Across-Country Wage Compression in Multinationals*

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July 12, 2022

Abstract

Many employers link wages at establishments outside of the home region to the level at headquarters. We show this using new data on 1,213 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 associated with particular headquarter country characteristics, such high inequality aversion, low inequality, and high urbanization.

*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; Barth *et al.*, 2016; Bloom *et al.*, 2018; Card *et al.*, 2018). One prominent example is multinationals operating abroad. They tend to pay large premiums to employees overseas, even when the multinational's foreign establishments are located in low-wage regions (Brown *et al.*, 2004; Martins & Esteves, 2015; Alfaro-Urena *et al.*, 2019; Setzler & Tintelnot, 2021). These pay premiums are 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 "anchor" the wages they pay abroad to the wages at headquarters. These firms also extend externally imposed headquarters wage increases to their foreign establishments, pointing to a direct link between wages at home and abroad. We find little evidence that wage change transmission arises indirectly through associated technology or employment changes.

To document wage anchoring, we use a dataset spanning 2000-2015 of yearly average wages for narrowly-defined occupations in multinationals' establishments across the world. These data were 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 1,213 multinationals that span 19 broad sectors and operate in 174 different cities around the world.[3] 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 confirm our findings, and to explore pathways underlying wage

[1] Recognition of and interest in "firm effects" in wages have a long history in labor economics. For early work, see e.g. Slichter (1950); Rees & Schultz (1970); Dickens & Katz (1987); Krueger & Summers (1988); Van Reenen (1996); Abowd *et al.* (1999, 2002). That multinationals pay workers more than local firms is extensively documented (see Brown *et al.* (2004); Lipsey (2004); Lipsey & Sjoholm (2006); Martins & Esteves (2015); Hijzen *et al.* (2013); Orefice *et al.* (2016); Earle *et al.* (2018); Setzler & Tintelnot (2021); Hjort *et al.* (2021); Alfaro-Urena *et al.* (2019)). See e.g. Aitken *et al.* (1996); Conyon *et al.* (2002); Egger & Kreickemeier (2013); Helpman *et al.* (2013); Sun (2020) on technological or production style differences in multinationals that raise worker productivity or attract more productive workers.

[2] See Adams & Williams (2019); DellaVigna & Gentzkow (2019) on firms that do not adjust their product prices to local contexts, and Clemens & Gottlieb (2017) on benchmarked (to a large competitor) pay-setting. Recent research has also shown that many societies 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 such attitudes can influence firms' wage-setting practices (Harrison & Scorse, 2010). Cappelli & Chauvin (1991) pioneered the study of *institutionally required* pay equality within firms.

[3] We observe wages for workers employed in the exact same position at both headquarters and foreign establishments in 101 of the multinationals, covering 111,954 establishment×job×year observations.

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 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.[4] 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 and middle-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 use changes in home minimum wage laws. We document that low-skill wages in "treated" and "control" establishments that are located in the same foreign city evolve similarly before the minimum wage is increased in the country or state where the headquarters of treated establishments is located. Thereafter (relative) wages in treated establishments abruptly increase. Within low-skill occupations in the same foreign establishment, these wage increases are concentrated 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 and Associates Inc, 2011; Alfaro-Urena *et al.*, 2019).[5] 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.[6]

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 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 of tasks to the firm's foreign

[4] In the Appendix we show that our results are very similar for private-sector firms and other types of employers. For simplicity, we use "firm" and "employer" interchangeably.

[5] In a recent survey of primarily North American employers operating in multiple locations, 29 percent report paying the same *nominal* wages across locations (Culpepper and Associates Inc, 2011) (see also Hazell *et al.*, 2022). Similarly, a growing list of firms—including 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) (see also Derenoncourt *et al.*, 2021). 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" Alfaro-Urena *et al.* (2019, p. 2).

[6] 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.

establishments and firm-wide technology changes.

We first use a causal forest algorithm to estimate the conditional average treatment effect of a minimum wage shock at a firm's headquarters, allowing the treatment effect on foreign establishment wages to vary with a wide range of characteristics associated with the job. We then construct and compare above- and below-median predicted average treatment groups, following Carlana & La Ferrara (2021). We find that high-wage-shock-transmission job observations differ the most in various correlated characteristics of the firm's headquarter country, such as inequality, cultural inequality aversion, and urbanization. In contrast, links between the headquarter and establishment countries; the sector the multinational operates in; the job itself; and especially the foreign establishment country, have little explanatory power for wage shock transmission.

We next link the global multinationals data to Brazilian employer-employee records. We begin by confirming the results from our earlier analysis in these administrative registries. The wage multinationals pay a given individual in Brazil abruptly rises when external shocks raise the wages of workers in the same position at the foreign headquarters. We then look at the employment response of 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 no change in total employment at foreign establishments. In addition, the estimated wage response does not depend on job offshorability or task content. Overall there is little evidence to suggest that the initial wage impact arises through local labor markets.

In sum, this paper shows that many large 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 the headquarters. An important question for future research is whether such wage-setting procedures ultimately benefit the firm as a whole. They may do so for example by reducing menu- and information-costs of localized wage-setting (Lemieux *et al.*, 2009, 2012); increasing foreign worker morale (Coviello *et al.*, forthcoming; 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 (Hortacsu & Puller, 2008; Cho & Rust, 2010; Goldfarb & Xiao, 2011; DellaVigna & Gentzkow, 2019; Almunia *et al.*, forthcoming; Dube *et al.*, 2020).

Our analysis builds on recent findings on invariability in firms' decisions across different contexts, especially DellaVigna & Gentzkow (2019).[7] We connect this body of evidence with the literature on spatial wage differences (see e.g. Moretti, 2011; Clemens *et al.*, 2019). Our research design builds on

[7] DellaVigna & Gentzkow (2019) show that many U.S. retailers charge nearly identical prices across large zones of the U.S. The literature on invariability in firms' decisions across contexts originates in the seminal work of Kahneman *et al.* (1986). Recent empirical studies have also documented constraints imposed on the wages firms pay different workers in a given worksite or country by workers' fairness preferences (Card *et al.*, 2012; Mas, 2017; Breza *et al.*, 2017; Cullen & Perez-Truglia, 2022). See also Akerlof & Yellen (1990); Fehr & Schmidt (1999), and the lab-based experimental studies surveyed in—and following on from—Rabin (1998).

the pioneering work of Harrison & Scorse (2010) showing that home country attitudes can influence how firms operate abroad, and Bloom & Van Reenen (2007) and Bloom *et al.* (2012a)'s influential 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 among others Card *et al.*, 2013, 2015; Barth *et al.*, 2016; Bloom *et al.*, 2018; Card *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 point 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 (Derenoncourt *et al.*, 2021; 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.[10] In this sense the paper relates to emerging evidence of 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 (see also Feenstra & Hanson, 1996; Grossman & Helpman, 2008; Dube & Kaplan, 2010; Blinder & Krueger, 2013; Aghion *et al.*, 2017). In doing so we build on the literature 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 and consequences for wage inequality (Lemieux *et al.*, 2009; Massenkoff & Wilmers, forthcoming).

[8] See also Akerlof & Kranton (2005) and Hermalin (2013)'s surveys of the literature on corporate culture.

[9] Budd *et al.* (2005); Martins & Yang (2015) find a high parent firm profits elasticity of foreign affiliate wages, consistent with our results. Card *et al.* (2018) review research documenting that some firms share rent with workers via higher wages. Goldschmidt & Schmieder (2017) show that high-wage German firms outsource the lowest-skill occupations.

[10] The minimum wage literature is large: see e.g. Neumark & Wascher (1992); Card & Krueger (1995); Lee (1999); Aaronson & French (2007); Draca *et al.* (2011); Autor *et al.* (2016); Engbom & Moser (2018); Harasztosi & Lindner (2019); Horton (2018); Neumark (2018); Haanwinckel (2019); Cengiz *et al.* (2019).

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 multinationals' establishments (both headquarters and foreign establishments) around the world. When a firm uses the Company's services, Human Resources personnel describe positions present in each reported establishment, as well as their tasks, responsibilities, and average gross and net monthly total pay.[11] The resulting dataset includes 287 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 287 occupations into 15 skill levels and 26 occupational categories. Examples of low-skill jobs (skill levels 1-5) include cleaner, guard, and data entry clerk. Middle-skill jobs (6-10) include administrative assistant, systems analyst, and finance officer, while high-skill jobs (11-16) include senior legal counsel, regional office manager, and Human Resources director. As seen in Appendix Figure A2, the most common occupation categories are "General Operations" and "Administrative", but others are more specific. Both high-skill and low-skill jobs are concentrated in the five or so most common occupational categories, while middle-skill jobs span a wider range. For example, out of the 510 positions observed in the "Engineering" category, 443 are middle-skill jobs, while 2275 out of 2986 "Secretary" positions are low-skill positions. On average, multinationals in our data report information on around 25 different jobs, spanning 9 skill levels, 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$\times$year level. Our primary outcome variable is the average nominal gross wage of domestic workers employed in a given job at a given establishment and year, measured in current USD.[12]

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 (22 percent), financial services (15 percent), petroleum (10 percent), business activities (8 percent), telecommunications (7 percent), technology (5 percent), and pharmaceuticals and health

[11] Pay data typically come from a firm's HR records and positions' tasks from in-depth qualitative interviews and quantitative surveys. The Company maps tasks/responsibilities associated with a job into specific, harmonized job titles.

[12] Our dataset does not cover expat workers. The Company informed us that they are rare in most of the jobs observed in these data, and especially in middle- and low-skill positions (see also Cho, 2018). 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.

services (4 percent), as shown in Appendix Figure A1. 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 significantly less likely to be in manufacturing and more likely to be in for example petroleum and financial services, and especially to be NGOs.[13]

The employers in the sample are also unusually large. In Appendix Table A1 we compare the finances of firms in our sample to the Orbis sample. Firms in our data have significantly more assets, working capital, revenues, and profits. The publicly listed U.S. firms in our data alone account for about one-third of the total revenue of all publicly listed U.S. firms.

As clients of the Company, 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 employers generally choose a rotation rule for establishments to report[14], and that there is some variation in HR personnel's non-response rates. The establishment×year panel structure of the data appear to confirm this. The included establishments are significantly skewed toward local headquarters, though many of these also employ production workers.

We include both private-sector and public-sector multinationals in our primary samples because the sources of the form of across-country wage compression we study 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 throughout the paper that the results are robust to restricting our analysis to firms operating in the private sector.

We use three samples of multinationals to conduct our analysis. These are are summarized in Table 1.[15] Our full sample (Sample 1) is the sample of foreign establishments we observe, regardless of whether there is a job-match between the headquarters and establishments. This sample includes 6,217 foreign establishments that belong to 1,213 employers. As shown in Appendix Figure A4, these are distributed across the world, in over 174 cities. In contrast—and also shown in the figure—most headquarters are located in Europe and North America, although some are in Asia, Latin America, and Africa, in part because the Company's primary focus is to collect data on establishments located

[13] Sectors are defined according to the Standard Industrial Classification, with NGOs and other multinational public sector employers classified separately. The multinational public sector employers in our data also include national banks and various branches of government that tend to have establishments abroad.

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

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

in low- and middle-income countries. We use Sample 1, in addition to the more narrowly defined samples discussed next, when we analyze the impact at foreign establishments of external shocks that influence headquarter wages in Section 4.[16]

In the descriptive analysis in Section 3 we directly compare the wages of workers in an employer's foreign establishment to those at the headquarters. For this purpose, 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 further restrict 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). While there are substantially fewer employers in these subsamples, samples 2 and 3 are nevertheless not small. As shown in Panel A of Table 1, Sample 2 (3) includes 101 (80) employers, 1,239 (610) of their foreign establishments, and 111,954 (27,318) 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 14,442 (in 2000 dollars), with a standard deviation of USD 9,016. The corresponding numbers are USD 13,573 and USD 8,125 in Sample 2 and USD 16,992 and USD 8,598 in Sample 3.

More information on the data from the Company can be found in Appendix III.

2.3 Additional data sources

We match our global data on multinationals' wages to three additional types of data.

Shocks to headquarter wages We gather information on two types of shocks in home countries or 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 tenure.

We merge the RAIS data on the multinationals in our sample that have an establishment in

[16] Data on wages at the multinational's headquarters are available for around 10 percent of the multinationals in Sample 1. Estimating the impact of shocks in home countries/states is nevertheless feasible because we observe home country/state minimum wage changes and exchange rate shocks in auxiliary data. See Section 4 for more details.

Brazil to the Company data, matching jobs by skill-level[17], to form our Brazil sample. This sample includes job level data from 54 multinationals that are headquartered in 20 different locations (most commonly in Australia, France, Germany, the US, and the UK). Although all of these multinationals are represented in the Company data, only 37 have a headquarter job-match. We thus show the correlation between headquarter and (Brazilian) establishment wages with the 37 firms that have a headquarter match and do the remainder of our Brazil analysis using the larger 54-firm sample.

Employer, job, and location attributes To identify country, firm, and job characteristics that may predict wage-setting practices, we make use of a host of data on the economic, political, and cultural context of headquarter and foreign establishment countries, as well as characteristics of the firms and jobs themselves. We consider over 50 characteristics, including cultural traits such as trust and inequality aversion; sectoral characteristics like tradability; occupation characteristics including the offshorability of a job; and characteristics specific to the headquarter-establishment country pairs, such as language commonality and geographic distance. The full set of characteristics are are laid out in Table 7 and discussed further in Section 5.1 and Appendix III.

3 Anchoring to Headquarter Wages

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

3.1 Across-country wage patterns

The raw data point toward a close relationship between the two. The mean headquarters wage is roughly USD 11,000, with a maximum wage of USD 42,000 in the lowest within-headquarters wage distribution quartile, and USD 37,000 (with a maximum of USD 91,000) in the highest one. 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 88 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 (74 percent) also for establishments in countries that are poorer than the home country. Given the countries where headquarters and foreign establishments are located (see Appendix Figure A4), real wages at foreign ~~establishments are much higher than at~~ headquarters.

[17] We match the RAIS data 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 wage observations for Brazil in the data from the Company and those from RAIS are highly correlated, at around 0.8. The main reason why the two are not perfectly correlated is likely that the Company measures total compensation—including for example variable and in-kind pay—whereas RAIS simply measures the wage itself, but other differences across the two data sources may also contribute.

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 firm×job fixed effects θ_{fj} to account for broader differences between workers in job j across firms, and 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.

The results from estimating equation (1) are presented in Table 2. Headquarter and foreign establishment wages are strongly correlated. As seen in Column 1 of Panel A, 10 percent higher wages at the headquarters are associated with 1.9 percent higher foreign establishment wages for workers in the same position, and 1 percent higher foreign wages when we replace the average-wage-paid-by-other-multinationals control and city×year fixed effects with city×job×year fixed effects in Panel B.[18] The within-firm-across-country correlation in wage levels is an order of magnitude 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 unchanged.

