The Effects of Multinationals on Workers: Evidence from Costa Rica

Alonso Alfaro-Urena, Isabela Manelici, Jose P. Vasquez*

November 15, 2019

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This paper estimates the effects of foreign multinational corporations (MNCs) on workers by combining administrative data on all worker-firm and firm-firm relationships in Costa Rica with an instrumental variable strategy that exploits variation in the size of MNCs in the country. First, using a within-worker event-study design, we find a direct MNC wage premium of nine percent. We provide evidence that this premium reflects above market wages rather than compensation for disamenities. Next, we study the indirect effects of MNCs on workers in domestic firms. As MNCs bring jobs that pay a premium, MNCs can improve the outside options of workers by altering both the level and composition of labor demand. MNCs can also enhance the performance of domestic employers through firm-level input-output linkages, which, in turn, can lead to higher wages. We show that the annual earnings of a worker experiencing a one standard deviation increase in either the labor market exposure or the firm-level exposure to MNCs grow one percentage point more than the earnings of an identical worker with no change in either MNC exposure. Finally, we develop a model to rationalize the reduced-form evidence and estimate structural parameters that govern wage setting. In the model, MNCs pay a wage premium and buy inputs from domestic firms that need to pay a recruitment and training cost to hire new workers. We find that workers have a low attachment to their employer and are sensitive to improvements in outside options. We also estimate that the marginal recruitment and training cost of the average domestic firm is equal to 90% of the annual earnings of a worker paid the competitive market wage. This high cost allows incumbent workers to extract part of the increase in firm rents resulting from higher sales to MNCs.

JEL Codes: F23, F16, J21, J23, J31, J63, M55

*Jose P. Vasquez (Job Market Paper): UC Berkeley. Corresponding author at jpvasquez@berkeley.edu. Alonso Alfaro-Urena: Central Bank of Costa Rica (BCCR) and Universidad de Costa Rica. Isabela Manelici: UC Berkeley. We thank Enrico Moretti, Patrick Kline, Andrés Rodríguez-Clare, Reed Walker, Ben Faber, Alan Auerbach, and Cecile Gaubert for their guidance and support. This paper has benefited from conversations with Kirill Borusyak, David Card, Elizabeth Cascio, Juan M. Castro-Vincenzi, Alessandra Fenizia, Julio Galvez, Daniel Haanwinckel, Supreet Kaur, Sergii Meleshchuk, Nina Pavcnik, Murilo Ramos, Evan Rose, Emmanuel Saez, Nicholas Sander, Na'ama Shenhav, Mauricio Ulate, Christopher Walters, Danny Yagan, Paolo Zacchia, Roman D. Zarate, and various seminar participants. We owe special thanks to BCCR and its Economic Division, in particular, for their hospitality during our visits. We also thank CINDE for collaborating on a firm-level survey. We acknowledge financial support from the Institute for Research on Labor and Employment, Center for Equitable Growth, Opportunity Lab, Private Enterprise Development in Low-Income Countries (PEDL), and Clausen Center. The views expressed herein are solely those of the authors and are not necessarily those of BCCR or any of the funding institutions. All results have been reviewed by BCCR to ensure no confidential information is disclosed.

1 Introduction

Developed and developing countries alike court foreign multinational corporations (MNCs) with generous tax incentives and productive infrastructure. For developing countries in particular, attracting MNCs is frequently at the heart of their development strategy. In 72% of developing countries, MNCs are offered preferential tax incentives, which have become only more generous over the past decade (World Bank, 2018). Most existing work analyzing the effectiveness of these policies has examined the impacts of MNCs at the firm, industry, or macroeconomic level. In this paper, we ask what are the impacts of MNCs on *workers* – both those directly employed by MNCs and those in the domestic economy, who are indirectly affected by MNCs. The answer to this question is central to a complete assessment of the effectiveness and equity of policies aimed at attracting MNCs. We address this question in Costa Rica, a middle-income country that has placed the pursuit of MNCs at the forefront of its development strategy.

Two challenges stand in the way of an answer. First, to understand the incidence of MNCs on workers, one needs to identify which workers are affected by MNCs and through which channels. We draw on a unique combination of administrative data that tracks all formal worker-firm and firm-firm relationships in the economy. We can, therefore, consider the effects of MNCs on workers as deriving from their dual role as firms that hire workers at above-market wages and affect domestic firms through firm-to-firm linkages. Second, the decision of MNCs to expand or contract within an economy may be endogenous to labor and product market conditions that can directly influence worker outcomes. We exploit variation in the global size of MNCs (*excluding* Costa Rica) with subsidiaries in the country to instrument for changes in the size of MNCs in Costa Rica.

We organize our study in three parts. First, we estimate the relative wage gain upon being hired as an MNC and examine its determinants. Second, we provide reduced-form evidence on the indirect effects of changes in the labor market and firm-level exposure to MNCs on wages. A back-of-the-envelope calculation compares the wage gains attributable to MNCs to the tax revenues foregone by the government due to tax breaks. Finally, we develop a stylized model of an economy with MNCs to rationalize our reduced-form evidence and estimate key parameters that govern wage setting.

We base our analysis on a new and rich collection of microdata. We first combine four administrative datasets: (i) the matched employer-employee dataset since 2006, which allows us to characterize employment spells for all workers and firms in Costa Rica; (ii) a dataset with all firm-to-firm transactions in Costa Rica since 2008; (iii) a dataset combining all yearly corporate income tax returns since 2006; and (iv) a dataset on firm-level foreign ownership. We complement these data with two surveys: (v) a nationally-representative household survey containing information on non-wage job characteristics and (vi) a survey conducted by the authors (in partnership with CINDE, the Costa Rican investment promotion agency) with human resources (HR) executives at MNCs on their wage setting practices. Lastly, we gather data from Orbis and Compustat on MNCs with subsidiaries in Costa Rica to construct instruments for the change in MNC employment in Costa Rica.

In the first part of the paper, we estimate the *direct effect* of being hired by an MNC on wages. To overcome potential selection effects, we use a within-worker event-study (movers) design, where the events of interest are moves from a domestic firm to an MNC (which we contrast to moves from one domestic firm to another). The wages of workers who move from a domestic firm to an MNC increase 9% more on average than those of workers who move from one domestic firm to another. This MNC premium varies greatly across industries and is higher for workers with a college education than for those without (12% vs. 8%). Identification in this design requires movers not to select into firms based on shocks to their productivity. We corroborate this assumption by plotting the full time series of differ-

ential wage changes among movers for eight quarters before the move and eight quarters after. Lastly, we instrument for the likelihood of a move from a domestic firm to an MNC by the contemporaneous expansion in employment *outside* of Costa Rica of MNCs with subsidiaries in the worker's labor market in Costa Rica. The IV estimate of the MNC premium is equal to 15%, with its 95% confidence interval including the 9% estimate from the movers design. Thus, both approaches yield comparable results.

Why would MNCs pay a wage premium? One possibility is that the premium compensates workers for undesirable job attributes. We find that MNC workers enjoy better in-kind and monetary benefits than workers in domestic firms while working a similar number of hours. We also show that MNCs have higher worker retention rates. Last, we find that while both MNCs and domestic firms face an upward-sloping labor supply, MNCs face a higher elasticity than domestic firms. Hence, if anything, MNCs appear to offer better amenities than domestic firms. Alternatively, MNCs may have to pay greater hiring and training costs than domestic firms or abide by MNC-wide wage setting policies (as in Hjort et al., 2019). Both possibilities are consistent with above-market wages. One way to investigate the plausibility of larger hiring and training costs is to control for firm characteristics that have been found to correlate with these costs, such as size and industry (Manning, 2011). These two controls explain about half of the MNC premium, with the remaining half being consistent with MNC-specific policies. Our survey results indicate that MNCs pay a higher wage to the same worker compared to domestic firms in order to avoid worker turnover, motivate the worker, and ensure pay fairness within the MNC.

In the second part of the paper, we study the *indirect effects* of MNCs on workers in domestic firms. There is growing evidence that workers' wages are affected not only by their productivity but also by their outside options in the labor market and by the performance of their employer (Beaudry et al., 2012; Card et al., 2018; Caldwell and Harmon, 2019). For this reason, we allow MNCs to affect both the outside options of workers in the labor market (by changing the level and composition of labor demand) and the performance of domestic employers (through firm-level input-output linkages).

We define two measures of exposure to MNCs: a labor market exposure and a firm-level exposure. We consider a labor market to be a two-digit industry within a given region. The labor market exposure measure is a weighted average of changes in MNC employment across all labor markets in the economy, where the weights reflect worker mobility flows between markets during the pre-period (2006 to 2008). We then scale each market-specific component in the labor market exposure sum by one plus the MNC wage premium. This last multiplication is guided by the intuition that MNC expansions in industries with high MNC premia are likely to improve the outside options of workers in domestic firms more than similarly-sized MNC expansions in industries with lower or no MNC premia.

The firm-level exposure measure is based on firm-to-firm input-output linkages to MNCs. More precisely, it is a weighted sum of the growth rate of each MNC in the economy, weighted by the share of sales of the domestic firm going to that MNC (either directly or indirectly). We focus only on the buyer role of MNCs as both meta-analyses and Alfaro-Urena et al. (2019b) find that, by and large, MNCs affect the performance of their domestic suppliers only (as opposed to the performance of clients or competitors). Shocks to the size of MNC buyers are likely to result in shocks to both the demand and productivity of domestic firms. In the presence of frictions such as those driven by hiring and training costs, incumbent workers at domestic firms could extract part of the increase in rents generated by these shocks. To our knowledge, this is the first paper to explore the implications of shocks in the domestic production network on workers. Thus far, the empirical literature on domestic production networks has shown how shocks propagating through the network can impact firm-level and aggregate outcomes.[1]

We are interested in the causal effects of changes in labor market and firm-level exposure to MNCs

[1]See Dhyne et al. (2018); Bernard et al. (2019); Furusawa et al. (2017); Miyauchi (2018); Huneeus (2018); Demir et al. (2018).

on workers' wages. OLS estimates, however, may be biased due to simultaneity and omitted variables. For instance, workers in a labor market may receive unobserved positive productivity shocks, which would lead to both expansions of MNCs and higher wages for workers in that market (independently of the MNC expansions). In such a case, OLS would overestimate the effect of increases in labor market exposure to MNCs on wages. Finally, OLS estimation of the firm-level exposure coefficient may also be biased if shocks to the productivity of workers in a given firm affect the growth of the direct or indirect MNC buyers from that firm. To address these concerns, we exploit the same variation in MNC employment in Costa Rica as that used for the IV estimation of the MNC premium, namely the variation in MNC employment *outside* of Costa Rica for MNCs with subsidiaries in Costa Rica.

We find that MNC expansions have a positive and significant impact on the wages of workers in domestic firms. This impact manifests through both the labor market and firm-level exposure of the worker to MNCs. Our IV estimates imply that the annual earnings of a worker experiencing a one standard deviation increase in either her labor market or firm-level exposure to MNCs grow about 1.1 percentage points more than the earnings of an identical worker with no change in either MNC exposure. This increase is half of the average annual increase in real earnings during our period of study.

We re-estimate our main empirical specification by replacing the firm-level change in exposure to MNCs with the change in value added per worker. We exploit our source of variation in firm performance – exogenous shocks to the size of a firm's direct and indirect MNC buyers – to estimate the pass-through of changes in value added per worker to worker wages (referred to as rent-sharing elasticity). This exercise allows us not only to build intuition on the plausibility of the coefficient estimate for the firm-level exposure, but also to compare the rent-sharing elasticity in Costa Rica with existing estimates (all of which are from developed countries). Our estimate of 0.09 implies that for each extra dollar of value added per worker, incumbent employees see their salaries increase by 9 cents. While comparable to existent estimates, our estimate is on the lower side (Card et al., 2018).

We conclude the reduced-form part of the paper with a back-of-the-envelope calculation. The aggregate gains in labor earnings attributable to MNCs are approximately 169 million U.S. dollars per year (or 735 U.S. dollars per MNC job per year). Of these gains, 60% are paid in the form of wage premia to workers directly hired by MNCs, with the remaining 40% coming from domestic-wage increases caused by the entry and expansion of MNCs. This amount is a likely lower bound since we abstract from the likely positive effect of MNCs on transitions from unemployment and informal employment to formal employment. During the same period, the yearly average foregone taxes due to tax exemptions offered to MNCs through Special Economic Zones amount to 467 million U.S. dollars (or 2,030 U.S. dollars per MNC job per year). As the aggregate gains in labor earnings match around 36% of these foregone taxes, gains in labor earnings alone do not justify the tax incentives extended to MNCs.

In the third and final part of the paper, we develop a model to rationalize our reduced-form evidence and estimate the parameters that govern wage setting. In our model, domestic firms incur hiring and training costs, which make them willing to confer rents on incumbent workers. The model also features two labor market imperfections. First, domestic firms have labor market power. Incumbent workers have idiosyncratic taste shocks for potential employers, which are private information for the worker but drawn from a distribution that is known to employers. Firms set wages taking into account that incumbent workers have an upward-sloping labor supply to the firm. Second, domestic firms demand new workers at the domestic market wage, but new workers supply labor according to the expected wage. This expected wage is increasing in the random probability of being hired by an MNC and, thus, entails a premium over the domestic market wage. The resulting excess labor supply to industries with higher MNC presence affects the equilibrium marginal revenue product of domestic firms.

The expansion of an MNC can affect wages paid to incumbent workers at domestic firms in three ways. First, the increase in labor demand puts pressure on the domestic market wage paid both in the industry of the MNC and in all other industries (weighted by the probability of transitioning to these other industries). Second, the MNC shifts the composition of labor demand toward jobs with a wage premium. This further improves the outside options of incumbent workers by making it more attractive for them to leave their current domestic employer. Finally, the expansion of the MNC also increases the demand for domestic inputs. In the presence of hiring and training costs, the domestic suppliers of the MNC have higher incentives to retain their incumbent workers and thus post a higher wage.

Wages depend on three structural parameters: the marginal cost of hiring and training the first new worker, the elasticity of the marginal cost of hiring and training with respect to the number of new hires, and the retention-wage elasticity that dictates the degree of attachment of incumbent workers to their current employer. Our model-based estimates show a high average marginal hiring and training cost equal to 90% of one year of earnings paid at the market wage, which is comparable to the estimated replacement cost faced by U.S. firms after a patent allowance shock (Kline et al., 2019). We then estimate a retention-wage elasticity of 9, which implies that incumbent workers see their employer and other firms as relatively close substitutes. Nonetheless, we reject that the inverse of the retention-wage elasticity is equal to zero. Workers earn a large – but not full – share of the value of their marginal product of labor.

Our findings suggest three avenues for future research. First, while we focus on the effects of MNCs on wages, MNCs are also likely to affect the extensive margin of employment, and, in particular, the decision to switch into or out of informality. A complete assessment of the effects of MNCs on workers would need to include these extensive margin effects. Second, MNCs seem to pay above-market wages, which suggests that MNCs create "good jobs" in the host economy (Acemoglu, 2001; Green, 2015). More research is needed to understand how MNCs sustain above-market wages in equilibrium. Finally, our model-based estimates draw attention to the high costs of hiring and training at domestic firms. While these costs allow incumbent workers to extract rents from employers, they also act as an obstacle to firm growth. Direct evidence on a potential link between the small size of firms in developing countries (Tybout, 2000; Bloom et al., 2010) and their hiring and training costs would be welcome.

Related Literature. Our paper contributes primarily to two literatures. First and foremost, we contribute to the vast literature on the effects of foreign direct investment (FDI) on the host economy. Most papers study the effects of FDI at the firm, industry or macroeconomic level. Firm-level regressions that estimate the effects of changes in MNC presence in either the industry (by region) of the firm or vertically-related industries sometimes add the firm-level number of workers and wage bill as outcome variables.[2] However, firm-level data sheds little light on which workers are affected by FDI and through which channels, both of which are important for understanding the incidence of MNC shocks.

In the few papers with individual-level data, the emphasis is typically on measuring the wage gain for workers who either join a foreign firm or whose firm becomes foreign-owned. This wage gain has been estimated in several developed countries and in one developing country (Brazil), with estimates ranging from 5% to 10%.[3] To our knowledge, all estimates use a variant of the movers design, relying on the assumption of no selection into firms based on idiosyncratic shocks to workers' productivity. We strengthen the causal claim over the MNC premium by using variation in the propensity of workers to

[2]See the reviews of Javorcik (2014); Hale and Xu (2020). Hale and Xu (2020) point to firm-level and industry-level studies that suggest that increased FDI in a given industry correlates with higher wages. The same authors then mention that the "spillover effect of FDI on other industries' labor markets is yet to be fully researched."

[3]The estimates of the MNC (foreign-owned) firm wage premium are 5% for Sweden (Heyman et al., 2007), 6% for Norway (Balsvik, 2011), 10% for Portugal (Martins, 2011), 6% for Brazil (Hijzen et al., 2013), 8% for Japan (Tanaka, 2015), 7% for Germany (Schröder, 2018), and 7% for the U.S. (Setzler and Tintelnot, 2019).

move to MNCs due to plausibly exogenous changes in the presence of MNCs in their labor market.[4] We then bring evidence from administrative data and surveys that the MNC premium is consistent with above-market wages, rather than a compensation for inferior amenities at MNCs.

Less attention has been paid to the channels by which MNCs may affect workers other than their direct employees.[5] In this regard, the contemporaneous paper by Setzler and Tintelnot (2019) is the closest to ours. In their framework, wage gains for workers in domestic firms can stem only from demand effects in the labor market or productivity spillovers to domestic firms. The authors estimate the effect of an increase in the share of MNC employment within a commuting zone on wage growth and find a statistically insignificant effect for the average worker in a domestic firm. We study the effects of MNCs on the outside options of workers in the labor market (where MNCs can shift both the level and composition of labor demand) and the potential rents of domestic firms that can be shared with workers (given labor market frictions). Increases in firm rents are not contingent on productivity increases; they can also arise from standard product demand effects. Moreover, we allow for workers in the same labor market to be differentially exposed to MNCs based on the firm-to-firm linkages of their employer to MNCs.

The second literature to which we contribute is the one that studies how changes in firm performance and outside options in the labor market affect wages. First and foremost, we complement this work by studying both of these wage determinants within the same empirical framework. Moreover, we add to a small set of papers that estimate the pass-through of changes in value added per worker to wages by using plausibly exogenous firm-specific shocks to instrument for changes in value added per worker (Garin and Silvério, 2018; Kline et al., 2019; Howell and Brown, 2019).[6] We exploit a new source of variation in firm performance – exogenous shocks to the size of a firm's direct and indirect buyers – to estimate the rent-sharing coefficient and the retention-wage elasticity of all (formal) domestic firms in Costa Rica. To our knowledge, our estimates of these parameters are the first from a developing country.

By emphasizing that MNC expansions can change both the level and composition of demand in a two-digit industry and region, our paper is related to Beaudry et al. (2012).[7] Their paper finds that switching the composition of jobs between low-paying and high-paying industries has important effects on wages in other industries in the same city. There are two key differences between the analysis in Beaudry et al. (2012) and ours. First, as the same industry can experience different MNC presence shocks across regions, we obtain region-specific shocks to the average premium of an industry. In Beaudry et al. (2012), the more aggregated nature of the data allows for changes in the premia of an industry to occur only at the national level. Second, because our analysis is at the individual level, we can explore the importance of pay differences between MNCs and domestic employers within the same industry.

The remainder of the paper is structured as follows. Section 2 describes the data and context. Section 3 presents the direct effects on workers who join MNCs. Section 4 explains the reduced-form empirical strategy used to study the indirect effects of MNCs on workers in domestic firms and the

[4] In an exercise that is conceptually close to ours, Frías et al. (2019) provide a causal estimate of the exporter wage premium by using an IV strategy to estimate the effect of within-plant changes in wage premia on changes in the export share.

[5] This stands in contrast to the growing literature that uses individual-level data to study the effects of trade on workers (Autor et al., 2014; Krishna et al., 2014; Pavcnik, 2017; Dix-Carneiro and Kovak, 2017; Helpman et al., 2017; Helm, 2019). The effects of FDI on workers are likely to differ from the effects of trade on workers, given that MNCs are exceptional employers and buyers that directly insert themselves into the labor and product markets of the host economy. Moreover, MNCs increasingly operate in services, whereas most of the research on the effects of trade on workers pertains to manufacturing industries.

[6] Guiso et al. (2005); Card et al. (2015); Lamadon et al. (2019); Friedrich et al. (2019) assume that worker-specific innovations to earnings neither co-vary across coworkers nor with shocks to firm value added.

[7] We also relate to a literature that, in its early days, emphasized the importance of the composition of employment for wage setting (e.g., the share of jobs that were in "good" industries affected the wages of workers in "bad" industries). With increasing access to rich microdata, this literature is now being revisited. See Krueger and Summers (1988); Katz et al. (1989); Gibbons and Katz (1992); Acemoglu (2001); Beaudry et al. (2012); Fortin and Lemieux (2015); Green et al. (2019); Caldwell and Harmon (2019); Caldwell and Danieli (2018); Schubert et al. (2019).

associated findings. Section 5 lays out a stylized model of an economy that formalizes the mechanisms documented in the reduced-form sections. We also leverage the model to estimate structural parameters that govern the labor market. Section 6 concludes.

2 Data and Context on MNCs in Costa Rica

2.1 Data

We bring together a new collection of microdata to assess the effects of MNCs on workers. We combine three types of data: (i) administrative (matched employer-employee data, firm-to-firm transaction data, corporate tax returns, foreign ownership data), (ii) commercial (Orbis and Compustat), and (iii) survey-based (our own survey data collection and a nationally-representative household survey). For details on these datasets and the procedures undertaken to clean them, see Appendix A.

2.1.1 Administrative Datasets

Matched employer-employee panel data. We construct a matched employer-employee panel covering the universe of formal workers in Costa Rica from January 2006 to December 2017. This project represents the first time that this data is used for research and even more, combined with the three administrative datasets described below. This panel is built on data collected by the *Caja Costarricense de Seguro Social* (Costa Rica's Social Security Administration). We observe (at least once) 1.9 million unique person identifiers (PIDs). For each PID, this data records, on a monthly basis, information on demographic characteristics (date of birth, nationality, sex, district of residence), and the labor earnings and occupation at each employer. We trace employers by their unique corporate tax ID (CID). Monthly labor earnings are not censored. The occupation is recorded as a standardized four-digit code.

We restrict the sample to full-time male and female employees aged 20 to 60, who are not self-employed. We aggregate the data to the quarterly or yearly level, depending on the analysis. We sum the earnings received by a given individual from each job in each quarter (year) and designate the employer that paid the highest total amount as the main employer for that quarter (year). Most full-time workers are employed by only one firm in any quarter (the average is 1.18 per quarter). While throughout the paper, we use the terms "wages" and "labor earnings" interchangeably, in practice, we only observe labor earnings and whether the employee works part-time or full-time. We only keep individuals who are employed full-time. Table A1 (Appendix A.1) provides the summary statistics of this resulting dataset.

Like most matched employer-employee datasets, Costa Rica's dataset does not contain the number of hours worked. While this data also does not include the education of the worker, following the Costa Rican law, employers assign occupational codes that are one-to-one mapped to the educational attainment of the worker. Therefore, we infer education from the occupational code and group workers in two categories: with or without a college education. Finally, this data does not track informal employment.[8]

Firm-to-firm transaction data. All firms in Costa Rica are required by the Ministry of Finance to report, using the D-151 tax form, the CID of all their suppliers and buyers with whom they generate at least 2.5 million Costa Rican colones (around 4,200 U.S. dollars) in transactions during a given year, in addition to the total amount transacted. We combine all D-151 tax forms between 2008 and 2017 into a dataset that allows us to track the universe of firm-to-firm relationships in Costa Rica for that period. From this dataset, we keep only those CIDs that appear in the other administrative datasets (i.e., firms that submit

[8] In Costa Rica, the rate of informality for employed individuals aged 15 to 64 is 30% – smaller than in other Latin American countries (e.g., Mexico 55%, or Argentina 47%) but higher than the OECD average (17%) (OECD, 2017).

corporate tax returns and report their employees to the Social Security Administration). This data allows us to identify domestic firms whose performance is affected by MNCs through supply-chain linkages.

Corporate tax returns data. We then use the universe of corporate tax returns from 2005 to 2017 to construct a firm-level dataset with balance sheet variables (such as total revenue and value added) and other characteristics (such as the firm's region and two-digit industry). We link the corporate tax returns data to the employer-employee data via firms' unique CIDs. We exclude state-owned enterprises, nonprofit organizations, and observations with zero reported total sales or just one employee in a given year. In our analysis of the effects of MNCs on workers in domestic firms, we also exclude MNC firms. Moreover, we restrict our sample to firms with non-missing information on value-added, and that are successfully merged to the matched employer-employee data. To avoid outliers, we exclude firms at the top and bottom 1% of annual percentage changes in value added per worker. Table A6 (Appendix B.1) summarizes the steps taken in the construction of the final dataset of analysis from Section 4.

Foreign ownership data. To construct a comprehensive account of foreign-owned firms in Costa Rica, we combine information from: (i) three annual surveys conducted by BCCR, (ii) the records of the investment promotion agency of Costa Rica (CINDE), and (iii) Orbis.

2.1.2 Data on the Worldwide Size of MNCs with Subsidiaries in Costa Rica

To construct the instrumental variables (IVs) for the change in MNC presence in Costa Rica, we rely on Orbis and Compustat. We first use Orbis to gather data on the consolidated accounts of MNCs with a subsidiary in Costa Rica. As the largest of these MNCs are publicly traded, we complement the Orbis data with data from Compustat. The final dataset contains data on 239 MNCs and has an unbalanced panel structure from 2006 to 2017. The two variables that are key to the construction of our leading set of IVs are the main industry code of the MNC and its worldwide number of workers. We also use Orbis to construct a second set of IVs for robustness checks. The latter IVs use employment changes in MNCs with at least one subsidiary in one of twenty Latin American and Caribbean countries.

2.1.3 Survey Data

Surveys we conduct in partnership with CINDE. In March 2019, we collaborated with CINDE (the Costa Rican investment promotion agency) on the design of a survey containing eleven questions on the hiring and wage setting practices of MNC subsidiaries in Costa Rica. The survey was administered the same month online and received 46 responses from the human resources (HR) executives of a representative set of MNCs (out of 246 contacted MNCs).

National Survey of Household Income and Expenditures (*Encuesta Nacional de Ingresos y Gastos de los Hogares* or ENIGH). Through ENIGH, the National Institute of Statistics and Censuses of Costa Rica collects data on the sources of income and expenditures on goods and services of a set of representative households. We use data from the 2018 round, which we merge with the 2017 matched employer-employee data based on PIDs. For 1,316 individuals, ENIGH contains information on the number of hours worked and monetary and in-kind benefits from employment. Of these workers, we study the 723 who have positive earnings in 2017, and who are not retirees, self-employed, public sector employees, or with special contracts (*convenios*).

2.2 MNCs in Costa Rica

We define "MNC subsidiaries" as those firms in Costa Rica that are subsidiaries of foreign-owned MNCs. We focus on MNCs whose median number of workers in Costa Rica is over 100. These MNCs, with a substantial economic presence in Costa Rica, are less likely to be shell companies. After applying these restrictions, we find 622 unique MNC subsidiaries that operate in Costa Rica at some point between 2005 and 2017.[9] We use 2006 to 2008 (the first three years of the matched employer-employee data) as the pre-period and study the effects of changes in the presence of MNCs in the country occurring between 2009 and 2017. This choice allows us to compute pre-period values for variables (such as the number of workers transitioning from one two-digit industry×region to another) whose post-2009 values might be equilibrium reactions to contemporaneous changes in the presence of MNCs.

Starting the treatment period in 2009 has an additional benefit. That year, Costa Rica ratified a new trade agreement with the U.S., called CAFTA-DR. The debate in Costa Rica on whether to sign the agreement or not was polarized and settled only by a referendum in which the decision to join CAFTA-DR won by a small margin. This makes its occurrence and timing plausibly exogenous to labor and product market conditions in Costa Rica. Two components of CAFTA-DR were foreseen to affect the composition of U.S. FDI flows to Costa Rica (World Bank, 2017). First, FDI in IT-enabled business services was expected to boom after the liberalization of the telecommunications sector. Second, with the strengthening of intellectual property rights and the legal framework protecting foreign investors, CAFTA-DR was predicted to increase FDI in technology-intensive industries. Besides, Costa Rica became attractive to MNCs in the medical device industry after the U.S. Food and Drug Administration opened its first office and regional hub in Latin America and the Caribbean in Costa Rica in 2009.

The industries for which MNC employment has grown the most (in % terms) between 2009 and 2017 are business support services, medical devices, HR services, computer programming, and scientific and technical activities. Conversely, the industries with the sharpest contraction in MNC presence have been those manufacturing apparel, metallic products, food products, motor vehicles, and electronic components. It is reassuring that the industries that most expanded after 2009 were those predicted by the rules introduced by CAFTA-DR.

Let us denote by $\Delta\mathcal{M}_{st}$ the percentage increase between years $(t-1)$ and t in the number of MNC workers in the labor market s in Costa Rica, i.e.,

$$\Delta\mathcal{M}_{st} \equiv \frac{M_{s,t}^{CR} - M_{s,t-1}^{CR}}{M_{s,t-1}^{CR}} \times 100, \tag{1}$$

where M is the number of MNC workers in market s in a given year and the CR superscript emphasizes that these are workers employed *in Costa Rica*. Tautologically, $M_{s,t}^{CR}$ is the sum of $M_{m,t}^{CR}$ across all MNCs m in market s in Costa Rica $\left(M_{s,t}^{CR} \equiv \sum_{m \in s} M_{m,t}^{CR}\right)$.

Throughout the paper, a labor market s is a two-digit industry × region. While there could be up to 480 markets (given the 80 two-digit industries and six regions in Costa Rica), in practice, we have 412 such markets (as not all two-digit industries exist in all regions). The average (median) number of workers in each market is 1,944 (140) in 2009 and 2,209 (141) in 2017. The manufacturing of motor vehicles, or food and beverage services are examples of two-digit industries. In Costa Rica, regions are defined based on commuting patterns. The average (median) region covers 8,515 (9,528) square miles (similar to commuting zones in the U.S.).

[9] Larger MNCs are also more likely to be found in Orbis and Compustat, which is necessary for the construction of the IVs. These 622 MNCs employ 75% of the workers employed by all of the firms in Costa Rica with some degree of foreign ownership. For detailed descriptive statistics on these 622 MNCs, see Appendix F from Alfaro-Urena et al. (2019b).

Table A3 (Appendix B.1) presents summary statistics for the market-level growth in MNC employment ($\Delta\mathcal{M}_{st}$). On average, between 2009 and 2017, markets experience an increase of 13% in MNC employment. While the median market is relatively unaffected (1%), some markets experience extreme contractions (*p1*=-100%) or extreme expansions (*p99*=240%) in MNC employment. On a yearly basis, on average, markets experience an increase of about 4%. Even at this higher frequency, some labor markets can be dramatically affected (*p1*=-83% and *p99*=141%).

One might worry that MNCs have expanded into markets that were systematically more high-skill intensive, which may obfuscate any attempt to disentangle the effect of MNCs on wages and broader trends in the high-skill wage premium. Figure 1 relates the percentage growth in the period of analysis (2009 to 2017) in MNC employment in each of the 412 two-digit industry $\times$ region markets in Costa Rica ($\Delta\mathcal{M}_{st}$) and the share of college graduates in those markets during the pre-period (2006 to 2008). On average, labor markets with a higher share of college-educated workers have experienced a higher growth rate in MNC employment. This reflects the fact that CAFTA-DR has made FDI inflows into high-tech and knowledge-intensive industries significantly more attractive. Notwithstanding, there is still considerable variation in the share of college graduates across markets with similar growth rates and the growth rate of MNC employment across markets with similar shares of college graduates.

In 2017, there are 538 MNCs subsidiaries in Costa Rica. These subsidiaries employ 28% of all (formal) private-sector workers. Their workers' wage bill represents 38% of the private sector wage bill. The average MNC (domestic firm) employs 492 (16) workers. The MNC (domestic firm) at the 99 percentile of the size distribution employs close to 6,000 (200) workers. Contrary to the common perception that the majority of MNC workers are college-educated, we find that 82% of MNC workers in 2017 have less than a college degree (relative to 92% in the domestic private sector). Thus, it is not a priori evident that MNC expansions would disproportionately benefit college-educated workers.

3 Direct Effects of MNCs on Wages: The MNC Wage Premium

We define the "MNC wage premium" as the additional average percentage gain in labor earnings experienced upon moving from a domestic firm to an MNC relative to the gain in labor earnings experienced upon moving from one domestic firm to another. The MNC wage premium is interesting in its own right. Moreover, as we discuss in Sections 4 and 5, if MNCs pay above-market wages, their expansions or contractions affect the wages of workers in domestic firms not only through the neoclassical demand channel but also by altering the composition of jobs that serve as potential outside options.

3.1 Movers Design Estimates of the MNC Premium

We first estimate the average MNC premium using a within-worker event-study – also called a movers design (as in Card et al., 2013). We restrict the sample to include only workers with the same employer in the eight quarters before a move and the same new employer in the next eight quarters. Hence, a move (event) is an across-quarter change in employers. We exclude movers to or from public sector employment. We study not only moves from a domestic firm to an MNC (DOM-MNC), but also the reverse moves from an MNC to a domestic firm (MNC-DOM), between domestic firms (DOM-DOM), and between MNCs (MNC-MNC). Our movers design specification is the following:

$$w_{it} = \sum_{k=\underline{C}}^{\overline{C}} \psi_k^{DD} D_{it}^k + \sum_{k=\underline{C}}^{\overline{C}} \psi_k^{DM} D_{it}^k I_i^{DM} + \sum_{k=\underline{C}}^{\overline{C}} \psi_k^{MD} D_{it}^k I_i^{MD} + \sum_{k=\underline{C}}^{\overline{C}} \psi_k^{MM} D_{it}^k I_i^{MM} + \alpha_i + \gamma_t + \epsilon_{it}, \quad (2)$$

where w_{it} is the log quarterly-average labor earnings of worker i in quarter-year t, α_i and γ_t are worker i and quarter-year t fixed effects. D_{it}^k are event-time dummies defined as $D_{it}^k := \mathbb{1}[t = \tau_i + k]\ \forall k$ s.t. $\underline{C} < k < \overline{C}$, $D_{it}^{\overline{C}} = \mathbb{1}[t \geq \tau_i + \overline{C}]$, $D_{it}^{\underline{C}} = \mathbb{1}[t \leq \tau_i + \underline{C}]$ (where $\mathbb{1}[.]$ is the indicator function and τ_i is the quarter-year when worker i moves employer). We set $\underline{C} = -8$ and $\overline{C} = +8$. I_i^{XX} with $XX \in \{DD, DM, MD, MM\}$ is an indicator for the type of move of worker i. DD stands for DOM-DOM, DM stands for DOM-MNC, MD for MNC-DOM, and MM for MNC-MNC. Our coefficients of interest are the ψ_k for all four types of moves. A causal estimate of these coefficients requires workers not to select into firms based on their idiosyncratic time-varying error term, ϵ_{it}. We normalize $\psi_{-2} = 0$ for each type of move. We use robust standard errors clustered at the individual-level.

Table A5 (Appendix B.1) presents summary statistics on the sample of workers used to estimate the regression in equation (2). In total, there are 84,756 unique workers in this sample, i.e., workers who we observe as changing employer in event quarter 0, and with the same old employer in the previous eight quarters and with the same new employer in the following eight quarters. Of these, 13,754 individuals move from a domestic firm to an MNC. Columns (4), (5), and (6) show that workers who move from one domestic firm to another tend to not only earn less, on average, than workers who move from a domestic firm to an MNC, but, in addition, come from smaller domestic firms at which co-workers earn less. This confirms the intuition that movers to MNCs are selected on levels.

Figure 2 presents two versions of the movers design side-by-side. Panel 2a presents raw means of the log wages of workers before and after their move (without α_i and γ_t). Panel 2b plots the results from the specification in equation (2). Both figures point to the same four takeaways: (i) irrespective of the type of move, workers do not display differential pre-trends, (ii) both DOM-DOM and MNC-MNC moves lead to a small increase in labor earnings (about 4% and 6%, respectively), (iii) DOM-MNC moves result in large boosts in labor earnings (about 13%), and (iv) MNC-DOM moves bring large declines in labor earnings (about 9%, symmetric to the gains from DOM-MNC moves, with respect to DOM-DOM moves). Thus, the MNC wage premium (the difference between the DOM-MNC increase and the DOM-DOM increase) is about 9%. In addition, Panel 2a echoes the finding from Table A5 that workers engaged in DOM-MNC moves already had higher labor earnings that those engaged in DOM-DOM moves.

We also perform an AKM decomposition (Abowd et al., 1999) and regress the firm fixed effects on an MNC dummy. While both the movers design and the AKM design rely on the same identification assumption, they differ in how they weigh each firm when comparing the average firm effects of MNCs to those of domestic firms. The movers design uses frequency weights based on how many workers move between one type of firm to another. In the AKM-based exercise, the coefficient on the MNC dummy compares the firm-size weighted average of the firm fixed effects of MNCs to that of domestic firms. This AKM-based exercise delivers an estimate of the MNC premium of around 10%. Hence, the movers-weighted and employment-weighted estimates are similar.

The main threat to identification that the move of a worker and, in particular, a move from a domestic firm to an MNC (or the reverse) is driven by unobserved shocks to her productivity, which would be subsumed in the error term. In Appendix B.2.2, we present three robustness checks. First, we estimate the MNC premium using only moves occurring within the first twelve months after the entry of a new MNC. Second, we estimate the premium using only workers coming from unemployment, whose earnings we benchmark to those of workers with similar observable characteristics but with continuous employment in a domestic firm. Finally, we estimate the premium only using the moves of workers who come from exiting domestic firms. As the estimates from these alternative specifications are similar to our main estimate of 9% (though noisier due to the smaller sample sizes), we assess that this main estimate is unlikely to be driven by contemporaneous shocks to workers' productivity.

3.2 IV Estimate of the MNC Premium

We also use an IV strategy that takes advantage of exogenous variation in the size of MNCs in Costa Rica. To our knowledge, this is the first time that the MNC premium is estimated without relying on the assumption of movers designs. Consider worker i who in year $(t-1)$ is part of two-digit industry $\times$ region market $s(i,t-1)$. To relate the change in wages of worker i upon moving to (from) an MNC employer from (to) a domestic employer, we adopt the following specification:

$$\begin{aligned}\Delta w_{it} =& \psi \Delta \mathbb{1}[j(i) = MNC]_t + \boldsymbol{X_i}'\boldsymbol{\beta}_{char} + \alpha_{j(i,t)} + \\ &+ \gamma_{ind(s(i,t-1))} + \mu_{reg(s(i,t-1))} + \underline{\gamma}_{ind(s(i,t))} + \underline{\mu}_{reg(s(i,t))} + \epsilon_{it}\end{aligned} \tag{3}$$

where Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t, $\Delta \mathbb{1}[j(i) = MNC]_t$ is the difference between two indicator functions which take value 1 if the employer of i, $j(i)$ is an MNC, and $\boldsymbol{X_i}$ is a vector of dummies for worker i characteristics. $\alpha_{j(i,t)}$ are firm $j(i,t)$ fixed effects, $\gamma_{ind(s(i,t-1))}$ and $\underline{\gamma}_{ind(s(i,t))}$ are two-digit industry fixed effects for the industry of the market s of i in $(t-1)$ and t respectively, $\mu_{reg(s(i,t-1))}$ and $\underline{\mu}_{reg(s(i,t))}$ are region fixed effects for the region of the market s of i in $(t-1)$ and t respectively, and ϵ_{it} is an idiosyncratic error term. Notice that we assume that the effect of moving from a domestic firm to an MNC is symmetric to the effect of the reverse move. Moreover, we use movers between firms of the same ownership type as the reference. These choices are consistent with our findings from the movers design.[10]

The typical concern with the OLS estimate of ψ in equation (3) is that workers switch to MNCs upon receiving a positive productivity shock. If that were the case, then the OLS estimate would be upward biased. To alleviate potential endogeneity concerns, we instrument the move from a domestic firm to an MNC between years $(t-1)$ and t by the contemporaneous change in MNC employment *outside* of Costa Rica of MNCs with subsidiaries in the labor market of the worker in $(t-1)$. Precisely we define the instrument, $\Delta\mathcal{O}_{s(i,t-1),t}$, as:

$$\Delta\mathcal{O}_{s(i,t-1),t} \equiv \frac{M^{Out}_{s(i,t-1),t} - M^{Out}_{s(i,t-1),t-1}}{M^{Out}_{s(i,t-1),t-1}} \times 100, \tag{4}$$

where $M^{Out}_{s,t}$ is defined as the year-t number of workers *outside* of Costa Rica for MNCs whose subsidiaries operate in the two-digit industry $\times$ region market s in Costa Rica. Hence, $M^{Out}_{s,t}$ is the sum of the MNC-specific outside of Costa Rica number of workers across all MNCs in s.

