The Effects of Multinationals on Workers: Evidence from Costa Rica

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What are the effects of foreign multinational corporations (MNCs) on workers in the host economy? Workers can be affected either directly, by being hired by MNCs, or indirectly, by being exposed to MNCs through the labor and product markets. To study the effects of MNCs on workers, we use (i) a unique combination of administrative datasets tracking all worker-firm and firm-firm relationships in Costa Rica, and (ii) an instrumental variable strategy that exploits variation in the global performance of MNCs with subsidiaries in the country. First, we estimate a direct MNC wage premium of nine percent, which is an above-market wage rather than a compensating differential. Second, for the study of the indirect effects of MNCs, we leverage the fact that MNCs in Costa Rica tend to limit their product market interactions to those with local suppliers. We can thus separately estimate the effects of MNCs on outside options in the labor market and the effects mediated by changes in the performance of domestic employers from input-output linkages to MNCs. The annual earnings of a worker experiencing a one standard deviation increase in either the labor market or employer-level exposure to MNCs grow one percentage point more than those of an identical worker with no change in both MNC exposures. Third, and finally, we write a stylized model of an economy with MNCs that allows us to rationalize the reduced-form evidence and estimate key parameters governing wage setting. 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 a high marginal hiring and training cost. To match our empirical estimates, the cost per worker must be equivalent to one year of earnings paid at the competitive market wage. This high cost allows incumbent workers to extract part of the increase in employer rents resulting from higher sales to MNCs.

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1 Introduction

Developed and developing countries alike court foreign multinational corporations (MNCs) with generous tax incentives and productive public inputs. For developing countries in particular, attracting MNCs is frequently at the heart of their development strategy. For instance, in 72% of developing countries, MNCs are offered preferential tax incentives which have only become more generous over the last 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 employed directly by MNCs and those in the domestic economy who are indirectly affected by the expansion or contraction of MNCs. The answer to this question is a key input to any evaluation of the effectiveness and equity of these policies.

Two challenges stand in the way of an answer. First, the decision of MNCs to expand or contract in an economy may be endogenous to labor and product market conditions that can independently affect worker outcomes. Second, to understand the incidence of changes in exposure to MNCs, one needs to observe who is affected by MNCs and through which channels. There is growing evidence that workers' wages are affected not only by their own productivity, but also by their outside options in the labor market and by the attributes of the firm they work at. To disentangle the effects of MNCs on workers one needs to find the data and empirical setting that allow one to consider not only standard demand effects but also potential effects on outside options (in the labor market) and on the performance of local firms (through the product market). We answer this question in Costa Rica, a middle-income country which – as many others – has placed the pursuit of MNCs at the forefront of its development strategy.

Two features of our setting help us overcome these challenges. First, due to the small size of the domestic market, we can exploit changes in the performance of MNCs *outside* of Costa Rica – plausibly exogenous to labor and product market conditions in Costa Rica – to instrument for changes in the presence of MNCs in Costa Rica. Second, we draw on a unique combination of administrative data where we can track all formal worker-firm and firm-to-firm relationships in the economy. We can thus characterize MNCs in their dual role: as employers that pay above-market wages and as firms in the production network of the country. As the most relevant product market interactions of MNCs are those with local suppliers, we can separately estimate the effects of a worker's exposure to MNCs through the labor market and those due to the exposure of her employer to MNC buyers.

We proceed in three steps. First, we estimate the relative wage gain upon becoming an MNC worker – the MNC wage premium – and examine its determinants. Second, we provide reduced-form evidence on the indirect effects of changes in exposure to MNCs – both through the labor market of the worker and her employer – on wages. We document the characteristics of workers most exposed to MNCs through each channel and of workers with the largest treatment effects. A back-of-the-envelope calculation compares the direct and indirect wage gains to the tax revenues foregone by the government due to tax breaks. Third and last, we develop a simple model of an economy with MNCs, to build intuition on our reduced form evidence and estimate key parameters governing wage setting (such as the sensitivity of workers to changes in outside options and the magnitude of hiring and training costs).

At the center of the analysis lies the construction of a new 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 with human resources (HR) executives at MNCs on their wage setting practices. Last, we gather data from Orbis and Compustat on the MNCs with subsidiaries in Costa Rica and in nineteen other Latin American and Caribbean countries, which serves as input to the construction of instruments for the change in MNC employment in Costa Rica.

In the first part of the paper, we estimate the direct effect of becoming an MNC worker on wages. We first employ a standard movers design that requires workers who change employer not to select into firms based on their idiosyncratic time-varying error term. Moving from a domestic firm to an MNC brings a 9% higher raise than a move from one domestic firm to another. The premium varies greatly across industries and is higher for workers with college education (12%) than for those without (8%). Robustness checks suggest that the identifying assumption holds in our setting. To strengthen the causal claim over the MNC premium, we also use an instrumental variable (IV) strategy where we instrument the move from a domestic firm to an MNC between two consecutive years by the contemporaneous expansion in MNC employment *outside* of Costa Rica for MNCs with subsidiaries in the labor market of the worker. The OLS and IV estimates of the MNC premium are 8 and 18%, respectively. The downward bias of the OLS is consistent with the IV compliers being workers who move from lower-wage domestic firms and who need a sizable expansion of MNCs in their labor market to move to an MNC.

Why would MNCs pay a wage premium? One potential explanation is that the premium is a compensating differential. We use the nationally-representative household survey to show that MNC workers enjoy better in-kind and monetary benefits than workers for domestic firms, while working a similar number of hours. From the administrative data, we find that MNCs have higher retention rates of their workers and require smaller increases in wages of new workers relative to incumbents to expand. If anything, the amenities provided by MNCs appear superior to those provided by domestic firms. A second set of explanations relate to the existence of labor recruitment and hiring costs, or MNC-wide wage setting policies and tax fairness concerns, all of which are consistent with above market wages. One way to investigate the plausibility of labor recruitment and hiring costs is to control for firm characteristics that are known to correlate with these costs, such as the size and industry of the firm (Manning, 2011). These two controls explain about half of the MNC premium, with the remaining half being consistent with other MNC-specific considerations, such as pay fairness within the MNC. We also use a survey conducted by the authors in partnership with CINDE (the Costa Rican investment promotion agency). Asked whether they pay higher wages to workers than domestic firms and why, MNCs mentioned that their higher wages are meant to avoid turnover costs, to motivate workers, and to ensure fairness in pay within the MNC. Overall, MNCs appear to pay above-market wages.

In the second part of the paper, we study the indirect effects of MNC expansions and contractions on workers who are not employed by MNCs. To that end, we define a labor market as a two-digit industry in a given region and propose two measures of exposure to MNCs – a labor market exposure and a firm-level exposure. We estimate the effects of changes between two consecutive years in exposure to MNCs on the contemporaneous changes in the yearly labor earnings of workers in domestic firms. We focus on stayers (workers who remain in their same domestic employer from one year to the next), as it allows us to emphasize the importance of changes in the firm-level exposure for wage setting.

The labor market exposure measure is a weighted average of changes in MNC employment over all labor markets in the economy, where the weights reflect worker mobility flows between markets in the pre-period (2006 to 2008). These weights are a transparent, non-parametric way to capture the full costs faced by workers upon changing industry and region. The change in MNC employment in a market is simply the multiplication between the share of MNC employment in that market in a given year and the percentage change in MNC employment over the following year. Each market-specific

component in the labor market exposure sum is then multiplied by one plus the MNC wage premium. This market-specific multiplication is motivated by our finding that MNC premia differ greatly across industries and by the intuition that shifts in the composition of jobs towards firms that pay a premium improve the outside options of workers who – while not working directly for these firms – are in the same or connected labor markets.

The second measure of exposure to MNCs that we propose varies at the firm-level. We focus on MNCs as buyers alone following the conclusions of both meta-analyses and Alfaro-Urena et al. (2019b) suggesting that, by and large, MNCs affect the performance of their domestic suppliers only (as opposed to clients or competitors). This exposure leverages the firm-to-firm transaction data and is a weighted sum of the growth rate of each MNC in the economy, weighted by the share of total (direct and indirect) sales of a given domestic firm going to a specific MNC. Shocks to the size of one's direct and indirect MNC buyers are likely to result in shocks to both the demand and productivity of the domestic firm. With labor market imperfections and frictions, incumbent workers at the domestic firm could extract part of the increase in rents generated by these shocks.

To address potential endogeneity concerns, we construct a set of instruments that rely on variation in global employment of the MNCs with a subsidiary in Costa Rica. The instruments we propose are analogous to our two measures of exposure. However, they use the changes in MNC employment *outside* of Costa Rica for the same MNC with subsidiaries in Costa Rica instead of their changes in employment *in* Costa Rica. In both the OLS and IV specifications, the coefficients on both measures of labor market and firm-level exposure to MNCs are positive and significant.

Our IV estimates suggest that an increase in one standard deviation in both our measures of exposure predicts an annual wage increase of around 2.3%, which is comparable to the average annual growth of real earnings during our period of study. Thus, a hypothetical worker who experiences a one standard deviation increase in both measures of exposure would see her annual wage increase twice as much as another worker experiencing no change in exposure to MNCs. In addition, we find that around 45% of the gains in wage growth come from improved outside options for the worker, while the remaining 55% come from the improved performance of her employer. The latter result highlights the role of the pass-through of firm-level shocks to worker level outcomes – a channel that is typically ignored in frameworks studying the effects of local labor market shocks.

While most of our emphasis so far has been set of the estimation of average treatment effects, our data allows us to uncover additional heterogeneities of interest. In particular, we find strong evidence that workers without a college education experience higher indirect gains through both types of exposure to MNCs than workers with a college education. This pattern has two candidate explanations. First, workers without a college degree represent the vast majority of the workforce in both domestic firms and MNCs. Hence, the weaker results for college-educated workers could be due to a less targeted definition of treatment. Moreover, previous research has shown that high-skill worker wages

For comparison with estimates of the pass-through of changes in value added per worker to worker wages (referred to as the rent-sharing elasticity), we re-estimate our empirical specifications using value added per worker instead of firm-level exposure as a dependent variable. We find estimates of the rent-sharing elasticity of 0.09, implying that for each extra dollar of value added per worker incumbent employees increase their salaries by 9 cents. This is consistent with existing literature (Card et al., 2018). Finding an estimate of the rent-sharing coefficient for Costa Rica that is comparable to those estimated in developed countries suggests that the findings from Costa Rica may apply more broadly.

A conservative back-on-the-envelope calculation suggests that the aggregate gains in labor earnings owed to MNCs for the period of study are approximately 152 million U.S. dollars per year. This

number is a likely lower bound since we abstract from employment effects and focus on gains in the labor earnings of employed workers. Around 83 million U.S. dollars of the total benefits are paid in the form of wage premia to those workers directly hired by MNCs. The remaining 69 million U.S. dollars come from domestic-wage increases caused by the entry and expansion of MNCs. At the same time, the official estimate by the Costa Rican government for the 2011 to 2015 period shows that the foregone taxes due to tax exemptions offered to MNCs amount to 467 million U.S. dollars on average per year. Thus, in our simple calculation, the aggregate gains labor earnings match around 33% of the costs, which implies that these gains in labor earnings alone would not justify the generous tax incentives extended to MNCs.

Our results of the first two parts of the paper show that MNCs pay a wage premium to the workers they employ directly, and that the product market exposure of domestic employers to MNC expansions leads to wage increases for their employees. Both facts point to the presence of at least some sort of labor market imperfection. To assess this possibility, the final part of the paper develops a stylized model that formalizes the channels by which MNCs can affect wages in a way that is qualitatively consistent with our empirical analysis. We then combine the structure of the model with the plausibly exogenous MNC shocks to infer the degree of labor market imperfections in the economy.

In our model, MNC subsidiaries produce in a small open economy using labor and intermediate inputs but export their production given an international demand. While the model is static, domestic firms start the period with an exogenous number of incumbent workers and a given set of MNC clients. Firms also face a cost of hiring and training that is convex with respect to the number of hires. They hire new workers at the competitive market wage but post a firm-specific wage to their incumbent workers.

An exogenous expansion of an MNC can affect wages paid to incumbent workers at domestic firms in three ways. First, the increase in labor demand by the MNC puts pressure on the competitive wage paid in its industry. Second, the composition of jobs in the same industry shifts towards jobs with a wage premium. This improves the outside option of incumbent workers by making it more attractive for them to leave their current domestic employer. Last, 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 they post a higher wage.

The magnitude of a wage change depends 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 elasticity that governs how substitutable the current employer is for its incumbent workers. Our model estimates show a high average marginal hiring and training cost of around 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 also find that workers see their employers and other firms as relatively close substitutes given the retention elasticity equal to 24. However, we reject that inverse of the retention elasticity is equal to zero. This suggests that workers earn a large – but not full– share of the value of their marginal product of labor.

Overall, we show that expansions or contractions of MNC employment can affect not only individuals directly working for MNCs but also workers employed by domestic firms, who are exposed to MNCs through the labor and product markets. Individuals who become employees of MNCs enjoy a wage premium of around 9%, that is not fully explained by neither compensating differentials nor firm characteristics. In terms of indirect effects, we find that an increase in the standard deviation of either the labor market or firm-level exposure to MNCs of a worker would lead to comparable increases in wages. Last, we write a model with hiring and training costs and imperfect labor markets that allows us to formalize the two channels of exposure to MNCs and estimate key parameters governing wage setting. To rationalize the data, our model suggests the labor market is characterized by relatively high

hiring costs and a relatively high sensitivity of workers to outside options.

Related Literature. Our paper contributes primarily to two literatures. First and foremost, we contribute to a vast literature on the effects of foreign direct investment (FDI) on the host economy. Most papers study the effects of FDI on firms, industries or at the macroeconomic level. Firm-level regressions that estimate the effects of changes in MNC presence in either the industry (industry by region) of the firm or vertically-related industries sometimes add the firm-level number of workers and wage bill as outcome variables.[1] Yet with firm-level data, it is difficult to shed 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 worker-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.[2] 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 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. Setzler and Tintelnot (2019) estimate the effects of an increase in the share of MNC employment in a commuting zone on the wages of workers in domestic firms in that commuting zone. In their framework, wage gains can only result from either demand effects in the labor market or productivity spillovers to domestic firms. The authors find a statistically insignificant effect on the average worker's wage growth. In contrast, our focus is on the effects of MNCs on the outside options of workers (given the MNC premium) in both their and connected labor markets, and on the potential rents of the employers that could be shared with workers (given labor market imperfections). 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 how connected their firm is to MNCs through firm-level input-output linkages.

Second, we contribute to the literature studying how wages react to variations in firm performance and outside options in the labor market. One benefit of our approach is that, within the same empirical framework, we show that both changes in firm-level outcomes and outside options affect the wages of stayers. We add to a small set of papers using matched employer-employee data and firm-level shocks to firm performance to estimate the pass-through of these shocks to worker wages (Guiso et al., 2005; Garin and Silvério, 2018; Kline et al., 2019; Lamadon et al., 2019; Howell and Brown, 2019; Friedrich

[1] 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 is correlated 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."

[2] Poole (2013) is a notable exception that studies the effects of hiring former MNC workers on domestic firms.

[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).

[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 within-plant changes in wage premia on changes in the export share.

[5] This stands in sharp contrast with the vast literature that uses worker-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 those of trade, given that MNCs are exceptional employers and buyers that directly insert themselves in the labor and product markets of the host economy. Moreover, MNCs increasingly operate in services, whereas most of the evidence on trade pertains to manufacturing industries.

et al., 2019). By exploiting a new source of variation in firm performance – exogenous shocks to the size of a firm's direct and indirect buyers – we characterize rent-sharing in the universe of domestic firms in Costa Rica (as opposed to more selected sets of firms studied thus far).[6] Moreover, to our knowledge, we provide the first quasi-experimental estimate of pass-through for a developing country, which is relatively smaller than that for developed countries.

By emphasizing that MNC expansions can change both the demand for labor and the composition of jobs in a two-digit industry and region, our paper is in essence 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 aggregate nature of the data implies that changes in the premia of an industry can only occur at the national level. Second, because our analysis is at the worker-level (as opposed to the industry-level), we can acknowledge pay heterogeneities across employers in the same industry and study the effects of changes in MNC presence on the wages of workers in 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 empirical strategy used to study the indirect effects of MNCs on workers in domestic firms and its reduced-form 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 infer estimates of the structural parameters governing the labor market. Section 6 concludes.

2 Data and Context

2.1 Data

We bring together a new collection of microdata to asses the effects of MNCs on workers. We combine three types of data: (i) administrative (matched employer-employee data, firm-to-firm transactions, corporate tax returns, foreign ownership), (ii) commercial (Orbis and Compustat), and (iii) survey (our own survey collection and a 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 being used for research and even more, combined with the next three administrative datasets described below. The employer-employee panel is built upon data collected by the *Caja Costarricense de Seguro Social* (Costa Rica's Social Security Administration). We observe (at least

[6] To our knowledge, this is the first paper to emphasize the implications of shocks in the domestic production network on workers. Thus far, the empirical literature on domestic production networks has documented how shocks propagating through the network impact firms' and aggregate outcomes (Tintelnot et al., 2018; Dhyne et al., 2018; Bernard et al., 2019; Furusawa et al., 2017; Miyauchi, 2018; Huneeus, 2018; Demir et al., 2018).

[7] Beyond Beaudry et al. (2012), we contribute 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 wages of workers in "bad" industries). With the increasing access to rich microdata, this literature is now 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).

once) 1.9 million unique person identifiers (IDs). For each person ID, this data records at a monthly frequency, information on demographic characteristics (date of birth, nationality, sex, district of residence) and the labor earnings and occupation at each employer. The monthly labor earnings are not censored. The occupation is recorded as a standardized four-digit code (out of a total of 482 codes). Employers are traced by their unique tax ID.

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 at 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 with full-time employment. Table A1 provides the summary statistics of this resulting dataset.

Like most matched employer-employee datasets, Costa Rica's dataset does not contain measures of hours worked. Moreover, this data does not contain the education of the worker. That said, following the Costa Rican law, employers assign occupational codes that have a one-to-one mapping to the educational attainment of the worker. We therefore infer education from the occupational code and group education levels into two categories: "college or more" and "less than college." Last, 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 in the D-151 tax form the tax ID 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 in 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 tax IDs that appear in the other administrative datasets (i.e. firms that fill corporate tax returns and report their employees to the Social Security Administration). This data allows us to identify those firms who 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 the total revenues and value added) and other characteristics (such as the region and two-digit industry of the firm). We link the corporate tax returns data to the employer-employee data via firms' unique tax IDs. We exclude state-owned enterprises, nonprofit organizations, and observations with zero reported total sales or with 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 B4 (Appendix B.1) summarizes the different steps 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.

