Global Influences on Gender Inequality:
Evidence from Female Employment in Korea

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July 4, 2019

Abstract

Do multinational enterprises (MNEs) from more gender-equal countries bring gender-equal employment practices with them to a less gender-equal host country? Using both difference-in-differences and nearest-neighbor-matching techniques and firm-level data for Korea, a country with low gender equality, we find evidence that MNEs bring their country of origin's gender norms in employment with them. Korean firms that switch to foreign ownership report 2 to 12 percentage-points higher female shares of permanent main-task workers at firm headquarters compared with non-acquired firms and the differential increases with the level of gender equality in the MNEs' home countries. We estimate that 1 to 7 percent of the productivity increase caused by foreign acquisition can be attributed to workforce reorganization that may reduce gender-based misallocations of talent.

Keywords: Gender inequality, Foreign ownership
JEL Code: J16; F23

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1 Introduction

For countries with low fertility rates, low immigration rates, and rapidly aging populations, increasing the national workforce by boosting female labor force participation often becomes a policy priority to maintain or improve economic growth. For example, the OECD's Going for Growth 2017 priorities for Japan and Korea include: "Strengthen policies to support female labour force participation."[1] Ideally, increased female labor force participation is accompanied by reductions in gender discrimination that limit women's occupational choices and career paths. Hsieh et al. (2019) estimate that 20 to 40 percent of the growth in aggregate output per person in the USA from 1960 to 2010 was due to improved allocation of labor force talent, specifically better utilization of the talents of women and black men.

Despite the growing recognition that increasing female employment and reducing workforce gender discrimination can boost economic growth, actually achieving these goals can be challenging in countries with high levels of gender inequality in the workforce. Current government and business leaders have risen to power within the existing system of societal gender norms and they often are reluctant or simply unable to effect changes in gender norms from within the existing system. Outside influences such as international organizations, events, traditional media and social media all can play a role in promoting more gender-equal workplace norms within a country.[2]

Another outsider with the potential to influence a country's workplace gender norms is a foreign investor, particularly one coming from a country with very different norms. Multinational enterprises (MNEs) may bring aspects of their home country workplace culture, such as gender norms, with them when entering a market or they may seek to adopt the gender norms of the host country as part of their assimilation strategy. We seek

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[1]OECD (2017a), pp. 235 and 237. Throughout the paper "Korea" is used to refer to the Republic of Korea (i.e., South Korea).

[2]Examples of such influences include the UN Convention on the Elimination of All Forms of Discrimination against Women, International Women's Day, and the #MeToo Movement.

to explore whether MNEs from more gender-equal countries of origin bring gender-equal employment practices with them to a less gender-equal host country or not.

To address this question, we use firm-level panel data for Korea, a country with quite low gender equality in the workplace despite a high rate of female educational attainment.[3] Korea's gender pay gap of 37.2 percent was the highest in the OECD in 2015, and more than double the OECD average of 14.3 percent.[4] Korea ranks near the bottom of the OECD for female labor force participation and for gender equality in labor force participation.[5] Korea is also an interesting host country to use for this study since it hosts large numbers of foreign affiliates from countries that rank well above it in gender equality (e.g., the USA and European nations), a large number of affiliates from a country with a similarly low gender-equality ranking (i.e., Japan), and a few affiliates from countries with even worse gender-equality rankings (e.g., Middle Eastern countries). A key advantage of our dataset is the identification of MNE country of origin so that we can analyze the potential relationship between home country gender norms and host country employment gender outcomes.

We find evidence that MNEs from more gender-equal countries bring gender-equal employment practices with them in investing abroad. Foreign owners employ proportionately more female workers and more female CEOs than do domestic owners and the differentials increase with the level of gender equality in the MNEs' home country. Using difference-in-differences and nearest-neighbor matching techniques, we find that foreign acquisition leads to increases of 2 to 12 percentage points in the female shares of perma-

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[3]Korea ranked 124 out of 149 countries in the World Economic Forum (2018) Global Gender Gap Index for Economic Participation and Opportunity. A bachelor's degree or equivalent had been achieved by 24.1 percent of the female population age 25 and over in Korea versus 33.4 percent for men in 2015, compared with comparable statistics (female percent, male percent) for France (17.1, 18.2), the UK (19.8, 30.0), and the USA (32.7, 32.3), the only G7 countries reporting these statistics that same year. (World Bank, 2019).

[4]Gender pay gap of median monthly earnings defined as the difference between male and female median monthly earnings divided by male median monthly earnings for full-time employees (OECD, 2017b).

[5]In 2017, Korea's 59 percent labor force participation rate (LFPR) for women was fifth lowest among OECD countries, while the OECD average was 64 percent, the USA rate was 67.9 percent and Japan's rate was 69.4 percent, based on the population aged 15-64. The gender gap in LFPR was 20.3 percent for Korea, topped only by Turkey (40.6 percent), Mexico (35.1 percent) and Chile (20.6 percent), and compared to an OECD average of 16.2 percent (OECD, 2019).

nent main-task workers[6] at firm headquarters compared with firms that remain under domestic ownership. This workforce reorganization due to foreign acquisition increases firm-level total factor productivity by an estimated 0.05 to 0.41 percent, which is 1 to 7 percent of the productivity gain due to foreign acquisition.

Our research relates to three main strands of economic literature. The most closely related strand seeks to quantify the effects of globalization, both trade and foreign direct investment (FDI), on gender outcomes, typically measured by gender wage gaps and female shares of the workforce and/or shares of managerial positions. The literature on this topic is often country-specific and finds conflicting results. Examples of papers finding that trade or trade liberalization lowers gender wage gaps include Black and Brainerd (2004) using USA import data and Juhn, Ujhelyi and Villegas-Sanchez (2014) using Mexican export data, while papers reaching the opposite conclusion include Berik, Rodgers and Zveglich (2004) using import data from Korea and Taiwan and Bøler, Javorcik and Ulltveit-Moe (2018) using export data from Norway. Research also has compared gender wage gaps at foreign-owned firms versus locally-owned firms and found similarly conflicting results. Vahter and Masso (2019) find larger gender wage gaps in MNEs than in locally-owned firms in Estonia, while Greaney and Tanaka (2019) find the opposite result using Japanese data.[7] Using cross-country data for 80 countries from 1983-1999, Oostendorp (2009) concludes that the within-occupation gender wage gap in richer countries tends to decrease with trade and FDI but he finds no significant effect in poorer countries.

A few papers in this strand of literature have used female employment shares, rather than gender wage gaps, to measure gender equality outcomes. Tejani and Milberg (2016) conclude that changes in female employment shares in manufacturing across countries since the mid-1980s are primarily driven by changes in production processes (e.g., adopt-

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[6]Over 90 percent of the workforce in our dataset is classified as permanent, rather than temporary, workers, while 19 percent work in main tasks at firm headquarters. The latter include executives, managers and others assigned to the most elite postings within the firm. See the Data section for further details.

[7]In both of these studies the MNEs are predominantly coming from countries with higher gender equality than the host country, either Estonia, the least gender equal country in the European Union, or Japan.

ing more capital-intensive technology) rather than by export growth. Kodama, Javorcik and Abe (2018) find that MNEs tend to employ proportionately more women and more female managers compared with locally-owned firms in Japan. Siegel, Pyun and Cheon (2019) find that MNEs are more likely to hire and/or promote female managers in Korea. Tang and Zhang (2017) find that foreign affiliates in China from more gender-equal countries tend to have higher female shares of employment and are more likely to have a female CEO compared with foreign affiliates from less gender-equal countries. Of these papers on MNEs and female employment shares and the aforementioned ones on MNEs and gender wage gaps, only Tang and Zhang (2017) allow for MNE heterogeneity in country of origin gender equality, which is also our focus.

A second related strand of literature reverses the direction of causality to examine how gender (or racial) discrimination impacts economic outcomes, as in the aforementioned paper by Hsieh et al. (2019). Siegel, Kodama and Halaburda (2014) find higher profitability among firms in Japan that employ and promote more female managers, while Siegel, Pyun and Cheon (2019) find a similar result for Korea. The latter two papers use return on assets to measure firm-level profitability, while we will use firm-level total factor productivity to examine whether higher female employment shares due to foreign acquisition of Korean firms improves firm productivity.

The third strand of literature seeks to understand the economics of culture. Guiso, Sapienza and Zingales (2006, 2009) argue that shared cultural norms such as religiosity, social capital, and trust are key determinants of bilateral economic outcomes such as trade, FDI and portfolio investment. Alesina, Giuliano and Nunn (2013) examine the opposite causal link, from economics to culture, in demonstrating that societies with less equal gender norms today tend to have made more intensive use of plough agriculture, which requires greater physical strength than shifting cultivation techniques, during their pre-industrial eras. Rather than focusing on a one-way causal relationship between cultural norms and economic outcomes, Maystre, Olivier, Thoenig and Verdier (2014) argue

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that they should be treated as co-determinant. They show that trade integration causes cultural convergence and vice versa, using answers to questions on the World Values Survey to examine cultural distances across countries. Our focus is on the transfer of gender-related cultural norms through MNE activities. Do foreign owners bring workplace gender norms from their home country with them to a country characterized by particularly high gender inequality in the workplace and does this matter for firm productivity? We measure workplace gender norms by using firm-level female shares of the workforce and the gender of a firm's Chief Executive Officer (CEO).

We make four main contributions to the existing literature on this topic. To the best of our knowledge, our research is the first to establish a causal relationship between MNE country of origin gender equality and workplace gender-equality outcomes in the host country. We use difference-in-differences (DID) and nearest-neighbor matching empirical strategies on Korean firm-level panel data from 2009-2016 to establish this causal relationship. We find that acquisitions of Korean firms by MNEs from more gender-equal countries of origin increase female employment shares of a particular workforce subgroup in the acquired firms, and this increase in shares is due to workforce reorganization rather than expansion. Kodama et al. (2018) find a 9-10 percentage-point increase in female share of the workforce and a slightly larger increase in employment due to foreign acquisition of a Japanese firm.[8] Our work differs from theirs by allowing for MNE country of origin heterogeneity in gender equality, by finding evidence that foreign acquisition causes workforce reorganization that favors women in key positions, and by linking this MNE workforce reorganization to productivity improvements.