Expansions in the global employment of MNCs with subsidiaries in Costa Rica are likely to predict the expansion of their subsidiaries in Costa Rica. Workers who move from a labor market $s(i,t-1)$ that experiences an increase in MNC employment are more likely to move to an MNC than workers who move from a market whose MNC employment has increased less. The exclusion restriction requires the expansion of MNCs outside of Costa Rica to affect the earnings of worker i only through its effect on the probability of i moving to the MNC subsidiaries in Costa Rica.

While the relationship between MNC expansions in Costa Rica and MNC expansions outside of Costa Rica is not the first stage of the IV, it is closely linked. Therefore, it is important to understand how $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ relate. Figure A1 and Table A4 (Appendix B.1) show that $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ (residualized of year and industry fixed effects) have a robust correlation of 0.86. One plausible explanation for this positive correlation is that MNC subsidiaries in Costa Rica carry out different tasks than those

[10] For comparability with the movers design, we only use the sample of workers who experience an employer change between $(t-1)$ and t (i.e., we exclude stayers – individuals with the same main employer $j(i)$ in both $(t-1)$ and t).

in their other locations.[11] We find that the four-digit (two-digit) industry code of the MNC subsidiary in Costa Rica is different from that of the MNC group in 82% (72%) of the cases. This is consistent with MNCs in Costa Rica having expanded mostly through "vertical" investment, by which the parent and subsidiaries exchange inputs and outputs through intrafirm trade.[12] Thus, $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ are plausible complements (as also shown in Harrison and McMillan, 2011).

What is the nature of the MNC-wide shock that affects the size of the subsidiary in Costa Rica? One such shock could affect the global demand of the final good of the MNC, which triggers a shock to the demand of the input provided by the Costa Rican subsidiary. In the model in Section 5, we assume that MNCs in Costa Rica are exposed to exogenous shifts in their international demand. Another shock could affect the productivity of the MNC (e.g., coming from the unexpected allowance of a new patent, such as in Kline et al., 2019), which could then lead to expansions or contractions across all locations. The last scenario is one that involves financial shocks at the HQ, which are also known to affect location decisions abroad (Desai et al., 2004; Baker et al., 2008; Erel et al., 2012; Alfaro and Chen, 2018).[13]

Table 1 presents the OLS and IV estimates. The OLS estimate of the MNC premium is 7.6%. This estimate is in line with the 9% estimate from the movers design. The only difference is definitional; in this exercise, we benchmark DOM-MNC moves to both DOM-DOM and MNC-MNC moves, whereas in the movers design we benchmark DOM-MNC moves only to DOM-DOM moves. The IV estimate is 15% (with an F-statistic of 677). While the IV estimate is larger than the OLS estimate, we cannot reject that the two estimates coincide. This finding assuages the concern that workers move to MNCs after receiving a positive and contemporaneous productivity shock. There is still the possibility that there are heterogeneous treatment effects. For instance, the compliers in this IV exercise may be workers who come from lower-paying domestic firms and who need a considerable expansion of MNCs in their labor market to move to an MNC. Notwithstanding, it is reassuring that our IV and movers design deliver similar estimates.

3.3 Interpretation of the MNC Premium

Finding an MNC wage premium is not per se incompatible with a competitive labor market. In particular, the MNC premium might serve as compensation for differences in undesirable job attributes. Put differently, an MNC wage premium might not be a utility premium. If that were the case, then an increase in the presence of MNCs in a labor market could no longer be interpreted as an improvement in the composition of outside options of workers in that market (but only in demand). It is, therefore, important for the study of the indirect effects of MNCs on workers to establish whether the premium is compensating for disamenities or consistent with above-market wages.

[11] The traditional theory of the expansion of multinationals emphasizes two types of expansion. "Horizontal" foreign investment is understood to mean situating production facilities to avoid trade costs (Markusen, 1984), whereas "vertical" investment represents firms' attempts to take advantage of cross-border factor cost differences (Helpman, 1984). Most past research found the bulk of FDI to be horizontal. However, newer research suggests that data limitations have led the literature to systematically underestimate vertical FDI, which is far more prevalent than previously thought (Alfaro and Charlton, 2009).

[12] Among the 82% of cases in which the subsidiary and the HQ of the MNC operate in different industries, the most frequent combination of industries features a subsidiary operating in business support services (such as "activities of head offices", or "activities of call centres") and the MNC group operating in various industries (such as the "manufacture of underwear" or the "operation of dairies and cheese making"). Most of the remaining combinations also point to obvious input-output relationships, such as the "growing of tropical fruits" (subsidiary industry) – "processing and preserving of fruit and vegetables" (MNC group industry) or the "manufacture of cordage, rope, twine and netting" (subsidiary) – "manufacture of irradiation, electromedical and electrotherapeutic equipment" (group).

[13] In the model presented in Section 5, all these shocks have isomorphic effects on domestic firms. Hence, we do not distinguish between them in our study of the effects of MNCs on workers in domestic firms.

3.3.1 Compensating Differentials

Better monetary and in-kind benefits at MNCs. For a sample of 723 workers surveyed in 2018 for the National Survey of Household Income and Expenditures (with ENIGH as its acronym in Spanish), we observe the number of hours worked for their employer in the previous week and whether this employer provides them with a series of monetary and in-kind employment benefits, that is, whether the employer pays for extra hours of work, a bonus salary at the end of the year, sick leave or vacation days, social security contributions, and occupational hazard insurance.[14] Table 2 presents OLS regressions on the cross-section of workers surveyed in 2018, for which the main explanatory variable is whether the individual worked for an MNC in 2017.[15] Working for an MNC in 2017 is not correlated with working extra hours in the employment held in 2018. Workers who worked for an MNC in 2017 are also 7% to 20% more likely to benefit from all of the above mentioned monetary and in-kind benefits.[16]

Higher retention probabilities at MNCs. We use the matched employer-employee data to provide evidence of the revealed desirability of MNC jobs. Figure A12 (Appendix B.2.3) plots the retention probability (i.e., the probability that a worker who started employment in quarter 1 at firm j is still working for firm j in quarter $t \geq 1$) for two groups of workers: those who start employment in quarter 1 in a domestic firm, and those who start employment in quarter 1 in an MNC. In both groups, we only include workers whom we observe to be employed by a different firm in the quarter after the separation from employer j. For these workers, the separation is more likely to result from the worker quitting than from being fired. While this graph showcases an overall high job churn, workers who start an employment spell at an MNC are more likely to be retained by the MNC than those starting an employment spell at a domestic firm.

Lower wage increases necessary for MNCs to expand. In Appendix B.2.3, we investigate how the ratio of wages for new vs. incumbent workers in a given occupation and firm changes with the size of the expansion of that firm. We then contrast how this ratio relates to the size of the expansion for domestic firms vs. MNCs. If MNCs are more attractive as employers than domestic firms, then MNCs should not find it as difficult to expand as domestic firms. We find that both MNCs and domestic firms pay larger relative wages (for new workers vs. incumbents) the larger the expansion of the firm.[17] However, the increase in the relative wage is twice as substantial for domestic firms than it is for MNCs. Thus, both types of firms face an upward-sloping labor supply, but the elasticity faced by MNCs is much higher than the one domestic firms face. This evidence combined suggests that, if anything, MNCs provide better work conditions than domestic firms.

[14] Another piece of qualitative evidence comes from the Great Place to Work Institute for Central America and the Caribbean. In 2019, this institute assessed and ranked 39 employers in Costa Rica. Of these 39 employers deemed as "great places to work," 29 were subsidiaries of MNCs such as Cisco Systems, Bridgestone, or 3M. See here.

[15] 2017 is the last year from the matched employer-employee data that is available as of now. We need the matched employer-employee data to be able to track the identity of the employer. An obvious caveat is that the employer of 2017 might not be the same employer described in the 2018 survey. As soon as the 2018 matched employer-employee data becomes available, we will match each individual to the actual employer from the month when she was surveyed for ENIGH in 2018. That said, we assume that the qualitative conclusion from this exercise will not be altered, as 70% of workers in the economy are "stayers" (i.e., they have the same employer for any two consecutive years, see Table A1 in Appendix A.1).

[16] This is also consistent with older evidence on inter-industry wage differentials. Katz and Summers (1989) show that the consideration of fringe benefits reinforces, rather than reduces, industry compensation differences.

[17] The average (median) ratio of the wages of new workers in a given occupation relative to incumbent workers in that same occupation and firm is 0.88 (0.86). Our analysis emphasizes how the ratio of wages of new workers to incumbent workers changes with the size of an expansion of the firm in the given occupation, but *does not imply* that the ratio is larger than 1.

3.3.2 Explanations Consistent with Above-Market Wages

Labor recruitment and training costs (Oi, 1962; Manning, 2011), or efficiency wages (Shapiro and Stiglitz, 1984). The evidence so far suggests that MNCs pay wages that are above the competitive levels of the domestic economy. Why would MNCs find it profitable to do so? An older literature on industry wage differentials and the firm size premium proposes two main plausible answers.

One strand of literature (dating back to Oi, 1962) stresses that worker turnover is undesirable to firms due to hiring and training costs. If working for MNCs requires building more firm-specific human capital (e.g., due to their more complex processes), this would imply that worker turnover is more costly for MNCs and would rationalize their premium. Another candidate explanation is the need for firms to deter workers from shirking. Conferring rents on them, which are forfeited if caught shirking, may be an efficient alternative to more extensive monitoring costs (Katz and Summers, 1989). Previous research points to MNCs as firms with high monitoring costs (due to the physical distance between the parent its subsidiaries; see Head and Ries, 2008) and for whom worker shirking can be more costly (e.g., due to their higher-capital intensity, as in the hold-up problem of Acemoglu, 2001).

Based on our surveys completed by HR executives at MNCs in Costa Rica, both factors seem to be at play. The two most common justifications for paying the same worker a higher wage than that of a domestic firm are that "workers [...] must be motivated to work hard" (33% of responses) and that MNCs want "to retain talent, to avoid turnover of workers whose training [they] invest in" (27%).[18]

While we cannot provide direct evidence on the turnover or monitoring costs of MNCs relative to domestic firms,[19] the literature suggests that observable firm characteristics, such as the size or industry of the firm, correlate with these costs (Brown and Medoff, 1989; Oi and Idson, 1999). Larger firms provide more training than smaller firms, with the gap growing at higher education levels. As MNCs tend to be larger and hire relatively more college-educated workers, it is, therefore, plausible that accounting for these firm and worker characteristics would account for at least part of the MNC premium.

Next, we examine whether the MNC premium depends on the education of the worker. Finding differences in MNC premia for workers with or without college education would point to the distributional effects of MNCs. Moreover, finding such differences would also be in line with the idea that turnover and monitoring costs vary by worker characteristics. To that end, we divide workers into two categories: those with a college degree and those without. Figure A6 (Appendix B.2.2) presents the event-study estimates for each educational group and for two types of moves (DOM-MNC and DOM-DOM). We find that college graduates who make DOM-MNC moves experience the highest premium (about 24%). College graduates transitioning from one domestic firm to another experience a premium as large as non-college graduates transitioning to an MNC (about 11%). Non-college graduates moving

[18] 11% of responses also suggest that the "company will employ the worker in projects that will generate higher income and where her competence will be better utilized." However, differences in productivity are, by themselves, *not* enough to explain why more productive firms would pay higher wages. In a competitive labor market model, more productive firms would be larger but would not pay higher wages than lower productivity firms. Recent work assumes that individuals have non-pecuniary idiosyncratic preferences for working at different firms (Card et al., 2018; Berger et al., 2019; Setzler and Tintelnot, 2019). As higher productivity firms want to be larger, they need to pay both marginal and inframarginal workers at a higher rate.

[19] While we do not observe the hiring and training costs of MNCs in Costa Rica, anecdotes suggest that MNCs spend considerable resources on both. The training of workers in MNCs can either be offered by the MNC subsidiary directly (e.g., the HQ sends specialists to the subsidiary to deliver standardized training) or at third-party institutes which provide the training on behalf of the MNC. Of these institutes, the National Institute of Learning of Costa Rica (with its acronym in Spanish, INA) is the most likely partner, in particular for the lower-skilled workers. In 2015, MNCs from Special Economic Zones (SEZs) contributed with 22 million U.S. dollars to INA, which represented 11% of the budget of this institution that year (Procomer, 2016).

from one domestic firm to another see their quarterly-average earnings increase by around 3%.[20]

Figure A7 examines the role of firm size and industry in explaining the differential educational premium. One may be concerned that college-graduates move, on average, to larger employers than non-college graduates, which could drive part of their larger premium. Panel A7a shows that conditional on their type of move (either DOM-DOM or DOM-MNC), both college and non-college graduates move to similarly-sized employers. Panel A7b re-estimates equation (2), this time controlling for the firm size and industry. The new premia are smaller in magnitude than those in Figure A6, becoming 18% for college graduates in DOM-MNC moves, 12% for college graduates in DOM-DOM moves, 5% for non-college graduates in DOM-MNC moves, and 2% for non-college graduates in DOM-DOM moves. Thus, while both MNCs and domestic firms pay higher raises to college-educated workers than to workers who have not attended college, the difference is larger for MNCs (13%) than for domestic firms (10%).

Figure 3 explores the heterogeneity of the MNC premium across two-digit industries. We estimate the average industry-specific MNC premia by restricting only to within-industry moves between domestic firms and MNCs. Panel 3a illustrates the heterogeneity in MNC premia, with some industries having premia as high as 50% or as low as a 10% discount. Among the industries with the highest MNC premia are the manufacturing of non-metal mineral products, professional and scientific services, engineering activities, and telecommunications. Industries such as forestry, manufacturing of apparel, land transportation, and cleaning services are among those with the lowest MNC premia.

One might ask whether these differences in industry-specific MNC premia reflect fundamental differences between industries or differences in the extent to which they employ college-educated workers. Panel 3b in Figure 3 shows a strong positive correlation between the MNC premium of college-educated workers in an industry and the MNC premium of non-college-educated workers in the same industry. Industries that tend to pay high premia to their college-educated workers also tend to pay high premia to their non-college-educated workers, and vice versa. Given the salience of the industry for the MNC premium, in Sections 4 and 5, when we study the indirect effects of changes in MNC presence on workers, we weigh the changes in the MNC presence of each industry with its industry-specific MNC premium.

These findings imply that about half of the MNC premium can be explained by firm characteristics that have been shown to correlate with various types of labor market imperfections (see Manning, 2011, for a review). That said, MNCs tend to be considerably larger than local firms in developing countries and operate in more sophisticated industries. MNC workers enjoy the full premium paid by MNCs, even if the MNC status per se explains only half of the premium.

Other factors, such as MNC-wide wage setting policies. Recent research shows that multi-establishment firms do not decide on employment and wages for each establishment as an independent unit, but also use information about the conditions in all other establishments in the group (see Giroud and Mueller, 2019). This interdependence between the outcomes of establishments in a group is likely to be even stronger for settings in which establishments are in a vertical (input-output) relationship – which seems to be the case for MNCs in Costa Rica. Concerns around wage equity are also likely to arise more frequently the more dissimilar the living standards are between the countries where MNCs operate. Hjort et al. (2019) find that MNCs – particularly those from inequality-averse countries – anchor

[20] One might worry that moves to MNCs are more frequent in the second half of our sample period and that the college premium in Costa Rica has increased with time (e.g., due to the higher demand for college-educated workers by MNCs). Figures A8 and A10 (Appendix B.2.2) run the same analysis separately for each half of our sample period. We compare MNCs to domestic firms and college-educated to non-college-educated workers in each sub-period and find no distinction in patterns across time.

their wages to HQ levels.[21] We conjecture that – at least to some extent – the practice of within-MNC wage compression is motivated by increasing consumer scrutiny over the practices of MNCs abroad (for example, see Harrison and Scorse, 2010).

Our survey to HR executives from MNCs lends support to the equity consideration as one of the explanations for the MNC premium. In particular, 27% of respondents stated that "for reasons of equity, the wages [they] pay to [their] workers in Costa Rica should be closer to the wages of similar workers in the HQ or other subsidiaries of [their] group."

Another plausible driver of above-market wages is the higher scrutiny of MNCs who benefit from preferential tax regimes (such as those offered by Special Economic Zones). To the extent that these tax regimes are justified (at least in part) by the high-quality employment that they are to create, the wages and work conditions offered by beneficiary firms are topics of polemic and broad interest in the host economy. In Appendix B.2.2 we divide MNC subsidiaries into two groups: those that are part of the Costa Rican Special Economic Zone regime (called *Zona Franca* or ZF) and those that are not. Workers who move from a domestic firm to an MNC in ZF experience a 10% higher premium than those who move from a domestic firm to an MNC outside of the ZF. After controlling for the size and industry of firms, the ZF MNC premium remains 7% higher than the non-ZF premium. While not definitive, this finding is consistent with MNCs in ZFs sharing part of their tax savings with workers.

3.4 Takeaways on the MNC Premium

Of our findings on the MNC premium, six directly inform our analysis of the indirect effects of MNCs on workers in domestic firms. First, we find that when hired by an MNC, workers receive, on average, a 9% higher wage than the counterfactual average wage of a move to a domestic firm. Second, our evidence suggests that the MNC premium has a causal interpretation. Third, the MNC premium does not seem to compensate for inferior amenities at MNCs. Fourth, part of the MNC premium is explained by observable characteristics such as the size and industry of the firm. Controlling for the size and industry of the old and new employer explains around half of the premium. The remaining half is consistent with other MNC-specific considerations, such as MNC-wide wage setting policies. Because the MNC premium varies greatly across industries, in the rest of the paper, we explicitly incorporate this heterogeneity. Fifth, while the MNC premium for college-educated workers is larger than the MNC premium for non-college-educated workers (12% vs. 8%), because most workers (in both MNCs and domestic firms) do not have a college degree, in our main specification we treat workers as homogeneous. Sixth and last, we do not find evidence that MNC premia change over time, which explains why we treat the MNC premium as constant for each industry.

4 Indirect Effects of MNCs on Wages

This section presents the main reduced-form findings on the effects of changes in MNC presence in Costa Rica on workers in domestic firms. We conjecture that expansions (contractions) of MNCs can affect the wages of workers in domestic firms through three channels: (i) changes in demand in the labor market, (ii) changes in the composition of demand in the labor market towards (or away from)

[21] One might expect that workers in college-educated occupations are those who work in international teams and who are more likely to benefit from within-MNC wage compression. Hjort et al. (2019) find that the correlation between the average wage MNCs pay local workers at foreign establishments and the average wage they pay workers in the same position at the HQ are strongly correlated, and particularly so for low-skilled staff. This is in line with our finding of a sizable MNC premium for workers without a college degree (8%).

MNC employers that pay a premium, and last, (iii) changes in the performance of domestic employers through supply-chain linkages to MNCs. We will group the first two effects as resulting from the "labor market exposure" to MNCs. The last effect results from the "firm-level exposure" to MNCs.

We then replace the change in firm-level exposure to MNCs by the change in the value added per worker of the firm. We use the same instrument proposed for the change in firm-level exposure to instrument for the change in value added per worker. The aim of this analysis is twofold. First, we contribute to the growing literature that uses matched employer-employee data and plausibly exogenous firm-level shocks to estimate the "rent-sharing" coefficient, i.e., the pass-through of firm-level changes in value added per worker to worker wages. Our estimate uses a novel source of variation coming from shocks to the set of direct and indirect (MNC) buyers of a firm. Second, this exercise allows us to build intuition on the magnitude of the effects of the firm-level exposure to MNCs on wages.

We conclude this section with a discussion about the distributional implications of the indirect effects and a back-of-the-envelope calculation of the wage gains attributable to MNCs from both the direct effects estimated in Section 3 and the indirect effects estimated in this section.

4.1 Main Empirical Specification for the Indirect Effects

We estimate the effects of changes between two consecutive years in exposure to MNCs on the contemporaneous changes in yearly labor earnings of workers in domestic firms. Our primary sample includes only stayers (or incumbent workers), defined as workers who remain at the same domestic employer for two consecutive years. The focus on stayers enables us to link changes in the performance of a domestic employer to changes in wages paid by the same employer. We use yearly changes (as opposed to longer differences) due to the relatively high turnover of workers across firms.

Consider worker i who is employed by the same domestic firm $j(i)$ in both years $(t-1)$ and t. Denote by $s(i)$ the two-digit industry $\times$ region market of i's employer. As worker i does not change employer and market between $(t-1)$ and t, we do not index $s(i)$ by time. To study the effects of exposure to MNCs on workers i, we use the following empirical specification:

$$\begin{aligned}\Delta w_{it} =& \beta_{LME}\Delta LME_{s(i),t} + \beta_{FLE}\Delta FLE_{j(i),t} + \\ & \boldsymbol{X'_{ij,t-1}\beta_c} + \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \epsilon_{it},\end{aligned} \tag{5}$$

where the outcome Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. The main explanatory variables of interest are $\Delta LME_{s(i),t}$ and $\Delta FLE_{j(i),t}$, which refer to the labor market and firm-level exposure measures. We define these measures in detail in Section 4.2. The remaining elements are other relevant controls. $\alpha_{j(i)}$ are firm $j(i)$ fixed effects, $\boldsymbol{X_{ij,t-1}}$ is a vector of worker and firm characteristics, e.g, the sex, year-of-birth, college education status, Costa Rican national status of the worker, and the share of total sales of the worker's employer to MNCs in year $(t-1)$.[22] $\gamma_{ind(s(i))\times t}$ controls for potential shocks to the two-digit industry of the two-digit industry $\times$ region market of i and $\mu_{reg(s(i))\times t}$ controls for potential shocks to the region of the same market. $\rho_{ind(s(i))\times reg(s(i))}$ controls for differences in levels between markets. As the labor market exposure varies at the two-digit industry $\times$ region level, regressions with two-digit industry $\times$ region $\times$ year fixed effects absorb this measure (but do not absorb the firm-level exposure measure). All changes

[22] In the measure of firm-level exposure that we define in Section 4.2, the exposure weights do not sum to one at the level of firm j (given that firms also tend to have a large share of domestic clients). Thus, it is important to control for the total share sold to MNCs. This ensures that our IV estimate is only driven by the variation in the share of sales sold to MNCs and not by unobserved shocks that systematically differ between MNC and domestic clients (Borusyak et al., 2018).

are defined over two consecutive years, $(t-1)$ to t. In all regressions using this specification, we use robust standard errors clustered at the firm level.

4.2 Margins of Indirect Exposure to the MNC Shock

4.2.1 Labor Market Exposure to MNCs

We now propose a measure called "Labor Market Exposure" to MNCs (LME, henceforth). We define a labor market as the two-digit industry $\times$ region s in which an individual works in year t. The assignment of the labor market $s(i)$ to an individual i is based on the two-digit industry and region of the firm employing i in year t. We assume that all workers in market $s(i)$ face the same change in $LME_{s(i)}$, which is brought about by the changes in MNC presence in their own market but also by the changes in MNC presence in other markets s'. Now, let us introduce and motivate our definition of $\Delta LME_{s(i),t}$:

$$\Delta LME_{s(i),t} \equiv \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s',t}. \tag{6}$$

$\Delta LME_{s(i)t}$ is a sum across all two-digit industry $\times$ region markets s' in Costa Rica, in which market s' is weighted by its "closeness" to the market s of the worker. $\pi_{s(i)s',t}$ – the "closeness" measure – is the number of workers who start year t in market $s(i)$ and end t in s', divided by the total number of workers who start t in market $s(i)$. On the one hand, weighing the importance of changes in other markets by $\pi_{s(i)s',t}$ is consistent with a long line of research that finds sizable mobility costs, across both regions and industries. In other words, $\pi_{s(i)s',t}$ acknowledges that not all jobs in the economy are equally accessible to workers in s. On the other hand, a worker is not only exposed to the shocks occurring in one's labor market, but also to shocks in connected labor markets. Defining $\Delta LME_{s(i),t}$ as not only based on one's labor market $s(i)$ allows for the boundaries of labor markets to be porous. Empirical worker transitions across markets capture factors that are relevant to workers upon deciding to switch industries and regions, which would not otherwise be captured by alternative approaches (such as those that build upon the occupational similarity between industries).

We compute these shares for each of the pre-period years (2006 to 2008, or t_0) and then average them across these years. By construction, $\sum_{s'} \pi_{s(i)s',t_0} = 1$. As the average π_{ss,t_0} is 0.82, most of the change in labor market exposure to MNCs experienced by a worker comes from the change in her own market. The average probability of staying in the same region but changing the two-digit industry during the year is 0.13, while the average probability of staying in the same industry but moving to another region is 0.02. The remaining 0.03 pertains to moves outside of one's region and two-digit industry.

$\nu_{s',t-1}$ is the share of workers employed by MNC subsidiaries in market s' in Costa Rica in year $(t-1)$. In 2009, the share of MNC employment in the average (median) market $(\nu_{s',2009})$ was 0.08 (0). In 2017, the average (median) share of MNC employment $(\nu_{s',2017})$ was 0.09 (0). We therefore weigh percentage changes in MNC employment in market s' $(\Delta \mathcal{M}_{s',t})$ between year $(t-1)$ and t by the share of MNC employment in market s' in $(t-1)$ $(\nu_{s',t-1})$. For descriptive statistics on $\Delta \mathcal{M}_{s',t}$, see Section 2.2.

$\psi_{s'}$ is defined as one plus the average MNC wage premium in the two-digit industry of s', $ind(s')$.[23] We have discussed the industry-specific MNC wage premia and their large heterogeneity in Section 3. This heterogeneity motivates the interaction of changes in MNC presence in market s' $(\nu_{s',t-1}\Delta \mathcal{M}_{s',t})$ with the MNC premium in the industry of that market $(\psi_{s'})$.

The multiplication by $\psi_{s'}$ reflects the fact that two similarly-sized MNC expansions would have

[23] The s' subscript on $\psi_{s'}$ is an abuse of notation as we cannot compute market-specific premia due to the reduced number of moves between domestic firms and MNCs for which both firms belong to the same market.

different effects on the average market wage depending on the magnitude of the premium they pay. Consider the following two hypothetical cases. In both cases, assume there is only one industry with MNCs in year $(t-1)$, which,- in addition, experiences growth in MNC employment between years $(t-1)$ and t. Denote by s' the industry of the first case and by s'' the industry of the second case. In the first case, assume MNCs in s' pay the same wage as domestic firms, i.e., $\psi_{s'} = 1$. In the second case, MNCs in s'' pay a 20% premium with respect to domestic firms, i.e., $\psi_{s''} = 1.2$. Moreover, assume that both s' and s'' were equally close to s in t_0 (that is, $\pi_{ss',t_0} = \pi_{ss'',t_0}$). Had we not acknowledged the actual MNC premia in s' and s'', we would have expected both cases to lead to the same effect on the wages of workers in domestic firms in s. However, in the first case, the expansion of MNCs in s' would lead to higher wages only through demand effects. In contrast, in the second case, the expansion of MNCs in s'' is likely to lead to larger increases in wages than those found in the first case, due to a combination of demand and composition effects (with the premium $\psi_{s''}$ further improving the outside options in s'').

Our interaction with $\psi_{s'}$ echoes one of the central insights of Beaudry et al. (2012).[24] There are two key differences between their analysis and ours. First, as the same industry can experience different MNC presence shocks across regions $(\nu_{s',t-1}\Delta\mathcal{M}_{s',t})$, we obtain region-specific shocks to the average premium of an industry.[25] Second, because our analysis is at the worker-level (as opposed to the industry-level), we can also study the effects of changes in MNC presence on the wages of workers in the same industry of the shock. Put differently, the more disaggregated data on which our analysis rests allows us to acknowledge pay heterogeneities across employers in the same industry.

4.2.2 Firm-Level Exposure to MNCs

MNCs can affect workers in domestic firms not only through the labor market but also through the product market. These product market interactions may affect the performance of these domestic firms, which, in turn, may affect the outcomes of their workers. In this subsection, we define the "Firm-Level Exposure" to MNCs (abbreviated FLE, henceforth) as the exposure of domestic firms j to the expansion or contraction of MNCs.

Define $\theta_{jm,t}$ as the share of total (direct and indirect) sales of firm j to the subsidiary of MNC m in Costa Rica in year t. We consider not only the direct sales to MNCs, but also the indirect sales made through one's buyers at different supply-chain distances. For details on how we construct θ_{jm}, see Appendix A.3.[26] Then,

$$\Delta FLE_{j(i),t} \equiv \sum_{m} \theta_{j(i)m,t-1}\Delta\mathcal{M}_{mt}, \tag{7}$$

where $\theta_{jm,t-1}$ is the share of total (direct and indirect) sales to the subsidiary of MNC m in Costa Rica in year $(t-1)$ and $\Delta\mathcal{M}_{mt}$ is the percentage increase in the employment of MNC buyer m in Costa Rica between $(t-1)$ and t. Note that we are weighting the importance of changes in employment of each MNC buyer m by its $(t-1)$ share of total sales $\left(\theta_{j(i)m,t-1}\right)$, as opposed to the same share in year t. Note

[24] In that paper, the authors study whether changing the composition of jobs between low-paying and high-paying industries has important effects on wages in other industries. In their index of industrial composition, the authors interact each industry share with the national-level wage premium of that industry relative to an arbitrarily chosen industry. In contrast to Beaudry et al. (2012) (who allow for industries to have time-varying premia), our estimates of MNC premia from Section 3 suggest that, at least for the time period that we study, MNC premia are time-invariant. This explains why $\psi_{s'}$ does not have a time subscript.

[25] One can define the average premium of an industry as $(1-\nu_{s't})\,1 + \nu_{s't}\psi_{s'}$, where the premium of MNCs in s' $(\psi_{s'})$ is defined relative the domestic wage (normalized to 1). In contrast, in Beaudry et al. (2012), the more aggregate nature of the data implies that changes in the premia of an industry can only be observed at the national level.

[26] Across all domestic firms, the average (median) share of total sales to MNCs in 2017 is 0.24 (0.11). Meanwhile, the average (median) share of *direct* sales to MNCs for the same firms and year is 0.07 (0.00). Thus, most of the variation in total sales to MNCs is actually driven by indirect sales, for which MNCs are buyers-of-buyers.

also that $\theta_{j,t-1} \equiv \sum_m \theta_{j(i)m,t-1} \leq 1$.[27]

What type of shocks to firm j does $\Delta FLE_{j(i),t}$ capture? First, it captures likely demand shocks to firm j from its expanding (or contracting) MNC buyers. Second, intensifying (or weakening) the linkage to MNC buyers may also affect the productivity of the firm. Alfaro-Urena, Manelici, and Vasquez (2019b) show that domestic firms that become first-time suppliers to MNCs do not only grow in size, but also improve their productivity. In the model in Section 5.1, demand and productivity effects have an isomorphic effect on the wages of incumbent workers. In practice – as we discuss in Section 4.5 – shocks to demand and productivity may have different implications for workers.

Two arguments motivate why our measure of firm-level exposure to MNCs only considers the exposure through firm-level supplying linkages. First, meta-analysis studies find that the "average forward spillovers [of FDI (the effects of MNCs on the productivity of their buyers)] are negligible" (Havránek and Iršová, 2011). In contrast, the same meta-analysis studies find that the "average backward spillover [of FDI (the effect of MNCs on the productivity of their suppliers)] is large."

Second, because most MNCs in Costa Rica are export-oriented, MNCs and domestic firms do not compete directly in the product market. In 2018, we conducted a survey with executives from MNCs in Costa Rica (see Alfaro-Urena, Manelici, and Vasquez, 2019b). In particular, we investigated the reasons why these MNCs chose to open a subsidiary in Costa Rica. The four most important attractions of Costa Rica were the quality of education, the relatively competitive wages, the tax incentives available in Special Economic Zones, and the distance to target markets. The domestic market was one of the least important reasons for coming to or staying in Costa Rica. Moreover, most of these MNCs have the parent located in a nearby country (such as the U.S., Canada, or another Latin American and Caribbean country) and tend to export a large share of the production to their parent. Finally, meta-analyses on the "horizontal spillovers of FDI" conclude that the effects of FDI on the productivity of domestic firms in the same industry are, on average, zero (Havránek and Iršová, 2013).

4.3 Instrumental Variables Strategy

We are interested in the causal estimates of the effects of changes in the labor market and firm-level exposures to MNCs on worker wages. OLS estimates of β_{LME} and β_{FLE} from equation (5), however, may be biased due to simultaneity and omitted variables. For instance, workers in a labor market may receive unobserved positive productivity shocks, which would lead to both expansions of MNCs and higher wages for workers in that market (independently of the MNC expansions). In such a case, OLS would overestimate the effect of increases in labor market exposure to MNCs on wages. Finally, OLS estimation of the firm-level exposure coefficient may also be biased if shocks to the productivity of workers in a given firm affect the growth of the direct or indirect MNC buyers from that firm.

To address these concerns, we exploit the same variation in MNC employment in Costa Rica as that used for the IV estimation of the MNC premium, namely the variation in MNC employment *outside* of Costa Rica for MNCs with subsidiaries in Costa Rica. Specifically, we construct the instruments for $\Delta LME_{s(i),t}$ and $\Delta FLE_{j(i),t}$ by using $\Delta \mathcal{O}_{st}$ and $\Delta \mathcal{O}_{mt}$ as the IV analogues of $\Delta \mathcal{M}_{st}$ and $\Delta \mathcal{M}_{mt}$.[28] $\Delta \mathcal{O}_{st}$ and $\Delta \mathcal{O}_{mt}$ are the percentage changes in employment of MNC groups in market s in Costa Rica and of the

[27] While the formula of $\Delta FLE_{j(i),t}$ has an intuitive empirical structure, it also has the advantage that (under some theoretical assumptions) it is proportional to changes in the value added per worker of firm j. We develop this intuition formally in the model in Section 5.

[28] This means that we instrument $\Delta LME_{s(i),t} \equiv \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s',t}$ by $IV\left(\Delta LME_{s(i),t}\right) \equiv \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{O}_{s',t}$ and $\Delta FLE_{j(i),t} \equiv \sum_m \theta_{j(i)m,t-1} \Delta \mathcal{M}_{mt}$ by $IV\left(\Delta FLE_{j(i),t}\right) \equiv \sum_m \theta_{j(i)m,t-1} \Delta \mathcal{O}_{mt}$. We weight the importance of shifters by $(t-1)$ and t_0 values to avoid that our measures of exposure reflect endogenous responses of labor markets and firms to the MNC shocks.

specific MNC m, respectively, both *outside* of Costa Rica.

The exclusion restriction for the IV of $\Delta LME_{s(i),t}$ is that changes between $(t-1)$ and t in the employment outside of Costa Rica of MNCs whose subsidiary is in labor market s in Costa Rica are not correlated with contemporaneous shocks to the productivity of workers in labor market s in Costa Rica. Two pieces of evidence suggest that this assumption is likely to hold. First, the average (median) share of the worldwide number of workers of each MNC group who work in the Costa Rican subsidiary of that MNC group is 0.8% (0.2%). This makes it unlikely that shocks to the productivity of workers in market s in Costa Rica would drive the worldwide growth of these MNCs. Second, and more importantly, as MNC subsidiaries in Costa Rica tend to be in a different (upstream) industry than that of the MNC group, it is less likely that shocks to the productivity of workers in the upstream industry in Costa Rica are correlated with shocks to a different industry outside of Costa Rica.

The exclusion restriction behind the IV of $\Delta FLE_{j(i),t}$ is that changes between $(t-1)$ and t in the size of MNC m outside of Costa Rica are not correlated with contemporaneous shocks to the performance of domestic firm j, a direct or indirect supplier to the subsidiary of MNC m in Costa Rica. Similar to the discussion of the exclusion restriction for $\Delta LME_{s(i),t}$, the assumption is plausibly valid for two reasons. First, the average share of the input costs of MNC subsidiaries that are costs with inputs from a given domestic firm is less than 1%. Hence, it is unlikely that shocks to specific domestic firms would affect the performance of the Costa Rican subsidiary of m, and, even more unlikely to affect the performance of the MNC outside of Costa Rica. Given that most domestic firms are exposed to MNCs mostly indirectly (as suppliers of suppliers of MNCs), this assumption is even more plausible. Second, because subsidiaries of MNCs in Costa Rica tend to be in a different industry than that of the MNC group, this further weakens the link between a supplier to the subsidiary in Costa Rica and the MNC outside of Costa Rica.

4.4 Estimates of the Indirect Effects of MNCs on Wages

Table 4 reports OLS estimates of equation (5). In Column (1) we only use the change in the labor market exposure (LME) to MNCs as an explanatory variable, in Column (2) we use only the change in the firm-level exposure (FLE), and in Column (3) we use both changes at the same time. Both changes in LME and FLE are strongly and positively associated with changes in worker wages. Reassuringly, the magnitudes of both the LME and FLE coefficients are largely unaffected by whether the two measures are included together or separately. This indicates that the market-level variation in exposure to MNCs is mostly unrelated to the firm-level exposure.

To interpret the magnitude of the OLS estimate of the coefficient on the labor market exposure, consider a hypothetical two-digit industry $\times$ region labor market s with the following characteristics: π_{ss,t_0} is 0.82 (the average share of stayers in the same market across all markets), $\psi_{s(i)}$ is 1.2 (a typical 20% MNC wage premium), $\nu_{s,t-1}$ is 0.25 (a higher than average share of MNC employment in $(t-1)$ in s). In the first scenario, this market experiences growth in MNC employment of 4% between $(t-1)$ and t (the average value for $\Delta\mathcal{M}_{st}$ across all markets and years). In the second scenario, MNC employment remains constant. In both scenarios, assume that all other markets do not experience any change in MNC employment between $(t-1)$ and t. The OLS coefficient of 0.05 on the labor market exposure measure indicates that the wages of stayers in domestic firms would grow 0.05 percentage points more in the first scenario relative to the second. Alternatively, one can compare the growth in the wages of two otherwise identical workers who happen to be in labor markets that differ by one standard deviation (7.04) in their labor market exposure to MNCs. Therefore, the wage of the worker in the more exposed market would grow 1.02 percentage points more than the wage of the worker in the less exposed market.

To interpret the magnitude of the OLS estimate of the importance of the firm-level exposure, consider two domestic firms: one whose share of total sales to this MNC in $(t-1)$ is 0.24 (the average share of total sales to MNCs in 2017) and a second whose share is 0. Assume that this MNC grows by 4% between $(t-1)$ and t. Given these numbers, the OLS coefficient of 0.74 on the firm-level exposure implies that the wages of stayers in the first firm would grow 0.71 percentage points more than those of the stayers in the second firm. Alternatively, one can compare the growth in wages of two otherwise identical workers who happen to work for firms that differ by one standard deviation (0.38) in their firm-level exposure to MNCs. Then, the wage of the worker in the more exposed firm would grow 1.25 percentage points more than the wage of the worker in the less exposed firm.

Table 3 reports the first stage and reduced form estimates for the leading IV Set 1. From Columns (1) and (2) we learn that both instruments are strongly correlated with the endogenous variable they are meant to instrument for. In Columns (3) and (4) we regress each measure of the change in exposure on the IVs of both measures. As expected, each measure of exposure is only correlated with its IV. Columns (5) to (7) contain the reduced form coefficients, which show a strong relationship between changes in wages in Costa Rica and the instruments (based on changes in the size of MNCs outside of Costa Rica).