[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).

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 the MNCs in Costa Rica 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 IV are the main industry code of the MNC and its worldwide number of workers. We also use Orbis to construct a second IV for robustness checks. This IV is based on employment changes in MNCs with at least one subsidiary in one out 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 individual tax IDs. For 1,316 individuals, ENIGH contains information on the number of hours worked, and monetary and in-kind benefits from employment. We study the 723 of these workers 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 as "MNC subsidiaries" those firms in Costa Rica that are subsidiaries of foreign-owned groups. We focus on MNCs whose median number of workers 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 moving from one industry to another) whose post-2009 values might be equilibrium reactions to contemporaneous changes in the presence of MNCs.

Starting the treatment period with 2009 has an additional benefit. In 2009, 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 expected to have the most sizable impact on the composition of U.S. FDI flows to Costa Rica (World Bank, 2017). First, FDI in IT-enabled

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

business services was expected to boom after the liberalization of the telecommunications sector. Second, with the strengthening of the intellectual property rights and the legal framework protecting foreign investors, CAFTA-DR was expected to increase FDI at the higher end of technology-intensive industries. In addition, Costa Rica became attractive to MNCs in the medical devices industry after the U.S. Food and Drug Administration (FDA) opened its first office and regional hub in Latin America and the Caribbean in Costa Rica in 2009.[10]

The industries whose MNC employment has grown the most (in % terms) between 2009 and 2017 have been business support services, medical devices, HR services, computer programming, and scientific and technical activities. Conversely, the industries with the strongest contraction in MNC presence have been the manufacturing of wearing apparel, manufacturing of metallic products, manufacturing of food products, manufacturing of 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 labor market s, i.e.,

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

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, $M^{CR}_{s,t}$ is the sum of $M^{CR}_{m,t}$ across all MNCs m in market s in Costa Rica $\left(M^{CR}_{s,t} \equiv \sum_{m \in s} M^{CR}_{m,t}\right)$.

Throughout the paper, a labor market s is a two-digit industry $\times$ region. While there could be up to 480 markets (given the 80 two-digit industries and 6 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.).

Table B1 (Appendix B.1) presents summary statistics for the market-level growth in MNC employment $(\Delta\mathcal{M}_{st})$. Between 2009 and 2017, on average, markets experience an increase in MNC employment of 13%. While the median market is relatively unaffected (1%), some markets experience extreme drops (*p1*=-100%) or booms (*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 in markets that were systematically more high-skill intensive, which may obfuscate any attempt to disentangle between 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 in 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 in the growth rate of MNC employment across markets with similar shares of college graduates.

[10]The Latin America Office works to ensure that the range of FDA-regulated products that are exported to the U.S. from this region meet FDA requirements."The FDA chose Costa Rica as a regional hub because the country has good infrastructure and a willing administration and recently entered the [CAFTA-DR agreement with the U.S.]," said Michael Leavitt, the U.S. Secretary of Health and Human Services in 2009 (see here).

Work in progress: two extra graphs that show that (i) there is enough variation in $\Delta\mathcal{M}_{st}$ across two-digit industries within a region, and (ii) there is enough variation within two-digit industries across regions. In the empirical analysis we will control for two-digit industry $\times$ year and region $\times$ year trends.

In 2017, the last year of data, 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 obvious that the "MNC shocks" would disproportionately benefit college-educated workers.

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

We define the "MNC wage premium" (or MNC premium, as a shorthand) as the additional average percentage increase in labor earnings experienced upon moving from a domestic firm to an MNC relative to the average increase in labor earnings experienced upon moving from one domestic firm to another. The MNC wage premium is interesting in its own right. As we discuss in Section 4, the MNC premium is also important for the effects of MNCs on the wages of workers employed by domestic firms. To the extent that MNC jobs are indeed higher wage jobs than those offered by domestic firms, changes in the presence of MNCs affects the composition of outside options of workers in domestic firms.

3.1 The Identification of the MNC Premium

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

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

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).[11] I_i^{XX} is an indicator for the type of move of worker i.[12] DM stands for DOM-MNC (a move from a domestic firm to an MNC), MD for MNC-DOM, and MM for MNC-MNC. The reference type of move is DD (DOM-DOM). Our coefficients of interest are the ψ_k for all four types of moves. We normalize $\psi_{-2} = 0$ for each type of move. We use robust standard errors clustered at the individual-level.

[11] We set $\underline{C} = -8$ and $\overline{C} = +8$.

[12] If a worker i is engaged in more than one move, then her observations are repeated in our panel as many times as her number of moves.

Table B3 (Appendix B.1) presents summary statistics on the sample of workers used to estimate the premia associated to the four types of moves. In total, there are 84,756 unique workers who enter in the regression described above, i.e. workers who we observe as engaged in a move in quarter 0, and who we observe 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 are engaged in moves from a domestic firm to an MNC. Columns (4), (5) and (6) show that workers who are engaged in a move from a domestic firm to another tend not only to earn less on average than workers who move from a domestic firm to an MNC, but, in addition, come from domestic firms in which co-workers earn less and domestic firms that are smaller. This confirms the intuition that movers to MNCs may be selected on levels.

Figure 2 presents side-by-side two versions of the movers design. 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) (which includes α_i and γ_t). Both figures point to the same four takeaways: (i) irrespective of the type of move, workers are not embarked in differential trends before the move, (ii) both DOM-DOM and MNC-MNC moves are associated with a small increase in labor earnings (about 4% and 6%, respectively), (iii) DOM-MNC moves lead to large boosts in labor earnings (about 13%), and (iv) MNC-DOM moves lead to 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 B3 that workers engaged in DOM-MNC moves already had higher labor earnings that those engaged in DOM-DOM moves.[13]

Identification in the movers design requires that workers do not select into firms based on the idiosyncratic time-varying error term, ϵ_{it}. One key concern to identification is therefore that the employer move and, in particular, a move from a domestic firm to an MNC (or the reverse) is driven by unobserved shocks to worker productivity which would be subsumed in the error term. Consider the scenario of a worker graduating from an evening Master's program who decides to leave her domestic employer for an MNC employer upon receiving the degree. If moves to MNCs are systematically driven by such scenarios, then this would lead to an overestimation of the MNC wage premium.

In Appendix C.1, we present three robustness checks on identification. First, we estimate the MNC premium only using moves to newly-entered MNCs, occurring in the first twelve months after entry. Second, we estimate the premium only using workers coming from unemployment, whose earnings are benchmarked to those of workers with similar observable characteristics but with a continuous employment in a domestic firm. Last, we estimate the premium only using moves of workers who come from exiting domestic firms. Given that 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 unobserved contemporaneous shocks to the productivity of workers.

Last, to further bolster the causal claim over the estimate of the MNC wage premium, we also leverage an IV strategy which takes advantage of the exogenous variation to the size of MNCs in Costa Rica (presented in detail in Appendix B.3.2). To our knowledge, this is the first time that the MNC premium is estimated without relying on the assumption of movers' designs. We instrument the move from (to) a domestic firm to (from) an MNC between $(t-1)$ and t by the contemporaneous change in MNC employment *outside* of Costa Rica for MNCs with subsidiaries in the labor market of the worker in year $(t-1)$, $s(i, t-1)$.

[13] Note that the estimate that we comment on is based on the behavior of labor earnings after the first quarter after the move. After one quarter, workers can be thought of as incumbent workers. In the quarter of the move, workers are new hires who – during their transition period – earn less than incumbent workers in the same firm. Notice that not only incumbent workers earn more at MNCs than at domestic firms, but also new hires.

The intuition of a significant first stage is that workers who move from a labor market $s(i, t-1)$ that experiences an increase in exposure to MNCs are more likely to move to an MNC than workers who move from a market whose exposure has increased less than for $s(i, t-1)$. The exclusion restriction requires the expansion of MNCs outside of Costa Rica to affect the change in earnings of worker i only through its effect on the probability of i to move to the MNC subsidiaries in Costa Rica. Table B6 (Appendix B.3.2) presents the IV estimate of 18% (with an F-statistic of 236). The compliers in this IV exercise are likely to be workers who come from lower-paying domestic firms and who need a considerable expansion of MNCs in their $(t-1)$ labor market to move to an MNC. Given that the 9% estimate of the MNC wage premium coming from the movers design is more conservative than the 18% from the IV strategy, going forward, we use the 9% estimate of the more familiar movers design.

3.2 Interpretation of the MNC Premium

3.2.1 Compensating Differentials

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 nonpecuniary differences in job attributes (such as a higher number of hours worked or other undesirable employment characteristics). If the MNC premium is a mere compensation for disamenities, then an increase in the presence of MNCs in a labor market could no longer be interpreted as an improvement in the outside options of workers in that market.

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 are able to observe features of employment that are typically not observed in matched employer-employee data. In particular, those surveyed are asked about 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, namely whether the employers pays for extra hours of work, whether it pays a bonus salary at the end of the year, whether it pays for sick leave or vacation days, whether it provides occupational hazard insurance, and last, whether it pays Social Security contributions for the worker.

Table 1 presents OLS regressions on the cross-section of workers surveyed in 2018, where the main explanatory variable is whether the worker worked for an MNC in 2017.[14] We first find that working for an MNC in 2017 is not correlated with working extra hours in the employment held in 2018 (Column (1)). In addition, workers who worked in 2017 for an MNC are 7 to 20% more likely to benefit from all of the above mentioned monetary and in-kind benefits.[15]

One important caveat with the current exercise is that the main 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., have the same employer in every two consecutive years, see Table A1 in Appendix A.1).[16]

[14] 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.

[15] 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.

[16] 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.

Higher retention probabilities at MNCs. We use the matched employer-employer data to provide evidence on the revealed desirability of MNC jobs. Figure B11 (Appendix B.3.3) 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 who are observed employed by a different firm in the quarter after the separation from employer j. For these workers, the separation is more likely to be a quit that a firing. While this graph showcases an overall high job churning, 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. This suggests that workers at MNCs have less incentives to quit their jobs than those at a domestic firm.

Lower wage increases necessary for MNCs to expand. In Appendix B.3.3 we inquire 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 employers than domestic firms, then MNCs should not have as hard a time 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 around twice as large for domestic firms than for MNCs (for college and non-college occupations alike). Thus, both types of firms face an upwards 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.

3.2.2 Explanations Consistent with Above-Market Wages

Labor recruitment and training costs (Oi, 1962; Manning, 2011), or efficiency wages (Stigler, 1962). The evidence so far suggests that MNCs pay wages that are above the competitive levels in 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. For instance, 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 of 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 for example Head and Ries, 2008) and for whom worker shirking can be more costly (e.g., due to their higher-capital intensity, akin to the hold-up problem in Acemoglu, 2001).

According to our surveys to 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 what a domestic firm would pay are (i) the fact that "workers of [their] company must be motivated to work hard" (33% of responses), and (ii) the fact that MNCs want "to retain talent, to avoid turnover of workers whose

[17] It is important to emphasize that 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 to begin with.

training [they] invest in" (27% of responses).[18]

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

Figure B2 (Appendix B.3.1) explores the role of employer size and industry. Panel B2a uses as dependent variable the number of workers hired by the employer of worker i in quarter-year t. We learn that while DOM-DOM moves occur between similarly-sized employers, DOM-MNC moves involve a jump of about 130% in the number of co-workers. Panel B2b adds to the main specification in Equation (2) controls for a second-order polynomial of the log number of workers of i's employer in quarter-year t, in addition to the two-digit industry of the employer. Controlling for employer characteristics reduces the MNC premium to about 5%. In another exercise, we introduce the firm size non-parametrically, by grouping MNC and domestic firms into either big or small. Even when comparing MNCs to domestic firms within the same bin of size and industry sophistication, the MNC premium remains between 2 and 6% (see Table B5).

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 would point to 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 B5 (Appendix B.3.1) 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 from one domestic firm to another see their quarterly-average earnings increase by around 3%.

One might be worried 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 (for instance, due to the higher demand for college-educated workers by MNCs). Figures B7 and B9 (Appendix B.3.1) 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.

[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." Note however that differences in productivity between firms 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 than lower productivity firms, they need to pay both marginal and inframarginal workers more.

[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 trainings) or at other third-party institutes which offer the training on behalf of the MNC. Of these institutes, INA (*"Instituto Nacional de Aprendizaje"* or the National Institute of Learning of Costa Rica) is the most likely partner, in particular for the lower-skilled workers. In 2015, firms from Special Economic Zones (SEZs) in Costa Rica contributed with 22 million U.S. dollars to INA, which represented 11% of the budget of this institution that year (Procomer, 2016). Partnerships between MNCs in SEZs and INA are frequent and aim to align the curriculum of INA with the skills demanded by MNCs (see example here). In 2018, 37 MNCs have provided training to 785 employees through INA.

Figure B6 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 B6a 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 B6b re-estimates equation (2), this time controlling for the firm size and industry. The new premia are smaller in magnitude than those in Figure B5. These new premia are 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 last, 2% for non-college graduates in DOM-DOM moves. Thus, while both MNCs and domestic firms pay higher raises to new college-educated hires than to new hires without 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 use the movers design to 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 the industries with the lowest MNC premia.

One might be ask whether these differences in industry-specific MNC premia reflect fundamental differences between industries, or differences in the extent to which industries employ college-educated workers. Panel 3b shows a strong positive 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. 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 effects of changes in MNC presence on workers, we weigh the changes in MNC presence of each industry with its industry-specific MNC premium.

Taken all together, 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). That said, MNCs tend to be considerably larger than local firms in developing countries and to operate in more sophisticated industries. Hence, their arrival and/or expansion are beneficial to workers, irrespective of whether they have an added benefit of being MNCs or not.

Other factors, such as MNC-wide wage setting policies or tax fairness concerns in the host country. Recent research shows that multi-establishment firms do not decide employment and wages for each establishment as an independent unit, but that they 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 within a group is likely to be even stronger in settings where establishments are in a vertical (input-output) relationship, which seems to be 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 their wages to HQ levels.[20] We conjecture that – at least to some extent – the practice of within-MNC wage compression is motivated by increasing consumer scrutiny

[20] 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-skill staff.

over the practices of MNCs abroad (for an example, see Harrison and Scorse, 2010).

Our survey to HR executives from MNCs lends supports 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 in 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.3.1 we divide MNC subsidiaries in 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.

3.3 Takeaways on the MNC Premium

Of our findings on the MNC premium, six will direct inform our analysis of the 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 analysis in Section 4 we allow explicitly for 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 of the workers (in both MNCs and domestic firms) do not have a college degree, our main specification is one that treats 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 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 employers that pay a premium, and last, (iii) changes in the performance of the employer through supply-chain linkages. 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.

Hereafter, we estimate the effects of changes between two consecutive years in exposure to MNCs

on the contemporaneous changes in the yearly labor earnings of workers in domestic firms.[21] In our main sample, we study stayers (or incumbent workers), defined as workers i who remain with the same main domestic employer $j(i)$ throughout $(t-1)$ and t. The focus on stayers allows to emphasize the importance of changes in the performance of one's employer for wage setting.[22] Given the relatively high turnover of workers across firms, this choice of timing allows us to link the outcomes of workers to that of their continuous employer.

In the last part of our analysis, we replace the change in firm-level exposure to MNCs by the change in value added per worker of the firm. We then use the instrument proposed for the change in firm-level exposure to MNCs to instrument for the change in value added per worker of the firm. The aim of this analysis is twofold. First, we can contribute to the growing literature that uses matched employer-employee data and 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.

4.1 Margins of Indirect Exposure to the MNC Shock

4.1.1 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 changes in MNC presence in their own market but also by changes in MNC presence in other markets s'.Now, let us introduce and motivate our definition of $\Delta LME_{s(i),t}$:

$$\Delta LME_{s(i),t} \equiv \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s',t}. \tag{3}$$

$\Delta LME_{s(i)t}$ 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. We propose as measure of closeness $\pi_{s(i)s',t}$, defined as 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, weighting 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, both across space and across 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 $s(i)$ acknowledges that the boundaries of one's labor market are porous.

Using observed worker transitions across markets is a transparent, non-parametric way to capture the full costs faced by workers upon changing their industry and region. In particular, empirical transitions capture a number of factors that are relevant to workers upon deciding to switch industries and

[21] While the matched employer-employee data has a monthly frequency, both the explanatory variables and their instruments have a yearly frequency. This makes a higher frequency analysis unfeasible.

[22] Changing employers tends to be associated with wage increases for reasons unrelated to changes in the performance of either the previous or the new employer. In additional exercises, we also include workers who move between $(t-1)$ and t from their employer in $(t-1)$.

regions and that 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 average them across these years. It is these shares that we use to weight the market s' specific component $(\psi_{s'}\nu_{s',t-1}\Delta\mathcal{M}_{s't})$ for the years 2009 onward. By construction, $\sum_{s'}\pi_{s(i)s',t_0} = 1$. Given that the average π_{ss,t_0} is 0.82, most of the change in labor market exposure to MNCs experienced by a worker is driven by the change occurring in one's own market. The average probability of staying in the same region but changing two-digit industry during a year is 0.13, while the average probability of staying in the same industry but moving to another region is 0.02. The remainder 0.03 concerns moves outside of one's region and two-digit industry.

Before defining the remaining three market specific terms ($\psi_{s'}$, $\nu_{s',t-1}$ and $\Delta\mathcal{M}_{s't}$), a discussion is in order. In particular, we want to address the reasons why we define labor markets based on the industry of the worker and not based on her occupation. To begin with, there is no clear consensus on the "correct" definition of a labor market. We prefer the industry for three reasons. First, when firms in Costa Rica assess the profile of a job candidate, they seem to find one's experience in the industry of the firm as very valuable.[23] Second, building an instrument that varies at the two-digit industry $\times$ region level requires fewer assumptions than one that would vary at the two-digit occupation $\times$ region level.[24] Third, in Section 3, we show that MNC wage premia vary more across industries than they vary between workers who have a college-degree and those who do not. This suggests that studying the expansion or contraction of MNCs across industries may be more relevant than doing so across occupations.

