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Overseas Expansion of Japanese Firms and Domestic Women's Active Engagement*

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Abstract

This paper empirically investigates whether more internationalized firms narrowed within-firm gender wage gaps in Japan in response to institutional reform aimed at promoting women's active engagement in the workplace. Specifically, we constructed a dataset by linking the Basic Survey on Wage Structure with the Basic Survey of Japanese Business Structure and Activities. We estimated changes in female workers' wages relative to their male counterparts before and after the institutional reform under the Act on the Promotion of Women's Active Engagement in Professional Life, using the triple difference method, which accounts for the firm's degree of internationalization as measured by the status of outward foreign direct investment (FDI). The analysis revealed that firms engaging in FDI experienced a statistically significant narrowing of the gender wage gap following the institutional reform relative to those that do not engage in FDI. Furthermore, analysis confirmed that the effect was more pronounced for firms with a greater number of overseas subsidiaries. These results suggest that FDI-active firms tend to respond more proactively to the reform, undertaking within-firm labor reallocation and internal transformations aimed at fostering a gender-equitable work environment. Furthermore, firms operating in countries and regions with significant time zone differences from Japan tend to experience a relatively weaker narrowing of the gender wage gap. This indicates that greater time differences may necessitate more flexible working hours, potentially leading to unfavorable evaluations for female workers and diminishing the effectiveness of institutional reform.

Keywords: Women's Active Engagement Act, FDI, Gender Wage Gap, Within-firm Labor Reallocation

JEL classification: J16, F23, J31, J78

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1. Introduction

Modern globalization is characterized by supply chains extending across national borders. The task-wise international division of labor involves shifting segments of the production process, previously performed by domestic labor, to overseas locations through foreign direct investment (FDI). Such an offshoring of production activities results in short-term domestic job losses. However, in the long term, utilizing overseas labor and other productive factors improves the efficiency of resource allocation within firms¹, thereby boosting production and increasing domestic employment². Furthermore, empirical evidence suggests that firms aiming to improve overall resource allocation efficiency through business diversification tend to reallocate labor within their organizations flexibly and effectively³. Offshoring has the potential to transform employment structures and working environments by facilitating organizational restructuring and increasing flexibility in workforce utilization.

Moreover, there is also growing evidence that firms with overseas operations are more likely to adopt human resource management practices that promote gender equality, drawing on their experiences in the foreign markets⁴. When an institutional reform mandates firms' initiatives to promote women's active engagement in the workplace, such firms are better positioned to leverage the reform as momentum, facilitating labor adjustments between male and female workers and revisions to human resource management and workplace practices toward a more gender-equitable work environment. In such cases, the intended effects of the reform are more likely to fully materialize among more internationalized firms.

From this perspective, this study examines how institutional reform under the Act on the Promotion of Women's Active Engagement in Professional Life (hereinafter referred to as the Women's Active Engagement Act)⁵ have impacted the gender wage gaps within firms. This study focuses on the interaction between institutional reform and the firm's degree of internationalization, clarifying how these differences have impacted the promotion of women's active engagement within firms and, consequently, the progress

¹ For example, see Chen et al. (2021) cited below.

² For example, Kovak et al. (2021) found that offshoring by U.S. multinationals, leading to a 10% rise in subsidiary employment abroad, corresponded to a 1.3% increase in employment at their U.S. parent firms.

³ For example, see Tate and Yang (2015).

⁴ For example, see Greenhill et al. (2009), Neumayer and De Soysa (2011), Halvarsson et al. (2023), and Heckl et al. (2025).

⁵ Act on the Promotion of Women's Active Engagement in Professional Life (Act No. 64 of 2015): <https://laws.e-gov.go.jp/law/427AC0000000064>

of gender equality. The analysis examines whether firms with a higher degree of internationalization through outward FDI narrowed their gender wage gaps in response to the reform.

