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FOREIGN DIRECT INVESTMENT AND WAGES: DOES THE LEVEL OF OWNERSHIP MATTER?

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Abstract

This study hypothesizes that the level of foreign equity participation is a key determinant of the multinational wage premium. In particular, the breakdown of equity in a foreign investment project determines the extent to which a multinational parent company transfers proprietary assets to its affiliate, directly impacting worker productivity. Moreover, it indicates multinationals' desire to restrict labor turnover and preserve human capital in light of organizational changes and training. Using detailed plant-level data from Turkey, the study finds strong support for these mechanisms. The results show that up to 15 percentage points of the multinational wage premium can be explained by the level of foreign ownership *per se*. They also indicate that greater foreign equity participation leads to greater transfer of both tangible and intangible assets and thus higher wage premia, especially for skilled workers. This relationship is better approximated as linear rather than binary in contrast to previous literature.

JEL Classification: C33; F23; J31

Keywords: Foreign Direct Investment; Wages; Censoring; Ownership Structure

ملخص

تفترض هذه الدراسة أن مستوى المشاركة في رأس المال الأجنبي هو المحدد الرئيسي للعلاوة في الأجور متعددة الجنسيات. وعلى وجه الخصوص، تقسيم الأسهم في مشروعات الاستثمار الأجنبي تحدد إلى حد كبير مدى تنقل الشركات المتعددة الجنسيات أصول الملكية التابعة لها، والذى يؤثر مباشرة على إنتاجية العامل. وعلاوة على ذلك، يشير هذه الدراسة إلى رغبة الشركات متعددة الجنسيات في الحد من معدل دوران العمل والمحافظة على رأس المال البشري في ضوء التغييرات التنظيمية والتدريب. وباستخدام بيانات تفصيلية على مستوى المصانع من تركيا، وجدت الدراسة دعما قويا لهذه الآليات. وأظهرت النتائج أن ما يصل إلى 15 نقطة مئوية من علاوة الأجور متعددة الجنسيات يمكن أن تفسر مستوى الملكية الأجنبية في حد ذاتها. كما أشارت إلى أنه كلما زادت حصة الشريك الأجنبي يؤدي ذلك إلى زيادة القدرة على نقل الأصول الملموسة وغير الملموسة على حد سواء، وبالتالي ارتفاع علاوات الأجور، خاصة بالنسبة للعمال المهرة. ويمكن وصف هذه العلاقة بشكل أفضل كعلاقة خطية بدلا من ان تكون ثنائية على النقيض من الدراسات السابقة.

1. Introduction

There is a large body of evidence documenting that affiliates of multinational companies pay higher wages compared to their domestic counterparts.[1] Existing studies provide a range of estimates for the average wage effect of foreign ownership from 10% to 70% (Heyman et al. 2007). What is still lacking in the literature is a convincing explanation of the determinants of the multinational wage premium and why there is such a large variation in estimates of this premium. The literature mentions the importance of observable characteristics such as skill composition or capital intensity, and unobservable characteristics such as training or rent-sharing as potential determinants. However, even after controlling for these attributes, there remains a fundamental problem in identifying the performance differences that is attributable to multinationality *per se* (Girma and Gorg, 2007).

This paper identifies the causes of such divergent estimates and documents the causal impact of foreign ownership on wages using methodology that sidesteps earlier limitations. In particular, we find that the level of foreign equity participation is the key driver behind the multinational wage premium. Up to 15 percentage points of the average wage premium attributed to multinationals come from the level of foreign ownership even after controlling for a set of firm-level characteristics. The heterogeneity in the premia is primarily due to the transfer of firm-specific assets by the multinational parent due to its greater control of the firm, but the level of ownership also affects the wage premium *per se*. Wage gains are delivered prominently via imports of firm-specific capital; however, transfer of intangible technology and new organizational methods also play an important role. We find strong evidence for complementarity between imported technology and the level of foreign ownership, which suggests that multinationals transplant their organizational practices along with their physical assets.[2] Against this background, we find that higher levels of foreign ownership indicate multinationals' desire to restrict labor turnover and preserve firm-specific human capital, thereby creating a residual wage premium that varies with the level of control.

We use a unique data set that contains the census of manufacturing plants from Turkey. The distinguishing feature of the data set is the observation of continuous levels of foreign ownership that vary considerably across plants and in time. Our framework differs from earlier studies by working with these uncensored values of foreign equity participation as opposed to an indicator variable defining multinational status. We are therefore able to bring out the heterogeneity in the wage premium due to the level of foreign ownership *per se* instead of estimating an average effect. We find that a 10 percentage point increase in foreign equity participation leads to a 3.1% increase in the average wage paid by the affiliate. This premium is in part due to an acquisition effect that arises from the transfer of ownership to a multinational parent and in part due to the level of foreign equity that is potentially time-varying even after acquisition. We estimate that once the acquisition effect is removed, a 10 percentage point increase in the level of foreign equity leads to a 1.5% increase in the average wage. This means that a fully owned affiliate offers 15% higher wages compared to a firm with minimal foreign ownership simply due to the level of ownership. This effect is especially strong for non-production workers, while production workers seem to benefit only from an acquisition effect and not as significantly from the level of ownership.

Using nonparametric and semi-parametric techniques we confirm that there is mostly a linear and increasing relationship between foreign equity participation and average plant wages.

[1] The literature shows the persistence of this effect even after controlling for sectoral, regional, and firm-level characteristics. See, for instance, Aitken et al. (1996), Feenstra and Hanson (1997), Doms and Jensen (1998), Figini and Gorg (1999), Taylor and Driffield (2005), Lipsey and Sjoholm (2006), Almeida (2007), Heyman et al. (2007), Girma and Gorg (2007), Earle and Telegdy (2008), and Arnold and Javorick (2009).

[2] See Guadalupe et al. (2012), Marin et al. (2012) and Bloom et al. (2012) for theoretical discussion and empirical findings on the transfer of technology and organizational methods jointly.

This not only validates our econometric approach, it also challenges our earlier understanding of the effects of foreign direct investment (FDI). A strand of the literature has emphasized the role of corporate control as the ownership advantage of foreign investors, suggesting that once effective control is achieved, any additional increases in the degree of ownership should not impact outcomes.[3] Yet, we find that the degree of foreign ownership does affect wages in a significantly linear fashion, especially when the multinational parent has already achieved some control at the firm. This supports our proposition that the transfer of firm-specific assets tied to the level of foreign ownership drives the wage premium at foreign affiliates.

We contribute to the literature in several respects. First of all, we identify the level of foreign equity participation as a key determinant of the multinational wage premium. This is mostly due to transfer of firm-specific assets and efficiency gains associated with greater corporate control. An immediate implication is that not all foreign affiliates are the same: those affiliates with higher foreign equity investment do more for recipient firms and workers. In addition, skilled workers benefit more from greater foreign control as imported technology complements existing human capital rather than substitutes it. Second, we document the role of portfolio control on average wages, which the literature has not discussed before. Understanding the role of low levels of foreign ownership is important in order to highlight the causal mechanisms behind the wage premium and from a policy perspective. We find that low levels of control do not affect average wages and that the premium becomes significantly positive only at higher levels of foreign ownership. Third, we show that when the true relationship between foreign equity participation and average wages is linear, using a binary variable instead of a continuous regressor leads to inconsistent estimates even if firm level individual effects are accounted for. Hence, we trace the cause of divergent estimates of the wage premium from the previous literature, which has mostly worked with binary variables, to a misspecification due to the omission of the level of ownership.[4]

The traditional theory of multinational enterprises within the OLI (ownership-location-internalisation) framework (Dunning, 1981) notes that a multinational possesses some ownership advantage in the form of a firm-specific asset such as a patent, technology, process, or managerial and organizational know-how.[5] We posit that the transfer of these firm-specific assets are inherently tied to the degree of ownership and this is the key behind the multinational wage premium. At the same time, we also argue that equity shares reflect the labor market practices of multinationals, for instance their ignorance of the market and desire to restrict labor turnover. Both these channels have an amplified effect on the wage premium the higher the level of foreign ownership. As multinationals invest in varying levels of equity shares at their affiliates, a significant degree of heterogeneity arises in the average wages paid to workers at these affiliates. We show that this heterogeneity not only extends to wages, but also to the transfer of firm-specific assets. This lends support to theoretical models in which workers at multinationals acquire knowledge of firm-specific technologies that are superior to domestic firms (Fosfuri et al. (2001), Glass and Saggi (2002)), thus justifying the presence of a wage premium to reduce technology dissipation via labor turnover.

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[3] For instance, Haskel et al. (2007) argue that the potential for knowledge spill-overs "almost surely rises with the degree of foreign ownership, but probably not linearly. For example, firms that are majority owned by foreigners very likely have key managerial decisions – in particular, those regarding knowledge dissemination and use – guided by these foreign owners regardless of the degree of ownership stake."

[4] Rigobon and Stoker (2009) show that the least squares estimator is prone to severe bias when there are several regressors and a binary variable is used in place of a continuous regressor. We extend their result to the fixed effects estimator and demonstrate how estimates of the wage premium become susceptible to the level of thresholds in defining multinational status. This shows how the common practice of working with binary variables in previous work may have led to inconsistent estimates.

[5] These assets are assumed to be easily transferable to subsidiaries to exploit the ownership advantage. Teece (1977) presents a framework when transfer of technology is costly.

Our results contribute to understanding the wide range of estimates observed for the multinational wage premium in the literature and what factors drive this premium. Understanding the discrepancy of outcomes across different foreign affiliates has an important policy implication. Policy makers around the world strive to attract FDI to boost local employment and income and technology upgrading. Yet, foreign equity restrictions remain widespread in the developing world (Karabay, 2010), with the hope that these policies can benefit domestic firms by facilitating technology diffusion (Javorick and Spatareanu, 2008). Our results show that such restrictions may prevent jobs that come with multinationals from delivering their expected benefits. In particular, they may minimise wage gains at foreign affiliates and limit transfer of assets. Hence, we provide evidence against the use of foreign ownership restrictions in contrast to studies that provide theoretical arguments that justify such policies (Mattoo et al. (2004), Karabay, (2010)).

Equity shares influence the cost of capital, the level of investment, the degree of technology transfer, and the distribution of gains from FDI (Asiedu and Esfahani, 2001). In this paper, we find that they are also a key determinant of firm-level wages and transfer of firm-specific assets. Our findings thus contribute to the growing literature on the effects of foreign ownership structure and the residual multinational wage premium. Javorick and Spatareanu, 2008, provides evidence that the level of foreign ownership impacts the nature of productivity spillovers in Romania, while Girma et al. (2012) study the effect of foreign ownership structure on R&D upgrading in China.[6] Aitken et al. (1996) and Lipsey and Sjoholm (2006) find that majority-owned foreign affiliates pay higher wages for skilled workers in Mexico and Venezuela, and Indonesia, respectively. In contrast, Martins (2004) finds no higher wage premia for firms that exhibit a stronger degree of control in Portugal. Yet, none of these studies control for the endogeneity of foreign ownership explicitly as the current study does, nor do they explain why level of foreign control impacts wages. Few studies present estimates of the wage premium that tackle endogeneity by using matching techniques (Heyman et al. (2007), Girma and Gorg (2007), Arnold and Javorick (2009)), but they do not address the level of foreign ownership as a determinant.[7] Our results suggest that studies that neglect the level of foreign equity as a potential determinant fail to uncover the heterogeneous impact of FDI on firm-level outcomes.

The rest of the paper is structured as follows. Section 2 discusses the potential channels through which the level of foreign ownership impacts wages. Section 3 introduces the firm-level data to be used in the analysis. Section 4 presents our empirical strategy to identify the relationship between foreign equity participation and wages, while Section 5 includes results and robustness checks. Concluding remarks appear in Section 6.

2. Foreign Equity Participation and Wages

Foreign equity participation is inherently related to the degree of control that a multinational parent exercises at its affiliate.[8] Degree of control in turn determines the parent's incentive to transfer proprietary knowledge and technology in the form of both physical and intangible

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[6] See also Blalock and Gertler (2009), who emphasize the role of firm capabilities in technology adoption from multinationals in Indonesia. A few number of studies provide theoretical models to explain the residual multinational wage premium. These studies highlight issues such as multinationals' use of superior technology and on-the-job training (Fosfuri et al. (2001), Glass and Saggi (2002), Gorg et al. (2007)) or country-specific factors with respect to productivities and global profit sharing (Egger and Kreickemeier, 2013).