The estimated correlation is robust to including wage observations from foreign establishment jobs that do not necessarily have a same-job-and-year counterpart at the headquarters in the sample. We show this in three different ways. In the first two we continue (as in column 1) to use the

[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 main independent variable (log headquarter wage) with respect to the fixed effects and then regress the (also residualized) log establishment wage on the residuals. 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.

sample for which we observe the relevant job at the headquarters in the same year as at the foreign establishment (Sample 3). 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 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] In the last approach 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). The within-firm-across-country correlation in wage levels is shown graphically in Panel A of Figure 1.

The estimated wage anchoring is almost twice as high if we restrict the sample to private-sector firms, as shown in Column 4 of Appendix Table A4. In Section 5 we show that these results also hold and are of similar magnitude when using individual worker-level data from Brazil.

3.3 Heterogeneity in wage anchoring

The within-firm, across-country correlation in wages does not appear to vary greatly 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 as defined by the World Bank, and all other countries. The relationship is slightly weaker for lower-income countries but the differences are small. The corresponding estimates are shown in Column 3 of Appendix Table A4.[21] We further characterize the types of employers, jobs, and locations where externally imposed changes in headquarter wages are (partially) transmitted to foreign establishments in Section 5.

Wages appear to be anchored to headquarter levels to a greater extent in low-skill than 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. When running the regressions separately by skill level, we see that the wage for low and middle-skill jobs have the strongest correlation with the headquarter wage. 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 2.7 percent higher foreign establishment wage in low-skill jobs, and 1.8 and 1.2 percent higher foreign establishment wages in middle and high-skill jobs.

[19] We correspondingly replace firm×job fixed effects θ_{fj} with firm×skill-level fixed effects θ_{fl}, job-specific local benchmark $\bar{w}_{j(-f)ct}$ with skill-level-specific local benchmark $\bar{w}_{l(-f)ct}$ (Panel A), and job×city×year fixed effects θ_{jct} with skill-level×city×year fixed effects θ_{lct} (Panel B).

[20] Correspondingly, firm×job fixed effects are replaced with firm fixed effects θ_f, and the controls for market wages are subsumed by city×year fixed effects θ_{ct}.

[21] In the figure, we estimate equation 1 separately for each firm type whereas in the table we pool and include an interaction with the high and other-income country dummies.

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 average wage of jobs that are of skill level $l+1$ versus skill level l but otherwise similar, 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 1.1 percent greater difference in establishment wages between workers of the same occupational category and skill levels.[23]

The results in this section leave open the possibility that changes in wages are linked across space within firms only via overlapping third factors, such as a firm's technology or production style. We 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 demonstrate 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.

[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 θ_{jct}, is also replaced by occupation-category×skill level-pair×city×year fixed effects $\theta_{o(l,l+1)ct}$. Firm×occupation fixed effects θ_{fj} are analogously replaced by firm×occupational category×skill level-pair fixed effects $\theta_{fo(l,l+1)}$.

[23] The results are very similar when the control for market wages is the occupational category-specific wage slope of other multinationals and when we instead include city×occupation-category×skill-level pair×year fixed effects (see Column 2). If we measure the wage slope across consecutive skill levels establishment-wide, then the anchoring estimate is similar to the occupational category-specific approach with the first market wage benchmark but substantially higher with the second one, as seen in columns 3 and 4. 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.

4.1 Event study analysis of minimum wage shocks

Minimum wage increases in headquarter countries and U.S. states occur throughout our 15-year data period. The frequency, size, and locations of minimum wage hikes are shown in Appendix Figure A5. Importantly, Panel B shows that the size of the increase varies substantially—less than 10 percent is most common, but larger minimum wage hikes are also relatively common—and Panel C shows that minimum wage hikes occur on all continents.[24]

We begin with an event study. We look within an establishment city, using establishments whose headquarters are located in countries/states that experience a minimum wage increase in year t as our treated establishments. Establishments in the same city whose headquarters do not experience a minimum wage increase in year t act as controls. We then compare the difference in the evolution of workers' wages between the two groups by estimating:

$$\mathrm{w}_{jfct} = \sum_{k=-3}^{3} \alpha_k^1 \mathbf{I}(\mathrm{MINw}_{h(f),t-k} > 0) + \theta_{fj} + \theta_{ct} + \varepsilon_{jfct} \tag{2}$$

on the sample of low-skill jobs (whose wages may directly respond to minimum wage changes). In equation 2, $\mathbf{I}(\mathrm{MINw}_{h(f)t-k} > 0)$ is an indicator that firm f experiences a minimum wage hike in its headquarters country or state h in a given year. The dependent variable, w_{jfct}, is defined as in Section 3. The coefficient $\hat{\alpha}_k^1$ thus 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. Standard errors are clustered at the home country/state 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 ($k = -1$). Annual wages in treated establishments increase by over USD 500 relative to control establishments following the minimum wage shock in the home country/state. Importantly, there is no evidence of differential wage growth in treated relative to control establishments before minimum wage changes.[25]

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. To do so,

[24] Panel D shows that, among the headquarter countries and states in our sample, log GDP per capita and the number of minimum wage hikes observed during our data period are weakly positively correlated.

[25] We estimate equation (2) using the sample of multinationals whose headquarters do not experience a minimum wage hike during the three-year period before an event so that we can compare treated and control establishments during a pre-period where both are not exposed to headquarter minimum wage hikes. This restricts our sample to roughly 330 firms. Only low-skill workers are included. 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.

we first show results from a reduced-form regression relating percent changes in the wages paid in a foreign establishment in year t to minimum wage increases in the home country/state in year t from year $t-1$, controlling for firm×job and city×year fixed effects as throughout our analysis and clustering standard errors at the home-country level (or the home-state level for U.S.-headquartered firms):

$$\%\Delta \text{w}_{jfct} = \alpha_1 \mathbf{I}(\text{MINw}_{h(f),t} > 0) + \theta_{ct} + \varepsilon_{jfct} \tag{3}$$

The indicator $\mathbf{I}(\text{MINw}_{h(f),t} > 0)$ now measures current-year changes in minimum wages and the outcome variable is therefore a measure of concurrent changes in wages (Jardim *et al.*, 2018; Cengiz *et al.*, 2019; Dustmann *et al.*, 2022). We use the full Sample 1 (see Section 2).

We find that a 10 percent increase in the home country's or state's minimum wage is associated with a 0.4 percent increase in the wages of low-skill jobs at foreign establishments (Table 4, column 1).[26] In Appendix Table A9 we show that there is no estimated response in the wages of middle- and high-skill jobs in foreign establishments.[27]

Wage anchoring appears to be a headquarters effect. In particular, we find no effect of minimum wage changes in the country where a given foreign establishment is located on wages at the headquarters of the multinational, 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 A12.

Next we show evidence that the foreign wage response to minimum wage shocks at headquarters operates through headquarter wages. We first regress the 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 $\mathbf{I}(\text{MINw}_{h(f),t} > 0)$. As seen in Column 2 of Table 4, a 10 percent increase in the home country's/state's minimum wage is associated with a roughly 0.6 percent increase in the wages of workers in low-skill jobs at the headquarters.[28] We then instrument for the change in job-specific headquarter wages, replacing $\mathbf{I}(\text{MINw}_{h(f),t} > 0)$ in (3) with the first-stage estimates $\%\Delta\widehat{\text{HQw}}_{jft}$. We estimate the second stage using two-sample two-stage least squares (TS2SLS) (Angrist & Krueger, 1992; Inoue & Solon, 2010). Recall that there are more employer×occupation×year cells for which we have data on establishment but not headquarter wages than vice versa. Using TS2SLS, we can include all jobs in foreign establishments and headquarters in our analysis sample. TS2SLS provides a consistent estimate if (the probability limit of) the correlation between the endogenous variable(s) and the instru-

[26] In Appendix Table A6, we show that the estimate is robust to alternative definitions of a low skill job, where we define low-skills jobs as those of levels 1-4 or 1-6, rather than 1-5, of the 16-level skill ladder. In Appendix Table A7 we limit the sample to private sector firms.

[27] In Section 5 we show that minimum wage hikes in a multinational's headquarter country or state also raise the wages of individual workers in foreign establishments in Brazil.

[28] The first stage is: $\%\Delta\text{HQw}_{jft} = \gamma_1 \mathbf{I}(\text{MINw}_{h(f),t} > 0) + \theta_{fj} + \theta_t + \varepsilon_{jft}$, where for headquarters ($c = h(f)$), city×year fixed effects ($\theta_{h(f)t}$) are replaced with year fixed effects (θ_t) and city fixed effects ($\theta_{h(f)}$), subsumed by firm×job fixed effects (θ_{fj}), so that the independent variable of interest is not subsumed.

ments (conditional on controls) is the same in the first-stage sample and the second-stage sample.[29]

We find that a minimum wage change-induced 10 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 6 percent. This is shown in Column 3 of Table 4.[30]

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.

We interpret Table 4 as evidence that externally imposed changes in headquarter wages *themselves* affect wages in multinationals' foreign establishments. 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.[31] Nevertheless, it could be, for example, that minimum wages increases more often occur when aggregate labor demand is high (see e.g. Baskaya & Rubinstein, 2015; Neumark, 2018), 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 changes in the average wage of workers in higher and lower-wage low-skill jobs within a given establishment, allowing us to "difference 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 paid its workers in job j a nominal gross wage lower than the new minimum wage in the year preceding

[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 the 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 leaves the estimates unchanged. Restricting to the very largest hikes (above the 75th percentile) gives a larger reduced form estimate and increases the IV estimate (columns 1-6 of Appendix Table A10).

[31] Dickens (2015) writes "In 47% of countries, the government sets the minimum wage on the advice and recommendation of an expert body; a further 11% of countries rely on an expert body alone. Practice varies across countries", "In some countries, the central government sets the national minimum wage. The most notable example of this approach is the US. But US states and even cities have the power to set minimum wages that are higher than the national rate", "Other countries follow a rule or formula for fixing the minimum wage. In France, the interprofessional minimum wage (salaire minimum interprofessionnel de croissance) is tied to the consumer price index and uprated annually", and "In some countries (largely in Europe), minimum wages emerge from bargaining between employers and employees".

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 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:

$$\%\Delta \text{w}_{jfct} = \alpha_2 \mathbf{I}(\text{MINw}_{h(f),t} > 0) \times \text{Binding}_{jh(f)} + \theta_{fj} + \theta_{fct} + \varepsilon_{jfct} \tag{4}$$

The minimum wage change itself and any possibly correlated demand shocks that affect both binding and non-binding jobs are absorbed by firm×establishment×year fixed effects, θ_{fct}.[33]

Within foreign establishments, home country/state minimum wage increases affect the wages of workers in jobs for which the minimum wage binds at headquarters significantly more than those of workers in other low-skill jobs. The estimate in Column 1 of Table 5 indicates that a 10 percent increase in the home country's/state's minimum wage results in a 0.7 percentage point larger increase in wages for binding low-skill jobs. We next leave out firm×establishment×year fixed effects so that the effect of headquarter minimum wage increases on the wages of workers in non-binding jobs can be identified. As seen in Column 2, this effect is much smaller (0.1 percent) than that for binding jobs.[34]

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.[35] In Appendix I we instead compare the foreign wage response of *employers* that are differentially exposed to minimum wage changes but headquartered in the same country or state. The impact on firms with less exposed headquarters and any macro-level demand shocks affecting the home country/state that are correlated with minimum wage changes can then be controlled for by including home country/state×year fixed effects. We find much larger impacts on the wages of

[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] In equation (4), firm×establishment×year fixed effects subsume city×year fixed effects. We thus restrict the sample to firm×establishment×years for which we observe both binding and non-binding jobs.

[34] It is possible that the interaction terms in our model are biased given the large number of fixed effects Balli & Sørensen (2013). In the final columns of Table 5 we therefore de-mean $\mathbf{I}(\text{MINw}_{h(f),t} > 0)$ with respect to all fixed effects prior to interacting it with $\text{Binding}_{jh(f)}$. Specifically, we de-mean the minimum wage shock indicator with respect to employer fixed effects, occupation fixed effects, establishment-city fixed effects, and year fixed effects, before interacting with the binding indicator. This leaves the estimated interaction effect unchanged.

[35] 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) (see also Engbom & Moser (2018)), or through firms' wage-setting procedures.

foreign establishment workers 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 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-induced 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.[36] 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 A14.

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:

$$\mathrm{w}_{jfct} = \alpha_6 \mathrm{e}_{h(f)t} + \theta_{fj} + \theta_{ct} + \varepsilon_{jfct} \tag{5}$$

where $\mathrm{e}_{h(f)t}$ is the log average nominal exchange rate of home country currency units per unit of USD

[36] We show this and the approximate symmetry of the distribution of exchange rate changes around zero—the median is positive but small—in Appendix Figure A6, restricting attention to the fluctuations we exploit in our analysis below.

in year t.[37] Standard errors are clustered at the home country (or currency zone) level. Only foreign establishments located outside the home country or currency zone are included in the estimation.[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 100 percent decrease in the exchange rate of home country currency to USD leads to a five percent increase in the dollar value of wages in foreign establishments. Panel B shows that, at headquarters, a 100 percent appreciation leads to a wage increase of about 50 percent. In columns 2 and 3, we split the sample based on whether there is a home country appreciation or depreciation. Consistent with downward nominal rigidity, we see that the establishment wage response is coming entirely from foreign establishment wages responding to home country currency appreciations.[39]

In Panel C of Table 6, we instrument for headquarter wages by replacing $\mathrm{e}_{h(f)t}$ in (5) with the first stage estimates $\widehat{\mathrm{HQw}_{jft}}$. The estimates are somewhat imprecise but suggest that an exchange rate shock-induced increase in headquarter wages of 100 percent leads to a 10 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.[40] 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.

[37] 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 (or country)×year fixed effects (year fixed effects in the first stage), (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 appreciation of the USD against other currencies is subsumed.

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

[39] For multinationals that pay foreign workers in local currency or USD and engage in USD-value wage level anchoring (as defined above), 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 for details).

[40] 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 wages and transmit externally imposed headquarters 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 country/state minimum wage shocks to foreign establishments is observed. We then use granular employer-employee data from Brazil to show more direct evidence that the transmission of wage shocks is unlikely to be caused by *indirect* pathways to foreign wages, such as offshoring and technology adoption, concluding that wage anchoring is most likely a result of firm-wide wage setting practices.

5.1 Which employers, jobs, and locations?

To better understand when wage anchoring occurs, we collected information on 54 attributes that may predict wage shock transmission. These attributes span characteristics of the headquarters country, establishment country, multinational's sector, the job in question, and the headquarter-establishment country match.[41] We run a regression akin to equation (3), but use a causal forest algorithm to estimate which attributes to the greatest extent captures 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 all covariates to minimize confounding (Wager & Athey, 2018). Standard errors are clustered at the headquarter-location level.