Specifically, this study examines two major institutional changes under the Women's Active Engagement Act: the first in 2016, which mandated firms to formulate and disclose action plans for promoting women's active engagement in the workplace; and the second in 2020, which strengthened these requirements to improve the effectiveness of the institutional reform. We then empirically analyze whether the reform contributed to a narrowing of within-firm gender wage gaps for more internationalized, FDI-active firms. For the analysis, we link the Basic Survey on Wage Structure (Ministry of Health, Labour and Welfare) with the Basic Survey of Japanese Business Structure and Activities (Ministry of Economy, Trade and Industry) from 2015 to 2022 to construct a dataset relating individual workers' wages with the FDI indicators of their parent firm. Using this dataset and the triple difference (Triple Difference, Difference-in-Difference-in-Differences: DDD) method, we estimate changes in female workers' wages relative to male workers' before and after the reform, with a specific focus on differences attributable to firm's FDI status and FDI scale; positive estimates indicate a narrowing of the within-firm gender wage gap. As an additional analysis, we also examine whether the impact of reform on the gender wage gap differs depending on how extensive firms geographically expand their business through FDI. In particular, the greater the time difference between Japan and the countries and regions where overseas subsidiaries are located, the greater the demand for flexible labor to accommodate potential after-hours communication with overseas bases—an arrangement that may disproportionately disadvantage female workers⁶. Building on this, we examine whether changes in the gender wage gap following the reform vary according to the magnitude of the time difference between Japan and the firms' overseas locations.

The estimation results indicate that following the 2020 amendment to the Act, which strengthened the firms' obligations to promote women's active engagement in the workplace, firms implementing FDI exhibited a statistically significant narrowing of within-firm gender wage gap relative to firms not implementing FDI. The analysis also confirmed that firms with a greater number of overseas subsidiaries demonstrate a stronger tendency toward narrowing the gender wage gap. These findings provide empirical evidence that highly internationalized firms are more likely to actively respond to institutional reform by

⁶ For example, see Bøler et al. (2018) cited below.

implementing labor adjustments between male and female workers and fostering a more gender-equitable workplace. Furthermore, it was also confirmed that firms operating in countries and regions with greater time differences from Japan tend to experience relatively less narrowing of the gender wage gap following the reform. This suggests that greater time differences necessitate greater workforce flexibility, which may make female workers more vulnerable to unfavorable evaluations, thereby potentially undermining the effectiveness of reform.

This study offers a new perspective to the literature on economic globalization's impact on gender equality, particularly the narrowing of the gender wage gap, by examining the interaction between institutional reform and the firm's degree of internationalization. Related literature has accumulated research from diverse angles. First, regarding the impact of trade liberalization, studies suggest that increased exports stimulate technological advancement, thereby reducing demand for manual labor and relatively improving wages and employment for female workers (Juhn et al. 2013, 2014). Research also demonstrates that according to comparative advantage, the expansion of industries relying on female labor-intensive or female-specific skills positively influences female's labor market participation rates (Do et al. 2016, Li 2021).

The impact of firms' overseas expansion, encompassing exports and outward FDI, is also examined through various channels. For example, Greenhill et al. (2009) and Neumayer and De Soysa (2011) reveal that firms entering foreign markets through exports or FDI tend to voluntarily adopt gender-related regulations and standards to maintain competitiveness, driven by foreign consumer pressure and evaluation. Furthermore, scholars have highlighted the pathway through which firms expanding overseas operations via FDI are exposed to alternative gender norms, which subsequently diffuse back to the home country and contribute to shifts in domestic gender norms (Halvarsson et al. 2023, Heckl et al. 2025)⁷. These prior studies indicate that firms with greater overseas exposure tend to adopt human resource management practices attentive to gender equality, potentially narrowing within-firm gender wage gap as a result.

In contrast, prior studies indicate that globalization actually widens the gender wage gap. For example, Berik et al. (2004) point out that intensified competition with foreign firms may weaken the negotiation

⁷ Relatedly, studies suggest that in the case of inward FDI, gender norms are transmitted to recipient firms through pressure from foreign investors, particularly those from countries with gender-inclusive cultures, resulting in an increase in the proportion of female employed by firms in host countries (Kodama et al. 2018, Choi and Greaney 2022).

power of female workers within firms, thereby potentially exacerbating wage discrimination against female workers. Bøler et al. (2018) report that firms entering foreign markets across multiple time zones through exports or FDI tend to exhibit greater demand for personnel capable of accommodating flexible working hours. They further suggest that female workers may face an increased risk of discriminatory treatment, as they are often perceived to lack such flexibility.

