Figure [D.1](#) visualizes this definition by plotting the average number of security guards and non-security guard employees at the establishment level during the years before and after an occupational layoff.

Figure D.1: Establishment employment before and after occupational layoff



Note: Figure plots the number of security guards and non-security guard employees for the years before and after an occupational layoff.

D.2 Matching Workers Affected by Occupational Layoff to a Control Group

We define non-outsourcing establishments as those with no occupational layoffs between 1990 and 2000. For each treated worker, we take the set of workers employed by non-outsourcing establishments in the same 2-digit industry, 5-digit occupation, and regional court jurisdiction to be our potential control group. For both treated and control groups, we restrict to workers who were employed at the same establishment as a security guard for three consecutive years prior to outsourcing. We then estimate a probit regression of whether a worker is experienced an occupational layoff, controlling for wages two and three years prior, as well as tenure and AKM firm effect in the year prior to outsourcing. For each treated worker, we then choose the non-outsourced worker with the closest propensity score to the comparison worker. Table D.1 presents summary statistics for the matched worker sample.

D.3 Estimation of Present Discounted Value of Earnings Losses

To estimate the present discounted value (PDV) of earnings losses, we follow the methodology of [Davis and von Wachter \(2011\)](#). We use a real interest rate of 5 percent, and sum the discounted losses over a 20-year period starting with the year of the occupational layoff. Because we do not

Table D.1: Descriptive Statistics, Matched worker sample

Worker characteristics in year t-1	Impacted worker	Control worker
Male	0.97 (0.2)	0.98 (0.1)
Years of schooling	5.4 (2.8)	5.1 (2.8)
Age	41.6 (10.2)	42.6 (10.7)
Tenure	5.1 (4.6)	4.9 (4.5)
Average monthly wage (2017 \$R)	2363 (1359)	2301 (1419)
Establishment Size	462 (720)	468 (964)
Firm FE	0.23 (0.28)	0.21 (0.3)
Sector:		
Manufacturing	0.32	0.32
Industrial utility	0.13	0.13
Retail	0.12	0.12
Wholesale	0.04	0.04
Finance	0.00	0.00
Service	0.11	0.10
Medical	0.03	0.03
Mining	0.03	0.03
Construction	0.04	0.04
Real estate and transportation	0.13	0.14
Other	0.05	0.05
<i>N</i>	12443	12443

Notes: Sample includes all matched security guards used to estimate the effects of occupational layoffs.

observe the full 20 years of earnings after an occupational layoff, we impose a common rate of decay past the 8th year. The estimated mean PDV earnings losses for occupational layoffs is

$$PDV_{Loss} = \sum_{k=0}^8 \hat{\delta}_k \frac{1}{(1+r)^k} + \sum_{k=8}^{19} \hat{\delta}_8 \frac{(1+\hat{\lambda})^{k-8}}{(1+r)^k} \quad (6)$$

where $\hat{\delta}_k$ is the average estimated earnings loss in year k after occupational layoff, estimated using equation (1), and $\hat{\delta}_8 (1+\hat{\lambda})^{k-8}$ is an extrapolated earnings loss using the common decay rate $\hat{\lambda}$. We calculate the decay rate as the average of annualized log differences in earnings losses from years 5 to 6 to years 7 to 8 after displacement.

A complication in our setting is that we do not observe earnings for workers who are employed in the informal sector. To impute earnings for missing observations, we use a range of methods that make different assumptions about what an unobserved worker would have earned. The first method simply assumes that workers earn nothing if they unobserved in our data. The second method assumes that unobserved workers earn half the minimum wage. The third method assumes that unobserved workers earn exactly the minimum wage. The final method assumes that unobserved workers had the same earnings as observed workers, so we simply use the monthly wage estimates from the non-missing data that we reported in the previous section as the estimates for earnings losses. While the first method yields a strict upper bound on total earnings losses, the final method is likely to understate them, since earnings in the informal sector are lower on average ([Bargain and Kwenda 2014](#)).

D.4 Measuring Firm Wage Premia using AKM Decomposition

To measure firm-specific wage premia, we use the decomposition method of [Abowd et al. \(1999\)](#) (henceforth, “AKM firm effects”). Using data on all formal workers in RAIS spanning 1985-2002, we estimate:

$$\log w_{it} = \psi_{J(i,t)} + \alpha_i + \theta_t + X_{it}\beta + \varepsilon_{ijt}$$

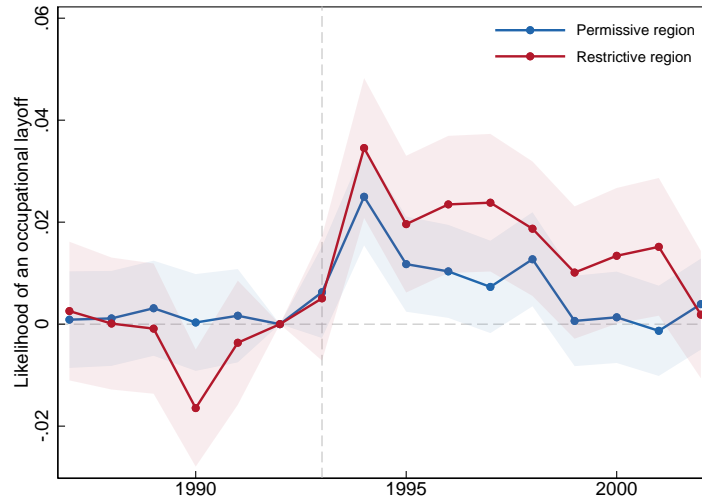
where w_{it} represents real monthly wage, α_i is a individual fixed effect (capturing the general productive characteristics of workers), $\psi_{J(i,t)}$ is a firm fixed effect (capturing the wage premia for all workers at the firm), θ_t is a year fixed effect, $X_{it}\beta$ are the effects of time-varying observable

worker characteristics (such as education and age), and ε_{ijt} is a composite error that may include idiosyncratic worker-firm match effects. The estimated firm fixed effect ($\hat{\psi}_j$) can be thought of as representing time-invariant policies of a given firm with respect to compensation.

To ensure that firm and worker fixed effects are identified, we restrict our analysis to the largest connected set of firms that are linked by workers moving between them. Identification of the AKM model also requires that workers do not move across firm in a manner that is systematically correlated with unmeasured productivity (Gibbons and Katz 1992). Alvarez et al. (2018) provide evidence that this assumption is justified in Brazilian RAIS data. A further concern when estimating the AKM model is limited mobility bias, which may generate misleading variance decompositions, as discussed by Andrews et al. (2008). However, limited mobility bias is likely to be small in our setting since we use a long panel (Lachowska et al. 2020a; Bonhomme et al. 2020).

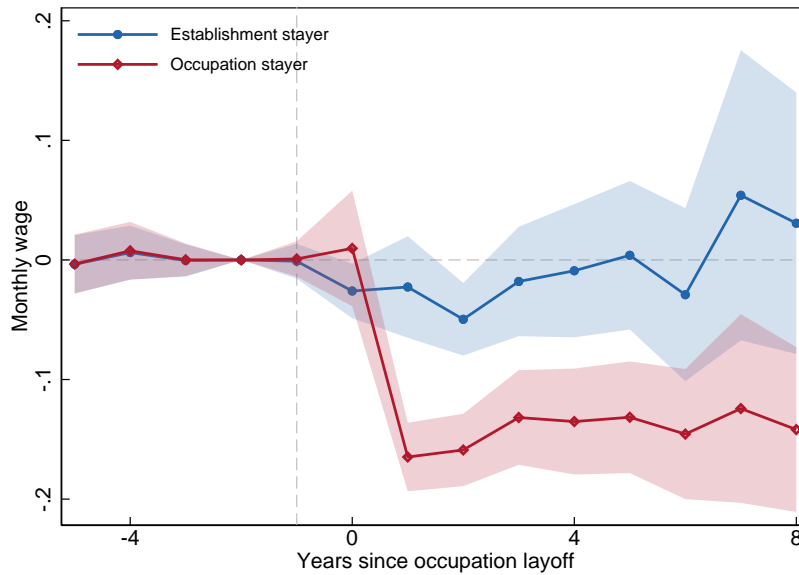
E Firm-level Outsourcing Events: Additional results

