Across-Country Wage Compression in Multinationals*

Jonas Hjort
UCL
& BREAD & CEPR & University of Oslo

Xuan Li
HKUST

Heather Sarsons
University of British Columbia
& CEPR & NBER

March 29, 2025

Abstract

Many employers link wages at establishments outside of the home region to the level at headquarters. We show this using new data on 1,200 multinationals' establishments across the world and linked employee-level data on their establishments in Brazil. Headquarters wage changes arising from minimum wage and exchange rate shocks are partially transmitted to workers employed in the same position abroad. Wage change transmission appears to be direct and results from firm-wide wage-setting procedures rather than associated technology or employment changes. "Anchored" wage-setting is somewhat associated with particular characteristics of the job×employer×headquarter-establishment country-pair.

*j.hjort@ucl.ac.uk, xuanli.suenlai@gmail.com, hsrsns@gmail.com We are grateful to editors Stefano DellaVigna and Thomas Lemieux, four anynomous referees, David Card, and Alex Mas for guidance that significantly improved the paper. We also thank Oriana Bandiera, Sandy Black, Nick Bloom, Jeff Clemens, Arindrajit Dube, Alex Frankel, Francois Gerard, Gordon Hanson, Simon Jäger, Emir Kamenica, Alan Krueger, Attila Lindner, W. Bentley MacLeod, Hannes Malmberg, Enrico Moretti, Suresh Naidu, John Van Reenen, Jonah Rockoff, David Silver, Catherine Thomas, Felix Tintelnot, and Eric Verhoogen for helpful advice and comments; Juan-Andres Castro Cienfuegos, Madhunika Iyer, Nidhaanjit Jain, and Jett Pettus for great research assistance; the Company for data access and many helpful conversations; and seminar audiences at the AEA Annual Meeting, Berkeley Haas, Bonn, Boston University, Brown, Columbia, IZA, LERA, LSE, NBER Summer Institute, NYU, Rome, UBC, UCL, UCLA, UCLA Anderson, UCSD, Uppsala, UVA, UWa, Zurich, and the briq Workshop on Firms, Jobs and Inequality for great feedback.

1 Introduction

Some firms pay more than others for workers of similar skill levels (Card *et al.*, 2013, 2015, 2018; Barth *et al.*, 2016; Bloom *et al.*, 2018). A prominent example is multinationals. They tend to pay large premiums to employees overseas, even when the establishment is located in a low-wage region (Brown *et al.*, 2004; Lipsey & Sjoholm, 2006; Alfaro-Urena *et al.*, 2019; Setzler & Tintelnot, 2021). This is often attributed to differences in technology or production style.[1] However, there is growing evidence that many firms may be unable or unwilling to fully adjust to the different contexts in which their establishment operate, pointing to a fundamentally different source of firm wage premiums.[2]

We hypothesize that the use of firm-wide wage-setting procedures limit spatial wage differences within firms, pulling wages at establishments in other regions toward the level at headquarters. Using job-level data from large, well-known multinationals, we provide evidence that many firms indeed "anchor" their wages. They appear to directly link wages at home and abroad, partially extending externally imposed headquarters wage increases to their foreign establishments. We find little evidence that wage change transmission arises through associated technology or employment changes.

The 2000-2015 dataset we use reports yearly average wages for narrowly-defined occupations in multinationals' establishments across the world. It was constructed by a consulting company which harmonizes occupations or "jobs" by tasks and responsibilities to provide aggregated information about prevailing wages. The full dataset covers foreign establishments from 1,215 multinationals that span 19 broad sectors and operate in more than 170 different cities around the world. Most are well-known for-profit firms—the publicly listed U.S. firms in our data account for about one-third of the total revenue of all publicly listed U.S. firms—but the dataset also contains many multinational public sector employers. We use an additional data source, matched employer-employee administrative data from Brazil, to corroborate our findings, and to explore pathways underlying wage change transmission.

The first part of the paper is descriptive. We show that the average wage a multinational pays *domestic* (non-expat) workers within a narrowly-defined occupation at foreign establishments is highly correlated with what it pays workers in the same occupation at headquarters. The same is true for the employer's wage slope—the difference between the wages it pays workers in similar

[1] Recognition of and interest in "firm effects" in wages have a long history in labor economics (see e.g. Slichter, 1950; Rees & Schultz, 1970; Dickens & Katz, 1987; Van Reenen, 1996; Abowd *et al.*, 1999). That multinationals pay workers more than local firms is extensively documented (see Brown *et al.*, 2004; Lipsey & Sjoholm, 2006; Hijzen *et al.*, 2013; Setzler & Tintelnot, 2021; Alfaro-Urena *et al.*, 2019). See e.g. Conyon *et al.* (2002); Helpman *et al.* (2013); Sun (2020) on technologies or production styles in multinationals that raise worker productivity or attract productive workers.

[2] See Adams & Williams (2019); DellaVigna & Gentzkow (2019) on firms not adjusting their product prices to local contexts. Recent research has also shown that many workers are averse to pay inequality (Card *et al.*, 2012; Mas, 2017; Breza *et al.*, 2017; Cullen & Perez-Truglia, 2022; Dube *et al.*, 2019), and that fairness preferences can influence firms' wage-setting practices (Harrison & Scorse, 2010).

jobs of slightly higher versus lower skill requirements. The multinationals in our sample ultimately pay most jobs in lower-income foreign countries wages that, relative to GDP per capita, are an order of magnitude higher than what they pay workers in the same position at headquarters.[3] We include fixed effects that rule out conventional explanations operating through firm×occupation or city×year productivity differences. Headquarters wage-anchoring is observed across the occupation range but is highest for low-skill occupations, such as cleaners, drivers, and security guards.

In the second part of the paper we show that multinationals partially transmit externally imposed changes in wages at the headquarters to their foreign establishments. To do so we first use changes in minimum wages. Comparing multinational-owned establishments located in the same foreign city, we document that low-skill wages in "treated" and "control" establishments evolve similarly, with treated establishments having slightly higher wage growth, before the minimum wage is increased in the country or U.S. state where the headquarters of treated establishments is located. Relative wages in treated foreign establishments then abruptly increase in the year of the minimum wage hike. Within low-skill occupations in the same foreign establishment, these wage increases are substantially bigger among workers in jobs whose headquarter counterparts are more exposed to minimum wage changes. The implied spatial compression of wages is in line with how many firms themselves report to set wages (Culpepper & Associates Inc, 2011; Alfaro-Urena *et al.*, 2019).[4] We show that endogenous timing of minimum wage changes is unlikely to explain the estimated impact on wages paid abroad, and also exploit a second source of externally-imposed changes to wages at headquarters: exchange rate shocks.[5]

In the third part of the paper we examine why wages at multinationals' foreign establishments are linked to the level at headquarters. We argue that wage anchoring is at least in part a result of firm-wide wage setting procedures that in effect directly tie foreign establishment wages to headquarter wages, but also consider indirect pathways to foreign wages, including offshoring and firm-wide technology changes.

We start by using a causal forest algorithm to estimate the conditional average treatment effect of a minimum wage shock at a firm's headquarters, allowing the foreign wage response to vary with a wide range of characteristics associated with the job. We then construct and compare above-

[3] In the Appendix we show that our results are similar for private-sector firms and other types of employers. Many of our estimates are somewhat bigger for private-sector firms. For simplicity, we use "firm" and "employer" interchangeably. "Job", "occupation", and "position" are also synonymous for this paper's analysis.

[4] In a recent survey of primarily North American employers, 29 percent report paying the same *nominal* wages across locations (Culpepper & Associates Inc, 2011) (see also Hazell *et al.*, 2022). Similarly, Amazon, IKEA, Walmart, and at least 58 other large employers have self-imposed, country-wide wage floors in the U.S. (National Employment Law Project, 2016). Alfaro-Urena *et al.* (2019) report survey evidence that multinational corporations pay high wages abroad in part to "ensure cross-country pay fairness within the MNC" (p. 2).

[5] Exchange rates both increase and decrease, are less stable over time, and have different underlying drivers than minimum wages. We show that, when the measured-in-USD headquarters wages of a (non-U.S.) multinational increase after an appreciation of the home country currency, foreign establishment wages are also increased in response.

and below-median predicted average treatment groups, following Carlana & La Ferrara (2021). Differences between high- and low-wage-shock-transmission observations are generally not large, but the former do differ somewhat in various pair characteristics of the headquarter and establishment country—transmission is greater across more closely connected country-pairs and those which share more similarities—and in some characteristics of the relevant foreign establishment country, such as inequality, urbanization, and some cultural characteristics. In contrast, occupation characteristics; the sector the multinational operates in; and characteristics of the headquarter country, have little explanatory power.[6]

We next link the global multinationals data to Brazilian employer-employee registries. We begin by confirming the results from our earlier analysis. The wage multinationals pay a given *individual* in Brazil abruptly rises when the foreign headquarters experience positive external shocks to its wages. We then look at the employment response at multinationals' Brazilian establishments. The results are hard to reconcile with indirect pathways explaining wage shock transmission. Both event study analysis and panel regressions point toward little change in total employment at foreign establishments. Overall there is little evidence to suggest that the initial wage impact arises through local labor markets.

In sum, this paper shows that many multinationals do not fully adjust wages to local contexts and instead partially link foreign workers' pay to that of workers in the same position at their headquarters. An important question for future research is whether such wage-setting procedures ultimately benefit the firm. They may do so for example by reducing menu- and information-costs of localized wage-setting (Lemieux *et al.*, 2012); increasing foreign worker morale (Dube *et al.*, 2019); or responding to consumer- or headquarter workers' fairness views (Harrison & Scorse, 2010). Alternatively, firm-wide wage-setting procedures may represent a form of firm mistakes (Goldfarb & Xiao, 2011; DellaVigna & Gentzkow, 2019; Dube *et al.*, 2020).

Our analysis builds on recent findings on invariability in firms' decisions across contexts, especially DellaVigna & Gentzkow (2019).[7] We connect this body of evidence with the literature on spatial wage differences (see e.g. Moretti, 2011). Our research design builds on the pioneering work of Harrison & Scorse (2010) showing that home country attitudes can influence how firms operate abroad, and Bloom *et al.* (2012)'s evidence that multinationals "transport" their practices across borders.[8]

By establishing a particular reason why some firms pay higher wages than others in a given labor market, this paper also helps uncover the nature of the well-known but poorly understood phenomenon of firm wage effects (see e.g. Card *et al.*, 2013, 2015, 2018; Barth *et al.*, 2016; Bloom

[6]While not conclusive, the findings from this analysis do not point towards employment- or technology-based explanations for wage "anchoring".

[7]The literature on invariability in firms' decisions across contexts originates in the seminal work of Kahneman *et al.* (1986). See also footnote 2 and the lab-based experimental studies surveyed in—and following on from—Rabin (1998).

[8]See also Hermalin (2013)'s surveys of the literature on corporate culture.

et al., 2018). The wage anchoring we document is consistent with existing evidence of rent-sharing (Van Reenen, 1996; Card *et al.*, 2018; Mogstad *et al.*, 2018); potential benefits to firms' of compressed wage-setting (Goldschmidt & Schmieder, 2017); and the use of pay benchmarks (Clemens & Gottlieb, 2017), but to our knowledge represents the first direct evidence of firm "wage norms".[9] Such norms' impact on wages across a wide span of countries and occupations multinationals operate in points towards similarly wide-ranging firm wage-setting power, and subsequent work suggests that firm wage norms may be even more widespread and consequential within countries (Hazell *et al.*, 2022). In this sense our analysis relates to studies that uncover characteristics of labor markets by identifying and studying the consequences of particular forms of wage-setting (see e.g. Dube *et al.*, 2020).

Finally, this paper shows evidence of across-country margins of adjustment to minimum wages and exchange rates. In this sense it relates to evidence on shocks spreading across space inside firms (Boehm *et al.*, 2019; Giroud & Mueller, 2019; Giroud & Rauh, 2019). We take a first step toward understanding how firm-wide wage-setting procedures affect economic activity across countries—in particular how "wage-anchoring" multinationals adjust employment abroad when wages rise at home. In doing so we build on the literature on how offshoring responds to home wages (Feenstra & Hanson, 1996; Grossman & Helpman, 2008; Muendler & Becker, 2010; Harrison & McMillan, 2011); on institutionally required pay equality (Cappelli & Chauvin, 1991; Propper & Reenen, 2010; Boeri *et al.*, 2021); and on work studying firms' decisions to directly tie worker compensation to performance or not and consequences for wage inequality (Lemieux *et al.*, 2009; Massenkoff & Wilmers, forthcoming).

2 Data and Summary Statistics

2.1 Job-level wages at multinationals' establishments

The primary dataset we use comes from a consulting company ("the Company") that gathers information on compensation at establishments around the world. When an employer uses its services, H.R. personnel describe positions present in each reported establishment: their tasks, responsibilities, and average gross and net monthly total pay. The Company's aggregated data includes 309 harmonized position titles, which we refer to as occupations or jobs. Because they are defined globally by the Company, whose business relies on its ability to harmonize occupations across employers and countries, the data is likely to be far more comparable across contexts than those generated by heterogeneous statistical agencies.

The Company maps the 309 occupations into 16 skill levels and 26 occupational categories. Examples of low-skill jobs (skill levels 1-5) include cleaner, guard, and data entry clerk. Middle-skill

[9] Budd *et al.* (2005); Martins & Yang (2015) find a high parent firm profits elasticity of foreign affiliate wages, consistent with our results.

jobs (6-10) include administrative assistant, systems analyst, and finance officer, and high-skill jobs (11-16) senior legal counsel, regional office manager, and H.R. director.

Appendix Figure A1 shows the occupations present in multinationals' establishments.[10] The most common occupation categories are "General Operations" and "Administrative", but others are more specific. Both high- and low-skill jobs are concentrated in the five or so most common occupational categories; middle-skill jobs span a wider range. For example, out of the 984 jobs observed in the "Engineering" category, 869 workers are in middle-skill jobs, while 9183 out of 11989 "Secretary" jobs are low-skill positions. On average, multinationals in our data report information on around 28 different jobs, spanning 9 skill levels and 6 occupational categories, that are present in an average of five foreign establishments.

The dataset covers the years 2000 through 2015. Data are collected each year, but not all establishments are included every year. The dataset is thus an unbalanced panel at the establishment×year level. Our primary outcome variable is the average nominal gross total wage of domestic workers employed in a given job at a given establishment and year, measured in current USD.[11]

2.2 Multinationals in the data, sample construction, and summary statistics

The full sample of multinationals we study includes roughly 1,200 employers. The majority are private sector firms, while a sizeable minority are multinational public sector employers (such as large, international NGOs, multilateral organizations, etc). They operate in a variety of sectors, including manufacturing, financial services, petroleum, business activities, telecommunications, technology, and pharmaceuticals and health services: the distribution across them is shown in Appendix Figure A2. For comparison, we drew a random sample of multinationals from the same headquarter country×sector combinations from Orbis, a comprehensive database of large and medium-sized formal firms' whose financial records are widely used in economic research. The sectoral comparison is shown in Appendix Figure A3. We cover many of the sectors in Orbis, but the multinationals in our sample are less likely to be in manufacturing and more likely to be in for example petroleum and financial services, and especially to be NGOs.[12]

The employers in the sample are unusually large. They have more assets, capital, revenues, and profits than firms in the Orbis sample (see Appendix Table A1). The publicly listed U.S. firms in

[10] Our analysis focuses on multinationals: establishments outside of an employer's headquarter country (and, where relevant and data coverage allows, the corresponding headquarter). The full analysis data also includes employers that only report data on their headquarter to the Company. Including them increases statistical power in some parts of our analysis in sections 4 and 5. The wage shock transmission we document is nevertheless identified off of foreign establishments only, as discussed in footnote 27. See also footnote 13.

[11] Our dataset does not cover expat workers. Most multinationals report their compensation data to the Company in USD. The Company converts the data of employers that report in local currency to USD (see also Appendix III).

[12] Sectors are defined by Standard Industrial Classification, with NGOs and other multinational public sector employers classified separately. The latter include national banks and branches of government that have establishments abroad.

our data account for about one-third of the total revenue of all publicly listed U.S. firms.

As clients, the multinationals choose which establishments report data to the Company in a given year, and most do not include all establishments. The Company informed us that a rotation rule for establishments to report is generally chosen[13], and that there is some variation in H.R. personnel's non-response rates. The panel structure of the data appear to confirm this. The included establishments are significantly skewed toward local headquarters, though many also employ production workers.

We include both private-sector and public-sector multinationals in our primary samples because some sources of across-country wage compression may influence both types of employers, and also because the econometric specifications we use limit statistical power in some parts of our analysis. We show that results are generally robust to restricting analysis to private-sector firms.

The samples of multinationals we construct are summarized in Table 1.[14] Our full Sample 1 is the foreign establishments we observe, regardless of whether there is a job-match between the headquarters and establishments. It includes 6,225 foreign establishments that belong to 1,215 employers. Appendix Figure A4 shows that these are distributed across the world, in 174 cities. In contrast—and also shown in the figure—most headquarters are in Europe and North America, although some are in Asia, Latin America, and Africa, in part because the Company's primary focus is establishments in low- and middle-income countries. We use Sample 1, in addition to narrower samples discussed next, when we analyze the foreign wage impact of external shocks to headquarter wages in Section 4.[15]

In Section 3 we descriptively compare the wages of workers in an employer's foreign establishment to those at the headquarters. We first restrict the sample to employers for which we observe at least one position at both the headquarters and at (one or more of) its foreign establishment(s) (Sample 2), and then to those multinationals for which at least one such job observation is in the same year at the headquarters and foreign establishment(s) (Sample 3). There are substantially fewer employers in subsamples 2 and 3, but they are nevertheless not small. As shown in Panel A of Table 1, Sample 2 (3) includes 101 (80) employers, 1,239 (611) of their foreign establishments, and 112,020 (27,292) establishment×job×year observations. The results of our analysis are generally similar in the smaller samples with "position overlap" and the full Sample 1. Panel B of Table 1 displays summary statistics for employers in each of the three samples of multinationals. The mean nominal wage the multinationals in Sample 1 pay across their foreign establishments is USD 17,681

[13]For example, "all foreign establishments report every year, but the headquarters only reports every fifth year" or "foreign establishments rotate in and out, and the headquarters never reports". There is also regional variation: some multinationals include establishments across the globe, while some include only certain continents. For a substantial fraction of foreign establishment wages, we do not observe a corresponding headquarter occupation wage in the same year. This is partly due to the fact that most multinationals seek the Company's services with their foreign establishments in mind.

[14]Appendix Table A2 shows summary statistics on the private-sector employers in our sample.

[15]Data on wages at the multinational's headquarters are available for around 10 percent of the multinationals in Sample 1. We observe home country/state wage shocks—minimum wage changes and exchange rate shocks—in auxiliary data.

(in 2000 dollars), with a standard deviation of USD 11,098. The corresponding numbers are USD 17,028 and USD 10,488 in Sample 2 and USD 21,114 and USD 10,692 in Sample 3.

2.3 Additional data sources

Shocks to headquarter wages We gather information on two types of shocks in home countries and states that are external to the firm, but that may influence wages at multinationals' headquarters: changes in minimum wages and exchange rates. Country-level minimum wage data come from the International Labour Organisation (ILO), and state-level minimum wage data from the U.S. come from Vaghul & Zipperer (2016). Yearly data on the headquarter country's exchange rate (in local currency units per USD) come from the World Bank. See Appendix III for details.

Matched employer-employee data from Brazil We use Brazil's longitudinal matched worker-firm database, the *Relação Anual de Informações Sociais* (RAIS) to study wages and employment outcomes in multinationals' foreign establishments in granularity, albeit in a more particular context in which a smaller set of multinationals operate. The RAIS data contain information on each individual employee at each establishment, including their wage, education, race, gender, age, and job tenure.

We identify the multinationals in the Company data that have an establishment in Brazil, and extract the 2000-2017 RAIS data on all of their Brazilian establishments, matching jobs by skill-level, to form our Brazil sample.[16] This sample includes job level data from 44 multinationals that are headquartered outside Brazil in 21 different locations (most commonly in the US, the UK, and the Netherlands), 42 of which have at least one non-Brazilian establishment in the Company data.

Employer, job, and location attributes We use a host of data on the economic, political, and cultural context of headquarter and foreign establishment countries—and characteristics of firms and jobs themselves—that may predict wage-setting practices. We consider economic traits such as urbanization; cultural traits such as trust and inequality aversion; sectoral characteristics like tradability; occupation ones like offshorability; and features of headquarter-establishment country pairs, such as language commonality and geographic distance. The full set are laid out in Table 7 and discussed in Section 5.1 and Appendix III.

3 Anchoring to Headquarter Wages

In this section we document a high correlation between the wages multinationals pay workers employed in a given position at the headquarters and in foreign establishments.

[16] For each such multinational, we keep all available years in the time period for all its establishments in RAIS, including ones located in a different city than the one in the Company data and years that could be missing in the unbalanced panel in the Company data, so as to maximize sample size. We match RAIS and the data from the Company by firm×year×job skill-level due the difficulty of matching individual positions in two data sources with narrowly-defined jobs/positions in the absence of a cross-walk. Recall that the jobs in the data from the Company belong to 16 different skill levels. The correlation between the wage observations from the two data sources is about 0.5.

3.1 Across-country wage patterns

The raw data point toward a close relationship between the two. In the lowest and highest within-headquarters wage distribution quartile, the mean and maximum are roughly USD 13,000/54,000 and USD 47,000/118,000 respectively. We show this in Panel C of Table 1, focusing on Sample 3 as defined in Sub-section 2.2. We also display, by headquarter wage-quartile, wage levels at employers' foreign establishments as percentages of their wage level for the same jobs at headquarters. The nominal wages paid to workers in foreign establishments are on average around 89 percent of those of headquarter workers in the same job in the same year, a number that is quite stable across the wage distribution and similar (78 percent) also for establishments in countries that are poorer than the home country.

3.2 Estimating wage anchoring

To estimate the extent of wage anchoring, we correlate the wages paid to workers in a particular occupation at a firm's foreign establishments with the wages paid to workers in the same occupation at the firm's headquarters. Specifically, we run

$$\mathrm{w}_{jfct} = \beta_1 \mathrm{HQw}_{jft} + \beta_2 x_{jct} + \theta_{fj} + \theta_{ct} + \varepsilon_{jfct} \tag{1}$$

where w_{jfct} is the log average wage of workers in job j at firm f's establishment in foreign city c in year t. A job or occupation here means a specific position such as driver, administrative assistant, or Human Resources director. HQw_{jft} is the log average wage of workers in the same job at firm f's headquarters in year t. We control for a benchmark measure of the foreign city "market" wage of workers in job j in year t—x_{jct}—in two ways. The first, $\bar{\mathrm{w}}_{j(-f)ct}$, directly measures how much multinationals *other than firm* f in our sample are paying their workers in job j in foreign city c in year t. Our second control for market wages—a fixed effect for job j in city c in year t, θ_{jct}—is more restrictive than $\bar{\mathrm{w}}_{j(-f)ct}$, but does not yield a benchmark correlation to which $\hat{\beta}_1$ can be compared.