Next, $\nu_{s't}$ is the share of workers employed by MNC subsidiaries in market s' in year t $\left(\nu_{s't} \equiv M^{CR}_{s't}/T^{CR}_{s't}\right)$, where M is the number of MNC workers in market s' in year t, T is the total number of workers in market s' in that same year, and the superscript CR emphasizes that these are workers employed *in Costa Rica*. 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).[25] Then, recall from Section 2.2 that $\Delta\mathcal{M}_{s't}$ is the percentage increase between years $(t-1)$ and t in the number of MNC workers in market s', i.e., $\Delta\mathcal{M}_{s't} \equiv \frac{M^{CR}_{s't}-M^{CR}_{s',t-1}}{M^{CR}_{s',t-1}} \times 100$.[26] We therefore weigh percentage changes in MNC employment in market s' between year $(t-1)$ and t by the share of MNC employment in market s' in $(t-1)$, $\nu_{s',t-1}$.

$\psi_{s'}$ is defined as 1 plus the average MNC wage premium in the two-digit industry of s', $ind(s')$.[27] 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 $(\psi_{s'})$.

Why is the multiplication by $\psi_{s'}$ intuitive and necessary? 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

[23] From our survey to HR executives at MNCs, we learn that upon recruiting new workers, having previous experience in the industry of the firm is among the two most important criteria (see Appendix F.1).

[24] Our main instrument builds upon changes in employment outside of Costa Rica for the same MNCs with a subsidiary in Costa Rica. While we observe the main industry code of MNC groups (which can differ from that of their subsidiary in Costa Rica), we do not observe their occupational structure outside of their Costa Rican subsidiary. To the extent that the subsidiary in Costa Rica and the rest of the MNC group are in a vertical (input-output) relationship, their occupational structures are likely to differ considerably.

[25] The following are additional summary statistics for $\nu_{s',2009}$: SD 0.21, *p75*=0, *p90*=0.34, *p95*=0.67, *p99*=0.95. The following are additional summary statistics for $\nu_{s',2017}$: SD 0.22, *p75*=0, *p90*=0.39, *p95*=0.70, *p99*=0.95.

[26] Table B1 in Appendix B.1 contains summary statistics for $\Delta\mathcal{M}_{s',2009-2017}$ and $\Delta\mathcal{M}_{s't}$. See 2.2 for a discussion.

[27] 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.

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 $\psi_{s''}$ improving further the outside options in s'').

Our interaction with $\psi_{s'}$ echoes one of the central insights of Beaudry et al. (2012). 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.

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 ($\nu_{s',t-1}\Delta\mathcal{M}_{s',t}$), we obtain region-specific shocks to the average premium of an industry.[28] 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. Second, because our analysis is at the worker-level (as opposed to the industry-level, as in Beaudry et al., 2012), 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.

4.1.2 Firm-Level Exposure to MNCs

MNCs can affect workers in domestic firms not only through the labor market, but also through the product market. In addition to their labor market interactions (e.g., through the competition for workers in a labor market s),[29] MNCs are also likely to interact with domestic firms 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.

While MNCs may act both as buyers and suppliers to domestic firms, two arguments motivate our focus only on the case in which the MNC is the buyer. First, most MNCs in Costa Rica are export-oriented. To the extent that MNCs sell to other firms in the country, their buyers tend to be MNCs themselves. Second and most importantly, 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" (Havránek and Iršová, 2011). Alfaro-Urena et al. (2019b) study the effects of MNCs on domestic firms through supply-chain relationships and confirm the importance of "backward spillovers" and the lack of "forward spillovers."

[28] 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).

[29] The labor market exposure measure already captures the effects of MNCs on domestic firms mediated by the labor market. Literature reviews suggest that this is the main channel by which MNCs affect firms in the same industry (Hale and Xu, 2020).

Another less direct yet plausible way in which MNCs may affect the performance of domestic firms is through competition in the product market. We claim that Costa Rica and the MNCs attracted to Costa Rica offer a helpful setting in which horizontal (within-industry) product market interactions are very unlikely. This particularity of the Costa Rican context allows us to interpret the effects of the within-industry component of our measure of labor market exposure, LME, as only capturing labor market interactions (and *not* product market interactions).

Several pieces of evidence bolster our claim. In 2018, we conducted a survey with executives from MNCs in Costa Rica (see Alfaro-Urena, Manelici, and Vasquez, 2019b). In particular, we inquired on the reasons why these MNCs chose to open a subsidiary in Costa Rica. The four most important attractions of Costa Rica were the overall 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 or staying in Costa Rica (mostly likely due to its small size). These answers are also in line with our observation that most MNC subsidiaries in Costa Rica are export-oriented. 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 their production to this parent country. Hence, even if they are in the same industry, MNCs and domestic firms are not direct competitors in the product market. This is compatible with the conclusion from meta-analyses that the effects of FDI on the productivity of domestic firms in the same industry are, on average, zero (Havránek and Iršová, 2011, 2013).

We conclude that in our context, firm-to-firm relationships – in which MNCs are the buyers and domestic firms are the suppliers – are the most pertinent type of product market interactions. Therefore, 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 which are either direct or indirect buyers from firm j. These changes from year-to-year in the size of MNCs in Costa Rica are likely to translate into changes in the purchases made from their local suppliers. The firm-to-firm transaction data from Costa Rica allows us to have firm-level variation in total (direct and indirect) sales to MNCs.[30] 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).[31] Thus, most of the variation in total sales to MNCs is actually driven by indirect sales, where MNCs are buyers-of-buyers.

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 a given 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 B.2. Then,

$$\Delta FLE_{j(i),t} \equiv \sum_{m} \theta_{j(i)m,t-1} \Delta \mathcal{M}_{mt}, \tag{4}$$

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

While the formula of $\Delta FLE_{j(i),t}$ has an intuitive empirical structure, it also has the advantage that

[30] Alfaro-Urena et al. (2019b) show that industry-level proxies for supplying to MNCs explain less than 1% of the actual supplying behavior of firms in each industry. Put differently, there is great heterogeneity in the supplying behavior of firms within an industry.

[31] For 2017, what follows are additional summary statistics for the share of total sales to MNCs: SD=0.303, *p1*=0, *p10*=0.002, *p25*=0.021, *p75*=0.329, *p90*=0.831, *p99*=1. Also for 2017, what follows are additional summary statistics for the share of direct sales to MNCs: SD=0.159, *p1*=0, *p10*=0, *p25*=0, *p75*=0.067, *p90*=0.197, *p99*=0.951.

(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 we propose in Section 5.

What type of shocks to firm j does $\Delta FLE_{j(i),t}$ capture? First and foremost, 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. In Alfaro-Urena et al. (2019b), we show that domestic firms who become first-time suppliers to MNCs do not only grow in size, but they also improve their productivity. In the model in Section 5, demand and productivity effects have an isomorphic effects on the wages of incumbent workers. In practice – as we discuss in Section 4.4.2 – shocks to demand and shocks to productivity may have different implications for workers.

4.2 Main Empirical Specification for the Indirect Effects

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:

$$\begin{aligned}\Delta w_{it} =& \beta_{LME} \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s't} + \beta_{FLE} \sum_{m} \theta_{j(i)m,t-1} \Delta \mathcal{M}_{mt} + \\ &+ \boldsymbol{X_i}' \boldsymbol{\beta}_{char} + \beta_{MNC\_share} \theta_{j,t-1} + \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \epsilon_{it}, \end{aligned} \tag{5}$$

where w_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t,[32] $\alpha_{j(i)}$ are firm $j(i)$ fixed effects, $\boldsymbol{X_i}$ is a vector of dummies of worker characteristics (for the sex, year-of-birth, college education status, and Costa Rican national status). $\theta_{j,t-1}$ is the share of total (direct and indirect) sales to MNCs in year $(t-1)$ $\left(\theta_{j,t-1} \equiv \sum_m \theta_{j(i)m,t-1}\right)$.[33] $\sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s't}$ and $\sum_m \theta_{j(i)m,t-1} \Delta \mathcal{M}_{mt}$ are the labor market and firm-level exposure measures defined and motivated in Section 4.1. All changes 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.

$\gamma_{ind(s(i))\times t}$ 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).

4.3 Instrumental Variables Strategy

We are interested in the causal estimates of the effects of changes in labor market exposure and firm-level exposure to MNCs on worker wages. However, the OLS estimation of Equation (5) may not yield consistent estimates of these effects. One worry is that of simultaneity, as changes in wages and MNC employment are jointly determined in equilibrium. Potential omitted variables are another source of concern. Workers in labor market s may receive unobserved positive productivity shocks which would lead to both expansions of MNCs and higher wages for workers in s (independently of the

[32] The monthly average labor earnings of worker i for year t is the average of the monthly labor earnings of that worker over the months with positive labor earnings in year t. This is meant to capture the monthly wage.

[33] Since the exposure weights $\theta_{j(i)m,t-1}$ do not sum to one at the level of firm j (given that firms tend to have a large share of domestic clients as well), it is important to control for the total share sold to MNCs ($\theta_{j,t-1} = \sum_m \theta_{j(i)m,t-1}$). This ensures that the IV estimate is only driven by 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).

MNC expansions). In such a case, OLS would overestimate the importance of changes in labor market exposure to MNCs on wages. Last, the OLS estimate of the firm-level exposure coefficient may also be biased if shocks to the productivity of workers in firm j affect the growth of the direct or indirect MNC buyers of firm j.

To address these potential concerns, we pursue an IV strategy. The instruments we propose use the changes in MNC employment *outside of Costa Rica* for the same MNC groups with subsidiaries in Costa Rica (instead of their changes in employment *in Costa Rica*). The data on these MNC groups comes from Orbis and Compustat. The variables that inform the IVs are the worldwide number of workers in a given year and the main industry code of the MNC group. Precisely let us define the main input for the IVs, $\Delta\mathcal{O}_{st}$, as

$$\Delta\mathcal{O}_{st} \equiv \frac{M_{s,t}^{Out} - M_{s,t-1}^{Out}}{M_{s,t-1}^{Out}} \times 100, \tag{6}$$

where $M_{s,t}^{Out}$ is the year-t number of workers *outside* of Costa Rica for MNCs whose subsidiaries operate in market s in Costa Rica. Hence, $M_{s,t}^{Out}$ is the sum of the MNC-specific outside of Costa Rica number of workers across all MNCs m in s $\left(M_{s,t}^{Out} = \sum_{m \in s} M_{m,t}^{Out}\right)$. Analogously, $\Delta\mathcal{O}_{mt} \equiv \frac{M_{m,t}^{Out} - M_{m,t-1}^{Out}}{M_{m,t-1}^{Out}} \times 100$. For more details on $\Delta\mathcal{O}_{st}$ and $\Delta\mathcal{O}_{mt}$, see Appendix A.2.

Our leading IVs (referred to as IV Set 1) for the two measures of changes in exposure to MNCs rely on plausibly exogenous variation in the performance of MNCs abroad for the same MNCs with a subsidiary in Costa Rica. For this preferred sets of instruments, the IV analogues of $\mathcal{M}_{st}$ and $\mathcal{M}_{mt}$, $\mathcal{O}_{st}$ and $\mathcal{O}_{mt}$ are the percentage changes in employment of MNC groups in market s in Costa Rica and of the specific MNC m, respectively, both *outside* of Costa Rica. Specifically, 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 $IV\left(\Delta FLE_{j(i),t}\right) \equiv \sum_{m} \theta_{j(i)m,t-1} \Delta\mathcal{O}_{mt}$. Note that we weight the importance of the shifters by $(t-1)$ and t_0 values to avoid that our measures of exposure reflect the endogenous responses of labor markets and firms to the MNC shocks.

While the relationship between $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ is not the first-stage of the IV, $\Delta\mathcal{O}_{st}$ are the shifts that provide exogenous variation in the IVs. Therefore, it is important to understand how $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ relate. Figure B1 and Table B2 (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. $\Delta\mathcal{M}_{mt}$ and $\Delta\mathcal{O}_{mt}$ (the disaggregated versions of $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$) relate in a similar way.

What can explain this positive correlation between changes in employment of the MNC subsidiary in Costa Rica and changes in employment of the same MNC outside of Costa Rica? As a starting point, we inquire on the frequency with which the subsidiaries in Costa Rica operate in the same industry as the main industry of the MNC group (as declared in Orbis). We find that in 82% (72%) of the cases, the four-digit (two-digit) industry code of the MNC subsidiary in Costa Rica is different from that of the MNC group. 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.[34]

Among the 82% of the cases where the subsidiary and the MNC group are in a different industry, 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

[34]The traditional theory of the expansion of multinationals emphasizes two types of expansion. "Horizontal" foreign investment is understood to mean situating production facilities so as to avoid trade costs (Markusen, 1984; Brainard, 1993), whereas "vertical" investment represents firms' attempts to take advantage of cross-border factor cost differences (Helpman, 1984). Most past research had 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).

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 "growing of tropical fruits" (subsidiary industry) – "processing and preserving of fruit and vegetables" (MNC group industry), "manufacture of cordage, rope, twine and netting" (subsidiary) – "manufacture of irradiation, electromedical and electrotherapeutic equipment" (group), or "translation and interpretation activities" (subsidiary) – "activities of collection agencies and credit bureaus" (group).[35]

As most MNC subsidiaries in Costa Rica have a nearby parent (in the U.S., Canada, or another Latin American or Caribbean country) and that the Costa Rican market is small, it is therefore not surprising that vertical FDI seems to be the most common type for Costa Rica. Moreover, MNCs in Special Economic Zones are exempted from customs duties, which also encourages intrafirm trade.[36] In sum, to the extent that MNCs carry out different tasks in the Costa Rican subsidiary with respect to their other locations, $\mathcal{M}_{st}$ 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 brings variation in the size of the MNC subsidiary in Costa Rica? One such shock could be that to the global demand of the final good of the MNC, which then triggers a shock to the demand of the input provided by the Costa Rican subsidiary. In the model Section 5, we assume that MNCs in Costa Rica are exposed to exogenous shifts in their international demand. Another shock could be that to the productivity of the MNC (e.g., coming from the unexpected allowance of a new patent, as in Kline et al., 2019) that leads to expansions or contractions across all locations. A last scenario is one that involves financial shocks at the HQ, which are known to also affect locational decisions abroad (Desai et al., 2004; Baker et al., 2008; Erel et al., 2012; Alfaro and Chen, 2018). As we note in Section 5.3.2, all these shocks have isomorphic effects on domestic firms. Hence, it is not important to distinguish between them to study their effects on workers in domestic firms.

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, this makes it 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 particular domestic firms would affect the performance of the Costa Rican subsidiary of m, and, even more unlikely, to affect the performance of the MNC group outside of Costa Rica. Given that most domestic firms are exposed to MNCs mostly

[35] A minority of cases point to either reverse input-output relationships, with the industry of the MNC group being upstream from that of the Costa Rican subsidiary, such as the "sale of cars and light motor vehicles" (subsidiary) – "manufacture of motor vehicles" (group), or to the MNC group being multi-industry, e.g., "hotels and similar accommodation" (subsidiary) – "manufacture of beer" (group).

[36] Using Costa Rican customs data, we find suggestive evidence that intrafirm trade is a common practice for MNC subsidiaries in Costa Rica (similar to Hanson et al., 2005).

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 weakens even more the link between a supplier to the subsidiary in Costa Rica and the MNC group outside of Costa Rica.

4.4 OLS and IV Estimates of the Indirect Effects of MNCs on Wages

Table 4 reports OLS estimates based on 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) 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 to 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.

Let us first 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 a 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 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.

Second, let us interpret the magnitude of the OLS estimate of the importance of the firm-level exposure. Assume another hypothetical case in which there is only one MNC in the economy. 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), 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 change in exposure on the IVs of both measures. As expected, each measure of exposure is only correlated to its own 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 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. This supports the interpretation that our identification strategy isolates market-level and firm-level shocks caused by shocks to MNCs rather than other temporal confounds.

In Columns (4) to (6) of Table 4 we report the findings from the IV estimation that uses the leading IV Set 1. 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 in 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, that 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).

4.4.1 Other Robustness Checks

IV estimates using a different source of variation in MNC size in Costa Rica. As mentioned in Section 4.2, our leading set of instruments (IV Set 1) is built upon changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica. The main appeal of IV Set 1 is that it relies on outside-of-Costa-Rica shocks to MNC groups whose main industry is different from the industry they shock in Costa Rica.

As a robustness check, we have used Orbis data to construct an alternative set of IVs for the two measures of exposure to MNCs (referred to as IV Set 2). For IV Set 2, 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 no longer have MNC-specific variation (but only 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 left in the extent to which domestic firms $j(i)$ supply MNCs in market s'.

In contrast to IV 1, IV 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). Figure C12 (Panel C12a, Appendix B.1) and Table B2 (Columns (3) and (4)) confirm 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 C1 (Appendix C.2) 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).

Sensitivity of the main results to fixed effects. In Table C2 (Appendix C.2) 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.

Sensitivity of the main results to different definitions of the labor market exposure measure. Work in progress: excluding the $\psi_{s'}$ from $\Delta LME_{s(i),t} \equiv \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s',t}$, (ii) using only the labor market exposure through one's labor market, i.e., $\pi_{s(i)s(i),t_0} \psi_{s(i)} \nu_{s(i),t-1} \Delta \mathcal{M}_{s(i),t}$, (iii) only the exposure of other labor markets, i.e., $\sum_{s' \neq s(i)} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s',t}$.

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

We now start from the same specification described in Equation (5) and 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 run the following regression, where all variables have the same definition as in Equation (5) and $\Delta \left(VA/L\right)_t$ is the percentage change increase in value added per worker between year $(t-1)$ and t:

$$\begin{aligned} \Delta w_{it} =& \beta_{LME} \sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-1} \Delta \mathcal{M}_{s't} + \beta_{VA/L} \Delta \left(VA/L\right)_t + \boldsymbol{X_i}' \boldsymbol{\beta}_{char} \\ &+ \beta_{MNC\_share} \theta_{j,t-1} + \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \epsilon_{it}. \end{aligned} \tag{7}$$

Our objective in this exercise is twofold. First, we can reuse the instrument constructed for the firm-level exposure to MNCs to address concerns over the potential endogeneity of changes in value added per worker. By using this novel source of variation in firm performance explained by shocks to the set of its MNC buyers, we contribute to a small literature that uses matched employer-employee data and firm-level shocks to estimate the "rent-sharing" coefficient – the pass-through of changes in value added per worker to worker wages. The intuition of the first stage is that shocks to the size of the MNC buyers of a firm become shocks to its sales to those buyers. This is likely to affect the value added per worker of the firm. 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 that in which workers in firms that start selling more to MNCs increase their own 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 rule out this threat directly, two aspects make this threat less likely. First, we study the effects of yearly changes in value added per worker on yearly changes in wages. Alfaro-Urena et al. (2019b) find that firms improve their total factor productivity only gradually. 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 improved.

As the second objective, we can build intuition on the magnitude of the effect of firm-level exposure

to MNCs on wages. Namely, we can calculate what changes in value added per worker are necessary to rationalize the effect of changes in firm-level exposure on wages.