Figure E.1: Frequency of occupational layoffs by region restrictiveness



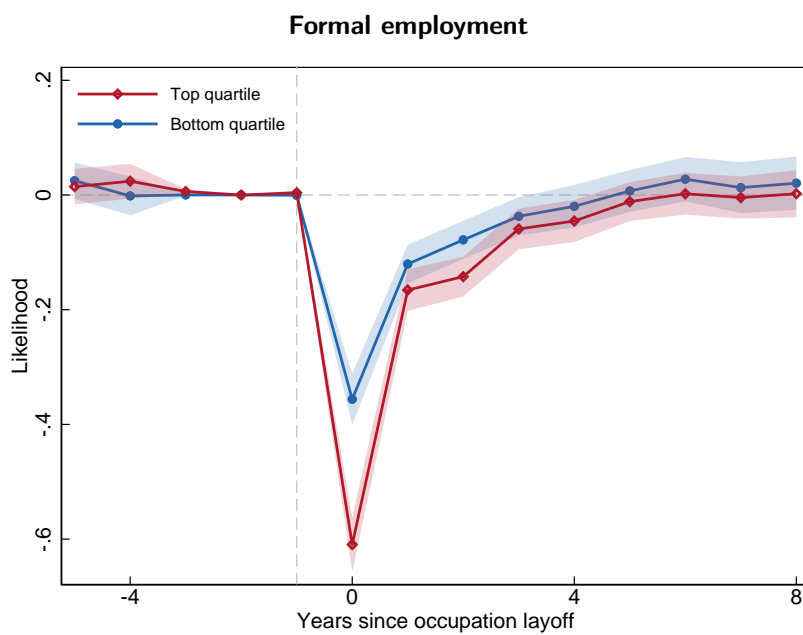
Note: This figure plots coefficients from a linear probability model with separate year fixed effects for restrictive and permissive regions. We cluster standard errors at the establishment level.

Figure E.2: Effect of occupational layoffs on establishment and occupation stayers



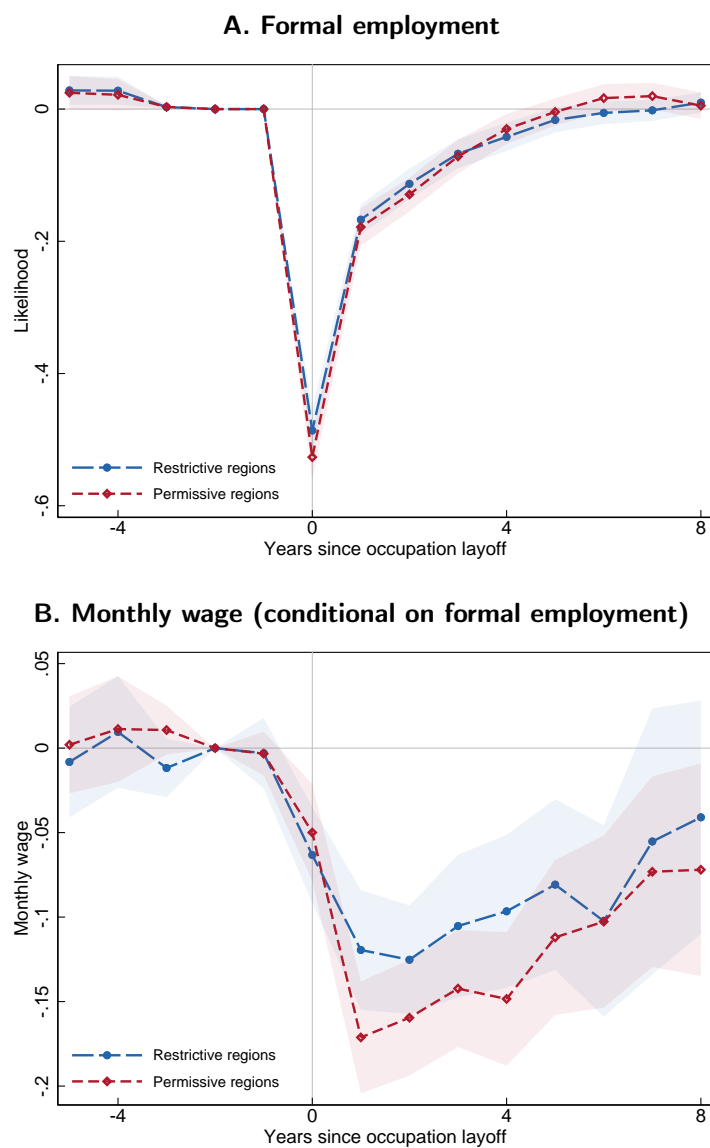
Note: Figure plots coefficient γ_t from a difference-in-differences regression measuring the impact of a firm occupational layoff on incumbent direct-hire security guards, where the control group are similar workers in establishments that did not have an occupational layoff. The outcome variable is monthly wage, as measured as a fraction of wage two years prior to the outsourcing event, and observations are included only if either (a) the worker remains at the same establishment or (b) the worker remains in the same occupation. Our sample includes all occupational layoffs, as identified by sudden drops in an establishment security guard count, between 1990 and 2000. We include controls for individual and year fixed effects, and time-varying demographics. Shaded bands indicate 95% confidence intervals, with standard errors clustered at the establishment level.

Figure E.3: Effect of occupational layoff on incumbent employment, by initial firm wage premia



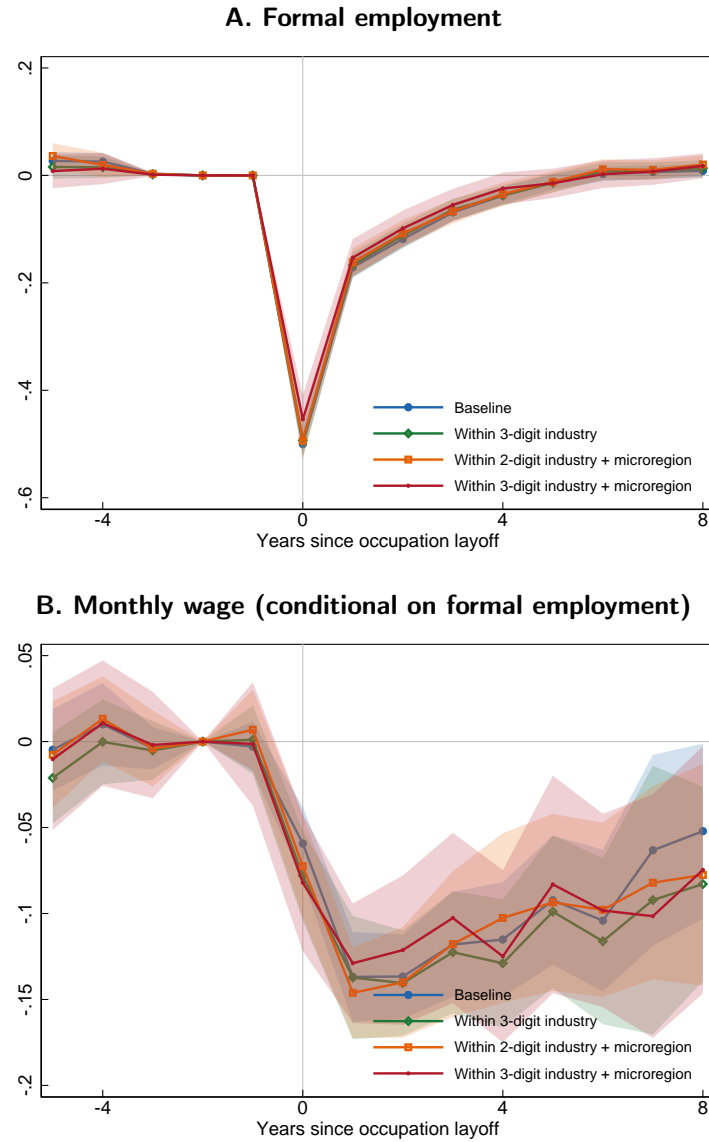
Note: Figure replicates Figure 4, Panel B using subsamples that include only workers initially in the top and bottom quartile of the AKM firm effects distribution, respectively.