We include employer×occupation fixed effects (θ_{fj}) to account for broader differences between workers in job j across firms, as well as city×year fixed effects (θ_{ct}) so that we only compare establishments in a given city at a given point in time. We measure all wage levels as the log of the relevant nominal, pre-tax wage in USD, and cluster standard errors at the firm level.[17]

Headquarter and foreign establishment wage changes are strongly correlated. Column 1 of Table

[17] Throughout the paper, we generally cluster standard errors following the guidance in Abadie *et al.* (2023). In the Company data, the sampling cluster is "employer×establishment city×year". The treatment assignment cluster is: "employer" in the correlational analysis in this section (where the "treatment" is job level (or skill-level) wages at the headquarters of a firm); "headquarter country" in the minimum wage shock analysis in Section 4 (where the treatment is minimum wage hikes in the headquarter country/state); and "headquarter country currency zone" in the exchange rate analysis also in Section 4 (where the treatment is the exchange rate of the headquarter's country currency zone). As all the assignment clusters are at a higher level than the sampling cluster, we cluster standard errors at the corresponding assignment cluster level for each of the three analyses.

2 shows that 10 percent higher wages at the headquarters is associated with 1.63 percent higher foreign establishment wages for workers in the same position (p = 0.07), and 0.9 percent higher foreign wages when we replace the local wage benchmark control and city×year fixed effects with city×job×year fixed effects (panel B, column 1).[18] The within-firm, across-country correlation in wage levels is four times larger than the correlation between a given establishment's wage level and the local average paid by other multinationals to workers in the same job. In Column 2 we include headquarter country×year fixed effects to account for possible technology shocks that occur in the firm's headquarters that could affect the relationship in wages for different jobs. The results are essentially unchanged.

In Columns 3-5, we test how the estimated correlation varies when we include wage observations from foreign establishment jobs that do not necessarily have a counterpart at the headquarters in the dataset. We do this in three different ways. In Column 3, we collapse the data to the skill level and look at the within-year correlation between the foreign establishment and headquarter wages of jobs that are not necessarily identical positions but of the same skill level.[19] In Panel A, the coefficient falls by roughly one third and is no longer statistically significant. When including an establishment city×skill-level×year fixed effect rather than the benchmark wage (Panel B), we see a statistically significant correlation of 0.16. In Column 4 we collapse the data to the firm level and correlate the average wages paid at headquarters and the foreign establishment, regardless of occupation or skill match.[20] This slightly increases the estimated correlation. In the last approach, shown in Column 5, we include firms for which foreign establishments and the headquarters are not necessarily interviewed in the same years (Sample 2). To do this, we replace w_{jfct} and HQw_{jft} with imputed values of the outcome variable (see Section 2 of Appendix III for details). This approach yields a high estimated correlation with headquarter wages (0.31 when we include city×job×year fixed effects in Panel B). The within-firm, across-country correlation in wage levels is shown graphically in Panel A of Figure 1. Overall and in each of the many ways we estimate its magnitude, we see a quite high correlation between headquarters and establishment wage changes, although the estimate varies substantially across specifications (likely in part due to the changing comparisons being made).

The estimated wage anchoring is more than twice as large if we restrict the sample to private-sector firms, as shown in Column 4 of Appendix Table A4.

[18] To maximize statistical power in the comparatively small samples in Table 2 (see Sub-section 2.2), we use a Frisch-Waugh approach in Panel B and residualize our dependent variable (log foreign establishment wage) with respect to the city×job×year fixed effects and then regress the residuals on the (also correspondingly residualized) log headquarter wage, where the residualization is performed using the larger Sample 1. We also present the results controlling for the set of fixed effects in Appendix Table A3. This gives very similar but less precisely estimated results.

[19] In Panel A, we replace firm×job fixed effects with firm×skill-level fixed effects, and the job-specific local benchmark with a skill-level-specific local benchmark in Panel A.

[20] Firm×job fixed effects are replaced with firm fixed effects, and the controls for market wages are subsumed by city×year fixed effects.

3.3 Heterogeneity in wage anchoring

The within-firm-across-country correlation in wages does not vary much with the income level of the headquarter country. Panel B of Figure 1 shows the correlation for firms headquartered in the U.S., other high income countries, and all other countries.[21] We further characterize the types of employers, jobs, and locations where externally imposed changes in wages are (partially) transmitted to foreign establishments in Section 5.

Wages appear to be anchored to headquarters levels to a greater extent in low-skill jobs than in higher-skill jobs. This can be seen in Panel C of Figure 1, where we separately plot the relationship between headquarter and establishment wages for low, middle, and high-skill jobs. In Column 2 of Appendix Table A4, we interact HQw_{jft} with indicators for the relevant job being middle- and high-skill, as opposed to low-skill. A ten percent higher wage at headquarters is associated with a 2.8 percent higher foreign establishment wage in low-skill jobs, and 1.2 percent higher foreign establishment wages in both middle and high-skill jobs.

3.4 Correlation in wage slopes

The *slope* of the wage profile across jobs of consecutive skill levels at multinationals' foreign establishments is also highly correlated with the slope at headquarters. To show this, we replace the wage level in equation (1) with a corresponding measure of the establishment's wage slope. We consider occupational categories rather than narrowly-defined occupations (or jobs) themselves. A given occupational category o—for example, administrative jobs—often has jobs of multiple skill levels represented within an establishment. This allows us to construct a measure of the difference between the log average wage of jobs that are of skill level $l+1$ versus skill level l in the foreign establishment of firm f that is located in city c at time t: $\nabla \text{w}_{o(l,l+1)fct}$. We also replace the independent variable of interest HQw_{jft} with an analogously defined measure of the corresponding wage slope at the headquarters, $\nabla \text{HQw}_{o(l,l+1)ft}$.[22] The slope correlation, shown in Table 3, is similar to the wage level correlation in Table 2: a 10 percent greater difference in occupational category-specific wages between jobs of consecutive skill levels at headquarters is associated with a 1.4 percent greater difference in establishment wages between workers of the same occupational category and skill levels. The results are similar when the control for market wages is the occupational category-specific wage slope of other multinationals in the same city and when we instead include

[21] The estimates are shown in the figure notes. Similar estimates are shown in Column 3 of Appendix Table A4, although these coefficients are estimated pooling the sample and including interactions between the wage regressor and skill levels whereas the figure is constructed by splitting the sample, meaning that the controls are fully interacted with the skill levels.

[22] Occupation-specific average wages paid by other employers $\bar{\text{w}}_{j(-f)ct}$, is replaced with the analogously defined slope measure $\nabla \bar{\text{w}}_{o(l,l+1)(-f)ct}$; and the second benchmark measure, occupation×city×year fixed effects, is also replaced by occupation-category×skill level-pair×city×year fixed effects. Firm×occupation fixed effects are analogously replaced by firm×occupational category×skill level-pair fixed effects.

city×occupation-category×skill-level pair×year fixed effects, as in Column 2. In Columns 3-4, we measure the wage slope pooling together all occupation groups across consecutive skill levels within an establishment. When including the local benchmark wage slope (Column 3), the estimate is similar in magnitude as in columns 1-2, but less precise (p = 0.07). Including an establishment city×skill-level pair×year fixed effect as the benchmark (Column 4) yields a large but again noisier estimate. The estimated within-employer-across-country correlation in wage slopes is also markedly higher if we restrict the sample to private-sector firms, as shown in Column 5 of Appendix Table A4.

The results in this section leave open the possibility that changes in wages within firms are linked across space only via overlapping third factors, such as the firm's technology or production style. We next use location-specific external shocks to wages to show that headquarter wages themselves affect foreign establishment wages, while there is no evidence of the reverse effect.

4 Changes in Foreign Wages in Response to Externally Imposed Changes in Headquarter Wages

In this section we provide evidence suggestive of a *direct* link between a multinational's headquarters and foreign establishment wages. We do this by exploiting minimum wage changes in a firm's home country or state, and corroborate the findings using exchange rate fluctuations—another source of externally imposed variation in headquarter wages.

4.1 Event study analysis of minimum wage shocks

Minimum wage increases in headquarter countries and U.S. states occur throughout our data period. Their frequency, size, and locations are shown in Appendix Figure A5. The size of the increase varies substantially, and minimum wage hikes occur on all continents. We define a minimum wage hike as $\text{Hike}_{h(f)t} := \text{I}[\text{MINw}_{h(f),t} > \text{MINw}_{h(f),t-1}]$. Thus, $\text{Hike}_{h(f)t} = 1$ if the minimum wage in the headquarter location of firm f was higher in year t than in year $t-1$.

We begin with an event study. We look within a city, using establishments that experience at least one isolated minimum wage hike during the sample period as our treatment group.[23] Establishments in the same city whose headquarters do not experience a minimum wage hike during the sample period act as controls.[24] When a firm experiences multiple isolated hikes, we stack each occurrence. We then compare the evolution of wages in the two groups by estimating:

[23] An isolated minimum wage hike is a hike in which the headquarters location increases its minimum wage in a year the establishment is observed without also doing so in the previous or subsequent year.

[24] Later, when we focus on the impact of a minimum wage change in year t on wages in year t, we use the full sample. Only low-skill workers are included.

$$w_{jfct} = \sum_{k=-3}^{3} \alpha_1^k \mathbf{I}[\text{Hike}_{h(f),t-k} = 1, \text{Hike}_{h(f),t\pm 1-k} = 0] + \theta_{fj} + \theta_{ct} + \varepsilon_{jfct} \quad (2)$$

on the sample of low-skill jobs. The dependent variable, w_{jfct}, is defined as in Section 3. The coefficient $\hat{\alpha}_1^k$ represents the difference in wages paid to workers in a specific job in treated foreign establishments and that paid to workers in the same job in control establishment in the same city in year k relative to the event. Standard errors are clustered at the home country level.

We see clear evidence that the wages of foreign establishment workers increase after a minimum wage hike in the multinational's home country or state. In Figure 2 we plot the coefficients $\hat{\alpha}_k^1$ estimated relative to the year before the minimum wage shock ($k = -1$). Relative to control establishments, annual wages in treated establishments increase by about USD 700 in the year of the minimum wage hike—about 6.5 percent compared to the sample mean. The positive effect on wages in treated establishments persists three years after the minimum wage hike in the headquarter's country/state, decreasing slightly in magnitude over time.[25] Looking at the pre-period coefficients, there is some evidence of slightly increasing relative wages in the treated establishments, but this does not explain the clear break in the year of the minimum wage hike. The pre-trend could for example be explained by endogenous timing of minimum wage hikes in the headquarters location, a concern we address in Section 4.3.

We see a similar result when using the RAIS employer-employee data from Brazil. In Panel B of Figure 2 we show results from estimating (2) using this individual level administrative data. Although we see a similar slight pre-trend in wages, the impact is again visually clear starting from the year of the minimum wage hike—a relative increase of about 8.5 percent—and in these data does not appear to decay over the course of three years. As described in Section 5.2, RAIS is a balanced panel and records a more precise measure of wages than the data from the Company.[26] It may thus be better suited to estimating event-time-year specific estimates.

4.2 Average effect of minimum wage shocks on foreign establishment wages

The pattern in Figure 2 suggests that changes in home country and state minimum wage laws can be used to estimate the impact of headquarter wage changes on foreign establishment wages. We first show results from a reduced-form regression relating year t percentage changes in wages paid in a foreign establishment to the home country/state minimum wage increasing from year $t-1$ to t,

[25] The pattern is similar if instead of stacking establishments' isolated minimum wage hike events we focus on the first or the last one they experience; if we restrict attention to establishments that experience a single isolated minimum wage hike during our data period; and if we define and restrict attention to hikes that are more isolated than those in Figure 2.

[26] Because the multinationals in our Brazil event study sample are headquartered in relatively few locations abroad (six), we wild-bootstrap the standard errors clustering at the headquarter country level in Figure 2, Panel B, and Figure 3 (Cameron *et al.*, 2008). The regression analyses in tables 8 and 9 use our full Brazil sample and thus do not suffer from this issue, so we do not bootstrap their standard errors.

controlling for job×city×year fixed effects and clustering standard errors at the home-country level:

$$\%\Delta \text{w}_{jfct} = \alpha_2 \text{Hike}_{h(f),t} + \theta_{jct} + \varepsilon_{jfct} \tag{3}$$

The indicator $\text{Hike}_{h(f)t}$ measures current-year changes in home minimum wages and the outcome variable is therefore a measure of concurrent percentage changes in wages (Jardim *et al.*, 2018; Cengiz *et al.*, 2019; Dustmann *et al.*, 2022). We use Sample 1 (see Section 2).[27]

We find that a minimum wage increase in the home country's or state's minimum wage is associated with a statistically significant 0.7 percent increase in the wages of workers in low-skill jobs at foreign establishments, as shown in Column 1 of Table 4.[28] For large minimum wage hikes (defined as those above median magnitude), the impact on foreign wages is twice as large. In Appendix Table A5 we show that the wages of middle- and high-skill jobs in foreign establishments are unaffected, although we do see evidence of minor spillovers to non-low skill jobs at headquarters. These results are not statistically significant.

Wage anchoring appears to be a headquarters effect. We find no effect of minimum wage changes in the country where a given foreign establishment is located on wages at the headquarters, nor on wages at foreign establishments that are part of the same firm but located in other countries, as shown in Columns 1 and 2 of Appendix Table A8.

We next provide evidence that the foreign wage response to minimum wage shocks at headquarters operates through headquarter wages. We first regress the percentage change in the average wage firm f pays workers in a given job j at the headquarters in year t, $\%\Delta\text{HQw}_{jft}$, on the minimum wage change indicator $\text{Hike}_{h(f)t}$. More specifically, the first stage is: $\%\Delta\text{HQw}_{jft} = \gamma_2 \text{Hike}_{h(f)t} + \theta_{jt} + \varepsilon_{jft}$, where for headquarters ($c = h(f)$), job×city×year fixed effects ($\theta_{jh(f)t}$) are replaced with job×year fixed effects (θ_{jt}), because the former subsume the regressor of interest, $\text{Hike}_{h(f)t}$.

As seen in Column 2 of Table 4, an increase in the home country's/state's minimum wage is associated with a roughly 3 percent increase in the wages of workers in low-skill jobs at the headquarters.

[27] We include job×city×year fixed effects throughout our analysis whenever the outcome variable is at establishment×job level and in first differences. In (3) and (4), the fixed effects subsume the regressor of interest for headquarters; therefore, we include headquarters—including those of firms which do not report data on their foreign establishments to the Company—in the estimation sample together with foreign establishments to help improve statistical power (though the reduced form coefficients of interest are still identified off of the foreign establishments). For the same reason we also include all headquarter observations whenever we examine the impact of external wage shocks on headquarter wages (i.e., a first stage regression). Whenever the outcome variable is in first differences, we also ensure that they are not taken across periods when the Company had different data collection procedures (see Appendix III).

[28] This estimate is almost an order of magnitude smaller than that in Figure 2, but the two are not directly comparable for several reasons, including that we look at all hikes instead of isolated hikes, and that we use the whole sample of firms instead of including only "clean" controls. Interestingly, the same is not true in the RAIS administrative data (see Sub-section 5.2). In Appendix Table A6, we show that estimate is robust to alternative definitions of a low-skill job (although when broadening the definition of low skill to include a sixth skill level in Column 4, p = 0.09 for the reduced form estimate). In Appendix Table A7 we limit the sample to private sector firms.

We then instrument for the change in job-specific headquarter wages, replacing $\text{Hike}_{h(f)t}$ in (3) with the first-stage estimates $\widehat{\%\Delta \text{HQw}}_{jft}$. We estimate the second stage using two-sample two-stage least squares (TS2SLS) (Angrist & Krueger, 1992; Inoue & Solon, 2010). Recall that there are many employer×occupation×year cells for which we have data on establishment but not headquarter wages. Using TS2SLS, we can include all jobs in foreign establishments and headquarters of all the employers in our analysis sample. TS2SLS provides a consistent estimate if (the probability limit of) the correlation between the endogenous variable(s) and the instruments (conditional on controls) is the same in the first-stage sample and the second-stage sample.[29]

As shown in Column 3 of Table 4, we find that a minimum wage change-induced 1 percent increase in the wages of workers in a given low-skill job at headquarters raises the wages of workers in the same job at the foreign establishments of the same multinational by about 0.2 percent, although the preferred IV estimate is not statistically significant (p = 0.16).[30]

We interpret Table 4 as evidence that externally imposed changes in headquarter wages *themselves* affect wages in multinationals' foreign establishments.[31] In the next sub-section we show that endogenous timing of minimum wage changes is unlikely to explain these results: the forces underlying a change to the minimum wage in the country or state where an employer is headquartered appear to be ignorable in our analysis. In Section 5 we in turn consider various direct and indirect pathways through which changes in headquarter wages may affect foreign establishment wages.

4.3 An identification concern: endogenous timing of minimum wage changes

Dickens (2015) documents wide variation in how minimum wages are set across countries, and across U.S. states. Nevertheless, it could be that minimum wage increases more often occur when aggregate labor demand is high, and that home labor demand is highly correlated with multinationals' demand for labor abroad.

Fluctuations in demand for foreign labor that co-vary with home country/state minimum wage changes should arguably extend beyond the particular part of the wage distribution most affected by minimum wages themselves. We thus compare wage changes for workers in higher and lower-

[29] Intuitively, this assumption requires that the average treatment effect of home country/state minimum wage increases on the (unobserved) headquarters low-skill wages in the subset of observations that have no such information in our data is similar to that on observed headquarter low-skill wages. One can alternatively focus on the reduced form estimates.

[30] Our preferred approach is to use all minimum wage hikes in headquarter countries/states. Using only above-median-size hikes or above-25th-percentile size hikes gives a larger reduced form estimate as well as a larger and more precise ($p < 0.05$) IV estimate, as shown in columns 4-6 of Table 4 and columns 1-4 of Appendix Table A9. Using the size of the hike (percentage change in home minimum wage) also gives positive and sizeable reduced form and first stage estimates ($p = 0.09$ and $p < 0.001$) as shown in columns 5 and 6 of Appendix Table A9, which yield almost the same IV estimate as column 3 in Table 4. The IV estimate is somewhat bigger for private-sector firms ($p = 0.07$), as shown in Appendix Table A7.

[31] These shocks might additionally affect the wages of other local employers, in which case our estimates capture the impact on the directly affected establishments—the establishments whose headquarters are exposed to the shock itself—over and above the broader impact affecting control establishments in the same foreign city.

wage low-skill jobs within a given establishment, thereby differencing-out the impact of broader fluctuations in labor demand on foreign wages.

Specifically, we define the minimum wage as (loosely) binding for job j in city c if an establishment in our sample located in the city ever paid its workers in job j a nominal gross wage lower than the new minimum wage in the year preceding the minimum wage change.[32] *Binding jobs* are thus a subset of low-skill jobs. When firms are headquartered in a city where $\text{Binding}_{jh(f)} = 1$, we define the minimum wage as binding also for job j in its foreign establishments. The reduced form relationship between home country/state minimum wage changes and the wages of binding versus non-binding jobs in foreign establishments is:

$$\%\Delta \text{w}_{jfct} = \alpha_3 \text{Hike}_{h(f)t} + \alpha_4 \text{Hike}_{h(f)t} \times \text{Binding}_{jh(f)} + \theta_{jct} + \varepsilon_{jfct} \tag{4}$$

Within foreign establishments, home country/state minimum wage increases may affect the wages of workers in the lowest-paid low-skill jobs—those for which the minimum wage binds at headquarters—more than those of workers in other low-skill jobs. The estimate in Column 1 of Table 5 suggests that a minimum wage hike in the home country's/state's minimum wage results in a 1.3 percentage point larger increase in wages for binding low-skill jobs (p = 0.07). The estimated impact of minimum wage hikes on binding jobs at the headquarters is also substantially larger than that on non-binding jobs.[33]

The differential wage response in foreign jobs for which the minimum wage binds at headquarters may over- or underestimate the true effect on the wages of low-wage workers in foreign establishments.[34] In Appendix I we instead compare the foreign wage response of *employers* that are differentially exposed to minimum wage changes at their headquarters. We find larger impacts on the wages of low-skill workers in foreign establishments with more exposed headquarters.

The evidence in this sub-section suggests that endogenous timing of minimum wage changes is not the primary explanation for the estimated transmission of headquarter wage increases to multinationals' foreign establishments. In Section 5 we consider a range of alternative pathways

[32] Given the unbalanced nature of our establishment×year panel, we face a trade-off between constructing a measure of bindingness that is specific to a given firm/headquarters, and measuring bindingness as close in time as possible to the minimum wage change. We opt for a labor market-level measure of bindingness akin to Card & Krueger (1995) and subsequent industry-level studies for power reasons.

[33] The corresponding estimate at the headquarter (shown in Column 2) is 2.8 percentage points (p = 0.13). In Columns 3 and 4 we restrict attention to larger minimum wage hikes—those of above median size magnitude—for which the increase in foreign establishment wages is 1.2 percentage points (or 106 percent) larger in binding than in other low-skill jobs. The corresponding estimate at the headquarter (shown in Column 4) is 2.9 percentage points.

[34] On the one hand, home country or state labor demand that directly affects multinationals' foreign wages and also encourages minimum wage increases may disproportionately be demand for low-wage workers. On the other hand, causal effects of minimum wage changes on the wages of workers that are higher up in the low-skill wage distribution within a given foreign establishment may arise through market-driven spillover effects in wage-formation (Teulings, 2003; Haanwinckel, 2019), or through firms' wage-setting procedures.

through which headquarter country minimum wage shocks might affect establishment wages.

4.4 An alternative source of changes in HQ wages: exchange rate shocks

Transmission of minimum wage shocks appears to occur at least in part because multinationals anchor their wages to headquarter levels. We now use a complementary source of variation in headquarter wages: exchange rate shocks to the home country's currency. Exchange rate-induced variation is a useful complement to the minimum wage shocks for two reasons. First, unlike minimum wages, exchange rates both increase and decrease over time, allowing us to investigate foreign wage responses to both positive and negative shocks to (real) headquarter wages.[35] Second, exchange rate shocks are temporary, meaning that employers are unlikely to make concurrent changes in their technologies or employment structures in response. Relative to minimum wage changes, exchange rate fluctuations also occur more frequently, as we show in Appendix Table A10.