Furthermore, this study's perspective—that highly internationalized firms are more likely to implement labor adjustments between male and female workers and foster a more gender-equitable workplace in response to institutional reform—builds on existing research linking firms' internationalization to more efficient internal resource allocation. Theoretical studies examining the impact of offshoring on labor adjustments within firms, as well as between firms and industries, include Groizard et al. (2014), among others. For empirical studies, Chen et al. (2021), for example, examine the impact of outward FDI on the optimal allocation of labor and capital within firms. The results show that Chinese firms' outward FDI significantly improves internal resource allocation, particularly by reducing capital misallocation. In addition, while not focusing specifically on FDI or offshoring, Tate and Yang (2015) examine whether diversified firms operating across multiple industries exhibit greater flexibility and efficiency in the internal reallocation of their workforce. Their results show that diversified firms exhibit a stronger tendency to reallocate labor, particularly toward high-growth industries and departments, compared with non-diversified firms.

This paper is structured as follows. First, the following section outlines the Women's Active Engagement Act and its institutional reform that forms the focus of this paper. Section 3 explains the data and analytical methods used in this study. Section 4 presents the estimation results and provides a discussion of their interpretation. Finally, Section 5 provides conclusions and summarizes the paper.

2. Overview of Firm Obligations Under the Women's Active Engagement Act

This paper focuses on the institutional reform under the Women's Active Engagement Act—specifically the introduction and subsequent strengthening of firm-level obligations to promote women's active engagement in the workplace—and examines whether these obligations have narrowed the gender wage gaps within firms. The Act was enacted on September 4, 2015, and has been implemented in stages as a time-limited,

10-year legislation⁸. First, under the relevant ministerial ordinance enacted on April 1, 2016⁹, employers with more than 300 regularly employed workers are obligated to:

- (1) Assess their firm's current situation regarding women's active engagement in the workplace, analyze challenges, and implement countermeasures
- (2) Formulate and submit a General Employer¹⁰ Action Plan (including targets for one or more items)
- (3) Disclose information on the firm's current situation regarding the women's active engagement (one or more items)

No penalties were imposed for non-compliance, and employers with 300 or fewer regular employees were subject only to a best-efforts obligation. Subsequent amendments to the Act expanded the scope of items under (2) applicable to employers with more than 300 regular employees from one or more items to two or more items, effective April 1, 2020. On June 1, 2020, the number of disclosure items required of employers with more than 300 regular employees under (3) was expanded from one or more items to two or more items. Additionally, the "Eruboshi Certification," an excellent employer recognition system, was revised, exempting firms obtaining the newly established "Platinum Eruboshi Certification" from the obligations under (2). Furthermore, on April 1, 2022, (1) through (3) became mandatory for employers with over 100 but fewer than 300 regular employees. On July 8, 2022, reflecting the global trend toward wage disclosure policies, "gender wage gap" was added as a mandatory disclosure item under (3) for employers with more than 300 regular employees¹¹.

Among firm-level obligations prescribed by the Act, this paper focuses on two phases of the institutional reform: the 2016 introduction of statutory firm-level obligations to assess the current situation, formulate action plans, and disclose information; and the 2020 strengthening of the latter two obligations. Both institutional changes are statutorily mandated only for employers with more than 300 workers regularly

⁸ The amendment extending the legislation by an additional 10 years was enacted following deliberation during the regular session of the Diet in 2025 and came into effect on June 1, 2025. The legislation is currently time-limited and remains in effect until the end of March 2036.

⁹ Ordinance on General Employer Action Plans, etc. under the Act on the Promotion of Women's Active Engagement in Professional Life (Ordinance of the Ministry of Health, Labour and Welfare No. 162 of 2015): <https://laws.e-gov.go.jp/law/427M60000100162>

¹⁰ "General Employer" refers to employers other than the national government and local governments. The term "Employer" used in the Act on the Promotion of Women's Participation and Advancement in the Workplace corresponds to the "firm" throughout the paper.