To facilitate comparisons, we standardize all potential predictors to have zero mean and unit standard deviation. Following Carlana & La Ferrara (2021), we present the results by displaying the difference in means of the predictors between above- and below-median conditional average treatment effect job observations. In Table 7, the P(50) column shows the mean value of the relevant variable among below-median wage shock transmission observations, measured in standard deviations, relative to zero. Above-median conditional average treatment effect observations' mean is the same in absolute value but of the opposite sign (and thus omitted from the table). We include an absolute value column to faciliate comparison of magnitudes.

The characteristics that most strongly predict a small versus a large treatment effect size are all features of the headquarters country. Characteristics of the foreign establishment location, the type of work done in the firm, links between the home and foreign establishment countries, and the job itself are weak predictors of wage shock transmission.[42]

Two headquarter country characteristics related to inequality especially differ between job observations with a low and high wage response: cultural inequality aversion and inequality itself. Cultural

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

[42] Note that if wage anchoring disincentivizes multinationals from setting up establishments abroad, we likely underestimate the overall extent of the phenomenon in our data.

inequality aversion is measured using Hofstede (2001)'s *Power Distance* metric (PDI), which captures a group's willingness to accept inequality among its members.[43] Firms headquartered in countries with a high value of the Inequality Aversion measure (meaning that citizens are willing to accept inequality—we code the variable as such to correspond to PDI) and high degrees of actual inequality show smaller impacts of headquarter minimum wage changes on foreign establishment wages.

In addition to the relatively high treatment effect intensity of attributes of the firm's home location, it is worth noting the very moderate intensity of other categories of job characteristics.[44] The measures of the headquarter's economic environment that most strongly predict across-country wage shock transmission within firms predict treatment effects heterogeneity to a much smaller extent when measured at the foreign establishment's location. This is especially true of cultural inequality aversion, which is essentially the same on average in foreign countries with a low versus a high wage response to wage shocks at multinationals' headquarters.

Links between the headquarters and foreign establishment country, such as the distance between the two or whether they use the same currency, and attributes of the job itself, including measures of how complex the tasks involved are and how "offshorable" the job is,[45] are also weak predictors of the treatment effect of minimum wage shocks on foreign establishment wages. This suggests that bilateral mechanisms and ones that operate through changes in employment probably do not explain wage shock transmission.[46] This finding is important since 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. We next explore this possibility more directly.

5.2 Through employment changes?

Changes in wages at multinationals' headquarters might affect their foreign establishment wages through changes in employment. There are several different theoretically plausible variants of such

[43] Hofstede (2001)'s "cultural dimensions" are especially useful measures of cultural traits 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 (see e.g. Tabellini, 2010; Gorodnichenko & Roland, 2011; Bloom *et al.*, 2012b; Martinez *et al.*, 2015; Bandiera *et al.*, 2019). The other variables that make up Hofstede's cultural dimensions are individualism, masculinity, uncertainty avoidance, and long vs. short term orientation. These variables are all included in the analysis. Inequality itself is measured by the Gini index. More details on these measures are provided in Appendix III.

[44] Interestingly, beyond the various characteristics of the home location discussed above, a lower sector labor share is the strongest predictor of comparatively small foreign wage changes when wages rise at the headquarters.

[45] See Appendix III for details on how we measure link and job attributes.

[46] An example of "bilateral" mechanisms is management learning about the benefits of efficiency wages. Suppose a firm, when forced to raise low-skill workers' wages in the headquarter country or state, discovers that supervision costs are lower when wages are higher (see e.g. Georgiadis, 2012), and therefore extends wage increases to its foreign establishments. We might then expect greater wage shocks transmission to foreign locations that are more similar to the headquartesr country, which we do not find in Table 7. However, we cannot rule this possibility out.

indirect pathways from the headquarter's economic context to the wages it pays in other countries. Our primary interest is in ones that can explain the phenomenon of wage shock transmission itself.[47]

We use both the global data from the Company and the more granular employer-employee data from Brazil to investigate. Before exploring the employment results, we first confirm that the findings in sections 3 and 4 also hold in the administrative data from Brazil. In Panel A of Table 8, we show the correlation between headquarters and establishment wages using the set of 37 RAIS firms that have a headquarters job-match. The estimated within-firm across-country correlation in annual wages is almost identical to what we found in the global data: ten percent higher wages at headquarters are associated with 1.1-1.7 percent higher RAIS-measured wages for workers in positions of the same skill-level in Brazilian establishments.[48] This correlation is shown graphically in Appendix Figure A8.

We also find that external shocks to wages at multinationals' headquarters are transmitted to their establishments in Brazil. The event study coefficients from estimating equation (2) using the Brazil sample are shown in Appendix Figure A9.[49] We again see that wages at "treated" foreign establishments evolve similarly to those at other multinationals' establishments nearby before a headquarter country/state minimum wage hike. They then markedly depart in the year of the minimum wage increase, rising further the following year, and thereafter level off. The regression estimate isolating the year-to-year impacts of minimum wage changes is also very similar to what we found in the global data from the Company, as seen in Panel B of Table 8. The wage effect is concentrated among low-skill jobs, with the point estimate for higher-skill jobs being close to zero.[50] In Appendix Table A11 we show that the foreign wage impact of exchange rate variation in headquarter wages is also similar to—and if anything somewhat larger than—the impact we found in the global data from the company in Sub-section 4.4.

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 the offshoring of jobs or tasks. When forced to pay workers at headquarters more, the employer might reduce the number of workers employed or hours worked there, shifting workload to foreign establishments, akin to Feenstra & Hanson (1996).[51] We

[47] 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 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.

[48] We control for worker characteristics (X_{it}) that are observed in RAIS, such as education, tenure at the firm, gender, race, and age; and firm×job and city×year fixed effects as throughout our analysis. Standard errors are clustered at the home-location level.

[49] We restrict to firms headquartered in countries that do not have any minimum wage shocks in the pre-period.

[50] Recall that the same is true in the global data from the Company, as shown in Appendix Table A9.

[51] Suppose e.g. that higher-skill jobs are initially done at headquarters and lower-skill jobs at foreign establishments. A minimum wage-induced increase in headquarter wages could then lead firms to shift the lowest-skill jobs previously

test for this possibility in two ways.

First, we measure wages accounting for adjustments in days worked. In columns 2 and 4 of Table 8, we measure the "effective" wage—the annual wage normalized by the number of days an individual works during the year.[52] We find partial transmission of the wage shock also when using this measure, suggesting that multinationals' workers in Brazil are not earning more when the minimum wage rises at headquarters because they are working more days of the year. The estimated passthrough to effective wages is somewhat smaller; it may be that Brazilian workers partially compensate for employer wage-anchoring through moderate adjustments in days worked.[53]

Another form of offshoring—the possibility that an employer incentivizes foreign workers to do more work *per day or hour* when wages rise at headquarters—is more difficult to test for. However, recall that characteristics of the low-skill job in question have little predictive power for wage shock transmission, as we showed in Table 7. These job characteristics include not only a measure of offshorability, but also of how routine, manual, and abstract the tasks involved are (see Appendix III). 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 A9).

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.[54] We estimate equation (3) but now with the outcome being an indicator for a job being present in year t but not in year $t+1$. We next look at *intensive margin* responses—the change in the number of workers employed in a position—using the Brazilian data.[55] 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) but using the number of employees in a given Brazilian establishment as an outcome are presented in Figure 3, where we again see a zero impact on employment.

done at headquarters to foreign establishments. This could trigger a simultaneous rise in foreign establishment wages.

[52] This measure captures sick leave, parental leave, military service leave, unpaid leave, as well as full/part-time adjustments.

[53] Similarly, we found indications of a small increase in contracted work-hours in multinationals' Brazilian establishments when the minimum wage rises at headquarters, but the response is too small for within-firm offshoring to explain the impact on wages in Brazil. Another possible explanation for the smaller impact on effective wages in Table 8 is that the measure of days-not-worked is only available from 2007 onwards. Note also that the impact of exchange rate shocks to headquarter wages on effective wages in Brazil is not smaller than that on annual wages (see Appendix Table A11).

[54] Wage compression can lead high-wage firms to outsource low-wage jobs to avoid paying wage premiums to low-skill workers (Goldschmidt & Schmieder, 2017).

[55] 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.

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 wages.

In Appendix Table A15 we use the Orbis data to show a precisely estimated zero effect of minimum wage shock at the headquarters on the firm's profit margin (Column 1).[56] This is arguably not surprising given the (large) size of the employers in our data and the (comparatively small) size of the shocks. We then point again to the employment results. There may be a small, but imprecisely estimated, negative impact on foreign establishment employment. Given the small size of these coefficients, and the zero impact of a shock on the profit margin, we view this mechanism as unlikely.

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 workers in non-offshorable jobs within the same foreign establishments rise because of productivity spillovers.[57] However, recall that we see little change in foreign establishment employment when minimum wages rise in firms' headquarter country or state. Additionally, the analysis in sub-section 5.1 showed no evidence that wage shocks transmission is greater in the country-pairs where offshoring if likely easiest, such as those that are close to each other or that use the same currency.

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; Lordan & Neumark, 2018); that these changes affect the entire firm; and that this in turn increases the marginal

[56] It should be noted that these results are based on a relatively small number of 60 firms for which we could find multiple years of data in Orbis that matched to the Company data.

[57] 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 are therefore offshored 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 no impact of headquarter minimum wage shocks on the wages of foreign workers in higher-skill positions.

productivity of the firm's workers in foreign establishments and consequently raises their wages. Like the changes in employment discussed above, this pathway to foreign establishment wages would (i) leave the estimates 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 a precisely estimated zero effect of minimum wage shocks not only on firms' profit margins, but also on their capital/labor ratio, in Appendix Table A15. Recall also that we did not find evidence of bigger impacts on wages in foreign establishment jobs that are more complementary with modern technology in Table 7.[58] 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 changes in employment triggered by within-firm offshoring, broader forms of firm level shock propagation, or productivity spillovers, and firm-wide technology adoption, are unlikely to explain why external shocks to headquarter wages affect the pay of same-position employees in foreign establishments. Such phenomena may be more likely to arise in response to larger shocks that occur less frequently.

5.4 Firm-wide wage-setting procedures

To summarize, we have shown the following. First, within multinationals, the wages of foreign establishment workers employed in a given position are highly correlated with those of headquarter workers in the same position. Second, the correlation 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. These shocks appear to be ignorable for purposes of our analysis, and 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 wages—exchange rate fluctuations—similarly affects foreign establishment wages. Fourth, predictors of transmission of headquarters wage shocks to foreign establishments are primarily characteristics of the employer's home location—not the firm's sector, the relevant job, the foreign establishment country, or links between the two countries. 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

[58] Autor & Dorn (2013) argue for example that computer capital substitutes for low-skill workers performing *routine* tasks; complements *abstract* tasks; and neither directly substitutes for nor complements *manual* tasks.

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 (via changes in the home country's minimum wage or exchange rate) 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.*, forthcoming; Dube *et al.*, 2020).[59]

References

Aaronson, Daniel, & French, Eric. 2007. Product Market Evidence on the Employment Effects of the Minimum Wage. *Journal of Labor economics*, **25**(1), 167–200.

Aaronson, Daniel, & Phelan, Brian J. 2017. Wage Shocks and the Technological Substitution of Low-wage Jobs. *The Economic Journal*, **129**(617), 1–34.

Abowd, John M., Kramarz, Francis, & Margolis, David. 1999. High Wage Workers and High Wage Firms. *Econometrica*, **67**, 251–333.

Abowd, John M., Creecy, Robert H., & Kramarz, Francis. 2002. *Computing Person and Firm Effects Using Linked Longitudinal Employer-Employee Data*. Census Bureau Technical Paper TP-2002-06.

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.

Aitken, Brian, Harrison, Ann, & Lipsey, Robert E. 1996. Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela, and the United States. *Journal of International Economics*, **40**(3-4), 345–371.

[59] Hjort *et al.* (2021) study macroeconomic 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.

AKERLOF, GEORGE, & YELLEN, JANET. 1990. The Fair-wage Effort Hypothesis and Unemployment. *The Quarterly Journal of Economics*, **105**(2), 255–283.

AKERLOF, GEORGE A., & KRANTON, RACHEL E. 2005. Identity and the Economics of Organizations. *Journal of Economic Perspectives*, **19**(1), 9–32.

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. forthcoming. Strategic or Confused Firms? Evidence from "Missing" Transactions in Uganda. *Review of Economics and Statistics*.

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, & WAGER, STEFAN. 2019. Estimating treatment effects with causal forests: An application. *Observational Studies*, **5**(2), 37–51.

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.

BALLI, HATICE OZER, & SØRENSEN, BENT E. 2013. Interaction effects in econometrics. *Empirical Economics*, **45**.

BANDIERA, ORIANA, DAHLSTRAND, AMANDA, & FISCHER, GREG. 2019. *Incentives and Culture: Evidence from a Multi-Country Experiment*. Mimeo LSE.

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), S67–S97.

BASKAYA, YUSUF SONER, & RUBINSTEIN, YONA. 2015. Using federal minimum wages to identify the impact of minimum wages on employment and earnings across the US states. mimeo LSE.

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. 2012a. Americans Do IT Better: U.S. Multinationals and the Productivity Miracle. *American Economic Review*, **102**(1), 167–201.

BLOOM, NICHOLAS, & VAN REENEN, JOHN. 2007. Measuring and Explaining Management Practices Across Firms and Countries. *The Quarterly Journal of Economics*, **122**(4), 1351–1408.

BLOOM, NICHOLAS, SADUN, RAFFAELLA, & VAN REENEN, JOHN. 2012b. The organization of firms across countries. *The Quarterly Journal of Economics*, **127**(4), 1663–1705.

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.

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.

CHO, JAEHAN. 2018. Knowledge transfer to foreign affiliates of multinationals through expatriation. *Journal of International Economics*, **113**, 106–117.

CHO, SUNGJIN, & RUST, JOHN. 2010. The flat rental puzzle. *Review of Economic Studies*, **77**(2), 560–594.

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.

CLEMENS, MICHAEL A., MONTENEGRO, CLAUDIO, & PRITCHETT, LANT. 2019. The Place Premium: Bounding the Price Equivalent of Migration Barriers. *Review of Economics and Statistics*, **101**(2), 201–2013.

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.

COVIELLO, DECIO, DESERRANNO, ERIKA, & PERSICO, NICOLA. forthcoming. Minimum Wage and Individual Worker Productivity: Evidence from a Large US Retailer nber. *Journal of Political Economy*.

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 AND 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.

DERENONCOURT, ELLORA, NOELKE, CLEMENS, & WEIL, DAVID. 2021. *Spillover effects from voluntary employer minimum wages*.

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 Profitability. *American Economic Journal: Applied Economics*, **3**(1), 129–51.

DUBE, ARINDRAJIT, & KAPLAN, ETHAN. 2010. Does Outsourcing Reduce Wages in the Low-Wage Service Occupations? Evidence from Janitors and Guards. *ILR Review*, **63**(2), 287–306.