If a multinational does not fully index its headquarter wages to e.g. the USD, a home country currency appreciation will increase headquarter wages measured in such international currencies. Wages at the multinational's foreign establishments will then also rise (in international currency terms) if its wage-setting system entails particular forms of anchoring-to-the-headquarters. These include:

1. USD-value wage-level anchoring A firm that pays in establishments' local currencies or in USD might compute the wages to pay at the headquarters and abroad using up-to-date exchange rates in a way that ensures that its wages are (partially) aligned in USD terms. The exchange rate updating and the wage adjustment may for example be automatically done within a firm-wide HR system.

2. Home country currency anchoring If a firm pays its workers abroad in, or partially indexes their pay to, the home country currency, then shocks to its value will be directly transmitted to foreign establishments, as long as nominal wages are not fully adjusted for changes in purchasing power.

To estimate the relationship between exchange rate shocks and a firm's wages, we run:

$$\mathrm{w}_{jfct} = \alpha_5 \mathrm{e}_{h(f)t} + \theta_{fj} + \theta_{ct} + \varepsilon_{jfct} \tag{5}$$

where $\mathrm{e}_{h(f)t}$ is the log average nominal exchange rate of home country currency units per unit of USD in year t.[36] Standard errors are clustered at the home country currency zone level. Only foreign

[35] We show this and approximate symmetry of exchange rate changes around zero in Appendix Figure A6.

[36] As we do not observe the point-in-time exchange rates when wages are paid out, we approximate these using annual exchange rates retrieved from the World Bank. The resulting measurement error in the exchange rates is the main reason why we adopt the log specification in this section instead of the percentage change specification (as taking the first difference exacerbates measurement error and attenuation bias (see Griliches & Hausman, 1986)). Since we include establishment-city×year fixed effects, (1) it is equivalent (i) to measure the foreign establishment wages in either the USD (our approach) or the local currency, and (ii) to use the home-country-currency-to-USD exchange rate (our approach) or the home-to-establishment-country-currency bilateral exchange rate; and (2) any depreciation or

establishments located outside the home country or currency zone are included.[37] In our preferred specification we control for the headquarter country currency's longer-run trend, which could reflect persistent, underlying changes in its economy that themselves affect multinationals' wages abroad.[38]

We find that a home country currency appreciation increases the dollar value of the wages paid to workers in multinationals' foreign establishments. The estimate in Column 1 of Panel A in Table 6 implies that a 10 percent decrease in the exchange rate of home country currency to USD leads to a 0.8 percent increase in the dollar value of wages in foreign establishments. Panel B shows that, at headquarters, a 10 percent appreciation leads to a wage increase of about 6 percent. In columns 2 and 3, we restrict attention respectively to depreciations and appreciations. Consistent with downward nominal rigidity, we see that the foreign establishment wage response is coming in large part from establishment wages responding to home country currency appreciations.[39]

In Panel C of Table 6, we instrument for headquarter wages by replacing $e_{h(f)t}$ in (5) with the first stage estimates $\widehat{HQw}_{jft}$.[40] The estimates are somewhat imprecise but suggest that an exchange rate shock-induced increase in headquarter wages of 1 percent leads to a 0.14 percent increase in foreign establishment wages.

The impact of shocks to the exchange rate of the home country currency on headquarter wages (in USD terms) is transitory (see Appendix Figure A7). We therefore do not expect exchange rate fluctuations to affect longer-run "latent" wages at foreign establishments. This is what we find: the impact of home country exchange rate shocks on foreign establishment wages is also transitory, as also shown in Appendix Figure A7.[41] In Appendix II we show that endogenous timing of exchange rate shocks is unlikely to explain the results in Table 6.

Taken together, the evidence in this section suggests that externally imposed changes in multinationals' headquarter wages themselves cause changes in their foreign establishment wages.

appreciation of the USD against other currencies is subsumed.

[37] Same-currency-zone establishment wages mechanically respond to exchange rate shocks also absent anchoring.

[38] In Appendix Table A11 we leave this linear trend out. The take-aways from Table 6 are largely unchanged. The same holds when only including private-sector firms (see Appendix Table A12).

[39] For multinationals that pay foreign workers in local currency or USD and engage in USD-value wage level anchoring, home country currency appreciation (depreciation) is an upward (downward) force on the nominal wages paid abroad. Downward rigidity then implies that pass-through of appreciation should be larger (see Appendix II).

[40] In the first stage estimation, city×year fixed effects are replaced with year fixed effects because headquarter-city×year fixed effects subsume the regressor of interest $e_{h(f)t}$.

[41] Unlike an exchange rate shock, a minimum wage increase in a home country is in effect a permanent shock to the nominal wage of some jobs at headquarters, and therefore enter longer-run "latent" wages. We find no evidence that a minimum-wage-induced foreign wage increase is followed by a slow-down (mean reversion) in wage growth in the following years, as Figure 2 also suggests.

5 Why Changes in Headquarters Wages Affect Foreign Wages

In this section we investigate why employers anchor their wages and transmit home wage changes to establishments located in fundamentally different labor markets. We begin by describing the types of employers, jobs, and locations where transmission of headquarter minimum wage shocks to foreign establishments is observed. We then use granular employer-employee data from Brazil to investigate if the transmission of wage shocks appears to operate through indirect pathways, such as offshoring and technology adoption that in turn affects foreign wages. We conclude that wage anchoring is most likely a result of firm-wide wage setting practices.

5.1 Which employers, jobs, and locations?

We collected information on 55 attributes—characteristics of the headquarter country, the establishment country, the multinational's sector, the job in question, and the headquarter-establishment country pair—that may predict wage anchoring.[42] We run a regression akin to equation (3) on all jobs and use a causal forest algorithm to infer which of these attributes to the greatest extent capture heterogeneity in the treatment effect of a headquarter country/state minimum wage change on foreign establishment wages (Wager & Athey, 2018; Carlana & La Ferrara, 2021). We orthogonalize both the outcome variable and the treatment indicator with respect to the job×city×year fixed effects as well as all covariates to minimize confounding (Athey *et al.*, 2019). Standard errors are clustered at the headquarter-location level, and we standardize all potential predictors to have zero mean and unit standard deviation within each skill group to facilitate comparisons. Appendix IV provides a detailed description of the estimation procedure.

As in Section 4 we distinguish between low- and higher-skill jobs and focus primarily on the former since their wages may directly respond to minimum wage changes.[43] Appendix Figure A8 shows that the estimates of the conditional treatment effect (CATE) are mostly positive for low-skill jobs (Panel A), and they group observations into those with different average treatment effects (ATE) quite well (Panel B).[44]

Following Carlana & La Ferrara (2021), we present results on drivers of heterogeneity in transmission by displaying the difference in means of the predictors between above- and below-median CATE observations. Table 7 shows the mean value of the relevant variable among above-median wage shock transmission low-skill job observations, measured in standard deviations, relative to the

[42] The full set of attributes are shown in Table 7 and described in greater detail in Appendix III.

[43] Note that, since the causal forest estimation also includes skill level (and controls for the fixed effects from (3)), our approach here is consistent both with that in Sub-section 4.2 and that in Sub-section 5.2.

[44] The average treatment effect (ATE) within each octile defined by the forest-estimated conditional average treatment effect is the difference in the outcome variable between the treated and the untreated groups after controlling for the fixed effects from (3). For higher-than-low-skill jobs, the CATE and ATE estimates are centered around a slightly positive mean which is substantially smaller than that of the low-skill jobs, consistent with the result in Appendix Table A5.

mean of the low-skill sample.[45]

Several country-pair characteristics predict a small versus a large treatment effect size. Panel A of Table 7 shows consistent evidence that wage shock transmission is greater in more closely connected country-pairs and those which share more similarities, such as being closer to each other, being in a regional trade agreement, having higher mutual historical migration and a smaller difference in GDP, or sharing a religion or a language.[46]

In panels B and C we do not see consistent evidence that wage shock transmission is higher when "offshorability" is higher, although we do see some evidence that occupational offshorability is slightly higher for observations with high transmission. Such observations are also those with jobs that entail less abstract tasks, which is hard to reconcile with an explanation operating through induced technology adoption—although the difference across above- and below-median CATE observations in occupation characteristics is generally small. Headquarter country characteristics are not very predictive of high wage shock transmission.

Establishment country characteristics are generally more predictive of high wage shock transmission. Wages in establishments located in more unequal, more urbanized, and wealthier countries are more responsive to headquarter wage shocks. High and low transmission observations also differ in the establishment country's cultural dimensions and measures of preferences.[47] Wages in establishments located in countries with a high-indulgence and a more short-term oriented and less individualistic culture are more responsive. Less intuitively, those in establishments located in countries with lower reciprocity, lower altruism, and lower trust are also more responsive.

Some of the most plausible indirect transmission pathways—alternatives to wage-setting procedures themselves "carrying" wage changes across borders—involve minimum wage changes triggering offshoring, firm-wide productivity growth, or technological upgrading that in turn raises foreign wages. The evidence in Table 7 does not point towards these possibilities, but is hardly conclusive. We next explore them more directly.

5.2 Through employment changes?

There are several different theoretically plausible, indirect pathways from changes in wages at multinationals' headquarters to the wages they pay in other countries that would operate through changes in employment. Our primary interest is in ones that can explain the phenomenon of wage shock transmission itself.[48] To analyze how plausible they—and the pathways operating through

[45] Our standardization makes sure that the below-median conditional average treatment effect observations' mean is the same in absolute value but of the opposite sign (and thus omitted from the table).

[46] See Appendix III for details on how we measure country-pair and job attributes.

[47] These are measured respectively through Hofstede (2001)'s "cultural dimensions" and the Global Preference Survey.

[48] Subsequent changes in employment—for example, the establishment attracting more productive workers or outsourcing the lowest-wage establishment jobs as a result of increased wages—may magnify the impact of the shock in foreign

firm-wide technology adoption we discuss in Sub-section 5.3—*empirically* are as explanations, the timing of wage shock transmission is important to keep in mind: we saw in Section 4 that external shocks to wages in an employer's home country or state affect wages in its foreign establishments immediately—that is, in the year of the wage shock itself.

We use both the global data from the Company and the more granular employer-employee data from Brazil to investigate. We first confirm that the firm-wide wage patterns from the employers in the Company data also appear to exist in the subset of firms that operate in Brazil.

The binned scatter plot in Panel A of Appendix Figure A9 shows the correlation between the skill-level wages at a given multinational-owned establishment located in Brazil measured using the Company data (x-axis) and the RAIS data (y-axis) respectively. The wages measured in the two datasets are strongly correlated with a slope of about 0.5. In Panel B, we show the correlation in skill-level wages between a given multinational's foreign establishments located outside of Brazil in the Company data (x-axis) and all of its foreign establishments located within Brazil in the RAIS data (y-axis).[49] We include employer×skill-level and city×year fixed effects. The estimated correlation between the two is 0.042—about 35 percent of the headquarter-foreign establishment correlation (0.062) in the full Company data.[50]

We find clear evidence in the administrative data that external shocks to wages at multinationals' headquarters are transmitted to their establishments in Brazil. Recall from Sub-section 4.1 that treated establishments in Brazil have slightly higher wage growth prior to a minimum wage shock at "home", but that there is a large and significant break the year of the minimum wage shock—a wage increase of about 8.5 percent—as we saw in Figure 2.

We now turn to estimating the impact of minimum wage shocks, using year-to-year changes in the minimum wage. The regression estimate isolating the impacts of minimum wage changes using the RAIS data is shown in Table 8. The wage effect is relatively large—close in magnitude to the event study estimate in Panel B of Figure 2—and is concentrated among low-skill jobs. In Appendix Table A13 we show that the foreign wage impact of exchange rate variation in headquarter wages is also larger than the impact we found in the global data in Sub-section 4.4.

establishments and affect the profitability of "anchored" wage-setting procedures. However, such reinforcement dynamics would then follow from headquarter wage changes more directly affecting foreign establishment wages in the first place.

[49]We include all establishments of these multinationals located in Brazil from the administrative data even if they are not all available in the Company data (see footnote 16). We use the correlation with wages at establishments outside of Brazil rather than headquarter wages because (a) the small fraction of foreign establishments in the Company data for which we have corresponding headquarter wage data and (b) the small fraction of employers in the Company data that operate in Brazil "multiplicatively" leave us with few headquarter observations. (a) is irrelevant for estimating reduced-form effects of headquarter country/state wage shocks on RAIS-measured wages and employment, as we do in figures 2 and 3 and tables 8 and 9.

[50]This correlation includes the fact that RAIS records a different and more precise measure of wages than the Company data (see Panel A of Figure A9).

Within-firm offshoring We now consider specific ways in which externally imposed changes in wages at a multinational's headquarters might affect foreign establishment wages through changes in employment. A first possibility centers on offshoring of jobs or tasks. When forced to pay workers at headquarters more, an employer might reduce the number of workers employed or hours worked there, shifting workload to foreign establishments, which could trigger a simultaneous rise in foreign wages (see e.g. Feenstra & Hanson, 1996).

We test for this possibility in several ways. First, we measure the annual wage normalized by the number of days an individual works during the year.[51] As seen in columns 2 and 4 of Table 8, we find partial—and if anything slightly higher—transmission of the wage shock also to such "effective" wages in Brazil, suggesting that multinationals' workers there are not earning more when the minimum wage rises at headquarters because they are working more days of the year.

Employers may additionally incentivize foreign workers to do more work *per day or hour* when wages rise at headquarters. This form of offshoring is more difficult to test for. However, differences in task "offshorability" across low-skill jobs and sectors with high vs. low wage shock transmission are small, as we saw in panels B and C of Table 7. We also find no impact of home country/state minimum wage changes on middle- or high-skill job wages at foreign establishments (see columns 1 and 2 of Appendix Table A5).

We next directly examine how employment at foreign establishments responds to minimum wage shocks at headquarters. If certain jobs are offshored to Brazilian establishments, employment should rise there. Using both the global data from the Company and the Brazilian employer-employee data, we first look at the impact on the *extensive margin* of job level employment in foreign establishments (see Goldschmidt & Schmieder, 2017). We estimate equation (3) but now with the outcome being an indicator for a job being present in year $t-1$ but not in year t. We next look at *intensive margin* responses—the percentage change in the number of workers employed in a position—using the Brazilian data.[52] The results are presented in Table 9. We see limited impacts of minimum wage shocks on both margins of employment. The estimates are imprecise but close to zero. The results from estimating the event study in equation (2) with the number of employees in a given Brazilian establishment as the outcome are presented in Figure 3, where we again see very little sign of impact on employment.[53]

[51] This measure captures sick leave, parental leave, military service leave, unpaid leave, and full/part-time adjustments.

[52] Because of the Company's focus on job-level wages, information on the intensive margin of employment is often missing in their data. Note that, since our analysis focuses on across-country wage compression within firm×job cells, extensive margin employment responses are unlikely to explain wage shock transmission on their own.

[53] Muendler & Becker (2010) show evidence that German manufacturers' decisions to open establishments abroad (in their terminology, the "extensive margin") and their employment levels there (the "intensive margin") are quite (positively) related to the collectively bargained wages they face at home (see also Harrison & McMillan, 2011). Here we find no (or if anything a small negative) employment-in-Brazil response to minimum wage shocks at multinationals' headquarters. These two findings are not inconsistent, however. First, the multinationals in our sample span a broader range (of both sectors and home locations), and the foreign establishments in our sample are of a different type (many

Firm level shock propagation A second possibility is that external shocks to wages in the home market are large enough to affect the firm's broader operations in ways that ultimately impact foreign workers' wages through changes in employment. Suppose that a firm shares rents with its workers, but that minimum wage shocks in the headquarter country or state reduce firm-wide profits. This could incentivize the firm to scale down, reducing the size of its foreign establishments. If a firm fires its least productive foreign establishment workers when profits fall, and the remaining, more productive workers have higher wages, such a compositional change in the firm's workforce might itself imply higher average wages within each position.

In Appendix Table A14 we use the Orbis data to show a close to zero, albeit imprecisely estimated, effect of minimum wage shocks at the headquarters on firms' profits (Column 1). This is arguably not surprising given the large size of the employers in our data and the comparatively small size of the shocks.[54] In addition, the (fairly imprecise) estimates in Table 9 and Figure 3 point towards no or a negative but small impact on foreign establishment employment. It thus appears unlikely that propagation through firms' broader operations explain the documented wage change transmission.

Productivity spillovers A third possibility is that headquarter wage shocks affect the wages of some categories of foreign establishment workers through changes in labor demand and others through productivity spillovers. Rather than being an independent potential explanation for our findings, productivity spillovers may make it difficult to test for other alternative explanations. A specific possibility is that headquarter wage shocks raise demand for workers in offshorable job categories abroad, but that the wages of coworkers in non-offshorable jobs rise because of productivity spillovers.[55] However, recall that we see little change in foreign establishment employment when

are local headquarters), than those in Muendler & Becker (2010). Second, they find significantly greater responsiveness to home wages on offshoring's extensive margin—a margin that our analysis holds constant. Finally, and perhaps most importantly, we document wage compression—not, and in fact quite far from, equalization—across multinationals' headquarter and foreign establishment countries. In Table 2 the variation in home wages comes, as in Muendler and Becker (2010), not from a wage shock, but rather more general supply and demand movements in the home market. We find that 10 percent higher wages at the headquarters are associated with 0.7-4.5% higher foreign establishment wages for workers in the same position. This leaves considerable scope for stronger incentives to for example open establishments abroad when wages rise at home, as in Muendler & Becker (2010).

[54] These results are estimated using a sample extracted from Orbis Historical which we can match to the Company data at the firm×year level. It should be noted that this sample consists of a relatively small number of ∼100 firms. Existing evidence on minimum wage changes' effect on firms' performance and factor choices is mixed, but overall points towards (i) a relatively small, although in some contexts robustly negative, impact on firm profits; and (ii) some degree of capital/labor substitution (see e.g. Draca *et al.* (2011); Harasztosi & Lindner (2019); Hau *et al.* (forthcoming) and references therein). However, existing research generally studies relatively localized firms that are more exposed to minimum wage hikes in the headquarter country/state than multinationals.

[55] Another possibility is that higher-skill workers at headquarters (also) become more expensive to employ when low-wage coworkers' wages rise; that high-skill positions therefore move to foreign establishments; that this increases the productivity of low-skill workers abroad through spillovers; and that their wages therefore rise. Recall, though, that we see a very small impact of headquarter minimum wage shocks on the wages of or employment of foreign workers

minimum wages rise in firms' headquarter country or state.

5.3 Through induced firm-wide technology adoption?

A final possibility is that multinationals invest in capital or upgrade their technology in response to home country/state minimum wage increases (see e.g. Aaronson & Phelan, 2017); that these changes affect the entire firm; and that this in turn increases the productivity of the firm's workers in foreign establishments and consequently raises their wages. Like the employment channels discussed above, this pathway to foreign wages would (i) leave this paper's main findings—the across-country wage shock transmission shown in Section 4—identified and informative, but (ii) represent a mechanism of substantively different nature than transmission through firm-wide wage-setting procedures.

We find no significant impact of headquarter minimum wage increases on firm-wide capital/labor ratios in Appendix Table A14. However, the coefficient is negative, suggesting that, if anything, firms invest in less capital following a minimum wage shock. The impact on wages in foreign establishment jobs that are more complementary with modern technology—Autor & Dorn (2013) argue that such jobs have tasks that are more abstract—are also somewhat smaller, while manual-task jobs that are relatively independent of computer capital tend to display slightly higher wage shock transmission (see Panel B of Table 7). These findings are difficult to reconcile with technology adoption explaining the estimated impact of minimum wages at headquarters on multinationals' foreign establishment wages.

We conclude that, absent accompanying direct effects, indirect pathways—changes in employment triggered by broader forms of firm level shock propagation, productivity spillovers, or firm-wide technology adoption—are unlikely to explain why external shocks to headquarter wages affect the pay of same-position employees in foreign establishments.

5.4 Firm-wide wage-setting procedures

To summarize, we have documented five facts. First, within multinationals, the nominal wages of foreign establishment workers employed in a given position are highly correlated with those of headquarter workers in the same position: in the raw data and across the full skill-distribution, the former are 89 percent of the latter, and 78 percent when the foreign establishment is in a poorer country. Second, holding constant the firm$\times$job and city$\times$year in question, the correlation in wage changes is especially high for low-skill workers such as cleaners, drivers, and security guards. Third, increases in headquarters wages induced by a change in the home country or state's minimum wage laws also raise wages in foreign establishments. The impact on foreign wages begins in the year of the minimum wage hike. We also show that another form of external shock to headquarters

in higher-skill positions.

wages—exchange rate fluctuations—similarly affects foreign establishment wages. Fourth, predictors of transmission of headquarters wage shocks to foreign establishments are primarily links between the headquarter country and the establishment country, as well as the establishment country's socioeconomic characteristics and cultural traits. Finally, we saw in the previous subsection that the initial impact of external headquarter wage shocks on foreign establishment wages does not appear to arise indirectly, through induced changes in employment or firm-wide technology.

Together, this evidence indicates that multinationals' headquarters wages *directly* affect foreign wages. Our five findings are difficult to reconcile with other explanations. A direct effect likely arises because multinationals use firm-wide wage-setting procedures that either explicitly or effectually tie foreign workers' wages to headquarter wages. Understanding why multinationals use such wage-setting procedures is an important topic for future research.

6 Conclusion

In this paper we show that many large multinationals use firm-wide wage-setting procedures that are imperfectly adjusted to local labor market conditions, instead "anchoring" the wages they pay domestic workers in a given occupation at their foreign establishments to the wages they pay workers in the same occupation in the home country. They do so across the occupational skill range—including for low-skill support staff—and partially transmit wage increases externally imposed on the headquarters to their foreign establishments. Our results point toward the existence of consequential "wage norms", which may contribute also to phenomena such as the acyclicality of wages and lack of delegation to establishments outside of firms' home region (see e.g. Lemieux *et al.*, 2012; Aghion *et al.*, 2017).

The reasons why employers use firm-wide wage-setting procedures may have to do with the cost of continuously gathering information about "appropriate" wages to pay in a given, frictional labor market (Lemieux *et al.*, 2009, 2012). The financial consequences to the firm of anchored wage-setting are far from obvious. High wages may for example increase worker morale and effort, or over time attract more productive workers, even if such responses occur only after—and do not in isolation explain why—foreign wages rise. If managers over time learn that efficiency wage-like dynamics can increase worker productivity, this may reduce incentives to tailor wage-setting procedures to each labor market the multinational operates in. On the other hand, there is also growing evidence that informational barriers to optimizing organizational procedures are difficult to overcome even for large firms (see e.g. DellaVigna & Gentzkow, 2019; Almunia *et al.*, 2024; Dube *et al.*, 2020).[56]

[56] Hjort *et al.* (2024) study firm structure consequences of differences in what private-sector multinationals pay *high-skill* workers in richer versus poorer countries using a subset of the data from the Company we analyze in this paper.