[7] There is also a strand of the literature that reports estimates of the wage premium from matched employer-employee data; while it is desirable to control for worker heterogeneity, such data do not exist for Turkey. Despite this, we take comfort in evidence that even when controlling for individual worker effects, firm-level effects are most important in explaining the variation in the wage premium (see for instance Heyman et al. (2007), Earle and Telegdy (2008), Frias et al. (2012), and Poole (2013)).

[8] This captures the Grossman and Hart (1986) concept that equates ownership with control.

assets.[9] A higher level of foreign ownership would then be associated with higher wages via two major channels. First, organizational restructuring may increase labor productivity by exploiting the parent firm's intangible assets, such as branding, know-how, and marketing, and by introducing new management practices. Second, transfer of physical assets from the parent firm may increase capital intensity at the affiliate, boosting the marginal product of workers. Workers can alternatively become more productive if capital intensity is unchanged but the multinational parent simply replaces existing capital with imported and better quality equipment.

The two mechanisms differ in their effects on wages, with the transfer of intangible assets more likely to have a non-linear impact. If wage gains arise due to organizational restructuring and transfer of intangibles, then these should be realised once the foreign investor achieves corporate control. If the wage premium is instead driven by transfer of tangibles, we would expect a more linear relationship with the level of ownership in the face of costly technology transfer (Teece, 1977). The multinational is likely to engage in a greater transfer of assets only when it is assured of capturing a greater share of the revenue from production as captured by its equity stake. Indeed, Lipsey and Sjoholm (2006) argue that a majority ownership share might be required for bringing in technologies from the parent firm, which in turn may lead to a higher wage premium. In a similar vein, Barbosa and Louri (2002) argue that a foreign partner will demand higher ownership in case of profitable affiliates and large intangible assets to be transferred. Chari et al. (2010) provide evidence that acquiring firms in M&A transactions may be reluctant to share valuable intangible assets unless they gain control of the target, especially in an emerging-market environment.[10]

What kind of firm-specific assets drives the wage premium? Existing evidence suggests that partially-owned foreign affiliates source more of their inputs domestically than fully-owned affiliates (Javorick and Spatareanu, 2008). At the same time, imported inputs are associated with productivity improvements and higher quality and wages (Kugler and Verhoogen (2009), Halpern et al. (2011), Amiti and Davis (2012)). These findings suggest that the level of foreign ownership impacts wages primarily through the transfer of tangible assets. Yet, domestic firms are also able to import foreign technology. What drives the wage premium should therefore be related also to the firm-specific advantages gained by new organizational methods and intangible assets. For instance, greater control is likely associated with more expatriate staff and training at the affiliate along with transfer of assets, which would increase the average wage not only through an expatriate premium but also through generating firm-specific human capital. This points to complementarity between imported tangible and intangible assets, which would be non-existent at domestic firms. Indeed, Guadalupe et al. (2012) find in a sample of manufacturing firms in Spain that foreign-acquired firms introduce new machinery and new organizational processes simultaneously rather than individually.

The degree of ownership can give rise to a wage premium over and above its impact through the transfer of firm-specific assets. In particular, it can impact on affiliate wages if it also proxies rent-sharing in a fair wages setup. Since majority-owning parents may have greater say in bargaining with affiliate workers, it seems plausible to expect any profit sharing from parents to affiliates to be stronger the higher is the ownership stake in the affiliate (Budd et al., 2005). Likewise, internal fairness policies could induce multinationals to even out the wage gaps between employees based in different locations and avoid geographical disparities

[9] Moran (2007) provides an excellent case-study account of transfer of assets within multinationals. Empirical evidence suggests that a higher share of foreign ownership is associated with greater technology transfer; see Dimelis and Louri (2002), Takii (2005), (Javorick and Spatareanu, 2008), and Brambilla (2009) for the cases of Greece, Indonesia, Romania, and China, respectively.

[10] See also Brambilla (2009), who finds in a sample of Chinese firms that majority-owned foreign firms are 20% more likely to transfer new products from a firm in the same corporate group than private domestic firms are, they are 31% more likely to purchase at least one foreign license, and they are 23% less likely to develop products in-house.

(Navaretti and Venables, 2004). Since greater control determines who engages in bargaining, such fairness policies are more likely to impact wages the higher the foreign equity participation.

Higher levels of equity ownership may also indicate the multinational parent's lack of knowledge about the labor market or its desire to restrict labor turnover, both of which can motivate foreign affiliates to offer higher wages for identical workers. The former effect is especially strong for greenfield investments, which may need to attract workers from other firms in the industry. The latter effect is especially strong when multinationals transfer firm-specific assets as they want to minimize the risk that this proprietary knowledge gets dissipated though frequent labor turnover (Navaretti and Venables, 2004). Affiliates would be reluctant to lose workers who have accumulated such knowledge, especially in light of high complementarity between imported technologies and skilled labor and productive but costly training.[11] Additionally, if higher levels of control are associated with greater capital- or skill-intensity, then multinationals with higher equity shares would have a less elastic labor demand curve. Considering any disadvantages that may arise from multinational employment, workers may demand a premium if they perceive their jobs to be less secure at foreign affiliates compared to domestic firms. To the extent that the level of ownership indicates the long-term strategies of the MNE and the probability of survival, it will have a direct impact on the premium demanded by workers.[12]

Given the sources of the wage premium, higher foreign equity participation should benefit skilled workers relatively more as this group of workers may be better positioned to acquire knowledge on firm-specific assets. Poole (2013) finds that higher-skilled former multinational workers are better able to transfer a multinational's technology to incumbent domestic workers and higher-skilled incumbent domestic workers are better able to absorb the foreign technology from former multinational workers. This suggests a complementarity between firm-specific assets and skilled labor, implying the wage premium to be higher for this group of workers not only through greater marginal productivity, but also as the complementarity increases the bargaining power of these workers. We also expect the linear relationship between foreign ownership and wages to be stronger for this group of workers if imported technology increases demand for skilled labor. Alternatively, if foreign equity participation represents efficiency gains achieved by corporate control and mechanisms such as rent-sharing, then the impact on skilled and unskilled worker wages should be similar.

3. Data

Turkey provides an ideal setting to study the impact of foreign equity participation on wages given its labor abundant economy with a liberal foreign equity framework that extends back to the period of our focus, 1993-2001. Following the liberalisation of its current account in 1989, Turkey joined a customs union with the EU in 1995, historically the biggest source of FDI in the country. The share of FDI stock in GDP grew from 5.51% to 10.04% over the period 1990-2001 and eventually reached a peak of 25.33% in 2010 (UNCTAD, 2013). We focus on Turkey's manufacturing industry, which faces no restrictions on the activities of multinationals, including foreign equity limits, screening and prior approval, foreign key personnel, and other operational restrictions (Kalinova et al., 2010). This allows for a setting with meaningful variation in equity shares held by multinationals in a variety of sectors across the panel.

[11] See Fosfuri et al. (2001), Glass and Saggi (2002), and Gorg et al. (2007) who formalize these ideas.

[12] There is a large literature on the stability of joint ventures and multinational investments in general; see, for instance, Bernard and Sjoholm (2003) and Bernard and Jensen (2007). In this context, we would expect higher levels of ownership to signal longer-lasting investment strategies by multinationals and thus be associated with a lower premium to be paid.

Our data come from the Industrial Analysis Database by the Turkish Statistical Institute (TurkStat) and are explained in more detail in the Appendix. The database provides a census of manufacturing firms in Turkey with more than ten employees.[13] Census forms are sent out to businesses annually, response to which is mandatory by law. Most importantly for us, the database provides a breakdown of equity stakes by domestic and foreign investors. We define foreign ownership as the percentage of subscribed equity owned by the foreign investor, which varies between 1 and 100%. Any firm with a positive equity share held by a foreign investor is classified as a multinational. Figure 1 demonstrates the distribution of firm-level foreign equity participation. There is substantial heterogeneity in how much control multinationals exercise, with ownership shares slightly more abundant around 50% and >90%. Importantly, one can notice the full range of ownership shares with sizable densities at different intervals. In unreported results, we confirm this pattern to hold across industry and firm size. The mean foreign equity participation at multinationals is 59.28% and the median is 51.00% over the sample period.[14]

Despite representing around 4% of all manufacturing firms, multinationals are large and important players in Turkey. They have employed around 15% of the workforce and contributed around 30% of total value added in manufacturing over the sample period. Compared to domestic firms, they are more capital and skill intensive, more productive, and they invest more, typically in imported capital (Table A.1). While we cannot discriminate between imported capital from parent and non-parent entities in our sample, earlier evidence suggests that imports to the affiliate most likely occur within the boundaries of the multinational. For instance, Hanson et al. (2005) document that approximately 90-95% of imports from the United States by the foreign affiliates of U.S. multinationals are from parent firms. They also argue that even where affiliate imports come from another entity, the parent firm may still have arranged the transaction. We expect this to hold in our sample as well, thus characterising imports of affiliates as specific to the multinational parent.

Notably, multinationals also differ from each other with respect to the wages they pay. Table 1 provides average wages by foreign equity participation in five intervals. Average wages for all groups of workers generally rise with the level of foreign ownership. However, non-production workers enjoy higher wages than production wages at all levels of foreign ownership. Interestingly, firms with "portfolio investment" seem to offer somewhat higher wages than affiliates with minority control. It is important to make the distinction between this type of investment, which entails less than 10% of equity holding, and direct investment defined by equity shares greater than 10%, which confers to the foreign investor control rights.

A frequently mentioned source of possible selection bias is acquisition of high-wage domestic plants by multinationals, also known as cherry picking.[15] We find evidence for such selection in our data as well. The top row in each panel of Table 1 compares multinational wages to those paid at the same plants prior to a foreign acquisition. Domestic firms that were eventually acquired already paid much higher average wages compared to the industry (see Table A.1). Yet, average wages were higher under foreign ownership compared to pre-acquisition levels, suggesting that foreign ownership per se might have an impact. A two-sample *t*-test for difference of means shows, however, that average wages were significantly

[13] To be more precise, the census collects information at the plant level, but the overwhelming majority of firms in Turkey are single-plant firms (Ozler et al. 2009). Hence, we use these two terms interchangeably.

[14] In the data there are few cases where equity is held by multiple foreign owners. This occurs only around 10% of the time, so we do not investigate the impact of multiple owners further.

[15] Multinationals typically acquire domestic establishments that are already highly productive and large in size and that therefore pay higher wages. See for instance Lipsey and Sjoholm (2006) and Almeida (2007).

higher only when the level of foreign ownership was greater than 25% and in the case of portfolio investment.

In addition to ownership, the database contains information on a wide set of firm-level variables including inputs, value added, and investment as well as employment and compensation by type of worker. In what follows, we work with yearly average wages calculated by excluding any additional benefits and compensation.

4. Empirical Methodology

We outline a three-step empirical strategy to document the link between foreign ownership and wages. First, we discuss the potential pitfalls associated with earlier literature. Second, we demonstrate the shape of the relationship between foreign equity participation and wages. Finally, we provide consistent estimates of the wage premium and the associated mechanisms that are robust to issues of endogeneity.

4.1 Defining thresholds

Assume that the true empirical model that links wages to foreign ownership at the plant level is given by:

$$w_{i,t} = \alpha_i + \beta x_{i,t} + \gamma' \mathbf{y}_{i,t} + \varepsilon_{i,t}, i = 1,...,N; t = 1,...,T \quad (1)$$

where $w_{i,t}$ represents potential wage, $x_{i,t} \in [0,100]$ denotes foreign equity participation in percentages at plant i at time t, α_i is a time-invariant plant effect, $\mathbf{y}_{i,t}$ is a vector of plant-level controls, and $\varepsilon_{i,t}$ is White noise. Equation (1) assumes a linear relationship between $w_{i,t}$ and $x_{i,t}$; we confirm in later sections that the estimated relationship is indeed linear for the present study. Interest lies in consistent estimation of the wage premium due to the level of multinational control, captured by β in (1). The inclusion of α_i enables the identification of β from within-plant variation in foreign ownership, thus sidestepping problems that might arise from selection of high-wage plants by multinationals.