¹¹ Following the enactment on July 8, 2022, firms were obligated, starting with the first fiscal year ending thereafter, to calculate and disclose the ratio of female wages to male wages within the firm using a standardized method.

employed, i.e., “large-scale firms.” The analysis in this paper distinguishes between large-scale firms subject to the mandate and other firms outside its scope, and examines whether the statutory mandate contributed to a narrowing of the gender wage gap. The analysis focuses on whether firms that have expanded their overseas operations through outward FDI demonstrate stronger effects of the reform in narrowing the within-firm gender wage gap.

3. Data and Estimation Method

3.1. Construction of the Dataset for Estimation

This study uses a dataset linking individual workers’ wages with the FDI status of the parent firm to which their workplace (establishment) belongs. We constructed this dataset by merging the Basic Survey on Wage Structure (Ministry of Health, Labour and Welfare) with the Basic Survey of Japanese Business Structure and Activities (Ministry of Economy, Trade and Industry) from 2015 to 2022.

First, wage information for workers is obtained from the Basic Survey on Wage Structure (hereinafter referred to as the Wage Census). The Wage Census is a core statistical survey based on the Statistics Act, aiming to clarify the actual conditions of workers employed in Japan’s major industries. The survey is conducted annually in July, targeting establishments randomly selected by prefecture, industry, and establishment size from among private businesses employing five or more regular workers (and public businesses employing ten or more regular workers). The surveyed establishments are requested to provide information on the characteristics of the establishment and the workers they employ. The information includes establishment attributes, worker gender, employment status, work arrangement, educational background, age, worker type, position, job category, years of experience, scheduled actual working hours, overtime hours, regular cash wages, overtime wages, annual bonuses from the previous survey year, and special payments such as year-end bonuses. The selection of survey establishments is conducted every two to three years. In principle, chosen establishments are required to respond annually until the next sampling cycle. However, because a different identification number is assigned each year to the information of workers reported by the same establishment, it is not possible to track individual workers over time or construct a panel dataset.

In addition, we utilize firm-level data collected through the Basic Survey of Japanese Business Structure and Activities (hereinafter, BSJBSA). The BSJBSA is a core statistical survey based on the Statistics Act, targeting firms headquartered in Japan and belonging to major industries under the jurisdiction of the Ministry of Economy, Trade and Industry, encompassing manufacturing and non-manufacturing industries. The survey covers nearly all large-scale firms in Japan, as well as small and medium-sized firms with 50 or more employees and capital of at least 30 million yen. The response rate exceeds 80%, with approximately 30,000 firms responding to the survey each year. In addition to basic firm attributes, it covers items related to production and service activities, as well as minor details found on the balance sheet. Moreover, the survey reports the number of domestic subsidiaries owned by each firm, as well as the number of overseas subsidiaries, disaggregated by region¹². This study utilizes information on the number of overseas subsidiaries to measure whether a firm engages in outward FDI, as well as the scale of that investment and the extent of its geographical expansion. As the BSJBSA is conducted annually in June and records firms' responses about economic activities in the previous fiscal year, we align by the year in which the activities actually took place (i.e., the target survey year) when linking these data to the aforementioned Wage Census.

Next, we link the Wage Census data with the BSJBSA data for the years 2015 to 2022. For data from 2018 onward, linkage can be achieved using corporate numbers. However, only about one-third of all worker-level observations in the Wage Census data from 2018 onward can be linked using corporate numbers. The remaining two-thirds consist of workers employed by small and medium-sized firms (particularly small businesses) not covered by the BSJBSA, as well as self-employed individuals. Given that many workers whose data could not be linked to the BSJBSA are likely employed by small firms with fewer than 50 employees, these individuals are not statutorily subject to the institutional reform under the Women's Active Engagement Act. This paper focuses on whether the effect of narrowing the gender wage gap through the institutional reform varies depending on the FDI status, with particular attention paid to large-scale firms that are directly subject to the reform.