References

AARONSON, DANIEL, & PHELAN, BRIAN J. 2017. Wage Shocks and the Technological Substitution of Low-wage Jobs. *The Economic Journal*, **129**(617), 1–34.

ABADIE, ALBERTO, ATHEY, SUSAN, IMBENS, GUIDO W, & WOOLDRIDGE, JEFFREY M. 2023. When should you adjust standard errors for clustering? *The Quarterly Journal of Economics*, **138**(1), 1–35.

ABOWD, JOHN M., KRAMARZ, FRANCIS, & MARGOLIS, DAVID. 1999. High Wage Workers and High Wage Firms. *Econometrica*, **67**, 251–333.

ADAMS, BRIAN, & WILLIAMS, KEVIN R. 2019. Zone Pricing in Retail Oligopoly. *American Economic Journal: Microeconomics*, **11**(1), 124–56.

AGHION, PHILIPPE, BLOOM, NICK, LUCKING, BRIAN, SADUN, RAFFAELLA, & VAN REENEN, JOHN. 2017. *Turbulence and Decentralization in Bad Times*. CEP Discussion Paper No. 1479.

ALFARO-URENA, ALONSO, MANELICI, ISABELA, & VASQUEZ, JOSE P. 2019. *The Effects of Multinationals on Workers: Evidence from Costa Rica*. Mimeo Universidad de Costa Rica.

ALMUNIA, MIGUEL, HJORT, JONAS, KNEBELMANN, JUSTINE, & TIAN, LIN. 2024. Strategic or confused firms? evidence from "missing" transactions in Uganda. *Review of Economics and Statistics*, **106**(1), 256–265.

ANGRIST, JOSHUA D, & KRUEGER, ALAN B. 1992. The effect of age at school entry on educational attainment: an application of instrumental variables with moments from two samples. *Journal of the American statistical Association*, **87**(418), 328–336.

ATHEY, SUSAN, TIBSHIRANI, JULIE, & WAGER, STEFAN. 2019. Generalized random forests. *The Annals of Statistics*, **47**(2), 1148–1178.

AUTOR, DAVID H, & DORN, DAVID. 2013. The growth of low-skill service jobs and the polarization of the US labor market. *American Economic Review*, **103**(5), 1553–97.

AUTOR, DAVID H., MANNING, ALAN, & SMITH, CHRISTOPHER L. 2016. The Contribution of the Minimum Wage to US Wage Inequality over Three Decades: A Reassessment. *American Economic Journal: Applied Economics*, **8**(1), 58–99.

BARTH, ERLING, BRYSON, ALEX, DAVIS, JAMES C, & FREEMAN, RICHARD. 2016. It's Where You Work: Increases in Earnings Dispersion Across Establishments and Individuals in the U.S. *Journal of Labor Economics*, **34**(S2).

BLINDER, ALAN S, & KRUEGER, ALAN B. 2013. Alternative measures of offshorability: a survey approach. *Journal of Labor Economics*, **31**(S1), S97–S128.

BLOOM, N., SADUN, R., & REENEN, J. VAN. 2012. Americans Do IT Better: U.S. Multinationals and the Productivity Miracle. *American Economic Review*, **102**(1), 167–201.

BLOOM, NICHOLAS, SONG, JAE, PRICE, DAVID, GUVENEN, FATIH, & VON WACHTER, TILL. 2018. Firming up inequality. *The Quarterly Journal of Economics*, **134**(1), 1–50.

BOEHM, CHRISTOPH E., FLAAEN, AARON, & PANDALAI-NAYAR, NITYA. 2019. Input Linkages and the Transmission of Shocks: Firm Level Evidence from the 2011 Tohoku Earthquake. *Review of Economics and Statistics*, **101**(1).

BOERI, TITO, ICHINO, ANDREA, MORETTI, ENRICO, & POSCH, JOHANNA. 2021. Wage equalization and regional misallocation: evidence from Italian and German provinces. *Journal of the European Economic Association*, **19**(6), 3249–3292.

BREZA, EMILY, KAUR, SUPREET, & SHAMDASANI, YOGITA. 2017. The Morale Effects of Pay Inequality. *The Quarterly Journal of Economics*, **133**(2), 611–663.

BROWN, DRUSILLA K., DEARDORFF, ALAN, & STERN, ROBERT. 2004. The Effects of Multinational Production on Wages and Working Conditions in Developing Countries. *In:* BALDWIN, ROBERT E., & WINTERS, L. ALAN (eds), *Challenges to Globalization: Analyzing the Economics*. University of Chicago Press.

BUDD, JOHN W., KONINGS, JOZEF, & SLAUGHTER, MATTHEW J. 2005. Wages and International Rent Sharing in Multinational Firms. *Review of Economics and Statistics*, **87**(1), 73–84.

CAMERON, AC, GELBACH, JB, & MILLER, DL. 2008. Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics*, **90**, 414–427.

CAMPA, JOSE MANUEL, & GOLDBERG, LINDA S. 2001. Employment versus wage adjustment and the US dollar. *Review of Economics and Statistics*, **83**(3), 477–489.

CAPPELLI, PETER, & CHAUVIN, KEITH. 1991. An Interplant Test of the Efficiency Wage Hypothesis. *Quarterly Journal of Economics*, **106**(3), 769–797.

CARD, D., MAS, A., MORETTI, E., & SAEZ, E. 2012. Inequality at work: The effect of peer salaries on job satisfaction. *American Economic Review*, **102**(6), 2981–3003.

CARD, DAVID, & KRUEGER, ALAN B. 1995. *Myth and measurement: the new economics of the minimum wage*. New Jersey: Princeton University Press.

CARD, DAVID, HEINING, JÖRG, & KLINE, PATRICK. 2013. Workplace Heterogeneity and the Rise of West German

Wage Inequality. *The Quarterly Journal of Economics*, **128**(3), 967–1015.

CARD, DAVID, CARDOSO, ANA RUTE, & KLINE, PATRICK. 2015. Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women. *The Quarterly Journal of Economics*, **131**(2), 633–686.

CARD, DAVID, CARDOSO, ANA RUTE, HEINING, JOERG, & KLINE, PATRICK. 2018. Firms and Labor Market Inequality: Evidence and Some Theory. *Journal of Labor Economics*, **36**(S1), S13–S70.

CARLANA, MICHELA, & LA FERRARA, ELIANA. 2021. *Apart but Connected: Online Tutoring and Student Outcomes during the COVID-19 Pandemic*. CEPR Discussion Paper 15761.

CENGIZ, DORUK, DUBE, ARINDRAJIT, LINDNER, ATTILA, & ZIPPERER, BEN. 2019. The effect of minimum wages on low-wage jobs: Evidence from the United States using a bunching estimator. *The Quarterly Journal of Economics*, **134**(3), 1405–1454.

CLEMENS, JEFFREY, & GOTTLIEB, JOSHUA D. 2017. In the Shadow of a Giant: Medicare's Influence on Private Physician Payment. *Journal of Political Economy*, **125**(1), 1–39.

CONYON, MARTIN J., GIRMA, SOURAFEL, THOMPSON, STEVE, & WRIGHT, PETER W. 2002. The Productivity and Wage Effects of Foreign Acquisition in the United Kingdom. *The Journal of Industrial Economics*, **50**(1), 85–102.

CULLEN, Z., & PEREZ-TRUGLIA, R. 2022. How Much Does Your Boss Make? The Effects of Salary Comparisons. *Journal of Political Economy*, **130**(3), 766–822.

CULPEPPER & ASSOCIATES INC. 2011. *Geographic Pay Differentials: Practices in Managing Pay Between Locations*.

DELLAVIGNA, STEFANO, & GENTZKOW, MATTHEW. 2019. Uniform Pricing in US Retail Chains. *The Quarterly Journal of Economics*, **134**(4), 2011–2084.

DICKENS, R. 2015. How are minimum wages set? *IZA World of Labor*, **2011**.

DICKENS, WT, & KATZ, LF. 1987. Interindustry Wage Differences and Industry Characteristics. *In:* K, LANG, & J, LEONARD (eds), *Unemployment and the Structure of Labor Markets*. Blackwell.

DRACA, MIRKO, MACHIN, STEPHEN, & VAN REENEN, JOHN. 2011. Minimum Wages and Firm Profitability. *American Economic Journal: Applied Economics*, **3**(1), 129–51.

DUBE, ARINDRAJIT, GIULIANO, LAURA, & LEONARD, JONATHAN. 2019. Fairness and Frictions: Impact of Unequal Raises on Quit Behavior. *American Economic Review*, **109**(2), 620–63.

DUBE, ARINDRAJIT, MANNING, ALAN, & NAIDU, SURESH. 2020. *Monopsony and Employer Mis-Optimization Explain Why Wages Bunch at Round Numbers*.

DUSTMANN, CHRISTIAN, LINDNER, ATTILA, SCHÖNBERG, UTA, UMKEHRER, MATTHIAS, & VOM BERGE, PHILIPP. 2022. Reallocation Effects of the Minimum Wage. *Quarterly Journal of Economics*, **137**, 267–328.

FALK, A., BECKER, A., DOHMEN, T., ENKE, B., HUFFMAN, D., & SUNDE, U. 2018. Global Evidence on Economic Preferences. *The Quarterly Journal of Economics*, **133**(4), 1645–1692.

FEENSTRA, ROBERT C., & HANSON, GORDON H. 1996. Foreign Investment, outsourcing and relative wages. *Chap. 6, pages 89–128 of:* GROSSMAN, GENE M., & IRWIN, DOUGLAS A. (eds), *The Political economy of trade policy: essays in honor of Jagdish Bhagwati*. MIT Press.

GIROUD, X., & MUELLER, H. 2019. Firms' Internal Networks and Local Economic Shocks. *American Economic Review*, **109**(10), 3617–49.

GIROUD, X., & RAUH, J. 2019. State Taxation and the Reallocation of Business Activity: Evidence from Establishment-Level Data. *Journal of Political Economy*, **127**(3), 1262–1316.

GOLDFARB, AVI, & XIAO, MO. 2011. Who thinks about the competition? Managerial ability and strategic entry in US local telephone markets. *American Economic Review*, **101**(7), 3130–3161.

GOLDSCHMIDT, DEBORAH, & SCHMIEDER, JOHANNES F. 2017. The rise of domestic outsourcing and the evolution of the German wage structure. *The Quarterly Journal of Economics*, **132**(3), 1165–1217.

GRILICHES, ZVI, & HAUSMAN, JERRY A. 1986. Errors in variables in panel data. *Journal of econometrics*, **31**(1), 93–118.

GROSSMAN, GENE M, & HELPMAN, ELHANAN. 2008. Fair wages and foreign sourcing. *The organization of firms in a global economy*, 273–310.

HAANWINCKEL, DANIEL. 2019. *Supply, Demand, Institutions, and Firms: A Theory of Labor Market Sorting and the Wage Distribution*. Mimeo U.C. Berkeley.

HARASZTOSI, PÉTER, & LINDNER, ATTILA. 2019. Who Pays for the Minimum Wage? *American Economic Review*, **109**(8), 2693–2727.

HARRISON, A, & SCORSE, J. 2010. Multinationals and anti-sweatshop activism. *American Economic Review*, **100**(1).

HARRISON, ANN, & MCMILLAN, MARGARET. 2011. Offshoring jobs? Multinationals and US manufacturing employment. *Review of Economics and Statistics*, **93**(3), 857–875.

HAU, HARALD, HUANG, YI, & WANG, GEWEI. forthcoming. Firm Response to Competitive Shocks: Evidence from China's Minimum Wage Policy. *Review of Economic Studies*.

HAZELL, JOE, PATTERSON, CHRISTINA, SARSONS, HEATHER, & TASKA, BLEDI. 2022. *National Wage Setting*. LSE working paper.

HELPMAN, ELHANAN, ITSKHOKI, OLEG, & REDDING, STEPHEN. 2013. Trade and Labor Market Outcomes. *Advances in Economics and Econometrics, Tenth World Congress, Volume II, Applied Economic*, 459–504.

HERMALIN, BENJAMIN E. 2013. Leadership and Corporate Culture. *Pages 432–476 of:* GIBBONS, R., & ROBERTS, J. (eds), *Handbook of Organizational Economics*. Princeton University Press.

HIJZEN, ALEXANDER, S.MARTINS, PEDRO, SCHANK, THORSTEN, & UPWARD, RICHARD. 2013. Foreign-owned firms around the world: A comparative analysis of wages and employment at the micro-level. *European Economic Review*, **60**, 170–188.

HJORT, JONAS, MALMBERG, HANNES, & SCHOELLMAN, TODD. 2024. *The Missing Middle Managers: Labor Costs, Firm Structure, and Development*. UCL working paper.

HOFSTEDE, GEERT. 1991. *Cultures and Organizations: Software of the Mind*. McGraw-Hill.

HOFSTEDE, GEERT. 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations across Nations*. 2nd edn. Thousand Oaks, California: Sage Publications, Inc.

INOUE, ATSUSHI, & SOLON, GARY. 2010. Two-sample instrumental variables estimators. *The Review of Economics and Statistics*, **92**(3), 557–561.

JARDIM, EKATERINA, LONG, MARK C., PLOTNICK, ROBERT, VAN INWEGEN, EMMA, VIGDOR, JACOB, & WETHING, HILARY. 2018. *Minimum Wage Increases, Wages, and Low-Wage Employment: Evidence from Seattle*. NBER Working Paper 23532.

KAHNEMAN, D., KNETSCH, J. L., & THALER, R. 1986. Fairness as a constraint on profit seeking: Entitlements in the market. *American Economic Review*, **76**(4), 728–741.

LEE, DAVID S. 1999. Wage Inequality in The United States During The 1980s: Rising Dispersion Or Falling Minimum Wage? *The Quarterly Journal of Economics*, **114**(3), 977–1023.

LEMIEUX, THOMAS, MACLEOD, W. BENTLEY, & PARENT, DANIEL. 2009. Performance Pay And Wage Inequality. *The Quarterly Journal of Economics*, **124**(1), 1–49.

LEMIEUX, THOMAS, MACLEOD, W. BENTLEY, & PARENT, DANIEL. 2012. Contract Form, Wage Flexibility, and Employment. *American Economic Review: Papers and Proceedings*, **102**(3), 526–31.

LIPSEY, RE, & SJOHOLM, F. 2006. Foreign firms and Indonesian manufacturing wages: An analysis with panel data. *Economic Development and Cultural Change*, **55**(1), 201–221.

MARTINS, PEDRO S., & YANG, YONG. 2015. Globalised labour markets? International rent sharing across 47 countries. *British Journal of Industrial Relations*, **53**(4), 664–691.

MAS, ALEXANDRE. 2017. Does Transparency Lead to Pay Compression? *Journal of Political Economy*, **125**(5), 1683–1721.

MASSENKOFF, MAXIM, & WILMERS, NATHAN. forthcoming. Wage Stagnation and the Decline of Standardized Pay Rates, 1974–1991. *AEJ: Applied Economics*.

MOGSTAD, MAGNE, SETZLER, BRADLEY, & LAMADON, THIBAUT. 2018. *Imperfect Competition and Rent Sharing in the U.S. Labor Market*. Mimeo University of Chicago.

MORETTI, ENRICO. 2011. Local Labor Markets. *In:* ASHENFELTER, ORLEY, & CARD, DAVID (eds), *Handbook of Labor Economics*. Elsevier.

MUENDLER, MARC-ANDREAS, & BECKER, SASCHA O. 2010. Margins of multinational labor substitution. *American Economic Review*, **100**(5), 1999–2030.

MUENDLER, MARC-ANDREAS, POOLE, JENNIFER, RAMEY, GAREY, & WAJNBERG, TAMARA. 2004. Job Concordances for Brazil: Mapping the Classificação Brasileira de Ocupações (CBO) to the International Standard Classification of Occupations (ISCO-88). 01.

NATIONAL EMPLOYMENT LAW PROJECT. 2016. *Fight for $15: Four Years, $62 Billion*. "https://www.nelp.org/wp-content/uploads/Fight-for-15-Four-Years-62-Billion-in-Raises.pdf".

PROPPER, CAROL, & REENEN, JOHN VAN. 2010. Can Pay Regulation Kill? Panel Data Evidence on the Effect of Labor Markets on Hospital Performance. *Journal of Political Economy*, **118**(2), 222–273.

RABIN, MATTHEW. 1998. Psychology and Economics. *Journal of Economic Literature*, **36**(1), 11–46.

REES, ALBERT, & SCHULTZ, GEORGE. 1970. Workers in an Urban Labor Market. University of Chicago Press.

SETZLER, BRADLEY, & TINTELNOT, FELIX. 2021. The effects of foreign multinationals on workers and firms in the United States. *The Quarterly Journal of Economics*, **136**(3), 1943–1991.

SLICHTER, SUMNER. 1950. Notes on the Structure of Wages. *Review of Economics and Statistics*, **32**(1), 80–91.

SUN, CHANG. 2020. Multinational production with non-neutral technologies. *Journal of International Economics*, **123**.

TABELLINI, G. 2010. Culture and Institutions: Economic Development in the Regions of Europe. *Journal of the European Economic Association*, **8**(4), 677–716.

TEULINGS, C. N. 2003. The Contribution Of Minimum Wages To Increasing Wage Inequality. *Economic Journal*, **113**(490), 801–833.

TIMMER, MARCEL P, DIETZENBACHER, ERIK, LOS, BART, STEHRER, ROBERT, & DE VRIES, GAAITZEN J. 2015. An illustrated user guide to the world input–output database: the case of global automotive production. *Review of International Economics*, **23**(3), 575–605.

VAGHUL, KAVYA, & ZIPPERER, BEN. 2016. Historical state and sub-state minimum wage data. *Washington Center for Equitable Growth*.

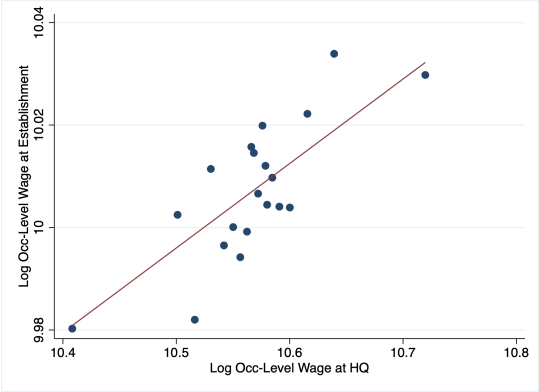
VAN REENEN, JOHN. 1996. The Creation and Capture of Rents: Wages and Innovation in a Panel of U.K. Companies. *The Quarterly Journal of Economics*, **111**(1), 195–226.

WAGER, S., & ATHEY, S. 2018. Estimation and inference of heterogeneous treatment effects using random forests. *Journal of the American Statistical Association*, **113**, 1228–1242.

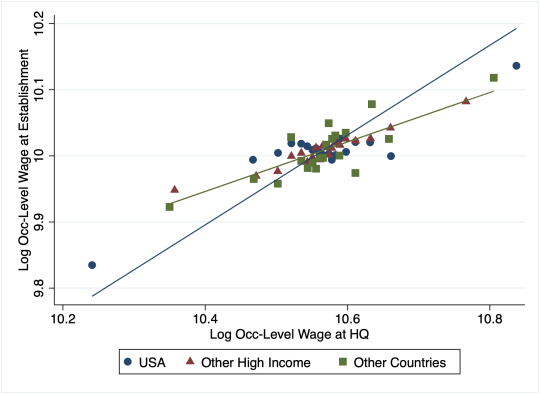
YOO, B N, DONTHU, Y, & LENARTOWICZ, T. 2011. Measuring Hofstede's five dimensions of cultural values at the individual level: Development and validation of cvscale. *Journal of International Consumer Marketing*, **23**(3-4), 193–210.

FIGURES

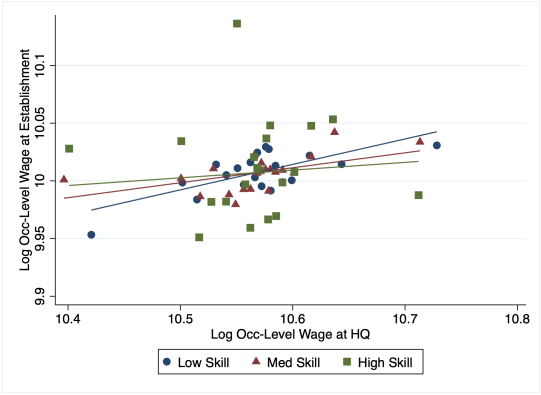
FIGURE 1: CORRELATION BETWEEN HQ AND FOREIGN ESTAB. WAGES



(A) JOB-LEVEL CORRELATION



(B) COUNTRY INCOME SPLIT

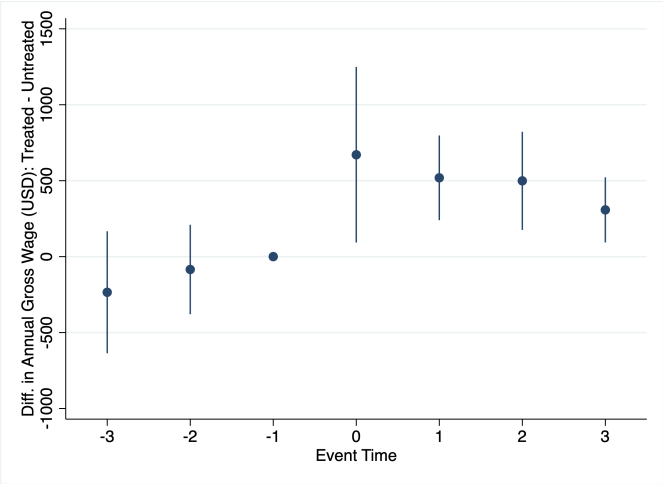


(C) SKILL LEVEL SPLIT

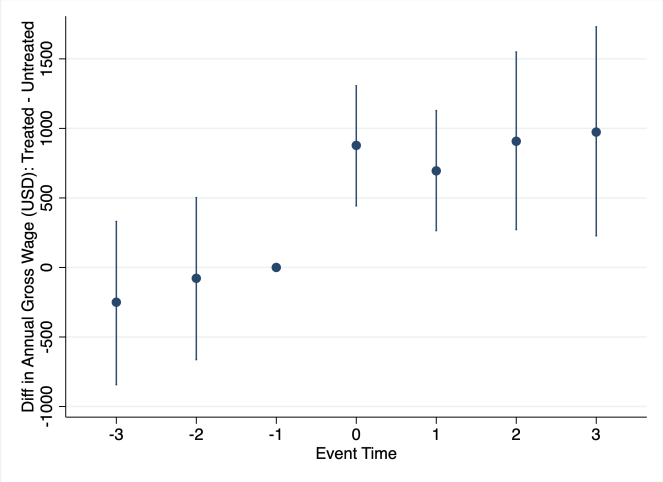
Note: This figure presents three binned scatterplots showing the relationship between the log wage paid for a given job at a multinational's headquarter (x-axis) and the wage paid for the same job at the multinational's foreign establishments (y-axis). To construct the plots, the log wage at the establishment is first residualized with respect to firm $\times$ job and establishment city $\times$ year fixed effects. In Panel B, we residualize with respect to firm $\times$ skill level and occupation-type fixed effects to preserve power. The x-variable, log wage at the firm's headquarter, is then divided into twenty equal-sized groups. Within each of these groups, we plot the mean of the y-variable residuals against the mean of the x-variable. We then add back the unconditional mean of the y-variable (establishment wage) to help with interpretation of the line of best fit. The line of best fit in Panel A is $\hat{\beta} = 0.165$, (s.e.=0.019). In Panel B, we separate headquarter countries based on whether the multinational is headquartered in the United States (circles), other high-income countries as defined by the World Bank (triangles), and all other countries (squares). The lines of best fit/standard errors are $\hat{\beta} = 0.679$, (s.e.=0.018) for the United States, $\hat{\beta} = 0.374$, (s.e.=0.019) for other high-income countries, and $\hat{\beta} = 0.374$, (s.e.=0.049) for all other countries. In Panel C, we separate jobs into low, medium, and high-skill occupations. The lines of best fit/standard errors are $\hat{\beta} = 0.221$, (s.e.=0.026) for low-skill jobs, $\hat{\beta} = 0.130$, (s.e.=0.027) for medium-skill jobs, and $\hat{\beta} = 0.067$, (s.e.=0.113) for high-skill jobs.