Our second contribution is to create a "gender-equality distance" term to measure the differences between MNE home countries and host countries in their levels of gender equality. MNEs from countries that are further from Korea's level of gender equality are expected to deviate more from Korea's gender norms in employment. The advantage of

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[8]Kodama et al. (2018) also find that foreign affiliates are more likely to have family-friendly human resource policies such as flexible working hours, telecommuting, and childcare facilities or subsidies.

our gender-equality distance term relative to merely using a gender-equality index as a variable is that our distance term can be used to examine these issues with host countries that rank anywhere along the gender-equality spectrum. In comparison, Tang and Zhang (2017) use the United Nations Development Program Gender Inequality Index with firm-level data from China and find that MNEs from more gender-equal countries tend to employ higher female workforce shares in China, but they do not directly compare MNEs to Chinese firms to show significant differences between foreign-owned and domestic-owned firms. We go further than Tang and Zhang (2017) by establishing significant differences between MNEs and domestic firms and by establishing a causal relationship of foreign ownership on female employment shares using DID methods.[9] Our gender-equality distance term may be particularly useful in cases where a host country such as China lies at an intermediate level in terms of gender equality, with large FDI flows coming from countries that are more gender equal (e.g., Europe, USA) and from countries that are less gender equal (e.g., Japan, Korea).

Our third contribution is finding evidence that MNE influences can work against gender equality in that MNEs from less gender-equal countries of origin may bring their less gender-equal practices across an international border. With some observations of such MNEs coming from countries that rank below Korea on gender equality, we find that these MNEs tend to have lower female employment shares than do Korean-owned firms.[10]

Our fourth and final contribution is using the DID method to estimate the productivity gains caused by foreign acquisition, and in particular the gains specifically due to

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[9]Tang and Zhang (2017) pursue the related topics of MNE spillover effects on gender norms in domestic-owned firms and the accompanying productivity gains as the losses due to gender discrimination are reduced.

[10]An interesting question left for future research is testing for symmetric effects by investors from countries that rank above or below a host country in terms of gender equality. Do investors from less gender-equal countries bring their workplace practices with them to more gender-equal host countries? Anecdotal evidence can be seen in Mitsubishi Motors Manufacturing of America Inc.'s $34 million settlement in 1998 of a class action lawsuit brought by over 300 female employees involving workplace sexual harassment and Toshiba America Inc.'s 2001 settlement of a gender bias lawsuit by two high-ranking female executives.

workforce reallocation that favors female workers in key positions at the headquarters. Siegel, Pyun and Cheon (2019) show that firms in Korea achieve higher returns on assets by having a larger number of female managers, and they show that foreign-owned firms tend to hire and/or promote more female managers than Korean-owned firms. Our results, based on a larger panel dataset, enable us to quantify that workforce reorganization due to foreign acquisition increases firm-level total factor productivity by 0.05 to 0.41 percent. This implies that 1 to 7 percent of the productivity increase due to foreign acquisition may be caused by reduced gender-based misallocations of talent. Our estimate range compares favorably with Hsieh et al. (2019) who find that 8 percent of growth in GDP per person in the USA between 1960 and 2010 was due to declining labor market discrimination on both gender and racial dimensions.[11]

The next section describes our empirical strategy which progresses from establishing correlations in the data between our variables of interest to estimating causal relationships, using both DID and nearest-neighbor matching strategies. Section three describes our Korean firm-level panel data and presents summary statistics. Our main empirical results are presented in section four. In section five we present a short extension to address whether foreign ownership can increase total factor productivity through workforce reallocation. Concluding comments are included in section six.

2 Empirical Strategy

2.1 OLS Approach

We begin our analysis of the impact of foreign ownership on gender balance of the workforce by seeking suggestive evidence using the following ordinary least squares (OLS)

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[11]Hsieh et al. (2019) find an additional 36 percent of growth can be explained by declining barriers to human capital accumulation.

regression equation:

$$Y_{it} = \alpha + \beta D_{it} + \gamma \mathbf{X_{it}} + \delta_{jrt} + \varepsilon_{it} \tag{1}$$

where subscript i denotes a firm, t a year, j an industry, and r a region. Y_{it} is the female share of the workforce for firm i in a given year t, D_{it} is an indicator of majority-foreign ownership that equals 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise,[12] $\mathbf{X_{it}}$ is a vector of firm-level control variables such as employment, sales, purchases, exports, and imports, and δ_{jrt} is a vector of industry-region-year fixed effects. We conservatively cluster standard errors at the sector level, which allows errors to be correlated within sectors. We use equation (1) to examine correlates of firms' female shares of the following: permanent workers, permanent workers at headquarters, permanent main-task workers at headquarters, and permanent plus temporary workers.

Since "foreign" owners of MNEs in Korea include a heterogeneous group of countries of origin in terms of gender equality, our next step is to capture this heterogeneity first by using dummy variables for specific countries (i.e., USA, Japan) or groups of countries by gender equality ranking (i.e., Europe, countries less gender-equal than Korea) and then by using continuous variables. The variables measure the "gender-equality distance" between the MNE country of origin and Korea using the World Economic Forum (WEF, 2010) Global Gender Gap Report 2010 index and rankings. The equations are as follows:

$$Y_{it} = \alpha + \beta D_{it} \times (GI_i - 0.520) + \gamma \mathbf{X_{it}} + \delta_{jrt} + \varepsilon_{it} \tag{2}$$

$$Y_{it} = \alpha + \beta D_{it} \times (111 - GR_i)/100 + \gamma \mathbf{X_{it}} + \delta_{jrt} + \varepsilon_{it} \tag{3}$$

where GI_i is the Gender Index (i.e., Economic Participation and Opportunity index) of country i and GR_i is the corresponding Gender Rank of country i, both of which are drawn from WEF (2010). Korea is ranked at 111 with an index of 0.520 in the WEF (2010)

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[12]We use a 50 percent criteria for defining foreign ownership because that level clearly establishes foreign corporate control and that level is required in order to identify the MNE home country.

report.[13] For example, the gender-equality distances of the USA, Japan and India from Korea based on their Gender Rankings are 1.05, 0.1 and -0.17, respectively, with the USA's ranking (6) well above Korea's, Japan's ranking (101) slightly above Korea's, and India's ranking (128) below Korea's. Both gender-equality distance terms use Korea's level of gender equality as the zero point and positive (negative) values indicate that a country is more (less) gender equal than Korea.

There are 134 countries in the WEF (2010) sample and the index ranges from 0.195 to 0.879 with higher values corresponding to more gender equality. The population-weighted average is 0.59, which implies that only 59 percent of the gender gap in employment outcomes has been closed on average across the 134 included countries in 2010. We simplify our analysis by using a single year's gender gap index to establish gender-equality distance from Korea since our focus is on cross-country heterogeneity rather than on country-level changes over time. We use the WEF (2010) index since that year is the first year in our panel data for 2009 to 2016 in which we can observe foreign acquisitions (i.e., ownership switches) of Korean firms.[14]

We also consider an alternative indicator of workplace gender balance by examining the gender of each firm's CEO. Our dataset provides CEO gender only for 2016, so our three estimating equations with the single year restriction become as follows:

$$CEO_i^* = \alpha + \beta D_i + \gamma \mathbf{X_i} + \delta_{jr} + \varepsilon_i \tag{4}$$

$$CEO_i^* = \alpha + \beta D_i \times (GI_i - 0.537) + \gamma \mathbf{X_i} + \delta_{jr} + \varepsilon_i \tag{5}$$

$$CEO_i^* = \alpha + \beta D_i \times (123 - GR_i)/100 + \gamma \mathbf{X_i} + \delta_{jr} + \varepsilon_i \tag{6}$$

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[13]See Appendix Table B.1 for a full list of ranked countries in 2010.

[14]As a robustness check, we also use WEF Gender Gap Indices for other years and our results remain consistent. Note that the correlation between the WEF (2010) index and the WEF (2016) index for employment outcomes is high at 0.9 so changes over this six-year period are relatively small.

$$CEO_i = \begin{cases} 1 & \text{if } CEO_i^* > 0 \\ 0 & \text{if } CEO_i^* \leq 0 \end{cases}$$

where the year is 2016, CEO_i is the observed binary outcome such that it equals 1 if the gender of firm i's CEO is female and 0 otherwise, CEO_i^* is an underlying latent variable, and δ_{jr} are industry-region fixed effects. Korea is ranked at 123 out of 144 countries with an index of 0.537 in the WEF (2016) report.

2.2 Difference-in-Differences (DID) Approach

We look for a causal relationship between foreign ownership and a more gender-balanced workplace using a DID strategy with the following regression equation:

$$Y_{it} = \alpha + \beta D_{it} + \gamma \mathbf{X_{it}} + \delta_i + \lambda_t + \varepsilon_{it} \tag{7}$$

where δ_i are firm fixed effects and λ_t are year fixed effects. Based on results from the DID estimations of female shares of the workforce, we repeat the DID analysis using the number workers in total and by gender for each workforce grouping for each firm as the dependent variable as follows:

$$EMP_{it} = \alpha + \beta D_{it} + \gamma \mathbf{X_{it}} + \delta_i + \lambda_t + \varepsilon_{it} \tag{8}$$

where EMP_{it} is the number of workers in the specified group.

In the same way that the industry-region-year fixed effects in equation (1) are replaced by firm and year fixed effects in equation (7), we make the same changes to fixed effects for equations (2) and (3) where foreign ownership is measured continuously using the WEF gender index and rankings.

The advantage of the DID approach is being able to control for all observable and unobservable non-random aspects of the acquisition decision that are time invariant at

the firm level. In addition, the DID approach exploits within-firm over-time variation of foreign ownership, so can establish a causal relationship. An additional advantage for our study is we are able to include MNE country of origin heterogeneity (i.e., using the gender-equality distance from Korea) with this approach. The disadvantage of the DID approach alone is that it does not address the issue of non-random sample selection (i.e., firms chosen for foreign acquisition). To address this issue, we combine nearest-neighbor matching with the DID approach, as described below.

2.3 Nearest-Neighbor Matching Combined with a DID Approach

Define a dummy variable

$$
C_{it} = \begin{cases} 1 & \text{if} \quad D_{it} = 1 \text{ and } D_{it-1} = 0 \\ 0 & \text{if} \quad D_{it} = 0 \text{ and } D_{it-1} = 0. \end{cases}
$$

Let ΔY_{1it} be the change in potential female share for a firm i between year t and year $t-1$ if $C_{it} = 1$. Let ΔY_{0it} be the change in potential female share for a firm i between year t and year $t-1$ if $C_{it} = 0$. The change in observed female share, ΔY_{it}, can be expressed as follows:

$$
\Delta Y_{it} = \Delta Y_{0it} + (\Delta Y_{1it} - \Delta Y_{0it}) \times C_{it}.
$$

We can only observe either ΔY_{1it} or ΔY_{0it}, but never both. Define the average treatment effect on the treated (ATET) as follows:

$$
\text{ATET} = \mathbb{E}\left[\Delta Y_{1it} - \Delta Y_{0it} | C_{it} = 1\right]. \tag{9}
$$

Since we can only observe ΔY_{1it}, we must solve the missing value problem to compute the ATET. We use one-to-one nearest-neighbor matching to impute the missing change in potential female share for each treated firm by using a weighted function of the covariates.