On the other hand, for data prior to 2017, linking to the Wage Census is not straightforward owing to the lack of corporate numbers. Therefore, we attempted to link the data using the following procedure: first, for

¹² In the BSJBSA, a subsidiary refers to a firm in which the surveyed firm holds over 50% of the voting rights. The number of overseas subsidiaries is reported by region: Asia, Europe, North America, and other regions. The figure for China (including Hong Kong) is also reported separately.

the BSJBSA, we constructed a panel of the data using a shared firm ID and assigned corporate numbers to the 2015–2017 data. For the Wage Census, corporate numbers are also assigned to the 2015–2017 data by referencing the common establishment code. Linking the Wage Census with the BSJBSA using corporate numbers resulted in a matching rate of approximately one-ninth of all observations in the Wage Census. This paper examines the impact of the two institutional changes under the Women’s Active Engagement Act in 2016 and 2020 on the gender wage gap. However, it should be noted that the 2016 analysis necessarily relies on samples with an extremely low matching rate compared with the 2020 analysis.

3.2. Estimation Method

Using a dataset constructed by linking the Wage Census with the BSJBSA and applying the triple difference method, we estimate how changes in the within-firm gender wage gap before and after the institutional reform under the Women’s Active Engagement Act differ, depending on the firm’s FDI status. The basic specification of the estimation equation is as follows.

$$Y_{ifjt} = \alpha + \lambda_f + \lambda_{jt} + Female_i + FDI_{ft} + \beta_1(Female_i \times Post_t) + \beta_2(Female_i \times FDI_{ft}) + \beta_3(Post_t \times FDI_{ft}) + \gamma(Female_i \times Post_t \times FDI_{ft}) + \varepsilon_{ifjt} \quad (1)$$

Y_{ifjt} represents the logarithm of total wages received in year t by worker i working at an establishment of the parent firm f belonging to industry j . In the actual estimation, annual total wages were approximated by multiplying each worker i ’s “regular monthly cash wages” by 12 and adding the “total amount of special wages such as bonuses and year-end allowances received over the past year.” Outliers in the top and bottom 2% of annual total wage values were winsorized. λ_f denotes the firm fixed effect, whereas λ_{jt} represents industry-year fixed effect. $Female_i$ is a dummy variable that takes the value of 1 if worker i is female (hereinafter referred to as the female dummy). $Post_t$ is a dummy variable that takes the value of 1 for the year 2016 (or 2020), when statutory firm-level obligations to promote women’s active engagement in the

workplace were introduced (or strengthened), and for subsequent years (hereinafter, post-reform dummy)¹³. FDI_{ft} captures the status of outward FDI by firm f in year t . Two types of FDI_{ft} were used in the estimation. The first is a dummy variable indicating the presence/absence of FDI (hereinafter, FDI dummy), which takes the value of 1 if firm f is engaged in outward FDI (i.e., owns at least one overseas subsidiary) in year t . While the FDI dummy has a clear interpretation, it lumps together diverse scales of FDI. For the second, we used the logarithm of the number of overseas subsidiaries held by firm f in year t ¹⁴.

In Equation (1), we are particularly interested in the coefficient of the triple difference term γ . This coefficient γ allows us to examine the heterogeneity in the effect of institutional reform aimed at promoting women's active engagement on the within-firm gender wage gap, depending on the firm's FDI status. More precisely, when using the FDI dummy, the coefficient γ captures the triple difference as the “difference in changes in the gender wage gap,” calculated as the change in female workers' wages relative to male workers' wages before and after the institutional reform in firms implementing FDI (FDI firms) minus the change in female wages relative to male wages before and after the reform in firms not implementing FDI (non-FDI firms). In other words, using non-FDI firms as the baseline, we capture the average additional change in female wages relative to male's in FDI firms following the reform. If the coefficient γ is positive, it indicates that following the reform, female wages in FDI firms improved relative to male's by more than in non-FDI firms; equivalently, the within-firm gender wage gap narrowed more in FDI firms. Conversely, if the coefficient γ is negative, it indicates that, even after the reform, the gender wage gap in FDI firms narrowed less than in non-FDI firms—or may have widened relative to them.