Earlier studies estimate a wage premium by using a censored version of $x_{i,t}$ mostly because data prevent them from observing it in its continuous nature.[16] Specifically, they estimate:

$$w_{i,t} = a_i + bF_{i,t} + c' \mathbf{y}_{i,t} + \varepsilon_{i,t}, i = 1,...,N; t = 1,...,T \quad (2)$$

where $F_{i,t}$ is a binary variable indicating foreign ownership defined by a threshold ϕ: $F_{i,t} = 1[x_{i,t} > \phi]$. Rigobon and Stoker (2009) derive the bias from using censored regressors for the OLS (ordinary least squares) estimator in settings such as (2). In Appendix A.1, we build on their results for the case of 0-1 censoring and show that their results can be readily extended to the FE (fixed effects) estimator. In particular, one can show that the probability limit of the FE estimate for the wage premium in (2) is given by:

$$plim\hat{b}_{FE} = \beta\{E[x_{i,t} | F_{i,t} = 1, \alpha_i] - E[x_{i,t} | F_{i,t} = 0, \alpha_i] - \eta(E[y_{i,t} | F_{i,t} = 1, \alpha_i] - E[y_{i,t} | F_{i,t} = 0, \alpha_i])\}$$

where $\eta = Cov(\Delta y_{i,t}, \Delta x_{i,t}) / Var(\Delta y_{i,t})$ measures how within-deviations in foreign equity participation are proxied by the within-deviations of the additional regressor (see Appendix

[16] Even when $x_{i,t}$ is observed, the common practice is to designate a certain threshold and define a plant as "foreign" if the multinational's equity stake exceeds that threshold. In national and international accounting standards, FDI is typically defined as involving an equity stake of 10% or more, although there are different recording practices. For instance, United Kingdom uses 20% Haskel et al. (2007) while Sweden and Norway use the 50% cut-off in defining foreign ownership (Heyman et al. 2007, Balsvik Haller, 2010).

A.1).[17] Hence, censoring the foreign equity participation variable as in earlier literature leads to biased estimates of the average wage premium in both OLS and FE estimation.

This result further suggests that the FE estimate of the wage premium in (2) will be downward biased compared to the OLS estimate through three channels. First, conditioning on plant-level effects α_i implies that the difference $E[x_{i,t} \mid F_{i,t}=1,\alpha_i]-E[x_{i,t} \mid F_{i,t}=0,\alpha_i]$ will be smaller compared to OLS.[18] Second, small changes in the level of foreign equity around the threshold make this difference minimal, which can cause underestimation especially of the effect of achieving key equity stakes related to transfer of control.[19] Third, $\hat{b}_{FE}$ will be downward biased when controls $\mathbf{y}_{i,t}$ show positive changes under foreign ownership compared to domestic ownership. When these changes are small, for instance if foreign investors acquire firms that are already capital- or skill-intensive Almeida (2007), the result implies that the bias in the censored estimate $\hat{b}_{FE}$ will mostly be driven by the within-variation of $x_{i,t}$ and the threshold level ϕ.

Observing continuous levels of foreign ownership in the Turkish data allows us to demonstrate how censoring with different thresholds affects the average wage premium. In particular, we estimate:

$$log\, w_{i,t} = \alpha + \beta F_{i,t} + \gamma' \mathbf{y}_{i,t} + \lambda_j + \mu_t + \varepsilon_{i,t} \tag{3}$$

where $F_{i,t} = 1[x_{i,t} > \phi]$ indicates multinational status depending on the threshold level ϕ.[20] We estimate (3) first by regressing average yearly wages on a single censored term $F_{i,t}$ and then on multiple indicator variables that capture different equity intervals. Both sets of regressions serve to highlight the heterogeneity and bias that may arise due to censoring and we present both OLS and FE estimates.[21] We control for a set of firm attributes $\mathbf{y}_{i,t}$, which we elaborate on below. Sectoral dummies λ_j at the two digit level of ISIC Rev. 3 and yearly time dummies μ_t control for sector and year specific wage effects, while FE estimates also control for time-invariant plant effects.

4.2 Nonparametric and semiparametric analysis

Equation (1) assumes a linear relationship between the level of foreign ownership and wages. In order to confirm this, we estimate the relationship non-parametrically using the locally weighted scatterplot smoothing (Lowess) estimator of Cleveland (1979). Consider the following regression of wages on foreign equity participation:

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[17] In our case, η is most likely to be positive.

[18] This is due to the fact that in the OLS case where we do not condition on α_i, $E[x_{i,t} \mid F_{i,t}=0]$ is severely biased towards zero regardless of ϕ given the abundance of domestic plants in the sample. In contrast, in the FE case, $E[x_{i,t} \mid F_{i,t}=0,\alpha_i]$ tends to be larger with ϕ as it only takes into account the within-firm expectation. This same fact also implies that $\hat{b}_{OLS}$ is likely to rise as the threshold level ϕ is raised, but this is unlikely to hold for $\hat{b}_{FE}$.

[19] Indeed, within-firm changes in foreign equity participation in the data are frequent but often small in size, typically less than 20 percentage points.

[20] We pick 0%, 10%, 25%, 50%, and 75% as alternate values for ϕ.

[21] Note that if there is no heterogeneity in the wage premium, then $\hat{\beta}$ should return the same estimate independent of ϕ and accurately capture the return to being a multinational. However, if $\hat{\beta}$ varies with ϕ, then the level of foreign equity participation inescapably affects average wages and censoring leads to biased estimates.

$$w_i = m(x_i) + \varepsilon_i,\ i = 1,...,N \qquad (4)$$

where the error term ε_i is i.i.d. Lowess is a standard local regression estimator, whereby one lets $m(x_i)$ be linear in the neighborhood of a data point x so that $m(x_i) = m + \beta(x_i - x)$. Cleveland (1979) suggests minimizing:

$$\sum_{i=1}^{N} \{w_i - m - \beta(x_i - x)\}^2 K\left(\frac{x_i - x}{h}\right) \qquad (5)$$

with respect to m and β, where $K(.)$ is a kernel weighting function. This can be achieved by performing a weighted least squares (WLS) regression of w_i against $z_i^{'} = (1,(x_i - x))$ with weights $K_i^{1/2}$ (Pagan and Ullah, 1999). The WLS regression estimates for each observation i are then used to predict the value of the dependent variable to trace out the non-parametric relationship between w and x. We implement Lowess with a tricubic kernel weighting function and use a bandwidth of 0.4.[22] Despite its computational intensity, Lowess is preferable over kernel regression as it uses a variable bandwidth, robustifies against outliers, and uses a local polynomial estimator to minimize boundary problems (Cameron and Trivedi, 2005). We implement Lowess first on the pooled cross-section sample of plant-year observations and then on the sample transformed into within-plant deviations to control for firm-specific effects.

One can question whether the identified relationship by the nonparametric analysis is driven by omitted variables. To overcome this concern, we turn to semiparametric analysis and include additional controls $\delta^{'}\mathbf{X}_i$ to the model in (4), which are additively separable from the nonparametric component. We implement the difference-based semiparametric estimator of Yatchew (1997) to estimate this partial linear model, whereby $m(.)$ is assumed to have a bounded first derivative. Yatchew (1997)suggests ordering the data such that $x_1 < x_2 < ... < x_N$ and taking the first difference of the model. The transformed equation is then estimable by OLS. First-differencing the model allows inference to be carried on $\delta^{'}$ as if there were no nonparametric component in the model. Once $\delta^{'}$ is estimated, a variety of nonparametric techniques could be applied to estimate $m(.)$ as if $\delta^{'}$ were known (Lokshin, 2006), that is, after constructing the differences $w_i - \hat{\delta}^{'}\mathbf{X}_i$. We estimate the nonlinear function $m(.)$ by Lowess as outlined earlier.[23]

4.3 Estimating the foreign equity participation premium

The final element in our empirical approach is to provide consistent estimates of foreign equity participation on wages. Two considerations are in place here. First, sorting may occur when highly skilled workers self-select into working at multinational firms, which are generally more productive and can afford to pay higher wages than domestic firms. Controlling for individual firm effects is thus necessary to guard against systematic sorting of workers across firms that pay wages at different levels Earle and Telegdy (2008). Second, while it is relatively easy to handle endogeneity that arises from unobserved heterogeneity, it is much harder to handle dynamic endogeneity whereby current and past levels of wages may

[22] Higher bandwidths lead to smoother and more linear estimates, so we do not report them.

[23] Additionally, a significance test on x_i can be carried out, which tests the null hypothesis that the regression function has the known parametric form $g(x,\zeta) + \alpha^{'}\mathbf{X}_i$, where ζ is an unknown parameter, against the alternative semiparametric form $m(x_i) + \delta^{'}\mathbf{X}_i$, where $m(.)$ is unknown. (Lokshin, 2006) provides details on the test.

affect the level of foreign ownership.[24] At this point, we take advantage of the panel data at hand to use exogenous regressors in other time periods to instrument for endogenous regressors in the current time period. Consider the dynamic model:

$$log\, w_{i,t} = \gamma log\, w_{i,t-1} + \beta FEP_{i,t} + \delta' \mathbf{X}_{i,t} + \alpha_i + \varepsilon_{i,t}, t = 2,..., T \qquad (6)$$

where α_i denote time-invariant plant effects and we treat foreign equity participation, $FEP_{i,t} \in [0,100]$, as endogenous. It is assumed that $|\gamma| < 1$ and $\varepsilon_{i,t}$ are serially uncorrelated. In order to tackle endogeneity, we first-difference the model in (6) to purge α_i, which in addition renders lagged values of $log\, w_{i,t}$ and $FEP_{i,t}$ to be valid instruments in the transformed equation. Consistent and efficient estimation can then be achieved by generalized method of moments (GMM) estimators that use all available lags at each period as instruments for the equations in first differences (Arellano and Bond, 1991). Blundell and Bond (1998) extend the Arellano-Bond estimator to include more instruments that are available by assuming that first differences of instrumenting variables are uncorrelated with the fixed effects, which greatly improves efficiency and reduces the finite sample bias.[25] We also include full sets of time and sector fixed effects and estimate (6) on the subset of plants that have been under multinational control at any point in the sample period. Therefore, our identification relies not on differences in average wages and differences in foreign equity participation, but on the deviation of differences in average wages and foreign equity participation from their firm, industry, and year means.

We implement the "system GMM" estimator of Blundell and Bond (1998) in a two-step procedure and apply the finite-sample correction of Windmeijer (2005) to the standard errors.[26] The dynamic wage setup in (6) is a case of partial adjustment with feedback, so that we explicitly allow current levels of foreign ownership (and other independent variables) to be affected by past realisations of wages. In this way, GMM estimation addresses the endogeneity that may arise, for instance, due to shifting worker characteristics associated with higher quality and higher pay. As controls, we include in our baseline: (log) plant size, (log) capital intensity, skill intensity, share of female workers, and (log) labor productivity. Multinationals may replace less productive workers with more productive ones following an acquisition if they are better able to monitor worker quality. Changes in labor force composition would then affect firm-level productivity and wages. Controlling for factor intensities and labor productivity are thus essential.

Because estimation is carried out on first-differenced data, first-order serial correlation will be built into the estimating equation when $\varepsilon_{i,t}$ in (6) are serially uncorrelated. The latter assumption implies that the estimators will be consistent in the absence of second-order serial correlation, which we test for and report as in (Arellano and Bond, 1991), and it is required to render the lagged values of *FEP* to be valid instruments in the (transformed) estimating

[24] Moreover, endogeneity bias will arise if the level of foreign ownership responds simultaneously to idiosyncratic shocks and in the case of measurement error.

[25] However, the estimator can easily generate a large number of instruments given the availability of lags and additional moment conditions; this leads to an overfit of the endogenous variables and tends to distort inference in finite samples. See Roodman (2008) for a discussion of how instrument proliferation can lead to serious problems when implementing these GMM estimators. In order to guard against such problems, we replicate all of our analysis with a restricted set of instruments and get similar results, which are available upon request.

[26] Traditionally, researchers using these GMM estimators have focused on results for the one-step estimator, partly because simulation studies suggested modest efficiency gains from using the two-step version (Bond, 2002). However, Windmeijer (2005) finds that the two-step efficient GMM estimator with the corrected variance estimate leads to more accurate inference compared to the one-step estimator. In unreported regressions, we check to see that our results are unchanged with the one-step estimator.

equation.[27] We additionally test for the validity of the GMM instruments with a Hansen test of overidentifying restrictions.

In order to identify the mechanisms behind the wage premium, we complement the model in (6) with interaction terms to analyse which affiliates benefit the most from higher levels of foreign ownership. In addition, we apply the same methodology described in this section to a set of firm attributes to uncover which of these attributes is most driven by foreign equity participation. This last set of regressions helps us differentiate between alternative theories for the wage premium suggested in the literature.