We further restrict that the matched control observations are assigned only from the same year as the acquired firm. As a robustness check, we alternatively restrict the matched firms to be assigned from the same sector-year and the same industry-year.

We use observable characteristics of firms, such as employment, sales, purchases, exports, and imports, as covariates to find the most similar firms as potential acquisition targets. All covariates are lagged one year in order to reflect that foreigners' investment decisions are based upon the pre-acquisition period.

Moreover, we exclude treatment status observations if $C_{it} = 1$ and $D_{it+1} = 0$, which implies that foreign acquisition happened in year t and then domestic firms re-acquire ownership in year $t + 1$. During the period from 2010 to 2016, we are able to identify 113 foreign acquisitions that meet our criteria for same year matching. By matching these foreign acquisitions to their nearest-neighbor firm, we are able to create the counterfactual of an acquired firm had it remained under domestic ownership, thereby addressing the problem of sample selection. Then we compare the workplace gender outcomes in the acquired firm versus its matched control firm in order to infer the causal impact of foreign ownership.[15] One disadvantage of the matched firms DID analysis approach for our study is we cannot include MNE country of origin heterogeneity because the treatment status (i.e., foreign acquisition) cannot be interacted with the gender-equality distance term.[16]

3   Data and Summary Statistics

The primary dataset is the Survey of Business Activities (SBA) from Statistics Korea. It is an annual survey which was first carried out in 2006. We use an eight-year data horizon for the period 2009 to 2016 because female employment information is only available from

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[15]Arnold and Javorcik (2009) use a similar technique to examine productivity improvements due to foreign acquisition of Indonesian plants.

[16]In addition, we have insufficient numbers of treated observations to define separate country-of-origin treatment variables (e.g., foreign acquisition by US, by Japan, etc.).

2009. The dataset covers all industries and includes firms that are conducting business activities in Korea as of the survey reference date, employing at least 50 full-time employees, and reporting a capital stock of at least 300 million Korean won (about 267,869 USD using the 2010 exchange rate).[17] All firms that satisfy the above conditions are included in the sample. The target sample size in each year is approximately 13,000 firms in Korea, which represents 80 percent of the total output of Korea in the year 2008. The structure of the data set is panel so that we can trace the firm ID across years.

Basic firm characteristics, such as employment (including female employment), foreign ownership, sales, purchases, exports, and imports, are available.[18] For each firm, we can also identify the region, sector, and industry. The regions match the administrative divisions of Korea. The country is made up of 16 first-tier administrative divisions in the year 2010: one special city, six metropolitan cities, eight provinces, and one special autonomous province. The sectors are identified by 17 one-digit divisions based on the Korean Standard Industrial Classification. At a more detailed level, we can identify the industries with 64 two-digit divisions based on the Korean Standard Industrial Classification. If a firm produces multiple products across different industries, the survey identifies the industry of a firm as the one with the highest sales value. If a firm has multiple plants, the survey identifies the firm's region based on its headquarters' location.

For our main dependent variable, we construct a female labor share at the firm level. We use four slightly different measures to capture the female share at the firm level. In the baseline analysis, we define employment as the number of permanent workers whose contract period is one year or more or for whom the contract period is not specified. Then we calculate the female share as the ratio of the number of permanent female workers to the total number of permanent workers. Second, the female share is defined as the ratio of

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[17]For enterprises in "Wholesale and Retail Trade" and "Service" industries, enterprises with capital stock of 1 billion Korean won (about 892,897 USD in the 2010 exchange rate) or more are included in the target population even if they have fewer than 40 full-time employees.

[18]Our dataset does not include worker wages by gender, which prevents us from measuring gender wage gaps.

female permanent workers working at the firm's headquarters (HQ) to total permanent workers working at HQ. Third, the female share is defined as the ratio of female permanent main-task workers at HQ to total permanent main-task workers at HQ. Lastly, the female share is defined as the ratio of permanent and temporary female workers to total permanent and temporary workers . For the year 2016 only, we have information on the gender of each firm's CEO. This information enables us to analyze a correlation between foreign ownership and female CEOs.[19]

Korea's labor market features strong dualism in which regular employees have the expectation of long-term or "permanent" employment with the firm and some family-friendly workplace benefits (e.g., paid maternity leave, childcare leave and childcare facilities at the workplace) but in exchange are expected to work very long hours with no overtime pay.[20] Irregular or temporary workers do not have these benefits but have more reasonable working hours. In our dataset, 91.7 percent of worker observations are for permanent workers, so they are the main focus of our empirical work, but we also include temporary workers in some specifications. Almost half (i.e., 48.2 percent) of our worker observations are of permanent HQ workers, while 19.1 percent are of permanent main-task HQ workers. According to the SBA categorization, the latter group includes corporate executives, managers and others assigned to so-called "main tasks" of the firm including management, planning, personnel, accounting, and research and development.[21] Work postings at HQ and in these main-task departments are considered to be the most elite postings within the firm. For this reason, we focus on permanent workers at HQ and permanent main-task workers at HQ in some specifications.

We construct the foreign ownership variable as follows. Each firm must report for-

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[19]Tang and Zhang (2017) use a similar strategy to analyze the relationship between foreign ownership and the gender of managers of firms operating in China. However, they do not have the exact information on managers' gender, and hence came up with a novel method to identify the gender of each firm's manager based on the last Chinese character of the name of each firm's legal representative in their data. We strengthen their findings by using better data, i.e., the CEO gender information of each firm.

[20]See Cho, Lee and Jung (2014) for further details on Korea's labor market dualism.

[21]Non-main-task assignments at HQ involve work in manufacturing, wholesale and retail trade departments, or other assignments that are not specified above.

eigners' share in total equity. We define foreign-owned firms as firms in which 50 percent or more of equity is owned by the foreign parent firm in the corresponding year. The data also identifies the country where the parent company is located if 50 percent or more of equity is owned by the parent firm so that we can link the information on the country of origin to the female share of each firm.

The dataset used to measure country-level gender equality is drawn from The Global Gender Gap Report published annually by the World Economic Forum since 2006. The Global Gender Gap Index captures the magnitude of gender-based disparities, with the most recent edition for 2018 covering 149 countries on their progress towards gender parity on a scale from 0 (disparity) to 1 (parity) along with country rankings across four dimensions: Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment. For our key variable, we use the Economic Participation and Opportunity Index, which contains three gender gap concepts - the participation gap, the remuneration gap and the advancement gap.

Table 1 summarizes the distribution of MNEs included in our dataset in 2010 by country of ownership with each country's corresponding Gender Gap Index and Rank.[22] Japan accounts for the largest number of MNEs with 213, or 26.9 percent of the 791 in total, followed by the USA with 173 (or 21.9 percent) and then Germany with 69 (8.7 percent). While Japan's gender gap ranking of 101 puts it quite close to Korea's rank of 111, most of the MNE countries of ownership rank well above that level, ranging from Norway, ranked number 3, to Spain at number 78. The low-ranking countries in addition to Japan and Korea are Austria (92) and Malaysia (99) with six firms each, Italy (97) with seven firms, and Kuwait (107), UAE (120), India (128) and Yemen (134) all with only one firm. The table illustrates that gender gap rankings can be quite disparate within regions. Austria's and Italy's low rankings are outliers among European countries, while Singapore's

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[22]Appendix Table B.1 shows the full list of 134 countries with their Gender Gap Indices and Ranks. Note that Taiwan, Hong Kong, and Swaziland are not included in the Gender Gap Index, so the observations associated with these three economies in our dataset are dropped when the Gender Gap Index or Rank is used in estimations.

high ranking of 20 is in stark comparison to Japan's and Korea's low rankings.

Summary statistics for our dependent and independent variables appear in Table 2. The female share of the workforce is only 26 percent for three of our workforce groupings (i.e., permanent, permanent HQ, and permanent plus temporary workers) but increases to 29 percent for the permanent main-task HQ grouping. Female CEO's led only 5 percent of firms in 2016, the one year available for that observation. Foreign-owned firms make up 8 percent of the firm observations for 2009-2016.

Table B.2 shows the regional variations of female shares of the workforce in Korea for 2010. Almost 41 percent of the 10,741 firms were located in Seoul and 57 percent of the 796 foreign-owned firms were located there.[23] On average, MNEs in Seoul had female labor force shares of 35 percent compared to the 29 percent reported by domestic firms on average. The next largest concentration of firms in our dataset is in Gyeonggi, with 2,206 firms or 20.5 percent, of firms, of which 143 were foreign-owned. In this province, foreign-owned firms employ smaller shares of female workers, at 21 percent, than do domestic-owned firms, at 23.3 percent, on average. In fact, in 10 out of 15 regions that hosted at least one MNE in 2010, the female share of the workforce was lower for MNEs than for Korean-owned firms on average. The remaining 5 regions (i.e., Seoul, Busan, Incheon, Gwangju, and Gwangwon) hosted 54 percent of all firms and 64 percent of MNEs.

Sectoral variations in female shares of Korea's workforce in 2010 appear in Table B.3. Of the 17 sectors, 13 report at least one MNE. In eight of these sectors, MNEs report higher female shares of the labor force than do Korean-owned firms on average, but the largest number of MNEs are in manufacturing with 361 firms and a female share of only 20.1 percent, lower than the 24.6 percent reported for Korean-owned manufacturing firms. The next largest sector for MNEs is wholesale and retail trade with 243 firms reporting a female share of 33.9 percent, slightly higher than the 32.1 percent reported by domestic-owned firms in the sector. Other sectors such as transportation and storage, accommo-

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[23]As described previously, the region of a multiplant firm is based on its headquarters location, which is often Seoul.

dation and food services, and education have large gaps favoring MNEs over domestic firms in their female shares, but these sectors have fewer MNEs in them with between 2 and 43 MNEs per sector. The data distribution results in Tables B.2 and B.3 combined suggest that there are large disparities across regions and sectors in female shares of the workforce and in comparisons of these shares between MNEs and domestic firms. Both tables show the bottom line comparison that MNEs on average report female shares of the workforce of 28.6 percent while Korean-owned firms report female shares of 25.2 percent.[24] We proceed with our empirical estimations in the next section.