Figure E.4: Effect of occupational layoff on incumbent guards, by region



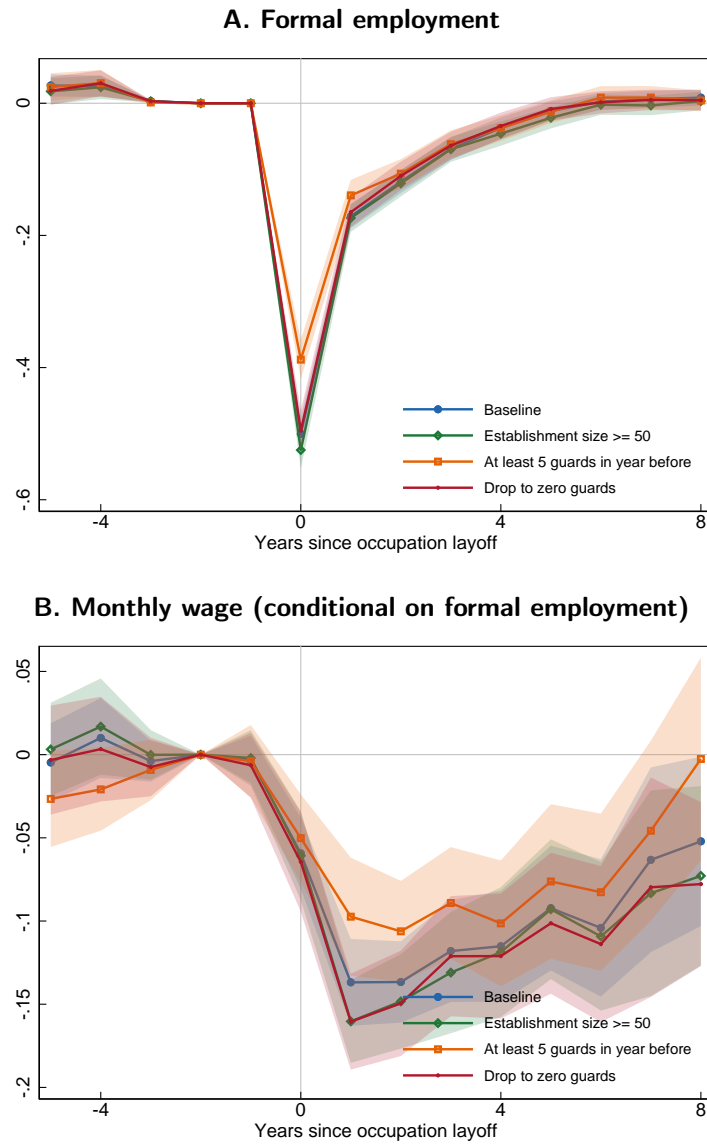
Note: Figure replicates Figure 4, Panels B and D using subsamples including only restrictive and permissive microregions, respectively.

Figure E.5: Effect of occupational layoff on incumbent guards, alternative matching strategies



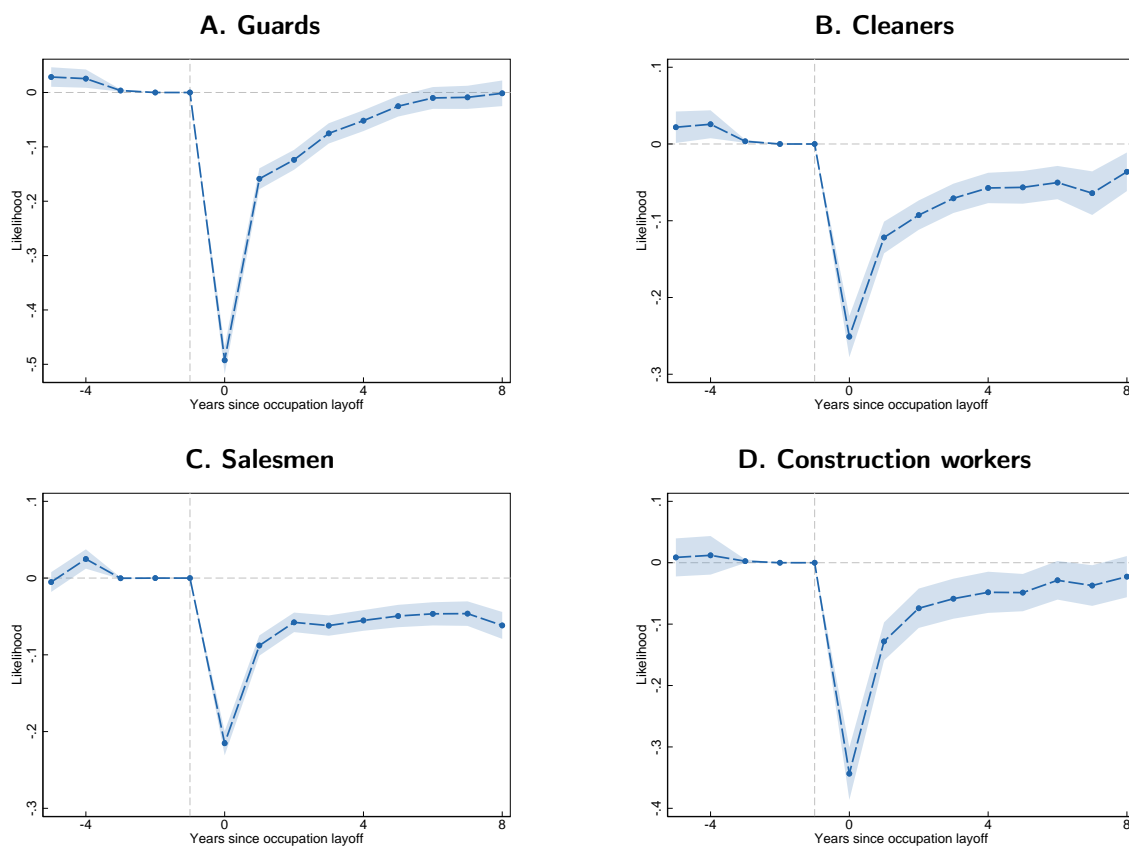
Note: Figure replicates Figure 4, Panels B and D with alternative matching strategies. The baseline specification matches workers within the 2-digit industry and local regional court jurisdiction. The alternative specifications matches within the 3-digit industry and local regional court jurisdiction (in green), within the 2-digit industry and microregion (in orange), and within the 3-digit industry and microregion (in red).

Figure E.6: Effect of occupational layoff on incumbent guards, alternative definitions



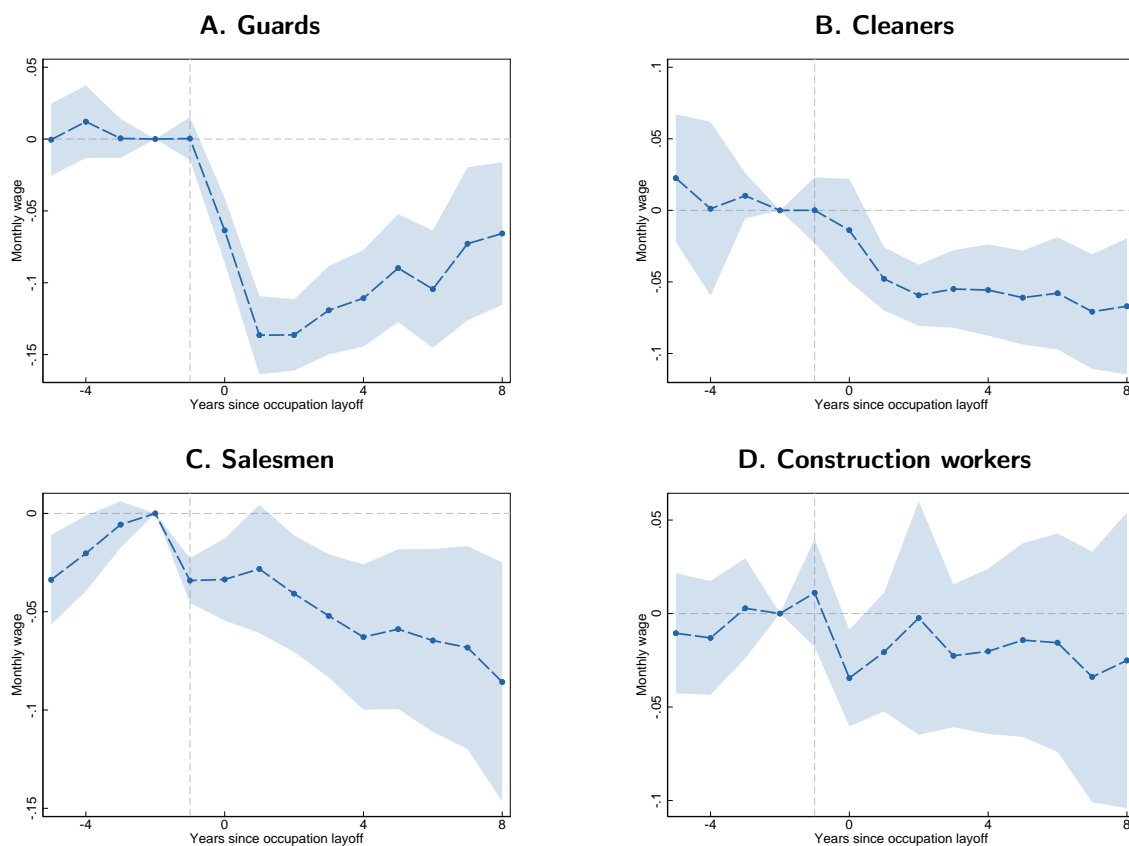
Note: Figure replicates Figure 4, Panels B and D with alternative definitions of occupational layoffs. The alternative specifications restricts to outsourcing establishments with at least 50 employees (in green), at least 5 security guards (in orange), or considers events where the number of security guards drops to zero (in red).