5. Results

5.1 Estimates with Different Thresholds

Table 2 summarizes the results for estimating (3) with censoring at different thresholds. We present estimates only for the binary foreign ownership variable to focus the discussion on the bias that ensues from censoring a continuous variable.[28] For example, column (1) row (d) reports the average wage premium for all workers when the cut-off for defining multinational status is at 50%. We find that up to 15 percentage points in OLS estimates and 4 percentage points in FE estimates are simply explained by varying the threshold level to define foreign affiliates.[29] The average wage premium typically rises with the *FEP* threshold under OLS estimation with a Wald test strongly rejecting the equality of coefficients across the models; however, this is not the case for FE estimation, which returns some non-monotonic premia as expected.[30] Most importantly, the estimated premium shows changes in significance by threshold level when fixed effects are accounted for, especially for production workers. Hence, the bias due to censoring can lead to remarkably different conclusions on whether there exists a premium or not, as well as how large this premium is.

Table 3 reports the results from estimating (3) including indicator terms for different intervals of *FEP*, which presents a more pronounced variation in the wage premium. While the average premium is 21% for a multinational with foreign equity participation in the 10-24% interval, it is 48% for the 75-100% interval (column 1). When firm-level individual effects are introduced, the premia for these two intervals become 1.6% and 10.7%, respectively (column 4).[31] Interestingly, plants under portfolio investment have greater premia compared to some higher levels of ownership in most specifications. The variation in the premia is more pronounced for non-production workers than for production workers. We find no significant premium for affiliates with up to 25% foreign equity participation when we control for individual firm effects, which suggests that the premium arises only when some corporate control is achieved by the foreign investor. As before, the estimates change considerably in significance and size across the intervals when individual firm effects are introduced.

Note that the estimates in Tables 2 and 3 are potentially biased due to censoring and endogeneity. Hence, part of the discrepancy in the estimates of the average wage premium could arise due to misspecification. Nevertheless, our results so far show three things simply

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[27] If $\varepsilon_{i,t}$ are found to be serially correlated, we include an additional lag for the dependent variable to transform the errors to be serially uncorrelated.

[28] Each regression includes the baseline set of controls. All controls are estimated accurately with the expected signs; see Table 3 for similar results. We remove outliers by excluding the top and bottom one percentile of the respective wage variables. Including those returns only slightly higher premium estimates, but qualitative results are unchanged.

[29] As in earlier literature, the average premium is estimated to be much higher when firm-level individual effects are not accounted for. This is consistent with the idea of "cherry-picking" that firms subject to foreign acquisitions pay high wages to start with.

[30] We conduct the Wald test for the equality of coefficients across different models by jointly estimating the variance-covariance matrix using Stata's command suest.

[31] The Wald test rejects equality of the five interval coefficients for OLS estimates, but it only rejects equality of FE estimates for some pairs of coefficients, notably for the 10-25% interval against others.

due to methodological issues. First, a significant share of variation in the wage premium estimates can be explained by the level of foreign ownership. Second, using a binary definition of ownership to estimate the premium may lead to misleading conclusions and inaccurate results. Third, whether there exists a wage premium for production workers is unclear.

5.2 Nonparametric and semiparametric estimates

Lowess plots of equation (4) are presented in Figure 2, which uses the subset of firms that have been under foreign ownership at any point in the sample period. Panel (a) depicts the relationship between the level of foreign ownership and (log) average wage in the pooled sample. The Lowess plot line is upward sloping and closely follows the linear fit, except for levels of control up to around 20% of ownership. Firms under portfolio control seem to introduce a non-linear element to the relationship. When we control for firm-level fixed effects in panel (b), which depicts within-firm deviations, the monotonic relationship persists and follows the linear fit more accurately. This means that it is not simply a change in control from domestic to foreign owners that brings a premium with it; the premium increases with the level of foreign ownership both across *and within* firms. Indeed, the relationship persists when we conduct the analysis after excluding observations under domestic control (results unreported), which implies that changes in equity shares subsequent to acquisition contribute to the wage premium *per se*. In the appendix, we show that the same positive and linear relationship holds for production and non-production workers as well.

We plot the results of our semiparametric estimation of (4) in Figure 3, which controls for a set of firm characteristics. The coefficient estimates are reported in Table A.2 along with the significance test for the nonparametric variable. The figure confirms our earlier finding that the level of foreign equity impacts wages positively once it exceeds 25%. The significance test indicates that foreign equity participation is highly significant with a p-value of zero. While we find similar significance for wages of production workers as well, Figure A.3 in the Appendix casts doubt on a linear relationship for this group of workers. In panel (a), the estimated Lowess plot line is initially downward sloping before rising only subsequently. This stands in contrast to the strongly linear and upward sloping relationship for non-production worker wages in panel (b). These results suggest that foreign equity participation per se may not impact wages of production workers and that the monotonic relationship between wages and the level of foreign ownership is likely driven by the premium for non-production workers only.

5.3 Estimates with uncensored regressors

Table 4 presents estimates of the wage premium due to the level of foreign ownership as in (6). In column (1), we control for our baseline except skill intensity. We find that a 10 percentage point increase in foreign equity participation (*FEP*) is associated with a 3.2% increase in the average firm wage. This premium is both statistically and economically highly significant. Controls are also estimated significantly with the expected signs in all columns. Given that the median *FEP* is 51% in the data, the average wage at a typical multinational is estimated to be around 15% higher than at a domestic firm. However, this premium varies significantly by the level of *FEP*. We now turn to discuss the sources of this heterogeneity.

Multinationals may undertake restructuring following acquisitions and shift the composition of the workforce towards skilled labor, which may explain the rise in average wages.[32] A higher level of control could facilitate greater restructuring, especially in the case of higher demand for skills with transfers of newer technology. It is therefore essential to control for the skill content of labor used in production, otherwise we might inconsistently estimate the

[32] Poole (2013) provides some evidence in support of such a sorting story. In contrast, Almeida (2007) finds that multinationals cherry-pick firms with more educated labor forces to invest in.

coefficient on *FEP*. We include our measure of skill intensity in column (2). Greater skill intensity is associated with higher average wages as expected, but *FEP* retains its significance with the coefficient little changed: a 10 percentage point increase in *FEP* leading to a 3.1% rise in the average wage. The wage premium is therefore not due to a shift towards skilled labor with greater foreign control, which we will confirm below. This finding is in line with earlier evidence that even when controlling for individual worker effects, firm-level effects explain most of the variation in the wage premium (see Heyman et al. (2007), Earle and Telegdy (2008), Frias et al. (2012), and Poole (2013)).

The estimated wage premium is in part due to an acquisition effect that arises from the transfer of ownership to a foreign investor and in part due to the level of *FEP*. In order to derive a more precise estimate of the latter's effect, we present estimates in column (3) that exclude observations prior to a multinational's initial investment. We find that a 10 percentage point increase in *FEP* leads to a 1.5% increase in the average wage. Since firm-level individual effects are controlled for, this estimate reflects the variation in the wage premium simply due to the variation in the level of foreign ownership within the affiliate. When one considers that *FEP* ranges from 1% to 100%, the estimate suggests that up to 15 percentage points of the wage premium is due to *FEP* per se. This means that the average wage at a fully owned foreign affiliate, for instance, is considerably higher than at minority-owned affiliates.

One could expect that *FEP* no longer impacts the wage premium when a multinational parent achieves corporate control. For instance, majority owned affiliates very likely have key managerial decisions guided by their foreign owners regardless of the degree of ownership stake Haskel et al. (2007). If the wage premium is driven by the superior decision-making skills of the foreign owners, then we should not see the premium rising with *FEP* at majority-owned affiliates. On the other hand, a majority stake may be needed to deploy more tangible assets, transfers of which correlate with *FEP*. In column (4) we test this idea by including the interaction of *FEP* with dummies for minority and majority holdings separately.[33] We find that *FEP* has a meaningful impact only at sufficiently higher levels of ownership. In particular, *FEP* has an insignificant impact at levels of ownership less than 50%, while it has a highly significant impact on wages above this level.[34] This result persists when we exclude observations prior to foreign ownership in column (5), providing strong evidence that the level of ownership matters even after achieving majority control. Indeed, the point estimates on the interaction terms with majority holding are slightly larger than the estimates in earlier columns, suggesting that the estimated relationship is driven by wage gains from higher levels of ownership under majority control. This non-linearity is confirmed in the last column with a significant estimate of a quadratic term on *FEP*.[35]

Table 5 replicates part of the previous analysis by type of worker. We find that a 10 percentage point increase in *FEP* leads to a 1.9% increase in average wages for production workers and a 3.4% increase for non-production workers. Consequently, the level of foreign ownership matters much more for non-production workers than for production workers. In fact, we find that *FEP* does not significantly affect average production worker wages when

[33] We define minority and majority share dummies as having a *FEP* of 10-49% and 50-100%, respectively, to focus on the impact of direct investment as opposed to portfolio control. While researchers typically use the 50% cut-off to define majority control, it has been noted by the finance literature that shareholders can achieve effective control in many cases by holding a block that is much smaller than 50% of the firm []]]56]. Hence, our definition provides a conservative estimate of *FEP* on wages given corporate control.

[34] A Wald test rejects the equality of coefficients for the two interaction terms at the 10% level in both columns (4) and (5).

[35] In column (6), *FEP* is insignificant while FEP^2 is significant with a positive coefficient. This is driven by the fact that firms with minority foreign ownership do not offer higher wages to their workers. Indeed, when we exclude observations prior to acquisition, we find that both *FEP* and FEP^2 are insignificant.

observations with no foreign equity are removed. This suggests that any wage premium for production workers arises simply from an acquisition effect and further changes in *FEP* do not significantly affect the premium. In contrast, up to 25 percentage points in the wage premium for non-production workers can be explained by *FEP* alone (column (5)). Columns (3) and (6) confirm our earlier finding that the premium is driven by the variation in higher levels of ownership and that the level of ownership matters even after achieving majority control. The results suggest that *FEP* matters positively for non-production workers below the 50% stake as well, although the coefficient is not estimated with enough precision.[36]

Note in Table 5 that skill intensity is significant for both types of workers, but it has a positive sign for production workers and a negative one for non-production workers. Since skill intensity is defined as the ratio of non-production to production workers, this switch in sign is consistent with a theory of within-firm demand for particular worker types. For instance, an unskilled worker's wage gains positively from recruitment of relatively more skilled workers, but a skilled worker's wage does not since there is now relatively more supply of skills, which lowers the bargaining power of skilled workers. Other controls are estimated significantly with expected signs, with the exception of capital intensity.

Tables 4 and 5 provide accurate and reliable estimates for the impact of *FEP* on average wages. The Arellano-Bond test statistics indicate the absence of second-order serial correlation, while the overidentifying restrictions test does not reject the null hypothesis that the instruments are exogenous to the error term. Taken together, these results provide strong evidence that the level of foreign ownership affects the size of the wage premium. This premium becomes significant especially at higher levels of foreign equity and there is greater heterogeneity for non-production workers. Similar to our semi-parametric analysis, the association between *FEP* and wages becomes linear and upward sloping once a certain degree of control is achieved. Lack of a robust linear relationship at lower levels of control is likely driven by lack of such a relationship for production workers.

Robustness & Mechanisms

We control for additional firm attributes in Table 6 to check the robustness of our results. In doing so, we also try to identify the sources of the wage premium deriving from the level of ownership by including interaction terms. In column (1), we test the idea that higher *FEP* leads to greater rent-sharing.[37] (Budd et al., 2005) find that the degree of multinational ownership could condition the degree of intra-firm profit sharing, with parents sharing profits only with majority-owned affiliates and more strongly with fully owned affiliates. We test for rent-sharing at the affiliate level and find that *FEP* does not condition its degree.[38]

An oft mentioned argument is that multinationals may offer higher wages to attract new workers. This will be the case especially if a higher level of foreign ownership indicates lack of knowledge about the local market (Gomes-Casseres, 1989), in particular for labor. While it is not obvious why a foreign acquisition should raise wages for workers that are already employed in the firm, a greenfield investor must attract new workers Heyman et al. (2007). When we include an indicator variable for greenfield investments and its interaction with *FEP* in column (2), we find no evidence for the suggested mechanism. In the Appendix, we analyse this channel further by type of labor; we would expect this channel to have a greater effect on skilled workers since they are less easily substitutable, but again we find no such evidence.