4 Results

4.1 OLS Results

Our results for estimating equation (1) seeking suggestive evidence between foreign ownership and female shares of the workforce are shown in Table 3, with foreign ownership measured by an indicator variable. Each column represents a different workforce grouping: permanent workers, permanent workers at headquarters (HQ), permanent main-task workers at HQ, or permanent plus temporary workers. With each grouping, the foreign dummy variable generates a significant and positive coefficient, implying that foreign ownership is correlated with higher female shares of the workforce even when we control for the added covariates and for industry-region-year fixed effects. The strongest result is seen for female shares of permanent main-task HQ workers, where foreign ownership is associated with a 6.1 percentage-point higher female share. For most of our workforce groupings, higher female shares are associated with larger employment, lower sales and lower trade, although the trade effects are quantitatively quite small.

In Table 4 we explore discrete differences in foreign country of ownership by divid-

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[24]Tang and Zhang (2017) find a much larger female share gap between foreign-owned and domestic-owned firms in China in 2004 with female shares of 48 and 39 percent, respectively.

ing foreign owners into five groups: USA (1,438 observations, gender gap ranked 6), Europe (2,829 observations, observations-weighted gender gap ranked 38), Japan (2,001 observations, gender gap ranked 101), Less Gender Equal countries[25] (37 observations, observations-weighted gender gap ranked 123) and Other Foreign (812 observations, observations-weighted gender gap ranked 32). The strongest results are seen for MNEs from the USA which are associated with 3.7 to 8.0 percentage points higher female employment shares than Korean-owned firms, depending on the employment group. The Other Foreign owners grouping also produced highly significant coefficients for all four worker groupings but in a tighter range of 4.3 to 6.5 percentage points. Based on the gender gap rankings, it is somewhat surprising that the Europe dummy variable only produces a significant coefficient for two worker groupings, while the Japan dummy variable produces a significant coefficient across all four worker groupings. The size of the coefficients follows our expectations, however, with Japan's coefficients of 2.1 to 3.3 percentage points being much smaller than Europe's coefficients of 4.4 to 7.0 percentage points. The countries that are Less Gender Equal than Korea produced significant, negative coefficients for three of our four workforce groupings. MNEs from these countries employ female workforce shares that are 5.2 to 5.3 percentage points lower than Korean-owned firms.

Next we measure the difference between foreign and Korean ownership using continuous variables based on the gender-equality distance between the foreign country of origin and Korea. Using the Gender Index distance specified in equation (2), Table 5 shows that the higher a country's gender equality relative to Korea, the higher the female share of their MNE workforce in Korea, with the strongest results again seen for permanent main-task HQ workers. The results indicate that a 0.1 increase in a country's Gender Gap Index corresponds with a 3.1 percentage point increase in the female share of permanent main-task HQ workers.[26] Alternatively, a one standard deviation (or 0.12) increase in a

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[25]Less Gender Equal countries are defined as those ranked below Korea (111) in Gender Gap Rank.
[26]The similar results using the Gender Gap Rank distance specified in equation (3) are shown in Ap-

country's Gender Gap Index is associated with a 3.7 percentage-point higher female share of this workforce. We estimate a 7.0 percentage-point increase in the female share of this workforce corresponding with an improvement from Japan's level (gender gap ranked 101, index of 0.572) of gender equality to the USA's level (gender gap ranked 6, index of 0.799).

The results in Table 6 reflect a change in our dependent variable from female shares of workforce to an indicator variable that takes a value of 1 if a firm is headed by a female CEO, as in estimating equations (4)-(6). This information is available only for 2016, when female CEOs were reported at 5 percent of firms in our dataset. The results in column (1) using a single Foreign dummy variable confirm a statistically significant and positive correlation between foreign ownership and female CEOs. Foreign-owned firms are 2.3 percent more likely to have a female CEO compared with Korean-owned firms. When we identify five discrete types of foreign owners, we see that a female CEO is 6.1 percent more likely under American ownership, 3.4 percent more likely under Other Foreign ownership, and 2.5 percent more likely under European ownership than under Korean ownership. The coefficients on Japanese ownership and on the Less Gender Equal country group ownership are negative but insignificant. The statistical significance of our results is stronger when we allow for country of ownership heterogeneity using our continuous variables, the Gender Gap Index and Gender Gap Ranking distances, as shown in columns (3) and (4). A one standard deviation increase in a country of origin's Gender Gap Index makes a female CEO 1.9 percent more likely.

Having established positive correlations between foreign ownership and both female shares of the workforce and the likelihood of having a female CEO, we examine interaction relationships in Table 7. These results show a strong positive correlation between female-led firms and female workforce shares among Korean firms, after controlling for other factors as in previous tables. Having a female CEO of a Korean firm is associ-

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pendix Table B.4.

ated with a 5.2 to 6.0 percentage point higher female share of the workforce, with significant coefficients for all four workforce subgroups. For a foreign firm, having a female CEO produces a significant coefficient on female shares of only two workforce subgroups—permanent HQ workers (5.1 percentage points) and permanent main-task HQ workers (5.3 percentage points). The results also indicate that foreign ownership has a positive correlation with female workforce shares even among the majority of firms that are led by a male CEO. The strongest correlation is seen with female shares of permanent main-task HQ workers, which tend to be 6.5 percentage points higher under foreign ownership with a male CEO than under Korean ownership with a male CEO. We now turn to the task of establishing causal relationships.

4.2 Difference-in-Differences Results

Table 8 shows DID results for equation (7). The Foreign Dummy coefficients are positive for each worker grouping but only statistically significant for permanent main-task HQ workers. Firms that switch from Korean to foreign ownership report approximately 2 percentage points higher female shares of permanent main-task HQ workers compared with firms that remain under Korean ownership. Since the female share of this workforce subgroup across all firms is 29 percent, our estimated effect is almost a 7 percent increase from the mean. In Table 9, we repeat the above analysis by including region-year, industry-year, and industry-region-year fixed effects, and a firm-specific trend, and the results are still robust, at 2.0 to 2.4 percentage-points higher female shares of permanent main-task HQ workers due to foreign acquisition.

A significant increase in the female share of permanent main-task HQ workers could be due to an increase in female workers, a decrease in male workers or a combination of both factors. To explore these contributory factors, Table 10 presents results using the employment of permanent main-task HQ workers in total and by gender as the dependent variable, as expressed in estimating equation (8). These results indicate that firms

that switch to foreign ownership tend to decrease their total number of permanent main-task HQ workers by 7.7 percent while decreasing their male workers in this subgroup by 10.2 percent after controlling for firm-specific trends. To check whether these negative employment effects on this worker subgroup reflect workforce reorganization or workforce downsizing, we repeat the analysis for Table 10 on our two other core workforce groupings—permanent and permanent HQ workers.[27] We find no significant employment effects for all permanent workers or for permanent HQ workers from a switch to foreign ownership when firm-specific trends are included in the estimations.

These results combined with Table 10 results imply that foreign acquisitions cause workforce reorganization that tends to shift some male permanent main-task HQ workers out of the main departments and into other departments at HQ. Alternatively, this workforce reallocation could occur through male departures from permanent main-task HQ positions (i.e., through retirement or pre-retirement voluntary or involuntary departures), accompanied by hiring of male workers in permanent non-main HQ positions. Case study evidence of foreign acquisitions of Korean firms by American and European MNEs suggests that workforce reorganization following the foreign acquisition may be due to foreign owners moving the acquired firm from a seniority-based human resource management (HRM) system towards a more performance-based system.[28] Prior to foreign acquisition, worker seniority, which tends to favor male workers, may have played a larger role than performance in determining which workers were posted to the per-

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[27]Employment effect results for our two other core workforce groupings analogous to Table 10 results can be found in Appendix Table B.5.

[28]Froese et al. (2008) conducted case studies on three Korean auto industry firms that were acquired by Western MNEs within the four years following the 1997 Asian financial crisis. They rank the firms based on the level and speed of management integration, from immediate integration (USA MNE) to indifferent integration (German MNE), with an intermediate integration case (French MNE). The USA MNE was the most aggressive in laying off substantial numbers of workers, but reportedly rehired some later on, while the French MNE made efforts to retain and rehire workers who left voluntarily and the German MNE retained most of the Korean managers. Interestingly, Froese et al. (2008) conclude that Korean workers in the acquired firms reported greater satisfaction with the strong moves by the USA and French MNEs to replace a seniority-based HRM system with a performance-based one compared with workers in the German MNE that made fewer HRM changes. Although their study is based on only three acquired firms, the authors' interview and survey evidence support their argument that Korean workers were quite open to changes towards more market-oriented HRM practices, particularly in the post-financial-crisis years.

manent main-task jobs at HQ that are considered highly desirable, elite postings within the firm. If so, the HRM reorganization that accompanies foreign acquisition may allow women to improve their shares of these positions, thereby enabling a favorable outcome for gender equality and for the efficient allocation of worker talent within the firm.

In Table 11 our DID estimations include MNE country of origin heterogeneity by using our continuous variable to measure the gender gap distance between the foreign owners' country of origin and Korea. These results confirm our finding of a causal relationship in which higher female shares of permanent main-task HQ workers are achieved when a firm is acquired by foreign owners from countries that are more gender equal than Korea. A one standard deviation increase in the Gender Gap Index of an MNE country of origin causes a 0.7 to 0.8 percentage point increase in the female shares of permanent main-task HQ workers in the acquired firm.[29] For example, acquisition of a Korean firm by an MNE from the USA (gender gap ranked 6, index of 0.799) causes a 1.4 to 1.5 percentage-point larger increase in the female share of the most elite workforce subgroup within the firm relative to a similar acquisition by an MNE from Japan (gender gap ranked 101, index of 0.572).

4.3   Nearest-Neighbor Matching Combined with DID Results

Using the nearest-neighbor same-year matching criteria described previously, we have 113 matched foreign-acquired firms with parent investors coming from a wide variety of countries of origin in terms of gender equality. The countries range from the highest-ranked country of origin in our dataset, Sweden (ranked 9) to one of the lowest-ranked, India (ranked 142), with Japan (ranked 117) and the USA (ranked 19) having the most observations at 33 and 26, respectively. Using a single dummy variable to capture all of these countries of origin may underestimate or overestimate the true effects of these

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[29]Alternatively, a one standard deviation increase in the Gender Gap Rank distance of an MNE country of origin causes a 0.6 to 0.7 percentage-point increase in the female shares of the most elite workforce subgroup.

heterogeneous foreign acquisitions but each firm is matched based on the other control variables.[30]

We begin by checking the standardized differences for the raw data and the matched sample. The standardized differences are all close to zero, and the variance ratios are all close to one. While the inference is informal, the covariates appear to be well-balanced after matching.[31]

Panel A of Table 12 presents nearest-neighbor matching results for equation (9) using same-year matches for all 113 foreign-acquired firms. In the acquisition year, we find positive and significant average treatment effects on the treated for female shares of both permanent HQ workers and permanent main-task HQ workers at foreign-acquired firms. The ATET's are 2.7 percentage points and 5.1 percentage points more female shares of permanent HQ and permanent main-task HQ workers, respectively. The year after foreign acquisition, the ATET is insignificant for permanent HQ workers, but is significant and slightly larger (i.e., 7.0 percentage points) for permanent main-task HQ workers. This provides further support for our previous interpretation of foreign owners reorganizing their workforce upon acquisition. By comparing each foreign-acquired firm with its most similar non-acquired (i.e., Korean-owned) firm in the same year, we find the foreign owners cause a 5 to 7 percentage-point shift during the acquisition year and the following year that favors female workers in the most elite positions within the firm (i.e., the permanent main-task HQ positions). No significant effects of foreign acquisition are found on female shares of the other workforce subgroups.