Figure E.7: Effect of occupational layoff on incumbent employment, other occupations



Note: Figure replicates Figure 4, Panel B for occupational layoffs in other occupations.

Figure E.8: Effect of occupational layoff on incumbent wage, other occupations



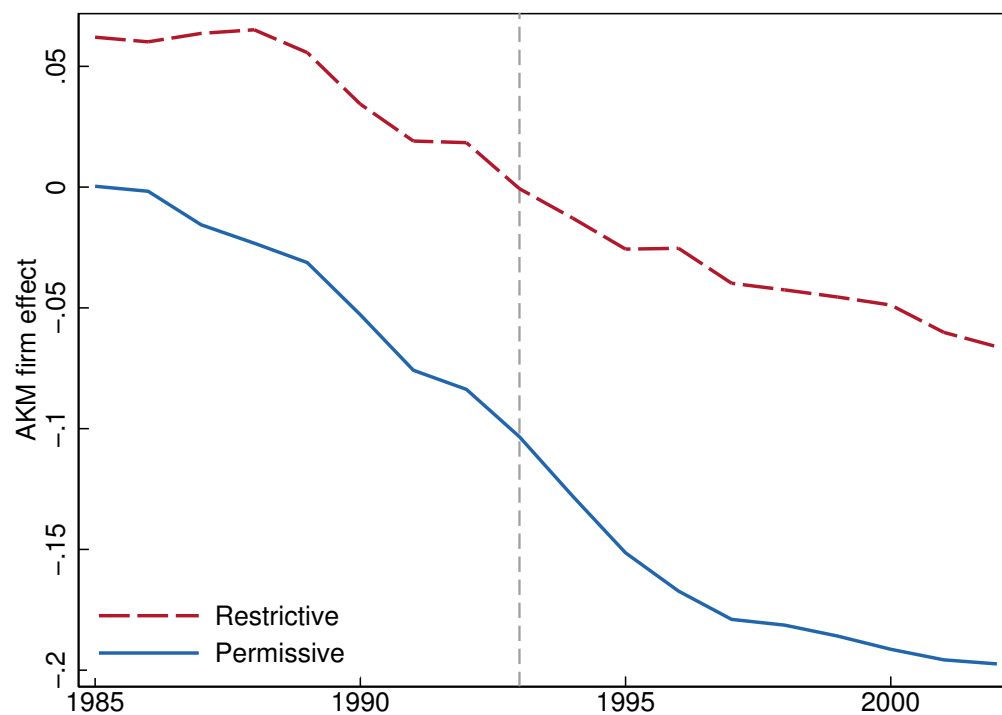
Note: Figure replicates Figure 4, Panel D for occupational layoffs in other occupations.

Table E.1: Establishment-level predictors of security guard outsourcing decisions, 1993-1998

	Dependent variable: Outsourcing decision			
Log(estab size)	0.004 (0.005)			
Log(estab mean wage)		0.057*** (0.008)		
Log(estab mean guard wage)			0.018* (0.009)	
AKM firm FE				0.088*** (0.016)
<i>N</i>	7682	7682	7682	7682
<i>R</i> ²	0.04	0.05	0.04	0.04

Note: Sample includes establishments with at least 50 employees and at least three security guards in 1993. We exclude establishments whose total non-security guard headcount declines by more than 10 percent by 1998. The dependent variable takes indicates whether the number of security guards at the establishment dropped by more than two thirds in 1998 (and dropped to zero if the initial number of guards is fewer than six). We include controls for log number of security guards at the establishment in 1993, as well as microregion fixed effects.

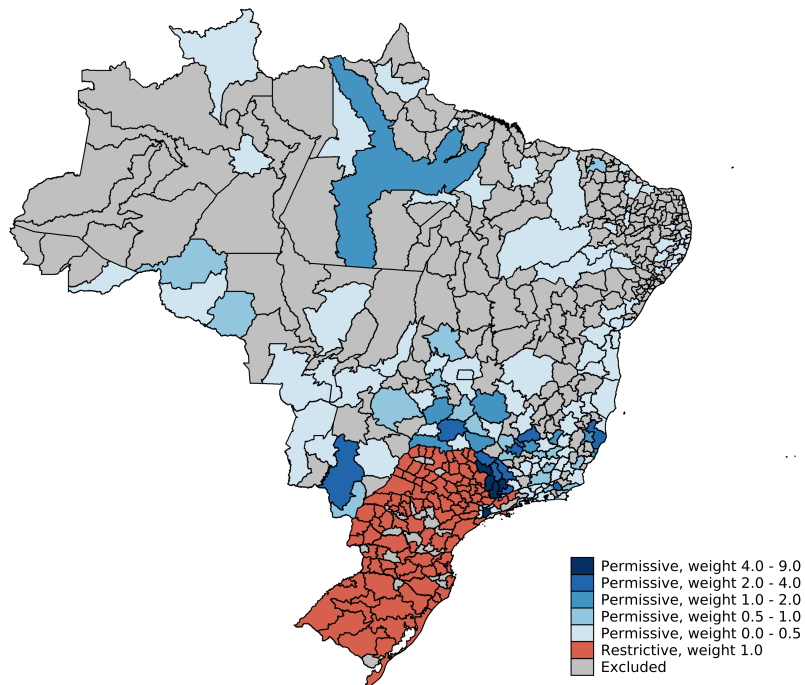
Figure E.9: Trends in average firm-specific wage premia among security guards



Note: Figure plots the trend in the mean AKM firm effect among security guards, averaged over microregions in our estimation sample with equal weights, separately for permissive and restrictive regions.

F Market-level Effects of Outsourcing: Additional results

Figure F.1: Map of microregions with entropy-balancing weights



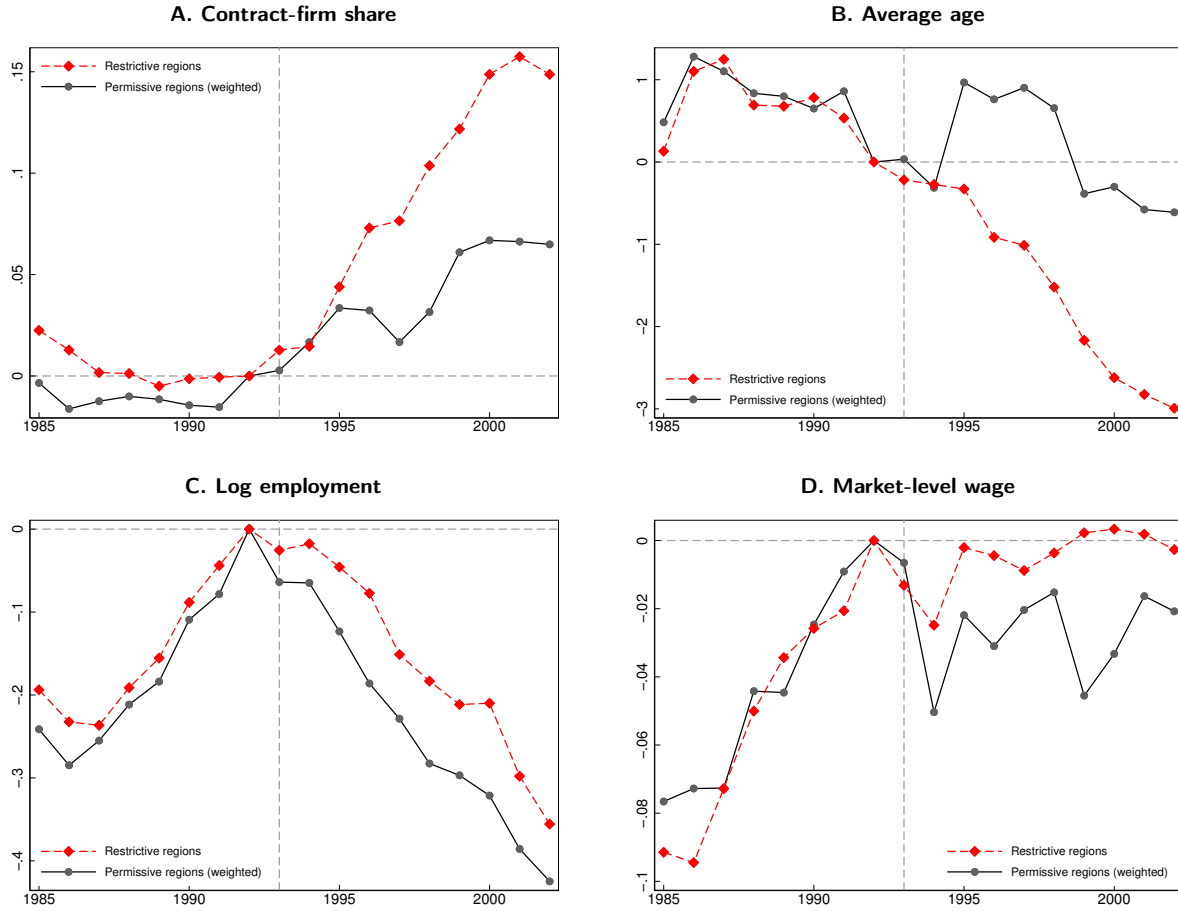
Note: Map shows microregions used in our main specifications, where observations are weighted using entropy balancing weights. Entropy balancing weights are computed using log employment, homicide rate, unemployment rate, share of employment in tradable industries, log formal employment of importers, and local import tariff competition exposure in 1992.