When using the logarithm of the number of overseas subsidiaries instead of the FDI dummy, the interpretation of coefficient γ becomes quantitative. If the coefficient γ is positive, it indicates that following the institutional reform, firms with a greater number of overseas subsidiaries tended to experience a relative improvement in female wages relative to male wages, leading to a narrowing of the gender wage gap. Conversely, if the coefficient γ is negative, it indicates that even after the reform, firms with a greater number

¹³ Equation (1) adopts a triple difference structure; however, since it contains the industry-year fixed effect λ_{jt} , it does not include standalone treatment or post-reform dummy variable. The same applies to Equations (2) and (3), as well as the trend variable in Equation (4).

¹⁴ For firm f having one or more overseas subsidiaries in year t , we calculated as $FDI_{ft} = \ln(\text{Number of overseas subsidiaries} + 1)$.

of overseas subsidiaries did not experience a narrowing of the gender wage gap; instead, the gap may have relatively widened.

When estimating Equation (1) and its variants described below, we also consider a basic estimation equation like Equation (2) and estimate it using the quadruple difference method in order to explicitly distinguish “large-scale firms” subject to statutory obligations from other firms.

$$\begin{aligned}
Y_{ifjt} = & \alpha + \lambda_f + \lambda_{jt} + Female_i + Treated_{ft} + FDI_{ft} + \beta_1(Female_i \times Post_t) + \\
& \beta_2(Female_i \times Treated_{ft}) + \beta_3(Female_i \times FDI_{ft}) + \beta_4(Post_t \times Treated_{ft}) + \\
& \beta_5(Post_t \times FDI_{ft}) + \beta_6(Treated_{ft} \times FDI_{ft}) + \gamma_1(Female_i \times Post_t \times Treated_{ft}) + \\
& \gamma_2(Female_i \times Post_t \times FDI_{ft}) + \gamma_3(Female_i \times Treated_{ft} \times FDI_{ft}) + \gamma_4(Post_t \times \\
& Treated_{ft} \times FDI_{ft}) + \delta(Female_i \times Post_t \times Treated_{ft} \times FDI_{ft}) + \varepsilon_{ifjt}
\end{aligned} \tag{2}$$

The newly added $Treated_{ft}$ is a dummy variable that takes the value of 1 for large-scale firms (hereinafter, target firm dummy). In Equation (2), the coefficient δ of the quadruple difference term is used to examine whether the relative effect on the gender wage gap in target firms of the institutional reform differs from that in non-target firms, depending on the firm’s FDI status.

One empirical concern in evaluating the effects of the institutional reform is the possibility that the impact of the 2016 mandate introduction may have persisted into the post-2020 period, potentially conflating the effect of the 2020 strengthening. To disentangle the 2016 introduction effect from the 2020 strengthening effect, we estimate the specification below using data covering the entire period from 2015 to 2022.

$$\begin{aligned}
Y_{ifjt} = & \alpha + \lambda_f + \lambda_{jt} + Female_i + FDI_{ft} + \sum_{T \in \{2016, 2020\}} \beta_{1T}(Female_i \times Post_{T,t}) + \\
& \beta_2(Female_i \times FDI_{ft}) + \sum_{T \in \{2016, 2020\}} \beta_{3T}(Post_{T,t} \times FDI_{ft}) + \\
& \sum_{T \in \{2016, 2020\}} \gamma_T(Female_i \times Post_{T,t} \times FDI_{ft}) + \varepsilon_{ifjt}
\end{aligned} \tag{3}$$

In Equation (3), the triple difference structure is similar to that in Equation (1); however, it simultaneously includes two sets of variables corresponding to the 2016 introduction and the 2020 strengthening. While the estimation results for this Equation (3) will be detailed in the next section, concern remains regarding the

accuracy of the estimates for the 2016 introduction effect. As noted in Section 3.1, we have to estimate the 2016 effect, unlike the 2020 effect, using data that link workers' wages to firm's FDI status at an extremely low matching rate. In addition, for the pre-2016 period, data are only available for a single point in 2015. Owing to these data constraints, the primary analysis in this paper focuses on the 2020 effect .