When we restrict our nearest-neighbor matching to be within the same sector and year, we reduce our number of matched pairs to 87, as shown in Panel B of Table 12. We find a significant ATET only in the year of acquisition for permanent main-task HQ workers, with a 6.7 percentage-point increase in the female share of this workforce due to foreign

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[30]The observation-weighted Gender Gap Rank corresponding with the dummy variable on foreign acquisitions is 51, approximating Albania in gender rank.

[31]See Appendix Table B.6 for the full covariates balance summary.

acquisition. This estimate is consistent with the range described above for Panel A of Table 12.

We also pursue nearest-neighbor matching within the same industry (more disaggregated than sector) and year and find only 44 matched pairs with this more restrictive matching. Panel C of Table 12 shows these results indicating that foreign acquisition causes an 11.7 percentage-point increase in the acquisition year and an 8.7 percentage-point increase one year later in the female share of permanent main-task HQ workers. Our most restrictive matching of firms uncovered the largest estimated effects of foreign acquisition at almost 9 to 12 percentage points.

Overall the results in these three panels indicate that a switch from Korean to foreign ownership causes an increase in the female share of permanent main-task HQ workers of 5 to 12 percentage points compared with similar firms that remain under Korean ownership. Combining these results with the DID results in the previous section gives us a range of 2 to 12 percentage points for the increase in the female share of the most elite workforce subgroup due to foreign acquisition.

5 Foreign Ownership, Reallocation of Talent and TFP

Hsieh et al. (2019) argue that gender and racial discrimination results in misallocation of a nation's talent. They find that the improved allocation of talent since 1960 can explain 20 to 40 percent of the growth in aggregate market output per person in the USA, with 8 percent of growth attributed to declining labor market discrimination. In the previous section, we established a positive causal relationship between foreign ownership and female shares of the permanent main-task HQ workforce. Further results showed that the increase in female shares is due to reallocations of the workforce within a firm, in particular moving permanent male workers out of main-tasks and into non-main-tasks at HQ. This result implies that foreign owners may reduce misallocations of talent within

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Korean firms that have tended to favor men relative to women for the most elite postings within the firm. If so, improved allocation of talent can increase TFP at the firm-level. We test this hypothesis by asking whether foreign ownership increases the total factor productivity through reorganizing the workforce within a firm.

We compute TFP by following the production function estimation technique in Ackerberg et al. (2015).[32] More specifically, we use the log of real value-added, log of employment, log of real tangible assets, and log of real intermediate input purchase to estimate TFP at the firm-year level. Because the SBA data is expressed in nominal values, we deflate nominal values of value-added, tangible assets, and intermediate inputs by the industry-level production price index drawn from the Bank of Korea. We restrict the sample to firms in the manufacturing sector because our estimating equation is most appropriate for this industry.

We set up the following three empirical specifications.

1. TFP regression without a mediating variable:

$$TFP_{it} = \beta_{10} + \beta_{11}D_{it} + \gamma\mathbf{X_{it}} + \delta_i + \lambda_t + \varepsilon_{it} \tag{10}$$

2. Mediating regression:

$$FS_{it} = \beta_{20} + \beta_{21}D_{it} + \gamma\mathbf{X_{it}} + \delta_i + \lambda_t + \varepsilon_{it} \tag{11}$$

3. TFP regression with a mediating variable:

$$TFP_{it} = \beta_{30} + \beta_{31}D_{it} + \beta_{32}FS_{it} + \gamma\mathbf{X_{it}} + \delta_i + \lambda_t + \varepsilon_{it} \tag{12}$$

where TFP_{it} is firm i's total factor productivity in a given year t and FS_{it} is the female share of the permanent main-task HQ workforce for firm i in a given year t. The first setup

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[32]Please refer to Appendix A for a detailed explanation on computing TFP.

in equation (10) is a DID strategy and it seeks to identify a causal relationship between foreign ownership and TFP. We can interpret the coefficient β_{11} as the total effect of foreign acquisition on TFP. We expect $\beta_{11} > 0$ with statistical significance because foreign-owned firms are mostly from more developed countries than Korea and hence they can bring more advanced technology and/or they are from more gender-equal countries and can reduce gender-based misallocation of talents within a firm. The coefficient β_{11} captures both of those effects.

The second setup in equation (11) is a DID strategy and it seeks to identify a causal relationship between foreign ownership and the female share of permanent main-task workers in HQ (the mediating variable). We already established the relationship between the two from the previous analyses and found $\beta_{21} > 0$ with statistical significance. The last setup in equation (12) extends equation (10) by adding the mediating variable. We can interpret the coefficient β_{31} as the direct effect of foreign acquisition on TFP, purging an indirect effect via the mediating variable. We expect $\beta_{31} > 0$ with statistical significance and smaller in magnitude than the coefficient of the total effect β_{11}. The coefficient β_{32} denotes the TFP impact of the female share of permanent main-task HQ workers conditioning on foreign-ownership and other control variables. We expect $\beta_{32} > 0$ with statistical significance, which implicitly represents (mis)allocation of talents within a firm.[33] Finally, we can quantify the indirect effect (i.e., the impact of foreign ownership on TFP via workforce reorganization) by subtracting the direct effect from the total effect: $\beta_{11} - \beta_{31} = \beta_{32} \times \beta_{21}$.

In Table 13, we present estimation results for equations (10) to (12). In the baseline sample, columns (1) to (3), all MNE countries are included; while in the restricted sample, columns (4) to (6), we restrict our sample to MNE countries with gender rankings higher than Korea. In the baseline sample, all the coefficients of interest, $\beta_{11}, \beta_{21}, \beta_{31}$, and β_{32}, have expected signs and statistical significance. In column (1), foreign ownership in-

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[33]If discrimination in the labor market suppresses utilizing women for permanent main-task postings in headquarters, then the increasing female share in these postings will improve the talent utilization within a firm. Therefore, we expect an increase in female share will boost TFP at the firm level.

creases TFP by 5.91 percent (the total effect). In column (2), foreign ownership increases the ratio of female permanent main-task HQ workers to total permanent main-task HQ workers by 1.35 percent.[34] In column (3), foreign ownership increases TFP by 5.87 percent (the direct effect) conditional on the female share, while the female share increases TFP by 3.43 percent (the allocation of talents effect). Therefore, the indirect effect (i.e., the impact of foreign ownership on TFP via workforce reorganization) is 0.05 percent (=3.43 percent × 1.35 percent). In the restricted sample, columns (4) to (6), we find quite similar results.

Our estimated indirect effect is statistically significant but relatively small in magnitude. Note that the estimated effect is solely based upon the manufacturing sector where foreign ownership is expected to increase the female share of the targeted workforce subgroup by only 1.35 percent. When we compute the impact of foreign ownership on the female share of this workforce subgroup in all sectors, our estimates range from 2 percent to 12 percent. Therefore, conditional on the impact of the female share on TFP being 3.43 percent in all sectors, the upper bound of the indirect impact is 0.41 percent (=3.43 percent × 12 percent). All in all, we quantify that the impact of foreign ownership on TFP via workforce reorganization is 0.05 to 0.41 percent. This implies that 1 to 7 percent of the productivity increase due to foreign acquisition may be caused by reduced gender-based misallocations of talent. Our estimates seem reasonable in comparison to the 8 percent growth estimate due to declining labor market discrimination in the USA found in Hsieh et al. (2019).

6 Conclusion

The female share of the workplace in foreign-owned firms in Korea is 28.6 percent compared with 25.2 percent for Korean-owned firms on average, a relatively modest gap of

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[34]The magnitude is somewhat lower than the magnitudes (2 to 12 percent) of our previous analyses because here we focus only on the manufacturing sector; while the previous analyses are based upon all sectors.

3.4 percentage-points. The differential in female shares of employment varies widely across regions and industries and does not always favor higher shares in foreign-owned firms. After controlling for industry-region-year fixed effects, we find strong suggestive evidence that MNEs from more gender-equal countries of origin, such as the USA and European nations, tend to employ proportionately more women and more female CEOs compared with Korean firms, while MNEs from countries that are less gender equal than Korea tend to employ proportionately fewer women than Korean firms. The strongest differentials between foreign-owned and Korean-owned firms are found in female shares of firms' most elite workers, the permanent main-task workers in headquarters. Foreign-owned firms tend to employ 6.1 percentage-points higher female shares of these elite workers and they are 2.3 percent more likely to have a female CEO compared with Korean-owned firms.

Differences-in-differences estimation allows us to establish a causal link between country of origin gender-equality distance from Korea and workplace gender employment outcomes following a foreign acquisition. A one standard deviation increase in the Gender Gap Index of an MNE country of origin causes a 0.7 to 0.8 percentage point increase in the female shares of permanent main-task HQ workers in the acquired firm. When we use nearest-neighbor matching along with difference-in-differences analysis, we find that firms that switch from Korean to foreign ownership report 2 to 12 percentage points higher female shares of permanent main-task workers at firm HQ compared with firms that remain under Korean ownership. These higher shares appear to be due to corporate reorganization that seems to maintain female employment numbers in main-tasks at HQ while reallocating male workers away from these main-tasks at HQ. We estimate a 5.9 percent increase in total factor productivity due to foreign acquisition, with 1 to 7 percent of this increase due to workforce reorganization that favors women in the most elite workforce subgroup within the firm.

In order to delve further into the workforce reorganizations that seem to accompany

foreign acquisition, particularly by MNEs from more gender-equal countries of origin, we would need micro-level data at the employee level which is beyond the scope of this study. Further research using employee-level wage data is needed to ascertain to what extent these worker reallocations involve cost-cutting, worker attrition or other motivations. Examining the impact of foreign acquisition on gender wage gaps while taking MNE country of origin heterogeneity into account is another interesting direction for further research.