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.

EARLE, JOHN S., TELEGDY, ALMOS, & ANTAL, GABOR. 2018. Foreign Ownership and Wages: Evidence from Hungary, 1986-2008. *ILR Review*, **71**(2), 458–491.

EGGER, HARTMUT, & KREICKEMEIER, UDO. 2013. Why Foreign Ownership May Be Good For You. *International Economic Review*, **54**(2), 693–716.

ENGBOM, NIKLAS, & MOSER, CHRISTIAN. 2018. *Earnings inequality and the minimum wage: Evidence from Brazil*. Federal Reserve Bank of Minneapolis-Opportunity and Inclusive Growth Institute Working Paper.

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.

FEHR, ERNST, & SCHMIDT, KLAUS M. 1999. A Theory of Fairness, Competition, and Cooperation. *The Quarterly Journal of Economics*, **114**(3), 817–868.

GEORGIADIS, ANDREAS. 2012. Efficiency Wages and the Economic Effects of the Minimum Wage: Evidence from a

Low-Wage Labour Market. *Oxford Bulletin of Economics and Statistics*, **75**.

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.

GOLDBERG, LINDA, & TRACY, JOSEPH. 2001. *Exchange rates and wages*. NBER Working Paper No. 8137.

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.

GORODNICHENKO, Y., & ROLAND, G. 2011. Which Dimensions of Culture Matter for Long-Run Growth? *American Economic Review: Papers and Proceedings*, **101**(3), 492–98.

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).

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. 2021. *The Missing Middle Managers: Labor Costs, Firm Structure, and Development*. Mimeo Columbia University.

HOFSTEDE, GEERT. 1980. *Culture's Consequences: International Differences in Work-Related Values*. 1st edn. Sage Publications Inc.

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.

HORTACSU, ALI, & PULLER, STEVEN L. 2008. Understanding strategic bidding in multi-unit auctions: a case study of the Texas electricity spot market. *The RAND Journal of Economics,*, **39**(1), 86–114.

HORTON, JOHN J. 2018. *Price Floors and Employer Preferences: Evidence from a Minimum Wage Experiment*. Mimeo MIT.

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.

KRUEGER, ALAN, & SUMMERS, LAWRENCE. 1988. Efficiency Wages and the Inter-Industry Wage Structure. *Econometrica*, **56**(2), 259–293.

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.

LIPSEY, ROBERT E. 2004. *Challenges to Globalization: Analyzing the Economics*. University of Chicago Press.

LORDAN, GRACE, & NEUMARK, DAVID. 2018. People versus machines: The impact of minimum wages on automatable jobs. *Labour Economics*, **52**, 40–53.

MARTINEZ, ELIZABETH A, BEAULIEU, NANCY, GIBBONS, ROBERT, PRONOVOST, PETER, & WANG, THOMAS. 2015. Organizational culture and performance. *American Economic Review*, **105**(5), 331–35.

MARTINS, PEDRO S, & ESTEVES, LUIZ A. 2015. Foreign Ownership, Employment and Wages in Brazil: Evidence from Acquisitions, Divestments and Job Movers. *Technology and Investment*, **6**(01), 22–45.

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, 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".

NEUMARK, DAVID. 2018. The Employment Effects Of Minimum Wages: Some Questions We Need To Answer. *In:* HAMILTON, JONATHAN, DIXIT, AVINASH, EDWARDS, SEBASTIAN, & JUDD, KENNETH (eds), *Oxford Research Encyclopedia of Economics and Finance*. Oxford, UK: Oxford University Press.

NEUMARK, DAVID, & WASCHER, WILLIAM. 1992. Employment effects of minimum and subminimum wages: panel data on state minimum wage laws. *ILR Review*, **46**(1), 55–81.

OREFICE, GIANLUCA, SLY, NICHOLAS, & TOUBAL, FARID. 2016. *The Multinational Wage Premium and Wage Dynamics*. The Federal Reserve Bank of Kansas City Research Working Paper 16.10.

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**, 103294.

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*.

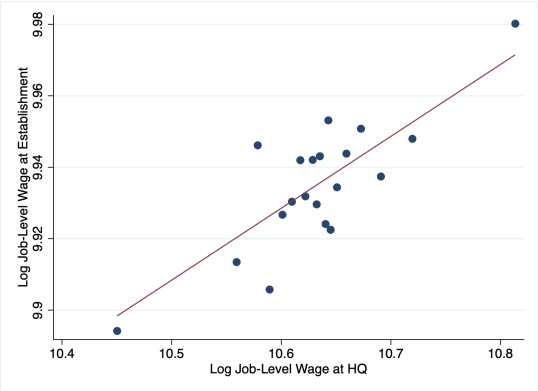
VAN REENEN, JOHN. 1996. The Creation and Capture of Rents: Wages and Innovation in a Panel of U.K. Companies. *The Quarterly Journal of Economics*, **111**(1), 195–226.

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

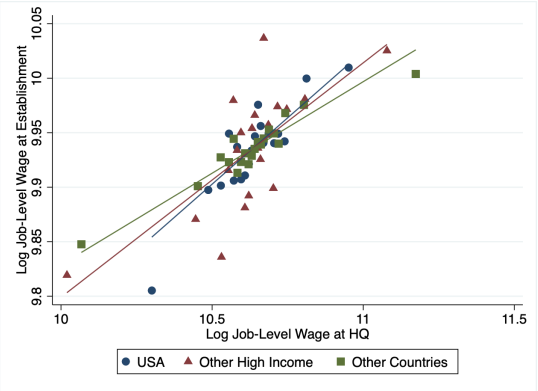
YOO, B N, DONTHU, Y, & LENARTOWICZ, T. 2011. Measuring Hofstede's five dimensions of cultural values at the individual level: Development and validation of cvscale. *Journal of International Consumer Marketing*, **23**(3-4), 193–210.

FIGURES

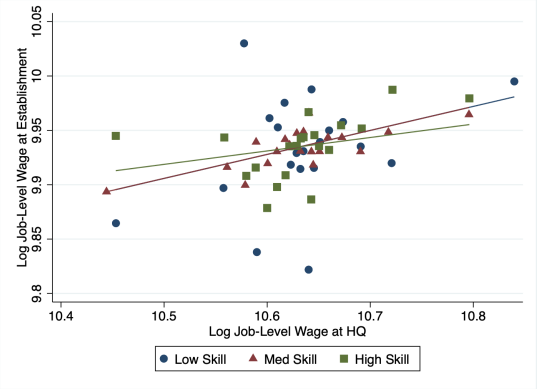
FIGURE 1: CORRELATION BETWEEN HQ AND ESTABLISHMENT WAGE



(A) JOB-LEVEL CORRELATION



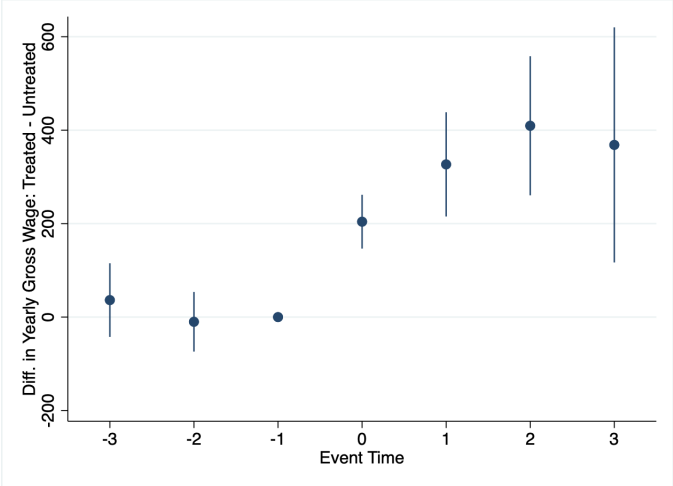
(B) COUNTRY INCOME SPLIT



(C) SKILL LEVEL SPLIT

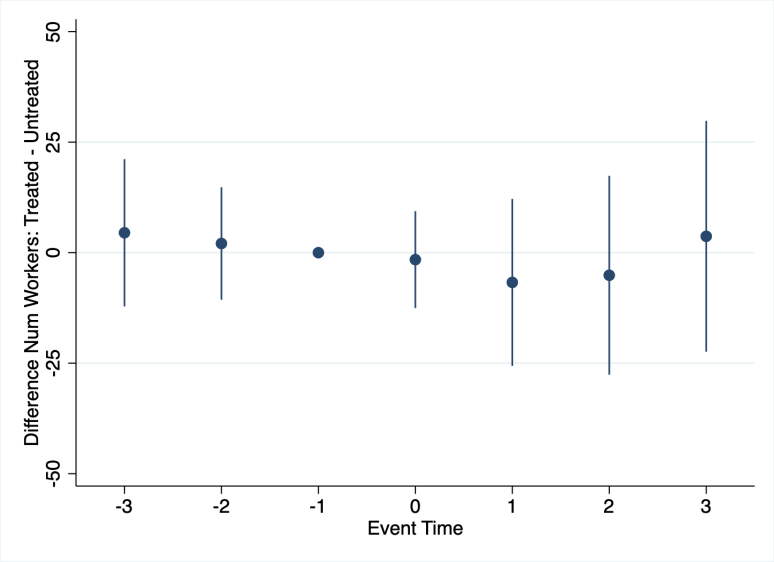
Note This figure presents three binned scatterplots showing the relationship between the wage paid for a given job at a multinational's headquarter (x-axis) and the wage paid for the same job at the multinational's foreign establishments (y-axis). To construct the plots, the log wage at the establishment 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 $\hat{\beta} = 0.201$, $(s.e. = 0.019)$. 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 $\hat{\beta} = 0.244\, s.e. = 0.035$ for the United States, $\hat{\beta} = 0.215\, s.e. = 0.022$ for other high income countries, and $\hat{\beta} = 0.168\, s.e. = 0.008$ 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 $\hat{\beta} = 0.124\, s.e. = 0.049$ for high-skill jobs, $\hat{\beta} = 0.220\, s.e. = 0.026$ for medium-skill jobs, and $\hat{\beta} = 0.221\, s.e. = 0.033$ for low-skill jobs.

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



Note: This figure plots the coefficients of the event time indicators from estimating equation (2). The outcome is the job-level wages at a firm's foreign establishment. The sample is restricted to low skill jobs, as defined by The Company, and to those firms that experience only one minimum wage increase at the headquarter during the event time window. The coefficients above are comparing the wages in treated establishments (those establishments at firms whose HQ experienced a minimum wage shock) to control establishments (establishments at firms whose HQ did not experience a minimum wage shock). All coefficients are normalized to $k = -1$, the year before the minimum wage increase.

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



Note: This figure plots the coefficients on the event time indicators from estimating equation (2) using the sample of matched Brazilian firms, but using employment as the outcome variable. Specifically, the y-variable is the number of workers employed for a given job in a firm's Brazilian establishment. We control for average worker characteristics: age, job tenure, race, and gender. The sample is restricted to low skill jobs and to those firms that experience only one minimum wage increase at the headquarter during the event time window. All coefficients are normalized to $k = -1$, the year before the minimum wage increase.

TABLES

TABLE 1: SUMMARY STATISTICS OF MULTINATIONALS

Panel A: *Summary of Multinational Samples*

	Number of Observations		
Unit of Observation	*Sample 1*	*Sample 2*	*Sample 3*
Employer	1213	101	80
Employer×year	5030	586	200
Establishment	6217	1239	610
Estab.×year	22721	5243	1339
Estab.×skill-level×year	185081	47564	12184
Estab.×occupation	140479	31860	13527
Estab.×occ.×year	436137	111954	27318

Panel B: *Multinationals' Foreign Establishments' Wages*

	Sample 1		*Sample 2*		*Sample 3*	
	Mean	SD	Mean	SD	Mean	SD
Net Wage (2000 USD)	14442.84	9016.22	13573.49	8125.58	16922.06	8598.13

Panel C: *Distribution & Compression of Wages (Sample 3)*

	HQ-Quart1	HQ-Quart2	HQ-Quart3	HQ-Quart4	HQ-All Occ
	Headquarter Wage Distribution				
Mean Net Wage (2000 USD)	10859.38	15257.02	24547.63	37311.53	20485.43
Max. Net Wage (2000 USD)	41875.64	58720.98	86427.27	90667.58	90667.58
	Establishment Wage as % of HQ Wage				
All Establishments	0.88	0.87	0.87	0.88	0.87
Estab.s in Poorer-than-HQ-Country Countries	0.74	0.76	0.77	0.81	0.77
Employer×occ.×year	952	678	722	581	2933

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. The sample sizes include only foreign establishments. Occupations refer to the job titles recorded by the Company (298 job titles in total); skill levels are defined globally by the Company (16 levels in total). 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. Outlier observations with net wages in the top and bottom 1% of the distribution are excluded. 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. Only multinationals with multiple establishments ever observed and establishment×occupations observed in multiple years are included.

TABLE 2: RELATIONSHIP BETWEEN HQ AND FOREIGN ESTABLISHMENT WAGES

Sample	*Sample 3* MNEs w/ est.-HQ match w/in occ×year				*Sample 2* MNEs w/ est.-HQ match w/in occ
Unit of Observation	est×occ×yr	est×occ×yr	est×skill-lev×yr	est×yr	est×occ
Data Structure	Panel				Imputed Panel
Dep. Var.	Log Wage at Foreign Establishment				
	Panel A: Local Benchmark Wage Control				
	(1)	(2)	(3)	(4)	(5)
Log HQ Wage	0.190	0.225	0.132	0.531	0.298
	(0.052)	(0.046)	(0.031)	(0.111)	(0.063)
Log Local Benchmark Wage	0.013	0.013	0.052		-0.006
	(0.008)	(0.008)	(0.021)		(0.005)
Employer×Occ FE	Y	Y			
Employer×Skill-level FE			Y		
Employer FE				Y	Y
Estab.-City×Year FE	Y	Y	Y	Y	Y
Occ FE					Y
HQ×Year FE		Y			
Observations	20,058	20,054	10,030	742	36,928
	Panel B: Estab.-city×Occupation×Year Fixed Effects				
	(1)	(2)	(3)	(4)	(5)
Log HQ Wage	0.105	0.093	0.134	0.239	0.173
	(0.026)	(0.030)	(0.037)	(0.088)	(0.078)
Employer×Occ FE	Y	Y			
Employer×Skill-level FE			Y		
Employer FE				Y	Y
Estab.-City×Year FE				Y	
Estab.-City×Occ×Year FE	Y	Y			Y
Estab.-City×Skill-level×Year FE			Y		
HQ×Year FE		Y			
Observations	20,141	20,029	9675	714	36,181

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 our main independent variable (log headquarter wage) with respect to the fixed effects and then regress the log establishment wage on the residuals. Standard errors are reported in parentheses and are clustered at the employer level.