In Columns (8) to (11) of Table 3, we perform a falsification test to verify that future values of the instrument (based on future changes in the size of MNCs outside of Costa Rica) do not predict current changes in worker outcomes in Costa Rica. We find that the year $(t+1)$ values of the instruments are not correlated with year t changes in worker wages. Hence, our identification strategy isolates market-level and firm-level shocks caused by shocks to MNCs rather than other temporal confounds.

Columns (4) to (6) of Table 4 report the leading IV estimates. The F-statistic is 26.3 when we only use the LME measure as an explanatory variable, 83.4 when we only use the FLE measure, and 41.2 when we use both variables together, all of which are above the commonly used threshold of 10. The IV estimates are 2.9 times larger than the OLS estimates for the labor market exposure measure and 4.5 times larger for the firm-level measure. A plausible candidate explanation for the larger IV estimate of β_{LME} is related to the simultaneous determination of changes in wages and MNC presence. The fact that the OLS estimate of β_{FLE} is also attenuated is in line with other empirical work that uses firm-level shocks to firm performance to measure rent-sharing. The typical explanation for this pattern is that wages respond more strongly to lower frequency fluctuations in surplus, or, put differently, short-run fluctuations in firm performance are poor measures of underlying changes in product market conditions (Guiso et al., 2005; Garin and Silvério, 2018; Card et al., 2018; Kline et al., 2019).

Robustness checks. First, we used Orbis data to construct an alternative set of IVs for the two measures of exposure to MNCs. We redefine $\Delta\mathcal{O}_{st}$ as the percentage change in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries. Over 90% of these 4,595 MNC groups do not have a subsidiary in Costa Rica. To assign changes in MNC employment outside of Costa Rica to two-digit industry $\times$ region markets in Costa Rica we rely on the main two-digit industry code of these MNCs. Namely, we attribute the change in employment of each MNC to a two-digit industry $\times$ region market in Costa Rica based on the common two-digit industry and based on the year $(t-1)$ share of total employment in that two-digit industry in the given region. Given that with this new source of variation we only have market-level variation, $\Delta FLE_{j(i)t}$ is redefined as $\sum_{s'} \theta_{j(i)s',t-1}\Delta\mathcal{M}_{s't}$. Fortunately, there is still considerable firm-level variation in the extent to which domestic firms $j(i)$ supply MNCs in market s'.

In contrast to IV Set 1, IV Set 2 now assumes that shocks to MNCs in a given industry outside of Costa Rica are correlated to shocks to MNC subsidiaries *in the same industry* in Costa Rica (as opposed to the upstream industries of the MNC subsidiaries in Costa Rica). Table A4 (Appendix B.1) (Columns

(3) and (4)) confirms a strong positive correlation between $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ (0.53 with year and two-digit industry fixed effects). At the same time, one can also notice that this correlation is lower than for the $\Delta\mathcal{O}_{st}$ from IV1, which uses the more direct variation in the behavior of the actual MNCs in Costa Rica.

Table A12 (Appendix B.3) is the counterpart of Table 3 for IV Set 2. Both the first stage and reduced form relationships are weaker for IV Set 2 than for IV Set 1. Nonetheless, the patterns are qualitatively similar. Moreover, IV Set 2 also passes the falsification test by failing to predict changes in wages with leads of the IVs. Table 4 presents alongside the IV estimates based on IV Set 1 alone, IV Set 2 alone, and the two sets of IVs together. Reassuringly, despite using a different source of variation, the two IV sets deliver almost identical results. Formally, we perform a standard Hansen-J overidentification test, which fails to reject that the estimates are statistically the same (our Hansen-J statistic has a p-value of 1).

Second, Table A13 (Appendix B.3) reports the OLS and IV estimates from the main equation (5) for two samples: the main sample of stayers, and a sample with year $(t-1)$ firm-level cohorts. In addition to stayers at firm j and workers who move from j directly into new employment in year t, the firm-level cohort sample also includes individuals who move from j into unemployment (as long as they find employment by the end of t). The estimates from the firm-level cohort sample tend to be slightly smaller than those from the main sample of stayers. This is driven by the fact that the sample is not selected on worker outcomes in t. We prefer the sample with stayers because it enables us to link the change in wages of a worker to the change in firm-level exposure to MNCs of the same employer.

Third and last, in Table A14 (Appendix B.3), we compare our main OLS and IV estimates with OLS and IV estimates from regressions with fewer fixed effects than those from the main specification in equation (5). Results remain largely unchanged.

4.5 The Effect of Changes in Value Added per Worker on Wages

We now replace the change in firm-level exposure to MNCs by the change in value added per worker of the firm – which no longer intends to capture changes in exposure to MNCs alone. Precisely, we estimate the following regression, where $\Delta\left(VA/L\right)_t$ is the percentage change increase in value added per worker between year $(t-1)$ and t:

$$\begin{aligned}\Delta w_{it} =& \beta_{LME}\Delta LME_{s(i),t} + \beta_{VA/L}\Delta\left(VA/L\right)_t + \\ &+ \boldsymbol{X'_{ij,t-1}}\boldsymbol{\beta}_c + \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \epsilon_{it}.\end{aligned} \tag{8}$$

Our objective is to estimate the "rent-sharing" coefficient – the pass-through of changes in the value added per worker on worker wages. The intuition of the first stage is that shocks to the size of the MNC buyers m of a firm j turn into shocks to the sales of j to buyers m. This is likely to affect the firm's value added per worker. Changes in sales to MNC buyers may bring two types of changes for the firm – to its scale and productivity. The exclusion restriction requires that changes in sales to MNCs only affect worker wages through the extent of rent-sharing of their firm. One scenario that stands out as problematic is one in which workers in firms that start selling more to MNCs increase their productivity in ways that are directly valued by competing employers. In such a case, the IV would overestimate the degree of rent-sharing, as it would attribute the part of the increase in wages coming from improved outside options to rent-sharing. While we cannot directly rule out this threat, two aspects make it less likely. First, we study the effects of yearly changes in value added per worker on annual changes in wages. Alfaro-Urena et al. (2019b) find that firms gradually improve their total factor productivity. Moreover, if working for a firm that intensifies its relationship with MNCs leads only to context-specific learning, then workers should not see their outside options improve. Last, we

assume that nonpecuniary firm amenities do not react to the shock to firm value added.

Table 5 contains the estimates from four OLS regressions. The first three introduce $\Delta LME_{s(i),t}$ alone (Column (1)), the change in value added per worker alone (Column (2)), or both explanatory variables at once (Column (3)). All three columns contain the main set of fixed effects from equation (5), namely region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region (in addition to firm fixed effects). Column (4) is an OLS regression with only the change in value added as the explanatory variable, and in which we replace the three sets of fixed effects just mentioned by two-digit industry $\times$ region $\times$ year (and continuing to keep the fixed effects). As the measure of labor market exposure to MNCs varies at the two-digit industry $\times$ region $\times$ year level, it is absorbed by this last set of fixed effects.

The OLS estimate of the coefficient on $\Delta LME_{s(i),t}$ from Column (3) is almost the same as that from Column (3) in Table 4. This suggests that the market level variation in the exposure to MNCs is largely unrelated to the variation in firm-specific outcomes. As for the coefficient on changes in value added per worker, its OLS estimate is identical and equal to 0.008 across all three specifications. Table 5 presents the IV results. The IV estimate of the coefficient on $\Delta LME_{s(i),t}$ from Column (3) is only a bit smaller than that in Column (6) in Table 4. The IV estimate on the change in value added per worker is unaffected by whether we include $\Delta LME_{s(i),t}$ or not, and by the set of fixed effects we use.

The IV estimate of the pass-through of changes in value added per worker on wages is 0.09, which is about 11 times larger than the OLS estimate. Finding an OLS estimate that is biased towards zero is in line with the existing literature. The most likely culprits for this bias are either the noisy nature of the measure of surplus (here, value added per worker) or the fact that wages may be less responsive to transitory fluctuations in rents. Our IV estimate of 0.09 is lower than the existing IV estimates: 0.14 for exporters in Portugal (Garin and Silvério, 2018) and 0.35 for patent-winning firms in the U.S. (Kline et al., 2019). This is consistent with the intuition that direct or indirect suppliers to MNCs in developing countries may have lower hiring and training costs than exporters or patent winners in developed countries.[29] Alternatively, consider a model that explains rent-sharing through Nash bargaining. Through the lens of that model, we can rationalize our lower rent-sharing coefficient by a lower Nash bargaining weight for workers in developing countries, where unemployment and informality are more prevalent.

The relationship between the estimates of for β_{FLE} and $\beta_{VA/L}$ coefficients. Consider our IV estimate of 3.3 for $\hat{\beta}_{FLE}$ and its 95% confidence interval of [1.5,5.1]. We ask whether this range is reasonable in the light of our estimate for the rent sharing coefficient $\hat{\beta}_{VA/L}$ of 0.09. To that end, let us return to our hypothetical example with only one MNC in the economy that grows 4% between $(t-1)$ and t. An incumbent worker at a domestic firm selling 24% of its sales to the MNC sees her wages grow between 1.4 and 4.9 percentage points more than a worker working at a firm selling 0% to the MNC. Assume that no other factors are impacting the value added per worker of these firms besides their different exposure to the expanding MNC. The IV estimate of the rent-sharing coefficient is 0.09 and its 95% confidence interval is [0.04, 0.15]. Using the highest estimate of the rent-sharing that our data cannot reject (0.15) and the lowest prediction of the percentage points growth of the wages in the first firm (1.4), yields that the value added per worker of the worker would need to increase by 9.3 percentage points from year $(t-1)$ and t. Evidence from Alfaro-Urena et al. (2019b) suggests that this magnitude is plausible.[30]

[29] In Costa Rica, exporters and patent-holders are, on average larger and more productive than suppliers to MNCs.

[30] In Alfaro-Urena et al. (2019b), we find that during the year when domestic firms become a first-time supplier to an MNC, on average, their value added per worker increases by 6%. While we have not yet explored how the value added per worker increases with subsequent increases in the amounts sold to MNCs, one might speculate that there are non-linearities in learning from MNCs. While the magnitude of the IV estimate of the firm-level exposure to MNCs appears large, a high elasticity of purchases from local suppliers to MNC employment and non-linearities in learning would make this magnitude plausible.

4.6 Who Gains from Increases in Exposure to MNCs?

College vs. non-college-educated workers. In Table A15 (Appendix B.3) we present the OLS and IV estimates from equation (5) on two groups of stayers in domestic firms: only those with a college degree (Panel B) and only those without a college degree (Panel C). There are two main messages that emerge from this comparison. First, both the OLS and IV estimates from the full sample are the most similar to those from the sample of workers without college (with the latter estimates being a bit higher than those from the full sample). This similarity is somewhat unsurprising once we realize that almost 90% of the observations from the full sample come from this subgroup. In general, workers who did not attend college represent the majority of the workforce in both domestic firms *and* MNCs. Second, the results for college-educated workers are less conclusive. Their analysis is hampered by the fact that the reduced form estimates are not significant. Because college-educated workers are in the minority, one may need to define more targeted shocks for them within a market or firm.

Next, we repeat the analysis by education level for the specification in equation (8), which replaces the change in firm-level exposure to MNCs by the change in value-added per worker of the firm. Table A17 (Appendix B.3) presents the OLS estimates, which are mainly identical for the two types of workers. However, as Table A18 (Appendix B.3) shows, the IV estimates diverge again. The rent-sharing coefficient of college-educated workers is not significantly different from zero, whereas the rent-sharing coefficient of workers without college is slightly larger than the pooled estimate. The IV estimation of the coefficients for college-educated workers is, again, hindered by the reduced form estimates being non-significant. The rent-sharing coefficient of workers without a college degree might also be higher because their wages tend to be more affected by firm-specific temporary productivity shocks, whereas those of high-skilled workers tend to be more affected by firm-specific permanent shocks (Friedrich et al., 2019).

Male vs. female workers. In Table A16 (Appendix B.3) we split the sample of stayers into two groups: women only (Panel B) and men only (Panel C). The OLS estimates for the importance of changes in labor market exposure are similar for women and men. However, the IV estimates for the same coefficients diverge; while, for women, we no longer find a statistically significant effect, for men, the effect becomes larger than that for the full sample. The OLS estimates for the importance of changes in firm-level exposure suggest larger effects for women than for men. The IV estimates revert this pattern, with women experiencing only about 70% of the effects on men. Overall, women seem to not be in as good of a position as men to benefit from improvements in the labor market and firm-level exposure to MNCs.

We repeat this heterogeneity analysis also for the rent-sharing coefficient in equation (8). While the OLS estimates are identical for women and men (see Table A19, Appendix B.3), the IV estimate of the rent-sharing coefficient for women is 0.07 and for men is 0.10 (see Table A20, Appendix B.3). Thus, women's wages are only 70% as responsive to observable measures of the surplus per worker as men. This is lower than the 90% found by Card et al. (2015) for Portugal. As in Kline et al. (2019), a potential explanation for the gender difference in earnings pass-through is that the marginal replacement costs of men could – on average – exceed those of women. If women work in occupations requiring lower hiring and training costs, this could explain their relatively lower pass-through rate.[31]

The characteristics of workers with different levels of labor market exposure to MNCs. To assess the distributional implications of expansions or contractions in MNC employment across labor markets, one needs to understand the characteristics of workers in those labor markets. Do they tend to be more

[31] Costa Rican women have relatively low labor force participation rates (43% in 2018, relative to 58% in Portugal in 2010). Costa Rican working women also tend to concentrate in more traditional service-oriented occupations.

college-educated, are they more likely to be male, already earn high wages? Table A7 (Appendix B.1) presents descriptive statistics on workers in a given labor market in the pre-period (2006 to 2008). Workers in 2006 to 2008 are separated in terciles by the percentage change in MNC employment between 2009 and 2017 ($\Delta\mathcal{M}_{s,2009-2017}$) in their labor market s in a given year between 2006 and 2008.

Labor markets in the top tercile of MNC employment growth after 2009 already had a 20% higher share of MNC employment between 2006 and 2008 than those in the bottom tercile and a 1.2% higher MNC premium. On average, workers in the top tercile labor markets had 9% higher labor earnings that those in the bottom tercile, were 3% more likely to be college-educated, and were 4% *less* likely to be male. These workers earned higher labor earnings across both domestic firms and MNCs, and across levels of education. Thus, the expansion of MNCs after 2009 is likely to have benefited workers with relatively more favorable initial labor market conditions. The higher prevalence of women in these labor markets, however, had a counterbalancing distributional benefit.

The labor markets in the bottom tercile – which experienced, on average, contractions of about 22% in MNC employment – tended to have higher shares of MNC employment that the middle tercile. Thus, the growth of MNC employment post-2009 was not monotonically related to the initial share of MNC employment. Workers in the bottom tercile were 5% more likely to be male than in the mid tercile and 3% less likely to have a college degree. Thus, the contractions of MNCs are likely to have hurt relatively more workers without a college education and men.

The characteristics of workers with different levels of firm-level exposure to MNCs. Table A8 (Appendix B.1) provides descriptive statistics on the sample of domestic firms and their incumbent workers between 2009 and 2017, by the tercile of subsequent yearly growth in the firm-level exposure to MNCs. Firms in the top tercile of future changes in firm-level exposure to MNCs tend to employ 32 more workers on average, pay 26% higher wages to their incumbent workers, have 3% more male workers, and 4% more college-educated workers than firms in the bottom tercile. However, similar to the case of the labor market exposure, there is a non-monotonous relationship between changes in firm-level exposure to MNCs and initial conditions. Firms who experience contractions in firm-level exposure tend to employ nine workers more on average, pay 7% higher wages to incumbent workers, have 8% more male workers, and 1% more college-educated workers than firms in the mid tercile.

The correlation between the labor market and firm-level exposure to MNCs. To understand the distributional implications of exposure to MNCs, one also needs to know whether the workers whose labor markets and firms experience increases in exposure to MNCs are the same or not. Figure 4 is a binned scatter plot of the worker-year labor market exposure to MNCs with respect to the worker-year firm-level exposure to MNCs. Both measures have been residualized by the same fixed effects and controls used in equation (5). The plot displays a clear negative relationship between the labor market and the firm-level exposures of workers. Workers who are hurt by the contraction of MNCs in an industry may benefit from working in a firm that supplies MNCs in another industry, and the reverse. Given these counterbalancing forces, increases in the presence of MNCs have an ambiguous effect on inequality.

4.7 Back-of-the-Envelope Aggregation of the Wage Gains from MNCs

A comprehensive evaluation of the costs and benefits of attracting MNCs on the labor market requires knowing (i) the effects on the wages of employed workers, and (ii) the effects on employment generation (or destruction) both in the formal and informal sectors. In this paper, we have focused on the first point. We can use our reduced-form evidence from Sections 3 and 4 to approximate the benefits of attracting MNCs based on the wage gains that we measure. Since the extensive margin of employment is

outside the scope of our empirical analysis, we assume full employment in our calculations and abstract from potential effects due to changes in unemployment. Also, for the sake of simplicity, we focus on our average treatment effect estimates.

We first consider the wage gains of workers directly hired by MNCs. Between 2007 and 2017, 500,492 individuals started working for an MNC in Costa Rica, with an average employment duration at those MNC jobs of 2.4 years (28.8 months). We assume that those individuals were drawn from similar domestic firms to those in our movers analysis. Thus, we can rely on our estimate of the MNC premium of 9%. In the year before moving to the MNC, the average monthly earnings of employed workers were approximately 840 real U.S. dollars of 2013. Given the 9% premium, the average worker increases her monthly earnings by 76 U.S. dollars. Let us take a conservative approach and assume that, in the absence of those MNC jobs, workers would earn the same 840 U.S. dollars per month. The estimate of aggregate wage gains owed to the wage premium is 1,095 million U.S. dollars (76 U.S. dollars $\times$ 28.8 months $\times$ 500,492 workers) for the entire period or about 100 million U.S. dollars per year.[32]

Let us now consider the wage gains for workers in domestic firms. Assume that the wages of public sector employees are unaffected. Also assume that all domestic firms sell (directly or indirectly) around 24% of their sales to MNCs (the average in the economy). Between 2009 and 2017, the average market experienced an increase in MNC presence of 12.9%. Using these averages together with our IV estimates from Table 4, we find a change in earnings for the average worker at a domestic firm equal to $3.3 \times 0.24 \times 12.9 + 0.14 \times 12.9 \approx 12\%$ between 2009 and 2017. Hence, MNCs lead to indirect increases in labor earnings of about 1.5% per year. Taking the average monthly earnings of 640 real U.S. dollars in the economy and applying these gains to approximately 600,000 incumbent workers at domestic firms, we find aggregate gains of around 69 million U.S. dollars per year ($0.015\times$ 640 U.S. dollars $\times$ 12 months $\times 600,000$ workers).

Adding the wage gains of workers directly hired by MNCs to those of workers employed at domestic firms, we reach an estimate for the average wage gains of around 169 million U.S. dollars per year. Given an average number of MNC workers of about 230,000 per year over the period of study, these 169 million U.S. dollars per year amount to 735 U.S. dollars per MNC job per year. While this gain may seem small, it is larger than the average monthly earnings of a worker in Costa Rica (640 U.S. dollars). Moreover, these numbers are a lower bound, as they rely on the assumption that, in the absence of MNCs, the domestic economy would be able to generate the number of jobs created by MNCs.

How do these numbers compare to the value of the tax exemptions that MNCs receive? The official estimate by the Costa Rican government for the 2011 to 2015 period shows that the foregone tax collection due to tax exemptions offered to MNCs in *Zona Francas* (the Costa Rican Special Economic Zones) amounts to 467 million U.S. dollars on average per year.[33]. This estimate of the costs of attracting MNCs is an upper bound since it assumes that MNCs would remain in the country in the absence of tax benefits. Comparing the wage benefits with the costs, we notice that the increase in labor earnings is equivalent to around 36% of the costs.

Does this mean that there is a net loss from attracting MNCs? Not necessarily. As stated before, in this simple calculation, we are abstracting from other potentially important effects that manifest on the extensive margin of employment and informality. Moreover, this calculation also does not account for the effects of MNCs on domestic firm profits, in particular, the part of those profits that is not shared with workers in the form of wage increases. These caveats notwithstanding, we find that the gains in

[32]This amount could increase to 166 million U.S. dollars per year if, instead, we assume that workers were drawn from the set of compliers identified by our IV estimate of the MNC premium.

[33]See https://procomer.com/downloads/zonas-francas/balance_zf_2011_2015.pdf.

labor earnings are unable to justify the generous tax incentives extended to MNCs by themselves.

5 A Stylized Model of an Economy with MNCs

Motivation. The first objective of the model is to formalize the channels by which MNCs affect workers in domestic firms, i.e., through changes in the level and the composition of labor demand (given the MNC wage premium) and changes in domestic firm outcomes (given supply-chain linkages with MNCs). The second objective of the model is to combine the structure of the model with the plausibly exogenous MNC shocks to infer the degree of labor market imperfections in the economy. On the one hand, if incumbents are stuck at their firm, there would not be any gains in earnings. On the other hand, if incumbents see domestic employers as perfect substitutes, they would be able to take full advantage of the potential gains in earnings. Thus, policies to attract MNCs can be more or less successful in improving worker earnings depending on the magnitude of the labor market imperfections. Moreover, what we learn about the ways in which these imperfections affect worker outcomes is not specific to the MNC shocks, but it also applies more broadly to other shocks affecting workers.

We model wage setting using a wage posting model, as opposed to a bargaining model. This choice is motivated by the specificity of Costa Rican labor market institutions, which are closer to those of the U.S. than to those of Europe or other Latin American countries. The unionization rate is notably low, even slightly lower than that in the U.S. Collective bargaining agreements over wages and working conditions are also limited (OECD, 2017). Moreover, the employment protection legislation for workers with regular contracts is one of the least stringent in the OECD and Latin American countries (OECD, 2017).[34] These features suggest that workers have a low bargaining power over their wages (particularly workers without college, who are in the majority in both domestic firms and MNCs).

In line with previous work on rent-sharing with workers (Becker, 1962; Stevens, 1994; Manning, 2006; Garin and Silvério, 2018; Kline et al., 2019), we model firms as having to bear a cost of recruitment and/or training when hiring a worker. Put differently, firms need to engage in costly searches for workers. Alternatively, workers and firms need to invest in the acquisition by workers of industry (or firm) specific capital, whose costs and returns are later shared by the worker and employer (Hashimoto, 1981; Neal, 1995; Lazear, 2009). This imperfect substitutability of incumbent workers with new hires is what allows the former to benefit from positive shocks to the performance of their employer.

Three pieces of evidence suggest that this modeling choice is also appropriate for Costa Rica. First, PricewaterhouseCoopers conducts annual studies on labor turnover across MNCs in Costa Rica (PwC, 2018). Labor turnover costs are perceived as high, and both MNCs and policy-makers seek ways to reduce these costs. Second, in our survey of HR executives from MNCs in Costa Rica, the costs of hiring and training stand out as one of the main reasons why MNCs choose to pay higher wages than domestic firms. These pieces of evidence point to the hiring and training costs of MNCs being larger than those of domestic firms. That said, incumbent workers at domestic firms also tend to receive higher wages than new workers in the same occupation.[35]

Summary. We propose a static model featuring the labor and product markets of a small open economy. There are three types of agents in this economy: workers, MNC subsidiaries, and domestic firms. The

[34] For details, see Appendix D.1.

[35] We calculate the ratio of the average wages paid to new workers hired in year t in four-digit occupation o by a given firm j to the average wages paid in the same year t by the same firm j to its incumbent workers in the same occupation o, $\left(\overline{w}_{oj,t}^{NEW}/\overline{w}_{oj,t}^{INC}\right)$. Incumbent workers are workers who are employed by firm j in both $(t-1)$ and t. In Table A10 (Appendix B.2.3), we show that the average (median) of this ratio is 0.88 (0.86).

economy is formed by a finite but large number of industries indexed by s. We assume that in each industry, there is one MNC and a large number of domestic firms producing differentiated varieties.

MNCs produce according to an international demand shifter and export all their production. Each MNC produces using labor and a composite of varieties purchased from domestic firms. When hiring workers, MNCs need to incur a hiring and training cost and pay the workers an exogenous premium with respect to the market wage. The assumption of an exogenous premium is not problematic given that this model aims to formalize the effects of MNCs on wages set *by domestic firms*.[36] We take the set of domestic suppliers of each MNC as exogenous, i.e., we do not model the decision of MNCs regarding which domestic firms to purchase from. There is one final consumption good, which is a composite of domestic varieties (whose prices are determined in equilibrium), and an imported good (whose price is set internationally). Domestic firms produce the domestic variety using labor only. Their variety serves as an input to either the production of the final good or the production of MNCs.

The modeling of the labor market for domestic firms builds most directly on Kline et al. (2019). As in their model, there are two types of workers of homogeneous ability: new workers and incumbent workers. Domestic firms post a wage for their incumbent workers, who decide, based on this wage, competitive wages in all industries and their taste draws whether to remain or not with the firm. Domestic firms also choose how many new workers to hire. To hire new workers, firms need to pay them a wage equal to the market wage and cover hiring and training costs.

The three innovations of our model (relative to Kline et al., 2019) are the following: (i) it models industries explicitly (allowing workers to have idiosyncratic preferences over industries and featuring a switching cost to be incurred by incumbent workers whenever they choose to become new workers in a different industry), (ii) it incorporates a richer structure for the product market, (iii) it introduces MNCs – exceptional firms whose wage setting is affected by factors exogenous to the local labor and product markets. The wages paid to incumbent workers by domestic firms are affected by the expansions of MNCs in three ways. First, since MNCs and domestic firms compete for workers in the labor market, the expansion of MNCs affects wages through a standard increase in labor demand. Second, since MNCs pay a premium beyond the market wage, the expansion of MNCs shifts the composition of jobs in those same industries towards jobs with a wage premium. Third, since domestic firms are directly and indirectly exposed to MNCs through supply linkages, the expansion of MNCs can potentially affect domestic wages through rent-sharing between the worker and her domestic employer.

Three structural parameters govern the magnitude of the wage gains of incumbents from MNCs. The first is the cost of hiring and training the first hire (as a proportion of the domestic market wage). The second is the elasticity of hiring and training costs with respect to the number of new hires. These two parameters inform us about the marginal cost of replacement of an incumbent worker and, thus, of the potential wage gains of an incumbent worker when her employer improves its performance. The last parameter is the elasticity of worker retention with respect to the posted wage. This parameter informs us how much an incumbent worker at a domestic firm can benefit from increases in her outside options and replacement costs. We estimate these parameters in Section 5.5.

[36] Proposing a microfoundation for the MNC premium is outside the scope of this paper. That said, Section 3 discusses a set of plausible explanations, such as the existence of MNC-specific policies over wage equity within the MNC group. Note that the MNC premium (which results from comparing the wages paid to new hires by MNCs vs. the wages paid to new hires by domestic firms) is conceptually different from the within-firm difference between the wages paid to incumbent workers vs. those paid to new hires.

5.1 The Product Market

The production of MNCs and their demand for domestic intermediates. For notational simplicity, we assume that there is only one MNC per industry s, which we denote by $MNC(s)$. We assume that the MNC in s faces a demand given by $Q_{MNC(s)} = B_{MNC(s)} p_{MNC(s)}^{-\sigma}$, where σ is the elasticity of demand and $B_{MNC(s)}$ is a demand shifter. We assume that $B_{MNC(s)}$ is set in the rest of the world and is exogenous to labor and product market conditions in the domestic economy. For brevity, we suppress the subscript s for now. All MNCs have a constant elasticity of substitution (CES) production function given by:[37]

$$Q_{MNC} = T_{MNC}\Big(L_{MNC}^{\frac{\sigma-1}{\sigma}} + J_{MNC}^{\frac{\sigma-1}{\sigma}}\Big)^{\frac{\sigma}{\sigma-1}},$$

where T_{MNC} is the factor-neutral productivity of the MNC, L_{MNC} is the labor employed by the MNC, and J_{MNC} is a composite of domestic varieties purchased from an MNC-specific exogenous set of domestic suppliers $\mathcal{S}_{MNC}$. The composite of intermediates is given by $J_{MNC}^{(\sigma-1)/\sigma} = \sum_{j\in\mathcal{S}_{MNC}} q_{j,MNC}^{(\sigma-1)/\sigma}$, where $q_{j,MNC}$ is the quantity of the domestic variety sold by firm $j \in \mathcal{S}_{MNC}$ to the MNC. The profit-maximizing MNC for the choice of the bundle of intermediates leads to $J_{MNC} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}\left(\frac{A_{MNC}}{P_{MNC}}\right)^{\sigma}$ where $A_{MNC} \equiv B_{MNC}^{\frac{1}{\sigma}} T_{MNC}^{\frac{\sigma-1}{\sigma}}$ is a revenue shifter for the MNC. The demand from the MNC for the variety of supplier j is equal to:

$$q_{j,MNC} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} \frac{A_{MNC(s)}^{\sigma} Q_{MNC(s)}}{J_{MNC(s)}} \equiv b_{MNC(s)} p_j^{-\sigma}, \tag{9}$$

where $b_{j,MNC)} \equiv P_{MNC}^{\sigma} Q_{MNC}$. A_{MNC} is determined only by forces outside of the domestic economy, i.e., by the exogenous worldwide demand for the product of the MNC subsidiary, B_{MNC}, and its exogenous productivity, T_{MNC}. An increase in either B_{MNC} or T_{MNC} triggers increases in the demand for inputs from domestic firms $j \in \mathcal{S}_{MNC}$.

Final demand for the products of domestic firms. We assume that domestic firms sell their output to either a domestic final good producer f or MNC subsidiaries.[38] Workers in this economy consume a final good Y, which is produced by final good producer f. Firm f does not hire workers but uses a technology that combines a domestic composite Y_{DOM} and an imported variety Y_{IMP} (purchased at an internationally set price). The domestic composite aggregates the production across all industries, which is, itself, an aggregate of the production of all domestic firms in each industry. The production of the final good is given by $Y = \left(Y_{DOM}^{(\sigma-1)/\sigma} + Y_{IMP}^{(\sigma-1)\sigma}\right)^{\sigma(\sigma-1)}$, where

$$Y_{DOM} = \Big(\sum_s \Big[\sum_{j\in s} x_j^{\frac{\sigma-1}{\sigma}}\Big]\Big)^{\frac{\sigma}{\sigma-1}},$$

and where x_j is the demand for the variety produced by firm j in industry s. This demand is given by $x_j = P^{\sigma} Y p_j^{-\sigma} \equiv b_{DOM} p_j^{-\sigma}$, where $b_{DOM} \equiv P^{\sigma} Y$ and P is the overall price index in the economy (over domestic and imported varieties).

The total demand for the variety of each domestic firm j is given by the demand coming from the

[37] We assume the same elasticity of substitution σ in the demand and production functions. While this assumption is made for simplicity, it does not impact the insights of the model.

[38] This has the disadvantage of not allowing domestic firms to be exposed to MNCs indirectly through their domestic buyers. Nonetheless, by not allowing domestic firms to sell inputs to other domestic firms, we abstract from the choice of intermediate goods and simplify the domestic firm problem.

domestic market and the demand coming from all of its MNC buyers:

$$Q_j = x_j + \sum_{s' \in \mathcal{B}_j} q_{j,MNC(s')} = b_{DOM} p_j^{-\sigma} + \sum_{s' \in \mathcal{B}_j} b_{j,MNC(s')} p_j^{-\sigma} = (b_{DOM} + B_{j,MNC}) p_j^{-\sigma} = B_j p_j^{-\sigma},$$

where $\mathcal{B}_j$ is the set of MNC buyers of firm j (if firm j does not supply any MNC subsidiary, then $\mathcal{B}_j$ is empty), $B_{MNC} \equiv \sum_{s' \in \mathcal{B}_j} b_{MNC(s')}$ and $B \equiv b_{DOM} + B_{MNC}$.

5.2 The Labor Market

There are two types of workers in our model: new workers and incumbent workers. New workers can be thought of as inexperienced workers, without previous attachment to a firm or industry. Incumbent workers start the period employed by firm j in industry s. Incumbent workers decide whether to remain with their current employer or join the pool of new workers to change employer.

Wage posting firms start with a number of incumbents I_j^0. They then need to make two decisions: the wage to post for incumbent workers (W_j) and the number of new workers to hire (N_j) at the competitive wage in s. When hiring N_j new workers, firms need to pay a recruitment and training cost $c(N_j)$. We assume $c(.)$ is twice differentiable and convex, which is consistent with the empirical evidence in favor of increasing marginal costs of recruitment (Manning, 2011). At the end of the period, the firm has a total of $L_j = I_j(W_j) + N_j$ workers available for production.

The hiring and wage setting of MNCs. Since our main interest, at this point, is on the effects of MNCs on employees working in domestic firms, we make two simplifying assumptions. First, we assume that MNCs start the period without incumbent workers of their own. This is equivalent to assuming that MNCs enter the economy at the beginning of the period. MNCs hire both on the entry market of new workers and on the market of former incumbent workers who break ties with their domestic employer. Therefore, for MNCs, $L_{MNC(s)} = N_{MNC(s)}$ (where L denotes the total number of workers in firm $MNC(s)$ and N denotes the total number of new workers hired by $MNC(s)$).

Our second simplifying assumption is that the MNC in s pays a wage $\psi_s \omega_s$, where ω_s is the domestic market wage of industry s, and $\psi_s \geq 1$ is a wage premium set exogenously by the HQ. We allow for heterogeneities in wage setting across industries.[39] ψ_s could be microfounded with MNC-wide fairness policies that bring the wage of new hires by MNCs in s from the domestic entry wage ω_s to a wage closer to that of HQ workers ($\psi_s \omega_s$).

When MNC subsidiaries hire new workers, they need to pay a hiring and training cost $C_{MNC}(N_{MNC(s)})$. To simplify derivations, we assume $C'_{MNC}(N_{MNC}) = c_0 N_{MNC}^{\alpha_m}$ (where $\alpha_m \geq \alpha > 1$ and where α is the corresponding exponent for the marginal cost of hiring and training of domestic firms). With α_m and α above 1, there are increasing marginal costs of hiring and training. The possibility that MNCs incur higher costs of hiring and training is consistent with MNCs employing workers in tasks with a more specialized and proprietary nature.

The labor market for new workers. At the beginning of the period, new workers receive taste shock draws for all industries. Their preferences over industries are distributed i.i.d. type 1 extreme value with dispersion parameter $1/\eta_N$. The draws of taste shocks are private information for new workers. Within an industry, new workers can be hired by either domestic firms or the MNC in that industry. All new workers hired by domestic firms j in industry s receive the domestic market wage in that industry, denoted ω_s. All new workers hired by MNCs receive an industry-specific premium over the domestic

[39] In our model, when an incumbent worker leaves her firm to join a firm in industry s, she is paid ω_s if hired by a domestic firm j in s or paid $\psi_s \omega_s$ if hired by the MNC in s.

market wage in that industry. Specifically, a new worker hired by the MNC in s is paid $\psi_s\omega_s$ ($\psi_s \geq 1$). We assume that when hiring new workers, all firms in industry s take ω_s as given.

We assume that after choosing an industry s, new workers are assigned randomly to firms in that industry, such that the probability to join a given (domestic or MNC) firm is equal to the share of its demand for new workers over the total demand for new workers in industry s ($\frac{N_j}{N_s}$ for domestic firms or $\frac{N_{MNC)(s)}}{N_s}$ for the MNC). This random search feature implies that new workers cannot choose whether to join a domestic firm or the MNC in s. Their choice of industry is based on the expected or average wage for new workers (denoted by $\tilde{\omega}_s$) and not on the realized wage (either ω_s or $\psi_s\omega_s$). We do not allow new workers to revisit their choice of an industry once the random allocation of an employer in that industry has materialized.[40] This assumption is in line with the "good jobs" literature, which argues that above-market wages in "good jobs" can be sustained as an equilibrium outcome when they are rationed and assigned based on "luck", i.e., there is no feature of the worker that makes her more deserving of the job in terms of productivity or preferences (see Green, 2015, for a discussion).

Given these assumptions, the overall supply of new workers to industry s is given by

$$l_{Ns} = \frac{\tilde{\omega}_s^{\eta_N}(\psi_s)}{\sum_{s'} \tilde{\omega}_{s'}^{\eta_N}(\psi_{s'})} L_N^0, \tag{10}$$

where L_N^0 is the start-of-period economy-wide number of new workers, and $\tilde{\omega}_s(\psi_s) \equiv \omega_s \left(1 - \frac{N_{MNC(s)}}{N_s}\right) + \psi_s\omega_s \frac{N_{MNC(s)}}{N_s}$. This way to model the expected wage has a precedent in Beaudry et al. (2012). Note that whenever $\psi_s = 1$ (MNCs do not pay a wage premium) then $\tilde{\omega}_s(\psi_s) = \tilde{\omega}_s(1) = \omega_s$. In such case, the composition of employment (domestic vs. MNC employers) is irrelevant and all new workers in s are paid the same market wage ω_s. Otherwise, $\tilde{\omega}_s$ is increasing in the MNC wage premium ψ_s and in the share of new workers hired by the MNC in industry s

The labor market for incumbent workers. Incumbent workers start the period employed by a domestic firm. They choose whether to stay or leave their beginning-of-period employer for a new employment opportunity depending on the wage posted by their initial employer, the expected competitive market wages in all industries, and their draws. In contrast to new workers, who choose to join industry s' (without prior firm or industry attachment), incumbent workers from firm j in industry $s(j)$ who become new workers in industry s' pay a cost to change industries that depends on their starting and ending industry $\left(\tau_{s(j)s'} \leq 1\right)$. We model this as an iceberg cost on the competitive market wage in industry s'.[41]

The initial number of incumbent workers of each domestic firm j in industry s is denoted by I_j^0 and is taken as given. The domestic firm has to decide and post a wage W_j for incumbent workers at the beginning of the period. After the wage is posted, incumbent workers decide whether to remain with firm j and earn W_j, or to switch to a different employer.

Incumbents draw a taste shock for their current employer and for all industries, which leads to upward-sloping supply curves to their domestic employer and all industries. The draws of taste shocks are private information for incumbent workers. While these taste shocks are not verifiable to the firm, the firm knows they are distributed i.i.d. type 1 extreme value with dispersion parameter $1/\eta_I$. Firms

[40] In a dynamic version of the model, new workers would have to wait one period for new taste draws across industries and employer draws within an industry. Moreover, we would need to assume workers are myopic, as they do not acknowledge that they become incumbents during the next period and that each firm would have a firm-specific rent-sharing.

[41] Because our model is a one-period model, this iceberg cost is equivalent to incumbent workers experiencing a permanent tax on their wages. A dynamic version of the model is one in which workers forfeit part of their wage only during the period when they switch industries, as at the beginning of the next period these workers become incumbents again. This assumption is consistent with industry-specific human capital (Neal, 1995).

take this into account when posting a wage for their incumbents.

Similar to the new workers, incumbent workers draw taste shocks for industries but cannot choose their employer in an industry (which is assigned randomly after the incumbent worker chooses an industry). If they decide to leave their employer but remain in industry s, the former incumbent worker has a probability $\left(N_{MNC(s)}/N_s\right)$ to be hired by an MNC and receive a wage equal to $\psi_s\omega_s$ and a probability $\left(1-N_{MNC(s)}/N_s\right)$ to be hired by a domestic firm and receive a wage ω_s. This way to think about outside options is similar in spirit to that of Beaudry et al. (2012). The expected wage of incumbent workers who break ties with their initial employer but stay in s is the same as the expected wage of new workers in s $(\tilde{\omega}_s(\psi_{s'}))$. Incumbent workers from industry s who move to s' experience an expected wage of $\tau_{ss'}\tilde{\omega}_{s'}(\psi_{s'})$.