FIGURE 2: IMPACT OF HQ MIN WAGE ON FOREIGN ESTAB. WAGES

(A) COMPANY DATA

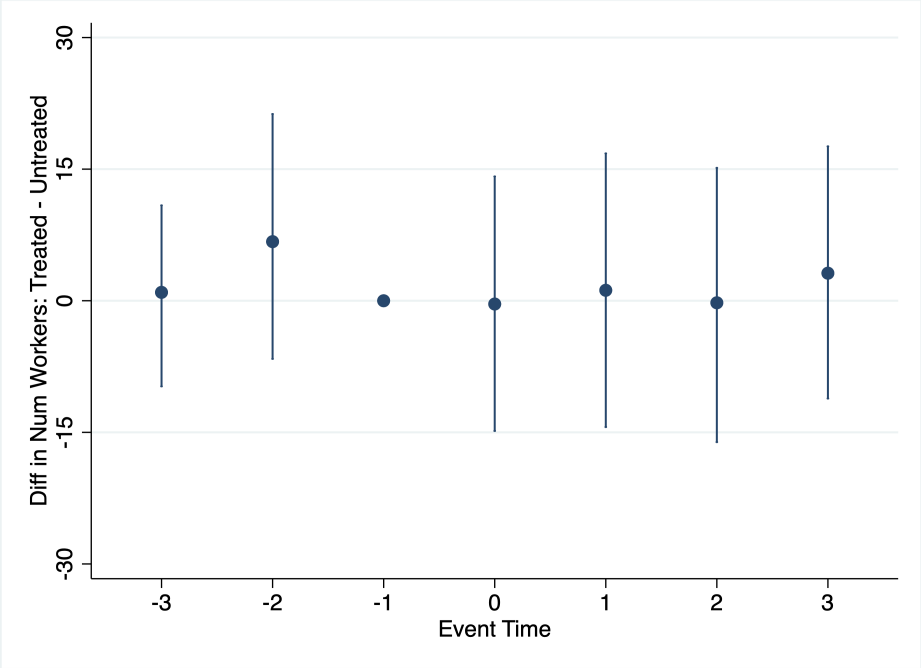


(B) RAIS DATA



Note: This figure plots the coefficients on the event time indicators from regressing gross wages on event time dummies before and after a headquarters country minimum wage increase using data from "The Company" (Panel A) and a sample of matched Brazilian firms (Panel B). The outcome is the wages at a firm's foreign establishment, measured at occupation level (Panel A) and worker level (Panel B). In Panel A, employer×occupation and establishment city× year fixed effects are included. In Panel B, we include worker×establishment×employer×occupation and establishment city× year fixed effects, as well as controls for the worker's gender, race, age and job tenure. The samples are restricted to low skill occupations and to those firms that experienced at least one isolated minimum wage hike at the headquarter country (state) during the sample period (the treatment group) or did not experience any minimum wage hike at the headquarter at all (the control group). An isolated hike in a headquarter country (state) is a minimum wage increase where there was no hike in the previous year and the following year. For each firm in the treatment group, the event(s) are defined as the the isolated hike(s) it experienced during the sample period in which it was present in the corresponding dataset. If there are multiple events for each treated firm in Panel A, we stack them in the estimation. In Panel B, all the firms in the RAIS dataset which experienced at least one isolated hike experienced exactly one such hike. In Panel B, wage levels measured in Brazilian Real are converted to USD using the average exchange rate during the sample period 2000-2017. All coefficients are normalized to $k = -1$, the year before the first isolated minimum wage hike. Standard errors are clustered at the headquarter country level. In Panel B, the standard errors are wild bootstrapped.

FIGURE 3: IMPACT OF HQ MIN WAGE ON ESTAB. EMPLOYMENT IN BRAZIL



Note: This figure plots the coefficients on the event time indicators from regressing occupation-specific employment in each establishment on event time dummies before and after a headquarters country minimum wage increase using the sample of matched Brazilian firms in the RAIS data. Employer×occupation and establishment city× year fixed effects are included. The samples are restricted to low skill occupations and to those firms that experienced at least one (and exactly one) isolated minimum wage hike at the headquarter during the sample period (the treatment group) or did not experience any minimum wage hike at the headquarter country (state) at all (the control group). All coefficients are normalized to $k = -1$, the year before the isolated minimum wage hike. Standard errors are wild bootstrapped and clustered at the HQ-country level.

TABLES

TABLE 1: SUMMARY STATISTICS OF MULTINATIONALS

Panel A: Summary of Multinational Samples

Unit of Observation	Number of Observations Sample 1	Sample 2	Sample 3
Employer	1215	101	80
Employer × Year	5040	587	200
Establishment	6225	1239	611
Estab. × Year	22820	5254	1344
Estab. × Skill-Level × Year	185351	47514	12186
Estab. × Occupation	140345	31868	13504
Estab. × Occ. × Year	436690	112020	27292

Panel B: Multinationals' Foreign Estab. Wages

	Sample 1		Sample 2		Sample 3	
	Mean	SD	Mean	SD	Mean	SD
Gross Wage (2000 USD)	17680.69	11098.39	17027.56	10488.13	21113.67	10692.11

Panel C: Distr. & Compression of Wages (Sample 3)

	HQ-Quart 1	HQ-Quart 2	HQ-Quart 3	HQ-Quart 4	HQ-All Occ
	Headquarter Wage Distribution				
Mean Gross Wage (2000 USD)	12735.33	18376.84	30571.13	47279.08	25216.82
Max. Gross Wage (2000 USD)	53590.05	73178.14	106129.25	117636.55	117636.55
	Establishment Wage as % of HQ Wage				
All Establishments	0.91	0.87	0.88	0.88	0.89
Estabs in Poorer-than-HQ Countries	0.76	0.78	0.78	0.82	0.78
Employer × Occ × Year	956	677	720	576	2929

Note: Only foreign establishments are included in panels A & B, while in panel C, headquarters are also included. Panel A summarizes the 3 main samples of multinationals and how they are used in the empirical analysis. Sample 1 consists of the full sample of multinationals for which we have wage data from at least one foreign establishment; Sample 2 consists of employers for which we observe at least one job in the headquarters and at least one foreign establishment; Sample 3 consists of employers for which we observe at least one job in the headquarters and at least one foreign establishment in the same year. Outlier observations with gross wages in the top and bottom 1% of the distribution are excluded. The sample sizes include only foreign establishments. Occupations refer to the job titles recorded by the Company (288 job titles in Sample 1); skill levels are defined globally by the Company (15 levels in Sample 1). In Panel B, the numbers are calculated over all foreign establishments of a given multinational in a given year. Wages are measured in 2000 USD. Panel C focuses on Sample 3, and only occupations that are observed in both the headquarters and at least one foreign establishment within the same year are included. We first show the average net wages within each quartile at an employer's headquarters in a given year. We then show the average wage in the firm's establishments as a share of headquarter wages for each quartile. "Establishments in poorer-than-HQ-country countries" means we only include establishments which are located in countries with lower GDP per capita than the home country.

TABLE 2: RELATIONSHIP BETWEEN HQ AND FOREIGN ESTAB. WAGES

Sample	Sample 3 MNEs w/ est-HQ match within occ-year				Sample 2 MNEs w/ est-HQ match within occ
Data Structure	Panel				Imputed Panel
Dep. Var.	Log Wage at Establishment				
	Panel A: Local Benchmark Wage Control				
	(1)	(2)	(3)	(4)	(5)
Log Occ-Level HQ Wage	0.163	0.183			0.448
	(0.088)	(0.087)			(0.108)
Log Skill-Level HQ Wage			0.125		
			(0.084)		
Log Firm-Level HQ Wage				0.217	
				(0.102)	
Log Occ-Level Local Benchmark Wage	0.040	0.040			0.009
	(0.006)	(0.006)			(0.003)
Log Skill-Level Local Benchmark Wage			0.077		
			(0.012)		
Employer × Occ FE	✓	✓			
Employer × Skill Level FE			✓		
Employer FE				✓	✓
Estab. City × Year FE	✓	✓	✓	✓	✓
Occ FE					✓
HQ Country (State) × Year FE		✓			
Observations	20182	20182	9911	721	37971
	Panel B: Estab. City × Occupation × Year FEs				
	(1)	(2)	(3)	(4)	(5)
Log Occ-Level HQ Wage	0.088	0.066			0.314
	(0.032)	(0.033)			(0.117)
Log Skill-Level HQ Wage			0.163		
			(0.068)		
Log Firm-Level HQ Wage				0.217	
				(0.102)	
Employer × Occ FE	✓	✓			
Employer × Skill-Level FE			✓		
Employer FE				✓	✓
Estab. City × Year FE				✓	
Estab. City × Occ × Year FE	✓	✓			✓
Estab. City × Skill-Level × Year FE			✓		
HQ Country (State) × Year FE		✓			
Observations	20157	20157	9911	721	37347

Note: This table shows the relationship between a firm's headquarters and establishment wage. Columns 1 and 2 measure wages at the occupation level. Column 3 measures wages and the skill level, and column 4 measures wages at the firm level. The local benchmark wage is the average wage of workers in a given occupation (or skill level) employed by other firms in our sample in the same establishment city c in year t. In Panel B, we residualize the dependent variable (log establishment wage) with respect to establishment-city×occupation×year fixed effects, main independent variable (log headquarter wage) with respect to occupation×year fixed effects, both estimated using Sample 1 (the largest sample); and then regress the residualized log establishment wage on the residualized log headquarter wage including the fixed effects in Panel A (without local benchmark wage as a regressor). Standard errors are reported in parentheses and are clustered at the employer level.

TABLE 3: RELATIONSHIP BETWEEN HQ AND FOREIGN ESTAB. WAGE SLOPES

	w/in Occ Wage Slope at Estab.		Pooled Wage Slope at Estab.	
	(1)	(2)	(3)	(4)
HQ Wage Slope	0.138	0.117	0.110	0.377
	(0.060)	(0.056)	(0.060)	(0.257)
Local Benchmark Wage Slope	0.022		-0.001	
	(0.007)		(0.010)	
Employer × Occ-Type × Skill-Lev Pair FE	✓	✓		
Employer × Skill-Lev Pair FE			✓	✓
Estab. City × Year FE	✓		✓	
Est. City × Occ-Type × Skill-Lev Pair × Yr FE		✓		
Est. City × Skill-Lev Pair × Yr FE				✓
Observations	13513	13250	8226	8197

Note: This table shows the relationship between an employer's between-skill-level "wage slope" at the employer's headquarter (independent variable) and foreign establishment (outcome variable). The wage slope is the difference between the average log wage of jobs in consecutive skill levels at a foreign establishment, and is calculated within occupation groups in columns 1-2 and by pooling together all occupation groups in columns 3-4. The Log Benchmark (or Leave-out) Wage Slope is defined analogously for the establishments of other firms in the same city in the same year. Standard errors are are clustered at the employer × skill-level-pair level.

TABLE 4: IMPACT OF HQ MIN WAGE HIKE ON FOREIGN ESTAB. WAGES

% Δ Wage at:	Estab (1)	HQ (2)	Estab (3)	Estab (4)	HQ (5)	Estab (6)
Min. Wage Hike	0.007	0.033				
	(0.003)	(0.016)				
Large Min. Wage Hike				0.014	0.028	
				(0.003)	(0.013)	
% Δ HQ Wage (IV)			0.198			0.487
			(0.140)			(0.242)
Occ × Estab City × Year FE	✓		✓	✓		✓
Occ × Year FE		✓			✓	
Observations	112100	11490	112100	79679	10748	79679

Note: This table shows the impact of a minimum wage change in a firm's headquarter location on establishment wages of low-skill jobs. The outcome variable is the percentage change in occupation-specific establishment or HQ wages. Min. Wage Hike is an indicator that takes the value one in year t if an employer's headquarter location experiences a minimum wage increase that year. Large Min. Wage Hike is an indicator that takes the value one in year t if a firm's headquarter location experiences a minimum wage increase of an above-sample-median magnitude that year. Columns (1) and (4) show the reduced form estimate of the impact of minimum wage shock in an employer's headquarter location on wages in the foreign establishments. These regressions are estimated using all low-skill jobs in all foreign establishments (including those for which we do not observe their headquarter counterparts in the same year). Columns (2) and (5) show the first stage effect (i.e., the impact on HQ wages measured analogously). These regressions are estimated using all low-skill jobs in all headquarters (including those for which we do not observe the same job in a foreign establishment in the same year). In column (3) and (6), we run two-sample 2SLS using the corresponding reduced form and first stage results, as described in Sub-section 4.2 of the paper. Standard errors are clustered at the headquarter country level. TS2SLS standard errors are computed following Pacini &Windmeijer (2016). The sample period of estimation is years 2005-2015.

TABLE 5: BINDING VS. NON-BINDING LOW SKILL OCCUPATIONS

% Δ Wage at:	Estab	HQ	Estab	HQ
	(1)	(2)	(3)	(4)
Min. Wage Hike	0.006	0.026		
	(0.003)	(0.016)		
Hike × Binding	0.013	0.028		
	(0.008)	(0.018)		
Large Min. Wage Hike			0.013	0.021
			(0.003)	(0.013)
Large Hike × Binding			0.012	0.029
			(0.007)	(0.022)
Occ × Estab City × Year FE	✓		✓	
Occ × Year FE		✓		✓
Observations	112100	11490	79679	10748

Note: In this table we interact the minimum wage hike indicator with an indicator for the job being "binding" in the headquarters location. An occupation is binding in a headquarters location if there exists an establishment (headquarters or foreign establishment) in that location which has ever paid a wage to that occupation that was below the minimum wage in the preceding year. Columns 1 and 3 show the reduced form estimate of the impact of respectively any minimum wage hike and large minimum wage hikes (those of an above-sample-median magnitude) in an employer's headquarters location on wages in the foreign establishments; and columns 2 and 4 the impact in the headquarters. We do not require that we see the wages for the same set of occupations in the firm's headquarters and foreign establishments in the same year for these regressions. Standard errors are clustered at the headquarter country level. The sample period of estimation is years 2005-2015.

TABLE 6: IMPACT OF HQ EX. RATE SHOCKS ON FOREIGN ESTAB. WAGES

	Panel A: Reduced Form		
Log Wage at Establishment			
	(1)	(2) Depreciation	(3) Appreciation
Log HQ Exchange Rate	-0.077	-0.032	-0.081
	(0.024)	(0.034)	(0.032)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE			
HQ Currency - Year Trend			
Observations	404425	192541	208840
	Panel B: First Stage		
Log HQ Wage			
	(1)	(2) Depreciation	(3) Appreciation
Log HQ Exchange Rate	-0.553	-0.503	-0.476
	(0.240)	(0.253)	(0.257)
Employer × Occ FE	✓	✓	✓
Year FE			
HQ Currency - Year Trend			
Observations	45154	27644	21206
	Panel C: TS2SLS		
Log Establishment Wage			
	(1)	(2) Depreciation	(3) Appreciation
Log HQ Wage	0.139	0.064	0.169
	(0.074)	(0.074)	(0.114)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE	✓	✓	✓
HQ Currency - Year Trend	✓	✓	✓
Observations	404425	192541	208840

Note: This table shows (1) the impact that a 100% local currency depreciation (relative to USD) in a firm's home country has on gross wages (in USD) in its foreign establishments (Panel A) and its headquarter (Panel B), and (2) the impact that wage headquarter wage changes induced by exchange rate shocks have on wages for the same occupation in the firm's foreign establishments (Panel C). The outcome is the occupation-specific log wage in a firm's establishment (Panels A and C) or headquarter (Panel B). In Panel C we run two-sample 2SLS by estimating the first stage using all jobs in all headquarters (including those for which we do not observe the same job in a foreign establishment in the same year), and the second stage and reduced form using all jobs in all foreign establishments (including those for which we do not observe their headquarter counterparts in the same year), as described in Sub-section 4.2 of the paper. The results in Column 2 are estimated using appreciation shocks and those in Column 3 are estimated using depreciation shocks. In all specifications, all foreign establishments located in the same currency zone as the firm's headquarter country are excluded. Standard errors are clustered at the headquarter country currency zone level. TS2SLS standard errors are computed following Pacini &Windmeijer (2016).

TABLE 7: PREDICTORS OF WAGE SHOCKS' TRANSMISSION

Panel A: HQ x Estab. Country Characteristics	
Common Border	0.067
Log Distance	-0.366
Time Difference	-0.411
Ever in Colonial Relationship	0.058
Common Currency	0.019
Common Religion	0.300
Common Legal Origin	-0.054
Regional Trade Agreement	0.257
Common Language Index	0.215
Log diff. in GDP per capita (HQ - Estab.)	-0.135
Log Estab.-to-HQ Migrant Stock	0.095
Log HQ-to-Estab. Migrant Stock	0.210
Panel B: Sector Characteristics	
Sector Offshorability	-0.050
Skill Share	0.064
Capital Share (1-Labor Share)	-0.099
Input Tradeability	-0.085
Output Tradeability	-0.074
Panel C: Occupation Characteristics	
Occ. Offshorability	0.090
Abstract Task	-0.146
Routine Task	-0.018
Manual Task	0.104

	Estab.	HQ
Panel D: Country Characteristics		
Hofstede's Cultural Dimensions		
Power Distance Index	-0.022	0.004
Individualism	-0.120	-0.054
Masculinity vs. Femininity	0.084	-0.025
Uncertainty Avoidance Index	0.077	0.025
Long-term (vs. Short-term) Orientation	-0.228	-0.033
Indulgence (vs. Restraint)	0.439	0.035
Global Preference Survey		
Patience	-0.004	-0.001
Risk Taking	0.065	0.005
Positive Reciprocity	-0.116	0.005
Negative Reciprocity	-0.187	0.008
Altruism	-0.124	-0.015
Trust	-0.165	-0.001
Other Socioeconomic Charac's		
Gini Index	0.370	-0.038
Urbanization	0.288	-0.035
Adult Education Attainment	-0.017	-0.033
Log GDP per capita	0.138	-0.030
Regulatory Index	-0.004	0.053

Note: This table presents the average value of HQ-establishment, sector, occupation, HQ, and destination characteristics for low-skill jobs in foreign establishments with above median conditional average treatment effect. The treatment variable is minimum wage hike at the headquarters location, the outcome variable is the percentage change in occupation-specific establishment wages, and the panels contain different groups of characteristics. These variables are described in more detail in Appendix IV. Only low-skill jobs in foreign establishments for which there were at least one hike year and at least one non-hike year are included, and we collapse the mean conditional average treatment effect across years within each establishment $\times$ occupation. All the characteristics variables are standardized to have zero mean and a unit standard deviation within the sample of analysis. Conditional average treatment effects are estimated using the Causal Forest methodology described in Appendix IV. The outcome variable and the treatment status are residualized with respect to occupation$\times$establishment-city$\times$year fixed effects for the sample of jobs of all skill levels. Then, we estimate the conditional average treatment effects (CATEs) using the causal forest, where it is specified to orthogonalize the residualized outcome variable and the treatment status with respect to all the characteristics variables, following Athey & Wager (2019). We cluster at the headquarter country level in the Causal Forest. The sample period of estimation is years 2005-2015.

TABLE 8: WAGE IMPACT OF HQ MIN WAGE HIKE: BRAZIL

	% Δ Worker-Level Wage at Brazilian Estab.s			
	(1)	(2)	(3)	(4)
	Annual	Effective	Annual	Effective
Min. Wage Hike	0.007	-0.005	0.017	0.012
	(0.002)	(0.003)	(0.002)	(0.004)
Hike × Low Skill	0.063	0.111	0.040	0.062
	(0.012)	(0.029)	(0.017)	(0.031)
Occ × Estab City × Year FE	✓	✓	✓	✓
Worker × Employer × Estab × Occ FE	✓	✓		
Worker Controls	✓	✓	✓	✓
Observations	511825	397506	595275	467404

Note: This table shows the impact of a minimum wage hike in a firm's headquarters location on wages in all of the firm's foreign establishments located in Brazil. Min. Wage Hike is an indicator that takes the value one in year t if a firm's headquarter location experiences a minimum wage increase that year. The outcome variable is percentage change in worker-level wage in year t, which is only defined if the worker also worked in the same firm establishment in the same occupation in year t-1. Worker controls include race and gender fixed effects, as well as controls for age and job tenure. Standard errors are clustered at the headquarters country level.