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Table 1: The Distribution of MNE Country of Ownership, 2010

Code	Country	Observations	Share	Gender Index	Gender Rank
102	Taiwan	10	1.26	NA	NA
105	Malaysia	6	0.76	0.577	99
107	Vietnam	1	0.13	0.721	33
111	Singapore	28	3.54	0.753	20
112	UAE	1	0.13	0.461	120
114	Yemen	1	0.13	0.195	134
119	Israel	1	0.13	0.688	49
120	India	1	0.13	0.403	128
122	Japan	213	26.93	0.572	101
123	China	11	1.39	0.693	46
127	Kuwait	1	0.13	0.537	107
128	Thailand	1	0.13	0.716	36
131	Hong Kong	22	2.78	NA	NA
202	Netherlands	66	8.34	0.723	31
203	Norway	3	0.38	0.831	3
204	Denmark	7	0.88	0.744	23
205	Germany	69	8.72	0.714	37
208	Luxembourg	2	0.25	0.751	22
210	Belgium	5	0.63	0.710	39
211	Bulgaria	2	0.25	0.684	50
212	Sweden	14	1.77	0.770	11
213	Switzerland	32	4.05	0.727	30
214	Spain	2	0.25	0.624	78
215	Slovenia	1	0.13	0.723	32
216	Ireland	3	0.38	0.741	25
220	UK	42	5.31	0.721	34
221	Austria	6	0.76	0.595	92
223	Italy	7	0.88	0.589	97
226	Cyprus	1	0.13	0.630	75
229	France	43	5.44	0.661	60
230	Finland	3	0.38	0.757	16
231	Hungary	2	0.25	0.689	48
232	Poland	1	0.13	0.653	63
301	USA	173	21.87	0.799	6
302	Canada	4	0.51	0.777	8
418	Panama	1	0.13	0.693	47
502	Australia	3	0.38	0.743	24
601	Ghana	1	0.13	0.758	15
615	Swaziland	1	0.13	NA	NA
Total		791	100.00		

Notes: For comparison, Korea's Gender Gap Index is 0.520 and Gender Gap Rank is 111. NA indicates not available since indices are not reported for Taiwan, Hong Kong, and Swaziland.

Table 2: Summary Statistics

Variables	Mean	SD	Min	Max	Obs	Format
Female Share:						
Perm	0.26	0.21	0	1	92,645	Percent
Perm (HQ)	0.26	0.20	0	1	92,645	Percent
Perm (HQ & Main)	0.29	0.18	0	1	92,645	Percent
Perm + Temp	0.26	0.21	0	1	92,645	Percent
Female CEO	0.05	0.21	0	1	12,101	Binary
Foreign Dummy	0.08	0.27	0	1	92,645	Binary
Employment	4.85	1.07	0	11.53	92,645	Log
Sales	10.41	1.65	0	18.88	92,645	Log
Purchase	7.05	4.52	0	18.15	92,645	Log
Exports	3.53	4.49	0	18.37	92,645	Log
Imports	2.87	4.20	0	17.72	92,645	Log
TFP	2.89	0.80	-8.95	7.47	45,680	Log
Gender Index	0.63	0.12	0.20	0.88	134	Index
Gender Rank	0.44	0.39	-0.23	1.10	134	Index

Notes: The statistics are calculated from all observations over the period 2009 - 2016. The Female CEO variable is only available for the year 2016. The TFP variable is based only on the manufacturing sector. Gender Index and Gender Rank are based on the year 2010. Gender Rank is calculated as $(111 - GR_i)/100$.

Table 3: Female Share and Foreign Ownership, 2009–2016

	Perm	Perm (HQ)	Perm (HQ & Main)	Perm + Temp
	(1)	(2)	(3)	(4)
Foreign Dummy	0.034*	0.039**	0.061***	0.033*
	(0.017)	(0.017)	(0.020)	(0.017)
Log of Employment	0.036***	0.026**	0.006	0.036***
	(0.011)	(0.010)	(0.004)	(0.011)
Log of Sales	-0.032**	-0.025*	-0.014***	-0.031**
	(0.013)	(0.012)	(0.003)	(0.013)
Log of Purchase	0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Log of Exports	-0.001**	-0.001**	-0.001**	-0.001**
	(0.001)	(0.000)	(0.000)	(0.001)
Log of Imports	-0.001*	-0.001*	-0.001	-0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:				
Industry-Region-Year	Yes	Yes	Yes	Yes
Observations	92,645	92,645	92,645	92,645
R-squared	0.424	0.351	0.242	0.429

Dependent Variable: Female Share (spanning header over columns 1–4)

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: Female Share and Foreign Ownership, 2009–2016

| | Dependent Variable: Female Share | | | |
| | Perm | Perm (HQ) | Perm (HQ & Main) | Perm + Temp |
	(1)	(2)	(3)	(4)
USA Dummy	0.039**	0.049***	0.080***	0.037**
	(0.016)	(0.016)	(0.019)	(0.015)
Europe Dummy	0.039	0.044*	0.070**	0.038
	(0.026)	(0.023)	(0.024)	(0.025)
Japan Dummy	0.021**	0.022*	0.033*	0.021**
	(0.010)	(0.011)	(0.018)	(0.010)
Less Equal Dummy	-0.053***	-0.052***	-0.011	-0.053***
	(0.016)	(0.012)	(0.015)	(0.017)
Other For. Dummy	0.045**	0.052***	0.065***	0.043**
	(0.018)	(0.016)	(0.015)	(0.018)
Log of Employment	0.036***	0.027**	0.007	0.036***
	(0.011)	(0.010)	(0.004)	(0.011)
Log of Sales	-0.032**	-0.025*	-0.014***	-0.031**
	(0.013)	(0.012)	(0.003)	(0.013)
Log of Purchase	0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Log of Exports	-0.001**	-0.001**	-0.001**	-0.001**
	(0.001)	(0.000)	(0.000)	(0.001)
Log of Imports	-0.001*	-0.001*	-0.001	-0.001**
	(0.001)	(0.001)	(0.000)	(0.001)
Fixed Effects:				
Industry-Region-Year	Yes	Yes	Yes	Yes
Observations	92,645	92,645	92,645	92,645
R-squared	0.424	0.351	0.243	0.430

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: Female Share and Foreign Ownership Using Gender Index, 2009–2016

| | Perm | Perm (HQ) | Perm (HQ & Main) | Perm + Temp |
	(1)	(2)	(3)	(4)
		Dependent Variable: Female Share		
Foreign dummy	0.160*	0.191**	0.310***	0.156*
× Gender Index	(0.077)	(0.074)	(0.082)	(0.074)
Log of Employment	0.036***	0.026**	0.006	0.036***
	(0.011)	(0.011)	(0.004)	(0.011)
Log of Sales	-0.032**	-0.025*	-0.014***	-0.031**
	(0.013)	(0.012)	(0.003)	(0.013)
Log of Purchase	0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Log of Exports	-0.001**	-0.001**	-0.001**	-0.001**
	(0.001)	(0.000)	(0.000)	(0.001)
Log of Imports	-0.001*	-0.001	-0.001	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:				
Industry-Region-Year	Yes	Yes	Yes	Yes
Observations	92,342	92,342	92,342	92,342
R-squared	0.424	0.351	0.242	0.430

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6: Female CEO and Foreign Ownership, 2016

	Dependent Variable: Female CEO			
	(1)	(2)	(3)	(4)
Foreign Dummy	0.023*			
	(0.012)			
USA Dummy		0.061*		
		(0.029)		
Europe Dummy		0.025*		
		(0.013)		
Japan Dummy		-0.005		
		(0.008)		
Less Equal Dummy		-0.005		
		(0.005)		
Other For. Dummy		0.035**		
		(0.013)		
Foreign Dummy × Gender Index			0.158**	
			(0.061)	
Foreign Dummy × Gender Rank				0.038**
				(0.014)
Log of Employment	-0.001	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Log of Sales	-0.007**	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Log of Purchase	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Exports	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Imports	-0.002**	-0.002**	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:				
Industry-Region	Yes	Yes	Yes	Yes
Observations	12,101	12,101	12,056	12,056
R-squared	0.076	0.077	0.076	0.076

Notes: The dependent variable is the observed binary outcome such that it equals 1 if the gender of firm i's CEO is female and 0 otherwise. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Gender Index and Gender rank are based upon the year 2016. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 7: Female Share, Female CEO and Foreign Ownership, 2016

	Dependent Variable: Female Share			
	Perm	Perm (HQ)	Perm (HQ & Main)	Perm + Temp
	(1)	(2)	(3)	(4)
Female CEO Dummy	0.053***	0.052***	0.060***	0.052***
	(0.014)	(0.013)	(0.009)	(0.014)
Foreign Dummy	0.035*	0.026*	0.065***	0.036*
	(0.018)	(0.015)	(0.018)	(0.018)
Female CEO Dummy	0.028	0.051*	0.053**	0.031
× Foreign Dummy	(0.023)	(0.027)	(0.022)	(0.023)
Log of Employment	0.035***	0.024**	0.011**	0.035***
	(0.011)	(0.010)	(0.004)	(0.011)
Log of Sales	-0.028**	-0.017	-0.016***	-0.028*
	(0.013)	(0.013)	(0.004)	(0.013)
Log of Purchase	-0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Exports	-0.001	-0.000	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Imports	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Fixed Effects:				
Industry-Region	Yes	Yes	Yes	Yes
Observations	12,101	12,101	12,101	12,101
R-squared	0.439	0.297	0.250	0.438

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Female CEO Dummy is the observed binary outcome such that it equals 1 if the gender of firm i's CEO is female and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 8: Female Share and Foreign Ownership, 2009–2016

	Perm	Perm (HQ)	Perm (HQ & Main)	Perm + Temp
	(1)	(2)	(3)	(4)
	Dependent Variable: Female Share			
Foreign Dummy	0.002	0.006	0.020***	0.002
	(0.003)	(0.004)	(0.003)	(0.003)
Log of Employment	0.021***	0.012***	0.004	0.018***
	(0.007)	(0.003)	(0.003)	(0.005)
Log of Sales	-0.000	-0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Purchase	-0.000**	-0.000*	0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Log of Exports	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Log of Imports	-0.000**	0.000	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Observations	90,644	90,644	90,644	90,644
R-squared	0.906	0.843	0.613	0.904

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9: Female Share and Foreign Ownership, 2009–2016