The decision of an incumbent worker in firm j is based on the wage posted by the current employer (W_j), the vector of expected wages in all industries $(\tilde{\boldsymbol{\omega}})$, the vector of moving costs $(\boldsymbol{\tau}_{s(j)})$, and the individual-specific taste shocks drawn at the beginning of the period. Given all these assumptions, when the employer posts a wage W_j, the labor supply of incumbent workers to their employer j is:

$$I_j(W_j;\boldsymbol{\psi}) = \frac{W_j(\boldsymbol{\psi})^{\eta_I}}{W_j(\boldsymbol{\psi})^{\eta_I}+\sum_{s'}\left(\tau_{s(j)s'}\tilde{\omega}_{s'}(\psi_{s'})\right)^{\eta_I}} I_j^0 \equiv \frac{W_j(\boldsymbol{\psi})^{\eta_I}}{\Omega_{js}(W_j,\tilde{\boldsymbol{\omega}};\boldsymbol{\psi})^{\eta_I}} I_j^0 \equiv \pi_j(W_j,\tilde{\boldsymbol{\omega}};\boldsymbol{\psi}) I_j^0, \tag{11}$$

where $\Omega_{js}(W_j,\tilde{\boldsymbol{\omega}};\boldsymbol{\psi}) = \left(W_j(\boldsymbol{\psi})^{\eta_I}+\sum_{s'}\left(\tau_{s(j)s'}\tilde{\omega}_{s'}(\psi_{s'})\right)^{\eta_I}\right)^{1/\eta_I}$. We allow the taste dispersion parameter of incumbent workers to possibly differ from the taste dispersion parameter of new workers ($\eta_I \neq \eta_N$).[42] $\pi_j(W_j,\tilde{\boldsymbol{\omega}};\boldsymbol{\psi}) \equiv \frac{W_j(\boldsymbol{\psi})^{\eta_I}}{\Omega_{js}(W_j,\tilde{\boldsymbol{\omega}};\boldsymbol{\psi})^{\eta_I}}$ is the share of the initial number of incumbent workers of firm j $\left(I_j^0\right)$ that remain with the firm, which is a function of the wage set by the firm for incumbents W_j and the vector of industry-specific expected entry wages $\tilde{\boldsymbol{\omega}}(\boldsymbol{\psi})$.

5.3 The Problem of the Domestic Firm

Domestic firms produce using only labor and sell their output to either the final good producer f or to MNCs. The production function of firm j is given by $Q_j = T_j L_j$, where T_j is its physical productivity and L_j is the total number of workers. The total demand for the variety of firm j is given by $Q_j = B_j p_j^{-\sigma}$, where $B_j \equiv b_{DOM} + \sum_{s'\in\mathcal{B}_j} b_{j,MNC(s')} \equiv b_{DOM} + B_{j,MNC}$. The revenue of firm j is given by

$$p_j Q_j = B_j^{\frac{1}{\sigma}} Q_j^{\frac{\sigma-1}{\sigma}} = B_j^{\frac{1}{\sigma}} T_j^{\frac{\sigma-1}{\sigma}} L_j^{\frac{\sigma-1}{\sigma}} = A_j L_j^{\frac{\sigma-1}{\sigma}}, \tag{12}$$

where $A_j \equiv B_j^{\frac{1}{\sigma}} T_j^{\frac{\sigma-1}{\sigma}}$ is the revenue shifter of firm j. Note that there is an isomorphism between the demand shifter of the firm and physical productivity. To simplify notation, we focus on the revenue shifter A_j as the heterogeneous feature of firm j.

Firm j in industry s chooses the number of new hires N_j and the wage of its incumbent workers W_j that maximize its profits:

$$\max_{N_j,W_j} \quad A_j\left(I_j(W_j)+N_j\right)^{\frac{\sigma-1}{\sigma}} - \left(\omega_{s(j)}N_j + W_j I_j(W_j)\right) - c\left(N_j\right),$$

where the first term represents the total revenue of firm j, the second term represents its wage bill, and

[42] We assume that incumbent workers receive new draws of their taste shocks (new relative to those received in a pre-period – which we do not model – when those workers were "new workers"). Put differently, we assume that the taste shocks received by a worker when she was a new worker are uncorrelated to the taste shocks received when she is an incumbent.

the third and last term represents its recruitment and training cost.

From the first-order condition (FOC) with respect to the number of new hires N_j, we obtain that, the firm equates the marginal revenue product MRP_j with the marginal cost of a new hire $\omega_{s(j)} + c'(N_j(\boldsymbol{\psi}))$:

$$MRP_j(\boldsymbol{\psi}) = \omega_{s(j)} + c'(N_j(\boldsymbol{\psi})), \tag{13}$$

where $MRP_j(\boldsymbol{\psi}) = \frac{\sigma-1}{\sigma} A_j L_j(\boldsymbol{\psi})^{-\frac{1}{\sigma}} = \frac{\sigma-1}{\sigma} A_j \left(I_j(W_j;\boldsymbol{\psi}) + N_j(\boldsymbol{\psi})\right)^{-\frac{1}{\sigma}}$.

From the FOC with respect to the wage of incumbent workers, and by assuming that firm j disregards its effect on $\Omega(W_j, \tilde{\boldsymbol{\omega}})$, we obtain that:

$$W_j(\boldsymbol{\psi}) = \frac{\eta_I}{\eta_I + 1} MRP_j(\boldsymbol{\psi}). \tag{14}$$

Equation (14) is useful to discuss the two types of labor market imperfections in our model and the conditions under which the model collapses to the competitive benchmark. The first labor market imperfection comes from domestic firms internalizing that incumbents have an upwards sloping supply curve to the firm. As in standard monopsony models, the firm equates the marginal revenue product of an incumbent worker to her marginal factor cost. This results in a posted wage equal to an exploitation rate $\frac{\eta_I}{\eta_I+1}$ times MRP_j. Thus, employers exert market power over their workers.

The second labor market imperfection stems from the existence of exogenous MNC premia $\psi_s \geq 1$. Workers supply labor to industries according to the expected wage $(\tilde{\omega}_s)$, which is higher than the wage paid by domestic firms (ω_s). The possibility of receiving the premium makes workers over-supply labor to industries with higher MNC presence. Since workers are randomly allocated to firms according to the share of MNC employment in the industry, too many workers end up working for domestic employers with lower MRP_j than that of alternative domestic employers in other industries (with fewer MNCs).

We can rearrange the terms of equation (14) to provide an intuitive expression for the two labor market imperfections. Define $MRP_j(1)$ as the optimal marginal revenue product in the absence of MNCs (or whenever MNCs do not pay a premium). $\psi = 1$ leads to an efficient MRP_j because domestic firms hire new workers according to the domestic market wage and new workers supply labor to each industry according to the same market wage. We can write equation (14) as:

$$W_j(\boldsymbol{\psi}) = \frac{\eta_I}{\eta_I + 1} MRP_j(1) + \frac{\eta_I}{\eta_I + 1}(MRP_j(\boldsymbol{\psi}) - MRP_j(1)).$$

Note that the first term incorporates a market power distortion whenever η_I is finite. However, the second term incorporates a distortion even when domestic firms face an infinitely elastic labor supply ($\eta_I \to +\infty$) because the MNC premium ψ creates a wedge in the optimal allocation at domestic firms. It is also apparent from the previous equation that our model collapses to the fully competitive benchmark only when $\eta \to +\infty$ and $\psi = 1$ at the same time.

5.4 First-Order Approximation of the Equilibrium Conditions

The equilibrium in this economy is characterized by the set of posted wages and new hire decisions such that equations (13) and (14) are satisfied $\forall j$. It also has to satisfy the market clearing condition for new workers presented in equation (A19).

Given the non-linearity of the equilibrium conditions described above, it is not possible to find a closed-form solution of the wage setting equation for incumbent workers at domestic firms. We consider a log-linearized version of the equilibrium conditions of this economy. We denote $\hat{X}$ as log-deviation of

variable X from its equilibrium and interpret it as percentage deviations and $\overline{X}$ as the equilibrium value of variable X around which the first order approximation is taken. We focus on the main equations and their intuition here and refer the reader to Appendix C for all the derivations.

We are interested in the determinants of changes in wages set by domestic firms for their incumbent workers. Using the first order conditions of the profit-maximization problem of a domestic firm j, we show in equation (A14) of Appendix C.1 that one can write the equilibrium log-linear approximation for the change in the wage set by j for its incumbent workers as:

$$\widehat{W}_j = \beta_{1j}\widehat{A}_j + \beta_{2j}\widehat{\omega}_{s(j)} + \beta_{3j}\sum_{s'\neq s(j)}\pi_{js'}\widehat{\omega}_{s'} + \beta_{4j}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right), \tag{15}$$

where $\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}$ are elasticities and $\pi_{js'} \equiv \frac{\left(\tau_{ss'}\overline{\omega}_{s'}\right)^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$ is the equilibrium probability that a worker from firm j moves to a market s'.[43] The first term on the right hand side represents the effect of changes in revenue shifters of firm j on incumbent wages. It is through this term that the wage setting of firm j is exposed to the MNC shock. The second term refers to changes in the competitive wages of new workers in the same market as firm j. The third term refers to changes in the competitive wages in other markets. These latter changes influence the wages of firm j depending on the ability of its workers to move to each market s', which is reflected in the equilibrium probabilities $\pi_{js'}$. The last term is related to changes in the composition of employment towards MNC jobs that pay a premium $\psi_{s'}$. As before, the changes in employment composition in market s' depend on how "easy" it is for workers from firm j to transition into market s'.

Our model also allows us to link the changes in wages and employment to the fundamental revenue shifters (both demand from clients and productivity of firms) in general equilibrium. This is useful for two main reasons: (i) it motivates the construction of our measures of labor market exposure and firm-level exposure to the expansion of MNC employment, and (ii) it also lays out the model-consistent conditions for the exclusion restriction that our IV strategy had to satisfy. Using the dependence between the competitive entry wages and the revenue shifters of firms in general equilibrium we show in Appendix C.2 that we can write equation (15) as:

$$\begin{aligned}\widehat{W}_j =& \Gamma_{1j}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=MNC\in s''}\lambda_{s'ks''}\widehat{A}_k\right) + \Gamma_{2j}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right)\\ &+ \Gamma_{3j}\sum_{s'\in\mathcal{B}_j}\theta_{MNC(s')j}(1+\varphi_{s'})\widehat{A}_{MNC(s')} + \Gamma_{4j}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=DOM\in s''}\lambda_{s'ks''}\widehat{A}_k\right)\\ &+ \Gamma_{5j}\widehat{T}_j + \Gamma_{6j}\theta_{DOMj}\widehat{b}_{DOM},\end{aligned} \tag{16}$$

where $\{\Gamma_{1j}, \Gamma_{2j}, \Gamma_{3j}, \Gamma_{4j}, \Gamma_{5j}, \Gamma_{6j}\}$ are equilibrium elasticities mediating effects. The right-hand side of this equation has six terms that affect the wage of a worker in firm j in industry s.

The first two terms capture the spirit of our measure of labor market exposure described in Section 4 (although we use changes in employment to proxy for the changes in revenue shifters in the model). The first term captures how changes in revenue shifters affect the labor demand in each market. It is a weighted average of the weighted changes in revenue shifters of MNCs in different industries. Then the weighted sum is weighted by the transition probabilities $\pi_{js'}$. The second term captures how changes in

[43] In our model, the β_j elasticities are firm-specific, since they depend on the initial characteristics of each firm before the "MNC shock." We lay out the identification assumptions for the estimation of the average of each elasticity and its relation to the primitives of the model in the next subsection.

the composition of employment affect wages beyond changes in labor demand. This term is a weighted average of the relative employment of MNCs multiplied by a term that reflects the differential wage premium. The third term is akin to our measure of firm-level exposure described in equation (7). This term captures how changes in the revenue shifters of MNCs, multiplied by the elasticity of size to sourcing $(1+\phi_s)$, affect wages in firm j depending on $\theta_{MNC(s')j}$, where $\theta_{MNC(s')j} = \overline{b}_{,MNC(s')}/\overline{B}_j = \overline{q}_{j,MNC}/\overline{Q}_j$ is the equilibrium share of sales that firm j sells to each MNC in s'.

The last three terms relate to changes in domestic shifters that affect wages of firm j, and that could occur for other reasons unrelated to changes in MNC shifters. Thus, these three terms are part of our regression error in equation (5). The fourth term is identical to the first term of equation (16), with the exception that it refers to revenue shifters of domestic firms. It captures changes in labor demand in local firms. These changes could happen, for example, if domestic workers become more productive in a given industry. The fifth term $\widehat{T}_j$ is the change in firm-level physical productivity that is unrelated to any level of exposure to MNCs (e.g., a change in management or organization of the firm). Finally, the last term $\theta_{DOMj}\widehat{b}_{DOM}$ is the product of the change in the demand shifter of the domestic consumer $\widehat{b}_{DOM}$ times the degree of exposure of firm j to the domestic client producing the final good θ_{DOMj}.

This model-based decomposition is helpful when considering the exclusion restrictions in the estimation of equation (5). Any shock that affects both the revenue shifters of MNCs and domestic firms in the same market would violate the exclusion restriction of the OLS estimator. A valid instrument should, thus, affect the revenue shifters of MNCs without having a systematic correlation with the revenue shifters of domestic firms. We believe that our instrumental variables, exploiting variation in the global employment of MNCs with subsidiaries in Costa Rica, represent plausibly valid candidates.

5.5 Estimation of Key Model Parameters and Discussion

In this subsection we use equation (15) to obtain estimates of the average elasticities β_j and to link these estimates to the structural parameters of the model. In particular, we are interested in obtaining estimates for the retention-wage elasticity (η_I), the cost of hiring and training of a worker as a proportion of the market wage (c_0/ω_s), and the elasticity of the marginal cost of hiring and training with respect to the number of hires (α). To do this we proceed in five steps. First, we write each of the elements of $\{\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}\}$ explicitly in a model-consistent way. Second, we estimate the reduced-form average elasticities. Third, we present estimation and results for the retention-wage elasticity η_I. Fourth, we calibrate the relevant equilibrium shares from the data. Fifth, we use the estimated elasticities together with the calibrated parameters to infer estimates of $\{c_0/\omega_s, \alpha\}$. We do this last step by minimizing the norm of the distances between the estimated elasticities and the structural elasticities. We also compute standard errors of $\{c_0/\omega_s, \alpha\}$ using a bootstrap procedure.[44]

Step 1. Model-consistent elasticities. We can write $\{\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}\}$ as:

$$\beta_{1j} \equiv \frac{\xi_j^C \alpha\sigma}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1-\pi_{jj})}$$

$$\beta_{2j} \equiv \frac{(1-\xi_j^C)(1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1+\pi_{js})}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1-\pi_{jj})}$$

[44] The elasticities could also be estimated using a simulated method of moments in which we simulate the economy of the model and infer the elasticities that would produce the closest regression coefficients to the ones obtained with the true data. We leave this alternative for future work.

$$\beta_{3j} = \beta_{4j} \equiv \frac{\xi_j^C \xi_j^I \alpha \eta_I}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha \eta_I (1-\pi_{jj})}, \tag{17}$$

where $\xi_j^I \equiv \frac{\overline{I}_j}{\overline{L}_j}$ (equilibrium share of incumbents in the total number of workers), $\xi_j^C \equiv \frac{c_0 \overline{N}_j^{\alpha}}{c_0 \overline{N}_j^{\alpha} + \overline{\omega}_s}$ (equilibrium share of the hiring and training marginal cost in the total labor cost per worker). $\beta_{3j} = \beta_{4j}$ because from the point of view of firm j, it does not matter whether incumbent workers could find more attractive options in other markets due to higher competitive wages or a shift in composition towards MNCs paying a premium. This equivalence is similar to the one discussed by Beaudry et al. (2012) in the context of a search-bargaining model. We use this equality to regroup the terms in equation (15) and write it as:

$$\begin{aligned}
\widehat{W}_j = & \frac{\xi_j^C \alpha\sigma}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha \eta_I (1-\pi_{jj})} \widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I) + \xi_j^C \xi_j^I \alpha \eta_I (1+\pi_{js})}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha \eta_I (1-\pi_{jj})} \widehat{\omega}_{s(j)} \\
& + \frac{\xi_j^C \xi_j^I \alpha \eta_I}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha \eta_I (1-\pi_{jj})} \underbrace{\left[\sum_{s' \neq s} \pi_{js'} \widehat{\omega}_{s'} + \sum_{s'} \pi_{js'} \frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})} \left(\widehat{N}_{MNC(s')} - \widehat{N}_{s'} \right) \right]}_{\widehat{\mathcal{C}}_s} \\
= & \beta_{1j} \widehat{A}_j + \beta_{2j} \widehat{\omega}_{s(j)} + \beta_{3j} \widehat{\mathcal{C}}_s.
\end{aligned} \tag{18}$$

The new element $\widehat{\mathcal{C}}_s$ combines the third and fourth terms from equation (15). Thus, it includes both the incumbents' wage effects coming from changes in the competitive wages in other labor markets and from changes in the composition of employment towards MNC jobs that pay a premium.

Step 2. From model to estimation. Our goal in the second step is to bring the previous equation to the data. To remain as close to the equation from the model as possible, there are four points to make. First, we need to address the construction of the explanatory variables. We compute the growth in the competitive wage paid to new workers in domestic firms in market s (ω_s) as the growth in the average residualized earnings paid to all new workers in domestic firms in market s. We compute residual earnings using the residuals of a earnings regression after controlling for individual fixed effects, year of birth dummies, a college dummy, a sex dummy and a Costa Rican national dummy. Then, we compute $\widehat{N}_{MNC(s)}$ and $\widehat{N}_s$ as the growth of new employment of MNCs and domestic firms in market s. Finally, we compute $\widehat{A}_j = \frac{\widehat{VA_j}}{L_j} - \frac{\sigma-1}{\sigma} \widehat{L}_j$, as suggested by the model.

Second, in the model, the β_j elasticities are heterogeneous. To obtain the average elasticities, we write the empirical counterpart of equation (18) as follows:

$$\widehat{W}_{it} = \overline{\beta}_1 \cdot \widehat{A}_{j(i),t} + \overline{\beta}_2 \cdot \widehat{\omega}_{s(i),t} + \overline{\beta}_3 \cdot \widehat{\mathcal{C}}_{s(i),t} + \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \varepsilon_{it}, \tag{19}$$

where ε_{it} is equal to $(\beta_{1j} - \overline{\beta}_1)\widehat{A}_{j(i),t} + (\beta_{2j} - \overline{\beta}_2)\widehat{\omega}_{s(i),t} + (\beta_{3j} - \overline{\beta}_3)\widehat{\mathcal{C}}_{s(i),t}$ net of the fixed effects. Equation (19) is the specification we take to the data.

Third, we aim to provide a consistent estimation of the average elasticities $\{\overline{\beta}_1, \overline{\beta}_2, \overline{\beta}_3\}$. These coefficients capture the average effect of the firm-level revenue shifters, the market wage, and the composition term on wages of incumbent workers in domestic firms. We also use these coefficients to infer our parameters of interest through equation (17). We rely on an IV strategy similar to the one used in Section 4. We construct the instruments for $\widehat{A}_{j(i),t}$, $\widehat{\omega}_{s(i),t}$, and $\widehat{\mathcal{C}}_{s(i)t}$ by leveraging the changes in global

employment of MNCs with subsidiaries in Costa Rica.[45]

Fourth and finally, under certain conditions, the heterogeneity of the β_j elasticities might pose a threat to identification. A consistent estimation of the average elasticities in equation (19) requires stronger assumptions for the IV strategy. This happens because the residual ε_{it} may be correlated with the instruments even if the instruments are uncorrelated with the heterogeneous coefficients. A sufficient condition discussed in Card (2001) and Heckman and Vytlacil (1998) in the context of heterogeneous returns to education, and adapted to our context, would have two parts. First, the instruments need to be uncorrelated with the heterogeneous coefficients. Second, the first stage regression should provide consistent estimates of the effect of the instrument of the endogenous variables (i.e., the instruments should be uncorrelated with the error term in the structural version of the first stage regression). The first condition would be violated, for example, if more able workers chose to work for domestic firms that supply MNCs that experience larger future global growth. The second condition would be violated if there are other factors that affect domestic firms' or sectoral wage growth in Costa Rica, which also affect the global growth of MNCs with subsidiaries in Costa Rica. However, as seen in Section 4.3, this concern is less likely to be warranted whenever the parent and its subsidiaries are in different industries.

Step 3. Estimates of the retention-wage elasticity. Before discussing the calibration of the parameters $\{\sigma, \xi_j^I, \pi_{jj}, \pi_{js}, \overline{N}_j\}$, we estimate one of our parameters of interest: the retention-wage elasticity η_I. To do this in a model-consistent way, we rearrange equation (11) and take logs on both sides to write:

$$\ln\left(\frac{I_j(W_j)/I_j^0}{1-I_j(W_j)/I_j^0}\right) = \eta_I \ln(W_j) + \ln\left(\sum_{s'}\left(\tau_{s(j)s'}\omega_{s'}\right)^{\eta_I}\right),$$

where the right hand side represents the log retention rate on the population of incumbents at each firm j. We then estimate the empirical counterpart of the previous equation. The second term on the right-hand side is a function of changes in the wages of all industries. We proxy for this function using a fine set firm and industry-region-year fixed effects. Our estimating equation is:

$$\ln\left(\frac{I_{jt}/I_{jt}^0}{1-I_{jt}/I_{jt}^0}\right) = \eta_I \ln(W_{jt}) + \alpha_j + \gamma_{ind(s(j))\times reg(s(j))\times t} + \varepsilon_{jt}, \tag{20}$$

where I_{jt}^0 is the number of workers of firm j who are observed working for j in both $(t-2)$ and $(t-1)$, i.e., the incumbents of firm j at the beginning of year t. I_{jt} is the number of workers of firm j who are observed working for j in $(t-2)$, $(t-1)$, and t, i.e., the workers who were incumbents at the beginning of year t and continue with firm t throughout t. $log(W_{jt})$ is the log of the yearly average labor earnings of incumbent workers who remain at firm j in year t (i.e., those I_{jt} workers who are observed employed by firm j in $(t-2)$, $(t-1)$, and t). An observation in equation (20) is a firm-year. We instrument $\ln(W_j)$ with the same instrument that we use for our measure of firm-level exposure to MNCs.

Table 6 reports the first stage, reduced form, OLS and IV regressions based on this equation. Our IV specification finds an estimate for the retention-wage elasticity η_I of 9.28. From the first order condition of the domestic firm problem (equation (14)) our estimate of η_I implies a value of the exploitation index $\frac{\eta_I}{1+\eta_I}$ of 0.90. This value is relatively high compared to other estimates in the literature (e.g., Manning, 2011; Berger et al., 2019; Kline et al., 2019). However, it is difficult to find an appropriate benchmark for our result since most of the evidence on monopsony or rent-sharing comes from developed countries.

[45] Concretely, $IV\left(\widehat{A}_{j(i),t}\right) \equiv IV\left(\Delta FLE_{j(i),t}\right) = \sum_m \theta_{j(i)m,t-1}\Delta\mathcal{O}_{mt}$, $IV\left(\widehat{\omega}_{s(i),t}\right) \equiv \Delta\mathcal{O}_{s(i),t}$ and $IV\left(\widehat{\mathcal{C}}_{s(i),t}\right) \equiv \sum_{s'\neq s}\pi_{js'}\Delta\mathcal{O}_{s',t} + \sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\Delta\mathcal{O}_{s',t}$. For the last term, both $\pi_{js'}$ and $\overline{N}_{MNC(s')}/\overline{N}_{s'}$ are calculated using 2006 to 2008 data.

Ours is the first paper that uses plausibly exogenous firm-level shocks to estimate their pass-through to workers' wages in a developing country setting. In addition, we focus our estimation on private domestic firms only, which are numerous (close to 30,000) and tend to be small (with a mean and median number of employees of 16 and 5, respectively). Thus, it may not be surprising to find that domestic firms have low labor market power.

As shown in Table 5, we find that a 10% increase in value added per worker leads to a 0.9% increase in incumbent wages, a result in the range suggested by previous research using matched employer-employee data (Card et al., 2018). Our different value of $\eta_I/(\eta_I+1)$ is consistent with the fact that, in our model, η_I governs the pass-through of both improvements in outside options and employer-level shocks. Besides, an infinitely elastic retention-wage elasticity ($\eta_I \to +\infty$) is not a sufficient condition for our model to collapse to the perfectly competitive labor market benchmark in the presence of MNC wage premia $\psi_s > 1$. Hence, the large value of η_I does not mean that labor markets are close to perfectly competitive. However, it does suggest that incumbent workers see firms as close substitutes and that markdowns under the marginal product of labor are small. Therefore, it appears that the monopsony power of domestic firms does not play an important role in our context. Most of the labor market imperfections are due to wedges that the MNC premia create in the labor market.

Step 4. Calibration of equilibrium moments. To estimate the structural parameters $\{c_0/\omega_s, \alpha\}$, we need to take a stand on six equilibrium moments. First and foremost, we set $\eta_I = 9.28$, as estimated using our IV strategy in the previous step. We set a value of $\sigma = 5.03$ (estimated in Alfaro-Urena et al. (2019b) for other purposes but in the same context). This value is close to the standard values of around six which are common in the literature (Broda and Weinstein, 2006). The other four moments are computed using averages across firms in our data. We set ξ_j^I (the share of incumbents among total workers) equal to 0.67. We set π_{jj} and π_{js} (the probabilities that an incumbent stays at her firm and that she moves to another firm in the same market, respectively) equal to 0.70 and 0.12 respectively. Finally, we set $\overline{N}_j$ (the average number of new hires) equal to 5.08.

Steps 5. Estimation of the marginal hiring and training cost. Tables 7 and 8 contain the results from the estimation of equation (19). Table 7 presents the first stage and reduced form, while Table 8 reports the OLS and IV results. Panel A of Table 8 refers to the estimated coefficients of equation (19). Panel B refers to the inferred structural parameters from our model. As in our estimation of indirect effects if Section 4, we focus on incumbent workers at domestic firms.

The IV results imply that, for each dollar increase in the revenue shifter of firm j ($\hat{A}_j$), incumbent workers get around nine cents. The results also show that an exogenous increase of 1% in the competitive market wage of a given market s implies that incumbents in that market see their wage increase by 1.81%. The more than proportional wage increase is rationalized in our model by a high replacement cost.

The value of $c_0/\overline{\omega} = 0.60$ implies that the cost of hiring and training the first new worker is 60% of the competitive market wage. Moreover, the positive value of the marginal cost elasticity $\alpha = 0.25$ implies that the cost of hiring and training increases are convex. However, we are unable to reject that α is statistically different from zero, which suggests that hiring and training costs could be linear in the number of hires.[46]

The value of $c_0/\overline{\omega}$ together with a marginal hiring and training cost elasticity α imply that the average marginal cost of hiring and training is 0.9 times the competitive wage ($C'(\overline{N}_j)/\overline{\omega}_{s(j)} = c_0/\overline{\omega} \times$

[46]The literature has found both convexity and linearity of the hiring and training cost, e.g., Dix-Carneiro et al. (2019) develops a structural model to study informality and finds that hiring costs are very convex for firms in the tradable sector (equivalent to $\alpha = 2.28$ in our notation), whereas Bloom (2009) cannot reject linearity in a linear-quadratic model of employment adjustment.

$\overline{N}_j^{\alpha} \approx 0.9$). This magnitude is smaller but comparable to the estimated replacement cost of around 1.1, faced by U.S. firms after a patent allowance shock (Kline et al., 2019). These features make firms responsive to improvements in the outside options of their workers.

To provide a quantification of the importance of the marginal replacement cost on changes in wages one can go back to the partial-equilibrium wage setting equation of firm j. Consider the log-linearized version of equation (14) after replacing MRP_j by the elements in equation (13):

$$\begin{aligned}\widehat{W}_j =& \frac{\overline{\omega}_{s(j)}}{\overline{\omega}_{s(j)}+C'(\overline{N}_j)}\widehat{\omega}_{s(j)} + \frac{C'(\overline{N}_j)}{\overline{\omega}_{s(j)}+C'(\overline{N}_j)}\widehat{c'(N_j)} = \frac{1}{1+C'(\overline{N}_j)/\overline{\omega}_{s(j)}}\widehat{\omega}_{s(j)} + \frac{C'(\overline{N}_j)/\overline{\omega}_{s(j)}}{1+C'(\overline{N}_j)/\overline{\omega}_{s(j)}}\widehat{c'(N_j)} \\ \approx& \frac{1}{1+0.9}\widehat{\omega}_{s(j)} + \frac{0.9}{1+0.9}\widehat{c'(N_j)} \approx 0.53\widehat{\omega}_{s(j)} + 0.47\widehat{c'(N_j)}. \end{aligned} \tag{21}$$

Therefore, our model implies that the wage growth of employees at firm j would come in roughly similar proportions from changes in the competitive market level outside option and from changes in the replacement cost. This result is consistent with our evidence in Section 4. If we take a proportional change of one standard deviation increase in labor market exposure (SD=7.04) and firm level exposure (SD=0.38), our main IV specification in Table 4 predicts that the earnings of incumbent workers at domestic firms would grow 1.02% (7.04×0.145) due to their increased labor market exposure to MNCs and 1.25% (0.38×3.3) due to their increased firm-level exposure to MNCs. This means that around 45% of the total increase comes from increases in labor market exposure (which reflects improvements in the outside options) and the remaining 55% comes from increases in firm-level exposure (which impact incumbent wages through the increase in the replacement cost of incumbent workers).

Overall, our estimates suggest that a social planner who cares about domestic workers' wages has little room for increasing the ability of workers to earn the full value of their marginal product of labor. There is more potential room for improvement from the side of the cost of hiring and training. While higher replacement costs result in higher wages for incumbent workers, these costs could also constrain firm growth. This can lead to unemployment or informality, margins that fall outside the scope of this paper. Besides, our findings suggest that the planner has scope to help local residents by boosting labor demand both directly through the hiring of MNCs and indirectly through supplying linkages.

6 Conclusion

This paper estimates the effects of MNCs on workers by combining administrative data on all worker-firm and firm-firm relationships in Costa Rica with an instrumental variable strategy that exploits variation in the size of MNCs in the country.

In the first part of the paper, we find a direct MNC wage premium of 9%, which is consistent with MNCs paying above-market wages rather than compensating workers for potential disamenities. The wage premium is not explained away by firm characteristics such as size or technological sophistication and is larger for workers with a college education (12%) than for those without one (8%).

In the second part, we study the indirect effects of MNCs on the wages of incumbent workers at domestic firms. We separately estimate the effects of MNCs on outside options in the labor market and those mediated by changes in the performance of domestic employers from input-output linkages to MNCs. We find that the annual earnings of a worker experiencing a one standard deviation increase in either the labor market or firm-level exposure to MNCs grow one percentage point more than those of an identical worker with no change in either of the MNC exposures.

In the third and final part, we present a stylized model of an economy that allows for both types

of exposure to MNCs. Our model-based estimates imply that workers have a low attachment to their employer and are, therefore, sensitive to changes in their outside options. We also find that domestic firms face high marginal hiring and training costs. These costs are equivalent to one year of worker earnings paid at the domestic market wage. This high cost allows incumbent workers to extract part of the increase in employer rents resulting from higher sales to MNCs.

We highlight three avenues for future research. First, this paper focuses on the effects of MNCs on workers that are measurable with administrative data. While such data cover all formal workers and firms, they exclude the informal sector. This sector accounts for a large share of total employment in developing countries. Recent work has shown how international trade can have significant reallocation effects between the formal and informal sectors (McCaig and Pavcnik, 2018; Dix-Carneiro et al., 2019). MNCs are likely to have an even stronger impact on reallocation than trade, as they embed themselves directly into the labor and product markets of the host country. Understanding the effects of MNCs on informality is vital for a comprehensive assessment of policies to attract MNCs to developing countries.

Second, our results on the direct effects of MNCs suggest that MNCs create "good jobs" in the host economy (Acemoglu, 2001; Green, 2015). While we provide evidence that indicates that MNCs pay above market-clearing wages, more research is required to understand the mechanisms that sustain these wages in equilibrium. The recent paper by Hjort et al. (2019) takes a step in this direction by studying the fairness concerns of the HQs of MNCs as a potential mechanism. More work is necessary to understand this and other types of company-wide policies that could lead to wage premia.

Finally, our model-based results suggest relatively high marginal costs of hiring and training at domestic firms. Such high costs might be one potential explanation for the well-established facts that firms in developing countries tend to be small and low-performing (Tybout, 2000; Bloom et al., 2010) and that they grow relatively little over their life cycle (Hsieh and Klenow, 2014). Future work should provide more direct evidence on the quantitative importance of hiring and training costs in explaining these facts.

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Figures

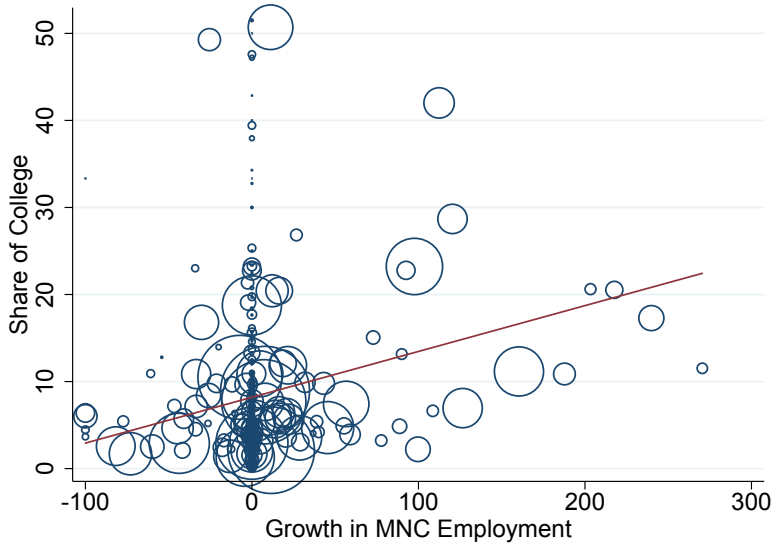
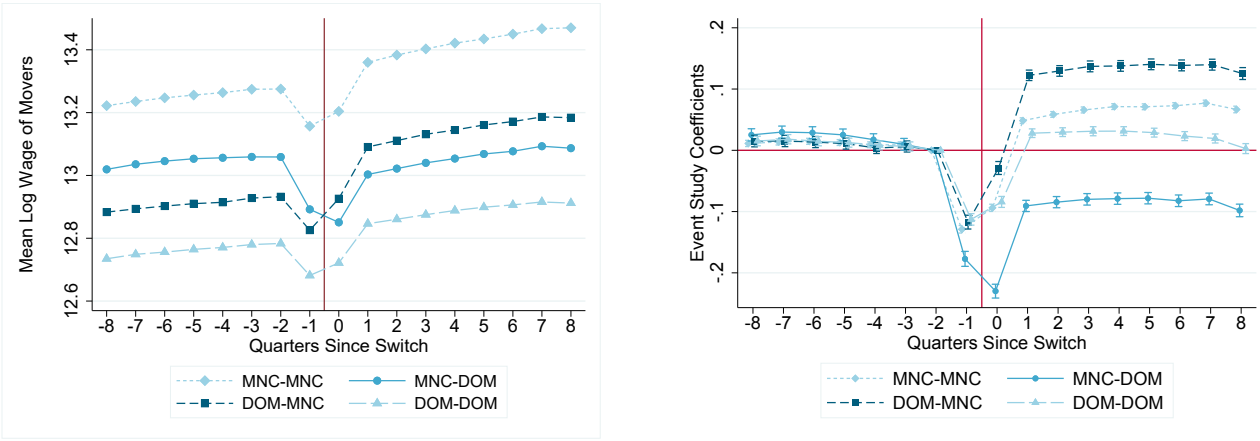


Figure 1: % Growth of MNC Employment between 2009-2017 vs. % Workers with College

Notes: Figure 1 relates the percentage growth in the period of analysis (2009 to 2017) in MNC employment in each of the 412 two-digit industry × region markets in Costa Rica and the share of workers with a college degree in those markets in the pre-period (2006 to 2008). The size of the circle reflects the number of workers in each market in the pre-period (2006 to 2008).

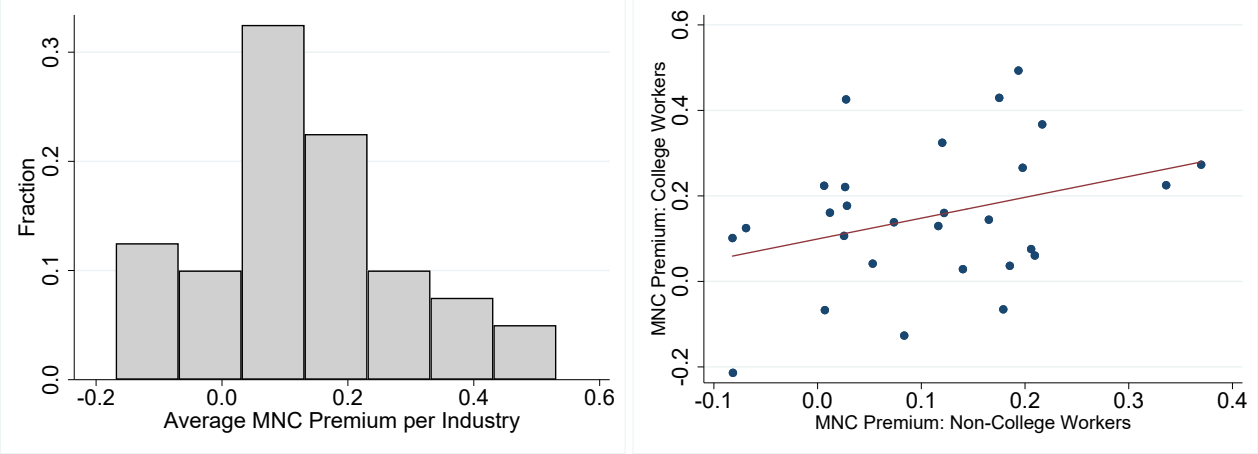


(a) Raw Means

(b) Movers Design

Figure 2: The Wage Effects of Moves To/From Domestic Firms/MNCs

Notes: Panel 2a plots the raw means of log worker quarterly-average labor earnings in each quarter before and after a change in employer. Panel 2b plots the event-study coefficients from the specification in equation (2), where the event is defined as an across-quarter change in employer. The sample is restricted to workers with the same main employer continuously between quarter *-8* and *-1* and the same new main employer between quarters *0* and *+8*. The dependent variable is the log worker quarterly-average labor earnings. In Panel 2b, we use robust standard errors clustered at the individual level.



(a) Histogram of Industry-Specific MNC Premia (b) Within-Industry Coll vs. Non-Coll Premia

Figure 3: The MNC Premium Differs by Industry

Notes: Figure 3a plots the estimates of industry-specific MNC premia based on the movers design and using only moves from domestic firms to MNCs for which both the domestic firm and the MNC are in the same industry. Figure 3b plots the correlation between the MNC premium of college-educated workers in a given industry and the MNC premium of non-college-educated workers in the same industry. The differential premium of college vs. non-college-educated workers is estimated via adding a set of interaction terms between the event dummies and a college-educated dummy in the main movers design specification from equation (2). In both figures, the industry refers to the two-digit industry of each firm.

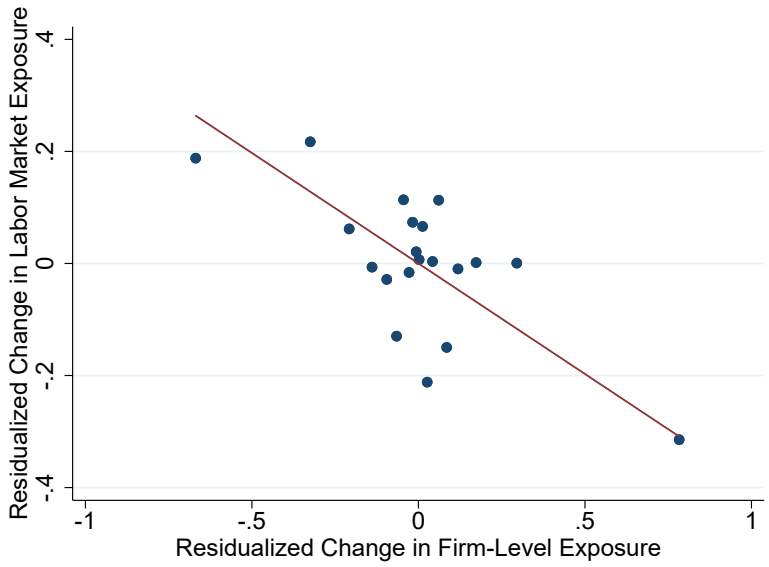


Figure 4: Correlation between Workers' Labor Market and Firm-Level Exposure to MNCs

Notes: Figure 4 displays a binned scatter plot of the worker-year labor market exposure to MNCs with respect to the worker-year firm-level exposure to MNCs. Both measures of exposure have been residualized by the same fixed effects and controls used in our main equation (5). We use twenty equal-sized bins.