TABLE 9: IMPACT OF HQ MIN. WAGE CHANGE ON FOREIGN ESTAB. EMPLOYMENT

	Panel A: Extensive Margin			
Outcome:	Occ Leaves Foreign Establishment			
Data Source:	Company		*RAIS*	
	(1)	(2)	(3)	(4)
Min. Wage Hike	-0.003	-0.003	-0.005	-0.006
	(0.007)	(0.009)	(0.003)	(0.003)
Hike × Low Skill		-0.001		0.010
		(0.006)		(0.016)
Occ × Estab. City × Year FE	✓	✓	✓	✓
Observations	150308	150308	42361	42361
	Panel B: Intensive Margin			
Outcome:	%Δ in Workers			
Data Source:	*RAIS*			
	(1)	(2)	(3)	(4)
Min. Wage Hike	-0.000	-0.002	0.001	-0.002
	(0.009)	(0.008)	(0.009)	(0.008)
Hike × Low Skill			-0.007	0.001
			(0.016)	(0.007)
Occ FE		✓		✓
Estab. City × Year FE		✓		✓
Occ × Estab. City × Year FE	✓		✓	
Observations	57029	58429	57029	58429

Note: Panel A shows the extensive employment response of foreign establishments to a home country (state) minimum wage shock. Columns 1-2 use data from the Company and columns 3-4 focus on Brazilian establishments using RAIS data. Only urban contracted workers are included. Min Wage Hike is an indicator that takes the value one if a headquarter country experiences in minimum wage increase in a given year. The outcome variable in Panel A is an indicator for an occupation disappearing from a given establishment. Panel B shows the intensive employment response using the RAIS data. The outcome is the percent change in workers in a given occupation. Low skill occupations are those with a skill level below 5, as defined by the Company. In Panel B, the occupation in the fixed effects is the first 4 digit of the 6-digit CBO02 to maintain statistical power. In columns 1-2 of Panel A, the sample period of estimation is years 2005-2015. Standard errors are clustered at the headquarters country (state) level.

Appendix I Heterogeneous exposure to minimum wage changes: the Kaitz index

In this appendix, we compare the wage response of *employers* that are differentially exposed to minimum wage changes. Following Lee (1999) and Autor *et al.* (2016), we measure *firm*-level bindingness as the ratio between the ex ante minimum wage and the firm's median wage at the headquarters (the so-called Kaitz index). Specifically, we interact the independent variables of interest in Equation (3) with Kaitz_{ft} and estimate:[57]

$$\%\Delta \text{w}_{jfct} = \alpha_6 \text{Hike}_{h(f)t} + \alpha_7 \text{Hike}_{h(f)t} \times \text{Kaitz}_{ft} + \theta_{jct} + \varepsilon_{jfct} \tag{A1}$$

We find that the wages of foreign workers in low-skill jobs are more affected by a minimum wage increase in the home country/state in firms for which the minimum wage was more binding at the headquarters. The estimates are reported in Appendix Table A15. Columns 1 and 3 imply that the transmission of a (large) minimum hike is around 10 percent higher for a firm whose headquarter is at the 75th percentile of the Kaitz index compared to one at the 25th percentile.[58]

Appendix II Threats to identification: transmission of exchange rate shocks

1. Endogenous timing of exchange rate fluctuations A currency appreciation may take place when a country's economy is doing well and aggregate demand for labor is relatively high. If home country labor demand and multinationals' demand for labor abroad are correlated, a home country currency appreciation could then coincide with a rise in wages paid in foreign establishments absent any wage anchoring.

To investigate this concern, we first break down the estimated impact of home country exchange rate shocks by sectors' export and import shares. If the positive foreign wage response to an increase in the USD value of a home country's currency is driven by underlying labor demand shocks, the impact should be small among output-exporting firms—which are likely to directly suffer from an increase in the relative price of domestically-produced goods—and large among input-importing firms, which conversely are likely to directly benefit from an decrease in the relative price of their inputs. As seen in columns 1-2 of Panel A in Appendix Table A16, we find little evidence that wage impacts of home country exchange rate shocks in foreign establishments are driven by firms in high-import-share and low-export-share home country sectors.[59]

It is worth noting that a story in which labor demand covaries with exchange fluctuations and this explains the estimated impact of exchange rate shocks on multinationals' foreign wages is hard

[57] Notice that $\theta_{jh(f)t}$ does not subsume Kaitz_{ft}; so unlike in sub-sections 4.2 and 4.3, we estimate this equation with only the foreign establishments sample. In the corresponding first stage estimation, job×city×year fixed effects are replaced with job×year fixed effects, the same as in sub-sections 4.2 and 4.3.

[58] (.2123-.1030)*.0090/(.0094+.0090*.1030)=0.095, and (.2123-.1030)*.0092/(.0090 +.0092*.1030)=0.101.

[59] The country×sector specific input/output shares are calculated using data from the World Input-Output Database (WIOD) in year 2004 (Timmer *et al.*, 2015). We use a pre-sample-period measure to avoid potentially confounding changes in the share of imported inputs/exported outputs, which might be endogenous to exchange rate changes.

to reconcile also with the asymmetric response of foreign establishment wages to home country appreciation and depreciation shown in columns 2 & 3 of Table 6. The evidence thus suggests that that endogenous timing of exchange rate fluctuations is not the primary explanation for the estimated transmission of externally imposed headquarter wage increases to multinationals' foreign establishments.

2. Offshoring in response to home country currency appreciation A home country currency appreciation can make some multinationals' headquarter workers more expensive to employ relative to the firm's foreign establishment workers. This could induce the employer to shift jobs to foreign establishments from the headquarters (as in Feenstra & Hanson (1996)) which could in turn raise wages both at home and abroad, contributing to the estimated impact of exchange rate shocks on multinationals' foreign wages.

For task reallocation within jobs to explain our exchange rate results, the effect of home country exchange rate shocks on wages in foreign establishments would need to be concentrated in firms that engage in international trade (see e.g. Campa & Goldberg, 2001).[60] Intuitively, if a firm's headquarters and foreign establishments buy from and sell to the domestic market of the country in which the relevant establishment is located, home country currency appreciation will lead to a similar increase in the dollar value of the firm's revenue, cost of labor and cost of other inputs, resulting in little or no change in the relevant price of labor at the headquarter relative to that at the firm's foreign establishments. However, recall that we showed in Panel A of Appendix Table A16 that a home country currency appreciation still leads to an increase in the foreign establishment wages of firms purchasing and/or producing less tradable goods and services, although the impact on those low-exporting firms is smaller.

We also find a similar impact on *headquarter* wages of home country exchange rate shocks in firms purchasing and/or producing more/less tradable goods and services (see columns 3 & 4 of Panel A of Appendix Table A16), and little heterogeneity in the impact on foreign establishment wages by job offshorability and multi-task content (see columns 1 & 2 of Panel B of Appendix Table A16). These findings are all hard to reconcile with an across-country task-shifting story.

The evidence thus suggests that a within-firm offshoring phenomenon is not the primary explanation for the transmission of exchange rate variation-induced headquarter wage changes to multinationals' foreign establishments. Such transmission appears to be due, at least in part, to wage anchoring.

3. Technology adoption in response to home country exchange rate shocks In contrast to minimum wage increases—which tend to be permanent—transitory exchange rate shocks are *a priori* unlikely to induce technology adoption. Nonetheless, we also show in Panel C of Appendix Table A16 that the estimated wage impact of home country/state exchange rate shocks do not vary much by job task content that is likely related to the complementarity or substitutability between labor and computer capital (information technology). This is hard to reconcile with technology adoption explaining the estimated impact of home country exchange rate shocks on multinationals' foreign establishment wages.

[60]The within-employer labor in-sourcing explanation has the same prediction as the endogenous labor demand explanation in terms of the wage impact difference between input-importing firms and non-input-importing firms, and the opposite prediction in terms of the wage impact difference between output-exporting firms and non-output-exporting firms.

Appendix III Data

1. Additional Data Sources

1.1 Minimum Wage Data

The International Labour Organisation (ILO) maintains a database of the nominal gross monthly minimum wage (local currency) for 118 of the 170 countries observed in our primary dataset.[61] Monthly numbers are multiplied by 12 to calculate the annual nominal minimum wage. For the United States, we use the annual state minimum wage database in Vaghul & Zipperer (2016). We retrieved the minimum wage data in September 2021.

1.2 Exchange Rate Data

The yearly exchange rate dataset is downloaded from the World Bank, which records the official exchange rate (in currency units per current USD).[62] The yearly exchange rate is calculated as an annual average based on monthly averages.

1.3 Measures of Occupational Characteristics

Occupation crosswalks

i Crosswalk between the detailed job titles in our primary dataset and the 3-digit 2000 Standard Occupational Classification (SOC-00) codes is constructed using O-NET's code connector. We record the SOC code(s) of the first two entries.

ii Crosswalk between the (6-digit) 2000 Standard Occupational Classification (SOC-00) codes and the 2000 US Census Codes is available on the United States Census Bureau website.

iii The crosswalk between the 2000 US Census Codes and the *occ1990dd* occupation classification codes is available on David Dorn's website.[63]

iv Crosswalk between the 2000 Standard Occupational Classification (SOC-00) codes and the 1988 International Standard Classification of Occupations (ISCO-88) codes is available on the Institute for Structural Research (IBS) website.

v Crosswalk between the 1988 International Standard Classification of Occupations (ISCO-88) codes and the 1994 Brazilian Classification of Occupations (CBO-94) is available in Muendler *et al.* (2004).

[61] According to ILO, minimum wages are not reported for countries for which collective bargaining is in place for minimum wages. In cases where a national minimum wage is not mandated, the minimum wage in place in the capital or major city is used. In some cases, an average of multiple regional minimum wages is used. In countries where the minimum wage is set at the sectoral level or occupational level, the minimum wage for manufacturing or unskilled workers is generally applied.

[62] Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market.

[63] "The *occ1990dd* occupation classification aggregates U.S. Census occupation codes to a balanced panel of occupations for the 1980, 1990, and 2000 Census, as well as the 2005-2008 ACS."

Offshorability The offshorability index comes from Blinder & Krueger (2013)'s externally coded survey measure of job offshorability (the ability to perform the job's work duties from abroad). Micro-level survey data is available on Princeton Data Improvement Initiative (PDII).[64]

Task Complexity Occupations that are categorized as "single-task" include Cleaner, Guard, Messenger, Driver, Administrative Clerk, Shipping & Receiving Clerk, and Data Entry Clerk. All these occupations are low-skill occupations (skill levels 1-5 out of 16 levels in total). Non-single-task low-skill occupations include, for example, Reproductive Machine Operator, Mechanical/Operations Assistant, Accounting Clerk, etc.

Task content Measures for abstract, routine, and manual tasks come from Autor & Dorn (2013) (see their Appendix D for a detailed description). The data is available from the authors' website.[65]

1.4 Measures of Sectoral Characteristics

Sector offshorability The sector offshorability index also comes from Blinder & Krueger (2013), where the survey measure in the raw data is collapsed at the sector level. [66]

Skill share and capital share The sector-specific capital share is calculated using data from the BEA Input-Output Accounts, concorded to 6-digit and reduced to 2-digit NAICS using gross output values as weights. Labor share is by definition equal to 1 - capital share. The sector-level skill share is the share of payroll going to occupations with skill level requirement 3 or 4 according to the ILO. The data is from the occupational employment survey in the US, collected on the NAICS 4-digit level and reduced to the 2-digit level using gross output as weights.[67]

Input and output tradeability The sector specific and country-sector specific tradeability measures are constructed using data from the 2004 World Input-Output Tables in the World Input Out Database (WIOD) (Timmer *et al.*, 2015). Country-sector specific input (output) tradeability is the value of imported input (exported output) as a share of the value of total input (out) in a given sector in a given country in 2004; sector specific tradeability measures are the corresponding shares in all countries.[68]

[64]The offshorability measure is first constructed at the level of 3-digit Standard Occupational Classification (SOC) codes and then mapped to the job titles in our primary dataset using Crosswalk i. When more than one SOC code is recorded for a given job title, the average offshorability measure is taken.

[65]The task content measures are mapped to the job titles in our primary dataset using crosswalks iii - ii - i.

[66]The sector code in Blinder & Krueger (2013) is 6-digit NAICS, and we use a cross-walk between 4-digit NAICS and the International Standard Industrial Classification of All Economic Activities (ISIC), the sector categories used in our primary dataset.

[67]The measures are mapped to the International Standard Industrial Classification of All Economic Activities (ISIC) sector categories used in our primary dataset according to the definition here.

[68]The sector definition in WIOD follows the Crosswalk between the International Standard Industrial Classification of All Economic Activities (ISIC), the same as our primary dataset.

1.5 Measures of Country-Level Characteristics

Hofstede's cultural measures Our preferred measures of cultural attributes come from Hofstede (2001)'s "cultural dimensions". These measures are especially useful as they are available for, and comparable across, over 80 countries, and extensively validated (see e.g. Yoo *et al.*, 2011). They are widely used in social science research, including in economics (starting with Tabellini, 2010).

The measures of Hofstede's national cultural dimensions are downloaded from Hofstede's website. These include Power distance index (PDI), Individualism vs. collectivism (IDV), Uncertainty avoidance index (UAI), Masculinity vs. femininity (MAS), Long-term orientation vs. short-term orientation (LTO), and Indulgence vs. restraint (IND). These measures were developed in the late 1960s and early 1970s through a large-scale survey conducted with IBM employees. Over 100,000 employees from across IBM's worldwide establishments answered questions regarding, for example, identity, beliefs and attitudes toward inequality, and ways of copying with uncertainty. The idea behind the survey was that any differences in how respondents answered could be attributed to differences in national cultures, since all workers were part of the same firm. Follow-up surveys, run by Hofstede, were run with a broader range of workers, including civil servants and airline pilots, throughout the 1990s and confirmed the earlier results (Hofstede, 1991, 2001).

Global Preferences Survey measures The country-level measures of preferences in the Global Preferences Survey are downloaded here. These include patience, risk taking, positive reciprocity, negative reciprocity, altruism and trust. See Falk *et al.* (see 2018) for a detailed description of these measures.

Other measures GDP per capita, Gini index, regulatory index, adult educational attainment, urban population shares are drawn from the World Bank and measured yearly.[69] The measure of collective bargaining (union coverage) in the public or private sector of a given country in a given year is defined as the proportion of all wage earners in this sector covered by collective bargaining agreement or statutory regulations and retrieved from the ICTWSS database. For all these measures, we take the country-level average of these variables during 2005-2015 (our sample period).

1.6 Measures of Country-Pair Bilateral Characteristics

The country-pair-specific bilateral gravity measures, including a common language index, a dummy for common religion, a dummy for common legal origin, a dummy for a historical colonial relationship, the distance between capital cities, a dummy for sharing a border, a dummy for sharing a time zone, a dummy for regional trade agreements, are downloaded from the CEPII datasets. Measures of the bilateral migrant stocks are drawn from the World Bank.

[69] A country's regulatory index is meant to capture the country's regulatory environment that affects growth of the private sector. The index is based on surveys and legal analysis conducted by the World Bank. A higher regulatory index means that a country's government is better able to create and implement regulations that promote private sector development. Adult education is the share of adults over the age of 25 who have received higher education.

1.7 Brazilian RAIS Data

The RAIS data is employer-employee administrative data collected through a mandatory survey by the Brazilian Ministry of Labor and Employment. We use data from the years 2000-2017 (the maximum time-span available in the version of RAIS we have access to). The dataset is at the individual worker level and contains individual identifiers, and firm and establishment identifiers. The firm identifiers are CNPJ numbers (Cadastro Nacional de Pessoa Juridica), identification numbers issued to all firms operating in Brazil (including non-profits).

We first identified 64 firms with establishments in Brazil in the Company data, 56 of which are foreign firms headquartered outside Brazil. We then looked for the CNPJ number of each firm using their name.[70]We use these identifiers to match firms in the multinational data to establishments in Brazil RAIS. We successfully identify 52 firms with establishments in Brazil, 44 of which are headquartered outside Brazil. These multinationals are headquartered in the United States (59%), the UK (9%), the Netherlands (7%), Germany (5%), Switzerland (5%), France (5%), Finland (5%), and the remainder are spread equally across Australia, Canada, and New Zealand.

To classify "jobs" in RAIS, we use its detailed occupation codes: the 6-digit level of the Brazilian CBO-02 codes (of which more than 2,500 jobs/occupation codes are present in RAIS). This does not in itself allow matching of individuals in Brazil to their direct job counterpart in the multinational data, however, because the Company does not use standard occupation codes. We therefore attempt to match by skill level of the job. We do this by dividing jobs in RAIS into 16 buckets based on the average education level of the workers in those jobs, as well as whether or not they are a manager. We then match these into the respective 16 skill levels in the Company's data.

We have information in individual's wages, hiring date, date of job termination and reason for termination, as well as various demographic characteristics including age, gender, race, and education.[71] Summary statistics are provided in Appendix Table A17.

2. Data Processing

2.1 Data trimming

Wages We trim outliers that are in the top and bottom 1% of the overall establishment wage distribution (as well as the headquarters wage distribution when available) in analyses where the outcome variable is in levels. In analyses where the outcome variable is percentage change in wages, we additionally trim percentage changes in wages that are in the top and bottom 1% of the distribution of such changes.

Employment We trim occupation×firm×establishment×year specific worker counts in Brazil that are in the top 1% of the overall distribution where the outcome variable is in levels (Figure 3). In

[70]We manually searched for the CNPJ of each firm using the name reported in the Company data. We first looked in various websites to retrieve a CNJP for each firm. Then, we used the official Government tool to Registration Status to make sure the CNPJ we assigned to each firm was the right one. We identified 61 CNPJs out of the 64 firms found in the Company data.

[71]For RAIS, we convert monthly wage values in Brazilian Real to annual values in USD using the average exchange rate of Brazilian Real in period 2000-2017.

analyses where the outcome is percentage change in worker counts, we trim the top 1% of the distribution of such changes. Many occupation×establishment×year cells are small, so small increases in the employed number of workers can lead to large asymmetric percent changes (Panel B of Table 9).

2.2 Data period used in analysis

The Company informed us that its data collection and harmonization procedures—such as for example whether wage data was originally recorded in local currency; the currency specified in the establishment's employment contracts; that of its pay-outs; or in USD, and how any subsequent currency conversion was done by the Company—were generally less standardized before 2004. For this paper's analysis, we need to avoid first-differencing across different "regimes". We use the full 2000-2015 data whenever the relevant analysis is in levels. In these cases, the fixed effects we include control for procedural differences across country-years, etc. For analyses where we use Company data and the outcome variable is in first-differences, we only use 2004-2015 data (with the earliest first difference we use thus being that between 2005 and 2004).[72]

2.3 Data Imputation for Sample 2

In Sample 2 we do not require that the same occupation is observed in an establishment and the headquarters of the employer in the exact same year. Some multinationals in our sample do not provide data to the Company on all of their establishments every year they are surveyed. For this reason, for a fraction of foreign establishment occupation wages we do not observe a corresponding headquarter occupation wage in the exact same year, but we do observe such a corresponding occupation wage in another close-in-time year within the same employer. In some exercises, we impute the missing occupation-specific wage values using observations on the same occupation at the same establishment or headquarters in close-in-time surveyed years.

To do so, we impute the values of the outcome variable (the wage in a firm's foreign establishment) in missing years using the fitted values from the estimation of the following two-way fixed effect model: $\mathrm{w}_{jfct} = \mathrm{w}_{jfc} + \mathrm{w}_{jct} + \epsilon_{jft}$, $\hat{\mathrm{w}}_{jfc} + \hat{\mathrm{w}}_{jct}$. All establishments—all foreign establishments and headquarters—are included in the estimation, while the imputation is conducted only on foreign establishment occupations to avoid double counting data points which provide effective information. The model has a fit of $R^2 = 0.98$. As the cross-sectional component $\hat{\mathrm{w}}_{jfc}$ is mechanically highly correlated with firm×occupation fixed effect θ_{fj}, we replace θ_{fj} with firm fixed effect θ_f and occupation fixed effect θ_j.

[72] If we instead use the full Company data period also when the outcome variable is in first differences, the estimated coefficients of interest are slightly smaller, but qualitatively unchanged (the reduced form estimate in Column 1 of Table 4 e.g. being 0.005 rather than 0.007 with our preferred approach).

Appendix IV Causal Forest Estimation Procedure

We compute heterogeneous treatment effect using the honest causal forest algorithm, which is an application of the Generalized Causal Forest of Athey *et al.* (2019). Closely following Carlana & La Ferrara (2021), we implement the following procedure:

1 For the full analysis sample (jobs of all skill levels at foreign establishments), we orthogonalize the outcome variable (the percentage change in job-specific wages) and the treatment status variable (the headquarters minimum wage hike dummy) with respect to job×city×year fixed effects, which is consistent with our main regression specification (3). We use the orthogonalized outcome and the treatment variables in the causal forest estimation below.

2 From the full sample, we obtain a random subsample—without replacement— consisting of 50% of the observations in the original sample. This subsample is the training sample and the remaining data is the test sample.

3 We use the training sample to estimate the causal forest. Covariates include skill level and 55 other variables (the characteristics of the headquarter country, the establishment country, the multinational's sector, the job in question, and the headquarter-establishment country pair). We implement this command building a forest with 2000 trees. To build each tree, we use 70% of the sample to determine splits. The other 30% is used to estimate the conditional average treatment effect (CATE). We orthogonalize the outcome and the treatment variables with respect to the covariates using a separate regression forest. We cluster at the headquarters country level, which is consistent with our approach in the linear regressions.

4 We use the causal forest estimation obtained in step 3 to compute the estimated treatment effect for each observation in the test sample.

5 We implement 500 replications of steps 2, 3, and 4.

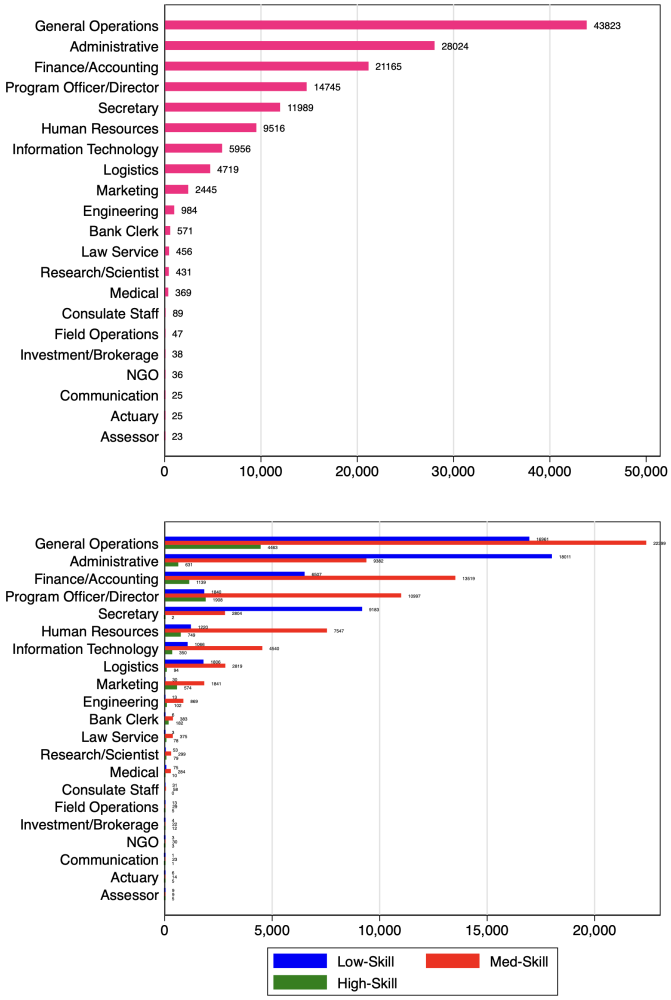
6 We take the mean of the estimated treatment effects across each replication for each observation in the full sample.