	Dependent Variable: Female Share of Perm (HQ & Main)					
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Dummy	0.020***	0.020***	0.021***	0.021***	0.022***	0.024***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
Log of Employment	0.004	0.004	0.003	0.000	-0.001	-0.002
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)
Log of Sales	0.000	0.002	0.002	-0.000	0.000	0.000
	(0.001)	(0.002)	(0.002)	(0.001)	(0.004)	(0.004)
Log of Purchase	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log of Exports	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log of Imports	-0.000	-0.000	-0.000*	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year	Yes	No	No	Yes	No	No
Industry-Year	No	Yes	No	No	Yes	No
Industry-Region-Year	No	No	Yes	No	No	Yes
Firm-Specific Trend:	No	No	No	Yes	Yes	Yes
Observations	90,644	90,644	90,626	90,644	90,644	90,626
R-squared	0.614	0.617	0.635	0.721	0.723	0.739

Notes: The dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 10: Employment and Foreign Ownership, 2009–2016

| | Dependent Variable: Employment of Perm (HQ & Main) | | | | | |
| | Total | Total | Female | Female | Male | Male |
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Dummy	-0.041	-0.077**	-0.001	-0.043	-0.068**	-0.102**
	(0.032)	(0.036)	(0.032)	(0.040)	(0.031)	(0.037)
Log of Sales	0.065	0.033	0.063	0.030	0.063	0.032
	(0.050)	(0.026)	(0.048)	(0.024)	(0.050)	(0.026)
Log of Purchase	-0.004*	-0.005***	-0.003**	-0.004***	-0.004	-0.005**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Log of Exports	0.002*	0.000	0.002	-0.000	0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log of Imports	0.002*	0.001	0.001	-0.000	0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Specific Trend:	No	Yes	No	Yes	No	Yes
Observations	90,644	90,644	88,895	88,895	90,258	90,258
R-squared	0.658	0.755	0.699	0.788	0.644	0.743

Notes: The dependent variable is the number of permanent main-task workers in headquarters. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 11: Female Share and Foreign Ownership, 2009–2016

Dependent Variable: Female Share of Perm (HQ & Main)				
	(1)	(2)	(3)	(4)
Foreign Dummy	0.067**	0.062**		
× Gender Index	(0.027)	(0.026)		
Foreign Dummy			0.018**	0.016**
× Gender Rank			(0.006)	(0.006)
Log of Employment	0.004	0.000	0.004	0.000
	(0.003)	(0.004)	(0.003)	(0.004)
Log of Sales	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Purchase	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Log of Exports	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Log of Imports	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Firm-Specific Trend:	No	Yes	No	Yes
Observations	90,330	90,330	90,330	90,330
R-squared	0.613	0.720	0.613	0.720

Notes: The dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Matching Results for Female Share

	Perm	Perm (HQ)	Perm (HQ & Main)	Perm + Temp
	(1)	(2)	(3)	(4)
Panel A. *Within the same year*				
ATET (Acquisition year)	0.003	0.027**	0.051***	0.005
	(0.012)	(0.013)	(0.019)	(0.012)
ATET (One year later)	0.003	-0.012	0.070***	-0.008
	(0.012)	(0.012)	(0.026)	(0.012)
Obs. Matched Pairs	113	113	113	113
Panel B. *Within the same sector-year*				
ATET (Acquisition year)	-0.006	0.014	0.067***	-0.007
	(0.013)	(0.014)	(0.021)	(0.013)
ATET (One year later)	-0.013	0.006	0.046	-0.015
	(0.012)	(0.015)	(0.030)	(0.013)
Obs. Matched Pairs	87	87	87	87
Panel C. *Within the same industry-year*				
ATET (Acquisition year)	0.010	0.029	0.117***	0.008
	(0.013)	(0.018)	(0.032)	(0.013)
ATET (One year later)	-0.009	0.009	0.087**	-0.006
	(0.019)	(0.023)	(0.039)	(0.021)
Obs. Matched Pairs	44	44	44	44

Notes: The dependent variable in Column (1) is the change in the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the change in the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the change in the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the change in the ratio of permanent and temporary female workers to total permanent and temporary female workers. We use nearest neighbor matching and specify that the number of matches per observation is one within the same year as the acquired firm. We correct for a large-sample bias that exists when matching on more than one continuous covariate. Mahalanobis distance measure is used. Robust Abadie–Imbens standard errors in parentheses. In Panel B, 26 observations have fewer than 2 exact matches when in-group clustering. In Panel C, 69 observations have fewer than 2 exact matches when in-group clustering. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 13: TFP, Foreign Ownership, and Female Share, 2009–2016

	Baseline Sample			Restricted Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	TFP	FS	TFP	TFP	FS	TFP
Foreign Dummy	0.0591***	0.0135*	0.0587***	0.0587**	0.0128*	0.0582**
	(0.0209)	(0.0065)	(0.0208)	(0.0213)	(0.0063)	(0.0211)
FS			0.0343*			0.0346*
			(0.0190)			(0.0189)
Log of Employment	-0.7128***	-0.0061	-0.7126***	-0.7126***	-0.0062	-0.7124***
	(0.0196)	(0.0046)	(0.0196)	(0.0198)	(0.0046)	(0.0197)
Log of Sales	0.9437***	0.0035	0.9436***	0.9439***	0.0035	0.9437***
	(0.0207)	(0.0025)	(0.0206)	(0.0206)	(0.0025)	(0.0206)
Log of Purchase	-0.1083***	-0.0004	-0.1083***	-0.1083***	-0.0004	-0.1083***
	(0.0048)	(0.0003)	(0.0048)	(0.0048)	(0.0003)	(0.0048)
Log of Exports	0.0010	0.0001	0.0010	0.0010	0.0001	0.0010
	(0.0015)	(0.0003)	(0.0015)	(0.0015)	(0.0003)	(0.0015)
Log of Imports	-0.0044***	-0.0003	-0.0044***	-0.0044***	-0.0003	-0.0044***
	(0.0015)	(0.0002)	(0.0015)	(0.0015)	(0.0002)	(0.0015)
Fixed Effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44,683	44,683	44,683	44,654	44,654	44,654
R-squared	0.7249	0.5670	0.7250	0.7250	0.5669	0.7250

Notes: The analysis is based on only manufacturing sector (C). In Columns (1) to (3), all countries are included; while in columns (4) to (6) we restrict our sample to countries where gender rankings are higher than Korea. TFP denotes the total factor productivity and FS indicates the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the industry level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Appendix

A   Production Function Estimation

We compute TFP by estimating a production function following Ackerberg et al. (2015).
Consider the following production function equation:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \omega_{it} + \varepsilon_{it} \tag{13}$$

where i and t denote the firm and year, y_{it} is the log of output, k_{it} is the log of capital input, l_{it} is the log of labor input, ω_{it} represents "productivity" shocks that are observed by firms when they make input decisions, and ε_{it} denotes shocks to production that are not observable by firms before making input decisions in the year t. Firms' intermediate input demand function is given by:

$$m_{it} = \widetilde{f}_t(k_{it}, l_{it}, \omega_{it}) \tag{14}$$

where $\tilde{f}_t(k_{it}, l_{it}, \omega_{it})$ is strictly increasing in ω_{it}. Invert the intermediate input demand function to get $\omega_{it} = \tilde{f}_t^{-1}(k_{it}, l_{it}, m_{it})$ and substitute it into the production function in equation (13) to yield the first-stage equation:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \tilde{f}_t^{-1}(k_{it}, l_{it}, m_{it}) + \varepsilon_{it} = \widetilde{\Phi}_t(k_{it}, l_{it}, m_{it}) + \varepsilon_{it}. \tag{15}$$

Assuming productivity shocks follow the Markov process and the fact that $\widetilde{\Phi}_t(k_{it}, l_{it}, m_{it}) = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \omega_{it}$,

$$\omega_{it} = \mathbb{E}[\omega_{it}|\omega_{it-1}] + \xi_{it} = g(\omega_{it-1}) + \xi_{it} \tag{16}$$
$$= g\left(\widetilde{\Phi}_{t-1}(k_{it-1}, l_{it-1}, m_{it-1}) - \beta_0 - \beta_k k_{it-1} - \beta_l l_{it-1}\right) + \xi_{it}.$$

Plugging the above equation (16) into the equation (13) yields the second-stage equation,

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + g\left(\widetilde{\Phi_{t-1}}\left(k_{it-1}, l_{it-1}, m_{it-1}\right) - \beta_0 - \beta_k k_{it-1} - \beta_l l_{it-1}\right) + \xi_{it} + \varepsilon_{it}. \quad (17)$$

Ackerberg et al. (2015) propose production function parameters in the second-stage equation using the following conditional moment:

$$\mathbb{E}[\xi_{it} + \varepsilon_{it}|I_{it-1}] = 0 \quad (18)$$

where I_{it-1} is the information set.

Then, we estimate the first stage equation (15) by regressing y_{it} on second-degree polynomials in the explanatory variables, k_{it}, l_{it}, and m_{it}. The first-stage produces an estimate $\widehat{\widetilde{\Phi}}_t\left(k_{it}, l_{it}, m_{it}\right)$ of $\widetilde{\Phi}_t\left(k_{it}, l_{it}, m_{it}\right)$. Plugging $\widehat{\widetilde{\Phi}}_t\left(k_{it}, l_{it}, m_{it}\right)$ into the equation (17) and using the moment condition in equation (18), we conduct GMM procedure to estimate production function parameters. Finally, we obtain estimated log productivity $\widehat{\omega_{it}}$ as follows:

$$\widehat{\omega_{it}} = y_{it} - \widehat{\beta}_0 - \widehat{\beta}_k k_{it} - \widehat{\beta}_l l_{it}.$$