Tables

Table 1: The Wage Effect of Moving to/from an MNC Employer: OLS and IV Estimates

	OLS	First Stage	Reduced Form	IV
Dependent Variable	Δw_{it}	$\Delta \mathbb{1}[j(i) = MNC]_t$	Δw_{it}	Δw_{it}
	(1)	(2)	(3)	(4)
$\Delta \mathbb{1}[j(i) = MNC]_t$	0.076^{***}			0.154^{**}
	(0.003)			(0.064)
$IV\ (\Delta \mathbb{1}[j(i) = MNC]_t)$		0.025^{***}	0.004^{**}	
		(0.001)	(0.002)	
Observations	1,529,265	1,529,265	1,529,265	1,529,265
F-Statistic				677.7

Notes: Table 1 presents the OLS and IV estimates for the specification described in equation (3). The goal of this exercise is to estimate the effects of a move to (from) an MNC from (to) a domestic firm on the labor earnings of the moving worker. Column (1) contains the OLS estimate, Column (2) the first stage of the IV exercise, Column (3) the reduced form of the IV exercise, and Column (4) the IV estimate. The dependent variable in Columns (1), (3), and (4) is the change in log yearly labor earnings for worker i between year $(t-1)$ and t. The dependent variable in Column (2) is $\Delta \mathbb{1}[j(i) = MNC]_t$, where $\Delta \mathbb{1}[j(i) = MNC]_t \equiv \mathbb{1}[j(i,t) = MNC] - \mathbb{1}[j(i,t-1) = MNC]$. The IV of $\Delta \mathbb{1}[j(i) = MNC]_t$ is $\Delta \mathcal{O}_{s(i,t-1),t}$, the expansion between $(t-1)$ and t of MNC employment *outside* of Costa Rica for MNCs with subsidiaries in the market of the worker in $(t-1)$ (the year before the move). Each regression controls for $\boldsymbol{X_i}$ (a vector of dummies for worker i characteristics: the college education status, Costa Rican national status, year-of-birth and sex), firm $j(i,t)$ fixed effects (where $j(i,t)$ is the employer of i in t), fixed effects for the industry of the market s of i in $(t-1)$ and t respectively, and fixed effects for the region of the market s of i in $(t-1)$ and t respectively. Each regression uses robust standard errors clustered at the individual level.

Table 2: MNCs Have Better Amenities than Domestic Firms

Dependent Variable	Extra Hours (1)	Paid Extra (2)	Paid Bonus (3)	Paid Sick Leave (4)	Paid Vacations (5)	Hazard Insurance (6)	Soc. Sec. Contrib. (7)
MNC	0.693	0.137**	0.067**	0.162***	0.132***	0.171***	0.192***
	(0.467)	(0.055)	(0.029)	(0.043)	(0.037)	(0.039)	(0.032)
Other Controls							
Wage	0.272	0.070**	0.066***	0.069**	0.078***	0.082***	0.058**
	(0.170)	(0.030)	(0.023)	(0.028)	(0.026)	(0.026)	(0.025)
W/ College	-0.127	-0.026	0.022	0.132**	0.113**	0.115**	0.077
	(0.305)	(0.092)	(0.039)	(0.063)	(0.045)	(0.057)	(0.056)
Male	-0.065	-0.028	0.008	0.053	0.041	0.058	0.084**
	(0.243)	(0.045)	(0.029)	(0.042)	(0.038)	(0.040)	(0.038)
Age	0.083	-0.023	-0.017	-0.009	-0.023*	-0.033**	-0.039***
	(0.069)	(0.017)	(0.012)	(0.016)	(0.014)	(0.015)	(0.014)
Age^2	-0.001	0.000	0.000	0.000	0.000	0.000**	0.000***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	723	469	469	469	469	469	469
Adjusted R^2	0.014	0.035	0.048	0.072	0.080	0.094	0.11

Notes: Table 2 presents OLS regressions on a cross-section of workers surveyed in 2018 as participants in the National Survey of Household Income and Expenditures (abbreviated ENIGH). Column (1) uses as dependent variable the answer to the question: "In the last week, how many hours more than the usual were you required to work for your employer?". Columns (2) to (7) have as dependent variable dummies which take value one if the person answered that her employer is providing her with a given benefit: is paid for extra hours of work (Column (2)), receives a bonus salary at the end of the year (Column (3)), is paid for sick leave (Column (4)), has paid vacation days (Column (5)), has occupational hazard insurance (Column (6)), the employer pays Social Security contributions for the worker (Column (7)). The MNC dummy takes value one if the main employer of the worker was an MNC in 2017. In addition, we control for the log of the average monthly labor earnings of the worker in 2017, whether the worker has a college degree or not (1 if yes), if the worker is male or not (1 if yes), and the age and the square of the age of the worker. As soon as the 2018 matched employer-employee data becomes available, we will match each worker to the employer she had in the actual month when she was surveyed for ENIGH in 2018. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. First Stage, Reduced Form, and Placebo IV for Leading IV Set 1. Stayers Only

	First Stage: Main IV Set 1				Reduced Form: Main IV Set 1			Placebo Reduced Form: Main IV Set 1		
Dep. Var.	$\Delta LME_{s(i),t}$	$\Delta FLE_{j(i),t}$	$\Delta LME_{s(i),t}$	$\Delta FLE_{j(i),t}$	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$IV\left(\Delta LME_{s(i),t}\right)$	0.615***		0.616***	-0.007	0.068**		0.065**			
	(0.120)		(0.120)	(0.007)	(0.031)		(0.030)			
$IV\left(\Delta FLE_{j(i),t}\right)$		0.093***	-0.044	0.093***		0.304***	0.300***			
		(0.010)	(0.044)	(0.010)		(0.077)	(0.077)			
$IV\left(\Delta LME_{s(i),t+1}\right)$								-0.024		-0.024
								(0.022)		(0.022)
$IV\left(\Delta FLE_{j(i),t+1}\right)$									-0.031	-0.030
									(0.073)	(0.073)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	2,721,231	2,721,231	2,721,231
Adjusted R^2	0.91	0.48	0.91	0.48	0.045	0.045	0.045	0.047	0.047	0.047

Notes: Table 3 reports the first stage and reduced form estimates associated to the IV strategy described in Section 4 for the estimation of the regression in equation (5). This exercise uses the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). Δw_{it} is the percentage change in the monthly average labor earnings of worker i between years $(t-1)$ and t. The difference between the reduced form estimates in Columns (5) to (7) and those in Columns (8) to (10) is that in the latter columns we use the value of the instrument from the next period $(t+1)$ (instead of the contemporaneous value of the instrument). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). All regressions include firm fixed effects, region × year, two-digit industry × year, and two-digit industry × region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. OLS and IV Estimates for Leading IV Set 1, Robustness Check Set IV2 and Both Sets Together. Stayers Only

				Main: IV Set 1			Rob. Check: IV Set 2			Rob. Check: Both IV Sets		
Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	IV (4)	IV (5)	IV (6)	IV (7)	IV (8)	IV (9)	IV (10)	IV (11)	IV (12)
$\Delta LME_{s(i),t}$	0.047***		0.050***	0.111**		0.143**	0.111*		0.147**	0.111**		0.145***
	(0.015)		(0.016)	(0.053)		(0.066)	(0.061)		(0.072)	(0.050)		(0.055)
$\Delta FLE_{j(i),t}$		0.718***	0.735***		3.269***	3.291***		3.293*	3.365*		3.274***	3.306***
		(0.137)	(0.134)		(0.909)	(0.910)		(1.826)	(1.834)		(0.868)	(0.866)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017
F-Statistic				26.3	83.4	41.2	35.2	17.9	8.74	40.0	53.2	27.3
Hansen Overid *p*-val										1.00	0.99	1.00

Notes: Table 4 reports the OLS and IV estimates for the regression in equation (5). Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. This exercise uses first the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) in Columns (4)-(6), then the robustness check IV Set 2 (the instrument using changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries) in Columns (7)-(9), and last, both sets of IVs together in Columns (10)-(12). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). All regressions include firm fixed effects, region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education status, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: The Effects of Changes in Labor Market Exposure to MNCs and in Firm Value Added Per Worker on Workers in Domestic Firms. Stayers Only. Leading IV Set 1

	First Stage: Main IV Set 1			Reduced Form: Main IV Set 1		OLS		Main: IV Set 1	
Dep. Var.	$\Delta LME_{s(i),t}$	Δ (*value-added/worker*)$_t$		Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta LME_{s(i),t}$						0.047***		0.129**	
						(0.015)		(0.065)	
Δ (*value-added/worker*)$_t$						0.008***	0.008***	0.092***	0.092***
						(0.001)	(0.000)	(0.029)	(0.029)
$IV\left(\Delta LME_{s(i),t}\right)$	0.616***	-0.152		0.065**					
	(0.120)	(0.227)		(0.030)					
$IV\left(\Delta FLE_{j(i),t}\right)$	-0.044	3.327***	3.242***	0.300***	0.298***				
	(0.044)	(0.648)	(0.653)	(0.077)	(0.077)				
Fixed Effects									
Region × Year	Yes	Yes	No	Yes	No	Yes	No	Yes	No
Two-Digit Industry × Year	Yes	Yes	No	Yes	No	Yes	No	Yes	No
Two-Digit Industry × Region × Year	No	No	Yes	No	Yes	No	Yes	No	Yes
Observations	3,080,017	3,080,017	3,079,984	3,080,017	3,079,984	3,080,017	3,079,984	3,080,017	3,079,984
Adjusted R^2	0.91	0.25	0.27	0.045	0.047	0.046	0.048		
F-Statistic								13.1	24.7

Notes: Table 5 reports the first stage, reduced form, OLS and IV estimates for the modified version of the main regression (equation (8)). The first stage, reduced form, and IV regressions use the leading IV Set 1 (the instruments using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). The modification, which drives the difference between the exercise in this table and that in Table 4, is that instead of the change in firm-level exposure to MNCs, we use the change in the value added per worker of the firm (see equation (8)). Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. Columns (1) to (3) contain the first stage, Columns (4) and (5) contain the reduced form regressions, Columns (6) and (7) the OLS regressions, and (8) and (9) the IV regressions. With the exception of the regression in Column (1), all other regressions have two versions, one with $\Delta LME_{s(i),t}$, and one without. Whenever $\Delta LME_{s(i),t}$ is included, the fixed effects used vary at the region × year and two-digit industry × year levels. Whenever $\Delta LME_{s(i),t}$ is excluded, the fixed effects vary at the region × two-digit industry × year level. All these regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Model-Based Estimation of the Retention-Wage Elasticity for Incumbent Workers

Regression	First Stage	Reduced Form	OLS	IV
Dependent Variable	$log(W_{jt})$	$log(\text{Retention rate}_{jt})$		
	(1)	(2)	(3)	(4)
$log(W_{jt})$			0.269***	9.283***
			(0.054)	(3.197)
$IV\left(log(W_{jt})\right)$	0.007***	0.061***		
	(0.001)	(0.019)		
Fixed Effects				
Two-Digit Industry × Region × Year	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Observations	181,298	181,298	181,298	181,298
Adjusted R^2	0.90	0.45	0.45	
F-Statistic				40.2

Notes: Table 6 reports the first stage, reduced form, OLS and IV regressions based on equation (20). The first stage, reduced form, and IV regressions use the leading IV Set 1 (the instruments using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). W_{jt} is the average wage of incumbents at firm j in year t. For $IV\left(log(W_{jt})\right)$ we use $IV\left(FLE_{j(i),t}\right)$. The retention rate is defined as $\frac{I_{jt}/I^0_{jt}}{1-I_{jt}/I^0_{jt}}$. I^0_{jt} is the number of workers of firm j who are observed working for j in both $(t-2)$ and $(t-1)$, i.e., the incumbents of firm j at the beginning of year t. I_{jt} is the number of workers of firm j who are observed working for j in $(t-2)$, $(t-1)$, and t, i.e., the workers who were incumbents at the beginning of year t and continue with firm t throughout t. By construction, $I_{jt}/I^0_{jt} \leq 1$. $log(W_{jt})$ is the log of the yearly average labor earnings of incumbent workers who remain at firm j in year t (i.e., those I_{jt} workers who are observed employed by firm j in $(t-2)$, $(t-1)$, and t). An observation is a firm-year. Given these definitions, the first year t is 2011 (as incumbents of firms j at the beginning of 2011 need to be observed working for j in 2009 and 2010). ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Model-Based Wage Equation (Reduced Form and First Stage). Stayers Only. Leading IV Set 1

	First Stage: Main IV Set 1			Reduced Form: Main IV Set 1			
	$\hat{A}_{j(i),t}$ (1)	$\hat{\omega}_{s(i),t}$ (2)	$\hat{C}_{s(i),t}$ (3)	Δw_{it} (4)	Δw_{it} (5)	Δw_{it} (6)	Δw_{it} (7)
$IV\left(\hat{A}_{j(i),t}\right)$	0.031***	-0.000	0.001	0.003***			0.003***
	(0.007)	(0.000)	(0.001)	(0.001)			(0.001)
$IV\left(\hat{\omega}_{s(i),t}\right)$	-19.028	2.966***	-4.556**		2.355**		2.515**
	(13.692)	(0.904)	(2.145)		(1.112)		(1.214)
$IV\left(\hat{C}_{s(i),t}\right)$	-1.555	-0.907***	5.256***			-0.019	-0.396
	(3.850)	(0.166)	(0.829)			(0.360)	(0.406)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017
Adjusted R^2	0.22	0.57	0.70	0.045	0.045	0.045	0.045

Notes: Table 7 reports the first stage and reduced form estimates for the model equation (19) and for the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. $\hat{A}_{j(i),t}$ is the change in the firm revenue shifter, $\hat{\omega}_{s(i),t}$ is the change in the competitive market wage, and $\hat{C}_{s(i),t}$ is the change in the composition term. $IV\left(\widehat{A}_{j(i),t}\right) \equiv IV\left(\Delta FLE_{j(i),t}\right) = \sum_m \theta_{j(i)m,t-1}\Delta\mathcal{O}_{mt}$, $IV\left(\widehat{\omega}_{s(i),t}\right) \equiv \Delta\mathcal{O}_{s(i),t}$ and $IV\left(\widehat{\mathcal{C}}_{s(i),t}\right) \equiv \sum_{s'\neq s}\pi_{js'}\Delta\mathcal{O}_{s',t} + \sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\Delta\mathcal{O}_{s',t}$. For the last term, both $\pi_{js'}$ and $\overline{N}_{MNC(s')}/\overline{N}_{s'}$ are calculated using 2006 to 2008 data. Columns (1) to (3) report the estimates from the first stage regressions for each of the three explanatory variables regressed on all three instruments. Columns (4) to (7) report the estimates from the reduced form regressions in which we either introduce one instrument at a time (Columns (4) to (6)) or all instruments at the same time (Column (7)). All regressions include only stayers, i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t. All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Standard errors for the regression coefficients are clustered at the level of the firm. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Model-Based Wage Equation (OLS and IV Estimates) and Estimation of the Structural Parameters. Stayers Only. Leading IV Set 1

Dep. Var. : Δw_{it}	OLS (1)	IV (2)
Panel A: Regression Coefficients		
Change in the Firm Revenue Shifter $\left(\hat{A}_{j(i),t}\right)$	0.008^{***}	0.088^{***}
	(0.001)	(0.030)
Change in the Competitive Market Wage $\left(\hat{\omega}_{s(i),t}\right)$	0.447^{***}	1.817^{***}
	(0.030)	(0.679)
Change in the Composition Term $\left(\hat{\mathcal{C}}_{s(i),t}\right)$	-0.003	0.264^{**}
	(0.004)	(0.134)
Panel B: Inferred Parameters		
Marginal Cost of Hiring and Training of First Hire $\left(\frac{c_0}{\bar{\omega}}\right)$	0.393^{***}	0.602^{***}
	(0.104)	(0.189)
Elasticity of Marginal Cost of Hiring and Training	0.172^{***}	0.255
With Respect to the Number of Hires (α)	(0.035)	(0.216)
Observations	3,080,017	3,080,017
Adjusted R^2	0.047	
F-Statistic		8.02

Notes: Table 8 reports the OLS and IV estimates for the model equation (19) using the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. Both regressions include only stayers, i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t. Both regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Standard errors for the regression coefficients are clustered at the level of the firm. Standard errors for the inferred model parameters are calculated using bootstrap. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

The Effects of Multinationals on Workers: Evidence from Costa Rica

Alonso Alfaro-Urena, Isabela Manelici, and Jose Vasquez

Appendices

These appendices supplement the paper "The Effects of Multinationals on Workers: Evidence from Costa Rica" with the following material:

- Appendix A presents our data construction.
- Appendix B includes additional evidence and robustness checks.
- Appendix C contains detailed model derivations.
- Appendix D provides more context on Costa Rica.
- Appendix E presents details on our data collection from surveys to MNCs.

Appendix A Data

Appendix A.1 Administrative Data

A. Matched employer-employee data. The matched employer-employee data is built on data from the Costa Rican Social Security Fund (*Caja Costarricense de Seguro Social* or CCSS). Given the nature of CCSS records, this data includes only individuals with social security contributions. This excludes the informal sector.

In CCSS, the total contributions to the social security of individuals are split by two types of insurance. The specific regulations of each type of insurance directly affect how an insured person is classified and, therefore, the criteria that must be used for the correct identification of workers. The raw data files were separated by the type of insurance.

The first type of insurance is for "Disability, Old Age and Death" (*Invalidez, Vejez y Muerte* or IVM). Two considerations motivated our choice of the sample of workers. First, not all workers contribute to the IVM (due to exceptions, such as those to workers in the judicial system). Second, non-working individuals can choose to contribute to IVM voluntarily. The second type of insurance is for "Security, Sickness and Maternity" (*Seguridad, Enfermedad y Maternidad* or SEM)," which is mandatory for all salaried workers, independent workers and the retirees of the national pension regimes. Given that the set of SEM contributors is a supraset of the IVM contributors, the analysis will be mainly carried out relying on the SEM records.

The SEM data has a monthly frequency, starts in January 2006, and ends in December 2017. Each line in the SEM data characterizes a given personal tax ID (PID), the type of insurance held, an indicator of whether the insurance is voluntary, the type of disability (if any), gender, age and date of birth, country of birth, monthly labor earnings, code of the occupation, type of work day, location codes for both the individual and the employer, corporate tax ID (CID) of the employer, type of firm, and economic activity of the firm.

The files that resulted from appending the raw monthly files contained a total of 13,804,333 entries in 2006 and ended with a total of 20,948,279 entries in 2017. The next step revolved around the cleaning of the unique tax IDs for both employees and employers. In particular, some tax IDs have changed over time (for instance, because the firm has changed its organizational structure). We have used correspondences to ensure that the same employee or employer can be tracked over time with a unique identifier. Because each employee can have more than one employer per month, each employee has as many monthly entries as employers that month. The minority of cases with duplicates in the employee-employer-month triad were due to either repetition of the entry with different vintages of a tax ID or due to typos that could be addressed manually.

Table A1: Summary Statistics for the Matched Employer-Employee Data

Year	Number of Observations (1)	Number of Individuals (2)	Number of Firms (3)	Mean Log Wage (4)	SD Log Wage (5)	College Educated (6)	Public Sector (7)	MNC Employer (8)	Male (9)	Stayer (10)	Costa Rican National (11)
2006	9,995,988	1,081,025	98,572	12.740	0.786	0.181	0.272	0.180	0.656		0.918
2007	10,429,890	1,155,168	96,398	12.758	0.791	0.176	0.257	0.188	0.656	0.662	0.912
2008	10,157,020	1,084,760	78,441	12.753	0.786	0.160	0.239	0.198	0.662	0.652	0.898
2009	9,946,083	1,058,652	79,433	12.810	0.821	0.168	0.263	0.199	0.653	0.692	0.897
2010	10,265,800	1,079,953	82,353	12.843	0.805	0.167	0.263	0.205	0.651	0.689	0.895
2011	10,572,580	1,103,652	84,186	12.890	0.821	0.171	0.270	0.208	0.647	0.692	0.895
2012	10,994,210	1,139,384	84,637	12.915	0.822	0.172	0.265	0.207	0.648	0.705	0.894
2013	11,076,160	1,134,648	82,053	12.932	0.832	0.175	0.267	0.208	0.644	0.725	0.898
2014	11,100,330	1,133,506	81,011	12.958	0.831	0.176	0.269	0.209	0.643	0.731	0.899
2015	11,100,750	1,135,353	80,526	12.991	0.815	0.179	0.267	0.214	0.641	0.731	0.899
2016	11,351,410	1,163,327	79,630	13.038	0.831	0.179	0.266	0.221	0.637	0.717	0.901
2017	11,635,540	1,191,060	79,892	13.054	0.831	0.180	0.262	0.224	0.632	0.713	0.903

Notes: Table A1 presents summary statistics of the matched employer-employee data with minimal restrictions, i.e., the raw data from which we dropped (i) non-working individuals (those voluntarily insured) and independent workers, and (ii) individuals under age 20 and over age 60. Observations are at the worker $\times$ employer $\times$ month level. If a worker has more than one employer in a given month, she appears as many times that month as the number of employers. Column (2) contains the number of unique personal tax IDs each year. Column (3) includes the number of unique corporate tax IDs each year. Labor earnings are in 2013 CPI-deflated Costa Rican Colones (in 2013, 1 U.S. dollar $\approx$ 500 Colones). Column (6) reports the share of college-educated workers in each year. Column (7) reports the share of workers employed in the public sector in each year. Column (8) reports the share of workers employed by an MNC in the entire formal economy in each year. Column (9) reports the share of male workers in each year. Column (10) reports the share of workers who in a given year have the same main employer as the one they had in the previous year. Column (11) contains the share of workers who are Costa Rican nationals in each year.

In the next stage, we produced descriptive statistics of the data to identify concerning patterns. The variable of most interest to our study is the labor earnings variable. Given the purpose of our research, we dropped non-working individuals (voluntarily insured) and independent workers (for whom there are no alternative means of cross-checking the labor earnings). In addition, we drop individuals under age 20 and over age 60. Table A1 presents summary statistics for this sample.

[TO BE COMPLETED]

On data quality and the Costa Rican labor market: Alfaro-Urena et al. (2019a) is a report on the evolution of labor earnings and inequality in Costa Rica. Because this report benchmarks the patterns in Costa Rica to those in other countries whose matched employer-employee datasets have been extensively used for research, Alfaro-Urena et al. (2019a) is informative on the quality of the data and on the extent to which the Costa Rican labor market is atypical.

B. Other administrative data. The remaining three administrative datasets (firm-to-firm transaction data, corporate income tax data, and foreign ownership data) have been introduced in detail in the Online Appendix F on "Data Construction and Statistics" of Alfaro-Urena et al. (2019b). Please refer to that project for more details than those already presented in Section 2.1.1.

Appendix A.2 Orbis and Compustat Data

To construct instruments for the expansion of MNC subsidiaries in Costa Rica, we have integrated data from two commercial databases: Compustat and Orbis.

A. Compustat. Compustat is a product of Standard&Poor's Global Market Intelligence. Compustat covers publicly-traded companies in the United States and other major markets. Compustat compiles the financial reports filed by public companies, which include variables such as income, expenses, assets, and liabilities.

We used the *Code Lookup* function of Compustat to search manually for the unique Compustat ID (called *gvkey*) of MNC groups with subsidiaries in Costa Rica. Our starting point was the list of 622 MNC subsidiaries in Costa Rica, for which we know the MNC group name and country of ultimate ownership. We undertook this search both in the "North America Fundamentals Annual" and "Global Fundamentals Annual" databases, to cover both U.S. owned and non-U.S. owned MNCs. The search was based on the name of the MNC group. Whenever the search yielded various results, we chose the *gvkey* of the firm whose industry SIC code and reporting period (used as a proxy for the period of activity) coincide with those of the correct MNC. For example, the search for "Intel" (*contains "Intel"*) yields 42 results. Of these, we keep the *gvkey* of "INTEL CORP" whose industry SIC code is 3674 (Semiconductors and Related Devices) and whose reporting period is 1971 to 2018 (which has the highest overlap among all options with Intel's existence since 1968).

This manual search led to finding 173 distinct MNC *gvkeys*. For these 173 *gvkeys*, we exported the following six variables: *ACT - Current Assets - Total, EMP – Employees, LOC – Current ISO Country Code – Headquarters, MKVALT – Market Value - Total - Fiscal, REVT – Revenue - Total, SALE – Sales/Turnover (Net).* We chose the level of consolidation of the accounts as "CONSOL== C," which means that the values exported correspond to the combined reports of the parent and subsidiaries' accounts. The dataset has annual frequency and is an unbalanced panel between 2006 and 2017.

B. Orbis. Orbis is Bureau van Dijk's flagship company database. The financial and balance sheet information in Orbis comes from business registers collected by the local Chambers of Commerce to ful-

fill legal and administrative requirements (Kalemli-Özcan, Sørensen, Villegas-Sanchez, Volosovych, and Yeşiltaş, 2015). The construction of our two proposed instrumental variable sets for the MNC presence in Costa Rica relies heavily on Orbis. We have carried out two major sets of queries, each associated with each IV set (the leading IV set and the IV set used in the robustness check).

The query for the data to construct IV Set 1 (the leading IV set): First, we have queried Orbis for information on all *bvdidnumbers* (unique identifiers of companies in Orbis) with a subsidiary in Costa Rica. These *bvdidnumbers* correspond to the *global ultimate owners* (abbreviated GUOs) of MNC subsidiaries in Costa Rica. Then, for each GUO *bvdidnumber*, we exported information on the NACE Rev 2 four-digit and ISIC three-digit industry codes of the GUO and "key financials and employees." Specifically, in addition to the industry codes, we exported the following variables: the number of employees, operating revenue (turnover), cash flow, total assets, P/L before tax, P/L for period [=Net income], shareholders funds, current ratio (x), profit margin (%), ROE using P/L before tax (%), ROCE using P/L before tax (%), and the solvency ratio (asset-based) (%).

We drop GUOs whose country was the same as the country of the subsidiary, and for which we only observe values for the number of employees and operating revenues in at most one year. The level of consolidation of the data is either "C1" or "C2."[i] For firms with more than one report per consolidation code $\times$ year, we keep the values reported at the latest date. For firms with both C1 and C2 reports in a given year, we take the average between the C1 and C2 values. Last, for firms in both this dataset and our Compustat dataset, we use the information on employment from Compustat to improve the quality of the information on employment from Orbis. Namely, in years when we only observe employment in one of the two datasets, we keep as the final value that unique value. In years when we observe employment both in Compustat and in Orbis, the final value is the average between the Compustat and the Orbis values.

We use this combined (Orbis and Compustat) dataset to construct our leading IV set. This dataset has an unbalanced panel structure between 2006 and 2017. Unfortunately, this dataset does not contain all of the 622 MNCs with subsidiaries in Costa Rica, but only 239 of them. As large firms are overrepresented in both datasets, we, therefore, have MNC-specific information for the largest 239 of the 622 MNCs in Costa Rica.[ii]

How do we proceed in the cases where we lack information to construct $\mathcal{O}_{st}$ and $\mathcal{O}_{mt}$ (see Section 4.3 for definitions)? Whenever we have information on the outside employment of a given MNC, we assign that information to the two-digit industry $\times$ region market s of its MNC subsidiary. To the markets with MNCs in Costa Rica but without data on the outside-of-Costa Rica employment of those MNCs, we assign a value based on the value for that same two-digit industry of that market aggregated at the level of Costa Rica, then apportioned to the region of the market according to the initial share of total employment in that market. In addition, whenever we lack MNC-specific information on its outside of Costa Rica employment, we replace $\mathcal{O}_{mt}$ by $\mathcal{O}_{st}$ (where s is the market that the subsidiary of m is part of in Costa Rica).

The query for the data to construct IV Set 2 (the IV set in the robustness check): Second, we have queried Orbis for information on all *bvdidnumbers* (unique identifiers of companies in Orbis) with a

[i] C1 refers to the account of a company-headquarter of a group, aggregating all companies belonging to the group (affiliates, subsidiaries, etc.), where the company headquarter has no unconsolidated account. C2 refers to the account of a company-headquarter of a group, aggregating all companies belonging to the group (affiliates, subsidiaries, etc.) where the company headquarter also presents an unconsolidated account.

[ii] The subsidiaries of the MNCs whose consolidated accounts we have found employ 58% of all the workers in MNCs subsidiaries in the country.

subsidiary in a list of twenty Latin American and Caribbean countries. This list of countries contains Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Suriname, and Uruguay.

This list yielded a total of 4,595 unique *bvdidnumbers* of GUOs with a subsidiary in at least one of the twenty countries mentioned above. This list includes the list of MNCs identified in the previous step (i.e., the MNCs with a subsidiary in Costa Rica). For each of these *bvdidnumbers*, we exported the same variables as in the step above, that is, their industry codes, and "key financials and employees." Cleaning the raw data involved the same steps as those described in the paragraph above. The structure of the cleaned dataset is an unbalanced panel between 2006 and 2017. We use this dataset to construct the second IV set, which we use in our robustness checks to the leading IV set (described above). As Table A2 shows, over half of these 4,595 MNCs are from one of the following five countries: the United States, Japan, Spain, Canada, and Italy.

Table A2: Countries of the Global Ultimate Owners for MNCs with Subsidiaries in Latin America and the Caribbean

Country	Number	%	Cumulative
US	1,023	22.3	22.3
JP	479	10.4	32.7
ES	382	8.3	41.0
CA	367	8.0	49.0
IT	269	5.9	54.8
GB	264	5.8	60.6
DE	214	4.7	65.2
FR	149	3.2	68.5
IN	110	2.4	70.9
AU	102	2.2	73.1
NL	98	2.1	75.2
SE	93	2.0	77.3
CN	78	1.7	79.0
TW	77	1.7	80.6
CH	62	1.4	82.0
BR	61	1.3	83.3
DK	59	1.3	84.6
KR	57	1.2	85.8
BE	52	1.1	87.0
BM	51	1.1	88.1
CL	38	0.8	88.9
FI	38	0.8	89.7
NO	36	0.8	90.5
Total	4,595	100	

Notes: Table A2 summarizes the country of the global ultimate owner of MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries. For brevity, we do not report the countries that cover the remaining 10% of MNCs.

Appendix A.3 Details on Variable Construction

Definition of the share of total (direct and indirect) sales to MNCs, $\theta^H_{jm,t}$. We want to measure the total (direct plus indirect) sales of each firm in the economy to MNCs in Costa Rica. That is, we consider not only direct sales to MNCs but also indirect sales made through one's clients at different supply-chain distances. This accounts for the fact that while few domestic firms are direct suppliers to MNCs, there are considerably more indirect suppliers. Accounting for indirect sales is in line with recent work on production networks, showing that the network structure of an economy can amplify shocks to specific nodes.

Let N_t be the total number of firms operating in Costa Rica in year t. Denote by N^M_t the number of MNC subsidiaries in the country that same year. While we omit subscript t from now on, note that N_t can differ across years. Define s_{jl} as the share of sales of firm j that go to firm l. Since no firm sells to itself, $s_{jj} = 0$. Now define the $N \times N$ matrix Σ as the matrix containing all the shares s_{jl} of sales between all firms in the economy:

$$\Sigma = \begin{pmatrix} 0 & s_{12} & \dots & s_{1N} \\ s_{21} & \ddots & & s_{2N} \\ \vdots & & \ddots & \vdots \\ s_{N1} & s_{N2} & \dots & 0 \end{pmatrix}.$$

Since the elements of matrix Σ are shares, note that $\sum_l s_{jl} = 1 \ \forall j$. Without loss of generality, we order firms such that the first N^M columns of matrix Σ correspond to the shares firms sell to the N^M MNCs in Costa Rica that year, indexed by m. The column m (containing the sales sold by each firm in the economy to MNC m) is denoted as $\Sigma_m = (s_{1m}, ..., s_{Nm})'$.

Define $\Sigma_m(h) \equiv \Sigma^h \cdot \Sigma_m$, where Σ^h is the h-power multiplication of matrix Σ (for instance, Σ^0 yields the $N \times N$ identity matrix). Intuitively, $\Sigma_m(0) = \Sigma_m$ contains the shares that firms sell directly to MNC m. $\Sigma_m(h)$ contains the shares sold indirectly to MNCs through clients who are at supply-chain distance $(h-1)$.[iii]

We can now define our object of interest. We denote as $\Theta_m(H)$ the vector of total (direct and indirect) shares of sales to MNC m (up to supply chain distance H):

$$\Theta_m(H) = \Big(\sum_h^H S^h \Big) \cdot \Sigma_m.$$

The total share of sales of domestic firm j to MNC m (of degree H) can be found in the entry corresponding to firm j in vector $\Theta_m(H)$. Denote this share by θ^H_{jm}. Going forward, we omit the H superscript.

[iii] In this case, the MNC m is at supply chain distance h. To fix ideas, a firm's *direct* clients are at supply chain distance 0, the clients of one's direct clients are at supply chain distance 1, and so forth. For example, $\Sigma_m(1)$ contains the indirect sales to MNC m, made through one's direct clients (at supply chain distance 0).

Appendix B Additional Evidence and Robustness Checks

Appendix B.1 Descriptive Statistics

Table A3: $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$

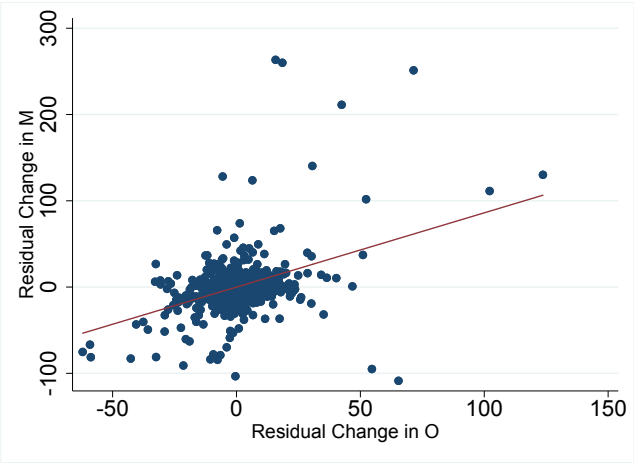
	Number of s	Mean	*p1*	*p10*	*p50*	*p90*	*p99*	SD
Panel A: 2009-2017								
$\Delta\mathcal{M}_{st}$	412	12.9	-100.0	-60.8	1.2	99.7	239.9	68.4
$\Delta\mathcal{O}_{st}$ from IV Set 1	412	21.2	-99.6	-38.7	5.4	96.8	237.5	61.0
$\Delta\mathcal{O}_{st}$ from IV Set 2	412	60.1	-99.5	-32.7	12.4	171.4	1068.2	175.8
Panel B: Yearly								
$\Delta\mathcal{M}_{st}$	3,699	3.7	-83.3	-17.4	0.2	18.1	141.3	111.1
$\Delta\mathcal{O}_{st}$ from IV Set 1	3,699	3.0	-68.4	-12.0	0.7	18.0	127.2	28.4
$\Delta\mathcal{O}_{st}$ from IV Set 2	3,699	6.1	-53.0	-12.7	2.3	22.9	151.1	32.6

Notes: Table presents summary statistics for the market-level growth in MNC employment inside and outside of Costa Rica, $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$, respectively. $\Delta\mathcal{O}_{st}$ can either come from the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) or the robustness check IV Set 2 (the instrument using changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries). Markets are defined at the two-digit industry $\times$ region level. Panel A calculates growth rates over the entire 2009 to 2017 period, whereas Panel B calculates yearly growth rates.

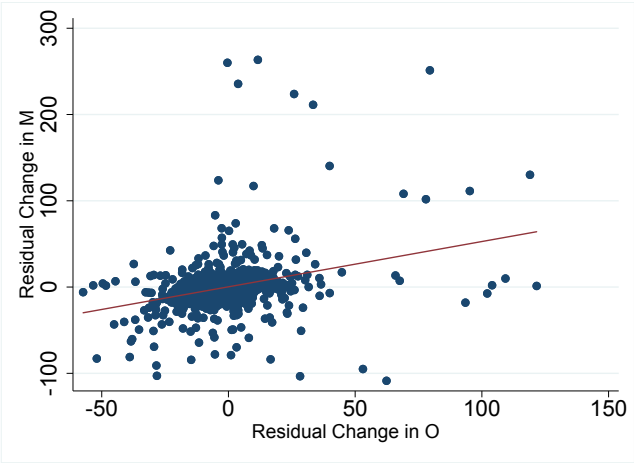
Table A4: Correlation between $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$

	$\Delta\mathcal{M}_{st}$ (1)	$\Delta\mathcal{M}_{st}$ (2)	$\Delta\mathcal{M}_{st}$ (3)	$\Delta\mathcal{M}_{st}$ (4)	$\Delta\mathcal{M}_{st}$ (5)	$\Delta\mathcal{M}_{st}$ (6)
$\Delta\mathcal{O}_{st}$ from IV Set 1	0.814***	0.862***			0.601***	0.608***
	(0.171)	(0.186)			(0.155)	(0.172)
$\Delta\mathcal{O}_{st}$ from IV Set 2			0.525***	0.532***	0.309***	0.315***
			(0.131)	(0.131)	(0.114)	(0.105)
Year FE	No	Yes	No	Yes	No	Yes
Two-Digit Industry FE	No	Yes	No	Yes	No	Yes
Observations	644	644	806	805	629	629
Adjusted R^2	0.15	0.15	0.096	0.075	0.17	0.17

Notes: Table A4 presents the regressions of $\Delta\mathcal{M}_{st}$ on the $\Delta\mathcal{O}_{st}$ from either the leading instrument IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) or the robustness check instrument IV Set 2 (the instrument using changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries). Columns (1) and (2) use the $\Delta\mathcal{O}_{st}$ from IV Set 1, Columns (3) and (4) use $\Delta\mathcal{O}_{st}$ from IV Set 2, and Columns (5) and (6) use both. Odd and even-numbered columns differ in the inclusion or exclusion of year and two-digit industry fixed effects. This regression only contains the markets s with non-zero values of MNC employment.



(a) Corr. b/n $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ from IV Set 1



(b) Corr. b/n $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ from IV Set 2

Figure A1: Growth Rates of MNC Employment Inside and Outside of Costa Rica

Notes: Figure A1 plots the relationship between $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$, the growth rates of MNC employment inside and outside of Costa Rica (residualized of year and two-digit industry fixed effects) associated to two-digit industry $\times$ region markets s in year t. Panel A1a uses the outside Costa Rica employment in the same MNC groups as those with subsidiaries in Costa Rica. Panel A1b uses the growth in MNC employment of groups with a subsidiary in one out of twenty Latin American and Caribbean countries. This figure only contains the observations with non-zero values of MNC employment.