OLS and IV Estimates. Table 5 contains the estimates from four OLS regressions. The first three introduce either $\Delta LME_{s(i),t}$ 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 where 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 exposure to MNCs is largely unrelated to the variation in firm-specific outcomes. As to the coefficient on changes in value added per worker, its OLS estimate is identical and equal to 0.008 across all three specifications. Table 6 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. We note again that the IV estimate on the change in value added per worker is unchanged by whether $\Delta LME_{s(i),t}$ is included or not and by the set of fixed effects used.

The IV estimate of the pass-through of changes in value added per worker to wages is 0.09 (about 11 times larger than the OLS estimate). The finding that the OLS estimate is biased towards zero resonates with the existing literature. The most likely culprits for this downward bias are either the noisy nature of the measure of surplus (here, value added for worker) or 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 have lower hiring and training costs than exporters or patent winners in developed countries.[37] 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 β_{FLE} and $\beta_{VA/L}$. Consider our IV estimate of 3.3 for the importance of changes in firm-level exposure to MNCs for wages and its rather wide 95% confidence interval of [1.5,5.1]. We proposed in Section 4.4 a hypothetical case with only one MNC in the economy. Then we considered two domestic firms, one whose share of total sales to this MNC in $(t-1)$ was 0.24, a second whose share was 0. If the MNC grows by 4% between $(t-1)$ and t, then the IV estimate of 3.3 predicts that the wages of stayers in the first firm grow 3.2 percentage points more than those of the stayers in the second firm. Or, given the confidence interval for the IV estimate, we cannot reject that their wages grow as low as 1.4 or as high as 4.9 percentage points more. We now ask whether this [1.4, 4.9] range is reasonable.

Assume that there are no other factors 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

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

points from year $(t-1)$ and t.

To assess the plausibility of such an increase, we rely on Alfaro-Urena et al. (2019b). That paper finds that in the year when domestic firms become a first-time supplier to an MNC, their value added per worker increases, on average, by 6%. While in that project the authors have not 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. To conclude, 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.

4.5 Who Gains from Increases in Exposure to MNCs?

4.5.1 Which Workers Experience the Highest Treatment Effects?

College vs. non-college-educated workers. In Table C3 (Appendix C.2) 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). The results from the full sample are in Panel (A) of this table and in Table 4.

There are two main messages that emerge from this comparison. First, both the OLS and IV estimates from the full sample are 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 without 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 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 (7), which replaces the change in firm-level exposure to MNCs by the change in value-added per worker of the firm. Table C5 (Appendix C.2) presents the OLS estimates which are mainly identical for the two types of workers. However, as Table C6 (Appendix C.2) 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 C4 (Appendix C.2) 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 (7). While the OLS estimates are identical for women and men (see Table C7, Appendix C.2), the IV estimate of the rent-sharing coefficient for women is 0.07 and for men is 0.10 (see Table C8, Appendix C.2). 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.[38]

4.5.2 Which Workers Experience the Highest Increases in Exposure to MNCs?

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 what are the characteristics of workers in those labor markets to begin with. Do they tend to be more college-educated, more likely to be male, to already earn high wages? To answer these questions, in Table 2 we present descriptive statistics on the characteristics of workers who were in a given labor market 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). 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 higher share of MNC employment between 2006 and 2008 than those in the middle tercile and a 1.2% higher MNC premium. On average, workers in the top tercile labor markets had 8% higher labor earnings that those in the middle tercile, were 3% more likely to be college-educated and 4% *less* likely to be male. These workers earned higher labor earnings across both domestic firms and MNCs and across levels of education. This implies that the expansion of MNCs in these labor markets after 2009 is likely to have benefited workers with relatively more favorable labor market conditions to begin with. 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 and a 1.3% higher MNC premium. Thus, the growth of MNC employment post-2009 was not monotonically related to the initial share of MNC employment or the MNC premium. The differences in labor earnings for workers in the bottom and middle tercile were very small (less than 1%). Workers in the bottom tercile were significantly more likely to be male that in the other two terciles and less likely to have a college degree. Thus, the contractions of MNCs in these labor markets are likely to have hurt relatively more non-college-educated workers and men. All in all, this evidence underlines that there are interactions with distributional implications between the initial characteristics of workers and their subsequent exposure to MNCs through their labor market.

Characteristics of workers with different levels of firm-level exposure to MNCs. This is work in progress.

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

[38] 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.

used in Equation (5). The plot displays a clear negative relationship between the labor market and firm-level exposure of workers. Workers who are hurt by the contraction of MNCs in an industry may benefit from working in a firm who supplies MNCs in another industry, and the reverse. Supplying industries (firms) to MNCs tend to have a lower share of college graduates and higher shares of women (both of which have lower wages on average, all else held constant) than the industries with higher shares of MNC employment. Typical supplying industries include cleaning or accommodation and food services, or low-tech manufacturing. Given these counterbalancing forces, increases in the presence of MNCs have an ambiguous effect on inequality.

4.6 Back-on-the-Envelope Aggregation of the Wage Gains

A comprehensive evaluation of the cost 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 sector. 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 we measure. Since the extensive margin of employment is outside of the scope of our the empirical analysis, we assume full employment in our calculations and abstract from potential effects due to changes in unemployment.

We consider first the wage gains of those workers who are directly hired by MNCs. In the decade from 2007 to 2017, 500,492 individuals started working for an MNC in the country, with an average employment duration at those MNC jobs of 2.4 years (28.8 months). In the year prior to moving to the MNC, the average monthly earnings of employed workers was approximately 640 real U.S. dollars of 2013 and given the 9% MNC premium that we estimate, the average worker increases her monthly earnings by 58 U.S. dollars. Taking a conservative approach and assuming that in the absence of those MNC jobs those workers would earn the same 640 U.S. dollars per month, we estimate aggregate wage gains of 830 million U.S. dollars (58 U.S. dollars $\times$ 28.8 months $\times$ 500,492 workers) for the entire period, or 83 million U.S. dollars per year owed to the wage premium.

Let us now consider the wage gains for workers in domestic firms. Assume that wages of public employees are unaffected. We also assume that all domestic firms sell directly or indirectly around 24% of their sales (the average in the distribution). In the 2009-2017 period the average market experienced an increase in MNC presence of around 12.9%. Using these averages together with our IV estimates from Table 4 we find a change in earnings for an average worker at a domestic firm equal to $3.3 \times 0.24 \times 12.86 + 0.14 \times 12.86 \approx 12\%$ during the same period. This is around 1.5% wage increase per year. Taking the same average monthly earnings of 640 real U.S. dollars as in the calculation above and applying these gains to approximately 600,000 incumbent workers at domestic firms, we find aggregate gains of around 69 million U.S. dollars ($0.015\times$ 640 U.S. dollars $\times$ 12 months $\times 600,000$ workers) per year.

Adding both the wage gains of workers directly hired by MNCs and those of workers employed at domestic firms, we estimate average gains of around 152 million U.S. dollars per year. 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 with 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.[39]. This estimate of the costs of attracting

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

MNCs is an upper bound of the cost, 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 33% 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. These caveats notwithstanding, we find that the gains in labor earnings are not able to justify by themselves the generous tax incentives extended to MNCs.

5 A Stylized Model of an Economy with MNCs

5.1 Motivation of the Model

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). While we limit the distinctive modelling of MNCs to only two features – the wage premium and the linkages to domestic suppliers –, these features have been identified as the most relevant not only in Costa Rica, but also in most of the empirical literature on FDI.

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 take full advantage of potential gains in earnings. Thus, policies attracting MNCs could be more (or less) successful in affecting workers' earnings depending 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 also applies more broadly to other shocks affecting workers (e.g., the "China shock").

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).[40] These features suggest that workers have a low bargaining power over their wages (particularly workers without college, who are in 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. Or, 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 appropriate for Costa Rica as well. First, PricewaterhouseCoopers conducts annual studies on labor turnover across MNCs in Costa Rica

[40] For details, see Appendix E.1.

(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 to 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.[41]

5.2 Summary of the Model

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 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*.[42] 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 decide how many new workers to hire. To hire new workers, firms need to pay them a wage equal to the market wage and cover a hiring and training cost.

The three key 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 expansions of the MNCs in three ways. First, since MNCs and domestic firms compete for workers in the same labor markets, the expansion of MNCs affect 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

[41] 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 B7 (Appendix B.3.3), we show that the average (median) of this ratio is 0.88 (0.86).

[42] Proposing a theory for the MNC premium is outside the scope of this paper. That said, Section 3 discuss 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.

and indirectly exposed to MNCs through supply linkages, the expansion of MNCs has the potential of affecting domestic wages through rent-sharing between the worker and her domestic employer.

There are three structural parameters that govern the magnitudes of the wage gains by incumbents and that we estimate in Section 5.7. The first one is the cost of hiring and training of the first hire as a proportion of the market wage. The second one is the elasticity of the cost 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 that an incumbent worker could get when her employer grows. The last parameter is the elasticity of worker retention with respect to the incumbent wage. This parameter – denoted by η_I – informs us about how much an incumbent worker at a domestic firm would benefit from her outside options and replacement cost.

5.3 The Product Market

5.3.1 MNCs Production 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 also 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 further simplification, we suppress the subscript s for now. All MNCs have a constant elasticity of substitution (CES) production function given by:[43]

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

where T_{MNC} is a 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 equal to:

$$q_{j,MNC} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} \frac{A_{MNC(s)}^{\sigma} Q_{MNC(s)}}{J_{MNC(s)}} \equiv b_{MNC(s)} p_j^{-\sigma}, \tag{8}$$

where $b_{j,MNC)} \equiv P_{MNC}^{\sigma} Q_{MNC}$. Recall that 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 of either of them increases the demand for inputs of any domestic firm $j \in \mathcal{S}_{MNC}$.

5.3.2 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.[44] Workers in this economy consume a final good Y, which is produced by final good pro-

[43] We assume the same elasticity of substitution σ in the demand and production functions. This is done for mathematical simplicity. However, apart from keeping track of the different elasticities, this assumption does not change any of the insights of the model.

[44] 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.

ducer 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

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

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 domestic market and the demand coming from all 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 a 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 $B \equiv b_{DOM} + B_{MNC}$.

5.4 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 prior attachment to a firm or industry. Incumbent workers start the period being employed by a 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. Then they 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.

Since our main interest at this point is on the effects of MNCs on workers working in domestic firms, we proceed with a simplified version of the labor market decisions of MNCs. In particular, 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.[45] 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 ($\psi_s \omega_s$).

[45] In our model, when an incumbent worker leaves its 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.

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.

5.4.1 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 the 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 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). Put differently, new workers cannot choose whether to join a domestic firm or the MNC in s. Their choice of an 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.[46] 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 "good jobs" 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

$$l_{Ns} = \frac{\tilde{\omega}_s^{\eta_N}}{\sum_{s'} \tilde{\omega}_{s'}^{\eta_N}} L_N^0, \tag{9}$$

where L_N^0 is the start-of-period economy-wide number of new workers, and

$$\tilde{\omega}_s \equiv \omega_s \left(1 - \tfrac{N_{MNC(s)}}{N_s}\right) + \psi_s \omega_s \tfrac{N_{MNC(s)}}{N_s}.$$

In equilibrium the supply of new workers to s, l_{Ns}, is equal to the total demand for new workers of all firms in s, N_s. If there is no MNC demanding workers in an industry s $\left(N_{MNC(s)} = 0\right)$ or that the MNC in s does not pay a premium with respect to domestic firms ($\psi_s = 1$), then 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.

[46] 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 in the next period and each firm would have a firm-specific rent-sharing.

5.4.2 The Labor Market for Incumbent Workers

Incumbent workers start the period employed by a domestic firm. Incumbent workers choose whether to stay at 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 cost as an iceberg cost on the competitive market wage in industry s'.[47]

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 employer.

Incumbents draw a taste shock for their current employer and for all industries, which leads to upwards sloping supply curves to their domestic employer and all industries. The draws of taste shocks are private information for the 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 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. Hence, 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 $\left(\tilde{\omega}_s \equiv \omega_s\left(1 - \frac{N_{MNC(s)}}{N_s}\right) + \psi_s\omega_s\frac{N_{MNC(s)}}{N_s}\right)$.

Incumbent workers from industry s who move to s' experience an expected wage of

$$\tau_{ss'}\omega_{s'}\left(1 - \frac{N_{MNC(s')}}{N_{s'}}\right) + \psi_{s'}\tau_{ss'}\omega_{s'}\frac{N_{MNC(s')}}{N_{s'}} \equiv \tau_{ss'}\tilde{\omega}_{s'}.$$

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:

$$I_j(W_j) = \frac{W_j^{\eta_I}}{W_j^{\eta_I} + \sum_{s'}\left(\tau_{s(j)s'}\tilde{\omega}_{s'}\right)^{\eta_I}} I_j^0 \equiv \frac{W_j^{\eta_I}}{\Omega_{js}(W_j, \tilde{\boldsymbol{\omega}})^{\eta_I}} I_j^0 \equiv \pi_j(W_j, \tilde{\boldsymbol{\omega}}) I_j^0, \tag{10}$$

where $\Omega_{js}(W_j, \tilde{\boldsymbol{\omega}}) = \left(W_j^{\eta_I} + \sum_{s'}\left(\tau_{s(j)s'}\tilde{\omega}_{s'}\right)^{\eta_I}\right)^{1/\eta_I}$. We allow the taste dispersion parameter of incumbent workers to possibly differ from the taste dispersion parameter of new workers ($\eta_I \neq \eta_N$).[48]

[47] 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).

[48] We assume that incumbent workers receive new draws of their taste shocks (new relative to those received in a pre-period – that 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.

$\pi_j(W_j, \tilde{\boldsymbol{\omega}}) \equiv \frac{W_j^{\eta_I}}{\Omega_{js}(W_j, \tilde{\boldsymbol{\omega}})^{\eta_I}}$ 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 $\tilde{\boldsymbol{\omega}}$. Conversely, $\left(1 - \pi_j(W_j, \tilde{\boldsymbol{\omega}})\right)$ is the share of incumbents of firm j that leave the firm and join the pool of new workers.

5.5 The Problem of the Domestic Firm

We now focus on the profit-maximizing problem of the domestic firm. As mentioned at the beginning of this section, domestic firms produce using only labor and sell their output to either the final good producer f or to MNCs. The production function of a 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.

As seen in Section 5.3.2, 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

$$p_j Q_j = B_j^{\frac{1}{\sigma}} Q_j^{\frac{\sigma-1}{\sigma}} = B_j^{\frac{1}{\sigma}} T_j^{\frac{\sigma-1}{\sigma}} L_j^{\frac{\sigma-1}{\sigma}} = A_j L_j^{\frac{\sigma-1}{\sigma}}, \tag{11}$$

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 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, at the optimum, the firm equates the marginal revenue product MRP_j with the marginal cost of a new hire $\omega_{s(j)} + c'(N_j)$:

$$MRP_j = \omega_{s(j)} + c'(N_j), \tag{12}$$

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

From the FOC with respect to wage of incumbent workers, and by assuming that firm j disregards its effect on $\Omega(W_j, \tilde{\boldsymbol{\omega}})$ (see Equation (10)) we obtain that:

$$W_j = MRP_j \frac{\eta_I}{\eta_I + 1} \tag{13}$$

Incumbent workers receive a share of the marginal product of labor of the firm. Replacing Equation (12) into Equation (13), we reach:

$$W_j = \frac{\eta_I}{\eta_I + 1}\left(\omega_{s(j)} + c'(N_j)\right) = \frac{\eta_I}{\eta_I + 1}\omega_{s(j)} + \frac{\eta_I}{\eta_I + 1} c'(N_j). \tag{14}$$

At the optimum, incumbent workers of firm j are offered a share of the entry wage in the domestic market of the industry of the firm $\left(\omega_{s(j)}\right)$ and the same share of the marginal cost of the recruitment and retraining cost of a marginal new hire $\left(c'(N_j)\right)$. If $\eta_I \to 0$, then $W_j \to 0$ (incumbent workers are

"locked in" with their employer). If $\eta_I \to \infty$, then $W_j \to \omega_{s(j)} + c'(N_j)$; that is, incumbents capture their full marginal replacement cost. If $c'(N_j) = 0$, then it is possible for incumbent workers to earn less than new hires (whenever η_I is finite). If $c'(N_j) = 0$ and $\eta_I \to \infty$, then $W_j \to \omega_{s(j)}$; this means that the firm views new hires and incumbents as perfect substitutes and pays them the same. If $c'(N_j)$ is large enough, incumbent workers earn a premium over new hires ($W_j \geq \omega_{s(j)}$). We assess this latter case to be the most plausible of those mentioned above.

5.6 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 (12) and (13) are satisfied $\forall j$. It also has to satisfy the market clearing condition for new workers presented in equation (D20).

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. In order to explore the first-order relationships, we consider a log-linearized version of the equilibrium conditions of this economy. In terms of notation we denote $\hat{X}$ as log-deviation of variable X from its equilibrium and interpret it as percentage deviations. We also denote $\overline{X}$ as the equilibrium value any 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 D 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 (D15) of Appendix D.1 that one can write the equilibrium log-linear approximation for the change in the wage set by j for its incumbent workers as:

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

where $\{\beta_j^1, \beta_j^2, \beta_j^3, \beta_j^4\}$ 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 would move to a market s'. In our model, the β_j elasticities are firm-specific, since they depend on the original 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. For now, we focus on the intuition of Equation (15), which highlights the channels through which changes in the labor market affect wages of incumbents at firm j.

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 of firm j. The third term refers to changes in the competitive wages in other markets. These latter changes influence wages of firm j depending on the ability of 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 to 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 further our 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 depen-

dence between the competitive entry wages and the revenue shifters of firms in general equilibrium we show in Appendix D.2 that we can write equation (15) as:

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

where $\{\Gamma_j^1, \Gamma_j^2, \Gamma_j^3, \Gamma_j^4, \Gamma_j^5, \Gamma_j^6\}$ 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 (though 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 labor demand in each market. It is a weighted average of the weighted changes in revenue shifters of the MNCs in different sectors. Then the weighted sum is weighted by the transition probabilities $\pi_{js'}$. The second term captures how changes in 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 (4). This term captures how changes in the revenue shifters of MNCs times 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, those 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 to think about 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 global employment of MNCs with subsidiaries in the Costa Rica represent plausibly valid candidates.