Table F.1: Baseline descriptive statistics of analyzed microregions by regional labor court restrictiveness

Microregion characteristics in 1992	Restrictive		Permissive		
Share of guards employed by contract firms	0.117 (0.177)	0.098 (0.14)	0.149 (0.218)	0.122 (0.178)	0.136 (0.202)
Establishments directly hiring guards	242 (343)	204 (263)	379 (1323)	784 (2632)	526 (1883)
HHI	0.060 (0.08)	0.054 (0.06)	0.072 (0.08)	0.059 (0.06)	0.065 (0.076)
Average log(wage), guards	7.20 (0.21)	7.22 (0.22)	6.95 (0.29)	7.03 (0.23)	6.97 (0.27)
Average log(wage), all formal workers	7.08 (0.2)	7.12 (0.21)	6.96 (0.27)	6.95 (0.27)	6.95 (0.27)
Guards per 1000 formal workers	22.07 (23.93)	23.56 (23.11)	30.15 (19.97)	22.40 (11.54)	26.85 (17.25)
By employment type:					
Direct-hire guards	17.00	19.31	22.29	18.06	20.56
Contract-firm guards	5.08	4.25	7.86	4.35	6.29
By age group:					
Age 18-24	1.62	2.03	2.92	1.92	2.48
Age 25-34	5.73	6.32	8.94	6.06	7.67
Age 35-44	5.27	5.61	7.64	5.67	6.80
Age 45-54	4.77	4.91	5.67	4.48	5.19
Age 55-64	3.91	3.93	4.20	3.56	3.96
Used for entropy balancing:					
Log formal-sector employment	10.1	9.9	9.7	10.1	9.8
Homicide rate (per 100K population)	11.6	13.4	16.6	11.6	14.2
Unemployment rate	0.027	0.037	0.045	0.027	0.037
Log formal employment of importers	9.1	9.0	8.7	9.1	8.8
Share of employment in tradeable sector	0.50	0.45	0.43	0.50	0.45
Import tariff competition exposure	-0.048	-0.043	-0.040	-0.048	-0.043
Weights	Uniform	Inv. prop. Score	Uniform	Entropy- balancing	Inv. prop. Score
TRT regional courts	4	4	20	20	20
<i>N</i>	107	107	159	159	159

Notes: Sample includes all microregions with at least 25 guards and 25 cleaners in all years between 1985 and 2006 .
Column (2) is weighted by entropy balancing weights. Standard deviations are in parentheses.

Figure F.2: Differences between security guard and other occupations by regional restrictiveness

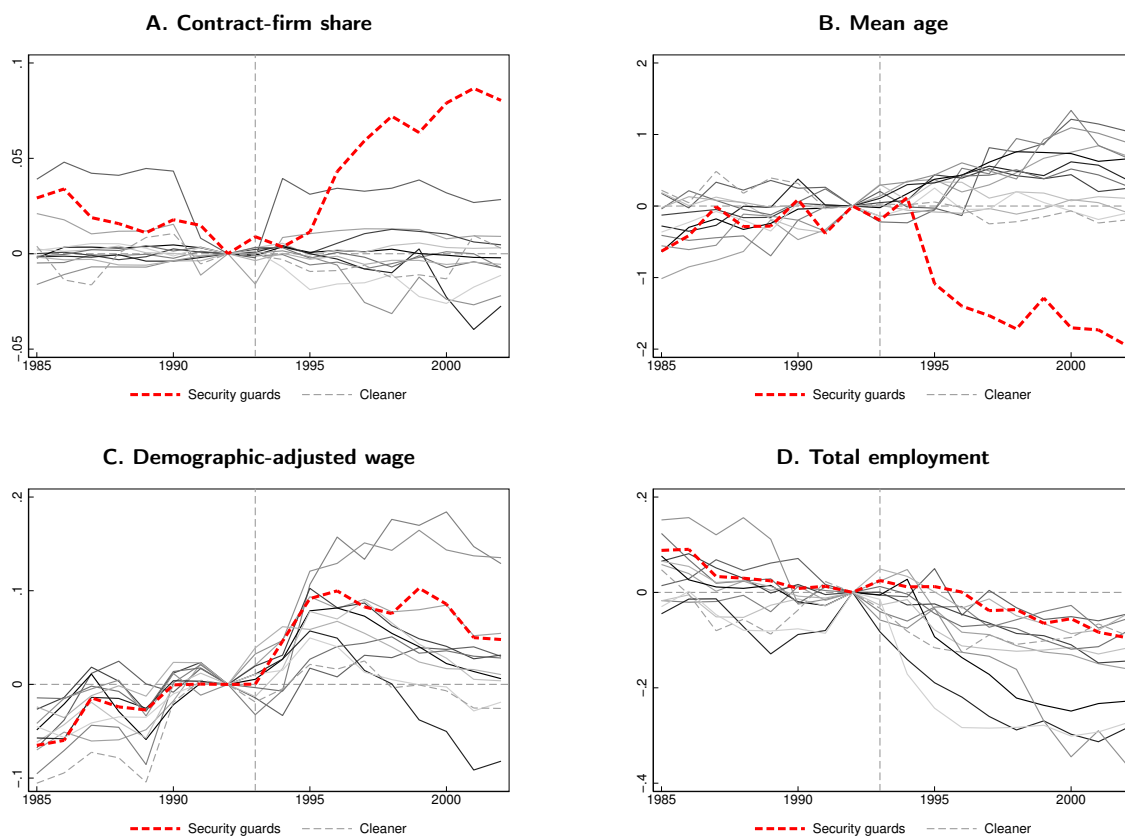


Note: We estimate and plot, separately for restrictive and permissive microregions, the α_τ coefficients from the following regression:

$$y_{ot} = \sum_{\tau=1985; \tau \neq 1992}^{2002} \alpha_\tau (T_o \times 1_{t=\tau}) + \delta_o + \delta_t + \varepsilon_{ot}, \quad (\text{DD})$$

where T_o equals one if occupation o denotes security guards. The outcome variables in each panel are (A) contract-firm share, (B) average age, (C) log private-sector formal employment, and (D) the estimated microregion-year fixed effect from a worker-level wage equation that includes worker demographic controls. The omitted year is 1992. Sample is weighted by entropy balancing weights. Standard errors are clustered at the regional labor court level.

Figure F.3: Differences between restrictive and permissive regions by occupation



Note: Each line plots the coefficients from a difference-in-differences regression that comparing restrictive microregions to permissive microregions, with controls for year and microregion fixed effects, separately estimated for each occupation in our estimation sample. The omitted year is 1992. Sample is weighted by entropy balancing weights. Standard errors are clustered at the regional labor court level.

Table F.2: Effect of outsourcing legalization on alternative measures of outsourcing prevalence

	(1)	(2)	(3)	(4)	(5)
A. Contract-firm share					
Short run effect	0.012 (0.014)	0.043* (0.022)	0.033** (0.012)	0.013* (0.007)	0.037* (0.020)
Long run effect	0.062** (0.029)	0.105*** (0.031)	0.081*** (0.022)	0.071*** (0.009)	0.100*** (0.025)
B. Occupational HHI					
Short run effect	0.011 (0.008)	0.018 (0.013)	0.013* (0.006)	0.013** (0.006)	0.018* (0.010)
Long run effect	0.029*** (0.009)	0.041** (0.017)	0.034*** (0.008)	0.037*** (0.008)	0.046*** (0.014)
C. IHS(Number of direct employers)					
Short run effect	-0.002 (0.010)	-0.015 (0.014)	-0.001 (0.014)	-0.005 (0.011)	-0.014 (0.012)
Long run effect	-0.059 (0.045)	-0.077 (0.045)	-0.046 (0.043)	-0.069 (0.042)	-0.071* (0.036)
1990 mreg features X occ X yr			X	X	X
	Entropy balancing weights	Propensity score weights	Uniform weights	Entropy balancing weights	Propensity score weights
Observations	57456	57456	57456	57456	57456

Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). 1990 microregion features include log employment, unemployment rate, employment share in tradeable industries, import tariff reduction exposure, log employment of importers, and homicide rate (per 100K population). These same variable are used to compute propensity score and entropy balancing weights. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level. All specifications include microregion-occupation linear trends.