To analyze firm heterogeneity in the effect of the 2020 strengthening of statutory firm-level obligations on the within-firm gender wage gap by FDI status, we define $Post_t$ as an indicator for the post-2020 period (i.e., 2020 post-reform dummy) and estimate the aforementioned Equation (1) in the triple difference framework. One fundamental assumption underlying the triple difference method is the common trend assumption. That is, it is assumed that in the absence of an intervention (here, the 2020 strengthening), the (wage) gap between the treatment group (female workers in FDI firms) and the control group (male workers in non-FDI firms) remains constant over time. Wing et al. (2018) propose examining group-specific linear trends as one method to test this common trend assumption. Following Greaney and Kiyota (2025), this study also tests the common trend assumption using data prior to the 2020 institutional change, based on the following equation.

$$Y_{ifjt} = \alpha + \lambda_f + \lambda_{jt} + Female_i + Trend_t + FDI_{ft} + \beta_1(Female_i \times Trend_t) + \beta_2(Female_i \times FDI_{ft}) + \beta_3(Trend_t \times FDI_{ft}) + \gamma(Female_i \times Trend_t \times FDI_{ft}) + \varepsilon_{ifjt} \quad (3)$$

$Trend_t$ is a continuous variable representing the time trend, with 2016 set to 1 and 2019 set to 4. The definitions of other variables are the same as in Equation (1). If the trend prior to the institutional change is common between female workers in FDI firms and male workers in non-FDI firms, the coefficient γ will not be statistically significant.

Furthermore, we analyze how the gender wage gap changed over time following the institutional reform. Specifically, in addition to estimating Equation (1) using the 2020 post-reform dummy, we visualize and examine the longitudinal effect of the reform on the gender wage gap using event study analysis. In doing so, we estimate the following equation, replacing $Post_t$ in Equation (1) (defined as the 2020 post-reform dummy) with a vector of year dummy variables (d_t).

$$Y_{ifjt} = \alpha + \lambda_f + \lambda_{jt} + Female_i + FDI_{ft} + \sum_t \beta_1 (Female_i \times \mathbf{d}_t) + \beta_2 (Female_i \times FDI_{ft}) + \sum_t \beta_3 (\mathbf{d}_t \times FDI_{ft}) + \sum_t \gamma_t (Female_i \times \mathbf{d}_t \times FDI_{ft}) + \varepsilon_{ifjt} \quad (4)$$

By plotting the estimated coefficients γ_t over time, we can visually clarify the medium-to-long-term effects of the reform relative to the pre-change period.

4. Estimation Results

4.1. Results of triple difference and quadruple difference estimations

First, Table 1 summarizes the estimation results obtained using Equation (3), which simultaneously accounts for both effects of the 2016 introduction and 2020 strengthening of the institutional reform under the Women's Active Engagement Act. The analysis covers all periods for which data exists from 2015 to 2022. Column (1) presents the estimation results including the FDI dummy, whereas Column (2) presents the results when the number of overseas subsidiaries is included in the triple difference term. As shown in the second row of Table 1, regarding the 2020 strengthening, the coefficient γ of the triple difference term (female dummy * 2020 post-reform dummy * FDI) is, as expected, positive and statistically significant, regardless of whether a firm's degree of internationalization is measured by the FDI status or the scale measured by the number of overseas subsidiaries. This indicates that firms engaging in more active foreign direct investment saw a larger increase in female workers' wages relative to male workers following the 2020 strengthening. In contrast, for the 2016 introduction, when using the number of overseas subsidiaries, the coefficient γ of the triple difference term (female dummy * 2016 post-reform dummy * FDI) was positive and significant. However, when using the FDI dummy, γ became negative and significant. This implies that the interaction direction between the institutional reform and the degree of a firms' internationalization differs, depending on whether the latter is measured by the status or scale of FDI. However, as mentioned above, due to the data constraints, there remains some concern regarding the reliability of the estimates for the 2016 effect.