[36] A Wald test fails to reject the equality of coefficients for the two interaction terms in columns (3) and (6).

[37] A large literature has found that rents are often shared with workers with most studies focusing on developed countries. In contrast, []]]48] find no evidence for rent-sharing in an emerging market context in Brazil.

[38] We proxy profits by (log) value added per worker as we do not have a reliable measure of profits.

In the remaining columns of Table 6, we control for the presence of tangible and intangible assets. In all specifications *FEP* remains highly significant with a 10 percentage point increase associated with between 2.5-2.9% increase in average wages. We find that the share of imported capital is associated with higher wages, and more importantly high shares of imported capital lower the effect of *FEP* (column (3)). At the same time, affiliates with a high ratio of value added to tangible assets, which proxies the importance of intangible assets, also lower the effect of *FEP* (column (4)). The interaction terms in both columns are significant and negative. When we probe further into the role of intangibles in the last two columns, our alternative measures for intangibles have the expected signs but are not statistically significant.[39] These results suggest that the *FEP* premium arises primarily from the transfer of tangible assets from the multinational parent, but transfer of intangibles also play an important role.[40] Moreover, they support the idea that it is the transfer of firm-specific assets rather than changes in corporate control that drives the wage premium.

We confirm this intuition in Table 7, which presents estimates of (6) with different firm attributes as the dependent variable. Columns (1)-(5) demonstrate that higher levels of foreign ownership are significantly associated with greater capital intensity and especially imported capital. A 10 percentage point increase in *FEP* leads to 5.8% increase in total investment and to 6.2% increase in investment in imported capital. At the same time, it does not lead to a change in the ratio of value added to tangible assets. These results are consistent with Arnold and Javorick (2009), who find in their study on Indonesia that total investment and investment in new machinery increase under foreign ownership, along with employment, wages, productivity and share of imported inputs. Hence, our results suggest that higher *FEP* conditions the degree of firm-specific asset transfers, which drive the gains in average wages.

We also visit an earlier discussion and test whether *FEP* captures the variation in the skill composition of labor. Even in the absence of any technology transfer, we may see a rise in average wages if the average worker is more skilled. Columns (6) and (7) present the results with two alternative skill intensity measures, which indicate that *FEP* does not induce a change in skill composition.[41] Although skill intensity remains unchanged, higher *FEP* may lead to organizational changes that enable affiliates to attract more experienced and better motivated employees, substitute expatriate staff for local managers, invest more in training and use higher quality inputs (Javorick, 2012). In the absence of data on these mostly unobservable characteristics, we expect them to be captured by *FEP*, especially if greater control induces reshuffling at the senior level.[42]

As a last round of robustness checks, we confirm our results by re-estimating the models after excluding the top and bottom one percentile of wages used in the analysis.[43] Moreover, we replicate our GMM analysis by restricting the set of instruments used to shorter lags. Both sets of results, not reported here to conserve space, are available upon request. Yet, we are limited by our data from conducting further analysis. For instance, we cannot differentiate

[39] We construct expenditures on R&D and advertising in levels and their ratio to total sales as alternative measures for intangibles.

[40] We replicate Table 6 by worker type in the Appendix and find that *FEP* loses its significance for production workers in some columns while it remains strong for non-production workers. Moreover, the intangibles channel seems to be more prominent for non-production workers. This supports our finding that the *FEP* premium is driven mostly by gains to non-production workers.

[41] While we do not observe educational attainment of workers, we have information on the technical sorting of production workers. Column (7) defines the alternative skill intensity measure as the ratio of high-level technical to total production workers. Our finding is in line with Almeida (2007), who also finds that the human capital characteristics of the workforce remain unchanged following an acquisition.

[42] See []]]4] for a model of offshoring in which wages of "southern" workers increase when they match with better "northern" managers, which increases the marginal productivity of workers.

[43] Highly productive firms matter. If plants that pay the highest wages also have high *FEP*, one could suspect whether the estimated relationship is driven by such star performers. We confirm this is not the case.

between foreign and domestic acquisitions, which would have provided a good test of the wage premium due to multinationality per se. We take comfort in earlier evidence from Sweden that the impact of foreign and domestic acquisitions differs only marginally Heyman et al. (2007). In addition, we do not fully observe worker characteristics that may potentially vary with the level of foreign ownership. Here again, we rely on earlier literature that shows that most of the variation in the wage premium is driven by firm-level as opposed to worker-level effects (Earle and Telegdy (2008)).

6. Conclusion

Despite a rich literature that provides empirical estimates of the multinational wage premium, identifying the sources of this premium has proved to be elusive. This paper highlights a key driver in this respect and describes how the level of foreign ownership impacts on firm-level wages. We find that up to 15 percentage points in the average wage premium can be explained by the variation in the level of foreign equity participation alone. The heterogeneity in the wage premia arises primarily due to the degree of firm-specific assets transferred by the multinational parent to its affiliate that is inherently determined by the level of control that the parent exercises. Moreover, non-production workers are the main beneficiaries of higher levels of foreign ownership, while production workers do not realise wage gains beyond a modest acquisition effect.

Understanding the causes of heterogeneity in the multinational wage premium is important to inform policies designed to attract FDI. Some jobs do more for development and growth than others. From a worker's perspective, a "good job" leads to higher earnings and greater potential for career improvement, while from a country's perspective it increases average productivity and adds to the existing skill set of workers (World Bank, 2013). In this respect, the findings in this paper suggest that affiliates with higher foreign equity participation do more for an economy. Higher levels of foreign ownership increase average earnings for workers, and they do so by increasing their indispensability to an affiliate due to greater transfer of firm-specific assets.

The policy implication does not simply relate to relaxation of restrictions on the degree of corporate control that can be exercised by foreign investors in developing countries. Liberalising equity restrictions in the absence of technology upgrading may not suffice to create "good jobs" from FDI. In order to facilitate gains in worker earnings and productivity, multinational parents should also be incentivised to transfer firm-specific assets, both tangible and intangible. In the absence of a framework to ensure the protection of these assets, for instance stronger legal systems to enforce contracts and resolve disputes between local and foreign partners, liberalisation of equity investment controls alone may not deliver the expected benefits. Future research can address the challenges in identifying how multinationals can better contribute to transfer of technology and skill upgrading in developing economies.

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Figure 1: Distribution of Foreign Equity Participation at Multinationals

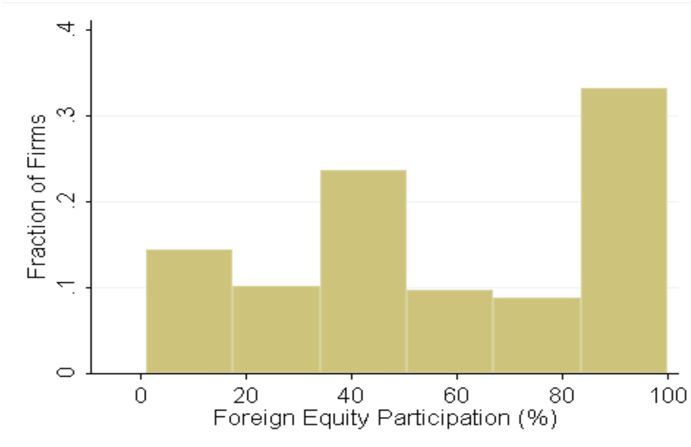
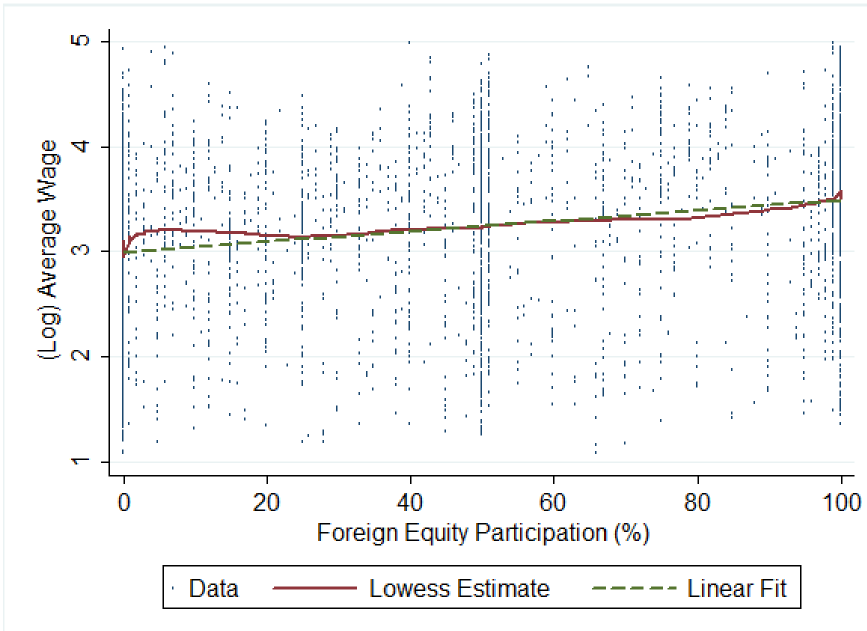


Figure 2: Average Wage and Foreign Equity Participation: Nonparametric Estimates

(a) Pooled OLS Regression



(b) Fixed Effects Regression

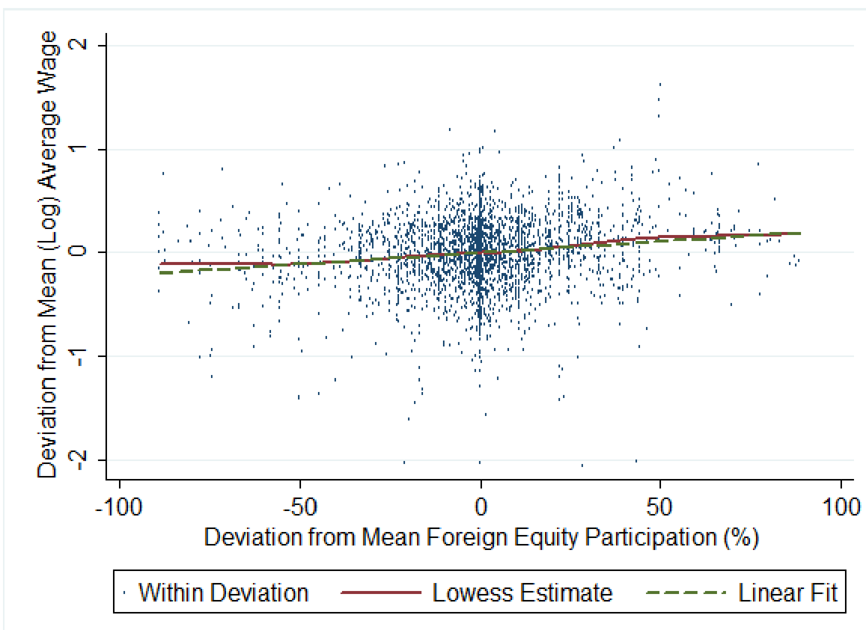


Figure 3: Average Wage and Foreign Equity Participation: Semiparametric Estimates

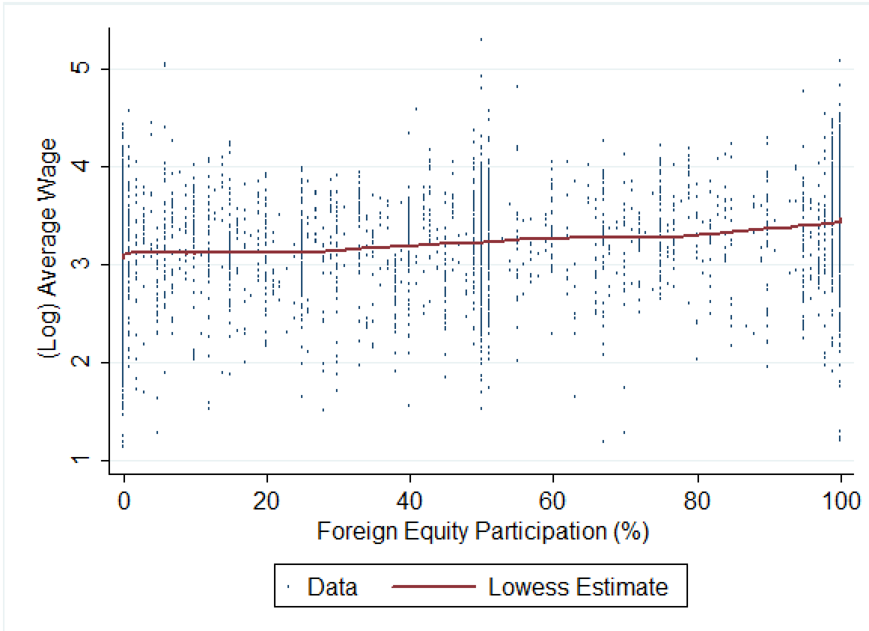


Table 1: Average Wages at Multinationals by Level of Foreign Ownership

(a) All Workers

FEP Interval	Mean	Std. Dev.	N
Pre-acquisition	25.76	20.80	968
1-9%	34.25***	28.75	214
10-24%	28.03	20.03	266
25-49%	31.74***	23.73	503
50-74%	38.75***	43.05	716
75-100%	42.93***	31.13	1058

(b) Production Workers

FEP Interval	Mean	Std. Dev.	N
Pre-acquisition	22.06	19.24	960
1-9%	30.85***	25.26	213
10-24%	23.69	17.72	266
25-49%	26.45***	22.81	498
50-74%	32.64***	48.63	716
75-100%	32.92***	24.96	1053

(c) Non-production Workers

FEP Interval	Mean	Std. Dev.	N
Pre-acquisition	38.46	36.68	952
1-9%	47.45**	52.17	214
10-24%	44.53**	36.84	264
25-49%	48.36***	43.90	502
50-74%	58.19***	59.39	714
75-100%	68.55***	63.36	1052

Notes: Average wages are in real Turkish Liras in 1990 prices. Pre-acquisition refers to the observations for foreign affiliates when they were under domestic ownership prior to acquisition by a foreign investor. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively, for a two-sample t-test for a difference in the means of multinationals and pre-acquisition observations.