5.7 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 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 four steps. First, we write each of the elements of

$\{\beta_j^1, \beta_j^2, \beta_j^3, \beta_j^4\}$ explicitly in a model-consistent way. Second, we estimate the average elasticities. Third, we calibrate the relevant equilibrium shares from the data. Fourth, we use the estimated elasticities together with the calibrated parameters to infer estimates of $\{\eta_I, c_0/\omega_s, \alpha\}$. 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 $\{\eta_I, c_0/\omega_s, \alpha\}$ using a bootstrap procedure.[49]

Step 1. Model-Consistent Elasticities. As part of the first step, we leverage the structure of the model to write $\{\beta_j^1, \beta_j^2, \beta_j^3, \beta_j^4\}$ explicitly as:

$$\begin{aligned}
\beta_j^1 \equiv & \frac{\xi_j^C \alpha\sigma}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1-\pi_{jj})} \\
\beta_j^2 \equiv & \frac{(1-\xi_j^C)(1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I \pi_{js}}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1-\pi_{jj})} \\
\beta_j^3 = & \beta_j^4 \equiv \frac{\xi_j^C \xi_j^I \alpha\eta_I}{\xi_j^C \alpha\sigma + (1-\xi_j^I) + \xi_j^C \xi_j^I \alpha\eta_I (1-\pi_{jj})},
\end{aligned} \tag{17}$$

where $\xi_j^I \equiv \frac{\overline{I}_j}{\overline{L}_j}$ (equilibrium share of incumbents in total 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). Note that $\beta_j^3 = \beta_j^4$. This is 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 to write it as:

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

The new element $\widehat{C}_s$ combines the third and fourth terms of equation (15). Thus, it includes both the incumbents' wage effects coming from changes in the competitive wages in other 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. In order to remain as close to the equation from the model as possible, there are several important points to make. The first of these has to do with the construction of the explanatory variables. We compute the growth in the competitive wage paid to new workers in domestic firms in a 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, college dummy, 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.

[49] 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.

The second consideration is related to the heterogeneity of the elasticities. To get at the average elasticities, we write the empirical counterpart of Equation (18) as follows:

$$\begin{aligned}\widehat{W}_{it} =& \overline{\beta^1} \cdot \widehat{A}_{j(i),t} + \overline{\beta^2} \cdot \widehat{\omega}_{s(i),t} + \overline{\beta^3} \cdot \widehat{\mathcal{C}}_{s(i),t} \\ &+ \alpha_{j(i)} + \gamma_{ind(s(i))\times t} + \mu_{reg(s(i))\times t} + \rho_{ind(s(i))\times reg(s(i))} + \varepsilon_{it},\end{aligned} \tag{19}$$

with $\varepsilon_{it} = (\beta^0_{j(i)} - \overline{\beta^0})\widehat{A}_{j(i),t} + (\beta^1_{j(i)} - \overline{\beta^0})\widehat{\omega}_{s(i),t} + (\beta^2_{j(i)} - \overline{\beta^0})\widehat{\mathcal{C}}_{s(i),t}$ net of the fixed effects. Equation (19) is the specification we take to the data.

The third consideration relates to the 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. Moreover, they are important to infer our parameters of interest through equation (17).

We rely on an IV strategy similar to the one we have implemented throughout the paper, by making use of changes in global employment of MNCs to construct the instruments.[50] For the last term, both $\pi_{js'}$ and $\overline{N}_{MNC(s')}/\overline{N}_{s'}$ are calculated using 2006-2008 data.

The last consideration is the heterogeneity of the structural elasticities. 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 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 error term in the structural version of the first stage regression). The first condition would be violated, for example, if more able workers would chose to work for domestic firms that supply the 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 that also affect global growth of the MNCs with presence 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. Calibration. In order to estimate the structural parameters $\{\eta_I, c_0/\omega_s, \alpha\}$, we need to take a stand on five equilibrium quantities of the economy. We set a value $\sigma = 5.03$ estimated in Alfaro-Urena et al. (2019b) for other purposes but in the same context. This value is close to the standard values around six that are common in the literature (Broda and Weinstein, 2006). The other four quantities are computed using averages across firms in our data. We set ξ^I_j (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) 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 4. Estimation Results and Discussion. 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.

[50] Concretely, we instrument for $\widehat{A}_{j(i),t}$, $\widehat{\omega}_{s(i),t}$, and $\widehat{\mathcal{C}}_{s(i),t}$ using the same instrument of the change in firm-level exposure to MNCs, $\widehat{\mathcal{O}}_{s(i),t}$, and $\sum_{s'\neq s} \pi_{js'}\widehat{\mathcal{O}}_{s(i),t} + \sum_{s'} \pi_{js'} \frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\mathcal{O}_{s(i),t}$.

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 combination of high replacement costs with high pass-through of the competitive outside option to the wage of incumbents. This is reflected in a value of $c_0/\overline{\omega}$ of 0.83 and a value of η_I of 24.16.

From the first order condition of the domestic firm problem (Equation (14)) this inferred value of η_I implies a value of the explotation index $\frac{\eta_I}{1+\eta_I} = 0.96$. This suggests that incumbent workers see firms as very close substitutes and that potential markdowns under the marginal product of labor are small. However, as shown on Panel B of Table of 8, we can reject the null hypothesis of potential employers being perfect substitutes ($1/\eta_I = 0$).

Our value of the exploitation index is relatively high compared to other estimates in the literature (e.g. Berger et al., 2019; Kline et al., 2019). 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. Ours is the first paper using plausibly exogenous firm-level shocks to estimate the 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 might not be surprising to find almost no labor market power of firms. Moreover, as shown in Table 6, 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 also consistent with the fact that, in our model, η_I governs the pass-through of both improvements in outside options and employer-level shocks.

The value of $c_0/\overline{\omega} = 0.83$ implies that the cost of hiring and training of the first hired worker is 83% of the competitive market wage. Moreover, the positive value of $\alpha = 0.15$ implies that the marginal cost of hiring and training increases slowly with the number of hires. 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 1.01 times the competitive wage ($C'(\overline{N}_j)/\overline{\omega_{s(j)}} = c_0/\overline{\omega} \times \overline{N}_j^{\alpha} \approx 1.01$). This magnitude is 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 be 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):

$$\begin{aligned}\widehat{W}_j =& \frac{\overline{\omega}_{s(j)}}{\overline{\omega}_{s(j)}+C'(\overline{N}_j)}\widehat{\omega}_{s(j)} + \frac{C'(\overline{N}_j)}{\overline{\omega}_{s(j)}+C'(\overline{N}_j)}\widehat{c'(N_j)} = \frac{1}{1+C'(\overline{N}_j)/\overline{\omega}_{s(j)}}\widehat{\omega}_{s(j)} + \frac{C'(\overline{N}_j)/\overline{\omega}_{s(j)}}{1+C'(\overline{N}_j)/\overline{\omega}_{s(j)}}\widehat{c'(N_j)} \\ \approx& \frac{1}{1+1.01}\widehat{\omega}_{s(j)} + \frac{1.01}{1+1.01}\widehat{c'(N_j)} \approx 0.5\widehat{\omega}_{s(j)} + 0.5\widehat{c'(N_j)}. \end{aligned} \tag{20}$$

Our model thus implies that 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 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 cost could also constrain firm growth. This can lead to unemployment or informality, margins that fall outside of the scope of this paper. Besides, the planner has scope to help local residents both by boosting labor demand directly through hiring of MNCs and indirectly through supplying linkages.

6 Conclusion

In this paper, we show that the entry and expansion of MNCs affect workers directly, by being hired by these firms, and indirectly, by being exposed to MNCs through the labor and product markets. We do this by combining a unique set of administrative datasets tracking all worker-firm and firm-firm relationships in Costa Rica, together with an instrumental variable strategy that exploits variation in the global performance of MNCs with subsidiaries in the country.

Our paper is divided in three main parts. In the first part, we estimate a direct MNC wage premium of 9%, which appears to be an above-market wage rather than a compensating differential. The wage premium is not explained away by firm characteristics such as size or technological sophistication, and it is larger for workers with college (12%) than for those without college (8%).

In the second part of the paper, we study the indirect effects of MNCs on wages of incumbent workers at domestic firms. We separately estimate the impact of MNCs on outside options in the labor market and the effects 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 employer-level exposure to MNCs grow 1 percentage point more than those of an identical worker with no change in both MNC exposures.

In the third and last part of the paper, 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 a high marginal hiring and training cost. These costs are equivalent to one year of earnings paid at the competitive 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, the focus of this paper is on the labor market effects of MNCs that can be measured using administrative data. While these datasets cover the universe of formal workers and firms, they exclude the informal sector. This sector typically 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). We conjecture that MNCs may have even more notable impacts on such reallocation than trade due to their direct presence in the labor market of the host country. Thus, understanding the effects of MNCs on informality is of great importance for a comprehensive assessment of policies attracting MNCs in developing countries.

Second, our results on the direct effects suggest that MNCs pay above-market wages consistent with the definition of "good jobs" (Acemoglu, 2001; Green, 2015). We discuss some explanations in line

with "good jobs" in Section 3 and present suggestive evidence from our own survey collection. However, there is room for a better understanding of the mechanisms that sustain these above-market wages in equilibrium. The recent paper by Hjort et al. (2019) takes a step in this direction by studying the fairness concerns of the HQ 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 relevant explanation for the well-established facts indicating that developing-country firms 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

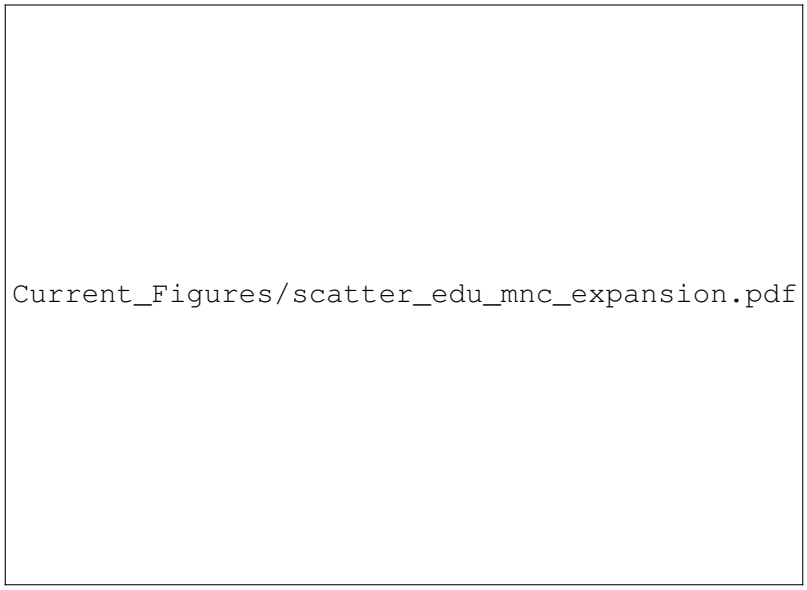
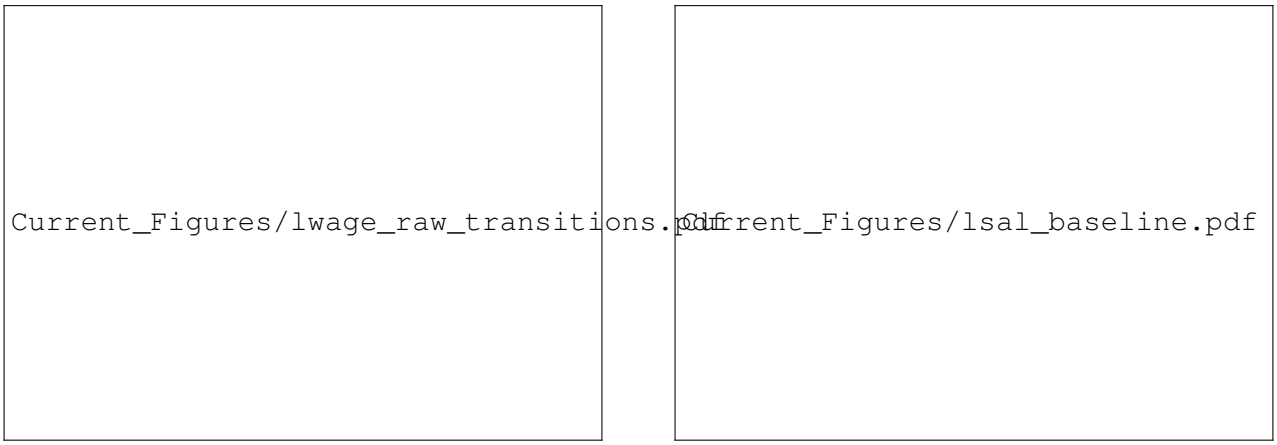


Figure 1: % Growth of MNC Employment between 2009-2017 vs. % Workers with College

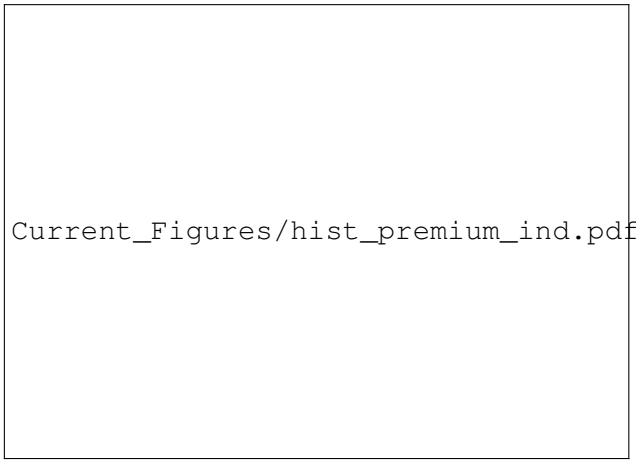
Notes: Figure 1 relates the percentage growth in the period of analysis (2009 to 2017) in MNC employment in each of the 412 two-digit industry × region markets in Costa Rica and the share of workers with a college degree in those markets in the pre-period (2006 to 2008). The size of the circle reflects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



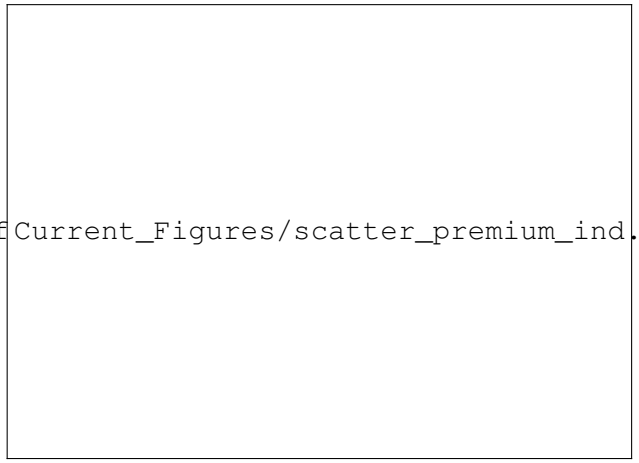
(a) Raw Means (b) Movers Design

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 continuously 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: 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 1 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 1 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)). Robust standard errors in parentheses. The MNC dummy takes value 1 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. ***,**,* denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Descriptive Statistics of Workers in the Pre-Period By Tercile of Subsequent Growth in MNC Employment in their Pre-Period 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)
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)
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	0.070	0.098	0.099	0.028***	0.001	0.028***
	(0.26)	(0.30)	(0.30)	(0.00)	(0.00)	(0.00)
Observations	823,193	823,194	823,197	1,646,387	1,646,391	1,646,390

Notes: Table 2 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 in 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 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 the IV strategy described in Section 4 for the estimation of regression 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 year $(t-1)$ and year 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 regression equation (5) described in Section 4. The outcome variable is the percentage growth in earnings from year $(t-1)$ to t. 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. 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

Dep. Var. : Δw_{it}	OLS (1)	OLS (2)	OLS (3)	OLS (4)
$\Delta LME_{s(i),t}$	0.047***		0.047***	
	(0.015)		(0.015)	
Δ (*value-added / worker*)$_t$		0.008***	0.008***	0.008***
		(0.001)	(0.001)	(0.000)
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
Observations	3,080,017	3,080,017	3,080,017	3,079,984
Adjusted R^2	0.045	0.046	0.046	0.048

Notes: Table 5 reports the OLS estimates for the modified main regression equation (7) 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. 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 (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). 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: 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

Dep. Var. : Δw_{it}	IV (1)	IV (2)	IV (3)	IV (4)
$\Delta LME_{s(i),t}$	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)
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
Observations	3,080,017	3,080,017	3,080,017	3,079,984
F-Statistic	26.3	26.3	13.1	24.7

Notes: Table 6 reports the IV estimates for the modified main regression equation (7) 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 (7)). 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 (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). 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 7: Model Equation and Estimation of the Structural Parameters. Stayers Only. Leading 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)
$IV\left(\Delta FLE_{s(i)t}\right)$	0.031***	-0.000	0.001	0.003***			0.003***
	(0.007)	(0.000)	(0.001)	(0.001)			(0.001)
$\Delta\mathcal{O}_{s(i)t}$	-19.028	2.966***	-4.556**		2.355**		2.515**
	(13.692)	(0.904)	(2.145)		(1.112)		(1.214)
$IV\left(\hat{\mathcal{C}}_{s(i)}\right)$	-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 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. $\hat{A}_{j(i),t}$ is the change in the firm revenue shifter, $\hat{\omega}_{s(i),t}$ is the change in the competitive market wage, and $\hat{\mathcal{C}}_{s(i),t}$ is the change in the composition term. 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.

Table 8: Model Equation 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 $\left(\hat{C}_{s(i),t}\right)$	-0.003	0.264**
	(0.004)	(0.134)
Panel B Inferred Parameters		
Incumbents' Retention Elasticiy $\left(\eta_I\right)$	2.378***	24.160***
	(0.168)	(1.517)
Inverse of Retention Elasticity $\left(\frac{1}{\eta_I}\right)$	0.420***	0.041***
	(0.029)	(0.003)
Marginal Hiring/Training Cost of First Hire $\left(\frac{c_0}{\bar{\omega}}\right)$	1.227***	0.827***
	(0.140)	(0.147)
Elasticity of Marginal Hiring/Training Cost w.r.t the Number of Hires (α)	0.010***	0.152***
	(0.001)	(0.048)
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 our paper, "The Effects of Multinationals on Workers: Evidence from Costa Rica", with the following material:

- Appendix A presents our data construction.
- Appendix B presents additional evidence.
- Appendix C includes robustness checks.
- Appendix D contains detailed model derivations.
- Appendix E provides more context on Costa Rica.
- Appendix F presents details 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 upon 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 the 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 the way in which an insured person is classified and, therefore, the criteria that must be use 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). There are two important considerations that we had to consider in forming 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 voluntarily contribute to IVM. 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 for 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 individual tax ID, the type of insurance held, an indicator of whether the insurance is voluntary, the type of disability (if any), the gender, the age and date of birth, the country of birth, the monthly labor earnings, the code of the occupation, the type of work day, the location codes for both the individual and the employer, the tax ID of the employer, the type of firm, and the economic activity of the firm.