TABLE 3: RELATIONSHIP BETWEEN HQ AND FOREIGN ESTABLISHMENT WAGE SLOPES

	w/in Occ Wage Slope at Estab.		Pooled Wage Slope at Estab.	
	(1)	(2)	(3)	(4)
HQ Wage Slope	0.115	0.110	0.080	0.350
	(0.045)	(0.050)	(0.044)	(0.269)
Log Benchmark Slope	0.009		-0.001	
	(0.003)		(0.005)	
Employer ×Occ-Type×Skill Level-Pair FE	Y	Y		
Employer ×Skill Level-Pair FE			Y	Y
Estab.-City×Year FE	Y		Y	
Estab.-City×Occ-Type×Skill Lev-Pair×Year FE		Y		
Estab.-City×Skill Lev-Pair×Year FE				Y
Observations	13,338	12,267	8,208	8,112

Note: This table shows the relationship between a firm's between-skill-level "wage slope" at the firm'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 1-3 and by pooling together all occupation groups in columns 4-6. Standard errors are clustered at the firm level.

TABLE 4: IMPACT OF HQ MIN. WAGE CHANGE ON FOREIGN ESTABLISHMENT WAGES

	%Δ Est. Wage	%Δ HQ Wage	%Δ Est. Wage
	(1)	(2)	(3)
Min. Wage Hike	0.039	0.060	
	(0.008)	(0.012)	
% Change HQ Wage (IV)			0.639
			(0.187)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	N	Y
Year FE	N	Y	N
Observations	86627	8557	86627

Note: This table shows the impact of a minimum wage change in a firm's headquarter country on establishment wages.The outcome variable is the percent change in occupation-specific establishment or HQ wages. *Min Wage Hike* is an indicator that takes the value one in year t if a firm's headquarter country experiences a minimum wage increase that year. Column (1) is the reduced form estimate of the impact of a minimum wage hike in a firm's headquarter on wages in the establishment country. We do not require that we see the wages for the same set of jobs in the firm's headquarter for this regression. Column (2) shows the first stage result, and column (3) shows the IV result, using TS2SLS from instrumenting a change in a firm's headquarter wages with a minimum wage shock.

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

	%Δ Est. Wage		%Δ HQ Wage		%Δ Est. Wage	%Δ HQ Wage
	(1)	(2)	(3)	(4)	(5)	(6)
					De-meaned	
Min Wage Hike		0.010		0.020		
		(0.006)		(0.013)		
Min Wage Hike x Binding	0.071	0.066	0.052	0.042	0.071	0.052
	(0.023)	(0.020)	(0.014)	(0.023)	(0.022)	(0.014)
Employer × Occ FE	Y	Y	Y	Y	Y	Y
Estab.-City × Year FE	N	Y	N	N	Y	N
Employer × Est.-City × Year FE	Y	N	N	N	Y	N
Year FE	N	N	N	Y	N	N
Observations	286557	286661	30483	30488	286557	30483

Note: In this table we interact the minimum wage hike indicator with an indicator for the job being binding in the headquarter. An occupation is binding in a country if there exists a HQ of foreign establishment that, in the preceding year, paid a wage to that occupation that was below the new minimum wage. Only establishment-years in which at least one HQ minimum-wage-binding occupations existed are included, as they are relevant in within-establishment-year analysis. Column (1) is the reduced form estimate of the impact of a minimum wage hike in a firm's headquarter on wages in the establishment country. We do not require that we see the wages for the same set of jobs in the firm's headquarter for this regression. Column (2) shows the first stage result, and column (3) shows the IV result, using TS2SLS from instrumenting a change in a firm's headquarter wages with a minimum wage shock. In columns (5)-(6) we first de-mean the minimum wage shock with respect to employer, occupation, establishment-city, and year fixed effects prior to interacting it the binding indicator

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

Panel A: Reduced Form	Log Establishment Wage		
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.052	0.002	-0.089
	(0.029)	(0.041)	(0.037)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y
Observations	369847	182842	198984
Panel B: First Stage	Log HQ Wage		
Log HQ Exchange Rate	-0.500	-0.509	-0.546
	(0.221)	(0.218)	(0.231)
Employer × Occ FE	Y	Y	Y
Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y
Observations	44995	27547	21130
Panel C: 2SLS	Log Establishment Wage		
Log HQ Exchange Rate	0.105	0.003	0.200
	(0.073)	(0.092)	(0.134)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y

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 perform 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). 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

Dependent Variable:	%Δ Estab. Wage				
	P(50)	Abs. Value		P(50)	Abs. Value
	(1)	(2)		(3)	(4)
Panel A: HQ country Charac's			*Panel C: Sector Charac's*		
Inequality Aversion Index	0.068	0.068	Labor share	-0.031	0.031
Individualism vs. collectivism	-0.016	0.016	Skill share	-0.015	0.015
Masculinity vs. femininity	-0.005	0.005	Output Tradeability	-0.021	0.021
Uncertainty avoidance index	0.016	0.016	Input Tradeability	0.008	0.008
Long-term orientation vs. short-term orientation	0.026	0.026	Offshorability index	0.017	0.017
Indulgence vs. restraint	-0.012	0.012			
Patience	0.023	0.023	*Panel D: Occupation Charac's*		
Risktaking	0.018	0.018	Routine tasks	-0.013	0.013
Positive reciprocity	-0.040	0.040	Manual tasks	0.020	0.020
Negative reciprocity	-0.028	0.028	Abstract tasks	0.012	0.012
Altruism	-0.033	0.033	Occ. Offshorability	0.009	0.009
Trust	0.018	0.018			
Gini index	0.063	0.063	*Panel E: Estab. country Charac's*		
Urban population	-0.051	0.051	Inequality Aversion Index	0.003	0.003
Adult educational attainment	-0.029	0.029	Individualism vs. collectivism	-0.010	0.010
Regulatory index	-0.006	0.006	Masculinity vs. femininity	0.011	0.011
GDP per capita	-0.046	0.046	Uncertainty avoidance index	0.013	0.013
			Long-term orientation vs. short-term orientation	-0.016	0.016
Panel B: HQ×Estab. country Charac's			Indulgence vs. restraint	0.011	0.011
Time Zone Difference	0.012	0.012	Patience	-0.016	0.016
Log Distance	0.009	0.009	Risktaking	0.007	0.007
Common Border	-0.016	0.016	Positive reciprocity	-0.019	0.019
Regional Trade Agreements	-0.020	0.020	Negative reciprocity	0.008	0.008
Common Currency Zone	0.005	0.005	Altruism	0.012	0.012
Common Legal Origin	0.013	0.013	Trust	-0.006	0.006
Common Religion	-0.014	0.014	Gini index	0.021	0.021
Ever in Colonial Relationship	-0.020	0.020	Urban population	0.012	0.012
Log HQ-to-Estab. Migrant Stock	-0.021	0.021	Adult educational attainment	-0.017	0.017
Log Estab.-to-HQMigrant Stock	0.009	0.009	Regulatory index	-0.013	0.013
GDP difference HQ-to-Estab.	-0.022	0.022	GDP per capita	0.021	0.021

Note: This table shows an implementation of the Causal Forest algorithm described in Carlana & La Ferrara (2021). We standardize all the variables to have zero mean and a unit standard deviation. Then, we estimate the conditional treatment effect, including the controls for HQ, HQ-establishment, sector, occupation, and destination characteristics. We use the predictions on the expected treatment effect to divide the sample above and below the median conditional treatment effect. The treatment variable is the HQ minimum wage hike, and the panels contain different groups of characteristics. In column (1) and (3), we show the average value of the observable's characteristics for firms with below-median conditional treatment effect; in column (2) and (4), we display the absolute value of this average. We clustered at the HQ-location level and orthogonalized the outcome variable and the treatment status for all the covariates, following Athey & Wager (2019). Inequality Aversion, Individualism vs. collectivism, masculinity, uncertainty avoidance, and long-term vs. short-term orientation are measures from the Hofstede cultural dimensions of theory. Inequality aversion is called the Power Distance Index in Hofstede, and a lower value of the inequality aversion index is associated with a country being more inequality averse. These variables and the others are described in more detail in Appendix Appendix III

TABLE 8: ESTABLISHMENT-HQ WAGE ANCHORING: BRAZIL

	Panel A: Relationship bet. HQ and Estab. Wages			
Log Wages:	Annual	Effective	Annual	Effective
	(1)	(2)	(3)	(4)
Log Skill-Lev Wage at HQ	0.108	0.088	0.169	0.077
	(0.005)	(0.007)	(0.027)	(0.015)
Employer × Occ FE	N	N	Y	Y
Worker FE	Y	Y	N	N
Estab.-City × Year FE	Y	Y	Y	Y
Worker Controls	Y	Y	Y	Y
Observations	143,012	100,552	193,049	135,913
	Panel B: Impact of HQ Min. Wage Change on Estab. Wages			
%Δ in Wages:	Annual	Effective	Annual	Effective
Sample:	Full sample		Matched sample	
	(1)	(2)	(3)	(4)
Min Wage Hike	0.004	0.003	-0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Hike x Low Skill Occ.	0.023	0.021	0.024	0.013
	(0.004)	(0.004)	(0.003)	(0.001)
Worker FE	Y	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y	Y
Worker Controls	Y	Y	Y	Y
Observations	970,262	970,262	876,702	876,426

Note: This table shows the relationship between a firm's establishment wage and headquarter wage using the sample of firms that have an establishment in Brazil. Panel A shows the correlation between the log skill-level wage in a firm's headquarter and the log wage at the firm's foreign establishment. In the RAIS data, an occupation's skill level is defined using the average education of workers employed in the occupation, and the coding of skill levels is designed so that the skill level distribution in RAIS is matched to the skill level distribution in the main (Company) dataset. Panel B shows the impact of a minimum wage hike in the firm's headquarter on wages in the firm's establishment. *Min Wage Hike* is an indicator that takes the value one in year t if a firm's headquarter country experiences a minimum wage increase that year. In columns 1 and 3, the outcome variable is log (or percentage change in) annual average monthly wage of a worker. In columns 2 and 4, the outcome variable is the log (or percentage change in) the average annual monthly wage after accounting for differences in hours worked. Worker controls include age and job tenure fixed effects, as well as controls for race and gender. In Panel A, standard errors are clustered at the employer level. In Panel B, standard errors are clustered at the headquarter country (or state) level.

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

	Panel A: Extensive Margin			
Outcome:	Job Leaves Foreign Establishment			
Data Source:	Company		RAIS	
	(1)	(2)	(3)	(4)
Min Wage Hike	-0.004	-0.002	0.002	0.001
	(0.003)	(0.004)	(0.001)	(0.001)
Hike × Low Skill		-0.006		0.002
		(0.002)		(0.003)
Employer × Occ FE	Y	Y	Y	Y
City × Year FE	Y	Y	Y	Y
Observations	431947	431947	72181	72181
	Panel B: Intensive Margin			
Outcome:	%Δ Workers			
Data Source:	RAIS			
	(1)	(2)	(3)	(4)
Min Wage Hike	-0.001	-0.012	-0.008	-0.012
	(0.011)	(0.012)	(0.011)	(0.012)
Hike × Low Skill			0.005	0.010
			(0.023)	(0.024)
Employer FE	Y	N	Y	N
Occ FE	Y	N	Y	N
Employer × Occ FE	N	Y	N	Y
City × Year FE	Y	Y	Y	Y
Observations	69296	68980	69314	68980

Note: Panel A shows the extensive employment response of Brazilian establishments following a minimum wage shock. Columns 1-2 use data from the Company and columns 3-5 use RAIS data. *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 in the year following the minimum wage hike. Panel B shows the intensive employment response using the RAIS data. The outcome is the percent change in workers in a given occupation from year t to $t+1$ (where a minimum wage hike occurs in year t). Low skill occupations are those with a skill level below 5, as defined by the Company. Standard errors are clustered at the headquarter 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 headquartered in the same country or state but differentially exposed to minimum wage changes. Following Lee (1999) and Autor *et al.* (2016) (see also Neumark (2018)), 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 equations (3) and (4) respectively with Kaitz_{ft} and estimate:

$$\%\Delta \text{w}_{jfct} = \alpha_3 \mathbb{I}(MINw_{h(f)t} > 0) \times \text{Kaitz}_{ft} + \theta_{fj} + \theta_{ct} + \theta_{h(f)t} + \varepsilon_{jfct} \tag{A1}$$

where the change in the minimum hike and any correlated macro-level demand shocks affecting the home country/state are now absorbed by home country/state×year fixed effects $\theta_{h(f)t}$.

We find that the wages of foreign workers in low-skill jobs and the lowest-wage jobs (for which the minimum wage is binding at the headquarters) are more affected by a minimum wage increase in the home country/state in firms for which the prior minimum wage was more binding at the headquarters. The estimates of $\hat{\alpha}_3$ is reported in Column 1, Appendix Table A13. Note that we also leave out home country/state×year fixed effects so that the effect of home country/state minimum wage increases on the wages of workers in low-skill occupations in multinationals with medium-level firm bindingness (Kaitz) can be identified. The estimated coefficients on the interaction terms of home country/state minimum wage change and the firm bindingness measure are robust to whether home country/state×year fixed effects are included (comparing columns 1 and 3 with columns 2 and 4 in Table A13).

The results in Table A13 suggest that potential heterogeneity in labor demand that covaries with minimum wage changes is to a large extent *firm*-specific rather than *occupation*-specific. This in turn implies that the concern discussed above—that home country/state labor demand that directly affects multinationals' foreign wages and also encourages minimum wage increases at home could disproportionately be demand for low-wage workers—is unlikely to drive our estimates.

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 no 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.[60]

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 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

[60]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.

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; Goldberg & Tracy, 2001).[61] 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 depreciation will lead to a similar decrease 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 leads to a similar, if anything larger, increase in the foreign establishment wages of firms purchasing and/or producing less tradable goods and services. 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, and little heterogeneity in the impact on foreign establishment wages by job offshorability and multi-task content (see 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 by job task content that is likely related to the complementarity 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.

[61] 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) includes a database on nominal gross monthly minimum wage (local currency) for 118 of the 170 countries observed in our primary dataset. The minimum wage is recorded as of December 31st of each year.[62] 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).

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).[63] 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.

[62] 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.

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

iii The crosswalk between the 2000 US Census Codes and the *occ1990dd* occupation classification codes is available on David Dorn's website.[64]

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).

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).[65]

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.[66]

1.4 Measures of Sectoral Characteristics

Skill share and labor share The sector-specific labor share is calculated using data from the BEA Input-Output Accounts, concorded to nails 6 digit and reduced to 2 digit NAICS using gross output values as weights. The sector-level skill share is the share of payroll going to occupations with skill

[64] "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."

[65] 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.

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

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

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 (see e.g. Tabellini, 2010; Gorodnichenko & Roland, 2011; Bloom *et al.*, 2012b; Martinez *et al.*, 2015; Bandiera *et al.*, 2019).

The measures of Hofstede's national cultural dimensions are downloaded from Hofstede's website. These include Power distance index (PDI, our primary culture measure), 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 (Hofstede, 1980). 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).