Table 2: Multinational Wage Premium at Different Equity Thresholds Dependent Variable: Log Average Yearly Wage

		OLS Estimates			FE Estimates		
		All Workers	Production Workers	Non-production Workers	All Workers	Production Workers	Non-production Workers
Foreign Equity Participation Threshold		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
0%	(a)	0.3577***	0.2479***	0.4645***	0.0797***	0.0443*	0.1056***
		(0.0215)	(0.0205)	(0.0258)	(0.0227)	(0.0233)	(0.0317)
10%	(b)	0.3646***	0.2442***	0.4834***	0.0769***	0.0382	0.0996***
		(0.0222)	(0.0211)	(0.0266)	(0.0228)	(0.0235)	(0.0309)
25%	(c)	0.3814***	0.2555***	0.5000***	0.0917***	0.0471*	0.1109***
		(0.0232)	(0.0222)	(0.0275)	(0.0235)	(0.0248)	(0.0328)
50%	(d)	0.4204***	0.2873***	0.5551***	0.0756***	0.0196	0.1025***
		(0.0261)	(0.0248)	(0.0307)	(0.0267)	(0.0279)	(0.0365)
75%	(e)	0.4597***	0.3233***	0.6035***	0.0807**	0.0552*	0.0865**
		(0.0325)	(0.0306)	(0.0373)	(0.0320)	(0.0315)	(0.0385)
Equality of Coefficients		0.0000	0.0000	0.0000	0.4848	0.2857	0.8185

Notes: This table reports the estimates for the censored foreign ownership variable defined at various thresholds in (3). Each row-column pair thus corresponds to one regression. The full set of results are available upon request. All standard errors are corrected for heteroskedasticity, clustered at the firm level. Coefficients are given in the first line; standard errors in parentheses; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively. All regressions include a constant term and (log) plant size, (log) capital intensity, (log) value added per worker, share of female workers, and skill intensity as controls. OLS regressions control additionally for sector and year effects and FE regressions for individual firm and year effects. The last row provides the Wald test for the joint equality of coefficients across different models (a)-(e); p-value reported.

Table 3: Multinational Wage Premium at Different Equity Intervals Dependent Variable: Log Average Yearly Wage

	OLS Estimates			FE Estimates		
	All Workers	Production Workers	Non-production Workers	All Workers	Production Workers	Non-production Workers
	(1)	(2)	(3)	(4)	(5)	(6)
FEP interval: 1-9%	0.2504***	0.2606***	0.2247***	0.0503	0.0514	0.0793
	(0.0629)	(0.0652)	(0.0673)	(0.0452)	(0.0477)	(0.0648)
FEP interval: 10-24%	0.2144***	0.1418***	0.3230***	0.0163	0.0125	0.0493
	(0.0487)	(0.0473)	(0.0688)	(0.0377)	(0.0390)	(0.0483)
FEP interval: 25-49%	0.2420***	0.1413***	0.3021***	0.1028***	0.0836**	0.1124**
	(0.0397)	(0.0410)	(0.0445)	(0.0344)	(0.0366)	(0.0484)
FEP interval: 50-74%	0.3603***	0.2326***	0.4791***	0.0707**	-0.0038	0.1166**
	(0.0375)	(0.0359)	(0.0451)	(0.0337)	(0.0380)	(0.0530)
FEP interval: 75-100%	0.4835***	0.3401***	0.6360***	0.1068***	0.0619*	0.1271***
	(0.0326)	(0.0308)	(0.0372)	(0.0335)	(0.0330)	(0.0416)
log Plant Size	0.2056***	0.1887***	0.2501***	0.0252***	0.0262***	0.0992***
	(0.0045)	(0.0045)	(0.0051)	(0.0069)	(0.0071)	(0.0102)
log Capital Intensity	0.0077***	0.0034	0.0145***	0.0277***	0.0224***	0.0348***
	(0.0027)	(0.0026)	(0.0032)	(0.0042)	(0.0044)	(0.0064)
log Value Added per Worker	0.2282***	0.2102***	0.2412***	0.0877***	0.0888***	0.0776***
	(0.0046)	(0.0045)	(0.0054)	(0.0028)	(0.0029)	(0.0039)
Share of Female Workers	-0.3339***	-0.3531***	-0.2105***	-0.0195	-0.0273*	-0.0166
	(0.0205)	(0.0199)	(0.0271)	(0.0149)	(0.0160)	(0.0247)
Skill Intensity	0.0895***	0.1212***	0.0136*	0.0138***	0.0626***	-0.0824***
	(0.0076)	(0.0105)	(0.0070)	(0.0044)	(0.0093)	(0.0085)
Model Effects	Yes	Yes	Yes	Yes	Yes	Yes
Equality of Coefficients	0.0000	0.0003	0.0000	0.2105	0.2358	0.7117
$Adj.R^2$	0.5631	0.5332	0.4715	0.3756	0.3355	0.2384
N	60,000	59,871	55,223	60,000	59,871	55,223

Notes: This table reports estimates of (x) when foreign ownership is defined as dummies at various intervals. Reference category: domestic firms. All standard errors are corrected for heteroskedasticity, clustered at the firm level. Coefficients are given in the first line; standard errors in parentheses; *, **, *** indicate significance at the 10%, 5% and 1% level, respectively. Model effects include sector and year effects for OLS regressions and individual firm and year effects for FE regressions. Equality of coefficients is a Wald test for the joint equality of coefficients across different intervals; p-value reported.

Table 4: Foreign Equity Participation and Average Wages Dependent Variable: Log Average Yearly Wage, All Workers

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	**Skill Intensity**	**Excluding 0% shares**	**Minority vs. majority**	**Excluding 0% shares**	**Quadratic term**
FEP	0.0032***	0.0031***	0.0015**			-0.0010
	(0.0008)	(0.0007)	(0.0008)			(0.0019)
FEP*Minority Share				-0.0002	-0.0012	
				(0.0021)	(0.0020)	
FEP*Majority Share				0.0034***	0.0020***	
				(0.0007)	(0.0007)	
FEP, Squared						0.00004**
						(0.00002)
log Plant Size	0.0789***	0.0825***	0.0736***	0.0870***	0.0750***	0.0772***
	(0.0137)	(0.0138)	(0.0145)	(0.0143)	(0.0157)	(0.0139)
log Capital Intensity	0.0250**	0.0244*	0.0312**	0.0164	0.0291*	0.0245*
	(0.0130)	(0.0130)	(0.0150)	(0.0132)	(0.0156)	(0.0132)
log Value Added per Worker	0.2123***	0.2068***	0.2076***	0.1959***	0.1927***	0.1932***
	(0.0197)	(0.0190)	(0.0228)	(0.0195)	(0.0217)	(0.0191)
Share of Female Workers	-0.6437***	-0.6648***	-0.6220***	-0.6430***	-0.6131***	-0.6287***
	(0.0811)	(0.0819)	(0.0921)	(0.0809)	(0.0920)	(0.0843)
Skill Intensity		0.0433***	0.0482***	0.0373***	0.0444***	0.0345***
		(0.0118)	(0.0131)	(0.0116)	(0.0124)	(0.0095)
log Wage $_{t-1}$	0.3064***	0.3028***	0.3161***	0.3285***	0.3342***	0.3362***
	(0.0426)	(0.0420)	(0.0498)	(0.0422)	(0.0508)	(0.0419)
Equality of Coefficients				0.0892	0.0931	
m1 (Pr>z)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m2 (Pr>z)	0.4541	0.4461	0.9431	0.4143	0.9240	0.4034
Hansen	0.4509	0.4991	0.2435	0.4370	0.2863	0.3200
Group Count	526	526	517	526	517	526
Instrument Count	82	83	83	118	118	118
N	3,163	3,163	2,346	3,163	2,346	3,163

Notes: FEP stands for foreign equity participation, measured in percent terms. All models include a constant, time and firm fixed effects. Robust standard errors in parentheses, clustered at firm level and adjusted for Windmeijer's correction; *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively. m1 and m2 are Arellano-Bond test statistics for first- and second-order serial correlation, asymptotically $N(0,1)$. Hansen is a test of the overidentifying restrictions for the GMM estimators, asymptotically χ^2. Equality of coefficients is a Wald test for the equality of coefficients on *FEP*Minority Share* and *FEP*Majority Share*. P-values are reported for all tests.

Table 5: Foreign Equity Participation and Average Wages Dependent Variable: Log Average Yearly Wage by Worker Type

	Production Workers			Non-production Workers		
	(1)	(2)	(3)	(4)	(5)	(6)
		Excluding 0% shares	**Minority vs. majority**		**Excluding 0% shares**	**Minority vs. majority**
FEP	0.0019**	0.0003 (0.0009)		0.0034***	0.0025**	
	(0.0009)			(0.0013)	(0.0013)	
FEP*Minority Share			-0.0008			0.0020
			(0.0026)			(0.0028)
FEP*Majority Share			0.0021**			0.0037***
			(0.0009)			(0.0012)
log Plant Size	0.0737***	0.0645***	0.0794***	0.0987***	0.0667***	0.1029***
	(0.0145)	(0.0152)	(0.0151)	(0.0190)	(0.0226)	(0.0199)
log Capital Intensity	0.0172	0.0311**	0.0120 (0.0138)	0.0160	-0.0009	0.0095
	(0.0132)	(0.0152)		(0.0155)	(0.0156)	(0.0158)
log Value Added per Worker	0.2009***	0.1960***	0.1993***	0.1922***	0.1677**	0.1866***
	(0.0180)	(0.0209)	(0.0188)	(0.0260)	(0.0334)	(0.0252)
Share of Female Workers	-0.7203***	-0.6049***	-0.6991***	-0.2772**	-0.2779**	-0.3374***
	(0.0852)	(0.0899)	(0.0843)	(0.1159)	(0.1228)	(0.1237)
Skill Intensity	0.0654***	0.0803***	0.0646***	-0.0433***	-0.0469***	-0.0422***
	(0.0218)	(0.0182)	(0.0198)	(0.0136)	(0.0124)	(0.0136)
log Wage $_{t-1}$	0.3074***	0.3399***	0.3135***	0.3088***	0.3609***	0.3212***
	(0.0389)	(0.0429)	(0.0403)	(0.0452)	(0.0626)	(0.0461)
log Wage $_{t-2}$				0.1430***	0.2365***	0.1315***
				(0.0367)	(0.0468)	(0.0386)
Equality of Coefficients			0.2596			0.5297
m1 (Pr>z)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m2 (Pr>z)	0.4738	0.7376	0.4406	0.9963	0.9928	0.7672
Hansen	0.1713	0.1166	0.3189	0.6815	0.6883	0.2468
Group Count	524	515	524	496	470	496
Instrument Count	83	83	118	80	80	114
N	3,145	2,335	3,145	2,605	1,939	2,605

Notes: FEP stands for foreign equity participation, measured in percent terms. All models include a constant, time and firm fixed effects. Robust standard errors in parentheses, clustered at firm level and adjusted for Windmeijer's correction; *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively. m1 and m2 are Arellano-Bond test statistics for first- and second-order serial correlation, asymptotically $N(0,1)$. Hansen is a test of the overidentifying restrictions for the GMM estimators, asymptotically χ^2. Equality of coefficients is a Wald test for the equality of coefficients on *FEP*Minority Share* and *FEP*Majority Share*. P-values are reported for all tests.