7 We divide full sample into low-skill jobs and middle-/high-skill jobs as in sub-section 4.2, and standardize all the covariates to have zero mean and unit standard deviation *within* each skill group.

8 Within each skill group, we sort the observations by the mean of their conditional average treatment effect (CATE) estimates obtained in Step 6, and calculate the value of the 55 covariates for the above-median-CATE subsample. (By construction, the value of the covariates for the below-median-CATE subsample is the opposite number of the same absolute value.)

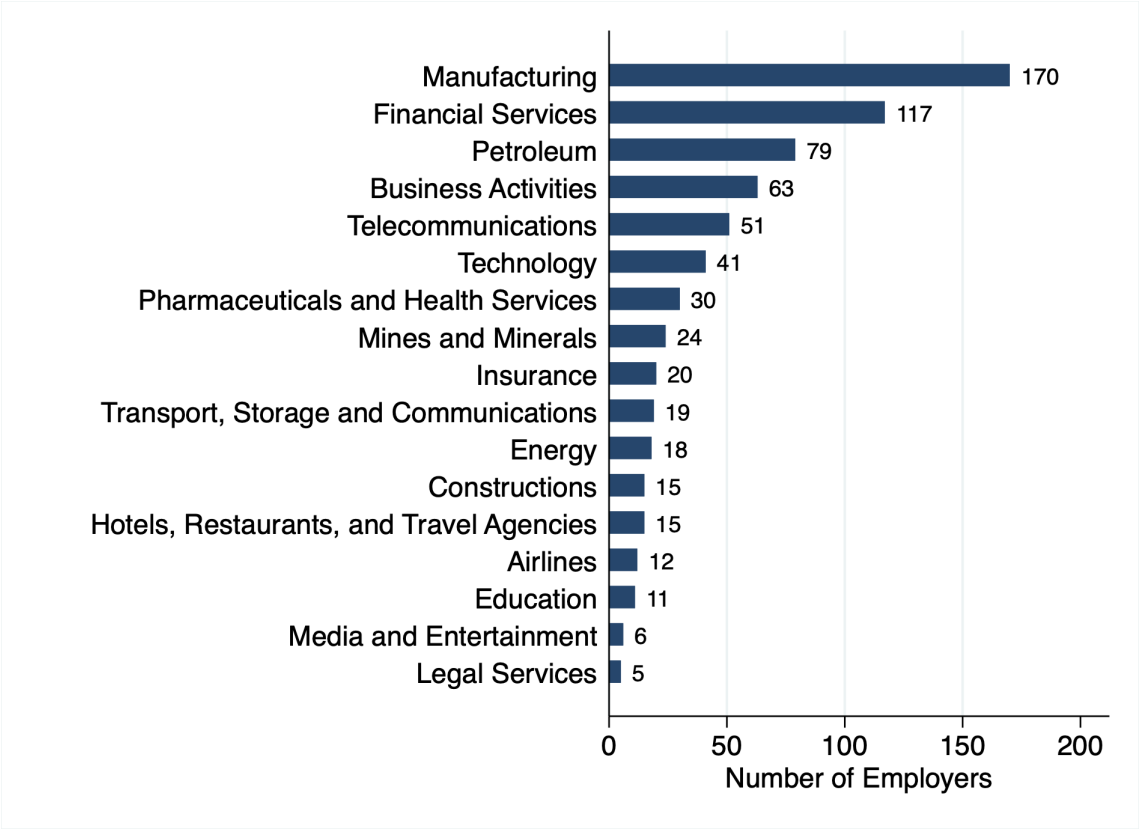
Appendix Figures

FIGURE A1: OCCUPATION DISTRIBUTION BY OCCUPATION CATEGORY AND SKILL LEVEL



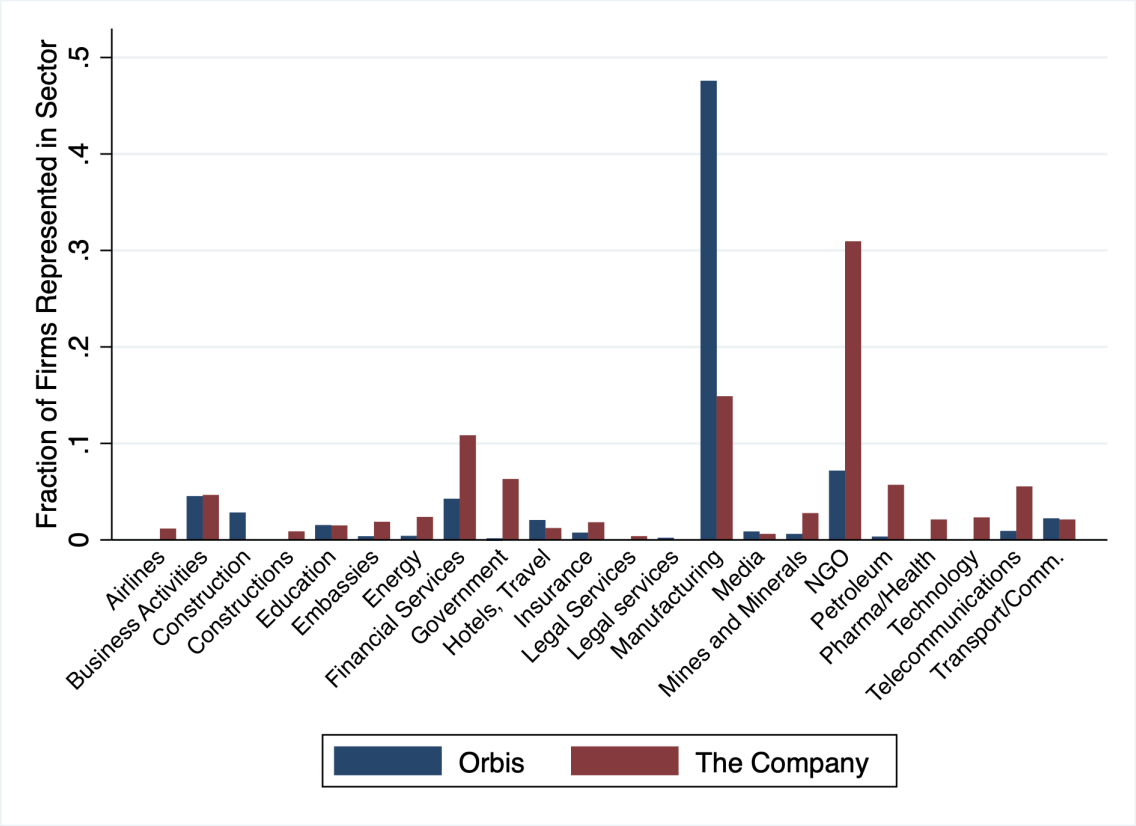
Notes: This figure displays the distribution of occupations in the headquarters and the foreign establishments of multinationals in the full sample of multinationals (Sample 1) according to the Company's global definition of occupation categories and skill levels. Low-skill: skill level 1-5; med-skill: skill levels 6-10; high-skill: skill levels 11 and above. The occupation type "NGO" contains 6 occupation types that only exist in NGOs: Resource Development, Policy Analyst, Technical Advisor, Government Aid Agency Coordinator, Monitoring & Evaluation Coordinator, and Policy Advisor. The unit of observation is an employer $\times$ establishment $\times$ occupation.

FIGURE A2: SECTORAL DISTRIBUTION OF PRIVATE-SECTOR FIRMS



Notes: This figure displays the sectoral distribution of the private-sector multinationals in the full sample of multinationals (Sample 1). The unit of observation is a multinational (employer).

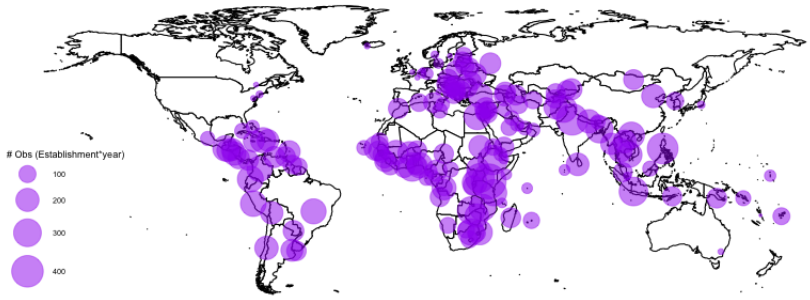
FIGURE A3: SECTORAL DISTRIBUTION OF COMPANY AND ORBIS FIRMS



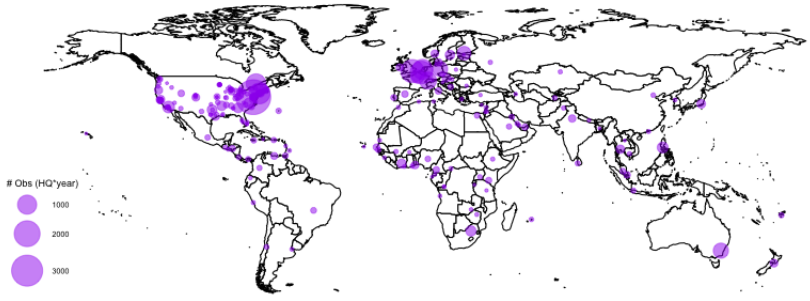
Notes: This figure displays the sectoral distribution of all multinationals in the Company dataset (red bars) and the Orbis sample (blue bars). The Orbis sample contains 1,100 firms randomly selected from the set of all sector $\times$ headquarters country location pairs that exist in the Company data. The unit of observation is a multinational (employer).

FIGURE A4: FOREIGN ESTABLISHMENT AND HQ LOCATIONS

(A) FOREIGN ESTABLISHMENT LOCATIONS

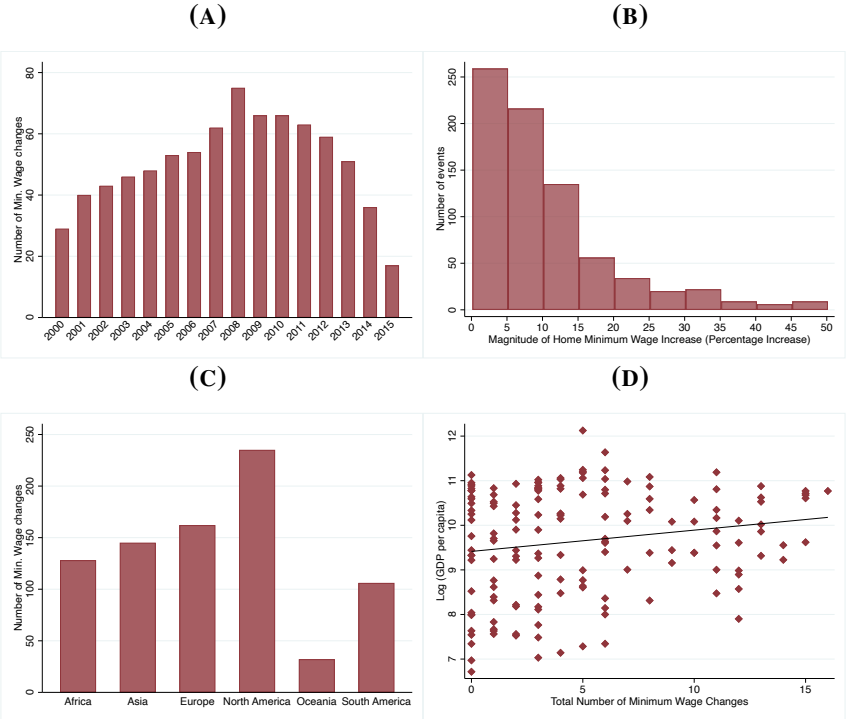


(B) HEADQUARTERS LOCATIONS



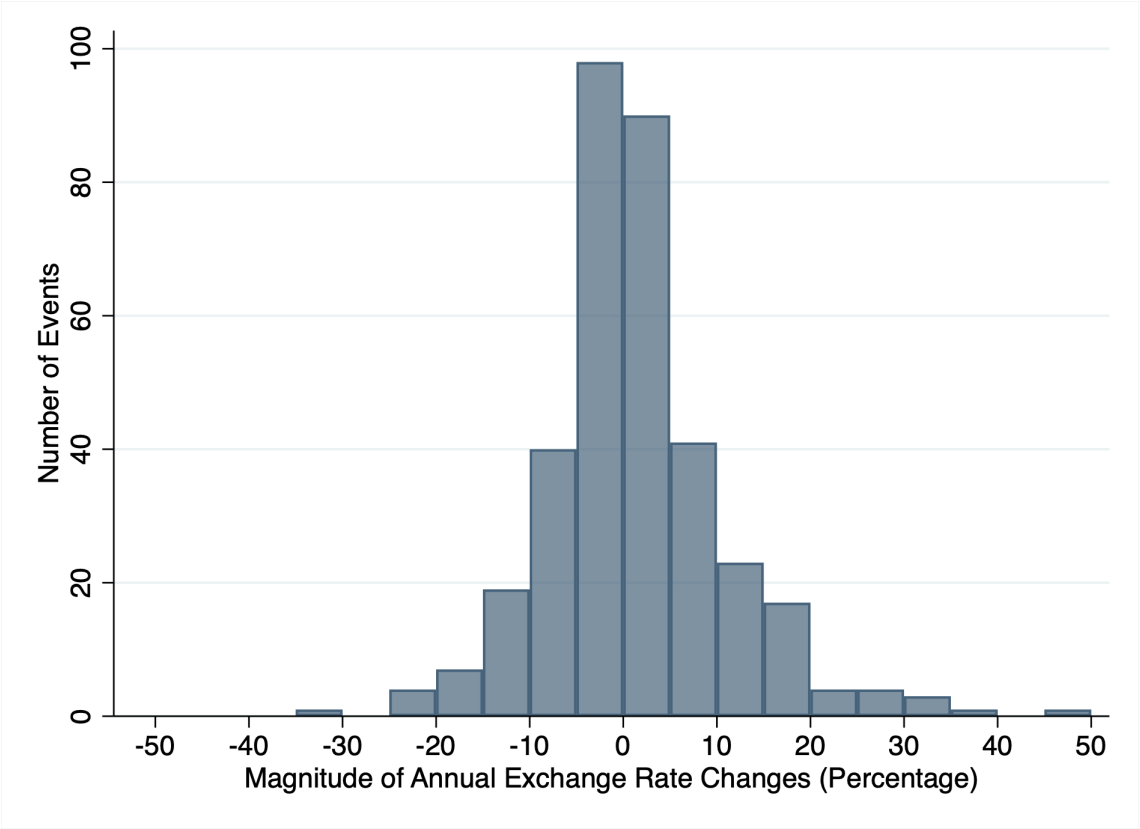
Notes: This figure displays the geographical distribution of the foreign establishments (top panel) in the full sample of multinationals (Sample 1) and their headquarters (bottom panel). The bubble size weight is the number of establishment (headquarters) $\times$ year observations in each city.

FIGURE A5: HQ COUNTRY/STATE MINIMUM WAGE CHANGES



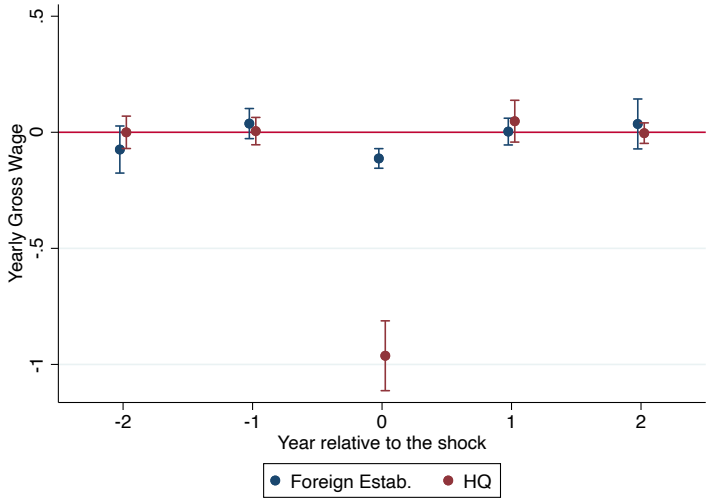
Notes: This figure presents evidence of the HQ-country/state minimum wage changes. Panel A shows the number of countries (or states in the case of the US) that are in the sample as a headquarter location in a particular year and have a minimum wage increase in that year. Panel B shows the distribution of the magnitude of headquarters countries/states' minimum wage increases. There are 808 minimum wage increases (including 42 whose magnitude is larger than 50%) and 746 counts of headquarters-location $\times$ years with zero minimum wage increase during 2000-2015. For the period between 2005 and 2015, the corresponding numbers are 602 (34) and 547.Panel C presents the total number of minimum wage increases grouped by continents. Panel D shows a scatter plot of the total number of minimum wage changes by country (or states in the case of the US), and the GDP per capita for 2015. [Data sources: US population by states from U.S. Census Bureau; US GDP by states from Bureau of Economic Analysis; Per capita GDP of other countries from World Bank, World Development Indicator].

FIGURE A6: HQ COUNTRY CURRENCY APPRECIATION/DEPRECIATION



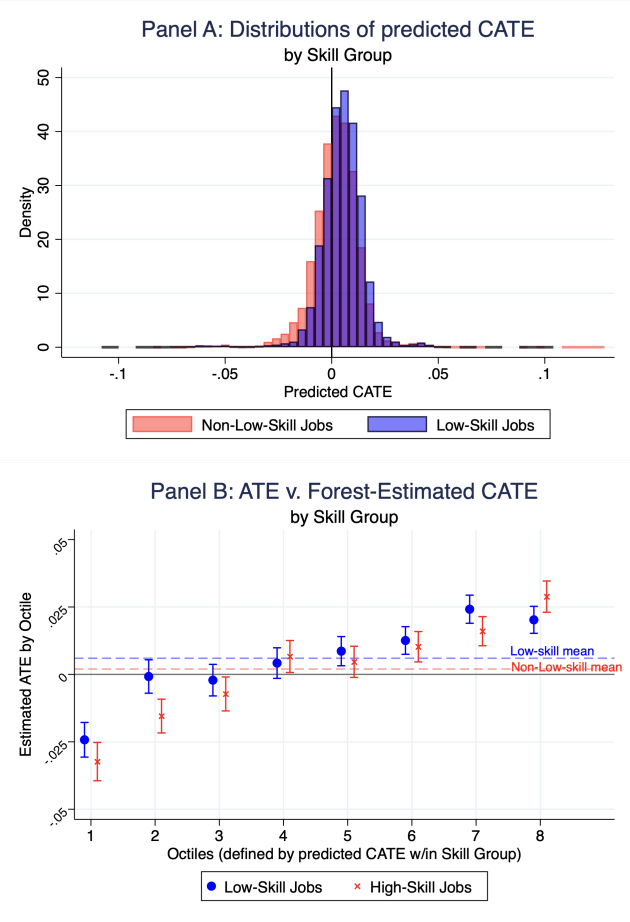
Notes: This figure shows the distribution of the magnitude of headquarters country exchange rate changes used in our main analysis. The unit of observation is currency-zone×year. All establishments located in the same currency zone as the headquarters are excluded; all headquarters countries, including the United States and those which peg their currencies to the USD, are also excluded. There are 352 events (including 2 whose magnitude is larger than 50%), consisting of 169 appreciations (a decrease in the exchange rate), 183 depreciations (an increase in the exchange rate), and 3 instances where the exchange rate does not change.

FIGURE A7: IMPACT OF HQ EX. RATE ON FIRM WAGES



Notes: This impulse response study plots the coefficients from a regression in which occupation-specific log gross wages (in current USD terms) at the foreign establishments (blue coefficients) and the headquarters (red coefficients) of a firm in year $t-3$ to $t+3$ are regressed on the detrended log exchange rate in year t in the firm's home country. Employer$\times$year and establishment-city$\times$year fixed effects are included. Exchange rates are detrended from home-country-specific time trends. All foreign establishments located in the same currency zone as the headquarters are excluded. Standard errors are clustered at the headquarter country currency zone level.

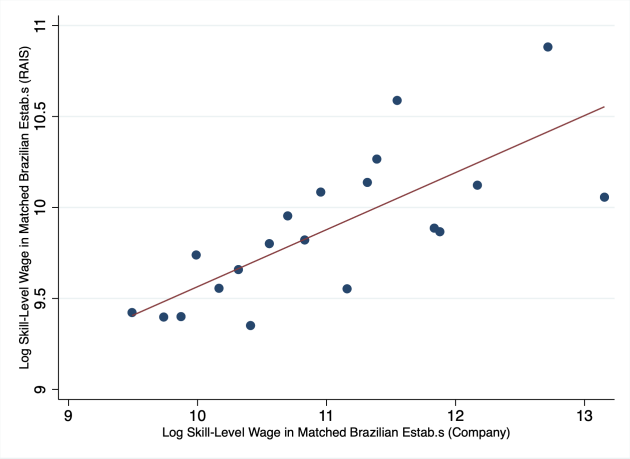
FIGURE A8: CAUSAL FOREST ON THE TRANSMISSION OF HQ MIN WAGE



Notes: Panel A plots the distributions of the predicted conditional treatment effect (CATE) using Causal Forest estimation of the low-skill and non-low-skill jobs. CATE is positive for 74% of low-skill observations and 61% of high-skill observations. Low-skill occupations are those requiring a skill level below 5, whereas non-low-skill occupations are defined as those requiring a skill level between 6-16, as defined by the Company. Panel B plots the average treatment effect (ATE) estimate for each octile of the predicted CATE. Octiles are defined within the samples of low-skill jobs and high-skill jobs respectively. Within-octile ATE estimate is the difference in the mean value of outcome variable (percentage change in foreign establishment wages) between observations in that octile with and without the treatment (minimum wage hike in the headquarters country/state), after controlling for occupation $\times$ establishment city $\times$ year fixed effects.