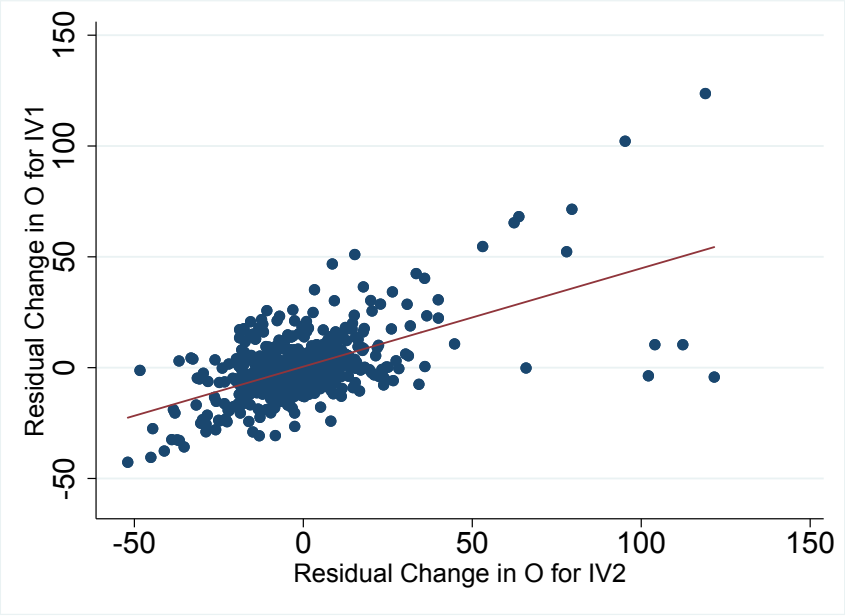


Figure A2: Correlation between $\Delta\mathcal{O}_{st}$ from IV Set 1 and $\Delta\mathcal{O}_{st}$ from IV Set 2

Notes: Figure A2 plots the relationship between $\Delta\mathcal{O}_{st}$ from IV Set 1 and $\Delta\mathcal{O}_{st}$ from IV Set 2 (residualized of year and two-digit industry fixed effects). This plot only contains the markets s with non-zero values of MNC employment.

Table A5: Summary Statistics for the Sample Used in the Movers Design

Group	Number of Observations	Number of Individuals	Number of Firms	Log Wage Before	Log Wage Coworkers Before	Size Before	Log Wage After	Log Wage Coworkers After	Size After
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Movers	1,559,512	84,756	26,093	12.99	12.86	37.66	13.06	12.96	36.96
				0.64	0.48	191.47	0.65	0.50	197.71
MNC-MNC Movers	281,384	15,544	579	13.37	13.18	402.11	13.46	13.28	353.65
				0.65	0.43	868.68	0.69	0.47	860.51
DOM-MNC Movers	234,005	13,754	4,843	12.99	12.87	67.87	13.19	13.14	369.35
				0.60	0.48	205.11	0.58	0.40	864.60
MNC-DOM Movers	190,757	11,217	4,198	13.15	13.02	415.58	13.08	12.97	73.19
				0.62	0.38	876.56	0.64	0.50	222.53
DOM-DOM Movers	853,366	47,114	23,845	12.82	12.71	28.49	12.89	12.80	27.26
				0.59	0.46	114.99	0.58	0.47	114.70

Notes: Table A5 presents summary statistics for the sample of workers to which we apply the movers design described in Section 3. An observation in this table is a worker × quarter × year. The data over which we run the movers regression is balanced, in the sense that each worker is observed for exactly 17 quarters: eight quarters before the move, the quarter of the move, and eight quarters after the move. The only exception applies to the minority of workers who have more than one event. The relevant quarter × year observations of those workers are repeated. This explains why the numbers in Column (1) are slightly larger than the multiplication of Column (2) by 17 (the number of quarter × year of each worker in the balanced panel). Columns (4) to (6) refer to the employer before the move, Columns (7) to (9) refer to the employer after the move. Columns (4) and (7) refer to the labor earnings of the mover, Columns (5) and (8) refer to the average labor earnings of the coworkers of the mover. Labor earnings are in 2013 CPI-deflated Costa Rican Colones (in 2013, 1 U.S. dollar ≈ 500 Colones). Columns (6) and (9) refer to the number of workers at the employer of the mover, before and after. The statistic under each titled average is the standard deviation of the variable above.

Table A6: Summary Statistics for the Steps of the Construction of the Final Sample of Workers in Domestic Firms

Year Sample	Number of Individuals I (1)	Number of Firms I (2)	Number of Individuals II (3)	Number of Firms II (4)	Number of Individuals III (5)	Number of Firms III (6)	Number of Individuals IV (7)	Number of Firms IV (8)
2009	1,054,362	74,519	572,105	40,445	538,048	33,754	388,713	26,186
2010	1,076,511	77,603	574,260	41,089	551,397	35,314	392,635	27,025
2011	1,098,885	79,234	577,738	41,492	553,769	35,715	397,598	28,245
2012	1,137,004	79,783	606,488	41,569	582,969	35,777	426,271	28,667
2013	1,131,449	77,817	594,839	40,252	569,920	34,472	427,442	28,246
2014	1,131,358	76,977	591,820	39,310	566,897	33,938	426,208	27,586
2015	1,130,973	76,634	588,807	39,003	569,029	34,422	420,378	27,454
2016	1,157,860	75,773	597,972	38,708	578,335	34,261	425,066	27,698
2017	1,186,333	75,821	614,469	38,887	578,148	32,026	437,638	27,855

Notes: Table A6 presents the number of unique individuals and firms in four samples. Sample I – the sample in Columns (1) and (2) – includes all workers and firms in the formal economy of Costa Rica each year (without self-employed individuals). Sample II – the sample in Columns (3) and (4) – excludes from Sample I those firms that are MNCs and the public sector, in addition to firms with only one worker. This sample drops all workers whose main employer in a given year is dropped according to these rules. Sample III – the sample in Columns (5) and (6) – keeps only those firms (and their associated workers) from Sample II that are matched to the corporate income tax records and that have the information necessary to compute value added. Sample IV – the sample in Columns (7) and (8) starts from sample III and drops the firms with extreme values for the change in value added per worker (top and bottom 1%). Moreover, it drops the workers with extreme changes in yearly labor earnings (the top and bottom 1%). We also drop observations for which we have missing changes in annual labor earnings (for the worker) or missing changes in value added per worker (for the firm). Sample IV is the final sample used in the analysis of the effects of MNCs workers in domestic firms.

Table A7: Descriptive Statistics of Labor Markets and Workers in the Pre-Period By Tercile of Subsequent Growth in MNC Employment in the Labor Market

	Bottom Tercile Mean (SD) (1)	Mid Tercile Mean (SD) (2)	Top Tercile Mean (SD) (3)	T2-T1 Diff(SE) (4)	T3-T2 Diff(SE) (5)	T3-T1 Diff(SE) (6)
Labor Market Characteristics						
Growth MNC Empl 2009-2017	-22.30	4.34	58.84	26.64***	54.51***	81.14***
	(27.00)	(3.88)	(56.84)	(0.03)	(0.06)	(0.07)
Share MNC Empl 2006-2008	0.21	0.14	0.40	-0.07***	0.26***	0.20***
	(0.23)	(0.15)	(0.29)	(0.00)	(0.00)	(0.00)
MNC Wage Premium	1.088	1.101	1.099	0.013***	-0.002***	0.012***
	(0.10)	(0.08)	(0.10)	(0.00)	(0.00)	(0.00)
Worker Characteristics						
log(labor earnings): All	12.09	12.09	12.18	0.01***	0.08***	0.09***
	(0.68)	(0.67)	(0.70)	(0.00)	(0.00)	(0.00)
log(labor earnings): NC DOM	11.97	11.99	12.00	0.03***	0.01***	0.03***
	(0.21)	(0.20)	(0.18)	(0.00)	(0.00)	(0.00)
log(labor earnings): C DOM	12.71	12.75	12.80	0.05***	0.05***	0.09***
	(0.32)	(0.31)	(0.22)	(0.00)	(0.00)	(0.00)
log(labor earnings): NC MNC	12.24	12.25	12.29	0.01***	0.04***	0.05***
	(0.34)	(0.14)	(0.31)	(0.00)	(0.00)	(0.00)
log(labor earnings): C MNC	13.25	13.21	13.26	-0.04***	0.05***	0.01***
	(0.40)	(0.31)	(0.29)	(0.00)	(0.00)	(0.00)
Male	0.73	0.68	0.69	-0.05***	0.01***	-0.04***
	(0.44)	(0.46)	(0.46)	(0.00)	(0.00)	(0.00)
College-Educated	0.07	0.10	0.10	0.03***	0.00	0.03***
	(0.26)	(0.30)	(0.30)	(0.00)	(0.00)	(0.00)
Observations: Worker-Year	823,193	823,194	823,197	1,646,387	1,646,391	1,646,390

Notes: Table A7 presents descriptive statistics over the sample of workers in the pre-period (2006 to 2008). Note that these are not necessarily the same workers as those in the sample of workers for 2009 and 2017 (over which we run the analysis of the indirect effects). Each observation is a worker-year. Workers from 2006 to 2008 are separated in terciles by the value of the percentage change in MNC employment between 2009 and 2017 ($\Delta\mathcal{M}_{s,2009-2017}$) in their labor market s in a given year (2006, 2007, or 2008). Columns (1), (2), and (3) present descriptive statistics over the workers in the bottom, mid, and top tercile of MNC employment growth from 2009 to 2017. Columns (4), (5), and (6) present the differences between the means of the mid tercile and the bottom tercile, top tercile and mid tercile, and top and bottom terciles, respectively. The average labor earnings are provided for all workers, for those without a college degree and who work for domestic firms (NC DOM), for those with a college degree and who work for domestic firms (C DOM), for those without a college degree and who work for MNCs (NC MNC), and for those with a college degree and who work for MNCs (C MNC). ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A8: Descriptive Statistics of Domestic Firms and Their Incumbent Workers By Tercile of Subsequent Yearly Growth in Firm-Level Exposure to MNCs

	Bottom Tercile Mean (SD) (1)	Mid Tercile Mean (SD) (2)	Top Tercile Mean (SD) (3)	T2-T1 Diff(SE) (4)	T3-T2 Diff(SE) (5)	T3-T1 Diff(SE) (6)
Firm Characteristics						
$\Delta FLE_{j(i),t}$	-0.07	0.001	0.27	0.07***	0.26***	0.34***
	(0.19)	(0.00)	(0.40)	(0.00)	(0.00)	(0.00)
Nr. Employees	20.96	12.01	52.48	-8.96***	40.47***	31.52***
	(93.86)	(88.72)	(162.65)	(0.44)	(0.97)	(1.02)
Worker Characteristics						
log(labor earnings): All DOM	12.48	12.41	12.74	-0.07***	0.33***	0.26***
	(0.47)	(0.47)	(0.48)	(0.00)	(0.00)	(0.00)
Male	0.68	0.60	0.71	-0.08***	0.11***	0.03***
	(0.33)	(0.37)	(0.26)	(0.00)	(0.00)	(0.00)
College-Educated	0.09	0.08	0.12	-0.01***	0.04***	0.04***
	(0.19)	(0.19)	(0.20)	(0.00)	(0.00)	(0.00)
Observations: Firm-Year	61,499	155,398	29,544	216,897	184,942	91,043
Observations: Worker-Year	1,027,639	1,027,639	1,027,639	2,055,278	2,055,278	2,055,278

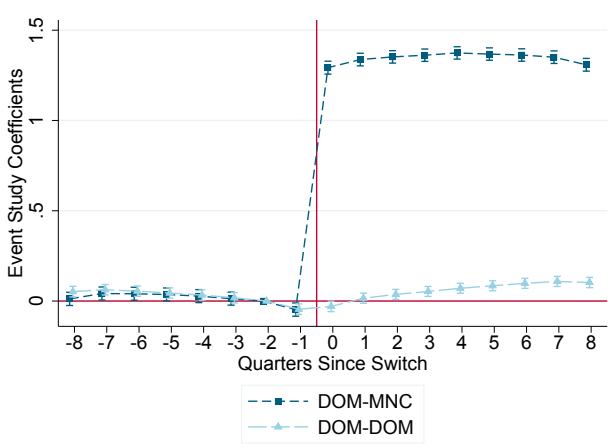
Notes: Table A8 presents descriptive statistics over the sample of domestic firms and their incumbent workers for 2009-2017. We first split the sample of worker-years into terciles according to the annual change in their firm-level exposure to MNCs $\left(\Delta FLE_{j(i),t}\right)$. We collapse the data such that each observation is a firm-year and present the descriptive statistics at the firm-year level (which is the unit of variation of the $\Delta FLE_{j(i),t}$). Columns (1), (2), and (3) present descriptive statistics for the workers in the bottom, mid, and top tercile of changes in $\Delta FLE_{j(i),t}$. Columns (4), (5), and (6) present the differences between the means of the mid tercile and the bottom tercile, top tercile and mid tercile, and top and bottom terciles, respectively. The number of observations in each column corresponds to firm-year observations. Each tercile has 1,027,639 worker-year observations. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix B.2 Magnitude and Interpretation of the MNC Wage Premium

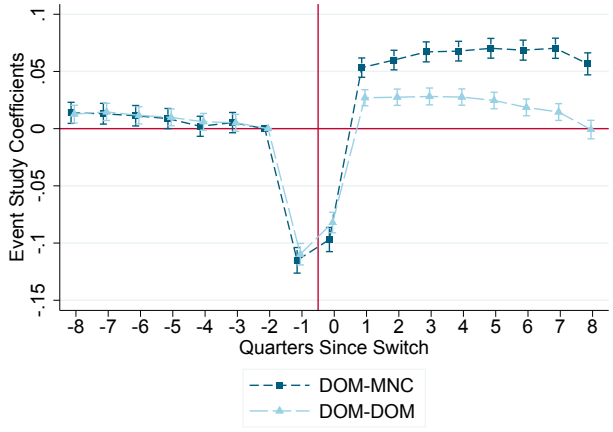
Appendix B.2.1 Robustness Checks on the MNC Wage Premium Estimate from the Movers Design

[TO BE ADDED]

Appendix B.2.2 Additional Evidence on the MNC Wage Premium Estimate from the Movers Design



(a) Log Employer Number of Workers



(b) Log Worker Quarterly-Average Labor Earnings. Controls for Employer Number of Workers and Industry

Figure A3: Employer Size and Worker Quarterly-Average Labor Earnings

Notes: Figure A3 explores the importance of employer size in explaining the change in earnings upon changing employers. Panel A3a uses as dependent variable the log number of workers of the employer that quarter. Panel A3b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel A3b and those in Figure 2 comes from the additional controls in Panel A3b for the logs of the number of workers of the employer that quarter and the square of this number, and the two-digit industry code of the employer. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime and workers of different educational attainment. We use robust standard errors clustered at the individual level.

The following specification estimates non-parametrically the contribution of firm size and industry characteristics to the size of the MNC wage premium. It also uses a more generous definition of the sample than that used in the main sample employed in the movers design. Workers used in the regression described in equation (A1) are only required to have worked for the same employer in the twelve months before a move.

$$w_{it} = \alpha_i + \lambda_t + \mu_r + \rho_o + \sum_{a\in\{\text{DOM,MNC}\}} \sum_{b\in\{\text{SMALL,BIG}\}} \sum_{c\in\{\text{HT,LT}\}} \psi_{(a+b+c)} D_{j(i,t)\in\{a+b+c\}} \tag{A1}$$

where w_{it} is the log of the labor earnings of individual i in month-year t, α_i is an individual fixed effect, λ_t is a month-year t fixed effect, μ_r is a region fixed effect, and ρ_o is an occupation fixed effect. $D_{j(i,t)\in\{a+b+c\}}$ is a dummy that takes value 1 if the employer $j(i,t)$ of i in t has characteristics a, b, and c, where DOM indicates that employer $j(i,t)$ is a domestic firm, MNC indicates that employer $j(i,t)$ is an MNC, SMALL means that the sales of employer $j(i,t) < 5$ million USD, BIG means that the sales of employer $j(i,t) \geq 5$ million USD, HT indicates that the industry of employer $j(i,t)$ is high-tech (according to the OECD classification), and LT indicates that the industry of employer $j(i,t)$ is low-tech. Estimates of the regression described in equation (A1) can be found in Table A9.

Table A9: Does the MNC Size or Industry Explain its Premium? Not Entirely

Dependent Variable: w_{it}	(1)	(2)	(3)
DOM + SMALL + HT	0.031**	0.028**	0.019**
	(0.001)	(0.001)	(0.001)
MNC + SMALL + LT	0.196**	0.198**	0.204**
	(0.003)	(0.003)	(0.003)
MNC + SMALL + HT	0.247**	0.247**	0.229**
	(0.004)	(0.004)	(0.004)
DOM + BIG + LT	0.198**	0.191**	0.179**
	(0.001)	(0.001)	(0.001)
DOM + BIG + HT	0.218**	0.208**	0.193**
	(0.001)	(0.001)	(0.001)
MNC + BIG + LT	0.260**	0.258**	0.248**
	(0.001)	(0.001)	(0.001)
MNC + BIG + HT	0.280**	0.276**	0.252**
	(0.001)	(0.001)	(0.001)
Individual FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region FE	No	Yes	Yes
Occupation FE	No	No	Yes
Observations	6,096,274	6,096,274	6,096,272

Notes: Table A9 presents the estimates of the $\psi_{(a+b+c)}$ coefficients on the dummies of employer characteristics from equation (A1). The reference category is that of an employer which is domestic, small, and in a low-tech industry (DOM+SMALL+LT). Columns (1), (2), (3) differ in the fixed effects used. We use robust standard errors clustered at the individual-level.

***Zona Franca* (Free Zone) status.** Like most countries around the world, Costa Rica has a Special Economic Zone regime called *Zona Franca* (Free Zone) under which authorized businesses (the majority of which MNCs) are exempt from the normal regime applicable in Costa Rica, in particular concerning customs and taxation. Entities established in *Zona Francas* may enjoy tax exemption on the exports of their goods, income tax (ranging from 0% to 100% depending on the activity, location in Costa Rica and the number of years the entity has already enjoyed this benefit), sales tax, selective consumption tax, real estate transfer tax, and withholding tax on remittances abroad, as well as the free possession and use of currencies related to their local operations.

We now investigate whether MNCs attracted in the ZF regime pay different premia to their workers relative to MNCs outside of the ZF regime and subject to the same obligations as domestic firms. The answer to this question is central to policy-making, as one of the most frequent arguments in favor of the ZF regime is that it creates "good jobs" for locals that would have presumably not been created without such a regime. We divide MNC subsidiaries in Costa Rica into two groups: those that are part of the ZF regime and those that are not.

Figure A4 plots the event-study coefficients for three types of moves: from a domestic firm to an MNC in the ZF regime (DOM-MNC(ZF)), from a domestic firm to a non-ZF MNC (DOM-MNC(NOT ZF)), and from one domestic firm to another. The magnitude of a gain upon changing employer is the highest for DOM-MNC(ZF) moves, followed by DOM-MNC(NOT ZF) moves, and then finally, by DOM-DOM moves.

Figure A5 investigates the role of firm size and industry in explaining the difference between the average premium of moves to an MNC in the ZF relative to the average premium of moves to an MNC outside of the ZF. First, in Panel A5a we use the log number of workers of the firm as the dependent variable and find that moves to an MNC in a ZF are moves to larger firms on average than moves to an MNC not in a ZF. This is in line with ZFs targeting firms that can make more substantial investments. Panel A5b plots again the event-study coefficients for the labor earnings as the dependent variable, this time after controlling for the firm size and industry. These controls make moves to a non-ZF MNC and a domestic firm significantly more similar among themselves, particularly in the short-term. However, there remains a significant difference between moving to a ZF MNC versus non-ZF MNC that is not explained away by the size and industry of the MNC.

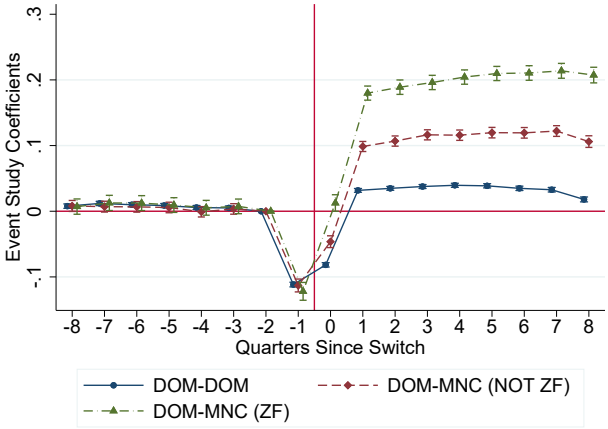
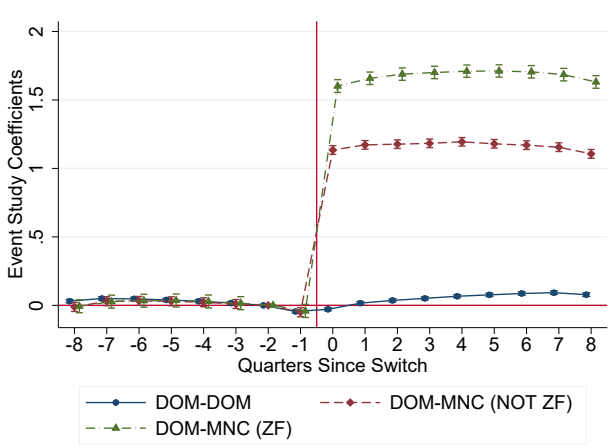
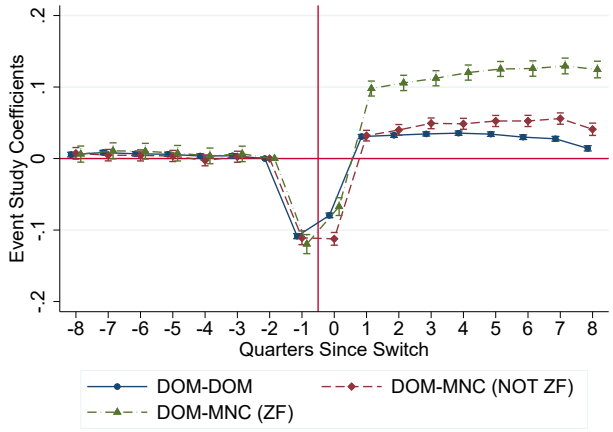


Figure A4: Log Worker Quarterly-Average Labor Earnings. Three Types of Worker Moves (DOM-DOM, DOM-MNC (in FZ), DOM-MNC (not FZ)

Notes: Figure A4 plots the event-study coefficients from a specification where the event is defined as an across-quarter switch in employment. The sample is restricted to workers with the same main employer continuously between quarter *-8* and *-1* and the same new main employer continuously between quarters *0* and *+8*. The dependent variable is the log worker quarterly-average labor earnings. In this exercise, MNCs in Costa Rica are split into two mutually exclusive categories based on whether they belong to the *Zona Franca* (Free Zone) regime or not. We use robust standard errors clustered at the individual level.



(a) Log Employer Number of Workers



(b) Log Quarterly-Average Labor Earnings. Controls for Employer Number of Workers and Industry

Figure A5: Employer Size, FZ Status and Worker Quarterly-Average Labor Earnings

Notes: Figure A5 explores the importance of employer size in explaining the change in earnings upon changing employers. In this exercise, MNCs in Costa Rica are split into two mutually exclusive categories based on whether they belong to the *Zona Franca* (Free Zone) regime or not. Panel A5a uses as dependent variable the log number of workers of the employer that quarter. Panel A5b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel A5b and those in Figure A4 comes from the additional controls in Panel A5b for the logs of the number of workers of the employer that quarter and the square of this number, and the two-digit industry code of the employer. We use robust standard errors clustered at the individual level.

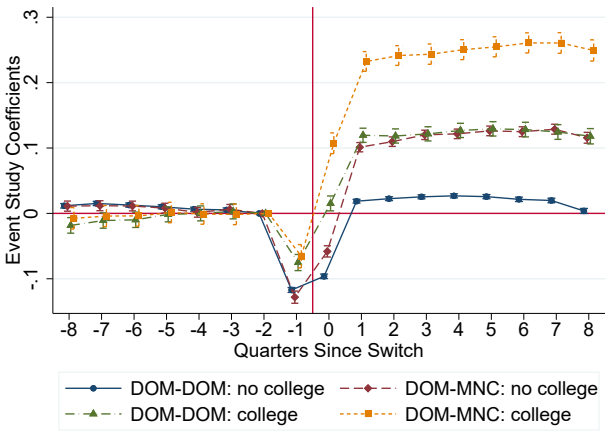
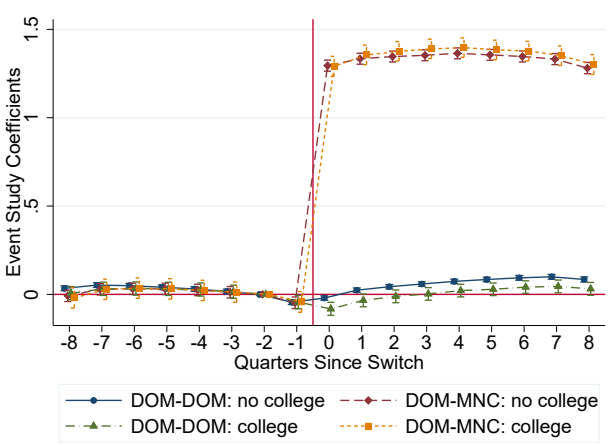
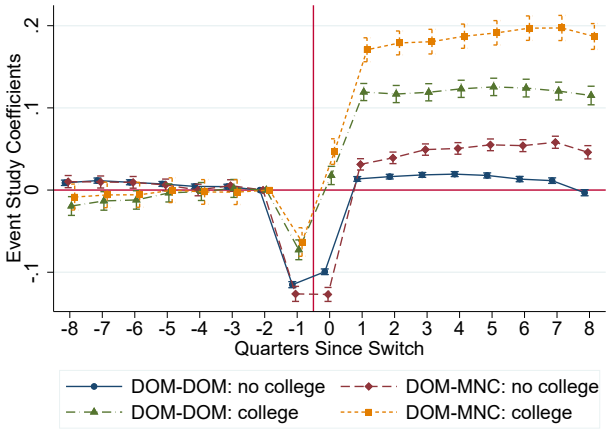


Figure A6: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves (DOM-DOM and DOM-MNC), by Educational Attainment

Notes: Figure A6 plots the event-study coefficients from a specification where the event is defined as an across-quarter switch in employment. Workers are split into two categories of educational attainment: college or more ("college") and less than college ("no college"). The sample is restricted to workers with the same main employer continuously between quarter *-8* and *-1* and the same new main employer continuously between quarters *0* and *+8*. The dependent variable is the log worker quarterly-average labor earnings. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime. We use robust standard errors clustered at the individual level.



(a) Log Employer Number of Workers



(b) Log Worker Quarterly-Average Labor Earnings. Controls for Employer Number of Workers and Industry

Figure A7: Employer Size and Worker Quarterly-Average Labor Earnings, by Educational Attainment

Notes: Figure A7 explores the importance of employer size in explaining the change in earnings upon changing employers. In this exercise, workers are split into two categories of educational attainment: college or more ("college") and less than college ("no college"). Panel A7a uses as dependent variable the log number of workers of the employer that quarter. Panel A7b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel A7b and those in Figure A6 comes from the additional controls in Panel A7b for the logs of the number of workers of the employer that quarter and the square of this number, and the two-digit industry code of the employer. We use robust standard errors clustered at the individual level.

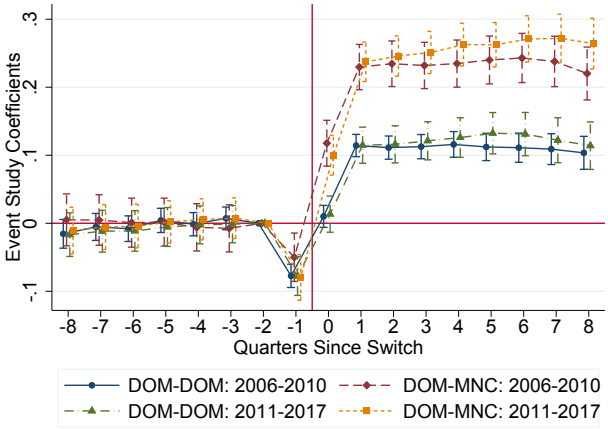
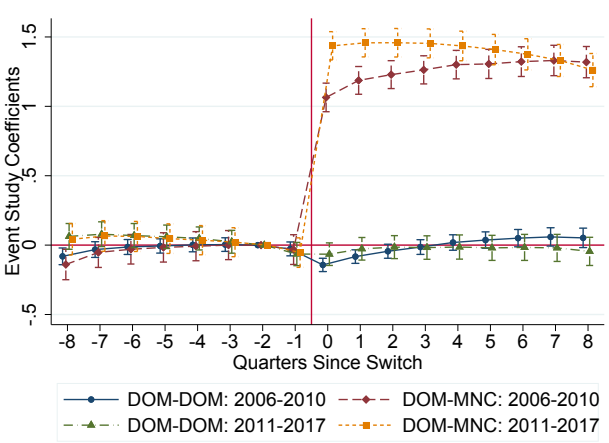
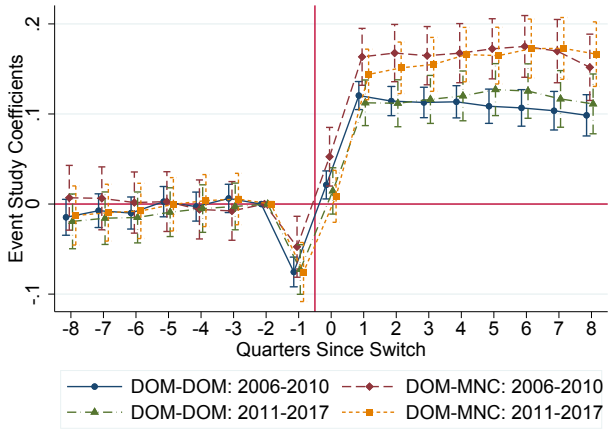


Figure A8: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves: DOM-MNC and DOM-DOM, and Two Periods: 2006-2010 and 2011-2017. **College Graduates Only**

Notes: Figure A8 plots the event-study coefficients from a specification where the event is defined as an across-quarter switch in employment. This exercise only studies workers with college or more. The sample is restricted to workers with the same main employer continuously between quarter *-8* and *-1* and the same new main employer continuously between quarters *0* and *+8*. The dependent variable is the log worker quarterly-average labor earnings. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime. We use robust standard errors clustered at the individual level.



(a) Log Employer Number of Workers



(b) Log Worker Quarterly-Average Labor Earnings. Controls for Employer Number of Workers and Industry

Figure A9: Employer Size and Worker Quarterly-Average Labor Earnings. Two Periods: 2006-2010 and 2011-2017. **College Graduates Only**

Notes: Figure A9 explores the importance of employer size in explaining the change in earnings upon changing employers. This exercise only studies workers with college or more. Panel A9a uses as dependent variable the log number of workers of the employer that quarter. Panel A9b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel A9b and those in Figure A8 comes from the additional controls in Panel A9b for the logs of the number of workers of the employer that quarter and the square of this number, and the two-digit industry code of the employer. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime. We use robust standard errors clustered at the individual level.

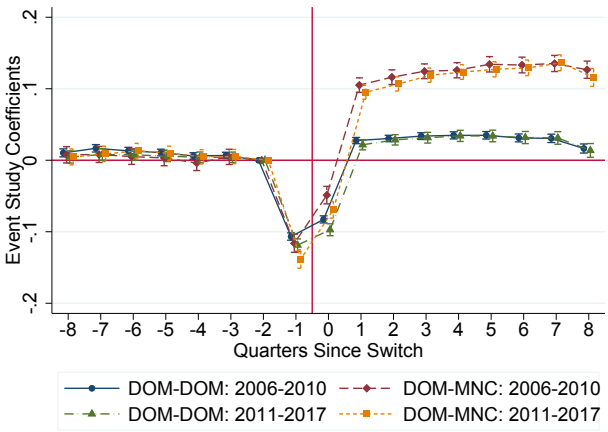
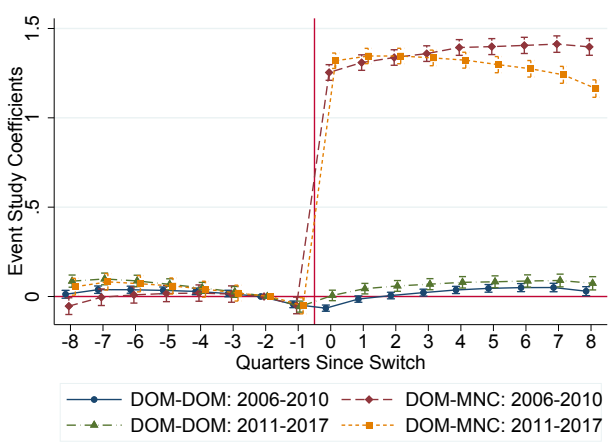
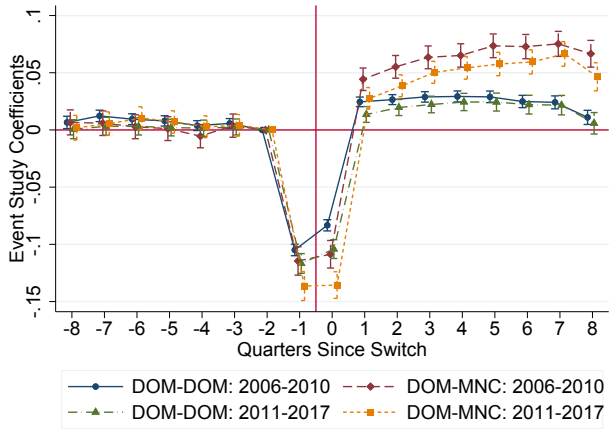


Figure A10: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves: DOM-MNC and DOM-DOM, and Two Periods: 2006-2010 and 2011-2017. **Less Than College Only**

Notes: Figure A10 plots the event-study coefficients from a specification where the event is defined as an across-quarter switch in employment. This exercise only studies workers with less than a college degree. The sample is restricted to workers with the same main employer continuously between quarter *-8* and *-1* and the same new main employer continuously between quarters *0* and *+8*. The dependent variable is the log worker quarterly-average labor earnings. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime. We use robust standard errors clustered at the individual level.



(a) Log Employer Number of Workers



(b) Log Worker Quarterly-Average Labor Earnings. Controls for Employer Number of Workers and Industry

Figure A11: Employer Size and Worker Quarterly-Average Labor Earnings. Two Periods: 2006-2010 and 2011-2017. **Less Than College Only**

Notes: Figure A11 explores the importance of employer size in explaining the change in earnings upon changing employers. This exercise only studies workers with less than a college degree. Panel A11a uses as dependent variable the log number of workers of the employer that quarter. Panel A11b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel A11b and those in Figure A10 comes from the additional controls in Panel A11b for the logs of the number of workers of the employer that quarter and the square of this number, and the two-digit industry code of the employer. This exercise pools together MNCs inside and outside of the *Zona Franca* (Free Zone) regime. We use robust standard errors clustered at the individual level.

Appendix B.2.3 MNC Wage Premium Unlikely To Be Driven by Inferior Amenities at MNCs

(a) Evidence using matched employer-employee data

(a1). Retention probabilities for domestic firms vs. MNCs. Figure A12 shows that workers who start employment at a domestic firm are more likely to change employment in the coming quarters than workers who start employment at an MNC.

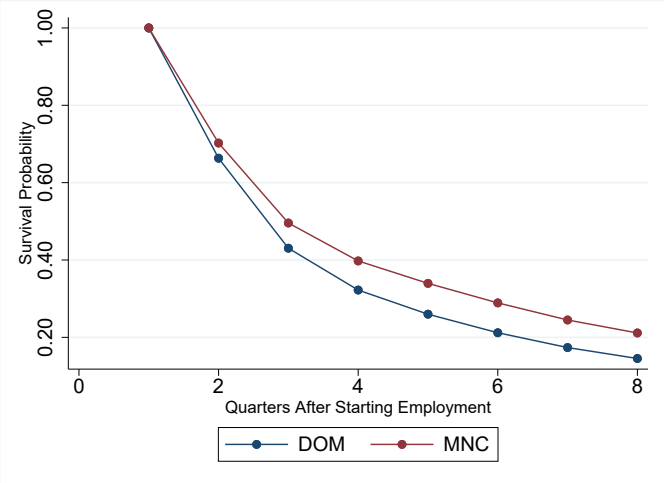


Figure A12: Higher Retention Probabilities at MNCs than at Domestic Firms

Notes: Figure A12 plots the retention probability (i.e., the probability that a worker who started employment in quarter 1 at firm j is still working for firm j in quarter $t \geq 1$) for two groups of workers: (i) workers who start employment in quarter 1 in a domestic firm (in blue, labelled by "DOM") and (ii) workers who start employment in quarter 1 in an MNC (in red, labelled by "MNC"). In both groups, we only include workers who are observed employed by a different firm in the quarter after the separation. For these workers, the separation can be interpreted as a quit (as opposed to a firing). By construction, all workers are working for the given firm in quarter 1, which explains the survival probability of 1 in quarter 1.

(a2). Ease of expanding for domestic firms vs. MNCs. The purpose of this exercise is to inquire how the ratio of wages for new vs. incumbent workers changes with the size of an expansion. We compare how this ratio relates to the size of the expansion for domestic firms vs. MNCs. If MNCs are more attractive employers than domestic firms, as firms aim for a larger expansion, this ratio should get relatively smaller for MNCs than for domestic firms.

Let $\ell_{oj,t}$ be the year-t number of employees of firm j (in industry $k(j)$) who work in four-digit occupation o. Let $\overline{w}_{oj,t}^{INC}$ be the year-t average wage of incumbent workers of firm j in occupation o. Incumbent workers are those who worked for firm j in both years $(t-1)$ and t. Finally, let $\overline{w}_{oj,t}^{NEW}$ be the average wage for workers newly-hired by firm j in the same occupation o in year t. The outcome variable is the ratio of the year t average wages for new workers relative to incumbent workers. Specifically,

$$\text{(Rel Wages)}_{oj,t} = \frac{\overline{w}_{oj,t}^{NEW}}{\overline{w}_{oj,t}^{INC}}.$$

Now let us define the explanatory variable, which measures the change between years $(t-1)$ and t in the number of workers employed in occupation o by firm j, $\Delta log(\ell_{oj,t}) = log(\ell_{oj,t}) - log(\ell_{oj,t-1})$. Going forward, we only consider the cases of expansion $\left(\Delta log(\ell_{oj,t}) > 0\right)$.

Table A10 presents summary statistics for the outcome variable $\left(\text{(Rel Wages)}_{oj,t}\right)$, the main explanatory variable $\left(\Delta log(\ell_{oj,t})\right)$, and the number of workers in each occupation-firm in years $(t-1)$. It

is important to emphasize that the average (median) ratio of $\left((\text{Rel Wages})_{oj,t}\right)$ is 0.88 (0.86). This means that new workers hired in a given occupation o typically earn less than the incumbent workers in the same occupation. Our analysis emphasizes how the ratio of wages of new workers to incumbent workers changes with the size of an expansion of the firm in the given occupation, but *does not imply* that the ratio is larger than 1 to begin with.

Table A10: Summary Statistics for the Sample Used to Study the Differential Ease of Expanding of Domestic Firms vs. MNCs

	N	Mean	Median	SD	Min	Max
$(\text{Rel Wages})_{oj,t}$	260,371	0.88	0.86	0.32	0.15	3.40
$\Delta log(\ell_{oj,t})$	260,371	0.52	0.41	0.33	0.001	1.95
$\ell_{oj,t-1}$	260,371	17.60	3	175.79	1	23,913

Notes: Table A10 presents summary statistics for the sample used to study the differential ease of expanding of domestic firms vs. MNCs. An observation in this analysis is an $occupation \times firm \times year$ $(o \times j \times t)$. The first row reports summary statistics for the outcome variable, $(\text{Rel Wages})_{oj,t}$ (the ratio of the year t average wages for new workers relative to incumbent workers). The second row reports summary statistics for the main explanatory variable, $\Delta log(\ell_{oj,t})$ (the increase in the number of workers from year $(t-1)$ to year t). The last row contains descriptive statistics on the number of workers in each occupation-firm in years $(t-1)$. The regression weighs observations according to $\ell_{oj,t-1}$. All wages are inflation-adjusted.