To measure inequality aversion, we use the "power distance index", defined as "the degree to

[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.

which the less powerful members of a society accept and expect that power is distributed unequally" and measuring "how a society handles inequalities among people" (Hofstede, 1980). For instance, the less inequality-averse countries and regions include France, Eastern Europe, India, North and West Africa, and the North-Eastern countries in Latin America. On the other side, an example of more inequality-averse countries and regions involve most of Europe, Eastern Africa, the South-Western countries in Latin America, Canada, and the U.S.[69][70]

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

Other measures GDP per capita, Gini index, regulatory index, adult educational attainment, urban population shares are drawn from the World Bank and measured yearly.[71] 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

[69] The strongest predictors of inequality-aversion we found were a higher GDP per capita, higher (Gini) inequality, and a stronger regulatory environment. For more information on the Hofstede measures, including the other five cultural dimensions—Individualism, Masculinity, Uncertainty Avoidance, Long Term Orientation, and Indulgence—see https://geerthofstede.com/culture-geert-hofstede-gert-jan-hofstede/6d-model-of-national-culture/ and https://www.hofstede-insights.com/. These usefully explain e.g. why the U.S. is considered (and measured) to be inequality-averse but individualistic.

[70] The exact questions asked to calculate this measure can be found at the following link: http://people.uncw.edu/nottinghamj/documents/slides6/Northouse6e%20Ch15%20Culture%20Survey.pdf and the exact formula to calculate the measure is found on page 6 of the following manual: https://geerthofstede.com/wp-content/uploads/2016/07/Manual-VSM-2013.pdf.

[71] 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.

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.

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 2005-2013 (the years covered in the multinational data). 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 use this identifiers to match firms in the multinational data to establishments in Brazil. We find identify 37 firms with establishments in Brazil.

Because the Company does not use standard occupation codes, we are unable to match individuals in Brazil (for whom we have CBO codes of occupations) to their direct job counterpart in the multinational data. We therefore instead match by skill level of the job. We do this by taking the average education level of individuals in a particular CBO in Brazil, as well as the average "level" people are at in the firm (manager, assistant manager), and match into the respective skill level in the Company's data. These multinationals are headquartered in the United States (61%), Germany (13%), Switzerland (12%), the UK (6%), France (5%), Finland (1.5%) and the remainder are spread equally across Australia, Canadaa, Ireland, and New Zealand.

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. Summary statistics are provided in Appendix Table A5. The wages in the Company's data have an roughly 80% correlation with wages in the Brazilian data.

2. Data Processing

The dataset from the Company is an unbalanced panel at establishment$\times$year level, and contains a few large wage changes within the same establishment in neighboring years that are very likely due to data entry errors. We process the wage data in the following two ways to address the potential estimation issues associated with these two features.

Trimming Outliers We drop observations with a wage change between two consecutive surveyed years larger than 100%. This trimming procedure drops less than 2% of the total observations.[72] We also drop wages that are in the top and bottom 1% of the overall wage distribution.

Adjusting for Panel Unbalancedness There are instances in which a firm experiences more than one home country minimum wage change between two consecutive survey years. For example, we see some cases in which if a firm is surveyed in 2005 and 2007 but its home country's minimum wage increases both in 2005 and 2006. In such instances, we use the most recent minimum wage increase as the independent variable and re-scale the associated gross wages by the ratio of the most recent minimum wage increase and the cumulative minimum wage increase. Because the cumulative minimum wage increase and the growth in job-specific wages are both likely to be larger when there is a longer time gap between two consecutive survey years, failing to re-scale the correlation between the two might spuriously capture the unbalanced panel feature of the dataset. The procedure also applies to any other regression in which the un-interacted home country minimum wage changes is the main independent variable of interest.

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.

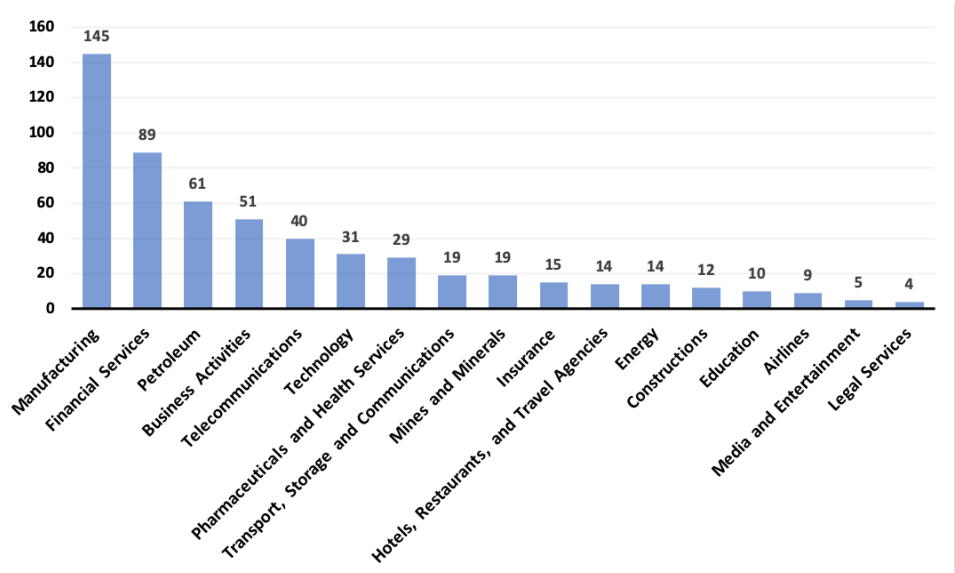
To do so, we impute the values of the outcome variable (the wage in a firm's foreign establishment) in missing years using the fitted values from the estimation of the following two-way fixed effect model: $\mathrm{w}_{jfct} = \mathrm{w}_{jfc} + \mathrm{w}_{jct} + \epsilon_{jft}$, $\hat{\mathrm{w}}_{jfc} + \hat{\mathrm{w}}_{jct}$. All establishments—all foreign establish-

[72] If data entry errors were more likely to occur when there was a longer time gap between two consecutive surveys on the same establishment, and home country minimum wage changes were also larger when the time gap was longer, including possibly erroneous outliers with very large wage growth could lead to a spurious positive correlation between the firm wage change and home country minimum wage change.

ments 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 $\hat{w}_{jfc}$ 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 (similarly to in the cross-sectional regression discussed above).

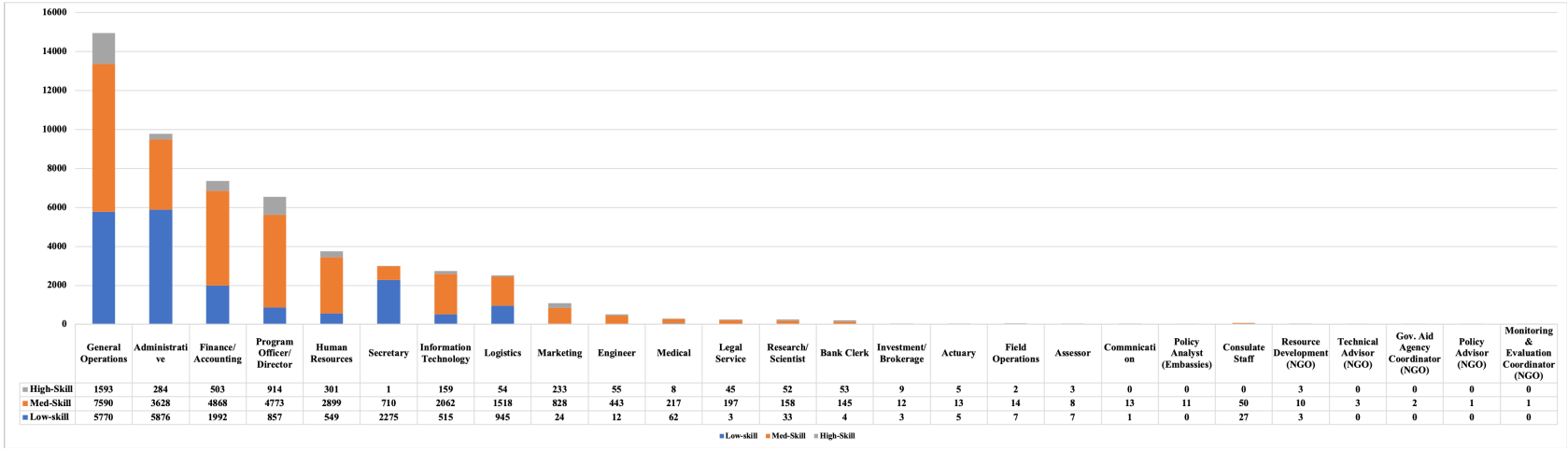
Appendix IV Figure

FIGURE A1: SECTORAL DISTRIBUTION OF PRIVATE-SECTOR FIRMS



Note: This figure displays the sectoral distribution of the private-sector multinationals in the full sample. The unit of observation is an employer.

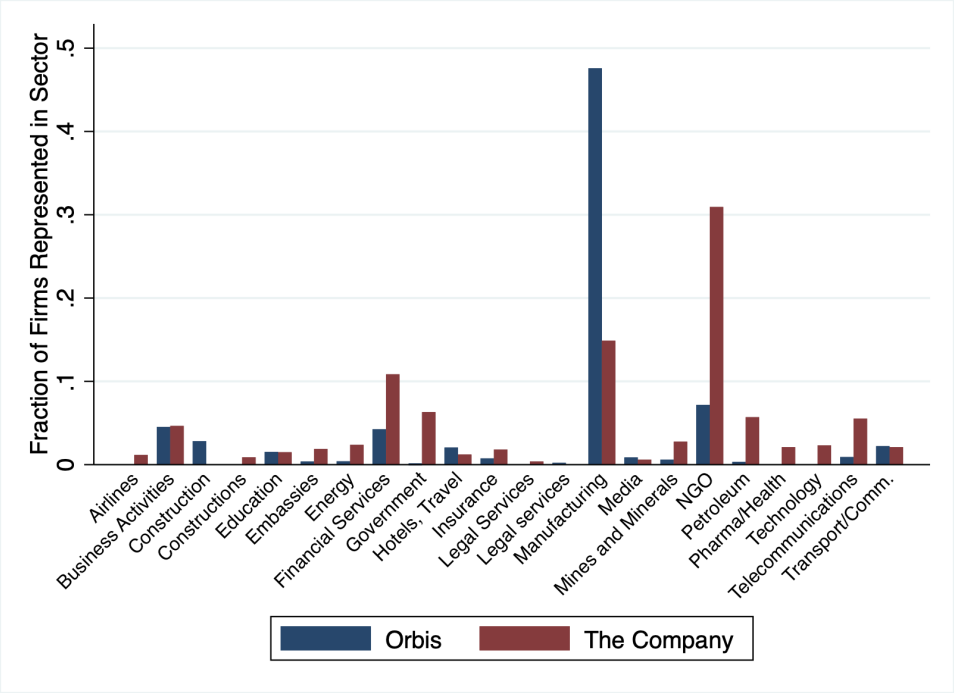
FIGURE A2: OCCUPATION DISTRIBUTION BY OCCUPATION CATEGORY AND SKILL LEVEL



	General Operations	Administrative	Finance/ Accounting	Program Officer/ Director	Human Resources	Secretary	Information Technology	Logistics	Marketing	Engineer	Medical	Legal Service	Research/ Scientist	Bank Clerk	Investment/ Brokerage	Actuary	Field Operations	Assessor	Commnication	Policy Analyst (Embassies)	Consulate Staff	Resource Development (NGO)	Technical Advisor (NGO)	Gov. Aid Agency Coordinator (NGO)	Policy Advisor (NGO)	Monitoring & Evaluation Coordinator (NGO)
High-Skill	1593	284	503	914	301	1	159	54	233	55	8	45	52	53	9	5	2	3	0	0	0	3	0	0	0	0
Med-Skill	7590	3628	4868	4773	2899	710	2062	1518	828	443	217	197	158	145	12	13	14	8	13	11	50	10	3	2	1	1
Low-skill	5770	5876	1992	857	549	2275	515	945	24	12	62	3	33	4	3	5	7	7	1	0	27	3	0	0	0	0

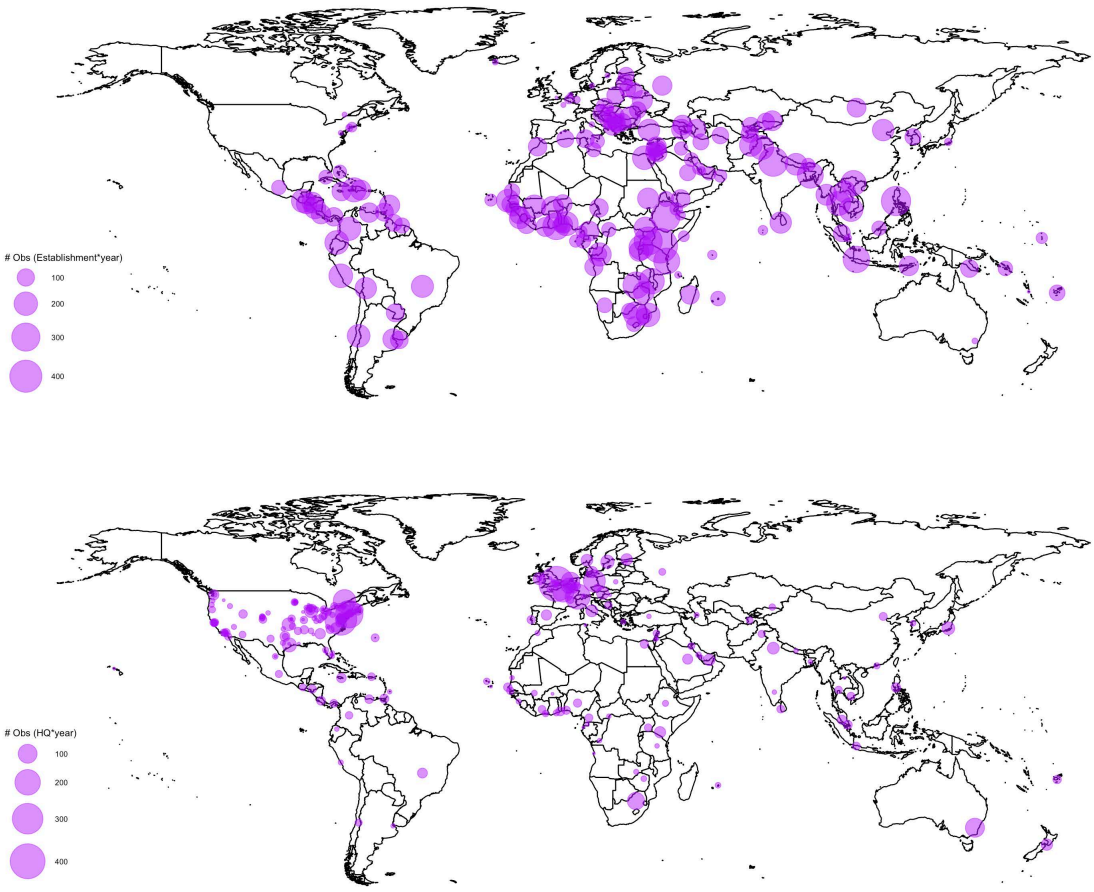
Note: This figure displays the distribution of occupations in the headquarters and the foreign establishments of multinationals according to the Company's global definition of occupation categories and skill levels. Low-skill: skill level 1-5; med-skill: skill levels 6-10; high-skill: skill levels 11-16. The unit of observation is an employer×establishment×occupation.