Table F.3: Effect of outsourcing legalization on alternative wage measures

	(1)	(2)	(3)	(4)	(5)
A. Mean log wage					
Short run effect	0.022 (0.024)	0.024 (0.028)	0.021 (0.020)	0.029 (0.018)	0.030 (0.019)
Long run effect	0.016 (0.019)	0.016 (0.026)	0.010 (0.016)	0.036** (0.013)	0.034** (0.014)
B. Demographic-adjusted wage					
Short run effect	0.023 (0.020)	0.023 (0.022)	0.023 (0.018)	0.030 (0.018)	0.028 (0.017)
Long run effect	0.025* (0.014)	0.020 (0.020)	0.017 (0.019)	0.047*** (0.016)	0.039** (0.015)
C. Within-worker wage					
Short run effect	0.021 (0.013)	0.028 (0.017)	0.024 (0.015)	0.027* (0.014)	0.032** (0.014)
Long run effect	0.023** (0.011)	0.025 (0.015)	0.024 (0.019)	0.038** (0.015)	0.036** (0.014)
1990 mreg features X occ X yr			X	X	X
	Entropy balancing weights	Propensity score weights	Uniform weights	Entropy balancing weights	Propensity score weights
Observations	57456	57456	57456	57456	57456

Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). 1990 microregion features include log employment, unemployment rate, employment share in tradeable industries, import tariff reduction exposure, log employment of importers, and homicide rate (per 100K population). These same variable are used to compute propensity score and entropy balancing weights. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level. All specifications include microregion-occupation linear trends.

Table F.4: Effect of outsourcing legalization, alternative entropy-balancing targets

	(1)	(2)	(3)	(4)
A. Contract-firm share				
Short run effect	0.027* (0.014)	0.017 (0.011)	0.009 (0.011)	0.012 (0.014)
Long run effect	0.087*** (0.022)	0.057** (0.026)	0.053** (0.022)	0.062** (0.029)
B. Mean age				
Short run effect	-0.654** (0.288)	-0.711** (0.318)	-0.749** (0.292)	-0.767** (0.305)
Long run effect	-1.863*** (0.510)	-1.516*** (0.503)	-1.473*** (0.435)	-1.512*** (0.460)
C. Log employment				
Short run effect	0.038 (0.044)	0.047 (0.036)	0.058 (0.035)	0.063* (0.036)
Long run effect	0.058 (0.057)	0.069* (0.033)	0.080*** (0.025)	0.085*** (0.029)
D. Demographic-adjusted wage				
Short run effect	0.008 (0.022)	0.010 (0.020)	0.021 (0.020)	0.023 (0.020)
Long run effect	-0.016 (0.017)	-0.007 (0.012)	0.021 (0.013)	0.025* (0.014)
Entropy-balancing targets				
Log employment		X	X	X
Unemployment rate		X	X	X
Emp share in tradeable industries			X	X
Import tariff reduction exposure			X	X
Log employment of importers			X	X
Homicide rate (per 100K population)				X
Observations	57456	57456	57456	57456

Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). Treatment group means in the pre-legalization year of 1992 are presented. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level. All specifications include microregion-occupation linear trends.

Table F.5: Effect of outsourcing legalization, alternative samples

	(1)	(2)	(3)
A. Contract-firm share			
Short run effect	0.012 (0.014)	0.020 (0.022)	0.017 (0.018)
Long run effect	0.062** (0.029)	0.082** (0.038)	0.065* (0.034)
B. Mean age			
Short run effect	-0.767** (0.305)	-1.168*** (0.389)	-0.741** (0.324)
Long run effect	-1.512*** (0.460)	-2.366*** (0.435)	-1.419*** (0.492)
C. Log employment			
Short run effect	0.063* (0.036)	0.121*** (0.039)	0.061 (0.039)
Long run effect	0.085*** (0.029)	0.100** (0.040)	0.074** (0.034)
D. Demographic-adjusted wage			
Short run effect	0.023 (0.020)	0.052* (0.026)	0.027 (0.021)
Long run effect	0.025* (0.014)	0.048** (0.021)	0.032* (0.016)
Sample	Main	Excl SP state	Excl SP metro
Observations	57456	45360	55944

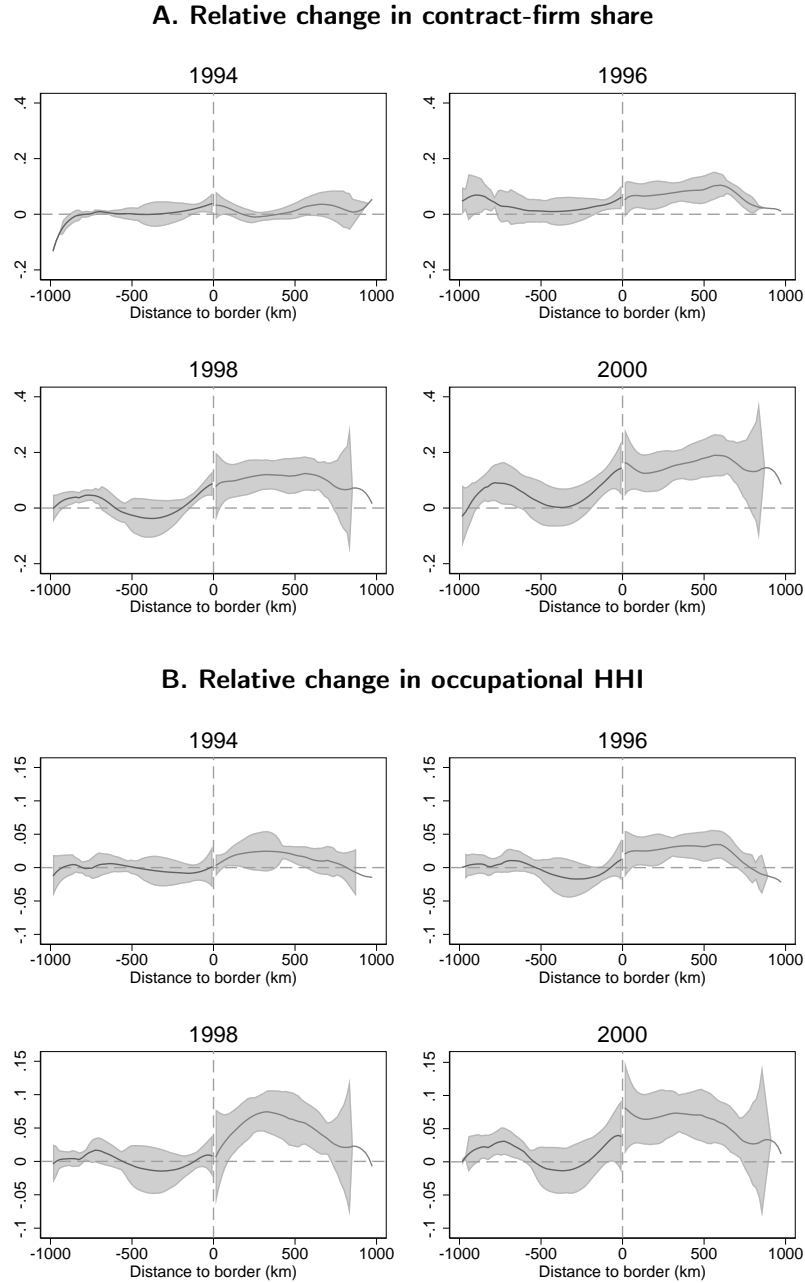
Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). Treatment group means in the pre-legalization year of 1992 are presented. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level. All specifications include microregion-occupation linear trends.