FIGURE A9: WAGE CORRELATION: BRAZIL

(A) SAME ESTAB.S IN COMPANY VS RAIS



(B) BRAZILIAN VS NON-BRAZILIAN ESTAB.S

Notes: Panel A shows the raw correlation between the skill-level wages at an multinational's foreign establishments located in Brazil from the Company dataset (x-variable) and from the RAIS dataset (y-variable). The correlation coefficient is 0.53. Panel B shows the relationship between the skill-level wages at all of a multinational's foreign establishments not located in Brazil from the Company dataset (x-variable) and the skill-level wages at all of this multinational's foreign establishments located in Brazil (including those which did not appear in the Company data) from the RAIS dataset (y-variable), after controlling for employer $\times$ skill-level fixed effects, Brazilian establishment city $\times$ year fixed effects and non-Brazilian establishment city $\times$ year fixed effects. The slope of the line of best fit is $\hat{\beta} = 0.042$ (s.e. = 0.014). Standard errors are clustered at the employer level. The 16 skill levels defined by the Company are matched to the Brazilian data using the average education for a given job. To construct the plots in Panel B, the log skill-level wage at the Brazilian establishments (y-variable) is first residualized with respect to the fixed effects; then the log skill-level wage at the non-Brazilian establishments (x-variable) is then divided into 20 equal-sized groupings. Within each of these groups, we plot the mean of the residuals of the y-variable against the groupings mean of the x-variable, and add back the unconditional mean of the y-variable to help with interpretation.

Appendix Tables

TABLE A1: COMPARISON WITH ORBIS FIRMS

	Company	Orbis
	(1)	(2)
Total Assets	8966.29	399.88
	[16421.90]	[2977.68]
Working Capital	411.98	35.17
	[3948.84]	[463.62]
Sales	6827.88	224.33
	[14915.55]	[2094.92]
Gross Profit	4018.94	98.21
	[12577.03]	[732.10]
Export Revenue	2782.75	32.28
	[2658.25]	[465.79]
Profit Margin	12.53	4.86
	[17.26]	[15.66]
N Firms	1,060	1,100

Note: This table shows summary statistics for the 1,200 multinationals in the Company dataset, and a random sample of 1,100 multinationals drawn from Orbis. When drawing the multinationals from Orbis, we restrict to the set of multinationals that are in the same headquarter $\times$ sector groupings. Total assets, working capital, sales, gross profit, and export revenue are all reported in the millions. Standard errors are shown in square brackets.

TABLE A2: SUMMARY STATISTICS OF MULTINATIONALS (PRIVATE SECTOR)

Panel A: Summary of Multinational Samples

Unit of Observation	Number of Observations Sample 1	Sample 2	Sample 3
Employer	761	39	29
Employer × Year	3276	190	96
Establishment	2940	199	101
Estab. × Year	11974	715	410
Estab. × Skill-Level × Year	93471	5496	3930
Estab. × Occupation	60511	3459	2462
Estab. × Occ. × Year	209973	13043	9687

Panel B: Multinationals' Foreign Estab. Wages

	Sample 1		Sample 2		Sample 3	
	Mean	SD	Mean	SD	Mean	SD
Gross Wage (2000 USD)	19232.79	11667.65	17426.68	11183.70	21113.67	10692.11

Panel C: Distr. & Compression of Wages (Sample 3)

	HQ-Quart 1	HQ-Quart 2	HQ-Quart 3	HQ-Quart 4	HQ-All Occ
	Headquarter Wage Distribution				
Mean Gross Wage (2000 USD)	9772.20	14794.79	27605.59	46604.99	25216.82
Max. Gross Wage (2000 USD)	46393.92	71939.24	106129.25	117636.55	117636.55
	Establishment Wage as % of HQ Wage				
All Establishments	0.95	0.88	0.93	0.93	0.93
Estabs in Poorer-than-HQ Countries	0.80	0.78	0.84	0.86	0.82
Employer × Occ × Year	513	357	381	309	1560

Note: This table replicates Table 1, restricting the sample to private-sector multinationals.

TABLE A3: RELATIONSHIP BETWEEN HQ AND FOREIGN ESTABLISHMENT WAGES

	Log Wage at Establishment			
	(1)	(2)	(3)	(4)
Log Occ-Level HQ Wage	0.190	0.058		
	(0.077)	(0.135)		
Log Skill-Level HQ Wage			0.148	
			(0.116)	
Log Firm-Level HQ Wage				0.217
				(0.102)
Employer × Occ FE	✓	✓		
Employer × Skill-Level FE			✓	
Employer FE				✓
Estab. City × Year FE				✓
Estab. City × Occ × Year	✓	✓		
Estab. City × Skill-Level × Year			✓	
HQ Country (State) × Year FE		✓		
Observations	5861	5861	3529	721

Note: This table replicates Panel B of Table 2 but directly controls for fixed effects instead of using the Frisch-Waugh method. Standard errors are clustered at the employer level.

TABLE A4: HETEROGENEITY IN CORRELATION BETWEEN HQ AND ESTAB. WAGES

	Log Occ-Level Wage at Establishment				Wage Slope at Estab
	(1)	(2)	(3)	(4)	(5)
				Private Sec.	Private Sec.
Log Occ-Level HQ Wage	0.165	0.278	0.534	0.376	
	(0.087)	(0.109)	(0.205)	(0.115)	
Med Skill x Log Occ-Level HQ Wage		-0.158			
		(0.032)			
High Skill x Log Occ-Level HQ Wage		-0.154			
		(0.054)			
USA x Log Occ-Level HQ Wage			-0.004		
			(0.024)		
Other High Inc x Log Occ-Level HQ Wage			-0.058		
			(0.052)		
HQ Wage Slope					0.531
					(0.061)
Log Local Benchmark Wage				0.044	
				(0.010)	
Local Benchmark Wage Slope					0.020
					(0.006)
Employer × Occ FE	✓	✓		✓	
Employer × Skill-Level FE			✓		
Employer × Occ-Type × Skill-Lev Pair FE					✓
Estab. City × Year FE	✓	✓	✓	✓	✓
Observations	20983	20983	21151	7483	5119

Note: Columns 1-3 show the estimates corresponding to Panels A-C in Figure 1. High income countries are defined by the World Bank. Medium skill jobs are skill levels 6-10 and high skill jobs are skill levels 11-16, as defined by the Company. Columns 4-5 limit the sample to firms operating in the private sector, with column 5 showing the results using the wage slope rather than the log wage. Standard errors are clustered at the employer level for columns 1-4, and at the employer × skill-level-pair for column 5.

TABLE A5: IMPACT OF SHOCKS ON NON-LOW SKILL JOBS

	% Δ Estab Wage		% Δ HQ Wage		Log Estab Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Non-Low		Non-Low		Low	Non-Low	Low	Non-Low
MW Hike	0.002		0.022					
	(0.005)		(0.014)					
Large MW Hike		0.002		0.024				
		(0.007)		(0.015)				
Log HQ Ex. Rate					-0.087	-0.070	-0.742	-0.453
					(0.025)	(0.033)	(0.168)	(0.252)
Occ × Estab City × Year FE	✓	✓						
Occ × Year FE			✓	✓				
Employer × Occ FE					✓	✓	✓	✓
Estab City × Year								
Year FE								
HQ Currency Trend								
Observations	119368	87189	12343	11760	174081	230344	18595	26559

Note: This table shows the impact of minimum wage shocks at a firm's headquarters on wages for non-low-skill workers (columns 1-4), and the impact of exchange rate shocks in the firm's headquarters on wages for low and non-low-skill workers respectively (columns 5-8). Low-skill occupations are defined as those requiring a skill level below 5, whereas non-low-skill occupations are those requiring a skill level between 6-16, as defined by the Company. A large minimum wage hike is a hike of above-sample-median magnitude. Standard errors are clustered at the headquarter country level (columns 1-4) and at the headquarter country currency zone level (columns 5-8). The sample period of analysis is from 2005 to 2015 in columns 1-4.

TABLE A6: ROBUSTNESS TO ALTERNATIVE LOW SKILL DEFINITIONS

% Δ Wage at:	Estab	HQ	Estab	Estab	HQ	Estab
	(1)	(2)	(3)	(4)	(5)	(6)
	Skill Levels 1-4			Skill Levels 1-6		
Min. Wage Hike	0.006	0.030		0.006	0.035	
	(0.003)	(0.018)		(0.004)	(0.016)	
% Δ HQ Wage (IV)			0.189			0.174
			(0.153)			(0.131)
Occ × Estab City × Year FE	✓		✓	✓		✓
Occ × Year FE		✓			✓	
Observations	76639	7771	76639	152354	16024	152354

Note: This table replicates columns 1-3 of Table 4, with low skill jobs defined as those of skill levels 1-4 (columns 1-3) and skill levels 1-6 (columns 4-6) respectively. Standard errors are clustered at the headquarter country level. The sample period of analysis is from 2005 to 2015.

TABLE A7: IMPACT OF MIN WAGE ON ESTAB. WAGES (PRIVATE SECTOR)

% Δ Wage at:	Estab	HQ	Estab
	(1)	(2)	(3)
Min. Wage Hike	0.013	0.042	
	(0.004)	(0.018)	
% Δ HQ Wage (IV)			0.298
			(0.165)
Occ × Estab City × Year FE	✓		✓
Occ × Year FE		✓	
Observations	49159	8758	49159

Note: This table replicates columns 1-3 of Table 4, restricting the sample to private-sector firms. Standard errors are clustered at the headquarter country level. The sample period of analysis is from 2005 to 2015.

TABLE A8: IMPACT OF ESTAB. COUNTRY MIN WAGE/EX RATE SHOCKS ON WAGES

	Estab Country Min Wage Hikes		Estab Country Ex Rate Shocks	
	(1)	(2)	(3)	(4)
	% Δ HQ Wage	% Δ Estab Wage (≠ j)	Log HQ Wage	Log Estab Wage (≠ j)
Min. Wage Hike at Estab. j	-0.000	-0.001		
	(0.000)	(0.000)		
Log Ex. Rate at Estab. j			0.000	-0.000
			(0.000)	(0.000)
Occ × HQ City × Year FE	✓			
Occ × Estab City × Year FE		✓		
Employer× Occ FE			✓	✓
HQ City × Year FE			✓	
Estab City × Year FE				✓
Observations	4981	5427094	17606	16493286

Note: This table shows the impact of a minimum wage hike or exchange rate shock in one of a firm's foreign establishments on wages in the firm's headquarters (columns 1 and 3) and other foreign establishments (columns 2 and 4). We weight by the number of occupations present in a given establishment. The regressions are run by creating a dataset in which a firm's headquarter is matched to every foreign establishment of the firm, and each foreign establishment is matched to every other foreign establishment of the firm. Standard errors in columns 1 and 2 are clustered at establishment j's location country level; standard errors in columns 3 and 4 are clustered at establishment j's location country currency zone level. The sample period of analysis is from 2005 to 2015 in columns 1 and 2.

TABLE A9: ROBUSTNESS TO SHOCK DEFINITIONS

	% Δ Wage						Log Wage		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Estab.	HQ	Estab.	HQ	Estab.	HQ	Estab.	HQ	Estab.
Min Wage Hike, 25th	0.013	0.027							
	(0.004)	(0.013)							
Min Wage Hike, 50th			0.014	0.028					
			(0.003)	(0.013)					
% Δ HQ Min. Wage					0.018	0.094			
					(0.011)	(0.021)			
Log HQ Ex. Rate							-0.105	-0.517	
							(0.041)	(0.266)	
Log HQ Wage (IV)									0.203
									(0.131)
Occ × Estab City × Year FE	✓		✓		✓				
Occ × Year FE		✓		✓		✓			
Employer × Occ FE							✓	✓	✓
Estab City × Year FE									✓
Year FE									
HQ Currency Trend									✓
Observations	95170	11134	79679	10748	104074	7971	126225	23499	126225

Note: This table shows robustness to different definitions of wage and exchange rate shocks. Min Wage Hike, 25th uses only minimum wage shocks that are above the 25th percentile in terms of the size of the minimum wage change. Similarly, Min Wage Hike, 50th uses only shocks above the median size. % Δ HQ Min. Wage is the percentage change in the minimum wage at the headquarter location from year t-1 to year t. In columns 7-9 we restrict to exchange rate shocks in which the change in the exchange rate from the previous year is greater than 3% (the average minimum wage change from year to year). Column 9 presents the IV estimate using exchange rate shock. Standard errors are clustered at the headquarters country level in columns 1-6, and at the headquarters country currency zone level in columns 7-9. The sample period of analysis is from 2005 to 2015 in columns 1-6.

TABLE A10: FREQUENCY AND MAGNITUDE OF SHOCKS

	Pct. Change			# country (state)-year	
	P(25)	P(50)	P(75)	Neg.	Total Δs
Minimum wage	4.13	8.23	14.83	0	808
Exchange-rate	-3.32	1.25	6.94	470	1084

Note: This table shows different statistics that illustrate the magnitude and frequencies of the changes in the minimum wage and exchange rates for the sample used in the estimations. Columns (1)-(3) contain percentiles of the variable percentages of change, conditional on being different from zero. Columns (4) and (5) present the number of negative percentages of changes and total events. The sample period is from 2000 to 2015.

TABLE A11: IMPACT OF HQ EX RATE SHOCKS WITHOUT CURRENCY TREND

Panel A: Reduced Form			
Log Wage at Establishment			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.110	-0.061	-0.116
	(0.025)	(0.018)	(0.045)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE			
Observations	404425	192541	208840
Panel B: First Stage			
Log HQ Wage			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.441	-0.472	-0.480
	(0.121)	(0.150)	(0.175)
Employer × Occ FE	✓	✓	✓
Year FE			
Observations	45154	27644	21206
Panel C: TS2SLS			
Log Establishment Wage			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Wage	0.249	0.130	0.243
	(0.089)	(0.056)	(0.129)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE	✓	✓	✓
Observations	404425	192541	208840

Note: This table replicates Table 6 but excludes the headquarter-country currency trend.

TABLE A12: IMPACT OF EXCHANGE RATE SHOCKS (PRIVATE SECTOR)

	Panel A: Reduced Form		
Log Wage at Establishment			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.081	-0.038	-0.107
	(0.055)	(0.074)	(0.095)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE			
HQ Currency - Year Trend			
Observations	191773	91543	100643
	Panel B: First Stage		
Log HQ Wage			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.551	-0.520	-0.465
	(0.261)	(0.280)	(0.263)
Employer × Occ FE	✓	✓	✓
Year FE			
HQ Currency - Year Trend			
Observations	39025	24027	18666
	Panel C: TS2SLS		
Log Establishment Wage			
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Wage	0.147	0.074	0.231
	(0.121)	(0.147)	(0.243)
Employer × Occ FE	✓	✓	✓
Estab. City × Year FE	✓	✓	✓
HQ Currency - Year Trend	✓	✓	✓
Observations	191773	91543	100643

Note: This table replicates Table 6 but restricts to the sample of firms operating in the private sector. See the table notes of Table 6.

TABLE A13: ESTAB-HQ WAGE ANCHORING: BRAZIL (EXCH. RATE)

	Data Source: RAIS			
	(1)	(2)	(3)	(4)
	Annual	Effective	Annual	Effective
Log HQ Ex. Rate	-0.252	-0.228	-0.325	-0.338
	(0.082)	(0.060)	(0.231)	(0.080)
Employer × Occ FE			✓	✓
Worker × Estab × Employer × Occ FE	✓	✓		
Estab City × Year FE	✓	✓	✓	✓
HQ Currency Trend	✓	✓	✓	✓
Worker Controls	✓	✓	✓	✓
Observations	1189089	914606	1376944	1075004

Note: This table shows the impact of a $100 local currency depreciation (relative to USD) in a firm's home country on gross wages in its foreign establishments in Brazil. In columns 1 and 3, the outcome variable is the log annual average monthly wage of a worker. In columns 2 and 4, the outcome variable is the log of the average annual monthly wage after accounting for differences in days worked. Worker controls include race and gender fixed effects, as well as controls for age and job tenure. Standard errors are clustered at headquarter country currency zone level.

TABLE A14: IMPACT OF HQ MIN WAGE INCREASE ON FIRM FINANCIALS

	% Δ Gross Profit	% Δ K/L Ratio
	(1)	(2)
Min. Wage Hike	-0.004	-0.014
	(0.038)	(0.031)
Mean of Dep. Var.	.077	.097
St. Dev. of Dep. Var.	.245	.224
Employer FE	✓	✓
Year FE	✓	✓
Observations	231	199

Note: This table shows the impact of a minimum wage hike at a firm's headquarter on the percentage change of the firm's gross profit (column 1) and capital-to-labor ratio (column 2). Capital-to-labor ratio is defined as the total fixed assets divided by the number of employees in the company's payroll. Percentage changes are calculated by taking the first difference of the inverse hyperbolic functions (asinh) of the variables, as they can take negative values. The outcome measures are constructed from Orbis Historical, from which we extract a sample that we could match to the Company data at the firm × year level. There are 107 firms included in the analysis. The sample period is from 2000 to 2015. We use the consolidated accounts which include the statement of a company integrating the statements of its subsidiaries. Top and bottom 1% of the outcome variables are trimmed. Firm fixed effects and year fixed effects are included. Standard errors are clustered at the headquarters country level.

TABLE A15: MORE VS. LESS EXPOSED HEADQUARTERS

% Δ Wage at:	Estab	HQ	Estab	HQ
	(1)	(2)	(3)	(4)
Min. Wage Hike	0.009	0.015		
	(0.005)	(0.014)		
Hike × Firm Bindingness	0.009	0.001		
	(0.001)	(0.000)		
Large Min. Wage Hike			0.009	0.017
			(0.006)	(0.015)
Large Hike × Firm Bindingness			0.009	0.001
			(0.001)	(0.000)
Occ × Estab City × Year FE	✓		✓	
Occ × Year FE		✓		✓
Observations	14988	7971	14137	7554

Note: This table shows the impact of a minimum wage shock on firms whose headquarters are more versus less exposed to the minimum wage shock. The firm-level bindingness measure is a employer-year-specific Kaitz variable calculated as the ratio between the ex ante minimum wage and the employer's median wage at the headquarters. For years in which the HQ was not surveyed, we impute the establishment-occupation level average Kaitz index. Columns 1 and 3 show the reduced form estimate of the impact of respectively any minimum wage hike and large minimum wage hikes (those of an above-sample-median magnitude) in an employer's headquarters location on wages in the foreign establishments; and columns 2 and 4 the impact in the headquarters. We do not require that we see the wages for the same set of occupations in the firm's headquarters and foreign establishments in the same year for these regressions. Standard errors are clustered at the headquarter country level. The sample period of analysis is from 2005 to 2015.

TABLE A16: ROBUSTNESS OF IMPACT OF HQ EX. RATE SHOCKS

	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.089	-0.041	-0.498	-0.463
	(0.051)	(0.043)	(0.138)	(0.161)
Log HQ Ex Rate × High Output Exporting		-0.079		0.022
		(0.044)		(0.204)
Log HQ Ex Rate × High Input Importing	-0.024		0.058	
	(0.046)		(0.158)	
Employer × Occ FE	✓	✓	✓	✓
Year FE			✓	✓
Estab. City × Year FE	✓	✓		
HQ Currency Trend	✓	✓	✓	✓
Observations	404425	404425	45154	45154

	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.102	-0.120	-0.421	-0.454
	(0.025)	(0.025)	(0.128)	(0.136)
Log HQ Ex Rate × Offshorable		0.019		0.022
		(0.018)		(0.039)
Log HQ Ex Rate × Single Task	-0.036		-0.127	
	(0.024)		(0.098)	
Employer × Occ FE	✓	✓	✓	✓
Year FE			✓	✓
Estab. City × Year FE	✓	✓		
HQ Currency Trend	✓	✓	✓	✓
Observations	404425	404425	45154	45154

	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.102	-0.133	-0.498	-0.383
	(0.028)	(0.023)	(0.098)	(0.148)
Log HQ Ex Rate × Abstract	-0.023		0.137	
	(0.023)		(0.098)	
Log HQ Ex Rate × Routine		0.035		-0.093
		(0.022)		(0.074)
Employer × Occ FE	✓	✓	✓	✓
Year FE			✓	✓
Estab. City × Year FE	✓	✓		
HQ Currency Trend	✓	✓	✓	✓
Observations	404386	404386	45148	45148

Note: Panel A compares the differential impact of exchange rate shock in a home country on the firm wages based on the home-country × sector-specific exported output as a share of total output and the home-country × sector-specific imported input as a share of total input in the foreign establishments (cols 1-2) and the headquarters (cols 3-4) of multinationals headquartered in that country. A home-country × sector is defined as highly output exporting (input importing) if its share of exported output (imported input) is above sample mean. The input/output shares are calculated using year-2004 data from the World Input-Output Database (WIOD) (Timmer et al., 2015). For countries without country-specific information in WIOD, we take the worldly sector-specific averages. Panel B compares the differential impact of exchange rate shock in a home country on the gross wages paid to occupations of high and low offshorability and of different task complexity. An occupation is defined as highly offshorable if its offshorability index is above the sample mean. The offshorability index is constructed according to Blinder & Krueger (2013). Occupations defined as single-task include: cleaner, messenger, guard, driver, data entry clerk, administrative clerk and shipping & receiving clerk. Panel C compares the differential impact of exchange rate shock in a home country on the gross wages paid to occupations of high and low abstractness and routineness. An occupation is defined as abstract (routine) if its abstractness (routineness) index is above the sample mean. The abstractness and routineness indices are from Autor & Dorn (2013). HQ country currency time trends are included in all specifications. All foreign establishments located in the same currency zone as the headquarters are excluded. Standard errors are reported in parentheses and clustered at the home-country-currency-zone level.

TABLE A17: RAIS DATA SUMMARY STATISTICS

	Mean	Min	Max	SD
Occupations	14	1	149	19.1
Workers	288.9	1	12804	974.7
% Brazilian	99.0	0	100	3.7
% no High School	11.2	0	100	17.3
Tenure (Months)	61	0.4	525.9	55.3
Yearly Wages (USD)	25412.1	0	394589	22142.0

Note: This table reports the mean, minimum, and maximum values, as well as the standard deviations of the listed variables in the Brazilian establishments of foreign firms in the RAIS data. Variables are measured at the firm establishment-by-year level so that an observation is a firm establishment-year. Occupations is the average number of occupations present in a firm's establishment in a given year. Workers is the number of full-time workers at a firm's establishment in a given year. % no High School is the percent of workers within a firm's establishment who did not finish high school. % Brazilian is the percent of workers who are Brazilian nationals. Tenure is the number of months a worker is at a specific establishment. Wages are measured in current US Dollars.