The version of the empirical specification with all interactions is the following:

$$\begin{aligned}(\text{Rel Wages})_{oj,t} =& \alpha_j + \lambda_{o\times ind(j)\times t} + \beta_1 \Delta log(\ell_{oj,t}) + \beta_2 \Delta log(\ell_{oj,t}) \mathbb{1}[o = college] + \\ & \beta_3 \Delta log(\ell_{oj,t}) \mathbb{1}[j = MNC] + \beta_4 \Delta log(\ell_{oj,t}) \times \mathbb{1}[o = college] \mathbb{1}[j = MNC] + \varepsilon_{oj,t} \end{aligned} \quad \text{(A2)}$$

where $\mathbb{1}[o = college]$ is an indicator equal to one if occupation o requires having a college degree (e.g. electronic engineer), and $\mathbb{1}[j = MNC]$ is an indicator equal to one if firm j is an MNC.

Results from regression (A2) (and its variants) are presented in Table A11. Columns (1) to (3) do not include the interactions of $\Delta log(\ell_{oj,t})$ with neither $\mathbb{1}[o = college]$ nor $\mathbb{1}[j = MNC]$. Columns (1) to (3) differ among themselves in the fixed effects used. Columns (4) to (6) include the interactions with $\mathbb{1}[o = college]$ and $\mathbb{1}[j = MNC]$. These last columns differ in the fixed effects used. We take column (6) as our baseline specification since it includes the most disaggregated set of controls: firm fixed effects plus the interaction of four-digit occupation $\times$ four-digit industry $\times$ year fixed effects. However, results are qualitatively similar across specifications.

Table A11: Findings on the Differential Ease of Expanding of Domestic Firms vs. MNCs

Outcome variable: (Rel Wages)$_{oj,t}$	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta log(\ell_{oj,t})$	0.043***	0.035***	0.030***	0.036***	0.032***	0.029***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$\Delta log(\ell_{oj,t})\mathbb{1}[o = college]$				0.102***	0.069***	0.064***
				(0.006)	(0.006)	(0.008)
$\Delta log(\ell_{oj,t})\mathbb{1}[j = MNC]$				-0.013***	-0.011***	-0.018***
				(0.004)	(0.004)	(0.005)
$\Delta log(\ell_{oj,t})\mathbb{1}[o = college]\mathbb{1}[j = MNC]$				-0.012	-0.036***	-0.030**
				(0.009)	(0.010)	(0.014)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-4D Occup FE	Yes	No	No	Yes	No	No
Year-4D Occup-2D Ind FE	No	Yes	No	No	Yes	No
Year-4D Occup-4D Ind FE	No	No	Yes	No	No	Yes
Observations	260,371	249,352	203,300	260,371	249,352	203,300
Adjusted R^2	0.46	0.53	0.59	0.46	0.53	0.59

Notes: Table A11 presents the results of the variants of the regression described in equation (A2). Columns (1) to (3) differ among themselves in the set of fixed effects used. Columns (4) to (6) add three interaction terms to the regressions run in Columns (1) to (3). All wages are inflation-adjusted. The regression weighs observations according to $\ell_{oj,t-1}$. Robust standard errors in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

There are three main takeaways. First, firms, on average, pay higher wages to new employees (relative to incumbent ones), the larger the expansion of a four-digit occupation within the firm. In particular, firms increase the pay of the new workers relative to incumbents by 1.7% more if they double their number of employees in a given occupation as opposed to expanding 50% (the mean). This is consistent with the firm facing an upward-sloping labor supply.

Second, the increase in the relative wage is significantly higher for college-educated occupations. This is consistent with low-skilled workers having a higher labor supply elasticity.

Third and last, both types of firms (MNC and domestic) in both types of college categories face larger relative wages (new workers vs. incumbents), the larger the expansion in the occupation at the firm. However, the increase in the relative wage is around twice as large for domestic firms than for MNCs (both for college and non-college occupations). Thus, MNC firms also face an upward-sloping labor supply, but the elasticity is much higher than the one domestic firms face.

Appendix B.3 The Indirect Effects of Exposure to MNCs on Workers in Domestic Firms

Table A12: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. First Stage, Reduced Form, and Placebo IV for Robustness Check IV Set 2. Stayers Only

	First Stage: IV Set 2				Reduced Form: IV Set 2			Placebo Reduced Form: IV Set 2		
Dep. Var.	$\Delta LME_{s(i),t}$	$\Delta FLE_{j(i),t}$	$\Delta LME_{s(i),t}$	$\Delta FLE_{j(i),t}$	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}	Δw_{it}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$IV\left(\Delta LME_{s(i),t}\right)$	0.284***		0.284***	-0.003	0.032*		0.032*			
	(0.048)		(0.048)	(0.002)	(0.017)		(0.017)			
$IV\left(\Delta FLE_{j(i),t}\right)$		0.021***	-0.007	0.021***		0.069*	0.070*			
		(0.005)	(0.018)	(0.005)		(0.036)	(0.036)			
$IV\left(\Delta LME_{s(i),t+1}\right)$								0.009		0.009
								(0.025)		(0.025)
$IV\left(\Delta FLE_{j(i),t+1}\right)$									-0.003	-0.003
									(0.036)	(0.036)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	2,721,231	2,721,231	2,721,231
Adjusted R^2	0.91	0.46	0.91	0.46	0.045	0.045	0.045	0.047	0.047	0.047

Notes: Table A12 reports the first stage and reduced form estimates for the IV strategy described in Section 4. This exercise uses the robustness check IV Set 2 (the instrument using changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries). The difference between the reduced form estimates in Columns (5) to (7) and those in Columns (8) to (10) is that in the latter columns we use the value of the instrument from the next period $(t+1)$ (instead of the contemporaneous value of the instrument). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). All regressions include firm fixed effects, region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A13: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. OLS and IV Estimates for Leading IV Set 1. Stayers and Movers

Sample	Main: Stayers Only			Stayers and Movers		
Dep. Var. : Δw_{it}	OLS (1)	IV Set 1 (2)	IV Set 2 (3)	OLS (4)	IV Set 1 (5)	IV Set 2 (6)
$\Delta LME_{s(i),t}$	0.050***	0.143**	0.147**	0.044***	0.114*	0.136*
	(0.016)	(0.066)	(0.072)	(0.017)	(0.065)	(0.073)
$\Delta FLE_{j(i),t}$	0.735***	3.291***	3.365*	0.685***	2.911***	4.135**
	(0.134)	(0.910)	(1.834)	(0.128)	(0.887)	(2.005)
Observations	3,080,017	3,080,017	3,080,017	3,740,151	3,740,151	3,740,151
Adjusted R^2	0.045	0.044	0.044	0.036	0.035	0.034
F-Statistic	-	41.2	8.74	-	44.4	8.89

Notes: Table A13 (Appendix B.3) reports the OLS and IV estimates for the main specification in equation (5) and for two samples: the main sample of stayers, and a sample that includes both the stayers and the movers. Stayers work for firm j in both year $(t-1)$ and t. Movers work for firm j in $(t-1)$, but are no longer observed in j in t. We allow in the sample of movers individuals who move from firm j into unemployment, as long as they find employment by the end of year t. To movers, we assign the firm-level exposure measure of their employer in year $(t-1)$. Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t. This exercise uses first the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) in Columns (2) and (5), then the robustness check IV Set 2 (the instrument using changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries) in Columns (3) and (6). All regressions include firm fixed effects, region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education status, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A14: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. OLS and IV Estimates for Leading IV Set 1 and Variations in Fixed Effects. Stayers Only

	Rob. Check		Main	Rob. Check: IV Set 1		Main IV1
Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	IV (4)	IV (5)	IV (6)
$\Delta LME_{s(i),t}$	0.051***	0.050***	0.050***	0.130*	0.143**	0.143**
	(0.015)	(0.016)	(0.016)	(0.073)	(0.066)	(0.066)
$\Delta FLE_{j(i),t}$	0.749***	0.735***	0.735***	3.217***	3.291***	3.291***
	(0.138)	(0.134)	(0.134)	(0.914)	(0.910)	(0.910)
Fixed Effects						
Region × Year	No	Yes	Yes	No	Yes	Yes
Two-Digit Industry × Year	Yes	Yes	Yes	Yes	Yes	Yes
Two-Digit Industry × Region	No	No	Yes	No	No	Yes
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017
F-Statistic				39.7	41.2	41.2

Notes: Table A14 reports the OLS and IV estimates for the IV strategy described in Section 4. This exercise uses the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). Columns (1), (2), and (3) differ among themselves in the set of fixed effects used. Our preferred set of fixed effects is that in Column (3). Similarly, Columns (4), (5), and (6) differ among themselves in the set of fixed effects used. Our preferred set of fixed effects is that in Column (6). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). All regressions include firm fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A15: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. OLS and IV Estimates for Leading IV Set 1. Stayers Only. All, College-Educated Only, Without College Only

Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	IV (4)	IV (5)	IV (6)
Panel A: Both With or Without College						
$\Delta LME_{s(i),t}$	0.047***		0.050***	0.111**		0.143**
	(0.015)		(0.016)	(0.053)		(0.066)
$\Delta FLE_{j(i),t}$		0.718***	0.735***		3.269***	3.291***
		(0.137)	(0.134)		(0.909)	(0.910)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017
F-Statistic				26.3	83.4	41.2
Panel B: College Educated Only						
$\Delta LME_{s(i),t}$	0.079***		0.085***	0.071		0.070
	(0.030)		(0.030)	(0.078)		(0.079)
$\Delta FLE_{j(i),t}$		1.090***	1.099***		0.909	0.927
		(0.351)	(0.351)		(1.352)	(1.351)
Observations	341,312	341,312	341,312	341,312	341,312	341,312
F-Statistic				27.4	22.6	11.3
Panel C: Without College Only						
$\Delta LME_{s(i),t}$	0.046***		0.049***	0.115**		0.150**
	(0.016)		(0.016)	(0.057)		(0.070)
$\Delta FLE_{j(i),t}$		0.647***	0.664***		3.508***	3.528***
		(0.139)	(0.136)		(0.956)	(0.956)
Observations	2,734,629	2,734,629	2,734,629	2,734,629	2,734,629	2,734,629
F-Statistic				26.2	97.0	47.8

Notes: Table A15 reports the OLS and IV estimates for the IV strategy described in Section 4. This exercise uses the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all stayers in domestic firms, Panel B includes only those stayers who are college-educated, and Panel C includes only those stayers who are not college-educated. All regressions include firm fixed effects, region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, and Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A16: The Effects of Changes in Exposure to MNCs on Workers in Domestic Firms. OLS and IV Estimates for Leading IV Set 1. Stayers Only. All, Women Only, Men Only

Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	IV (4)	IV (5)	IV (6)
Panel A: Both Women and Men						
$\Delta LME_{s(i),t}$	0.047***		0.050***	0.111**		0.143**
	(0.015)		(0.016)	(0.053)		(0.066)
$\Delta FLE_{j(i),t}$		0.718***	0.735***		3.269***	3.291***
		(0.137)	(0.134)		(0.909)	(0.910)
Observations	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017	3,080,017
F-Statistic				26.3	83.4	41.2
Panel B: Women Only						
$\Delta LME_{s(i),t}$	0.046***		0.046***	0.039		0.050
	(0.015)		(0.016)	(0.055)		(0.059)
$\Delta FLE_{j(i),t}$		0.843***	0.845***		2.444**	2.456**
		(0.190)	(0.190)		(1.211)	(1.214)
Observations	974,286	974,286	974,286	974,286	974,286	974,286
F-Statistic				32.2	66.4	32.7
Panel C: Men Only						
$\Delta LME_{s(i),t}$	0.046**		0.050***	0.138**		0.177**
	(0.018)		(0.018)	(0.063)		(0.073)
$\Delta FLE_{j(i),t}$		0.674***	0.695***		3.476***	3.497***
		(0.151)	(0.148)		(0.972)	(0.968)
Observations	2,097,458	2,097,458	2,097,458	2,097,458	2,097,458	2,097,458
F-Statistic				20.3	80.2	40.0

Notes: Table A16 reports the OLS and IV estimates for the IV strategy described in Section 4. This exercise uses the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). These regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all stayers in domestic firms, Panel B includes only those stayers who are women, and Panel C includes only those stayers who are men. All regressions include firm fixed effects, region $\times$ year, two-digit industry $\times$ year, and two-digit industry $\times$ region fixed effects, and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, education status, and Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A17: The Effects of Changes in Labor Market Exposure to MNCs and in Firm Value Added Per Worker on Workers in Domestic Firms. Stayers Only. All, College-Educated Only, Without College Only

Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Panel A: Both With or Without College				
$\Delta LME_{s(i),t}$	0.047***		0.047***	
	(0.015)		(0.015)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.000)
Observations	3,080,017	3,080,017	3,080,017	3,079,984
Adjusted R^2	0.045	0.046	0.046	0.048
Panel B: College Educated Only				
$\Delta LME_{s(i),t}$	0.079***		0.078***	
	(0.030)		(0.030)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.009***	0.009***	0.009***
		(0.001)	(0.001)	(0.001)
Observations	341,312	341,312	341,312	340,937
Adjusted R^2	0.067	0.068	0.068	0.070
Panel C: Without College Only				
$\Delta LME_{s(i),t}$	0.046***		0.046***	
	(0.016)		(0.016)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.000)
Observations	2,734,629	2,734,629	2,734,629	2,734,576
Adj. R2	0.045	0.045	0.045	0.047
Fixed Effects				
Region × Year	Yes	Yes	Yes	No
Two-Digit Industry × Year	Yes	Yes	Yes	No
Two-Digit Industry × Region	Yes	Yes	Yes	No
Two-Digit Industry × Region × Year	No	No	No	Yes

Notes: Table A17 reports the OLS estimates for the modified main regression described in Section 4. The modification, which drives the difference between the exercise in this table and that in Table 4, is that instead of the change in firm-level exposure to MNCs we use the change in the value added per worker of the firm (see equation (8)). Columns (1) to (4) differ in the explanatory variables used and in the set of fixed effects. When one includes two-digit industry × region × year, one absorbs all variation occurring at the two-digit industry × region level (namely $\Delta LME_{s(i),t}$). All these regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all workers, both with or without college. Panel B includes only workers with a college education. Panel C includes only workers without a college education. All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A18: The Effects of Changes in Labor Market Exposure to MNCs and in Firm Value Added Per Worker on Workers in Domestic Firms. Stayers Only. All, College-Educated Only, Without College Only. Leading IV Set 1

Dep. Var. : Δw_{it}	IV (1)	IV (2)	IV (3)	IV (4)
Panel A: Both With or Without College				
$\Delta LME_{s(i),t}$	0.111**		0.129**	
	(0.053)		(0.065)	
Δ (*value-added/worker*)$_t$		0.091***	0.092***	0.092***
		(0.029)	(0.029)	(0.029)
Observations	3,080,017	3,080,017	3,080,017	3,079,984
F-Statistic	26.3	26.3	13.1	24.7
Panel B: College Educated Only				
$\Delta LME_{s(i),t}$	0.071		0.060	
	(0.078)		(0.080)	
Δ (*value-added/worker*)$_t$		0.024	0.024	0.027
		(0.032)	(0.031)	(0.035)
Observations	341,312	341,312	341,312	340,937
F-Statistic	27.4	4.26	2.14	3.50
Panel C: Without College Only				
$\Delta LME_{s(i),t}$	0.115**		0.139**	
	(0.057)		(0.070)	
Δ (*value-added/worker*)$_t$		0.099***	0.099***	0.099***
		(0.031)	(0.031)	(0.031)
Observations	2,734,629	2,734,629	2,734,629	2,734,576
F-Statistic	26.2	33.2	16.6	31.5
Fixed Effects				
Region × Year	Yes	Yes	Yes	No
Two-Digit Industry × Year	Yes	Yes	Yes	No
Two-Digit Industry × Region	Yes	Yes	Yes	No
Two-Digit Industry × Region × Year	No	No	No	Yes

Notes: Table A18 reports the IV estimates for the modified main regression described in Section 4 and for the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). The modification, which drives the difference between the exercise in this table and that in Table 4, is that instead of the change in firm-level exposure to MNCs we use the change in the value added per worker of the firm (see equation (8)). Columns (1) to (4) differ in the explanatory variables used and in the set of fixed effects. When one includes two-digit industry × region × year, one absorbs all variation occurring at the two-digit industry × region level (namely $\Delta LME_{s(i),t}$). All these regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all workers, both with or without college. Panel B includes only workers with a college education. Panel C includes only workers without a college education. All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, sex, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A19: The Effects of Changes in Labor Market Exposure to MNCs and in Firm Value Added Per Worker on Workers in Domestic Firms. Stayers Only. All, Women Only, Men Only

Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Panel A: Both Women and Men				
$\Delta LME_{s(i),t}$	0.047***		0.047***	
	(0.015)		(0.015)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.000)
Observations	3,080,017	3,080,017	3,080,017	3,079,984
Adjusted R^2	0.045	0.046	0.046	0.048
Panel B: Women Only				
$\Delta LME_{s(i),t}$	0.046***		0.046***	
	(0.015)		(0.015)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.001)
Observations	974,286	974,286	974,286	974,010
Adjusted R^2	0.039	0.040	0.040	0.041
Panel C: Men Only				
$\Delta LME_{s(i),t}$	0.046**		0.046**	
	(0.018)		(0.018)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.001)
Observations	2,097,458	2,097,458	2,097,458	2,097,375
Adjusted R^2	0.049	0.049	0.049	0.052
Fixed Effects				
Region × Year	Yes	Yes	Yes	No
Two-Digit Industry × Year	Yes	Yes	Yes	No
Two-Digit Industry × Region	Yes	Yes	Yes	No
Two-Digit Industry × Region × Year	No	No	No	Yes

Notes: Table A19 reports the OLS estimates for the modified main regression described in Section 4. The modification, which drives the difference between the exercise in this table and that in Table 4, is that instead of the change in firm-level exposure to MNCs we use the change in the value added per worker of the firm (see equation (8)). Columns (1) to (4) differ in the explanatory variables used and in the set of fixed effects. When one includes two-digit industry × region × year, one absorbs all variation occurring at the two-digit industry × region level (namely $\Delta LME_{s(i),t}$). All these regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all workers, both female and male. Panel B includes only the women. Panel C includes only the men. All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A20: The Effects of Changes in Labor Market Exposure to MNCs and in Firm Value Added Per Worker on Workers in Domestic Firms. Stayers Only. All, Women Only, Men Only. Leading IV Set 1

Dep. Var. : Δw_{it}	IV (1)	IV (2)	IV (3)	IV (4)
Panel A: Both Women and Men				
$\Delta LME_{s(i),t}$	0.111**		0.129**	
	(0.053)		(0.065)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.091***	0.092***	0.092***
		(0.029)	(0.029)	(0.029)
Observations	3,080,017	3,080,017	3,080,017	3,079,984
F-Statistic	26.3	26.3	13.1	24.7
Panel B: Women Only				
$\Delta LME_{s(i),t}$	0.039		0.052	
	(0.055)		(0.062)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.067*	0.068*	0.065*
		(0.036)	(0.036)	(0.036)
Observations	974,286	974,286	974,286	974,010
F-Statistic	32.2	13.4	6.70	13.0
Panel C: Men Only				
$\Delta LME_{s(i),t}$	0.138**		0.158**	
	(0.063)		(0.076)	
$\Delta\left(value\text{-}added/worker\right)_t$		0.098***	0.099***	0.100***
		(0.031)	(0.031)	(0.032)
Observations	2,097,458	2,097,458	2,097,458	2,097,375
F-Statistic	20.3	28.7	14.4	27.0
Fixed Effects				
Region × Year	Yes	Yes	Yes	No
Two-Digit Industry × Year	Yes	Yes	Yes	No
Two-Digit Industry × Region	Yes	Yes	Yes	No
Two-Digit Industry × Region × Year	No	No	No	Yes

Notes: Table A20 reports the IV estimates for the modified main regression described in Section 4 and for the leading IV Set 1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica). The modification, which drives the difference between the exercise in this table and that in Table 4, is that instead of the change in firm-level exposure to MNCs, we use the change in the value added per worker of the firm (see equation (8)). Columns (1) to (4) differ in the explanatory variables used and in the set of fixed effects. When one includes two-digit industry × region × year, one absorbs all variation occurring at the two-digit industry × region level (namely $\Delta LME_{s(i),t}$). All these regressions include only stayers (i.e., workers in domestic firms who stay in the same domestic firm in both year $(t-1)$ and t). Panel A includes all workers, both female and male. Panel B includes only women. Panel C includes only men. All regressions include firm fixed effects and control for the $(t-1)$ share of total sales to MNCs and a vector of worker characteristics (age, college education, Costa Rican nationality). Robust standard errors clustered at the level of the firm in parentheses. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix C Additional Model Derivations

Appendix C.1 Log-Linearization of the FOCs

Appendix C.1.1 Log-Linearization of the FOCs of the Domestic Firms' Problem

The equilibrium of the profit maximization of a domestic firm j is described by the following sets of equations:

$$W_j = \frac{\eta_I}{\eta_I+1}\frac{\sigma-1}{\sigma}A_j\left(\frac{W_j^{\eta_I}}{\Omega_{js}^{\eta_I}}I_j^0 + N_j\right)^{-\frac{1}{\sigma}} \forall j, \tag{A3}$$

$$\frac{\sigma-1}{\sigma}A_j\left(\frac{W_j^{\eta_I}}{\Omega_{js}^{\eta_I}}I_j^0 + N_j\right)^{-\frac{1}{\sigma}} - c'(N_j) = \omega_{s(j)}\forall j, \tag{A4}$$

where $\Omega_{js} \equiv \Omega_{js}(W_j, \tilde{\omega}) = \left(W_j^{\eta_I} + \sum_{s'}(\tau_{s(j)s'}\tilde{\omega}_{s'})^{\eta_I}\right)^{1/\eta_I}$. Equations (A3) and (A4) are the FOCs of the domestic firm problem.

Then, we add the FOCs of the MNC problem:

$$\frac{\sigma-1}{\sigma}A_{MNC(s)}N_{MNC(s)}^{-\frac{1}{\sigma}} = \psi_s\omega_s + C'_{MNC(s)}\left(N_{MNC(s)}\right) = \psi_s\omega_s + c_0 N_{MNC}^{\alpha_m}. \tag{A5}$$

$$J_{MNC(s)} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}\left(\frac{A_{MNC(s)}}{P_{MNC(s)}}\right)^{\sigma}. \tag{A6}$$

Let us first log-linearize equations (A3) and (A4) with respect to W_j, N_j, A_j, ω_s and Ω_{js}. Variables with hats denote log differences ($\hat{x} \equiv \log(x) - \log(\overline{x})$) and variables with an overline denote initial equilibrium values.

$$\widehat{W}_j = \widehat{A}_j - \tfrac{1}{\sigma}\widehat{L}_j = \widehat{A}_j - \tfrac{1}{\sigma}\left[\frac{\overline{I}_j}{\overline{L}_j}\eta_I(\widehat{W}_j - \widehat{\Omega}_{js}) + \frac{\overline{N}_j}{\overline{L}_j}\widehat{N}_j\right]$$

$$\widehat{A}_j - \tfrac{1}{\sigma}\left[\frac{\overline{I}_j}{\overline{L}_j}\eta_I(\widehat{W}_j - \widehat{\Omega}_{js}) + \frac{\overline{N}_j}{\overline{L}_j}\widehat{N}_j\right] = \frac{c_0\overline{N_j^{\alpha}}}{c_0\overline{N_j^{\alpha}}+\overline{\omega_s}}\alpha\widehat{N}_j + \frac{\overline{\omega_s}}{c_0\overline{N_j^{\alpha}}+\overline{\omega_s}}\widehat{\omega}_s.$$

Define $\xi_j^I \equiv \frac{\overline{I}_j}{\overline{L}_j}$, $\xi_j^N \equiv \frac{\overline{N}_j}{\overline{L}_j}$, $\xi_j^C \equiv \frac{C'(\overline{N}_j)}{C'(\overline{N}_j)+\overline{\omega_s}} = \frac{C'(\overline{N}_j)}{\overline{MRP}_j} = \frac{c_0\overline{N_j^{\alpha}}}{\overline{MRP}_j}$, and $\xi_j^O \equiv \frac{\overline{\omega_s}}{c_0\overline{N_j^{\alpha}}+\overline{\omega_s}}$ (where $\xi_j^I + \xi_j^N = 1$ and $\xi_j^C + \xi_j^O = 1$). Then:

$$\widehat{W}_j = \widehat{A}_j - \tfrac{1}{\sigma}\left[\xi_j^I\eta_I(\widehat{W}_j - \widehat{\Omega}_{js}) + (1-\xi_j^I)\widehat{N}_j\right]$$

$$\widehat{A}_j - \tfrac{1}{\sigma}\left[\xi_j^I\eta_I(\widehat{W}_j - \widehat{\Omega}_{js}) + (1-\xi_j^I)\widehat{N}_j\right] = \xi_j^C\alpha\widehat{N}_j + (1-\xi_j^C)\widehat{\omega}_s.$$

Rearranging:

$$\begin{aligned}\widehat{W}_j\left(\sigma + \xi_j^I\eta_I\right) =& \sigma\widehat{A}_j - (1-\xi_j^I)\widehat{N}_j + \xi_j^I\eta_I\widehat{\Omega}_{js}\\ \widehat{W}_j =& \tfrac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - \tfrac{(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\widehat{N}_j + \tfrac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js}\end{aligned} \tag{A7}$$

Then

$$\begin{aligned}\tfrac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - \tfrac{(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\widehat{N}_j + \tfrac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js} =& \xi_j^C\alpha\widehat{N}_j + (1-\xi_j^C)\widehat{\omega}_s\\ \left(\xi_j^C\alpha + \tfrac{(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\right)\widehat{N}_j =& \tfrac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - (1-\xi_j^C)\widehat{\omega}_s + \tfrac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js}\\ \tfrac{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\widehat{N}_j =& \tfrac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - \tfrac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\sigma+\xi_j^I\eta_I}\widehat{\omega}_s + \tfrac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js}\end{aligned}$$

$$\widehat{N}_j = \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js}. \tag{A8}$$

Now replace $\widehat{N}_j$ from equation (A8) into equation (A7) to obtain:

$$\begin{aligned}
\widehat{W}_j = \frac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - & \\
\frac{(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\left(\frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js}\right) & \\
+ \frac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js} & \\
= \frac{\sigma}{\sigma+\xi_j^I\eta_I}\left(1 - \frac{(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\right)\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + & \\
+ \frac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\left(1 - \frac{\xi_j^N}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\right)\widehat{\Omega}_{js} & \\
= \frac{\sigma}{\sigma+\xi_j^I\eta_I}\frac{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + & \\
+ \frac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\frac{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js} &
\end{aligned}$$

$$\widehat{W}_j = \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js}. \tag{A9}$$

Hereafter, we write together the versions of equations (A8) and (A9), where we do not yet replace the log-deviation of $\Omega_{js} = \left(W_j^{\eta_I} + \sum_{s'}(\tau_{s(j)s'}\tilde{\omega}_{s'})^{\eta_I}\right)^{\frac{1}{\eta_I}}$:

$$\begin{aligned}
\widehat{N}_j =& \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js} \\
\widehat{W}_j =& \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js}.
\end{aligned} \tag{A10}$$

Recall that $\Omega_{js}^{\eta_I} = W_j^{\eta_I} + \sum_{s'}(\tau_{s(j)s'}\tilde{\omega}_{s'})^{\eta_I}$. Define $\pi_{js'} \equiv \frac{\left(\tau_{ss'}\overline{\omega}_{s'}\right)^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$ and $\pi_{jj} \equiv \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$.

$$\widehat{\Omega}_{js} = \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}\widehat{W}_j + \sum_{s'}\frac{\left(\tau_{ss'}\overline{\omega}_{s'}\right)^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}\widehat{\omega}_{s'} = \pi_{jj}\widehat{W}_j + \sum_{s'}\pi_{js'}\widehat{\omega}_{s'} \tag{A11}$$

We now replace the expression for $\widehat{\Omega}_{js}$ into equations (A8) and (A9)

$$\begin{aligned}
\widehat{N}_j =& \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s \\
&+ \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\left(\pi_{jj}\widehat{W}_j + \sum_{s'}\pi_{js'}\widehat{\omega}_{s'}\right).
\end{aligned} \tag{A12}$$

$$\begin{aligned}
\widehat{W}_j =& \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s \\
&+ \frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\left(\pi_{jj}\widehat{W}_j + \sum_{s'}\pi_{js'}\widehat{\omega}_{s'}\right) \\
&\left(1 - \frac{\xi_j^C\xi_j^I\alpha\eta_I\pi_{jj}}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\right)\widehat{W}_j = \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s
\end{aligned}$$

$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\sum_{s'}\pi_{js'}\widehat{\widetilde{\omega}}_{s'}$$

$$\frac{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{W}_j=\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j+$$
$$\frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\sum_{s'}\pi_{js'}\widehat{\widetilde{\omega}}_{s'}$$

$$\widehat{W}_j=\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{A}_j+\frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{\omega}_s+$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\widehat{\widetilde{\omega}}_{s'}. \tag{A13}$$

Now, recall that $\tilde{\omega}_{s'}\equiv\omega_{s'}\left[1+(\psi_{s'}-1)\frac{N_{MNC(s')}}{N_{s'}}\right]$. Let us assume that the MNC premia $(\psi_{s'})$ do not change with time, which is consistent with our empirical evidence. Then, we can replace $\widehat{\widetilde{\omega}}_{s'}$ with $\widehat{\omega}_{s'}+\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right)$ into equation (A13). This leads to:

$$\widehat{W}_j=\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{A}_j+\frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{\omega}_s$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\widehat{\omega}_{s'}$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right), \tag{A14}$$

Note that to the extent that MNCs do not pay a premium with respect to domestic employers (i.e., $\psi_{s'}=1$) or that the growth rate of the number of MNC workers is not different from the growth rate of new workers in the entire industry, then the economy would collapse to one where the wages of incumbent workers in domestic firms are not explicitly responding to changes in the composition of employment towards or away MNCs. Equation (A14) is the one we estimate in Section 5.5 to recover the structural parameters of interest.

Appendix C.1.2 Log-Linearization of the FOCs of the MNC Problem

Let us first log-linearize equation (A5) with respect to $N_{MNC(s)}$, $A_{MNC(s)}$, and ω_s:

$$\frac{\sigma-1}{\sigma}A_{MNC(s)}N_{MNC(s)}^{-\frac{1}{\sigma}}=\psi_s\omega_s+C'_{MNC(s)}\left(N_{MNC(s)}\right)=\psi_s\omega_s+c_0N_{MNC}^{\alpha_m}. \tag{A15}$$

$$\widehat{A}_{MNC(s)}-\tfrac{1}{\sigma}\widehat{N}_{MNC(s)}=\frac{\psi_s\overline{\omega}_s}{\psi_s\overline{\omega}_s+c_0\overline{N}_{MNC(s)}^{\alpha_m}}\widehat{\omega}_s+\frac{c_0\overline{N}_{MNC(s)}^{\alpha_m}}{\psi_s\overline{\omega}_s+c_0\overline{N}_{MNC(s)}^{\alpha_m}}\alpha_m\widehat{N}_{MNC(s)}. \tag{A16}$$

Define $\xi_{MNC(s)}^C=\frac{c_0\overline{N}_{MNC(s)}^{\alpha_m}}{\psi_s\overline{\omega}_s+c_0\overline{N}_{MNC(s)}^{\alpha_m}}$. Then

$$\widehat{A}_{MNC(s)}-\tfrac{1}{\sigma}\widehat{N}_{MNC(s)}=\left(1-\xi_{MNC(s)}^C\right)\widehat{\omega}_s+\xi_{MNC(s)}^C\alpha_m\widehat{N}_{MNC(s)}. \tag{A17}$$

Therefore

$$\widehat{N}_{MNC(s)}=\frac{\sigma}{1+\xi_{MNC(s)}^C\alpha_m\sigma}\widehat{A}_{MNC(s)}-\frac{\sigma\left(1-\xi_{MNC(s)}^C\right)}{1+\xi_{MNC(s)}^C\alpha_m\sigma}\widehat{\omega}_s. \tag{A18}$$

Appendix C.2 Log-Linearization of the Labor Market Clearing Condition

The labor market clearing condition for new workers in industry s is given by:

$$N_s \equiv N_{MNC(s)} + \sum_{j \in \mathcal{D}_s} N_j = \frac{\tilde{\omega}_s^{\eta_N}}{\Omega_N^{\eta_N}} L_N^0 + \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0 \forall s, \tag{A19}$$

where $\Omega_N = \left(\sum_{s'} \tilde{\omega}_{s'}^{\eta_N}\right)^{1/\eta_N}$, $\Omega_{js} \equiv \Omega_{js}(W_j, \tilde{\boldsymbol{\omega}}) = \left(W_j^{\eta_I} + \sum_{s'} (\tau_{s(j)s'} \tilde{\omega}_{s'})^{\eta_I}\right)^{1/\eta_I}$, and $\Omega_{j's'} \equiv \Omega_{j's'}(W_{j'}, \tilde{\boldsymbol{\omega}}) = \left(W_{j'}^{\eta_I} + \sum_{s''} (\tau_{s'(j')s''} \tilde{\omega}_{s''})^{\eta_I}\right)^{1/\eta_I}$. The RHS term is the overall demand for new workers by the MNC in s and all domestic firms j in s (set denoted by $\mathcal{D}_s$). The LHS term is the overall supply of new workers, who are either newly-entered in the labor market at the beginning of the period (the first term) or incumbents who break ties with their beginning-of-period employer j' in industry s' to join industry s.

Last, the product markets clear when the total production of the variety of each domestic firm j is equal to the total demand (coming from the demand of the domestic market and the demand coming from all its MNC buyers, if any). We have already incorporated this condition in the definition of firm revenues in equation (12).

Let us now log-linearize the labor market clearing condition introduced in equation (A19) with respect to $N_{MNC(s)}$, N_j, ω_s, Ω_N, and $\Omega_{j's'}$.

$$N_{MNC(s)} + \sum_{j \in \mathcal{D}_s} N_j = \frac{\tilde{\omega}_s^{\eta_N}}{\Omega_N^{\eta_N}} L_N^0 + \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0 \forall s, \tag{A20}$$

where $\Omega_N = \left(\sum_{s'} \tilde{\omega}_{s'}^{\eta_N}\right)^{1/\eta_N}$, $\Omega_{js} \equiv \Omega_{js}(W_j, \tilde{\boldsymbol{\omega}}) = \left(W_j^{\eta_I} + \sum_{s'} (\tau_{s(j)s'} \tilde{\omega}_{s'})^{\eta_I}\right)^{1/\eta_I}$, and $\Omega_{j's'} \equiv \Omega_{j's'}(W_{j'}, \tilde{\boldsymbol{\omega}}) = \left(W_{j'}^{\eta_I} + \sum_{s''} (\tau_{s'(j')s''} \tilde{\omega}_{s''})^{\eta_I}\right)^{1/\eta_I}$.

To that end, define $N_s \equiv N_{MNC(s)} + \sum_{j \in \mathcal{D}_s} N_j$, $L_{Ns} \equiv \frac{\tilde{\omega}_s^{\eta_N}}{\Omega_N^{\eta_N}} L_N^0$ and $I_s \equiv \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0$. Equation (A19) can be rewritten as $N_s = L_{Ns} + I_s$. Then

$$\widehat{N}_s = \frac{\overline{L}_{Ns}}{\overline{N}_s} \widehat{L}_{Ns} + \frac{\overline{I}_s}{\overline{N}_s} \widehat{I}_s = \Psi_s^N \widehat{L}_{Ns} + \Psi_s^I \widehat{I}_s, \tag{A21}$$

where $\Psi_s^N \equiv \frac{\overline{L}_{Ns}}{\overline{N}_s}$ and $\Psi_s^I \equiv \frac{\overline{I}_s}{\overline{N}_s} = 1 - \Psi_s^N$. $\widehat{N}_s = \frac{\overline{N}_{MNC(s)}}{\overline{N}_s} \widehat{N}_{MNC(s)} + \sum_{j \in \mathcal{D}_s} \frac{\overline{N}_j}{\overline{N}_s} \widehat{N}_j$. Define $\chi_{MNC(s)}^N \equiv \frac{\overline{N}_{MNC(s)}}{\overline{N}_s}$ and $\chi_j^N \equiv \frac{\overline{N}_j}{\overline{N}_s}$. Hence, the left-hand side of equation (A21) is equal to

$$\widehat{N}_s = \chi_{MNC(s)}^N \widehat{N}_{MNC(s)} + \sum_{j \in \mathcal{D}_s} \chi_j^N \widehat{N}_j. \tag{A22}$$

Then:

$$\widehat{L}_{Ns} = \eta_N \left(\widehat{\omega}_s - \widehat{\Omega}_N\right). \tag{A23}$$

Now, we are left with deriving $\widehat{I}_s$. To that end, define $Z_{j'}^s = \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0$. Then

$$\widehat{I}_s = \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\overline{Z}_{j'}^s}{\overline{I}_s} \widehat{Z}_{j'}^s = \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I \left(\widehat{\omega}_s - \widehat{\Omega}_{j's'}\right), \tag{A24}$$

where $\zeta^s_{j'} \equiv \frac{\frac{\left(\tau_{s'(j')_s}\overline{\widehat{\omega}}_s\right)^{\eta_I}}{\overline{\Omega}^{\eta_I}_{j's'}} I^0_{j'}}{\sum_{s''}\sum_{j''\in\mathcal{D}_{s''}} \frac{\left(\tau_{s''(j'')_s}\overline{\widehat{\omega}}_s\right)^{\eta_I}}{\overline{\Omega}^{\eta_I}_{j''s''}} I^0_{j''}} = \frac{\overline{Z}^s_{j'}}{\overline{I}_s}$. We now replace $\widehat{N}_s, \widehat{L}_{Ns}, \widehat{I}_s$ from equations (A22), (A23), and (A24) into equation (A21):

$$\chi^N_{MNC(s)}\widehat{N}_{MNC(s)} + \sum_{j\in\mathcal{D}_s}\chi^N_j\widehat{N}_j = \Psi^N_s\eta_N\left(\widehat{\widehat{\omega}}_s - \widehat{\Omega}_N\right) + \Psi^I_s\sum_{s'}\sum_{j'\in\mathcal{D}_{s'}}\zeta^s_{j'}\eta_I\left(\widehat{\widehat{\omega}}_s - \widehat{\Omega}_{j's'}\right). \tag{A25}$$

To make progress, we need to find expressions for the change in the number of workers hired. To do that, replace $\widehat{W}_j$ from equation (A13) into equation (A12):

$$\begin{aligned}\widehat{N}_j = {} & \frac{\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\widehat{A}_j - \frac{(1-\xi^C_j)(\sigma+\xi^I_j\eta_I)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\widehat{\omega}_s + \frac{\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\sum_{s'}\pi_{js'}\widehat{\widehat{\omega}}_{s'} \\ & + \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{\xi^C_j\alpha\sigma}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\widehat{A}_j + \\ & + \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{(1-\xi^C_j)(1-\xi^I_j)}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\widehat{\omega}_s \\ & + \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{\xi^C_j\xi^I_j\alpha\eta_I}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\widehat{\widehat{\omega}}_{s'}\end{aligned}$$

$$\begin{aligned}\widehat{N}_j = {} & \left(\frac{\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)} + \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{\xi^C_j\alpha\sigma}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\widehat{A}_j \\ & - \left(\frac{(1-\xi^C_j)(\sigma+\xi^I_j\eta_I)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)} - \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{(1-\xi^C_j)(1-\xi^I_j)}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\widehat{\omega}_s \\ & + \left(\frac{\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)} + \frac{\xi^I_j\eta_I\pi_{jj}}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\frac{\xi^C_j\xi^I_j\alpha\eta_I}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\sum_{s'}\pi_{js'}\widehat{\widehat{\omega}}_{s'}\end{aligned}$$

$$\begin{aligned}\widehat{N}_j = {} & \left[\frac{\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\widehat{A}_j \\ & - \left[\frac{(1-\xi^C_j)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(\sigma+\frac{\xi^I_j\eta_I[\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})]-\xi^I_j(1-\xi^I_j)\eta_I\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\ & \times\widehat{\omega}_s + \left[\frac{\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\sum_{s'}\pi_{js'}\widehat{\widehat{\omega}}_{s'}\end{aligned} \tag{A26}$$

Next, we replace the $\widehat{N}_{MNC(s)}$ and $\widehat{N}_j$ in the left-hand side (LHS) of equation (A25) with the expressions found in equations (A18) and (A26):

$$\begin{aligned}LHS = \widehat{N}_s = {} & \chi^N_{MNC(s)}\widehat{N}_{MNC(s)} \\ & + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\widehat{A}_j \\ & - \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j(1-\xi^C_j)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(\sigma+\frac{\xi^I_j\eta_I[\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})]-\xi^I_j(1-\xi^I_j)\eta_I\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\ & \times\widehat{\omega}_s + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\sum_{s'}\pi_{js'}\widehat{\widehat{\omega}}_{s'} \\ & + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times\end{aligned}$$

$$\times \sum_{s'} \pi_{js'} \frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})} \left(\widehat{N}_{MNC(s')} - \widehat{N}_{s'}\right). \quad \text{(A27)}$$

where $\widehat{N}_{MNC(s)} = \frac{\sigma}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{A}_{MNC(s)} - \frac{\sigma\left(1-\xi^C_{MNC(s)}\right)}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{\omega}_s$ and $\widehat{N}_{MNC(s')} = \frac{\sigma}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{A}_{MNC(s')} - \frac{\sigma\left(1-\xi^C_{MNC(s')}\right)}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{\omega}_{s'}$.

$$\begin{aligned}
LHS = \widehat{N}_s = {} & \chi^N_{MNC(s)} \frac{\sigma}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{A}_{MNC(s)} \\
& + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\
& \times \sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\frac{\sigma}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{A}_{MNC(s')} \\
& + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\widehat{A}_j \\
& - \chi^N_{MNC(s)}\frac{\sigma\left(1-\xi^C_{MNC(s)}\right)}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{\omega}_s \\
& - \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j(1-\xi^C_j)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(\sigma+\frac{\xi^I_j\eta_I[\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})]-\xi^I_j(1-\xi^I_j)\eta_I\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\
& \times\widehat{\omega}_s + \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\sum_{s'}\pi_{js'}\widehat{\omega}_{s'} \\
& - \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\
& \times\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\frac{\sigma\left(1-\xi^C_{MNC(s')}\right)}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{\omega}_{s'} \\
& - \sum_{j\in\mathcal{D}_s}\left[\frac{\chi^N_j\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\
& \times\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\widehat{N}_{s'}. \quad \text{(A28)}
\end{aligned}$$

Therefore, the LHS terms for industry s equalizes $\widehat{N}_s$ to three large weighted sums: i) one weighted sum over the $\widehat{A}$s of all domestic firms and MNCs in the economy (denote the total number of firms in the economy by $|k|$), (ii) another weighted sum over the $\widehat{\omega}$ of all the industries in the economy (denote the number of industries in the economy by $|s|$), and (iii) last, a weighted sum over the $\widehat{N}$ of all industries in the economy.