Table F.6: Effect of outsourcing legalization on market-level outcomes, without microregion-occupation linear trend controls

	(1)	(2)	(3)	(4)	(5)
A. Contract-firm share					
Short run effect	0.013 (0.022)	0.030** (0.011)	0.035** (0.015)	0.024 (0.015)	0.027*** (0.009)
Long run effect	0.064 (0.038)	0.083** (0.030)	0.079*** (0.023)	0.085*** (0.020)	0.082*** (0.014)
B. Mean age					
Short run effect	-1.090*** (0.275)	-0.954*** (0.280)	-1.342*** (0.246)	-1.210*** (0.217)	-0.947*** (0.210)
Long run effect	-2.059*** (0.412)	-2.404*** (0.343)	-2.661*** (0.362)	-2.252*** (0.366)	-2.272*** (0.279)
C. Log employment					
Short run effect	0.049** (0.022)	0.048 (0.035)	0.068** (0.029)	0.059** (0.021)	0.055 (0.037)
Long run effect	0.062 (0.056)	0.099 (0.059)	0.104 (0.061)	0.084** (0.031)	0.114*** (0.039)
D. Demographic-adjusted wage					
Short run effect	0.027 (0.029)	0.004 (0.030)	0.025 (0.026)	0.029 (0.026)	0.006 (0.026)
Long run effect	0.032 (0.029)	-0.010 (0.037)	0.010 (0.027)	0.036 (0.022)	-0.009 (0.033)
1990 mreg features X occ X yr			X	X	X
	Entropy balancing weights	Propensity score weights	Uniform weights	Entropy balancing weights	Propensity score weights
Observations	57456	57456	57456	57456	57456

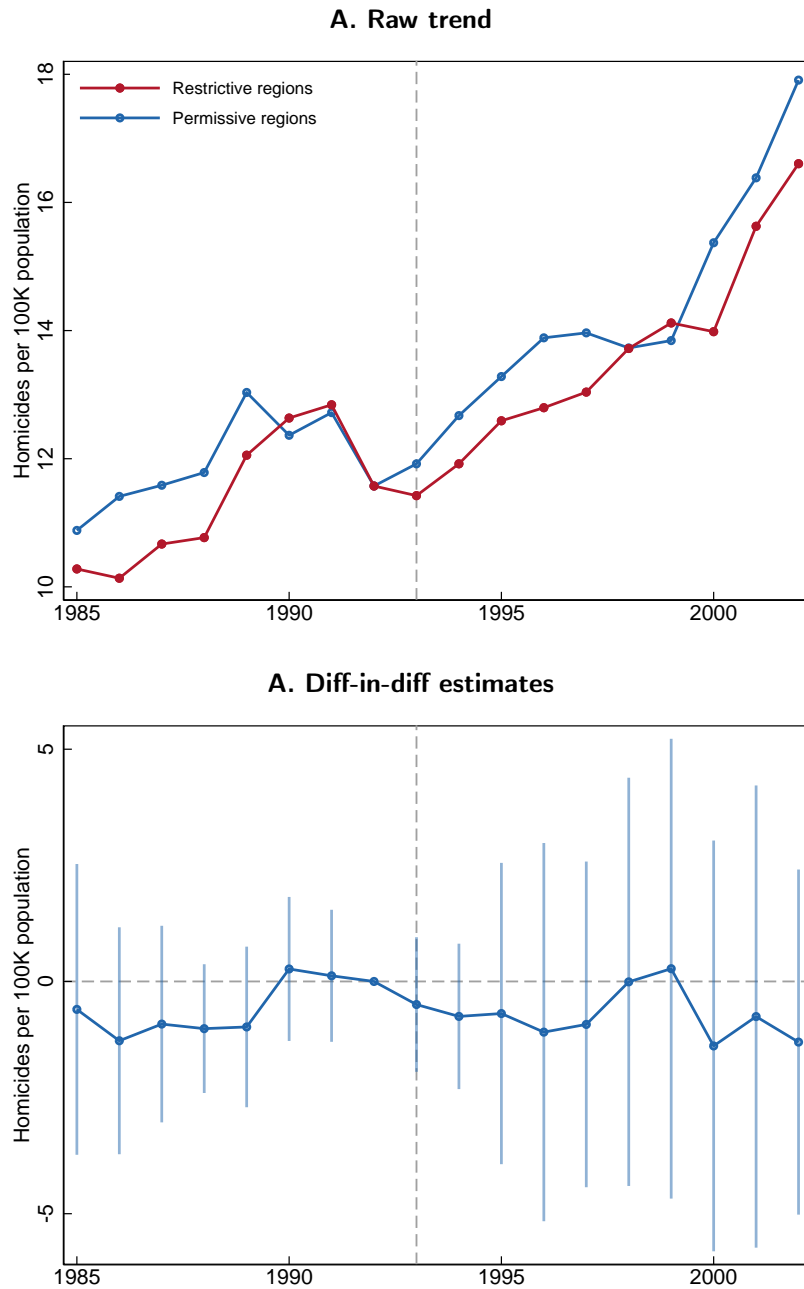
Notes: Estimates are from our main triple-difference specification. We report pooled coefficients for the short-run post-legalization (1994-1997) and long-run post-legalization (1998-2002). 1990 microregion features include log employment, unemployment rate, employment share in tradeable industries, import tariff reduction exposure, log employment of importers, and homicide rate (per 100K population). These same variable are used to compute propensity score and entropy balancing weights. Standard errors in parentheses are clustered at the TRT regional court level, with * = significant at the 10% level, ** = significant at the 5% level, and *** = significant at the 1% level.

Figure F.4: Changes in outsourcing prevalence and distance to the state border



Note: We estimate kernel-weighted local polynomial regressions of the relative change of an outcome in year X on distance to border, using the Epanechnikov kernel, polynomials of degree 2, and a bandwidth of 200km, separately for restrictive and permissive microregions. We define the relative change of an outcome in year X = (outcome in year X - outcome in year 1992) - (mean outcome among comparison occupations in year X - mean outcome among comparison occupations in year 1992). Sample includes all microregions within 1000 km of the border between restrictive and permissive jurisdictions, but excludes the 2nd region. We display a graph of the smoothed values with 95% confidence bands, where restrictive regions given positive distance and permissive regions are given negative distance.

Figure F.5: Regional differences in homicide rates



Note: Panel A plots the mean homicide rate for restrictive and permissive microregions, respectively. Panel B plots the coefficients from a difference-in-differences regression that comparing restrictive microregions to permissive microregions, with controls for year and microregion fixed effects. The omitted year is 1992. Sample includes all microregions with at least 50 security guards in every year between 1985-2006 and is weighted by entropy balancing weights. Standard errors are clustered at the regional labor court level.

G Welfare Implications: Model details

G.1 Derivations for Right-to-Manage Union Bargaining Model

Here we derive the changes in worker and firm surplus due to outsourcing legalization under the right-to-manage union bargaining model. We calculate the effects due to reduced worker bargaining power and reduced management cost, separately. Figure G.1, Panel A plots the welfare effects of reduced worker power, which can be decomposed into three components:

1. Area A is a transfer of worker surplus to the firm due to reduced wage for existing workers, given by

$$A = L \times (-w_c d\mu).$$

2. Area B is new firm surplus from new employment, given by

$$B = \frac{1}{2} \left(-\frac{dL^D}{dw} w_c d\mu \right) \times (w_c d\mu).$$

3. Area C is new worker surplus from new employment, given by

$$C = \left(-\frac{dL^D}{dw} w_c d\mu \right) \times \left[\left(1 - \frac{\varepsilon_D}{\varepsilon_S} \right) w_c (\mu - 1 + d\mu) + \frac{1}{2} \left(-\frac{\varepsilon_D}{\varepsilon_S} w_c d\mu \right) \right].$$

The change in firm surplus is $A + B$. The change in worker surplus is $C - A$. The change in total surplus is $B + C$.

Figure G.1, Panel B plots the welfare effects of reduced management cost, which can be decomposed into four components:

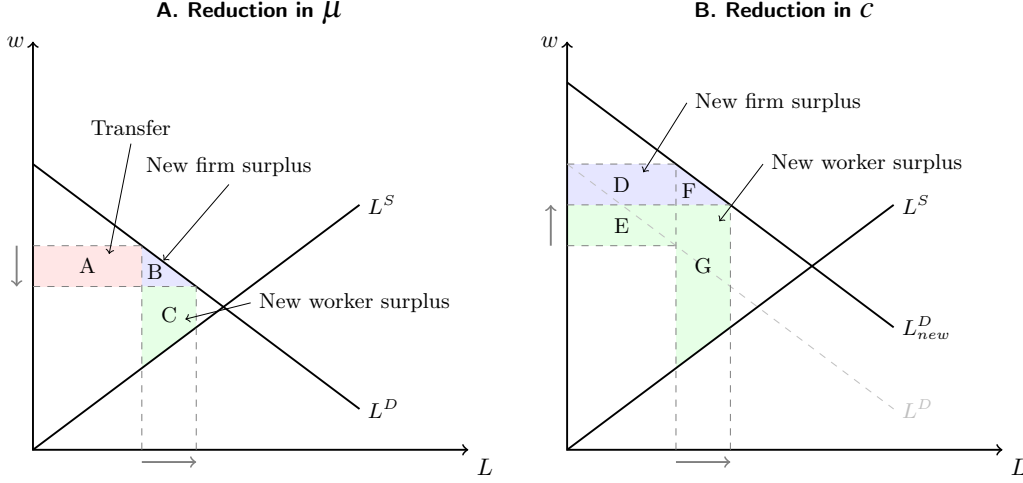
1. Area D is the pass-through of reduced management cost to firms (holding the employment level fixed), given by

$$D = L \times (1 + \mu\phi) (-dc).$$

2. Area E is the pass-through of reduced management cost to workers (holding the employment level fixed), given by

$$E = L \times (-\mu\phi) (-dc).$$

Figure G.1: Welfare effects in a right-to-manage union bargaining model



Note: Panel A and B plots the effects of reduced wage markup μ and reduced management cost c on worker and firm surpluses.