The files 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 undergone changes over time (for instance, because the firm has undergone changes in 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 repetitions of the entry with different vintages of a tax ID or due or 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, it appears as many times that month as number of employers. Column (2) contains the number of unique individual tax IDs each year. Column (3) contains the number of unique firm 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 was 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.

This section is work in progress.

On data quality and the Costa Rican labor market: Alfaro-Urena et al. (2019a) is a report on inequality trends in Costa Rica. Because this report benchmark trends in inequality in Costa Rica to trends in inequality 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 whether the Costa Rican labor market is atypical or not.

B. Other Administrative Data. The remaining three administrative datasets (the firm-to-firm transaction data, the corporate income tax data, and the 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 in other major markets. Compustat compiles the financial reports filed by these 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 (see Appendix A.1 for details), 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 activity 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 variables (IVs) 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 (the leading IV and the IV used in the robustness check).

The query for the data to construct IV1 (the leading IV): 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 (see above), 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.

This combined (Orbis and Compustat) dataset is used in the construction of our leading IV. 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 IV2 (the IV in the robustness check): Second, we have queried Orbis for information on all *bvdidnumbers* (unique identifiers of companies in Orbis) with a subsidiary

[i] C1 refers to the account of a company-headquarter of a group, aggregating all companies belonging to the group (subsidiaries, 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 (subsidiaries, 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.

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 included the list of *bvdidnumbers* identified at the previous step.

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. 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. This dataset is used in the construction of the second IV, which we use in our robustness checks to the leading IV (described above). As Table A2 shows, over half of these 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 B Additional Evidence

Appendix B.1 Descriptive Statistics

Table B1: $\Delta\mathcal{M}_{st}$ 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 IV1	412	21.2	-99.6	-38.7	5.4	96.8	237.5	61.0
$\Delta\mathcal{O}_{st}$ from IV2	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 IV1	3,699	3.0	-68.4	-12.0	0.7	18.0	127.2	28.4
$\Delta\mathcal{O}_{st}$ from IV2	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 IV1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) or the robustness check IV2 (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.

Figure B1: Growth Rates of MNC Employment Inside and Outside of Costa Rica

Notes: Figure B1 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 industry fixed effects) associated to two-digit industry $\times$ region markets s in year t. The MNC employment outside of Costa Rica refers to employment in the same MNC groups as those with subsidiaries in Costa Rica. This figure only contains the observations with non-zero values of MNC employment.

Table B2: 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 IV1	0.814***	0.862***			0.601***	0.608***
	(0.171)	(0.186)			(0.155)	(0.172)
$\Delta\mathcal{O}_{st}$ from IV2			0.525***	0.532***	0.309***	0.315***
			(0.131)	(0.131)	(0.114)	(0.105)
Year FE	No	Yes	No	Yes	No	Yes
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 B2 presents the regressions of $\Delta\mathcal{M}_{st}$ onto the $\Delta\mathcal{O}_{st}$ from either the leading instrument IV1 (the instrument using changes in MNC employment outside Costa Rica for the same MNCs with subsidiaries in Costa Rica) or the robustness check instrument IV2 (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 IV1, Columns (3) and (4) use $\Delta\mathcal{O}_{st}$ from IV2, 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.

Table B3: Summary Statistics for the Sample Used in 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 B3 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: 8 quarters before the move, the quarter of the move, and 8 quarters after the move. The only exception applies for 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 B4: 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 B4 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 in 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 yearly 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.

Appendix B.2 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. We consider not only the direct sales to MNCs, but also the 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, the number of indirect suppliers is considerably larger. 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, we denote $s_{jj} = 0$. 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):

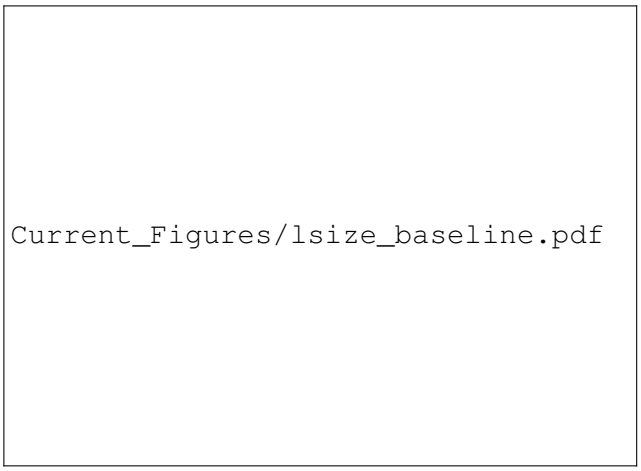
$$\Theta_m(H) = \Big(\sum_h^H S^h \Big) \cdot \Sigma_m.$$

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 $\Theta_m(H)$ defined above. Denote this share by θ^H_{jm}. Going forward, we omit the H superscript.

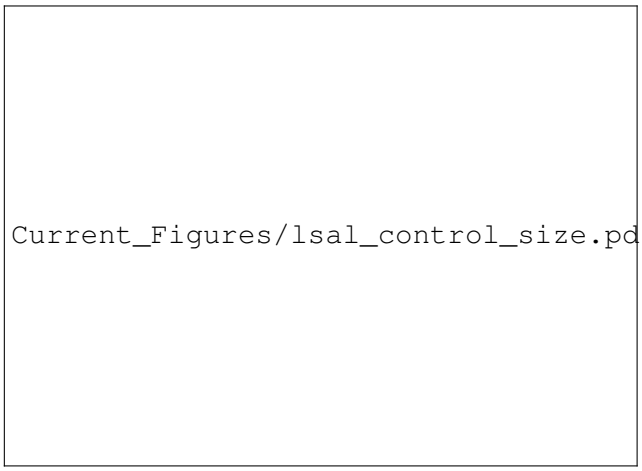
[iii] In this case, the MNC m is at supply chain distance h. To fix ideas, a firm's *direct* clients are at supply chain distance 0, the clients of one's direct clients are at supply chain distance 1, and so forth. For example, $\Sigma_m(1)$ contains the indirect sales to MNC m, made through one's direct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

Appendix B.3 Magnitude and Interpretation of the MNC Wage Premium

Appendix B.3.1 The MNC Wage Premium Estimated with 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 B2: Employer Size and Worker Quarterly-Average Labor Earnings

Notes: Figure B2 explores the importance of employer size in explaining the change in earnings upon changing employer. Panel B2a uses as dependent variable the log number of workers of the employer that quarter. Panel B2b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel B2b and those in Figure 2 come from the additional controls in Panel B2b 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 earnings premium. It also uses a more generous definition of the sample than that used in the main sample used in the movers design. Workers used in the regression described in Equation (B1) are only required to have worked for the same employer in the four quarters (twelve months) before a move.

$$w_{it} = \alpha_i + \lambda_t + \mu_r + \rho_o + \sum_{a \in \{\text{DOM,MNC}\}} \sum_{b \in \{\text{SMALL,BIG}\}} \sum_{c \in \{\text{HT,LT}\}} \psi_{(a+b+c)} D_{j(i,t) \in \{a+b+c\}} \tag{B1}$$

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= employer $j(i,t)$ is a domestic firm, MNC= employer $j(i,t)$ is an MNC, SMALL = sales of employer $j(i,t)$ < 5 million USD, BIG = sales of employer $j(i,t)$ $\geq$5 million USD, HT = industry of employer $j(i,t)$ is high-tech (according to the OECD classification), and LT = industry of employer $j(i,t)$ is low-tech. Estimates of the regression described in Equation (B1) can be found in Table B5

Table B5: 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 B5 presents the estimates of the $\psi_{(a+b+c)}$ coefficients on the dummies of employer characteristics from Equation (B1). 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.** As 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 with respect to customs and taxation.[iv]

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 in two groups: those that are part of the ZF regime and those that are not.

Figure B3 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 B4 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 B4a 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 an ZF. This is line with ZFs targeting firms which can make larger investments. Panel B4b plots again the event-study coefficients for the labor earnings as dependent variable, this time after controlling for the firm size and industry. These controls make moves to a non-ZF MNC and to a domestic firm significantly more similar among themselves, particularly in the short-term. However, there remains a large difference between moving to an ZF MNC versus non-ZF MNC that is not explained away by the size and industry of the MNC.

[iv] 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.

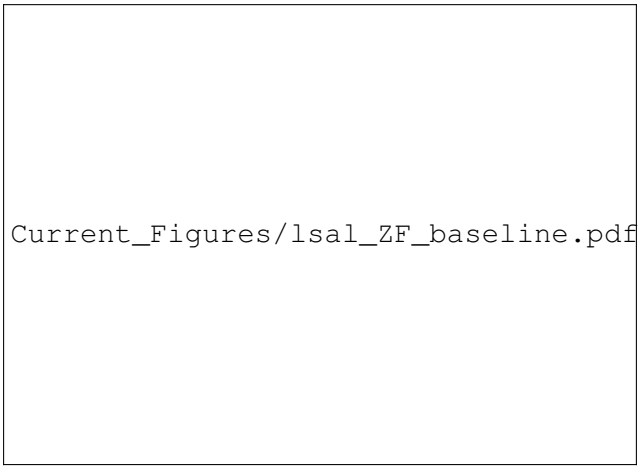
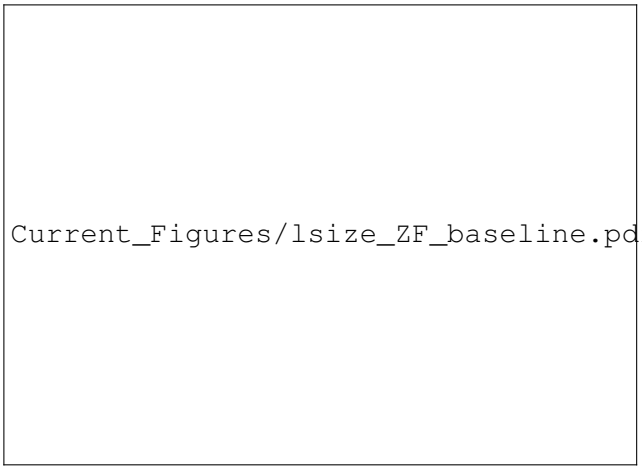
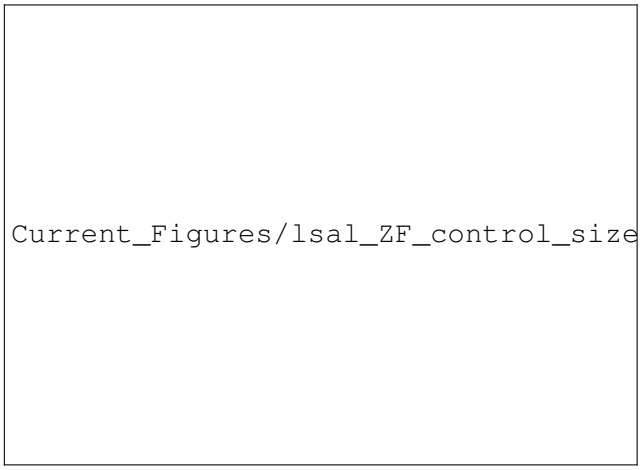


Figure B3: Log Worker Quarterly-Average Labor Earnings. Three Types of Worker Moves (DOM-DOM, DOM-MNC (in FZ), DOM-MNC (not in FZ)

Notes: Figure B3 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 in 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 B4: Employer Size, FZ Status and Worker Quarterly-Average Labor Earnings

Notes: Figure B4 explores the importance of employer size in explaining the change in earnings upon changing employer. In this exercise, MNCs in Costa Rica are split in two mutually exclusive categories based on whether they belong to the *Zona Franca* (Free Zone) regime or not. Panel B4a uses as dependent variable the log number of workers of the employer that quarter. Panel B4b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel B4b and those in Figure B3 come from the additional controls in Panel B4b 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.

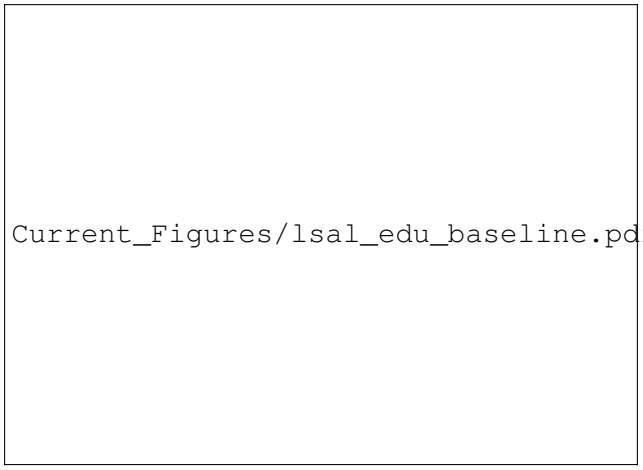
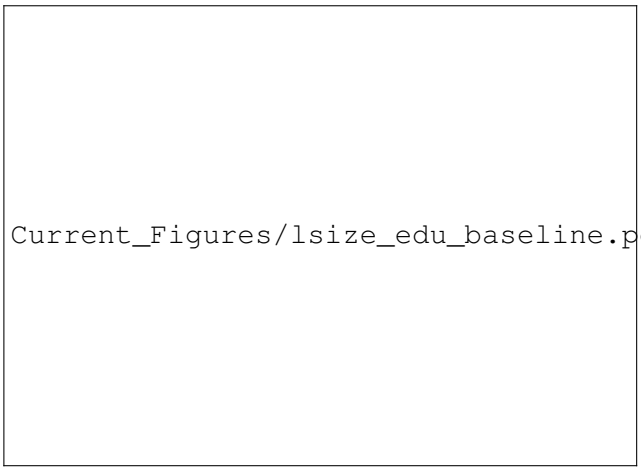
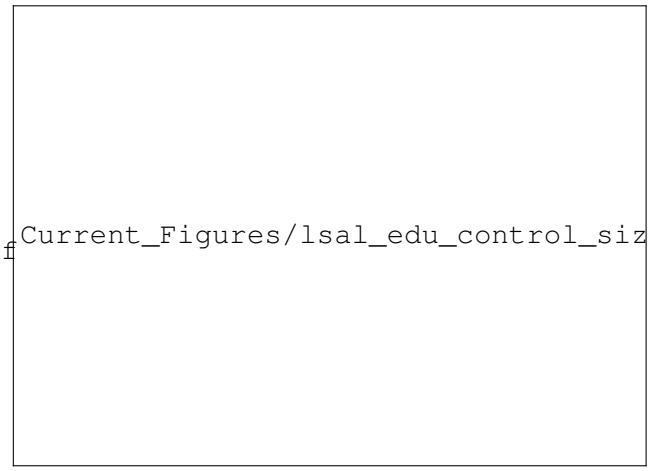


Figure B5: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves (DOM-DOM and DOM-MNC), by Educational Attainment

Notes: Figure B5 plots the event-study coefficients from a specification where the event is defined as an across-quarter switch in employment. Workers are split in 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 B6: Employer Size and Worker Quarterly-Average Labor Earnings, by Educational Attainment

Notes: Figure B6 explores the importance of employer size in explaining the change in earnings upon changing employer. In this exercise, Workers are split in two categories of educational attainment: college or more ("college") and less than college ("no college"). Panel B6a uses as dependent variable the log number of workers of the employer that quarter. Panel B6b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel B6b and those in Figure B5 come from the additional controls in Panel B6b 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.

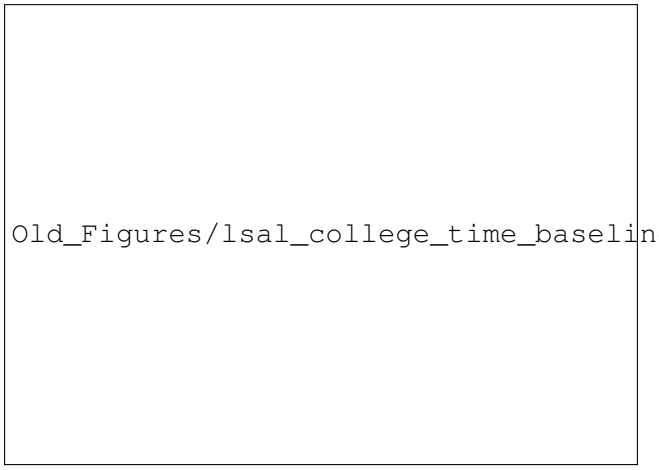
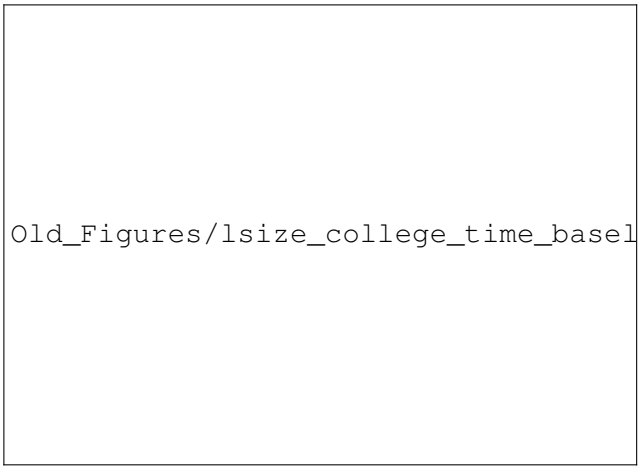
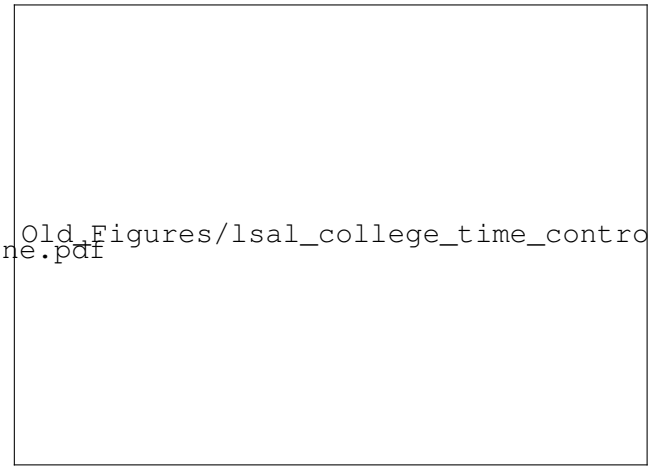


Figure B7: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves: DOM-MNC and DOM-DOM, and Two Periods: 2006-2010 and 2011-2017. **College Graduates Only**

Notes: Figure B7 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 B8: Employer Size and Worker Quarterly-Average Labor Earnings. Two Periods: 2006-2010 and 2011-2017. **College Graduates Only**

Notes: Figure B8 explores the importance of employer size in explaining the change in earnings upon changing employer. This exercise only studies workers with college or more. Panel B8a uses as dependent variable the log number of workers of the employer that quarter. Panel B8b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel B8b and those in Figure B7 come from the additional controls in Panel B8b 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.