FIGURE A3: SECTORAL DISTRIBUTION OF COMPANY FIRMS AND ORBIS FIRMS



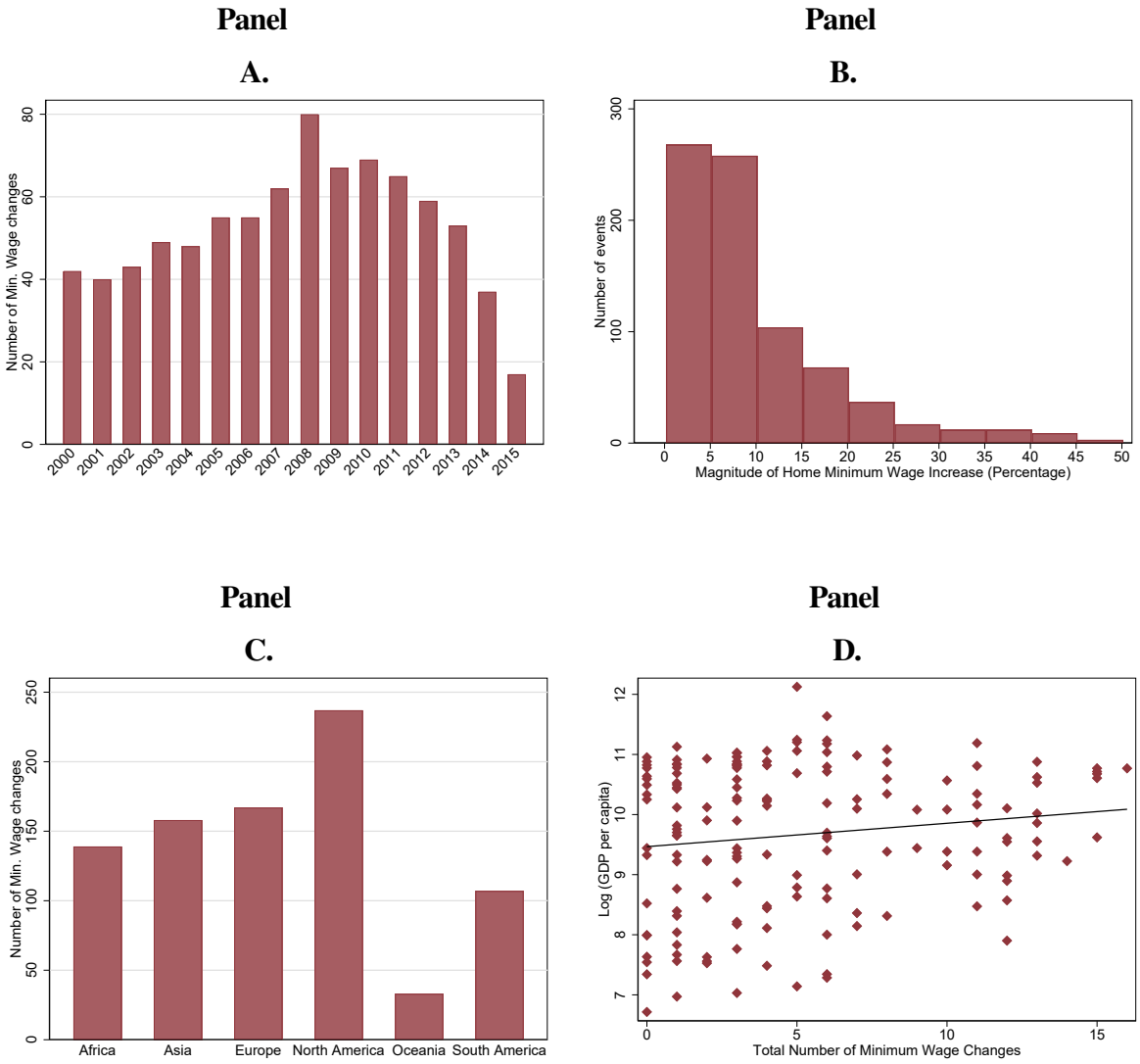
Note: This figure displays the sectoral distribution of all MNEs in the Company dataset (red bars) and the Orbis sample (blue bars). The Orbis sample contains 1,100 firms randomly selected from the set of all sector × HQ country location pairs that exist in the Company data. The unit of observation is an MNE.

FIGURE A4: FOREIGN ESTABLISHMENT AND HQ LOCATIONS



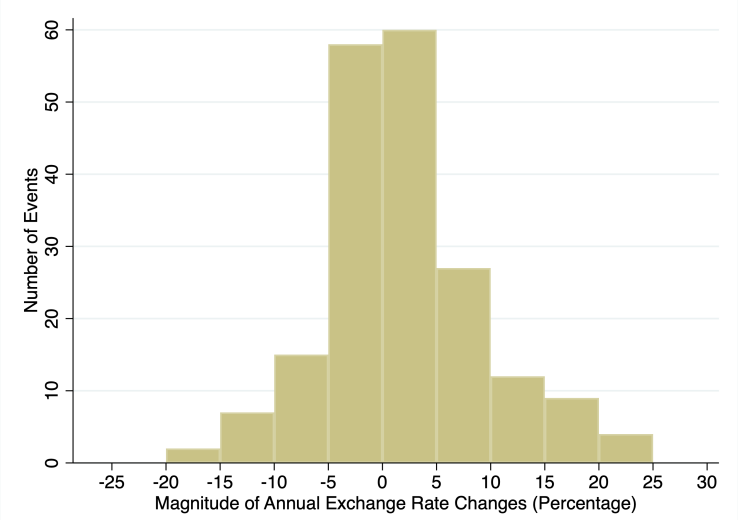
Note: This figure displays the geographical distribution of the establishments (top panel) in the full sample of multinationals and their headquarters (bottom panel). The bubble size weight is the number of establishment (headquarters)×year observations in each city.

FIGURE A5: HQ COUNTRY/STATE MINIMUM WAGE CHANGES



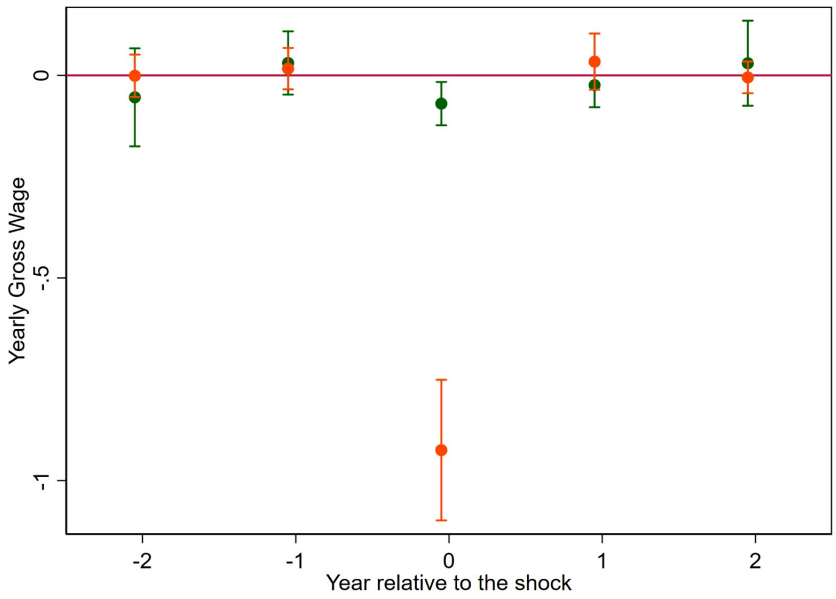
Note: This figure presents evidence of the HQ-country/state minimum wage changes. Panel A depicts whether a country (or states in the case of the US) has a minimum wage increase in a particular year. Panel B shows the distribution of the magnitude of headquarters countries/states' minimum wage increases from 2000 and 2015. There are 841 minimum wage increases (including 53 whose magnitude is larger than 50%) and 742 counts of headquarters-location $\times$ years with zero minimum wage increase. Panel C presents the total number of minimum wage increases between 2000 and 2015 grouped by their 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) between 2000 and 2015, 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 CURRRENCY APPRECIATION/DEPRECIATION



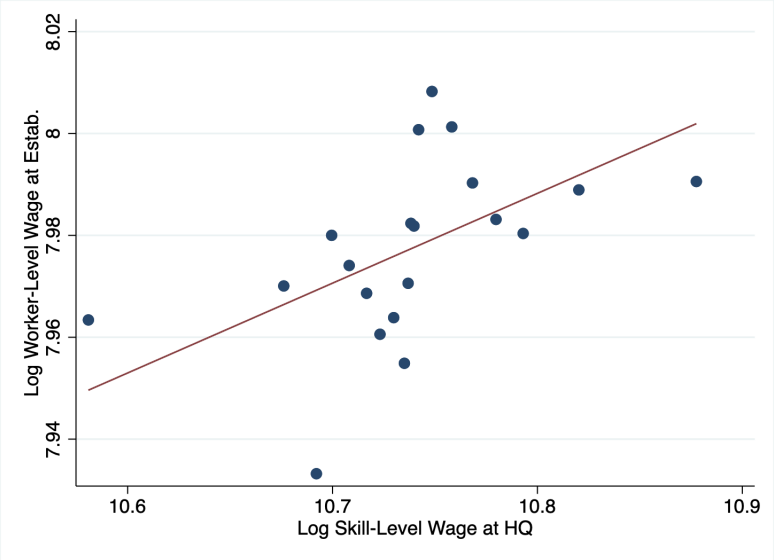
Note: This figure shows the distribution of the magnitude of headquarters country exchange rate changes used in our main analysis. The unit of observation is currency-zone×year. All establishments which are located in the same currency zone as the headquarters are excluded; All headquarters countries including the United States and those which peg their currencies to the USD are also excluded. There are 197 events (including 3 whose magnitude is larger than 50%), including 82 appreciations (a decrease in exchange rate), 109 appreciations (an increase in exchange rate) and 6 instances where the exchange rate does not change .

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



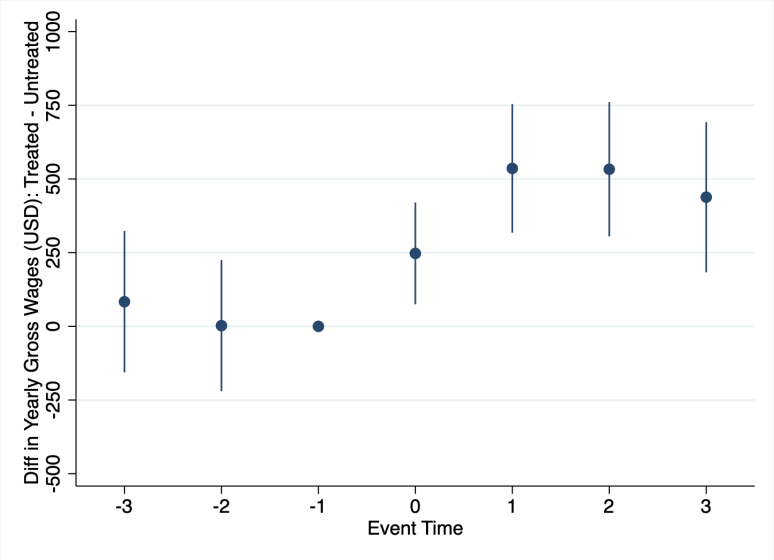
Note: This impulse response study plots the coefficients from a regression in which occupation-specific log gross wages (in current USD terms) at the foreign establishments (green coefficents) and the headquarters (orange coefficients) of a firm in year $t-3$ to $t+3$ are regressed on the detrended log exchange rate in year t in the firm's home country. Employer×year and establishment-city×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.

FIGURE A8: RELATIONSHIP BETWEEN HQ AND BRAZILIAN ESTABLISHMENT WAGES



Note: This binned scatterplot shows the relationship between the wage paid for a given skill level at a multinational's headquarter (x-axis) and the wage paid for a given skill level at the multinational's Brazilian establishment (y-axis). Data on headquarter wages come from the Company and data on wages on Brazil comes from *RAIS*. There are 16 skill levels, as defined by the Company. We then match these skill levels to the Brazilian data using the average education for a given job. To construct the plots, the log wage at the establishment if first residualized with respect to establishment city$\times$ year fixed effects, as well as worker age, tenure, race, and gender controls. The log wage at the firm's headquarter is then divided into twenty equal-sized groupings. Within each of these groups, we plot the mean of the establishment wage residuals against the mean of the headquarter wage and add back the unconditional mean of the y-variable to help with interpretation. The slope of the line of best fit is $\hat{\beta} = 0.176$ (s.e. = 0.011).

FIGURE A9: IMPACT OF HQ MIN WAGE ON FOREIGN ESTAB. WAGES IN BRAZIL



Note: This figure plots the coefficients on the event time indicators from estimating equation (2) using the sample of matched Brazilian firms. The outcome is the job-level wages at a firm's foreign establishment, and we additionally control for average worker characteristics for a given establishment-job (race, education, gender, and job tenure). The sample is restricted to low skill jobs and to those firms that experience only one minimum wage increase at the headquarter during the event time window. All coefficients are normalized to $k = -1$, the year before the minimum wage increase.