3. Area F is the increase in firm surplus due to new employment, given by

$$F = \frac{1}{2} \left[-\frac{dL^D}{dw} (1 + \mu\phi) (-dc) \right] \times (1 + \mu\phi) (-dc).$$

4. Area G is the increase in worker surplus due to new employment, given by

$$G = \left[-\frac{dL^D}{dw} (1 + \mu\phi) (-dc) \right] \times \left[\left(1 - \frac{\varepsilon_D}{\varepsilon_S} \right) (\mu - 1) (w_c + dw_c) + \frac{1 - \varepsilon_D}{2 \varepsilon_S} (1 + \mu\phi) (-dc) \right].$$

The change in firm surplus is $D + F$. The change in worker surplus is $E + G$. If management costs are dissipated, then the change in total surplus is $D + E + F + G$. If management costs are redistributed, then the change in total surplus is $F + G$.

Table G.1 shows the estimates for each of these components.

G.2 Sensitivity to calibrated parameters

Table G.2 investigates the sensitivity of our model estimates to alternative choices of elasticities and markup. We report the estimated effects on management cost, wage markup, firm surplus and worker surplus for $\varepsilon_S \in \{1, 3, 5\}$, $\varepsilon_D \in \{-1, -3, -5\}$, and $\mu \in \{1.05, 1.1, 1.2\}$. The results are intuitive. A less elastic labor supply implies a slightly larger reduction in the wage markup, but

Table G.1: Decomposition of welfare effects under right-to-manage model

	% of initial guard wagebill	
Change in firm surplus	2.7%	(1.0%)
Due to reduced transactions cost	2.4%	(0.7%)
For existing employment (D)	2.3%	(0.7%)
From new employment (F)	0.1%	(0.0%)
Due to reduced markup	0.3%	(0.9%)
For existing employment (A)	0.3%	(0.9%)
From new employment (B)	0.0%	(0.0%)
Change in worker surplus	4.1%	(1.5%)
Due to reduced transactions cost	4.2%	(1.3%)
For existing employment (E)	2.8%	(0.8%)
From new employment (G)	1.4%	(0.4%)
Due to reduced markup	-0.1%	(0.4%)
For existing employment (-A)	-0.3%	(0.9%)
From new employment (C)	0.2%	(0.5%)

Notes: Table decomposes changes in firm, worker, and total surplus due to outsourcing legalization into components due to existing employment and new employment.

does not significantly alter the estimated changes in management cost or firm and worker surpluses. By contrast, a less elastic labor demand implies in a larger reduction in management cost as well as a larger increase in firm surplus, but hardly alters the estimated changes in worker surplus. A higher markup increases the pass-through of management costs to equilibrium wages, and hence implies a smaller increase in management cost and a large increase in worker surplus. Since the range of markups we consider plausible is small in relative terms, the estimated effects are largely insensitive to the alternative wage markups.

Across the range of alternative parameters that we consider, the welfare implications are largely similar: outsourcing legalization reduced management cost, had little effect on the wage markup, and increased both firm and worker surplus. The welfare estimates are insensitive to parameter choices because our reduced-form findings impose discipline on our parametric model. A substantial reduction in management cost raises both wages and employment, and is consistent with the

Table G.2: Robustness to alternative parameter choices

	Change in transactions cost (dc/w_0)	Change in wage markup ($d\mu$)	Change as % of initial guard wagebill	
			Firm Surplus	Worker Surplus
Baseline	-5.1%	-0.3%	2.7%	4.1%
$\varepsilon_S = 1$	-5.3%	-2.0%	4.5%	3.7%
$\varepsilon_S = 5$	-5.1%	0.5%	2.5%	4.0%
$\varepsilon_D = -1$	-10.3%	-0.3%	8.1%	3.6%
$\varepsilon_D = -5$	-4.1%	-0.3%	1.9%	4.2%
$\mu = 1.05$	-5.2%	-0.2%	2.9%	3.4%
$\mu = 1.2$	-5.0%	-0.5%	2.9%	4.7%

Notes: Table reports the changes in transactions cost, wage markup, and firm and worker surplus due to outsourcing legalization.

findings. However, a substantial reduction in worker bargaining power lowers wages and increases employment, and therefore cannot rationalize the findings.

G.3 Alternative Model: Strongly Efficient Union Bargaining

Table G.3 presents welfare estimates from an alternative model in which union bargaining is “strongly efficient” (à la McDonald and Solow 1981). In this model, a risk-neutral firm and a risk-neutral union negotiate simultaneously over wages and employment in order to maximize the joint surplus of their economic activity. As such, there is no employment distortion from elevated union wages. We consider this framework to be a less realistic model of the Brazilian labor market, where collective bargaining agreements typically do not determine the firm’s employment level.

The welfare implications are similar: outsourcing legalization reduced management cost, had little effect on the wage markup, and increased both firm and worker surplus. The welfare estimates are insensitive to alternative assumptions because our reduced-form findings impose discipline on our estimates. A substantial reduction in management cost raises both wages and employment, and is consistent with the findings. However, a substantial reduction in worker bargaining power lowers wages and increases employment, and therefore cannot rationalize the findings.

Table G.3: Effects of outsourcing legalization on structural parameters under efficient bargaining and heterogeneous firm models

	Right-to-manage	Efficient bargaining
Change in transactions cost (dc/w_0)	-5.1%	-5.7%
Change in markup ($d\mu$)	-0.3%	-0.7%
Change in firm surplus	2.7%	2.5%
Change in worker surplus	4.1%	3.5%

Notes: Table reports the changes in transactions cost, wage markup, and firm and worker surplus due to outsourcing legalization under alternative models.

Details In this model, the union and firm bargain over both wage and employment. The union has “risk-neutral” preferences and equal weights across all workers. The employment level therefore coincides with competitive allocation.

The wage level is given by

$$w = \mu w_c \quad (7)$$

Employment is given by market-clearing

$$L^D(w_c + m) = L^S(w_c) \quad (8)$$

Thus we can write

$$\frac{\partial w}{\partial c} = \mu \frac{\partial w_c}{\partial c} = \mu \phi \quad (9)$$

and

$$\frac{\partial L}{\partial c} = \frac{\partial (L^D(w_c + m))}{\partial c} = \frac{\partial L^D}{\partial c} \left(\frac{\partial w_c}{\partial c} + \frac{\partial c}{\partial c} \right) = \frac{\partial L^D}{\partial w_c} (\phi + 1) \quad (10)$$

Totally differentiation of (7) and (8) and substitution of (9) and (10) yields:

$$\begin{aligned} \frac{dw}{w} &= \frac{d\mu}{\mu} + \mu \phi \frac{dc}{w} \\ \frac{dL}{L} &= \mu \epsilon_D (\phi + 1) \frac{dc}{w}. \end{aligned}$$

Rearranging, we have that

$$\begin{aligned}\frac{dc}{w} &= \frac{\frac{dL}{L}}{\mu \varepsilon_D (\phi + 1)} \\ \frac{d\mu}{\mu} &= \frac{dw}{w} - \mu \phi \frac{dc}{w}.\end{aligned}$$

The change in total surplus can be computed as

$$d(TS) = -Ldc \left(1 + \frac{dL}{2L} \right)$$

The change in firm surplus is comprised of two parts:

$$d(FS) = B - A,$$

where

$$A = dw \times L \left(1 + \varepsilon^D \left(\frac{\mu - 1}{\mu} + \frac{1}{2} \frac{dw}{w} \right) \right)$$

and

$$B = -dc \times L \left(1 + \varepsilon^D \left(\frac{\mu - 1}{\mu} + \frac{dw}{w} + \frac{1}{2} \frac{dc}{w} \right) \right).$$