Table 6: Foreign Equity Participation and Average Wages: Channels Dependent Variable: Log Average Yearly Wage, All Workers

	(1)	(2)	(3)	(4)	(5)	(6)
FEP	0.0028***	0.0027***	0.0026***	0.0025***	0.0029***	0.0026***
	(0.0006)	(0.0009)	(0.0008)	(0.0007)	(0.0009)	(0.0008)
FEP*log Value Added per Worker	0.0001					
	(0.0007)					
FEP*Greenfield Investment		0.0004				
		(0.0021)				
FEP*Share of Imported Capital			-0.0015*			
			(0.0008)			
FEP*(Value Added / Tangibles)				-0.0003**		
				(0.0001)		
FEP*log Intangibles Expenditure					-0.0003	
					(0.0006)	
FEP*(Intangibles / Sales)						-0.0149
						(0.0419)
log Plant Size	0.0856***	0.0741***	0.0769***	0.0817***	0.0651***	0.0809***
	(0.0137)	(0.0136)	(0.0136)	(0.0131)	(0.0148)	(0.0139)
log Capital Intensity	0.0267**	0.0307**	0.0282**	0.0261*	0.0246*	0.0323***
	(0.0136)	(0.0132)	(0.0128)	(0.0136)	(0.0128)	(0.0125)
log Value Added per Worker	0.2091***	0.2056***	0.2169***	0.2112***	0.1977***	0.1989***
	(0.0405)	(0.0209)	(0.0203)	(0.0184)	(0.0188)	(0.0193)
Share of Female Workers	-0.6668***	-0.6024***	-0.6101***	-0.5931***	-0.6709***	-0.6481***
	(0.0839)	(0.0794)	(0.0819)	(0.0836)	(0.0837)	(0.0832)
Skill Intensity	0.0456***	0.0436***	0.0430***	0.0389***	0.0422***	0.0419***
	(0.0131)	(0.0121)	(0.0119)	(0.0122)	(0.0121)	(0.0122)
Greenfield Investment		-0.0082				
		(0.1140)				
Share of Imported Capital			0.0304*			
			(0.0157)			
Value Added / Tangibles				-0.0075		
				(0.0047)		
log Intangibles Expenditure					0.0604*	
					(0.0312)	
Intangibles / Sales						0.6571
						(2.3033)
log Wage $_{t-1}$	0.2936***	0.3254***	0.3244***	0.3190***	0.3052***	0.3276***
	(0.0435)	(0.0429)	(0.0473)	(0.0438)	(0.0433)	(0.0498)
m1 (Pr>z)	0.0000	0.0000	0.0000	0.0000	0.0000	0.000
m2 (Pr>z)	0.4452	0.4038	0.3660	0.4087	0.3222	0.3669
Hansen	0.1206	0.4044	0.3251	0.5772	0.4289	0.4901
Group Count	526	526	526	526	526	526
Instrument Count	118	111	119	119	119	119
N	3,163	3,163	3,163	3,157	3,163	3,161

Notes: See notes to Tables 4 and 5.

Table 7: Foreign Equity Participation and Firm Capabilities Dependent Variable: Various Firm Capabilities

	(1) log Capital Intensity	(2) Share of Imported Investment	(3) log Imported Investment	(4) log Total Investment	(5) log Value Added / Tangibles	(6) Skill Intensity	(7) Skill in Production
FEP	0.0015**	0.0009*	0.0062**	0.0058**	-0.0001	0.0011	0.0001
	(0.0007)	(0.0006)	(0.0025)	(0.0026)	(0.0004)	(0.0010)	(0.0002)
log Plant Size	-0.0202*	0.0601***	0.6031***	0.6214***	-0.0288***	-0.0416***	-0.0129***
	(0.0113)	(0.0079)	(0.0652)	(0.0710)	(0.0070)	(0.0130)	(0.0029)
log Capital Intensity		0.0121*	0.0729**	0.0512	-0.5383***	0.0182*	0.0041**
		(0.0069)	(0.0371)	(0.0402)	(0.0180)	(0.0093)	(0.0021)
log Value Added per Worker	0.0868***	0.0313***	0.2365***	0.2679***	0.5197***	0.0270**	0.0164***
	(0.0249)	(0.0095)	(0.0405)	(0.0416)	(0.0155)	(0.0109)	(0.0027)
Skill Intensity	-0.0112	-0.0052	0.0206	0.0484	0.0097		0.0167***
	(0.0079)	(0.0071)	(0.0297)	(0.0311)	(0.0072)		(0.0044)
Dependent Variable $_{t-1}$	0.9098***	0.3464***	0.3083***	0.3108***	0.0466*	0.6008***	0.3379***
	(0.0506)	(0.0343)	(0.0403)	(0.0429)	(0.0269)	(0.0888)	(0.0546)
Dependent Variable $_{t-2}$	-0.0331	0.1057***	0.0742**	0.0770**			
	(0.0242)	(0.0310)	(0.0306)	(0.0311)			
m1 (Pr>z)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0000
m2 (Pr>z)	0.4040	0.7458	0.3124	0.3583	0.6700	0.4483	0.2932
Hansen	0.8700	0.4543	0.2805	0.1288	0.6400	0.3156	0.6191
Group Count	501	501	501	501	525	526	521
Instrument Count	78	79	79	79	82	81	82
N	2,642	2,642	2,642	2,642	3,155	3,167	3,128

Notes: FEP stands for foreign equity participation, measured in percent terms. All models include a constant, time and firm fixed effects. Robust standard errors in parentheses, clustered at firm level and adjusted for Windmeijer's correction; *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively. m1 and m2 are Arellano-Bond test statistics for first- and second-order serial correlation, asymptotically $N(0,1)$. Hansen is a test of the overidentifying restrictions for the GMM estimators, asymptotically χ^2. P-values are reported for all tests.

Appendix A

A.1 Censoring the Level of Foreign Ownership

In this section we characterize the bias associated with censoring continuous explanatory variables when firm-level individual effects are taken into account. Rigobon and Stoker (2009) derive the bias from using censored regressors for the ordinary least squares (OLS) estimator and we build on their results for the case of 0-1 censoring. We show here that their results can be readily extended to the fixed-effects (FE) estimator. In order to motivate the result, we start the analysis with a single regressor. Let the true model be given by (1), excluding the vector of controls $\mathbf{y}_{i,t}$. The fixed effects transformation eliminates α_i from (1) and yields a single variable model in deviations from individual means:

$$w_{i,t} - \overline{w}_i = (x_{i,t} - \overline{x}_i)\beta + (\varepsilon_{i,t} - \overline{\varepsilon}_i) \tag{7}$$

where $\overline{w}_i = T^{-1}\sum_{t=1}^{T} w_{i,t}$, and $\overline{x}_i$ and $\overline{\varepsilon}_i$ are defined similarly. The FE estimator, which is unbiased in finite samples, is given by:

$$\hat{\beta}_{FE} = \frac{\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{i,t} - \overline{x}_i)(w_{i,t} - \overline{w}_i)}{\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{i,t} - \overline{x}_i)^2}$$

We are interested in the asymptotic bias that arises when one estimates the following model instead:

$$w_{i,t} = a_i + bF_{i,t} + \varepsilon_{i,t},\ i = 1,...,N; t = 1,...,T \tag{8}$$

where $F_{i,t} = 1[x_{i,t} > \phi]$. The coefficient of interest is estimated by:

$$\hat{b}_{FE} = \frac{\sum_{i=1}^{N}\sum_{t=1}^{T}(F_{i,t} - \overline{F}_i)(w_{i,t} - \overline{w}_i)}{\sum_{i=1}^{N}\sum_{t=1}^{T}(F_{i,t} - \overline{F}_i)^2}$$

The bias that we are going to characterize is given by $plim\hat{b}_{FE} - \beta$, which will clearly be affected by the threshold ϕ. To see this formally, recall that $\hat{b}_{FE}$ is identical to the estimator obtained by an OLS estimation of the dummy variable model:

$$w_{i,t} = \sum_{j=1}^{N} a_j d_{i,,j} + bF_{i,t} + \varepsilon_{i,t} \tag{9}$$

where $d_{i,,j} = 1$ if $i = j$ and 0 elsewhere. Following Rigobon and Stoker (2009), the probability limits of the OLS estimators of (9) are given by:[44]

$$plim\hat{a}_{i,FE} = E[w_{i,t} \mid F_{i,t} = 0, \alpha_i] = \alpha_i + \beta E[x_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$plim\hat{b}_{FE} = E[w_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[a_i \mid F_{i,t} = 1, \alpha_i]$$

[44] The difference here from Rigobon and Stoker (2009) is the conditional expectations, since the true data generating process (DGP) is now given by the single variable version of (1) with time-invariant individual effects instead of a cross-sectional DGP. Remember that the interpretation of β comes from the conditional expectation on the structural equation (1) even though one uses the censored version of (7) or (9) in practice to estimate the parameters of the model.

$$= E[w_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[w_i \mid F_{i,t} = 0, \alpha_i]$$

$$= \alpha_i + \beta E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - \alpha_i - \beta E[x_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$= \beta \{ E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[x_{i,t} \mid F_{i,t} = 0, \alpha_i] \}$$

The WG estimator $\hat{b}_{FE}$ measures β up to a positive scalar as in the OLS case, but differently, this scalar is now determined by the expectations conditional on α_i. The bias is:

$$plim \hat{b}_{FE} - \beta = \beta \{ E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[x_{i,t} \mid F_{i,t} = 0, \alpha_i] - 1 \}$$

What does this result tell us? If one is merely interested in whether foreign ownership causes a positive or negative wage premium, then using a censored regressor will provide a consistent answer as to the direction of this association.[45] However, if the interest is in the size of the premium, then $\hat{b}_{FE}$ provides an estimate that is confounded by the difference $E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[x_{i,t} \mid F_{i,t} = 0, \alpha_i]$. This *within* difference depends not only on ϕ, but also on the distribution of $x_{i,t}$ conditional on α_i. For instance, if foreign owners acquire higher equity shares in certain industries, then we would expect the bias to be larger in these industries. This result helps highlight how estimates may differ under OLS estimation compared to FE estimation. Because the difference is simply given by $E[x_{i,t} \mid F_{i,t} = 1] - E[x_{i,t} \mid F_{i,t} = 0]$ under OLS and the majority of the firms for which $F_{i,t} = 0$ are domestic regardless of ϕ, $\hat{b}_{OLS}$ will typically rise with ϕ; this is not the case when we condition on α_i so that using a higher threshold ϕ need not lead to a higher $\hat{b}_{FE}$. Indeed, our regression results support this observation. Thus, the extent of the heterogeneity in foreign ownership directly impacts the wage premium estimate and 0-1 censoring might lead to different kinds of misestimates under OLS and FE by hiding this information.

In practice, one is typically interested in the parameters of a multivariate model, which calls into question the transmission of bias among the regressors. Assume that the true model is given by (1) in which the vector $\mathbf{y}_{i,t}$ consists of a single control $y_{i,t}$. The censored model is:

$$w_{i,t} = a_i + bF_{i,t} + cy_{i,t} + \varepsilon_{i,t}, i = 1,...,N; t = 1,...,T \tag{10}$$

The FE estimator of b is again identical to the estimator obtained by OLS estimation of the dummy variable model:

$$w_{i,t} = \sum_{j=1}^{N} a_j d_{i,,j} + bF_{i,t} + cy_{i,t} + \varepsilon_{i,t} \tag{11}$$

Following Rigobon and Stoker (2009), denote the residual of $w_{i,t}$ regressed on $F_{i,t}$ as: $\Delta w_{i,t} = w_{i,t} - (1 - F_{i,t})\overline{w}_{0,t} - F_{i,t}\overline{w}_{1,t}$; where $\overline{w}_{1,t} = \sum_{i=1}^{N}\sum_{t=1}^{T} F_{i,t} w_{i,t} / \sum_{i=1}^{N}\sum_{t=1}^{T} F_{i,t}$ is the average of $w_{i,t}$ for $F_{i,t} = 1$, and $\overline{w}_{0,t} = \sum_{i=1}^{N}\sum_{t=1}^{T}(1 - F_{i,t}) w_{i,t} / \sum_{i=1}^{N}\sum_{t=1}^{T}(1 - F_{i,t})$. Applying the same transformation to both sides of (1), we get:

$$\Delta w_{i,t} = \beta \Delta x_{i,t} + \gamma \Delta y_{i,t} + \Delta \varepsilon_{i,t} \tag{12}$$

[45] This holds only in the single variate case; a sign reversal is possible in the multivariate case as we will demonstrate shortly.