Appendix V Table

TABLE A1: COMPARISON WITH ORBIS FIRMS

	Company	Orbis	p-value
	(1)	(2)	(3)
Total Assets	8966.29	399.88	0.001
	[16421.90]	[2977.68]	
Working Capital	411.98	35.17	0.001
	[3948.84]	[463.62]	
Sales	6827.88	224.33	0.001
	[14915.55]	[2094.92]	
Gross Profit	4018.94	98.21	0.001
	[12577.03]	[732.10]	
Export Revenue	2782.75	32.28	0.001
	[2658.25]	[465.79]	
Profit Margin	12.53	4.86	0.001
	[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 Private-Sector Multinational Samples*

	Number of Observations		
Unit of Observation	*Sample 1*	*Sample 2*	*Sample 3*
Employer	567	27	21
Employer×year	1980	100	56
Establishment	1914	157	80
Estab.×year	5329	484	302
Estab.×skill-level×year	41692	3742	3018
Estab.×occupation	40388	2606	2043
Estab.×occ.×year	105913	9573	7924

Panel B: *Private-Sector Multinationals' Foreign Establishments' Wages*

	Sample 1		*Sample 2*		*Sample 3*	
	Mean	SD	Mean	SD	Mean	SD
Net Wage (2000 USD)	19174.93	12514.61	18055.60	13437.92	21222.36	15235.30

Panel C: *Distribution & Compression of Wages (Sample 3)*

	HQ-Quart1	HQ-Quart2	HQ-Quart3	HQ-Quart4	HQ-All Occ
	Headquarter Wage Distribution				
Mean Net Wage (2000 USD)	9217.89	16457.06	24139.08	44354.32	21879.53
Max. Net Wage (2000 USD)	46715.80	69712.34	98355.27	163925.9	163925.9
	Establishment Wage as % of HQ Wage				
All Establishments	0.89	0.87	0.97	0.97	0.92
Estab.s in Poorer-than-HQ-Country Countries	0.75	0.73	0.83	0.84	0.78
Employer×occ.×year	314	236	257	208	1015

Note: Only foreign establishments are included in panels A & B, while in panel C, headquarters are also included. 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	0.156	0.183		
	(0.106)	(0.138)		
Log Skill-Level HQ Wage			0.144	
			(0.185)	
Log Firm-Level HQ Wage				0.531
				(0.111)
Employer×Occ FE	Y	Y		
Employer×Skill-level FE			Y	
Employer FE				Y
Estab.-City×Year FE				Y
Estab.-City×Occ×Year FE	Y	Y		
Estab.-City×Skill-level×Year FE			Y	
HQ×Year FE		Y		
Observations	7,093	7,089	4,808	742

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 Gross Wage at Establishment				Log Wage Slope at Estab.
	(1)	(2)	(3)	(4)	(5)
				Private Sec.	Private Sec.
Log Occ-Level HQ Wage	0.201	0.273	0.420	0.376	
	(0.020)	(0.025)	(0.057)	(0.032)	
Med Skill × Log Occ-Level HQ Wage		-0.088			
		(0.025)			
High Skill × Log Occ-Level HQ Wage		-0.158			
		(0.032)			
USA × Log Occ-Level HQ Wage			-0.205		
			(0.061)		
Other High Inc × Log Occ-Level HQ Wage			-0.249		
			(0.056)		
HQ Wage Slope					0.436
					(0.054)
Employer × Occ FE	Y	Y	N	Y	N
Estab.-City × Year FE	Y	Y	Y	Y	Y
Employer × Skill Level FE	N	N	Y	N	Y
Observations	20957	20957	20957	7939	4994

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 firm level.

TABLE A5: RAIS DATA SUMMARY STATISTICS

	Mean	Min	Max	SD
Occupations	17.8	1	149	20.8
Workers	995.4	1	178,225	4730.4
% Brazilian	99.4	0	1	2.9
% no High School	10.5	0	86.0	16.4
Tenure (months)	55.3	0.5	469.3	50.0
Yearly Wages (USD)	33,896.2	7007.5	642,216.6	36,507.4

Note: This table reports the mean, minimum, and maximum values, as well as the standard deviations of the listed variables 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 US dollars.

TABLE A6: ROBUSTNESS TO ALTERNATIVE LOW SKILL DEFINITIONS

	%Δ Est. Wage (1)	%Δ HQ Wage (2)	%Δ Est. Wage (3)	%Δ Est. Wage (4)	%Δ HQ Wage (5)	%Δ Est. Wage (6)
	Skill Levels 1-4			Skill Levels 1-6		
Min Wage Hike at HQ	0.048	0.062		0.018	0.046	
	(0.015)	(0.013)		(0.009)	(0.013)	
%Δ HQ Min Wage			0.773			0.396
			(0.296)			(0.214)
Employer × Occ FE	Y	Y	Y	Y	Y	Y
Estab.- City × Year FE	Y	N	Y	Y	N	Y
Year FE	N	Y	N	N	Y	N
Observations	37395	3661	37395	91968	10303	91968

Note: This table shows (1) the reduced form impact of a minimum wage change in a firm's headquarter on wages in the firm's foreign establishments (columns 1 and 4), (2) the first stage impact on the firm's headquarter (columns 2 and 5), and (3) the impact of a wage change in a firm's headquarter on the firm's establishment wages, using the minimum wage change as an instrument for headquarter wages (columns 3 and 6). In columns 1-3, occupations that the Company defines as being in skill levels 1-4 are defined as low skill. In columns 4-6, low skill jobs are defined as those occupations that are in skill levels 1-6.

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

	(1)	(2)	(3)
	%Δ Estab Wage	%Δ HQ Wage	%Δ Estab Wage
Min Wage Hike at HQ	0.023	0.052	
	(0.007)	(0.016)	
%Δ HQ Wage			0.439
			(0.185)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	N	Y
Year FE	N	Y	N
Observations	13047	5282	13047

Note: This table shows the impact of a minimum wage shock in a firm's headquarters country on wages in the firm's foreign establishments, restricting to private sector firms. Column 1 shows the reduced form result, column 2 shows the first stage result, and in column 3 we instrument for the headquarter wage with the minimum wage shock and estimate the impact on establishment wages. In column 3, we use two sample two-stage least-squares. Standard errors are clustered at the headquarter country (or state) level.

TABLE A8: IMPACT OF EXCHANGE RATE SHOCKS (PRIVATE SECTOR)

Panel A: Reduced Form	Log Establishment Wage		
	(1)	(2)	(3)
		Depreciation	Appreciation
Log HQ Exchange Rate	-0.114	-0.074	-0.136
	(0.043)	(0.054)	(0.064)
Observations	181211	89461	98495
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y
Observations	369847	182842	198984
Panel B: First Stage	Log HQ Wage		
Log HQ Exchange Rate	-0.494	-0.517	-0.538
	(0.238)	(0.239)	(0.240)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y
Observations	38856	23925	18592
Panel C: 2SLS	Log Establishment Wage		
Log HQ Wage	0.167	0.112	0.320
	(0.145)	(0.181)	(0.298)
Employer × Occ FE	Y	Y	Y
Estab.-City × Year FE	Y	Y	Y
HQ Currency Trend	Y	Y	Y
Observations	6142	4430	3468

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

TABLE A9: IMPACT OF SHOCKS ON NON-LOW SKILL JOBS

	(1)	(2)	(3)	(4)	(5)	(6)
	Establishment Occ-Level Wage				HQ Occ-Level Wage	
Sample:	High Skill		Low Skill	High Skill	Low Skill	High Skill
Min Wage Hike	-0.004	0.004				
	(0.006)	(0.015)				
Log HQ Ex. Rate			-0.062	-0.066	-0.622	-0.478
			(0.044)	(0.030)	(0.138)	(0.253)
Employer × Occ FE	Y	Y	Y	Y	Y	Y
Estab.- City × Year FE	Y	N	Y	Y	N	N
Year FE	N	Y	N	N	Y	Y
Observations	159007	17340	116106	287952	12219	33075

Note: This table shows the impact of minimum wage shocks (columns 1-2) and exchange rate shocks (columns 3-6) at a firm's headquarters on wages in the firm's foreign establishments. Columns 5-6 also show the impact of exchange rate shocks in the firm's headquarters on wages in the firm's headquarters for low and high-skill workers. High-skill occupations are defined as those requiring a skill level between 6-16, whereas low-skill occupations are those requiring a skill level below 5, as defined by the Company. Standard errors are clustered at the country (columns 1-2) or country currency zone level (columns 3-6).

TABLE A10: ROBUSTNESS TO SHOCK DEFINITIONS

	%Δ in Wage at:				Log Wage at:		
	Estab.	HQ	Estab.	HQ	Estab.	HQ	Estab.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Min Wage Hike, 50th	0.028	0.054					
	(0.010)	(0.012)					
Min Wage Hike, 75th			0.067	0.035			
			(0.023)	(0.014)			
Log HQ Ex. Rate					-0.105	-0.478	
					(0.049)	(0.251)	
Log HQ Wage (IV)							0.221
							(0.154)
Employer × Occ FE	Y	Y	Y	Y	Y	Y	Y
Estab City × Year FE	Y	N	Y	N	Y	N	Y
Year FE	N	Y	N	Y	N	N	N
HQ Currency Trend	N	N	N	N	Y	Y	Y
Observations	61348	6682	61348	6682	125989	23560	125989

Note: This table shows robustness to different definitions of wage and exchange rate shocks. *Min Wage Hike, 50th* uses only minimum wage shocks that are above the 50th percentile in terms of the size of the minimum wage change. Similarly, *Min Wage Hike, 75th* uses only shocks above the 75th percentile. In columns 5-7, 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 7 presents the IV exchange rate results. Standard errors are clustered at the headquarter country (columns 1-4) or headquarter country currency zone level (columns 5-7).

TABLE A11: ESTABLISHMENT-HQ WAGE ANCHORING: BRAZIL (EXCHANGE RATE)

Log Wage:	Annual	Effective	Annual	Effective
	(1)	(2)	(3)	(4)
Log HQ Ex. Rate	-0.326	-0.287	-0.139	-0.170
	(0.014)	(0.021)	(0.007)	(0.012)
Firm × Occ FE	Y	Y	N	N
Firm × Worker × Occ FE	N	N	Y	Y
Estab City × Year FE	Y	Y	Y	Y
HQ Currency Trend	Y	Y	Y	Y
Worker Controls	Y	Y	N	N
Observations	1430589	1116486	1227145	942921

Note: This table shows the impact of a 100$ local currency depreciation (relative to USD) in a firm's home country has on gross wages in its foreign establishments. In columns 1 and 3, the outcome variable is 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 hours worked. Worker controls include age and job tenure fixed effects, as well as controls for race and gender.

TABLE A12: IMPACT OF ESTAB. COUNTRY MIN. WAGE/ EX. RATE SHOCKS ON WAGES

	Estab-Country Min. Wage Hikes		Estab-Country Ex. Rate Shocks	
	%Δ HQ Wage	%Δ Estab j Wage	Log HQ Wage	Log Estab j Wage
	(1)	(2)	(3)	(4)
Hike at Estab. ($\neq$ j)	0.002	-0.0001		
	(0.001)	(0.001)		
Log Ex. Rate at Estab. ($\neq$ j)			-0.003	-0.0001
			(0.003)	(0.001)
Employer $\times$ Occ FE	Y	Y	Y	Y
HQ City $\times$ Year FE	Y	N	Y	N
Estab. j-City $\times$ Year FE	N	Y	N	Y
Observations	1,387	1,629,751	20,345	14,783,948

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 regression is run by creating a dataset in which each foreign establishment is matched to every other foreign establishment within the firm, as well as the firm's headquarter. Standard errors are clustered at the level of the independent variable establishment.

TABLE A13: IMPACT OF MIN. WAGE CHANGE AT HQ ON FOREIGN ESTABLISHMENT WAGES: FIRMS WITH MORE VS. LESS EXPOSED HQS

	%Δ Establishment Wage		%Δ Headquarter Wage	
	(1)	(2)	(3)	(4)
Min Wage Hike at HQ	0.006	0.006	-0.015	-0.015
	(0.015)	(0.015)	(0.018)	(0.018)
Hike × Firm Bindingness	0.787	0.787	0.360	0.361
	(0.145)	(0.145)	(0.083)	(0.083)
Firm × Occ FE	Y	Y	Y	Y
HQ Country FE	Y	N	Y	N
Year FE	N	N	Y	Y
Estab City × Year FE	Y	Y	N	N
Observations	23,179	23,179	4,103	4,103

Note: This table shows the impact of a minimum wage shock on firms that are more versus less exposed to the shock. The Kaitz index is a measure of firm-level bindingness, calculated as the ratio between the ex ante minimum wage and the firm's median wage at the headquarters. For years in which the HQ was not surveyed, we impute the firm-level average Kaitz index. Only the firms for which the HQ and at least one foreign establishment are observed are included, as the Kaitz index is only available for these firms. Columns 1-2 show the reduced form impact on foreign establishments and columns 3-4 show the first stage impact on headquarters. Standard errors are clustered at the HQ-country (state) level.

TABLE A14: FREQUENCY AND MAGNITUDES OF SHOCKS

	% of change			# country (state)-year	
	P(25)	P(50)	P(75)	Neg.	Total changes
	(1)	(2)	(3)	(4)	(5)
Minimum wage	4.07	8.04	15.25	0	841
Exchange-rate	-3.26	1.39	7.07	477	1114

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 negatives percentage of changes and total events.

TABLE A15: IMPACT OF HQ MINIMUM WAGE INCREASE ON FIRM FINANCIALS

	Log Profit Margin	K:L Ratio
	(1)	(2)
Hike	0.000089	-0.000043
	(0.000017)	(0.00014)
Mean of Dep. Var.	2.27	4.23
Firm FE	Y	Y
Year FE	Y	Y
Observations	253	209

Note: This paper shows the impact of minimum wage hike at a firm's headquarter on the log of the firm's profit margin (column 1), and the capital-to-labor ratio (column 2). The outcome measures are taken from Orbis Historical. An observation is a firm $\times$ year and 60 firms are included in the analysis. Firm and year fixed effects are included and standard errors are clustered at the firm level.

TABLE A16: ROBUSTNESS OF IMPACT OF HQ COUNTRY EX. RATE SHOCKS ON WAGES

Panel A: Exporting/Important Sectors				
	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.104	-0.104	-0.226	-0.330
	(0.051)	(0.052)	(0.126)	(0.119)
Log HQ Ex Rate × High Output Exporting		0.042		-0.046
		(0.103)		(0.170)
Log HQ Ex Rate × High Input Importing	0.043		-0.299*	
	(0.101)		(0.158)	
Employer × Occ FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Estab City × Year FE	Y	Y	N	N
Observations	369847	369847	44995	44995
Panel B: Occupation Offshorability				
	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.093	-0.091	-0.401	-0.354
	(0.027)	(0.027)	(0.124)	(0.111)
Log HQ Ex Rate × Offshorable		0.009		-0.026
		(0.007)		(0.016)
Log HQ Ex Rate × Single Task	0.019		0.278	
	(0.034)		(0.171)	
Employer × Occ FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Estab City × Year FE	Y	Y	N	N
Observations	369847	365860	44995	44930
Panel C: Technology Adoption				
	Log Estab. Wage		Log HQ Wage	
	(1)	(2)	(3)	(4)
Log HQ Exchange Rate	-0.053	-0.105	-0.339	-0.075
	(0.043)	(0.029)	(0.133)	(0.132)
Log HQ Ex Rate × Abstract	-0.013		-0.006	
	(0.009)		(0.042)	
Log HQ Ex Rate × Routine		0.003		-0.052
		(0.005)		(0.011)
Log HQ Ex Rate × Manual				
Employer × Occ FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Estab City × Year FE	Y	Y	N	N
Observations	369808	369808	44989	44989

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 offshorablilty 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, routineness and manualness. An occupation is defined as abstract-task (routine-task, manual task) if its abstractness (routineness, manualness) index is above the sample mean. The abstractness, routineness, manualness 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.