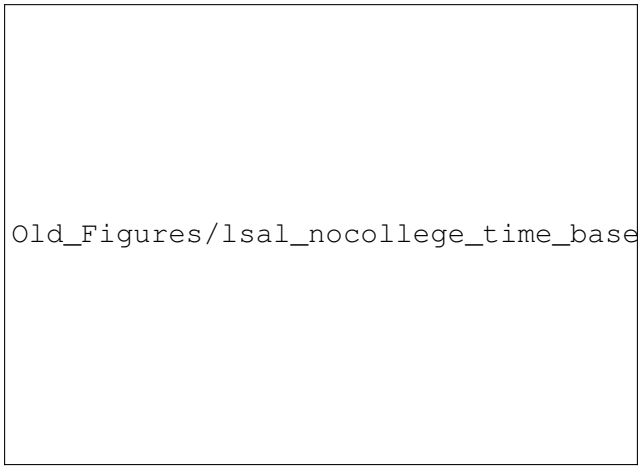
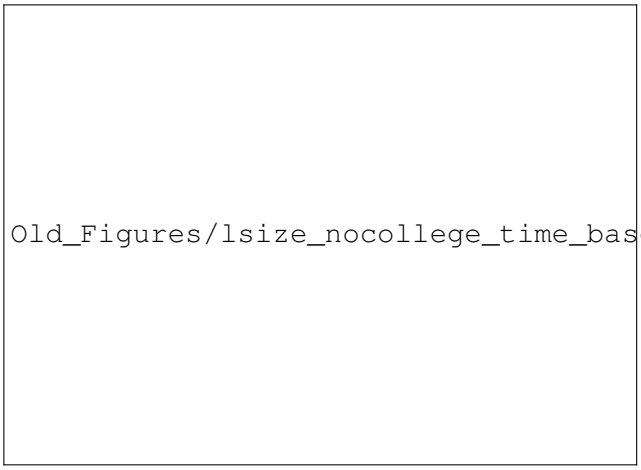
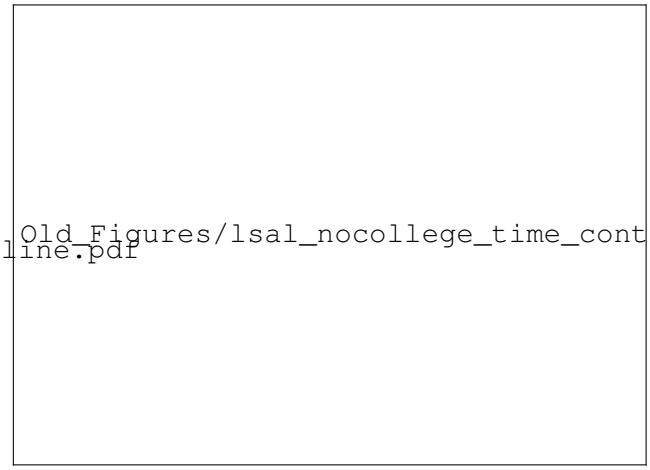


Figure B9: Log Worker Quarterly-Average Labor Earnings. Two Types of Worker Moves: DOM-MNC and DOM-DOM, and Two Periods: 2006-2010 and 2011-2017. **Less Than College Only**

Notes: Figure B9 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 B10: Employer Size and Worker Quarterly-Average Labor Earnings. Two Periods: 2006-2010 and 2011-2017. **Less Than College Only**

Notes: Figure B10 explores the importance of employer size in explaining the change in earnings upon changing employer. This exercise only studies workers with less than a college degree. Panel B10a uses as dependent variable the log number of workers of the employer that quarter. Panel B10b uses as dependent variable the log quarterly-average worker labor earnings. The difference between the estimates in Panel B10b and those in Figure B9 come from the additional controls in Panel B10b 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.3.2 The MNC Wage Premium Estimated with an IV Strategy

To bolster the causal claim over the estimate of an MNC wage premium, we leverage an IV strategy which takes advantage of the exogenous variation to 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 no selection into firms based on the idiosyncratic time-varying error term.

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:

$$\begin{aligned}\Delta w_{it} =& \psi \Delta \mathbb{1}[j(i) = MNC]_t + \boldsymbol{X_i}' \boldsymbol{\beta}_{char} + \alpha_{j(i,t)} + \\ &+ \gamma_{ind(s(i,t-1))} + \mu_{reg(s(i,t-1))} + \underline{\gamma}_{ind(s(i,t))} + \underline{\mu}_{reg(s(i,t))} + \epsilon_{it}\end{aligned} \tag{B2}$$

where Δw_{it} is the percentage change in the monthly average labor earnings of worker i between year $(t-1)$ and year t,[51] $\boldsymbol{X_i}$ is a vector of dummies for worker i characteristics (sex, year-of-birth, college education status, and Costa Rican national status), $\alpha_{j(i,t)}$ are firm $j(i,t)$ fixed effects (where $j(i,t)$ is the employer of i in t), $\gamma_{ind(s(i,t-1))}$ 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. We use robust standard errors clustered at the individual-level.

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). To the extent that moving is on average associated with a higher wage increase than staying, it is also important to exclude stayers to avoid overestimating the MNC wage premium.

$\Delta \mathbb{1}[j(i) = MNC]_t$ is the difference between two indicator functions which take value 1 if the employer of i, $j(i)$ is an MNC. Formally, $\Delta \mathbb{1}[j(i) = MNC]_t \equiv \mathbb{1}[j(i,t) = MNC] - \mathbb{1}[j(i,t-1) = MNC]$. $\Delta \mathbb{1}[j(i) = MNC]_t$ can take three values: -1, 0, or 1. This indicator takes value -1 if worker i moves from an MNC in $(t-1)$ to a domestic firm in t. It takes value 0 if worker i does not change employer type between $(t-1)$ and t (i.e., the worker changes employer but the old and new employer are either both domestic or both MNCs). Last, it takes value 1 if worker i moves from a domestic firm in $(t-1)$ to an MNC in t. 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 same ownership type firms as the reference. These choices are consistent with our findings from the movers design.

We instrument $\Delta \mathbb{1}[j(i) = MNC]_t$ with the same IV proposed in Section 4.1.1 for ΔLME, namely $IV\left(\Delta LME_{s(i,t-1),t}\right) \equiv \sum_{s'} \pi_{s(i,t-1)s',t_0} \psi_{s'} \nu_{s',t} \Delta \mathcal{O}_{s',t}$. Worker i is assigned an IV based on her labor market affiliation in year $(t-1)$ $(s(i,t-1))$. This is done to avoid sorting across labor markets between $(t-1)$ and t based on the MNC exposure shocks occurring between those same years. The intuition of a significant first stage is that workers who move from a labor market $s(i,t-1)$ that experiences an increase in exposure to MNCs are more likely to move to an MNC than workers who move from a market whose exposure to MNCs has increased less than for $s(i,t-1)$. The exclusion restriction requires the $IV\left(\Delta LME_{s(i,t-1),t}\right)$ to affect the change in earnings of worker i only through its effect on the probability of i to move to an MNC.

The magnitude and sign of the bias of the OLS estimate of ψ is not obvious a priori. On the one hand, if those switching to MNCs do so upon receiving a positive productivity shock, then the estimate may be upward biased. On the other hand, the estimate is likely to be downward biased, as workers who move to MNCs tend to come from high-paying domestic firms (as shown in Column (5) of Table B3, Appendix B.1). Moreover, the estimate may also be downward biased if there are market-wide shocks (most importantly, the MNC shock) that increase the wages of all workers in that market (and,

[51] The monthly average labor earnings of worker i for year t is the average of the monthly labor earnings of that worker over the months with positive labor earnings in year t. This is meant to capture the monthly wage.

in particular, that lead to higher increases in wages for workers engaged in the reference domestic-to-domestic and MNC-to-MNC moves).[52]

Table B6 reports the OLS and IV results. Column (1) contains the OLS estimate, Column (2) the first stage of the IV, Column (3) the reduced form of the IV, and Column (4) the IV estimate. The OLS estimate of the MNC wage premium is 8%, which (despite the additional fixed effects) is similar to the MNC wage premium estimate through the movers design. Column (2) confirms the strength of the first stage, i.e., of the ability of $IV\left(\Delta LME_{s(i,t-1),t}\right)$ to predict the likelihood of a move from (to) a domestic firm to (from) an MNC. Column (3) shows the positive relationship between the change in labor earnings and the instrument. Column (4) presents the IV estimate, of 18% (with an F-statistic of 236).[53] The compliers in this IV exercise are likely to be workers who come from lower-paying domestic firms and who need a considerable expansion of MNCs in their $(t-1)$ labor market to move to an MNC.[54]

Given that the estimates of the MNC premium coming from the IV estimate and those coming from the movers design are of a similar order of magnitude and that the estimates of the premium from the movers design are a lower bound, going forward we use the estimates of the more familiar movers design.

Table B6: The Wage Effect of Moving to/from an MNC Employer: OLS and IV Estimates

	OLS	First Stage	Reduced Form	IV
Dep. Var.	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***			0.184**
	(0.003)			(0.081)
$IV\left(\Delta LME_{s(i,t-1),t}\right)$		0.037***	0.007**	
		(0.002)	(0.003)	
Observations	1,559,410	1,559,410	1,559,410	1,559,410
F-Statistic				235.7

Notes: Table B6 presents the OLS and IV estimates for the specification described in Equation (B2). 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 used in this regression is the IV proposed for the measure of "Labor Market Exposure" (LME), defined in Section 4.1.1, i.e. $\sum_{s'} \pi_{s(i)s',t_0} \psi_{s'} \nu_{s',t-2} \Delta \mathcal{O}_{s',t-1}$. Note that the assignment of the IV is based on the labor market $s(i,t-1)$ to which i belongs to in year $(t-1)$, 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.

[52] In Section 4, we show that stayers in domestic firms also benefit from market-level increases in MNC exposure.

[53] When we replicate these results using the exact same sample used in the movers design, results are almost identical. These results are available upon request.

[54] This IV does not address the underestimation of the MNC premium that is due to the indirect effects of changes in the presence of MNCs in a labor market on workers in domestic firms in that same market (shown in Section 4).

Appendix B.3.3 MNC Wage Premium Unlikely Driven by Inferior Amenities at MNCs

(a) Evidence using Matched Employer-Employee Data

(a1). Retention probabilities for domestic firms vs. MNCs. Figure B11 shows that workers who start employment at a domestic firm are more likely to change employment in the following quarters than workers who start employment at an MNC.

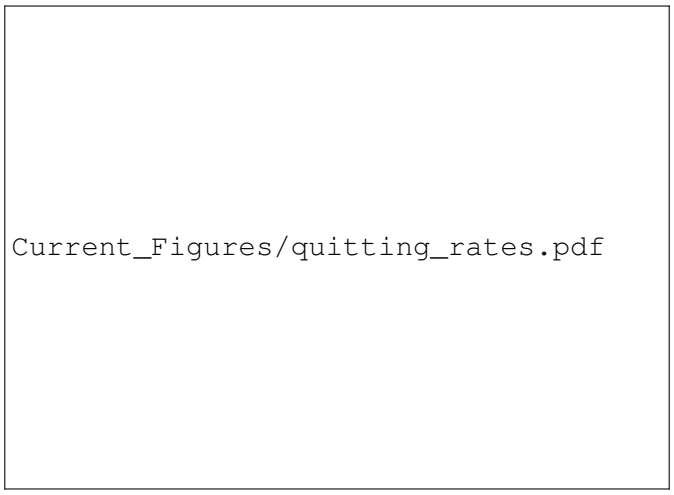


Figure B11: Higher Retention Probabilities at MNCs than at Domestic Firms

Notes: Figure B11 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 B7 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 B7: Summary Statistics for 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 B7 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:

$$\begin{aligned}\text{(Rel Wages)}_{oj,t} =& \alpha_j + \lambda_{o\times k(j)\times t} + \beta_1 \Delta log(\ell_{oj,t}) + \beta_2 \Delta log(\ell_{oj,t}) \mathbb{1}[o = college] + \\ & \beta_3 \Delta log(\ell_{oj,t}) \mathbb{1}[j = MNC] + \beta_4 \Delta log(\ell_{oj,t}) \times \mathbb{1}[o = college] \mathbb{1}[j = MNC] + \varepsilon_{oj,t} \end{aligned} \quad \text{(B3)}$$

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 (B3) (and its variants) are presented in Table B8. 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 year-by-four-digit occupation-by-four-digit industry fixed effects. However, results are qualitatively similar across specifications.

There are three interesting takeaways. First, firms on average pay higher wages to new employees (relative to incumbent ones) the larger the expansion of the four-digit occupation within the firm. In particular, firms increase the pay of the new workers relative to the 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 upwards 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, 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.

Table B8: 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 B8 presents the results of the variants of the regression described in Equation (B3). 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.

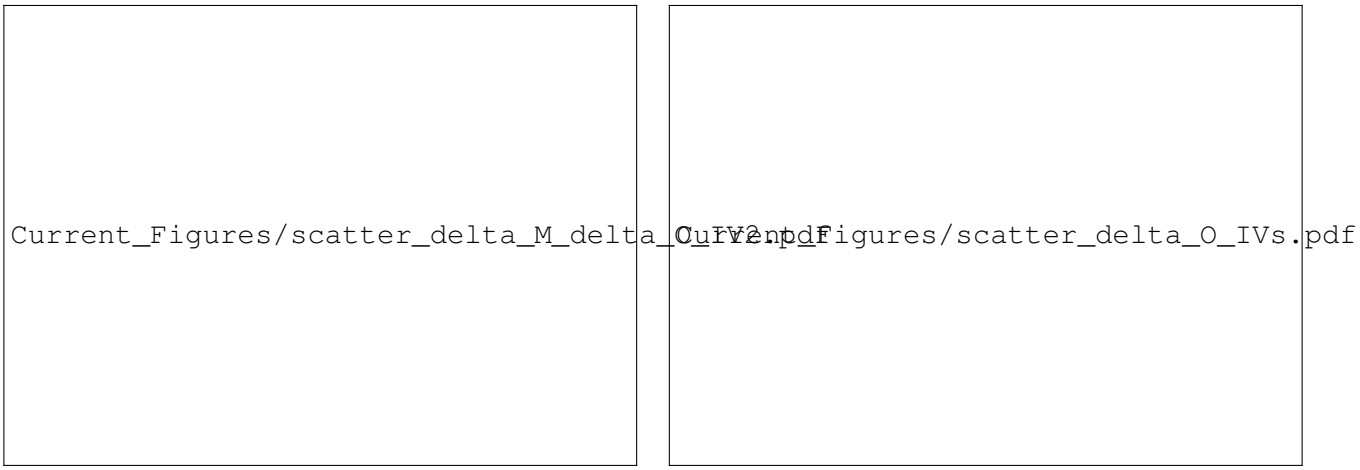
However, the increase in the relative wage is around twice as large for domestic firms than for MNCs (both for college and non-college occupations). Thus, MNC firms also face an upwards sloping labor supply but the elasticity is much higher than the one domestic firms face.

Appendix C Robustness Checks

Appendix C.1 MNC Wage Premium Estimate from the Movers Design

This section is work in progress.

Appendix C.2 Reduced Form Evidence on The Effects of Exposure to MNCs on Workers in Domestic Firms



(a) Corr. b/n $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ from IV2

(b) Corr. b/n $\Delta\mathcal{O}_{st}$ from IV1 and $\Delta\mathcal{O}_{st}$ from IV2

Figure C12: Correlation between $\Delta\mathcal{O}_{st}$ from IV2 and $\Delta\mathcal{M}_{st}$ (Left) or $\Delta\mathcal{O}_{st}$ from IV1 (Right)

Notes: Figure C12 builds intuition on the variation in $\Delta\mathcal{O}_{st}$ from IV2 (the robustness check instrument, which uses changes in MNC employment outside of Costa Rica for MNCs with subsidiaries in at least one of twenty Latin American and Caribbean countries). Panel C12a plots the relationship between $\Delta\mathcal{M}_{st}$ and $\Delta\mathcal{O}_{st}$ from IV2. Panel C12b plots the relationship between $\Delta\mathcal{O}_{st}$ from IV1 and $\Delta\mathcal{O}_{st}$ from IV2. These plots only contain the markets s with non-zero values of MNC employment.

Table C1: 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 C1 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 × 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 C2: 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 C2 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 C3: 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 C3 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 C4: 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 C4 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 C5: 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 C5 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 (7)). 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 college education. Panel C includes only workers without 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 C6: 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 C6 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 (7)). 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 college education. Panel C includes only workers without 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 C7: 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)	
Δ (*value-added/worker*)$_t$		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)	
Δ (*value-added/worker*)$_t$		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)	
Δ (*value-added/worker*)$_t$		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 C7 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 (7)). 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 C8: 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)	
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: Women Only				
$\Delta LME_{s(i),t}$	0.039		0.052	
	(0.055)		(0.062)	
Δ (*value-added/worker*)$_t$		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)	
Δ (*value-added/worker*)$_t$		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 C8 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 (7)). 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.

Appendix D Additional Model Derivations

Appendix D.1 Log-Linearization of the FOCs

Appendix D.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:

$$W_j = \frac{\eta_I}{\eta_I+1}\frac{\sigma-1}{\sigma}A_j\left(\frac{W_j^{\eta_I}}{\Omega_{js}^{\eta_I}}I_j^0 + N_j\right)^{-\frac{1}{\sigma}} \forall j, \tag{D4}$$

$$\frac{\sigma-1}{\sigma}A_j\left(\frac{W_j^{\eta_I}}{\Omega_{js}^{\eta_I}}I_j^0 + N_j\right)^{-\frac{1}{\sigma}} - c'(N_j) = \omega_{s(j)} \forall j, \tag{D5}$$

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 (D4) and (D5) are the FOCs of the domestic firm problem.