If one applies this transformation to the model in (11), both the censored variable $F_{i,t}$ and the individual dummies $d_{i,,j}$ are removed, which yields the estimation equation:

$$\Delta w_{i,t} = c\Delta y_{i,t} + v_{i,t} \tag{13}$$

Rigobon and Stoker (2009) note that the bias in $\hat{c}$ of (10) is the same as that of (13), which arises due to the omission of $\Delta x_{i,t}$ from (12). The standard omitted variable bias formula then yields $plim\hat{c}_{FE} = \gamma + \beta\eta \equiv c$, where η is defined by:

$$\eta = \frac{Cov(\Delta y_{i,t}, \Delta x_{i,t})}{Var(\Delta y_{i,t})} = \frac{(1-p)Cov(y_{i,t}, x_{i,t} \mid F_{i,t} = 1, \alpha_i^*) + pCov(y_{i,t}, x_{i,t} \mid F_{i,t} = 0, \alpha_i^*)}{(1-p)Var(y_{i,t} \mid F_{i,t} = 1, \alpha_i^*) + pVar(y_{i,t} \mid F_{i,t} = 0, \alpha_i^*)}$$

and p is the probability that $F_{i,t} = 1$. Again, the difference in the current result from that of Rigobon and Stoker (2009) for the OLS case is that the covariances and variances are now conditioned on individual effects, α_i^*, where the linear projection of $x_{i,t}$ on the additional regressor is expressed as: $x_{i,t} = \alpha_i^* + \eta y_{i,t} + r_{i,t}$.

Hence, the parameter η, which measures how within-deviations of foreign equity participation are proxied by the within-deviations of the additional regressor, determines the size of the bias in $\hat{c}$. As Rigobon and Stoker (2009) note, it is impossible to assess the bias in terms of size and direction if one has no information regarding the within-variation of $x_{i,t}$. The probability limits for the other coefficients in (10) are given by:

$$plim\hat{a}_{i,FE} = E[w_{i,t} \mid F_{i,t} = 0, \alpha_i] - cE[y_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$= \alpha_i + \beta E[x_{i,t} \mid F_{i,t} = 0, \alpha_i] + (\gamma - c)E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$= \alpha_i + \beta\left[E[x_{i,t} \mid F_{i,t} = 0, \alpha_i] - \eta E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]\right]$$

$$plim\hat{b}_{FE} = E[w_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[w_{i,t} \mid F_{i,t} = 0, \alpha_i] + cE[y_{i,t} \mid F_{i,t} = 0, \alpha_i] - cE[y_{i,t} \mid F_{i,t} = 1, \alpha_i]$$

$$= \alpha_i + \beta E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] + \gamma E[y_{i,t} \mid F_{i,t} = 1, \alpha_i]$$

$$- \alpha_i - \beta E[x_{i,t} \mid F_{i,t} = 0, \alpha_i] - \gamma E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$- c\left\{E[y_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]\right\}$$

$$= \beta\Big[E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[x_{i,t} \mid F_{i,t} = 0, \alpha_i]$$

$$- \eta\left\{E[y_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]\right\}\Big]$$

The bias in $\hat{b}_{FE}$ thus depends on two extra terms compared to the single regressor case: how the additional regressor covaries with x, and the distribution of the additional regressor conditional on censoring and α_i. With additional regressors in the picture, it is possible to have a case where $\hat{b}_{FE}$ may actually have the *wrong* sign.[46] Hence, with 0-1 censoring, it is

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[46] This will be the case whenever we have: $\dfrac{E[x_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[x_{i,t} \mid F_{i,t} = 0, \alpha_i]}{E[y_{i,t} \mid F_{i,t} = 1, \alpha_i] - E[y_{i,t} \mid F_{i,t} = 0, \alpha_i]} < \eta$.

possible to end up not only with a biased estimate of the wage premium, but also with the wrong sign on it.

A.2 Data and Variable Construction

In this section, I provide a detailed description of the database and the construction of the variables used in the paper. All data come from TurkStat's Industrial Analysis Database and are available in a machine-readable format at TurkStat's premises in Ankara. We focus on manufacturing plants with more than 10 employees, which is a close approximation of the universe of Turkish plants in manufacturing. Accordingly we restrict our frame of analysis to 1993-2001 to retrieve data consistent across years although we use data starting from 1990 to calculate the capital stock series.[47] Note that all variables in the data set are measured in 1990 prices (Turkish Liras). Table A.1 provides the summary statistics of the variables used in the analysis following the cleaning procedure.

Foreign Ownership information is included for each firm in the breakdown of equity shares into three groups: government institutions, domestic private entities, and foreign investors. The equity shares for these three groups are given in percentages and sum up to 100. If a firm reports having any foreign equity participation, a further breakdown of this share into the top three shareholding countries and their respective shares are provided. In the data, only around 10% of all foreign affiliates have parents from multiple countries. We classify a firm with at least a 1% foreign equity participation as an affiliate. In the sample, the minimum share of foreign ownership was 1% and the maximum share was 100%.

Wages are measured as total salary payments to production and non-production workers separately, excluding any additional benefits and compensation.

Plant Size is measured as the average number of paid workers of the plant in a given year. Number of paid workers is reported for production and non-production workers four times during a given year (in February, May, August, and November) and the average of these four observations constitutes the plant size.

Skill Intensity is measured as the ratio of non-production workers to production workers following the literature. Further disaggregation of skills among production workers is available. Employees working in production are classified as technical workers, foremen and workers, and technical workers are further disaggregated into high- and mid-level technical personnel. Non-production employees are classified as management, office personnel, laboratory workers and others.

Skill in Production is measured as the ratio of technical workers in total production workers. We also constructed an alternative variable where we measure skill in production as the ratio of high-level technical workers to all production workers and our results are robust to the use of this alternative definition.

Share of Female Workers is measured as the ratio of all female workers to total workers. Further disaggregation of male and female workers by skill categories as above is available.

Sales are measured as revenues generated from the annual sales of final products and contract manufacturing, deflated by the relevant four-digit output price deflator provided by TurkStat.

Intangibles Expenditure is measured as total annual spending on research and development (excluding market research) as well as intangible property, including patents, copyrights, etc.

Value Added is calculated by TurkStat and takes into account revenues generated from the annual sales of firms' final products, contract manufacturing, change in inventories and

[47] While more recent data are available up to 2008, data were not collected in 2002 and a change in the sampling technique and the firm surveys precludes the creation of a compatible panel.

material inputs including intermediates and energy. The series are deflated by the relevant four-digit output price deflator.

Tangible Assets are measured as part of the capital stock that excludes investments in computers, software, and advertisements.

Investment data are available in detail by type and whether investment goods are imported or not. The database includes information on investment in machinery and equipment, building and structures (which cannot be imported by default), transportation equipment, office fixtures, computers and software, and advertisements. All series are available since 1990, except for computers and software, which are available since 1995. Since the disaggregated investment deflator is not available, we use an annual aggregate investment deflator provided by TurkStat to deflate all series.

Capital Stock information is not reported in the database, so we calculate it using the reported investment data. We use the perpetual inventory method in constructing the yearly capital stock for each of these series at the plant level. Since initial capital stock is not reported, we impute it by assuming that plants are on their balanced growth path. We assume that capital stock is predetermined and evolves according to $K_{t+1} = (1-\delta)K_t + I_t$ as current investment takes one period before it becomes productive. If plants are on their balanced growth path, then $K_1/K_0 = Y_1/Y_0 = 1 + g_{0,1}$, where $g_{0,1}$ is the initial output growth of the plant. It is then easy to show that initial capital stock is given by: $K_0 = I_0/(g_{0,1} + \delta)$. After calculating K_0, we apply the perpetual inventory method to construct the capital stock series. We use depreciation rates of 5%, 10%, 20%, and 30%, respectively, for building and structures; machinery, equipment and office fixtures; transportation equipment; and computers, software and advertisements. We observe zero initial investment for a small number of plants, for which we calculate initial capital stock at the year that they first report positive investment and then iterate back by dividing capital stock by $(1-\delta)$ each year. After calculating the capital stock series separately for each type of investment, we aggregate the series to form the total capital stock. The database provides information on imported investment series so we follow the same approach to calculate the stock of imported capital.

The database is cleaned thoroughly as we check for inconsistent firm identifier codes, detect any duplicate observations and remove them. We follow two additional rules to clean the data. First, plants that have "gaps" in the panel are excluded from the analysis. Second, observations with a non-positive value for capital stock or value added are also excluded. This removes 36,798 firm-year observations out of a total of 98,924 from the raw data. Most eliminated observations are due to missing capital stock. However, this variable is created for all foreign affiliates and larger firms, which are in general immune to data collection problems. Plants for which we were unable to calculate a capital stock had a mean of 44 employees while our resulting database has a mean of 128 employees, suggesting that the resulting sample captures the vast majority of total manufacturing activity as smaller plants drop. In the end, we get a fairly balanced panel of firms, of which around 4% are foreign affiliates.

Table A.1: Summary Statistics of the Variables Used in the Analysis by Type of Ownership

		Mean	Median	Std. Dev.	Observations
Foreign Equity Participation (%)	Domestic	0.00	0.00	0.00	59,321
	Foreign	59.27	51.00	32.80	2,756
	Total	2.63	0.00	14.03	62,077
Average Wage, All Workers	Domestic	12.75	8.66	12.02	59,321
	Foreign	37.69	30.77	32.94	2,756
	Total	13.86	8.96	14.58	62,077
Average Wage, Production Workers	Domestic	11.88	8.22	11.22	59,199
	Foreign	30.62	23.50	32.25	2,745
	Total	12.71	8.47	13.46	61,944
Average Wage, Non-production Workers	Domestic	17.77	10.89	22.20	54,406
	Foreign	58.23	44.67	56.85	2,745
	Total	19.72	11.39	26.45	57,151
log Plant Size	Domestic	3.97	3.76	1.10	59,321
	Foreign	5.15	5.13	1.25	2,756
	Total	4.02	3.81	1.13	62,077
log Capital Intensity	Domestic	1.62	0.35	17.90	59,321
	Foreign	2.78	0.98	7.18	2,756
	Total	1.67	0.36	17.56	62,077
log Value Added per Worker	Domestic	-0.94	-0.97	1.04	58,598
	Foreign	0.27	0.31	1.09	2,728
	Total	-0.89	-0.93	1.07	61,326
Share of Female Workers	Domestic	0.20	0.11	0.23	59,191
	Foreign	0.22	0.14	0.22	2,753
	Total	0.21	0.12	0.22	61,944
Skill Intensity	Domestic	0.33	0.18	0.69	59,321
	Foreign	0.78	0.39	1.27	2,756
	Total	0.35	0.19	0.74	62,077
Skill in Production	Domestic	0.08	0.04	0.13	58,829
	Foreign	0.13	0.09	0.16	2,733
	Total	0.08	0.04	0.13	61,562
Share of Imported Capital	Domestic	0.65	0.00	9.72	59,321
	Foreign	0.52	0.31	1.61	2,756
	Total	0.65	0.00	9.51	62,077
log Investment in Imported Capital	Domestic	0.80	0.14	1.27	59,321
	Foreign	2.55	2.45	2.03	2,756
	Total	0.88	0.17	1.37	62,077
log Total Investment	Domestic	0.97	0.31	1.36	59,321
	Foreign	2.80	2.78	2.07	2,756
	Total	1.05	0.36	1.45	62,077
Ratio of Value Added to Tangible Assets	Domestic	21.36	1.14	1728.07	58,965
	Foreign	9.82	1.36	127.70	2,753
	Total	20.87	1.15	1689.31	61,718
log Intangibles Expenditure	Domestic	0.16	0.00	0.51	59,321
	Foreign	1.06	0.20	1.53	2,756
	Total	0.20	0.00	0.62	62,077