B   Tables

Table B.1: The Global Gender Gap Index, 2010

Rank	Country	Index	Rank	Country	Index	Rank	Country	Index
1	Lesotho	0.8789	46	China	0.6927	91	Bolivia	0.5957
2	Mongolia	0.8746	47	Panama	0.6925	92	Austria	0.5952
3	Norway	0.8306	48	Hungary	0.6894	93	Guyana	0.5915
4	Bahamas	0.8288	49	Israel	0.6883	94	Nicaragua	0.5915
5	Mozambique	0.8113	50	Bulgaria	0.6843	95	Maldives	0.5907
6	USA	0.7992	51	Albania	0.6808	96	Honduras	0.5904
7	Barbados	0.7870	52	Kyrgyz	0.6796	97	Italy	0.5893
8	Canada	0.7768	53	Macedonia	0.6775	98	Costa Rica	0.5787
9	New Zealand	0.7743	54	Georgia	0.6751	99	Malaysia	0.5765
10	Moldova	0.7707	55	South Africa	0.6727	100	Indonesia	0.5750
11	Sweden	0.7695	56	Portugal	0.6723	101	Japan	0.5718
12	Kazakhstan	0.7633	57	Tanzania	0.6710	102	El Salvador	0.5534
13	Philippines	0.7611	58	Madagascar	0.6708	103	Mauritius	0.5491
14	Gambia	0.7588	59	Armenia	0.6690	104	Malta	0.5428
15	Ghana	0.7577	60	France	0.6610	105	Cameroon	0.5414
16	Finland	0.7566	61	Croatia	0.6606	106	Côted'Ivoire	0.5390
17	Lithuania	0.7555	62	Uruguay	0.6566	107	Kuwait	0.5369
18	Iceland	0.7540	63	Poland	0.6526	108	Chile	0.5338
19	Jamaica	0.7535	64	Dominica	0.6516	109	Guatemala	0.5280
20	Singapore	0.7527	65	Senegal	0.6439	110	Mexico	0.5212
21	Latvia	0.7516	66	Brazil	0.6431	**111**	**Korea**	**0.5203**
22	Luxembourg	0.7507	67	Zimbabwe	0.6397	112	Nepal	0.5174
23	Denmark	0.7438	68	Cambodia	0.6383	113	Mali	0.5137
24	Australia	0.7428	69	Burkina Faso	0.6383	114	Fiji	0.4983
25	Ireland	0.7409	70	Slovak	0.6375	115	Bahrain	0.4967
26	Brunei	0.7404	71	Paraguay	0.6373	116	Qatar	0.4829
27	Namibia	0.7386	72	Belize	0.6362	117	Bangladesh	0.4732
28	Russia	0.7360	73	Azerbaijan	0.6352	118	Mauritania	0.4668
29	Botswana	0.7359	74	Ethiopia	0.6316	119	Algeria	0.4666
30	Switzerland	0.7267	75	Cyprus	0.6300	120	UAE	0.4605
31	Netherlands	0.7230	76	Angola	0.6296	121	Egypt	0.4530
32	Slovenia	0.7229	77	Chad	0.6265	122	Tunisia	0.4501
33	Vietnam	0.7212	78	Spain	0.6240	123	Suriname	0.4495
34	UK	0.7210	79	Greece	0.6209	124	Lebanon	0.4483
35	Estonia	0.7193	80	Czech	0.6205	125	Iran	0.4257
36	Thailand	0.7160	81	Peru	0.6201	126	Jordan	0.4225
37	Germany	0.7138	82	Kenya	0.6151	127	Morocco	0.4077
38	Trinidad & Tobago	0.7120	83	Venezuela	0.6145	128	India	0.4025
39	Belgium	0.7097	84	Cuba	0.6092	129	Oman	0.4003
40	Tajikistan	0.7087	85	Benin	0.6049	130	Syria	0.3980
41	Romania	0.7081	86	Nigeria	0.6044	131	Turkey	0.3856
42	Uganda	0.7075	87	Argentina	0.6024	132	Saudi Arabia	0.3351
43	Ukraine	0.7074	88	Zambia	0.6011	133	Pakistan	0.3059
44	Malawi	0.6979	89	Sri Lanka	0.6008	134	Yemen	0.1951
45	Colombia	0.6941	90	Ecuador	0.5985			

Notes: The data are drawn from Global Gender Gap Report 2010, World Economic Forum. We use Economic Participation and Opportunity subindex that covers 134 countries featured in the year 2010.

Table B.2: Regional Variations of Female Share in Korea, 2010

Type	Code	Name	All		Foreign		Others	
			Obs	Share	Obs	Share	Obs	Share
Special city	11	Seoul	4,362	29.82	455	35.19	3,907	29.20
Metropolitan city	21	Busan	648	23.24	20	23.34	628	23.24
Metropolitan city	22	Daegu	339	23.75	11	13.98	328	24.08
Metropolitan city	23	Incheon	505	22.73	32	23.43	473	22.69
Metropolitan city	24	Gwangju	189	22.97	4	36.25	185	22.68
Metropolitan city	25	Daejeon	150	23.04	2	8.69	148	23.23
Metropolitan city	26	Ulsan	156	14.22	9	7.30	147	14.64
Province	31	Gyeonggi	2,206	23.11	143	20.95	2,063	23.26
Province	32	Gangwon	84	23.26	1	29.21	83	23.19
Province	33	Chungcheongbuk	296	26.08	22	20.32	274	26.54
Province	34	Chungcheongnam	373	20.43	28	18.95	345	20.55
Province	35	Jeollabuk	178	21.73	6	10.20	172	22.13
Province	36	Jeollanam	183	16.48	6	11.99	177	16.63
Province	37	Gyeongsangbuk	427	21.54	22	13.81	405	21.96
Province	38	Gyeongsangnam	610	21.92	35	20.57	575	22.01
Special autonomous	39	Jeju	35	33.77	0	-	35	33.77
Total			10,741	25.47	796	28.60	9,945	25.22

Notes: Korea is made up of 16 first-tier administrative divisions: 1 special city, 6 metropolitan cities, 8 provinces, and 1 special autonomous province in the year 2010. "Obs" denotes the number of firms and "Share" indicates the female share.

Table B.3: Sector Variations of Female Share in Korea, 2010

Sector	Code	All		Foreign		Others	
		Obs	Share	Obs	Share	Obs	Share
Agriculture, forestry and fishing	A	15	11.36	0	-	15	11.36
Mining and quarrying	B	5	16.98	0	-	5	16.98
Manufacturing	C	5,305	24.25	361	20.14	4,944	24.56
Electricity, gas, steam supply	D	29	8.12	0	-	29	8.12
Water supply; sewage, waste management	E	44	13.21	1	8.22	43	13.33
Construction	F	676	10.83	8	16.34	668	10.76
Wholesale and retail trade	G	1,112	32.48	243	33.92	869	32.08
Transportation and storage	H	683	12.43	43	38.81	640	10.66
Accommodation and food service activities	I	188	47.56	8	62.44	180	46.90
Information and communication	J	847	26.26	30	26.90	817	26.24
Financial and insurance activities	K	249	39.12	50	50.42	199	36.29
Real estate activities	L	155	27.43	4	24.85	151	27.49
Professional, scientific and technical	M	556	21.53	29	33.23	527	20.89
Business facilities management	N	555	41.16	14	26.48	541	41.54
Education	P	69	50.29	2	69.94	67	49.70
Arts, sports and recreation related services	R	198	34.80	0	-	198	34.80
Membership organizations	S	55	28.76	3	16.49	52	29.46
Total		10,741	25.47	796	28.60	9,945	25.22

Notes: There are 17 sectors. "Obs" denotes the number of firms and "Share" indicates the female share.

Table B.4: Female Share and Foreign Ownership, 2009–2016

| | | Dependent Variable: Female Share | | |
| | Perm | Perm (HQ) | Perm (HQ & Main) | Perm + Temp |
	(1)	(2)	(3)	(4)
Foreign Dummy	0.040*	0.049**	0.080***	0.039*
× Gender Rank	(0.020)	(0.019)	(0.020)	(0.019)
Log of Employment	0.036***	0.026**	0.006	0.036***
	(0.011)	(0.011)	(0.004)	(0.011)
Log of Sales	-0.032**	-0.025*	-0.014***	-0.031**
	(0.013)	(0.012)	(0.003)	(0.013)
Log of Purchase	0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Log of Exports	-0.001**	-0.001**	-0.001**	-0.001**
	(0.001)	(0.000)	(0.000)	(0.001)
Log of Imports	-0.001	-0.001	-0.001	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:				
Industry-Region-Year	Yes	Yes	Yes	Yes
Observations	92,342	92,342	92,342	92,342
R-squared	0.424	0.351	0.241	0.430

Notes: The dependent variable in Column (1) is the ratio of female permanent workers to total permanent workers. In Column (2), the dependent variable is the ratio of female permanent workers in headquarters to total permanent workers in headquarters. In Column (3), the dependent variable is the ratio of female permanent main-task workers in headquarters to total permanent main-task workers in headquarters. In Column (4), the dependent variable is the ratio of permanent and temporary female workers to total permanent and temporary female workers. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B.5: Employment and Foreign Ownership, 2009–2016

	Dependent Variable: Employment of:					
	Perm			Perm (HQ)		
	Total	Female	Male	Total	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Dummy	0.005	0.013	0.001	0.008	0.018	-0.000
	(0.009)	(0.012)	(0.010)	(0.022)	(0.023)	(0.029)
Log of Sales	0.038	0.038	0.038	0.026	0.025	0.025
	(0.043)	(0.045)	(0.042)	(0.034)	(0.035)	(0.033)
Log of Purchase	0.003***	0.003**	0.003***	0.002	0.001	0.003*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Log of Exports	0.002***	0.002**	0.001***	0.001	0.001	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Log of Imports	-0.000	-0.001	-0.000	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fixed Effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Specific Trend:	Yes	Yes	Yes	Yes	Yes	Yes
Observations	90,644	90,245	90,628	90,644	89,344	89,997
R-squared	0.968	0.952	0.965	0.884	0.906	0.886

Notes: The dependent variable for columns (1)-(3) is the number of permanent workers, and for columns (4)-(6) is the number of permanent workers in headquarters. Foreign Dummy is a measure of foreign ownership that equal 1 if 50 percent or more of equity is owned by the foreign parent firm and 0 otherwise. Standard errors are clustered at the sector level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B.6: Covariate Balance Summary

	Standardized Differences		Variance Ratio	
	Raw	Matched	Raw	Matched
Panel A. *Within the same year*				
Log of Employment$_{t-1}$	0.199	-0.002	1.271	1.008
Log of Sales$_{t-1}$	0.399	-0.006	0.858	1.001
Log of Purchase$_{t-1}$	0.036	-0.004	1.183	0.997
Log of Exports$_{t-1}$	0.174	-0.006	1.189	0.995
Log of Imports$_{t-1}$	0.293	-0.001	1.368	1.006
Panel B. *Within the same sector-year*				
Log of Employment$_{t-1}$	0.221	0.008	1.563	1.027
Log of Sales$_{t-1}$	0.297	0.002	1.334	1.019
Log of Purchase$_{t-1}$	-0.176	-0.001	1.672	1.005
Log of Exports$_{t-1}$	0.045	0.003	1.133	1.021
Log of Imports$_{t-1}$	0.171	-0.005	1.191	1.019
Panel C. *Within the same industry-year*				
Log of Employment$_{t-1}$	0.340	-0.020	1.487	1.017
Log of Sales$_{t-1}$	0.307	-0.003	1.522	1.038
Log of Purchase$_{t-1}$	-0.119	0.026	1.538	1.048
Log of Exports$_{t-1}$	0.166	-0.007	1.189	1.050
Log of Imports$_{t-1}$	0.323	-0.035	1.152	0.974

Notes: In Panel A, the number of matched pairs is 113. In Panel B, the number of matched pairs is 87. In Panel C, the number of matched pairs is 44.