Then, we add the FOCs of the MNC problem:

$$\frac{\sigma-1}{\sigma}A_{MNC(s)}N_{MNC(s)}^{-\frac{1}{\sigma}} = \psi_s\omega_s + C'_{MNC(s)}\left(N_{MNC(s)}\right) = \psi_s\omega_s + c_0 N_{MNC}^{\alpha_m}. \tag{D6}$$

$$J_{MNC(s)} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}\left(\frac{A_{MNC(s)}}{P_{MNC(s)}}\right)^{\sigma}. \tag{D7}$$

Let us first log-linearize Equations (D4) and (D5) 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:

$$\begin{aligned}
\widehat{W}_j\left(\sigma + \xi_j^I\eta_I\right) =& \sigma\widehat{A}_j - (1-\xi_j^I)\widehat{N}_j + \xi_j^I\eta_I\widehat{\Omega}_{js} \\
\widehat{W}_j =& \frac{\sigma}{\sigma+\xi_j^I\eta_I}\widehat{A}_j - \frac{(1-\xi_j^I)}{\sigma+\xi_j^I\eta_I}\widehat{N}_j + \frac{\xi_j^I\eta_I}{\sigma+\xi_j^I\eta_I}\widehat{\Omega}_{js}
\end{aligned} \tag{D8}$$

Then

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

$$\widehat{N}_j = \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js} \tag{D9}$$

Now replace $\widehat{N}_j$ from Equation (D9) into Equation (D8) to obtain:

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

$$\widehat{W}_j = \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js} \tag{D10}$$

Hereafter, we write together the versions of Equations (D9) and (D10), where we do not yet replace the log-deviation of $\Omega_{js} = \left(W_j^{\eta_I} + \sum_{s'}(\tau_{s(j)s'}\tilde{\omega}_{s'})^{\eta_I}\right)^{\frac{1}{\eta_I}}$:

$$\begin{aligned}
\widehat{N}_j =& \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js} \\
\widehat{W}_j =& \frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j + \frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s + \frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\Omega}_{js}.
\end{aligned} \tag{D11}$$

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 $\pi_{jj} \equiv \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$.

$$\widehat{\Omega}_{js} = \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}\widehat{W}_j + \sum_{s'}\frac{\left(\tau_{ss'}\overline{\omega}_{s'}\right)^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}\widehat{\omega}_{s'} = \pi_{jj}\widehat{W}_j + \sum_{s'}\pi_{js'}\widehat{\omega}_{s'} \tag{D12}$$

We now replace the expression for $\widehat{\Omega}_{js}$ into Equations (D9) and (D10)

$$\begin{aligned}
\widehat{N}_j =& \frac{\sigma}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{A}_j - \frac{(1-\xi_j^C)(\sigma+\xi_j^I\eta_I)}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\widehat{\omega}_s \\
& + \frac{\xi_j^I\eta_I}{\xi_j^C\alpha(\sigma+\xi_j^I\eta_I)+(1-\xi_j^I)}\left(\pi_{jj}\widehat{W}_j + \sum_{s'}\pi_{js'}\widehat{\omega}_{s'}\right).
\end{aligned} \tag{D13}$$

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

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

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

$$\widehat{W}_j=\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{A}_j+\frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{\omega}_s+$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\widehat{\widetilde{\omega}}_{s'} \tag{D14}$$

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 (D14). This leads to:

$$\widehat{W}_j=\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{A}_j+\frac{(1-\xi_j^C)(1-\xi_j^I)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{\omega}_s$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\widehat{\omega}_{s'}$$
$$+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right), \tag{D15}$$

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 (D15) is the one we estimate in Section 5.7 to recover the structural parameters of interest.

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

Let us first log-linearize Equation (D6) with respect to $N_{MNC(s)}$, $A_{MNC(s)}$, and ω_s:

$$\tfrac{\sigma-1}{\sigma}A_{MNC(s)}N_{MNC(s)}^{-\frac{1}{\sigma}}=\psi_s\omega_s+C'_{MNC(s)}\left(N_{MNC(s)}\right)=\psi_s\omega_s+c_0N_{MNC}^{\alpha_m}. \tag{D16}$$

$$\widehat{A}_{MNC(s)}-\tfrac{1}{\sigma}\widehat{N}_{MNC(s)}=\frac{\psi_s\overline{\omega}_s}{\psi_s\overline{\omega}_s+c_0\overline{N}_{MNC(s)}^{\alpha_m}}\widehat{\omega}_s+\frac{c_0\overline{N}_{MNC(s)}^{\alpha_m}}{\psi_s\overline{\omega}_s+c_0\overline{N}_{MNC(s)}^{\alpha_m}}\alpha_m\widehat{N}_{MNC(s)}. \tag{D17}$$

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

$$\widehat{A}_{MNC(s)}-\tfrac{1}{\sigma}\widehat{N}_{MNC(s)}=\left(1-\xi^C_{MNC(s)}\right)\widehat{\omega}_s+\xi^C_{MNC(s)}\alpha_m\widehat{N}_{MNC(s)}. \tag{D18}$$

Therefore

$$\widehat{N}_{MNC(s)}=\frac{\sigma}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{A}_{MNC(s)}-\frac{\sigma\left(1-\xi^C_{MNC(s)}\right)}{1+\xi^C_{MNC(s)}\alpha_m\sigma}\widehat{\omega}_s. \tag{D19}$$

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

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

$$N_s \equiv N_{MNC(s)} + \sum_{j \in \mathcal{D}_s} N_j = \frac{\tilde{\omega}_s^{\eta_N}}{\Omega_N^{\eta_N}} L_N^0 + \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0 \forall s, \tag{D20}$$

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 (11).

Let us now log-linearize the labor market clearing condition introduced in Equation (D20) with respect to $N_{MNC(s)}$, N_j, ω_s, Ω_N, and $\Omega_{j's'}$.

$$N_{MNC(s)} + \sum_{j \in \mathcal{D}_s} N_j = \frac{\tilde{\omega}_s^{\eta_N}}{\Omega_N^{\eta_N}} L_N^0 + \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\left(\tau_{s'(j')s} \tilde{\omega}_s\right)^{\eta_I}}{\Omega_{j's'}^{\eta_I}} I_{j'}^0 \forall s, \tag{D21}$$

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 (D20) can be rewritten as $N_s = L_{Ns} + I_s$. Then

$$\widehat{N}_s = \frac{\overline{L}_{Ns}}{\overline{N}_s} \widehat{L}_{Ns} + \frac{\overline{I}_s}{\overline{N}_s} \widehat{I}_s = \Psi_s^N \widehat{L}_{Ns} + \Psi_s^I \widehat{I}_s, \tag{D22}$$

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 (D22) is equal to

$$\widehat{N}_s = \chi_{MNC(s)}^N \widehat{N}_{MNC(s)} + \sum_{j \in \mathcal{D}_s} \chi_j^N \widehat{N}_j. \tag{D23}$$

Then:

$$\widehat{L}_{Ns} = \eta_N \left(\widehat{\tilde{\omega}}_s - \widehat{\Omega}_N\right) \tag{D24}$$

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

$$\widehat{I}_s = \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \frac{\overline{Z}_{j'}^s}{\overline{I}_s} \widehat{Z_{j'}^s} = \sum_{s'} \sum_{j' \in \mathcal{D}_{s'}} \zeta_{j'}^s \eta_I \left(\widehat{\tilde{\omega}}_s - \widehat{\Omega}_{j's'}\right) \tag{D25}$$

where $\zeta^s_{j'} \equiv \dfrac{\frac{\left(\tau_{s'(j')_s}\overline{\widetilde{\omega}}_s\right)^{\eta_I}}{\overline{\Omega}^{\eta_I}_{j's'}} I^0_{j'}}{\sum_{s''}\sum_{j''\in\mathcal{D}_{s''}} \frac{\left(\tau_{s''(j'')_s}\overline{\widetilde{\omega}}_s\right)^{\eta_I}}{\overline{\Omega}^{\eta_I}_{j''s''}} I^0_{j''}} = \frac{\overline{Z}^s_{j'}}{\overline{I}_s}$. We now replace $\widehat{N}_s, \widehat{L}_{Ns}, \widehat{I}_s$ from Equations (D23), (D24), and (D25) into Equation (D22):

$$\chi^N_{MNC(s)}\widehat{N}_{MNC(s)} + \sum_{j\in\mathcal{D}_s}\chi^N_j\widehat{N}_j = \Psi^N_s\eta_N\left(\widehat{\widetilde{\omega}}_s - \widehat{\Omega}_N\right) + \Psi^I_s\sum_{s'}\sum_{j'\in\mathcal{D}_{s'}}\zeta^s_{j'}\eta_I\left(\widehat{\widetilde{\omega}}_s - \widehat{\Omega}_{j's'}\right). \tag{D26}$$

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 (D14) into Equation (D13):

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

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

$$\begin{aligned}\widehat{N}_j = {} & \left[\frac{\sigma}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\widehat{A}_j \\ & - \left[\frac{(1-\xi^C_j)}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(\sigma+\frac{\xi^I_j\eta_I[\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})]-\xi^I_j(1-\xi^I_j)\eta_I\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\times \\ & \times\widehat{\omega}_s + \left[\frac{\xi^I_j\eta_I}{\xi^C_j\alpha(\sigma+\xi^I_j\eta_I)+(1-\xi^I_j)}\left(1+\frac{\xi^I_j\xi^C_j\eta_I\alpha\pi_{jj}}{\xi^C_j\alpha\sigma+(1-\xi^I_j)+\xi^C_j\xi^I_j\alpha\eta_I(1-\pi_{jj})}\right)\right]\sum_{s'}\pi_{js'}\widehat{\widetilde{\omega}}_{s'}\end{aligned} \tag{D27}$$

Next, we replace the $\widehat{N}_{MNC(s)}$ and $\widehat{N}_j$ in the left-hand side (LHS) of Equation (D26) with the expressions found in Equations (D19) and (D27):

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

$$\times \sum_{s'} \pi_{js'} \frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})} \left(\widehat{N}_{MNC(s')} - \widehat{N}_{s'}\right). \quad \text{(D28)}$$

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{(D29)}
\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 $\widehat{\boldsymbol{N}}_{|s|\times 1}$.

$$\widehat{\boldsymbol{N}}_{|s|\times 1} = \left(\boldsymbol{I}_{|s|\times|s|} - \boldsymbol{Q}_{|s|\times|s|}\right)^{-1}\boldsymbol{P}_{|s|\times|k|}\widehat{\boldsymbol{A}}_{|k|\times 1} + \left(\boldsymbol{I}_{|s|\times|s|} - \boldsymbol{Q}_{|s|\times|s|}\right)^{-1}\boldsymbol{R}_{|s|\times|s|}\widehat{\boldsymbol{\omega}}_{|s|\times 1}. \quad \text{(D30)}$$

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 (D26). 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 $\pi_{jj} \equiv \frac{\overline{W}_j^{\eta_I}}{\overline{\Omega}_{js}^{\eta_I}}$.

$$\begin{aligned}
\widehat{\Omega}_N &= \sum_{s'} \frac{\overline{\omega}_{s'}^{\eta_N}}{\overline{\Omega}_N^{\eta_N}} \widehat{\omega}_{s'} = \sum_{s'} \kappa_{s'} \widehat{\tilde{\omega}}_{s'}, \\
\widehat{\Omega}_{j's'} &= \frac{\overline{W}_{j'}^{\eta_I}}{\overline{\Omega}_{j's'}^{\eta_I}} \widehat{W}_{j'} + \sum_{s''} \frac{\left(\tau_{s's''}\overline{\omega}_{s''}\right)^{\eta_I}}{\overline{\Omega}_{j's'}^{\eta_I}} \widehat{\tilde{\omega}}_{s''} = \pi_{j'j'}\widehat{W}_{j'} + \sum_{s''} \pi_{j's''}\widehat{\tilde{\omega}}_{s''}.
\end{aligned} \tag{D31}$$

We replace the expressions for $\widehat{\Omega}_N$ and $\widehat{\Omega}_{j's'}$ from Equation (D31) and the expression of $\widehat{W}_{j'}$ from Equation (D15) into the RHS to reach:

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

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

$$-\sum_{s'}\sum_{j'\in\mathcal{D}_{s'}}\Psi_s^I\zeta_{j'}^s\eta_I\pi_{j'j'}\left(\frac{\xi_{j'}^C\xi_{j'}^I\alpha\eta_I}{\xi_{j'}^C\alpha\sigma+(1-\xi_{j'}^I)+\xi_{j'}^C\xi_{j'}^I\alpha\eta_I(1-\pi_{j'j'})}\right)\sum_{s''}\pi_{j's''}\times$$
$$\times\frac{(\psi_{s''}-1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})}{1+(\psi_{s''}-1)(\overline{N}_{MNC(s'')}/\overline{N}_{s''})}\left(\widehat{N}_{MNC(s'')}-\widehat{N}_{s''}\right) \quad \text{(D32)}$$

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

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 (D30) 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:

$$\widehat{\boldsymbol{\omega}}_{|s|\times 1} = \boldsymbol{\Lambda}_{|s|\times|k|}\widehat{\boldsymbol{A}}_{|k|\times 1} \quad \text{(D33)}$$

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_j^C), 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

$$\widehat{\omega}_s = \sum_{s'}\sum_{k'\in s'}\lambda_{sk's'}\widehat{A}_{k'} \quad \text{(D34)}$$

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 D.2.1 Determinants of the Wage Setting Equation in General Equilibrium

Let us go back to equation (D15). 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 $\theta_{MNC(s')j} \equiv \frac{\overline{q}_{MNC(s')j}}{\overline{Q}_j}$.

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

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

$$\widehat{B}_j = \frac{\overline{q}_{DOM}}{\overline{Q}_j}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \frac{\overline{q}_{MNC(s')j}}{\overline{Q}_j}\widehat{b}_{j,MNC(s')} = \theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\widehat{b}_{j,MNC(s')} \tag{D35}$$

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 $\widehat{A}_j$.

$$\begin{aligned}
\widehat{A}_j =& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\widehat{B}_j = \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\left(\theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\widehat{b}_{j,MNC(s')}\right) \\
=& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\theta_{DOMj}\widehat{b}_{DOM} + \tfrac{1}{\sigma}\sum_{s' \in \mathcal{B}_j} \theta_{MNC(s')j}\sigma(1+\varphi_{s'})\widehat{A}_{MNC(s')} \\
=& \tfrac{\sigma-1}{\sigma}\widehat{T}_j + \tfrac{1}{\sigma}\theta_{DOMj}\widehat{b}_{DOM} + \sum_{s' \in \mathcal{B}_j} (1+\varphi_{s'})\theta_{MNC(s')j}\widehat{A}_{MNC(s')}
\end{aligned} \tag{D36}$$

Equation (D36) 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 (D15)

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

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 (D14):

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

$$
\begin{aligned}
&+\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'\in\mathcal{B}_j}(1+\varphi_{s'})\theta_{MNC(s')j}\widehat{A}_{MNC(s')}\\
&+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k\in s''}\lambda_{s'ks''}\widehat{A}_k\right)\\
&+\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right). \qquad \text{(D37)}
\end{aligned}
$$

We can separate the term in the fourth line between the weighted sum of demand shifters fro domestic firms $k = DOM$ and the ones for MNC firms $k = MNC$. We can also rearrange the terms such that the first two capture the spirit of our measure of labor market exposure, then the third captures the spirit of our measure of firm-level exposure, and then the remaining terms of our main empirical specification for the indirect effects described in equation (5).

$$
\begin{aligned}
\widehat{W}_j =&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=MNC\in s''}\lambda_{s'ks''}\widehat{A}_k\right)+\\
&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\frac{(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}{1+(\psi_{s'}-1)(\overline{N}_{MNC(s')}/\overline{N}_{s'})}\left(\widehat{N}_{MNC(s')}-\widehat{N}_{s'}\right)+\\
&\frac{\xi_j^C\alpha\sigma}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'\in\mathcal{B}_j}\theta_{MNC(s')j}(1+\varphi_{s'})\widehat{A}_{MNC(s')}+\\
&\frac{\xi_j^C\alpha(\sigma-1)}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\widehat{T}_j+\\
&\frac{\xi_j^C\xi_j^I\alpha\eta_I}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\sum_{s'}\pi_{js'}\left(\sum_{s''}\sum_{k=DOM\in s''}\lambda_{s'ks''}\widehat{A}_k\right)+\\
&\frac{\xi_j^C\alpha}{\xi_j^C\alpha\sigma+(1-\xi_j^I)+\xi_j^C\xi_j^I\alpha\eta_I(1-\pi_{jj})}\theta_{DOMj}\widehat{b}_{DOM}. \qquad \text{(D38)}
\end{aligned}
$$

This last equation is the same as equation (16) discussed in Section 5.6.

Appendix E Additional Context on Costa Rica

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

Labor market institutions. 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 a 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 em-

ployer 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 sectors such as agriculture, construction, or domestic service).

Appendix F Survey Data

Appendix F.1 Survey Conducted in Collaboration with CINDE

The survey instrument was designed in a 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 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 F1 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% operate in services, 23% in life sciences, and 22% in advanced manufacturing.

Table F1: Industry Group 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 F1 summarizes the industry group to which the 46 respondents of the survey belong to.

B. Survey Questions and Answers. Questions 1 and 2: "When the company made the decision 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 F2: 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 F2 summarizes the answers to Question 1.

Table F3: 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 F3 summarizes the answers to Question 2. "O=1" means that a given step was done first in order.

Question 3: "Once the main team is 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

Table F4: 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 F4 summarizes the answers to Question 3.

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.

Table F5: 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 F5 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

Table F6: 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 F6 summarizes the answers to Question 5.

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 F7: 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 F7 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.

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)

Table F8: 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 F8 summarizes the answers to Question 7.

benchmarking with wages in the industry, (vii) other.

Table F9: 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 F9 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 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 tend 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

Table F10: Answers to Question 9

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

Notes: Table F10 summarizes the answers to Question 9.

Table F11: Answers to Question 10

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

Notes: Table F11 summarizes the answers to Question 10.

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 (for example, work under pressure). 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 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., oper-

Table F12: 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 tend to be more competent.	11	1	11	6	0
The workers of our company must be motivated to work hard (for example, work under pressure). 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 F12 summarizes the answers to Question 11. "R=1" means that a given answer has been ranked first out of five options.

ators, 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 in the same industry are the most valuable pre-selection criteria for both high- and low-skilled workers. Second, the academic studies and previous experience with MNCs are also important criteria. Last, the 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 type of workers receive tests of the knowledge or professional skills

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 have an influence on wage setting.

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

Question 10. Most MNCs pay larger wages than domestic forms 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 F.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.