By using all the labor market clearing conditions across all industries, one can write the following system:

$$\widehat{\boldsymbol{N}}_{|s|\times 1} = \boldsymbol{P}_{|s|\times|k|}\widehat{\boldsymbol{A}}_{|k|\times 1} + \boldsymbol{R}_{|s|\times|s|}\widehat{\boldsymbol{\omega}}_{|s|\times 1} + \boldsymbol{Q}_{|s|\times|s|}\widehat{\boldsymbol{N}}_{|s|\times 1},$$

where the subscripts denote the dimensions of each matrix. We can rewrite the system by isolating $\widehat{\boldsymbol{N}}_{|s|\times 1}$:

$$\widehat{\boldsymbol{N}}_{|s|\times 1} = \left(\boldsymbol{I}_{|s|\times|s|} - \boldsymbol{Q}_{|s|\times|s|}\right)^{-1}\boldsymbol{P}_{|s|\times|k|}\widehat{\boldsymbol{A}}_{|k|\times 1} + \left(\boldsymbol{I}_{|s|\times|s|} - \boldsymbol{Q}_{|s|\times|s|}\right)^{-1}\boldsymbol{R}_{|s|\times|s|}\widehat{\boldsymbol{\omega}}_{|s|\times 1}. \quad \text{(A29)}$$

In words, the log-deviation in the number of new workers in each industry s $\left(\widehat{N}_s\right)$ can be written as the sum of two weighted sums: (i) one of all the log-deviations in the revenue shifters $\left(\widehat{A}\right)$ of all

the firms in the economy (both domestic firms and MNCs) and (ii) another weighted sum of all the log-deviations of the entry wages in the domestic markets ($\widehat{\omega}$) of all the industries in the economy.

Next, we deal with the right-hand side (RHS) of equation (A25). Recall that $\Omega_N = \left(\sum_{s'} \tilde{\omega}_{s'}^{\eta_N}\right)^{1/\eta_N}$, $\Omega_{js} \equiv \Omega_{js}(W_j, \tilde{\boldsymbol{\omega}}) = \left(W_j^{\eta_I} + \sum_{s'} (\tau_{s(j)s'}\tilde{\omega}_{s'})^{\eta_I}\right)^{1/\eta_I}$, and $\Omega_{j's'} \equiv \Omega_{j's'}(W_{j'}, \tilde{\boldsymbol{\omega}}) = \left(W_{j'}^{\eta_I} + \sum_{s''} (\tau_{s'(j')s''}\tilde{\omega}_{s''})^{\eta_I}\right)^{1/\eta_I}$. Define $\kappa_{s'} \equiv \frac{\overline{\omega}_{s'}^{\eta_N}}{\overline{\Omega}_N^{\eta_N}}$. Define $\pi_{js'} \equiv \frac{\left(\tau_{ss'}\overline{\omega}_{s'}\right)^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$ and $\pi_{jj} \equiv \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$.

$$\begin{aligned}
\widehat{\Omega}_N =& \sum_{s'} \frac{\overline{\omega}_{s'}^{\eta_N}}{\overline{\Omega}_N^{\eta_N}} \widehat{\omega}_{s'} = \sum_{s'} \kappa_{s'} \widehat{\tilde{\omega}}_{s'}, \\
\widehat{\Omega}_{j's'} =& \frac{\overline{W}_{j'}^{\eta_I}}{\overline{\Omega}_{j's'}^{\eta_I}} \widehat{W}_{j'} + \sum_{s''} \frac{\left(\tau_{s's''}\overline{\omega}_{s''}\right)^{\eta_I}}{\overline{\Omega}_{j's'}^{\eta_I}} \widehat{\tilde{\omega}}_{s''} = \pi_{j'j'} \widehat{W}_{j'} + \sum_{s''} \pi_{j's''} \widehat{\tilde{\omega}}_{s''}.
\end{aligned} \tag{A30}$$

We replace the expressions for $\widehat{\Omega}_N$ and $\widehat{\Omega}_{j's'}$ from equation (A30) and the expression of $\widehat{W}_{j'}$ from equation (A14) into the RHS to reach:

$$\begin{aligned}
RHS =& \left(\Psi_s^N \eta_N\right) \widehat{\tilde{\omega}}_s - \Psi_s^N \eta_N \widehat{\Omega}_N + \left(\Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I\right) \widehat{\tilde{\omega}}_s - \Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \widehat{\Omega}_{j's'} \\
=& \left[\Psi_s^N \eta_N + \left(\Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I\right)\right] \widehat{\tilde{\omega}}_s - \Psi_s^N \eta_N \sum_{s'} \kappa_{s'} \widehat{\tilde{\omega}}_{s'} - \Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I \sum_{s''} \pi_{j's''} \widehat{\tilde{\omega}}_{s''} \\
& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \left(\frac{\pi_{j'j'} \Psi_s^I \zeta_{j'}^s \xi_{j'}^C \eta_I \alpha\sigma}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})}\right) \widehat{A}_{j'} - \\
& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \left(\frac{\pi_{j'j'} \Psi_s^I \zeta_{j'}^s \xi_{j'}^O \xi_{j'}^N \eta_I}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})}\right) \widehat{\omega}_{s'} - \\
& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \Psi_s^I \zeta_{j'}^s \eta_I \pi_{j'j'} \left(\frac{\xi_{j'}^C \xi_{j'}^I \alpha\eta_I}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})} \sum_{s''} \pi_{j's''} \widehat{\tilde{\omega}}_{s''}\right)
\end{aligned}$$

$$\begin{aligned}
RHS =& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \left(\frac{\pi_{j'j'} \Psi_s^I \zeta_{j'}^s \xi_{j'}^C \eta_I \alpha\sigma}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})}\right) \widehat{A}_{j'} - \\
& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \left(\frac{\pi_{j'j'} \Psi_s^I \zeta_{j'}^s \xi_{j'}^O \xi_{j'}^N \eta_I}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})}\right) \widehat{\omega}_{s'} - \\
& + \left[\Psi_s^N \eta_N + \left(\Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I\right)\right] \widehat{\omega}_s - \Psi_s^N \eta_N \sum_{s'} \kappa_{s'} \widehat{\omega}_{s'} - \Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I \sum_{s''} \pi_{j's''} \widehat{\omega}_{s''} \\
& + \left[\Psi_s^N \eta_N \left(\Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I\right)\right] \frac{(\psi_s - 1)(\overline{N}_{MNC(s)}/\overline{N}_s)}{1 + (\psi_s - 1)(\overline{N}_{MNC(s)}/\overline{N}_s)} \left(\widehat{N}_{MNC(s)} - \widehat{N}_s\right) \\
& - \Psi_s^N \eta_N \sum_{s'} \kappa_{s'} \frac{(\psi_{s'} - 1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1 + (\psi_{s'} - 1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})} \left(\widehat{N}_{MNC(s')} - \widehat{N}_{s'}\right) \\
& - \Psi_s^I \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I \sum_{s''} \pi_{j's''} \frac{(\psi_{s''} - 1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})}{1 + (\psi_{s''} - 1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})} \left(\widehat{N}_{MNC(s'')} - \widehat{N}_{s''}\right) \\
& - \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \Psi_s^I \zeta_{j'}^s \eta_I \pi_{j'j'} \left(\frac{\xi_{j'}^C \xi_{j'}^I \alpha\eta_I}{\xi_{j'}^C \alpha\sigma + (1-\xi_{j'}^I) + \xi_{j'}^C \xi_{j'}^I \alpha\eta_I (1-\pi_{j'j'})} \sum_{s''} \pi_{j's''} \widehat{\omega}_{s''}\right)
\end{aligned}$$

$$-\sum_{s'}\sum_{j'\in\mathcal{D}_{s'}}\Psi^I_s\zeta^s_{j'}\eta_I\pi_{j'j'}\left(\frac{\xi^C_{j'}\xi^I_{j'}\alpha\eta_I}{\xi^C_{j'}\alpha\sigma+(1-\xi^I_{j'})+\xi^C_{j'}\xi^I_{j'}\alpha\eta_I(1-\pi_{j'j'})}\right)\sum_{s''}\pi_{j's''}\times$$
$$\times\frac{(\psi_{s''}-1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})}{1+(\psi_{s''}-1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})}\left(\widehat{N}_{MNC(s'')}-\widehat{N}_{s''}\right) \quad \text{(A31)}$$

where $\widehat{N}_{MNC(s)} = \frac{\sigma}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{A}_{MNC(s)} - \frac{\sigma\left(1-\xi^C_{MNC(s)}\right)}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{\omega}_s$, $\widehat{N}_{MNC(s')} = \frac{\sigma}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{A}_{MNC(s')} - \frac{\sigma\left(1-\xi^C_{MNC(s')}\right)}{1+\xi^C_{MNC(s')}\alpha_m\sigma}\widehat{\omega}_{s'}$ and $\widehat{N}_{MNC(s'')} = \frac{\sigma}{1+\xi^C_{MNC(s'')}\alpha_m\sigma}\widehat{A}_{MNC(s'')} - \frac{\sigma\left(1-\xi^C_{MNC(s'')}\right)}{1+\xi^C_{MNC(s'')}\alpha_m\sigma}\widehat{\omega}_{s''}$.

Overall, the RHS contains three large weighted sums: (i) one weighted sum over the revenue shifters $\left(\widehat{A}\right)$ of all firms in the economy (both domestic firms and MNCs), (ii) another weighted sum over all the log-deviations of the entry wages in the domestic markets $(\widehat{\omega})$ of all the industries in the economy, and (iii) last, a weighted sum over the log-deviations of the number of new workers in all industries of all industries in the economy $\left(\widehat{N}\right)$.

Now, recall that $\widehat{N}_s = RHS$ for each industry s. We can replace all $\widehat{N}_s$, $\widehat{N}_{s'}$, and $\widehat{N}_{s''}$ with their respective formulas obtained from the system in equation (A29) and arrive to a system (one equation per industry s) that relates the log-deviations in the revenue shifters $\left(\widehat{A}\right)$ of all the firms in the economy (both domestic firms and MNCs) to the log-deviations of the entry wages in the domestic markets $(\widehat{\omega})$ of all the industries in the economy. Ultimately, one can describe this relationship in a matrix form:

$$\widehat{\boldsymbol{\omega}}_{|s|\times 1} = \boldsymbol{\Lambda}_{|s|\times|k|}\widehat{\boldsymbol{A}}_{|k|\times 1} \quad \text{(A32)}$$

In words, each log-deviation in the entry wage in the domestic market s $(\widehat{\omega}_s)$ can be written as a weighted sum of all the log-deviations in the revenue shifters $\left(\widehat{A}\right)$ of all the firms in the economy (both domestic firms and MNCs). Unfortunately, one cannot obtain an explicit expression for these weights, but they combine characteristics of firms (e.g., the equilibrium share of the total cost of a new hire that goes to the hiring and training cost, ξ^C_j), of industries (e.g., the equilibrium share of MNCs in the employment of the industry or their premium ψ_s), and of the relationships between industries (e.g., the equilibrium transition probabilities $\pi_{ss'}$).

One can therefore write

$$\widehat{\omega}_s = \sum_{s'}\sum_{k'\in s'}\lambda_{sk's'}\widehat{A}_{k'} \quad \text{(A33)}$$

where $\lambda_{sk's'}$ is the element of matrix $\boldsymbol{\Lambda}_{|s|\times|k|}$ in row s and column $k's'$ (s' being the industry of firm k').

Appendix C.2.1 Determinants of the Wage Setting Equation in General Equilibrium

Let us go back to equation (A14). We want to write the change in wages of incumbent workers at domestic firms as a function of the revenue shifters of all firms in the economy. Let us first focus on $\widehat{A}_j$. Recall that $A_j \equiv B_j^{\frac{1}{\sigma}}T_j^{\frac{\sigma-1}{\sigma}}$ is the revenue shifter of firm j, where T_j is the physical productivity of firm j and $B_j \equiv b_{DOM} + \sum_{s'\in\mathcal{B}_j} b_{j,MNC(s')} \equiv b_{DOM} + B_{j,MNC}$ ($\mathcal{B}_j$ is the set of MNC buyers of firm j and $b_{j,MNC(s')}$ is the demand shifter of the MNC in industry s'). Define $\theta_{DOMj} = \frac{\overline{q}_{DOM}}{\overline{Q}_j}$ and $\theta_{MNC(s')j} \equiv \frac{\overline{q}_{MNC(s')j}}{\overline{Q}_j}$.

$$\widehat{B}_j = \frac{\overline{b}_{DOM}}{\overline{B}_j}\widehat{b}_{DOM} + \frac{\overline{B}_{j,MNC}}{\overline{B}_j}\widehat{B}_{j,MNC} = \frac{\overline{b}_{DOM}}{\overline{B}_j}\widehat{b}_{DOM} + \frac{\overline{B}_{j,MNC}}{\overline{B}_j}\sum_{s'\in\mathcal{B}_j}\frac{\overline{b}_{j,MNC(s')}}{\overline{B}_{j,MNC}}\widehat{b}_{j,MNC(s')}$$

$$\widehat{B}_j = \frac{\overline{b}_{DOM}}{\overline{B}_j}\widehat{b}_{DOM} + \sum_{s'\in\mathcal{B}_j}\frac{\overline{b}_{j,MNC(s')}}{\overline{B}_j}\widehat{b}_{j,MNC(s')} = \frac{\overline{b}_{DOM}\overline{p}_j^{1-\sigma}}{\overline{B}_j\overline{p}_j^{1-\sigma}}\widehat{b}_{DOM} + \sum_{s'\in\mathcal{B}_j}\frac{\overline{b}_{j,MNC(s')}\overline{p}_j^{1-\sigma}}{\overline{B}_j\overline{p}_j^{1-\sigma}}\widehat{b}_{j,MNC(s')}$$

$$\widehat{B}_j = \frac{\overline{q}_{DOM}}{\overline{Q}_j}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \frac{\overline{q}_{MNC(s')j}}{\overline{Q}_j}\widehat{b}_{j,MNC(s')} = \theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\widehat{b}_{j,MNC(s')}. \tag{A34}$$

Then, in the MNC problem we defined $b_{j,MNC(s')} \equiv \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} A^{\sigma}_{MNC(s')} \frac{Q_{MNC(s')}}{I_{MNC(s')}} a^{\sigma}_{j,MNC(s')}$. Similar as for domestic firms, $A_{MNC(s')} = B^{\frac{1}{\sigma}}_{MNC(s')} T^{\frac{\sigma-1}{\sigma}}_{MNC(s')}$, where $B_{MNC(s')}$ is the demand shifter of $MNC(s')$ (which is determined only by market forces in the rest of the world) and $T_{MNC(s')}$ is the physical productivity of $MNC(s')$. Assume that $a_{j,MNC(s')}$ stays constant (where $a_{j,MNC(s')}$ can be thought of as the variable that governs whether $MNC(s')$ buys or not from domestic firm j). Last, note that $\widehat{Q}_{MNC(s')} - \widehat{I}_{MNC(s')} \propto \widehat{A}_{MNC(s')}$ or $\left(\widehat{Q}_{MNC(s')} - \widehat{I}_{MNC(s')}\right) \equiv \varphi_{s'}\widehat{A}_{MNC(s')}$. Hence,

$$\widehat{b}_{j,MNC(s')} = \sigma\widehat{A}_{MNC(s')} + \sigma\left(\widehat{Q}_{MNC(s')} - \widehat{I}_{MNC(s')}\right) = \sigma(1+\varphi_{s'})\widehat{A}_{MNC(s')}.$$

We now replace the expression for $\widehat{b}_{j,MNC(s')}$ into the expression for $\widehat{A}_j$.

$$\begin{aligned}
\widehat{A}_j =& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\widehat{B}_j = \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\left(\theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\widehat{b}_{j,MNC(s')}\right) \\
=& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\theta_{DOMj}\widehat{b}_{DOM} + \tfrac{1}{\sigma}\sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\sigma(1+\varphi_{s'})\widehat{A}_{MNC(s')} \\
=& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} (1+\varphi_{s'})\theta_{MNC(s')j}\widehat{A}_{MNC(s')}.
\end{aligned} \tag{A35}$$

equation (A35) allows us to decompose the revenue shifter of firm j into three components: (i) one that is related to its shocks to physical productivity $\left(\widehat{T}_j\right)$, (ii) another related to shocks to the domestic demand shifter $\left(\widehat{b}_{DOM}\right)$, and (iii) last, one related to shocks to the revenue shifters of its MNC buyers $\left(\widehat{A}_{MNC(s')}\right)$.

Note that there is an isomorphism between modeling the effects of buyers as only working through the demand shifters of the firm (b_{DOM} or $b_{MNC(s')j}$) – which is the avenue we take – and modeling them as working through both the productivity and the demand shifters. For instance, one can imagine that shocks to either the productivity $\left(T_{MNC(s')}\right)$ or the demand $\left(B_{MNC(s')}\right)$ of $MNC(s')$ can affect the productivity of its supplier $\left(T_j\right)$. That said, in our model, an incumbent worker in j is indifferent to the source of a given improvement in A_j.

Next, let us rewrite the ratio of the last term in equation (A14)

$$\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})} = \frac{\overline{\widetilde{\omega}}_{s'} - \overline{\omega}_{s'}}{\overline{\widetilde{\omega}}_{s'}},$$

where $\tilde{\omega}_{s'} \equiv \omega_{s'}\left[1 + (\psi_{s'}-1)\frac{N_{MNC(s')}}{N_{s'}}\right]$ was the expected entry market wage in industry s'. Therefore, the ratio captures the importance of the MNC premium in increasing the expected entry market wage above the entry market wage in a world without MNCs. To the extent that MNCs do not pay a large enough premium or that the share of MNCs in the industry was small in the reference equilibrium, then MNCs do not have a large effect on the expected entry market wage.

We now replace the formula of $\widehat{A}_j$ into equation (A13):

$$\begin{aligned}
\widehat{W}_j =& \frac{\xi^C_j\alpha(\sigma-1)}{\xi^C_j\alpha\sigma + (1-\xi^I_j) + \xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\widehat{T}_j \\
&+ \frac{\xi^C_j\alpha}{\xi^C_j\alpha\sigma + (1-\xi^I_j) + \xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\theta_{DOMj}\widehat{b}_{DOM}
\end{aligned}$$

$$+\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'\in\mathcal{B}_j}(1+\varphi_{s'})\theta_{MNC(s')j}\widehat{A}_{MNC(s')}$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k\in s''}\lambda_{s'ks''}\widehat{A}_k\right)$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right). \tag{A36}$$

We can separate the term in the fourth line between the weighted sum of demand shifters for domestic firms $k = DOM$ and the ones for MNC firms $k = MNC$. The first two terms capture the spirit of our measure of labor market exposure. The third is the model equivalent of our measure of firm-level exposure. The remaining three terms are subsumed in the error term of our main empirical specification for the indirect effects described in equation (5).

$$\begin{aligned}\widehat{W}_j =&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=MNC\in s''}\lambda_{s'ks''}\widehat{A}_k\right)+\\
&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right)+\\
&\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'\in\mathcal{B}_j}\theta_{MNC(s')j}(1+\varphi_{s'})\widehat{A}_{MNC(s')}+\\
&\frac{\xi_j^C\alpha(\sigma-1)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{T}_j+\\
&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=DOM\in s''}\lambda_{s'ks''}\widehat{A}_k\right)+\\
&\frac{\xi_j^C\alpha}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\theta_{DOMj}\widehat{b}_{DOM}.\end{aligned} \tag{A37}$$

This last equation is the same as equation (16) discussed in Section 5.4.

Appendix D Additional Context on Costa Rica

Appendix D.1 Details on Labor Market Institutions in Costa Rica

Less than 1% of private-sector workers are members of a union in 2015. When including the public sector as well, the trade union density is at 7%, which is slightly lower than that in the United States. Collective bargaining agreements over wages and working conditions are also limited (OECD, 2017).

According to OECD (2017), employment protection legislation for workers with regular contracts in Costa Rica is one of the least stringent in the OECD and Latin American countries. First, regulations on advance notification and severance pay are milder than in most OECD countries. Second, employers can dismiss an employee without cause, provided prior notice is offered. Third, Costa Rica does not operate any special regulations against collective dismissals other than those applying to individual dismissals. Given these lax regulations, employers do not prefer temporary contracts over open-ended contracts. This explains why temporary employment is less common in Costa Rica than in other OECD countries.

There are two main policies that address the personal cost of unemployment. First, employers have to pay severance to dismissed workers that is equal to one month for each year of service (with a maximum of eight months of pay). Second, Labor Capitalization Funds are accounts funded through employer contributions and meant to support the employees in case they leave the labor force. In practice,

employees can and tend to withdraw the funds after five years of contributions, limiting the support that remains available to them in the event of unemployment. Overall, the unemployment insurance scheme of Costa Rica is seen as not adequately covering the costs of unemployment. Moreover, job-placement and labor market intermediation services are under-developed.

Costa Rica uses a multi-tiered system of legal wage floors, with 24 minima that differ by occupation and skill level. Minimum wages are revised twice a year, mainly based on expected inflation and growth in GDP per capita. The minimum wage for unskilled workers amounts to 70% of median wages. This fraction is relatively high relative to that in OECD countries. That said, these minimum wages are perceived as a reference by the private sector, and non-compliance is high (particularly in industries such as agriculture, construction, or domestic service).

Appendix E Survey Data

Appendix E.1 Survey Conducted in Collaboration with CINDE

The survey instrument was designed in collaboration between CINDE (the Costa Rican investment promotion agency) and our team. The focus of the survey is on the hiring practices of MNCs with a subsidiary in Costa Rica.

A. Survey response rate and representativeness. The survey was sent on March 18, 2019, to the contacts of CINDE in the Human Resources (HR) departments of 246 MNCs. Responses were recorded until March 29, 2019. During this window, 46 MNCs responded to the survey. CINDE regularly conducts surveys over the same set of MNCs. A response rate of 19% is typical. The relatively low response rate is, to some extent, explained by the turnover of employees in MNCs, which imposes regular efforts to update the list of contacts.

As Table A21 shows, of the 46 surveyed MNCs, 54% operate in services, 33% in life sciences, and 13% in advanced manufacturing. In the set of 246 contacted MNCs, 55% work in services, 23% in life sciences, and 22% in advanced manufacturing.

Table A21: Industry of Surveyed MNCs and All MNCs

Industry Group	MNCs in survey sample	All MNCs contacted
Services	54%	55%
Life Sciences	33%	23%
Advanced Manufacturing	13%	22%
Number of MNCs	46	246

Notes: Table A21 summarizes the industry group to which the 46 respondents of the survey belong.

B. Survey questions and answers. **Questions 1 and 2:** "When the company decided to settle in the country, which of the following steps were carried out to form the main team? Select all that apply" (Question 1). "Please order the steps of the first hiring process, with 1 denoting the first step performed"

(Question 2). These two questions presented the same seven options: (i) hire recruitment agencies to hire the main team or "heads," (ii) expatriate an executive in charge of operations, (iii) form a team with expatriates of the company, (iv) form a team with locals, (v) run a media campaign (social media, press, other) to receive applications, then use overseas offices to evaluate profiles, (vi) advertise available positions on the company website, (vii) other.

Table A22: Answers to Question 1

Answer	N
Form a team with locals	36
Hire recruitment agencies to hire the main team or "heads"	27
Expatriate an executive in charge of operations	18
Advertise available positions on the company website	17
Form a team with expatriates of the company	11
Run a media campaign (social media, press, other) to receive applications, then use overseas offices to evaluate profiles	11
Other	3

Notes: Table A22 summarizes the answers to Question 1.

Table A23: Answers to Question 2

Answer	O=1	O=2	O=3	O=4	O=5
Hire recruitment agencies to hire the main team or "heads"	14	6	3	2	1
Expatriate an executive in charge of operations	13	3	1	0	1
Form a team with expatriates of the company	2	5	2	1	0
Form a team with locals	11	11	8	4	1
Run a media campaign (social media, press, other) to receive applications, then use overseas offices to evaluate profiles	0	3	6	2	0
Advertise available positions on the company website	3	5	3	4	2
Other	3	2	2	0	0

Notes: Table A23 summarizes the answers to Question 2. "O=1" means that a given step was done first in order.

Question 3: "Once the main team was formed, which of the following processes were carried out to hire the remaining staff?" Select all that apply. This question presented eight options: (i) hire a recruitment agency, (ii) run a media campaign (social media, press, other) to receive applications, then use the local team to evaluate profiles, (iii) advertise available positions on the company website, (iv) run a campaign with municipalities, (v) run a campaign during employment fairs of Free Zones, (vi) establish partnerships with educational institutions, (vii) attend (other) employment fairs, (viii) other.

Question 4: "What are the most important qualities when pre-selecting the most skilled workers (managers, engineers, administrative staff, etc.). Select the three most important options." This question presented six options: (i) previous experience in multinational corporations, (ii) experience working

Table A24: Answers to Question 3

Answer	N
Run a media campaign (social media, press, other) to receive applications, then use the local team to evaluate profiles	26
Hire a recruitment agency	22
Advertise available positions on the company website	18
Attend (other) employment fairs	18
Establish partnerships with educational institutions	11
Run a campaign during employment fairs of Free Zones	7
Run a campaign with municipalities	6
Other	3

Notes: Table A24 summarizes the answers to Question 3.

abroad, (iii) academic studies and the institution where the worker graduated, (iv) previous experience in the same industry in which the company operates, (v) previous experience in the same job position, (vi) experience in personnel management.

Table A25: Answers to Question 4

Answer	N
Previous experience in the same job position	33
Previous experience in the same industry in which the company operates	29
Academic studies and the institution where the worker graduated	23
Experience in personnel management	23
Previous experience in multinational corporations	20
Experience working abroad	1

Notes: Table A25 summarizes the answers to Question 4.

Question 5: "Which are the most important qualities when pre-selecting the less-skilled workers (operators, packers, mechanics, cleaning staff, etc.). Select the three most important options." This question presented six options: (i) previous experience in multinational corporations, (ii) experience working abroad, (iii) academic studies and the institution where the worker graduated, (iv) previous experience in the same industry in which the company operates, (v) previous experience in the same job position, (vi) experience in personnel management.

Question 6: "What are the most important sources of information your company uses when it comes to choosing the most skilled workers (managers, engineers, administrative staff, etc.) to hire? Select the three most important options." This question presented eight options: (i) Curriculum Vitae, (ii) letters of recommendation or references of former employers / teachers, (iii) immediate availability, (iv) test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team), (v) test of knowledge or professional skills related to the job, (vi) evaluation of the

Table A26: Answers to Question 5

Answer	N
Previous experience in the same job position	41
Previous experience in the same industry in which the company operates	38
Academic studies and the institution where the worker graduated	26
Previous experience in multinational corporations	23
Experience working abroad	1
Experience in personnel management	0

Notes: Table A26 summarizes the answers to Question 5.

work done during a trial period, (vii) test / interview about the use of English or other languages, (viii) criminal records.

Table A27: Answers to Question 6

Answer	N
Curriculum Vitae	38
Test / interview about the use of English or other languages	29
Test of knowledge or professional skills related to the job	25
Letters of recommendation or references of former employers / teachers	15
Test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team)	14
Evaluation of the work done during a trial period	4
Criminal records	3
Immediate availability	1

Notes: Table A27 summarizes the answers to Question 6.

Question 7: "What are the most important sources of information your company uses when it comes to choosing the less-skilled workers (operators, packers, mechanics, cleaning staff, etc.) to hire? Select the three most important options." This question presented eight options: (i) Curriculum Vitae, (ii) letters of recommendation or references of former employers / teachers, (iii) immediate availability, (iv) test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team), (v) test of knowledge or professional skills related to the job, (vi) evaluation of the work done during a trial period, (vii) test / interview about the use of English or other languages, (viii) criminal records.

Table A28: Answers to Question 7

Answer	N
Curriculum Vitae	30
Test of knowledge or professional skills related to the job	25
Letters of recommendation or references of former employers / teachers	18
Immediate availability	14
Evaluation of the work done during a trial period	14
Test / interview about the use of English or other languages	11
Test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team)	9
Criminal records	8

Notes: Table A28 summarizes the answers to Question 7.

Question 8: "Indicate which of the following resources you use to set wages. Select all that apply." This question presented seven options: (i) information provided by CINDE, (ii) information provided by recruitment agencies, (iii) information about wages from the headquarters, (iv) information from surveys about wages, (v) information about wages from the Ministry of Labor and Social Security, (vi) benchmarking with wages in the industry, (vii) other.

Table A29: Answers to Question 8

Answer	N
Information from surveys about wages	33
Benchmarking with wages in the industry	33
Information about wages from the headquarters	14
Information about wages from the Ministry of Labor and Social Security	12
Information provided by CINDE	10
Information provided by recruitment agencies	5
Other	0

Notes: Table A29 summarizes the answers to Question 8.

Question 9: "With what frequency do you update the wage brackets?" This question presented four options: (i) quarterly, (ii) semiannually, (iii) every year, (iv) other.

Question 10: "In general, for a worker of the same education, with the same number of years of experience and hired in the same occupation, your company pays the same salary or a salary higher than what a domestic company would pay? Please, choose only one option that applies best." This question presented three options: (i) we pay the same wage, (ii) we pay a higher wage, (iii) other.

Question 11: "If you chose the option that your company pays a higher salary than a domestic company, please rate the following options from 1 (the most important reason to pay more) to 5 (the least important reason to pay more). If you answered in the previous question that your company pays the same as a national company, you can skip this question." This question presented five options: (i) even

Table A30: Answers to Question 9

Answer	N
Every year	25
Every semester	12
Other	3
Every trimester	1

Notes: Table A30 summarizes the answers to Question 9.

Table A31: Answers to Question 10

Answer	N
We pay a higher wage	31
We pay the same wage	9
Other	3

Notes: Table A31 summarizes the answers to Question 10.

if we hire a worker with the same education, experience, and occupation as a domestic company, our company has a better selection filter of workers, and the worker we hire tends to be more competent. Therefore, the worker needs to be paid more, (ii) even if the worker hired by us and by the national company is equally competent, for reasons of equity, the wages we pay to our workers in Costa Rica should be closer to the wages of similar workers in the headquarters or in other subsidiaries of our group, (iii) even if the worker hired by us and by the domestic company is equally competent, the workers of our company must be motivated to work hard. Then, the worker needs to be compensated for that, (iv) even if the worker hired by us and by the national company is equally competent, our company will employ the worker in projects that will generate higher income and where its competence will be better utilized. Therefore, the worker needs to be paid more, (iv) other (please fill in the blank). Please rate this option as number 5 if nothing is filled.

C. Summary and discussion of survey answers. Questions 1 and 2. Answers to these questions suggest that the main team is mostly formed by locals. These local employees are typically found with the help of recruitment agencies and expatriates who come to Costa Rica to support the first rounds of hiring.

Question 3. To hire the rest of the staff, MNCs use various communication media (e.g., social media, company website, printed press, etc.). MNCs also continue to rely heavily on recruitment agencies. To a lesser extent, MNCs use employment fairs, partnerships with educational institutions, campaigns with municipalities, etc.

Question 4. The most important criteria upon pre-selecting the most skilled workers (e.g., managers, engineers, administrative staff) are: (i) having previous experience in the same job position (33 respondents chose this answer), (ii) having experience in the same industry in which the company operates (29), (iii) the academic studies and the institution where the worker graduated (23), (iv) having

Table A32: Answers to Question 11

Answer	R=1	R=2	R=3	R=4	R=5
Our company has a better selection filter of workers and the worker we hire tends to be more competent.	11	1	11	6	0
The workers of our company must be motivated to work hard. Then, the worker needs to be compensated for that.	6	11	6	5	1
Our company will employ the worker in projects that will generate higher income and where its competence will be better utilized.	2	12	4	9	2
For reasons of equity, the wages we pay to our workers in Costa Rica should be closer to the wages of similar workers in the headquarters or in other subsidiaries of our group.	5	4	7	9	4
Other: We pay higher wages to motivate and retain talent, to avoid turnover of workers whose training we invest in.	5	1	1	0	22

Notes: Table A32 summarizes the answers to Question 11. "R=1" means that a given answer has been ranked first out of five options.

experience in personnel management (23), (v) having previous experience in MNCs (20), and last, (vi) having experience working abroad (1).

Question 5. The most important criteria upon pre-selecting the less-skilled workers (e.g., operators, packers, mechanics, cleaning staff) are: (i) having previous experience in the same job position (41 respondents chose this answer), (ii) having experience in the same industry in which the company operates (38), (iii) the academic studies and the institution where the worker graduated (26), (iv) having previous experience in MNCs (23), (v) having experience working abroad (1), (vi) having experience in personnel management (0). Questions 4 and 5 bring a series of insights. First, experience in the same job position and the same industry are the most valuable pre-selection criteria for both high- and low-skilled workers. Second, academic studies and previous experience with MNCs are also important criteria. Last, experience with personnel management is only necessary for high-skilled workers.

Question 6. The most important sources of information used by MNCs when it comes to choosing the most skilled workers (e.g., managers, engineers, administrative staff, etc.) to hire are: (i) the Curriculum Vitae (38 respondents chose this answer), (ii) a test / interview about the use of English or other languages (29), (iii) a test of knowledge or professional skills related to the job (25), (iv) letters of recommendation or references of former employers / teachers (15), (v) a test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team) (14), (vi) an evaluation of the work done during a trial period (4), (vii) criminal records (3), (viii) the immediate availability (1).

Question 7. The most important sources of information used by MNCs when it comes to choosing the less-skilled workers (operators, packers, mechanics, cleaning staff, etc) to hire: (i) the Curriculum Vitae (30 respondents chose this answer), (ii) a test of knowledge or professional skills related to the job (25), (iii) letters of recommendation or references of former employers / teachers (18), (iv) the immediate availability (14), (v) an evaluation of the work done during a trial period (15), (vi) the test / interview about the use of English or other languages (11), (vii) a test of cognitive, psychometric and / or psychological skills (IQ, emotional intelligence, ability to work in a team) (9), (viii) criminal records (8). Questions 6 and 7 bring a series of insights. First, language skills are more important for high-

than low-skilled workers. Second, both types of workers receive tests of the knowledge or professional qualifications relevant to the job. Third, letters of recommendation from former employers are useful to the evaluation of both types of workers. Fourth, trial periods are slightly more frequent for low- than high-skilled workers. Last, the immediate availability of low-skilled workers is seen as an advantage.

Question 8. The most frequently used resources to set wages are: (i) surveys about wages (33 respondents chose this answer), (ii) benchmarking with wages in the industry (33), (iii) information about wages from the headquarters (14), (iv) information about wages from the Ministry of Labor and Social Security (12), (v) information provided by CINDE (10), (vi) information provided by recruitment agencies (5). Local wages seem to anchor wage setting for MNCs. That said, HQs also influence wage setting.

Question 9. Most MNCs update wage brackets (at least) once a year.

Question 10. Most MNCs pay higher wages than domestic firms for a worker of the same education, with the same number of years of experience and hired in the same occupation.

Question 11. MNCs claim to have a better selection filter than domestic firms, meaning that workers hired by MNCs tend to be more competent than workers hired by domestic firms (even if of the same education, with the same number of years of experience and hired in the same occupation). That said, the (unobserved) ability of a worker is not the only explanation for the wage differential (particularly for the within-worker wage differential, which keeps the unobserved ability constant). MNCs pay higher wages also to motivate workers, to retain workers in whom they have invested, because these workers are employed in higher income-generating projects, and last but not least, for reasons of within-MNC wage equity.

Appendix E.2 Representative Household Survey Data

We use information from a survey conducted by INEC – *"Instituto Nacional de Estadistica y Censos"* or the National Institute of Statistics and Censuses of Costa Rica. This survey – called the *Encuesta Nacional de Ingresos y Gastos de los Hogares* or the National Survey of Household Income and Expenditures (abbreviated as ENIGH) – collects data on the household sources of income and expenditures on goods and services. We use data from the 2018 round, which surveyed a nationally representative sample of 9,828 households. Across these 9,828 households, the survey recorded 3,411 individual tax IDs (the tax ID information not being compulsory). Of these 3,411 tax IDs, 3,034 had the correct number of digits to qualify as a possibly valid tax ID.

We merge the 3,034 ENIGH tax IDs with the tax IDs in the 2017 matched employer-employee data. Of the 3,034 potentially valid tax IDs, 1,316 are found in the 2017 matched employer-employee data. For these 1,316 individuals, ENIGH adds (to the labor earnings information from social security records) information on the number of hours worked, and monetary and in-kind benefits from employment.

We remove the individuals with zero earnings throughout 2017 (one tax ID), retirees (18 tax IDs), self-employed or individuals working for the public sector (525 tax IDs), individuals with special contracts or *convenios* (13 tax IDs), individuals working part-time (37 tax IDs). We are left with 723 individuals. Among the 2,688 individuals dropped from the initial sample (3,411-723), 1,294 declared to be unemployed.

Appendices References

Kalemli-Özcan, Şebnem; Sørensen, Bent; Villegas-Sanchez, Carolina; Volosovych, Vadym, and Yeşiltaş, Sevcan. How to Construct Nationally Representative Firm Level Data from the ORBIS Global Database. Note, 2015.