The following Table 2 summarizes the results of transforming Equation (3) into a quadruple difference structure by including the target firm dummy (similar to the transformation from Equation (1) to Equation (2)). This specification allows us to explicitly distinguish between target and non-target firms in estimating

the effects of the two institutional changes. The analysis period is 2015–2022, the same as in Table 1. The interaction between the institutional reform and the degree of a firm’s internationalization is expected to yield a stronger positive effect for the firms subject to the Act’s statutory mandate than among those outside its scope. Accordingly, the coefficient on the quadruple difference term is expected to be positive. However, as shown in the first row of Table 2, regarding the 2016 introduction, the coefficient of the quadruple difference term (female dummy * 2016 post-reform dummy * target firm dummy * FDI) is negative and significant regardless of whether the FDI dummy or the number of overseas subsidiaries is used. Interpreting these results in conjunction with Table 1 indicates that firms implementing FDI and firms with more overseas subsidiaries saw a narrowing of the gender wage gap following the 2016 introduction; however, among firms subject to the statutory mandate, the extent of the gender wage gap narrowing was less pronounced relative to firms outside its scope, indicating a relative widening of the wage gap. This is an unexpected result. To reiterate, it should be noted that concerns remain regarding the accuracy of the estimates for the 2016 effect. Regarding the 2020 strengthening, although the coefficient for the quadruple difference term (female dummy * 2020 post-reform dummy * target firm dummy * FDI) is positive when using the number of overseas subsidiaries, it is not statistically significant regardless of whether the FDI dummy or the number of overseas subsidiaries is used. No statistically significant difference by firms’ statutory-mandate status was detected in the interaction between the institutional reform and the firm’s degree of internationalization.

Based on the results presented in Tables 1 and 2, and in light of data constraints that limit the identification of the 2016 effect—raising concerns about the reliability of those estimates—the subsequent analysis focuses on the impact of the 2020 strengthening of the institutional reform. The analysis period covers 2016 to 2022. Table 2 indicates that the interaction between the institutional reform and the firm’s degree of internationalization may not be limited solely to firms subject to the statutory mandate. As described in Section 2, under the Act, large-scale firms were mandated to implement measures promoting women’s active engagement; however, no penalties were imposed for non-compliance. Firms not subject to this mandate were only required to make voluntary efforts to implement such initiatives. Furthermore, the institutional reform to promote women’s active engagement were implemented in phases, thus firms initially excluded from the mandate’s scope could reasonably anticipate that the target range would expand over time. In fact, medium-sized firms with over 100 regular employees, which were initially excluded from the scope, became

subject to a statutory mandate starting in 2022. Given this situation, the institutional reform may have indirectly affected even non-target firms that were not initially mandated, prompting labor adjustments between male and female workers and the establishment of gender-equitable work environment in the midst of a societal push for women's active engagement. The subsequent analysis employs a basic estimation using a triple difference structure that does not include the target firm dummy, followed by the presentation of the quadruple difference estimation results that includes the target firm dummy for reference.

Before further examining the effect of the 2020 strengthening of the institutional reform, we conducted tests for the presence of pre-existing trends using data from the period before the change (2016–2019). As shown in Table 3, the coefficients for the triple difference term were not statistically significant, regardless of the use of the FDI dummy or the number of overseas subsidiaries. These results support the validity of the common trend assumption on which the verification of the effect of the 2020 strengthening is based. We also tested for the presence of prior trends in a quadruple difference structure that includes the target firm dummy, with the results summarized in Table 4. For the quadruple difference terms, similar to the triple difference terms (Table 3), the coefficients were not statistically significant, confirming that the common trend assumption holds even when explicitly distinguishing between target and non-target firms.

Having confirmed that the necessary prerequisites are met, we proceed to estimate the effect of the 2020 strengthening using Equations (1) and (2). The estimation results of the triple difference estimation using Equation (1) are shown in Tables 5 and 6. As noted earlier, since medium-sized firms with over 100 regular employees became subject to statutory mandate starting in 2022, we conducted estimations for the sample period from 2016 to 2022 (Table 5) as well as for the period from 2016 to 2021 (Table 6) to verify robustness. In columns (3) and (4) of each table, in addition to the firm fixed effect, the logarithm of each worker's monthly scheduled working hours is added as an explanatory variable to more accurately control for time-varying firm-specific factors that may affect wages.¹⁵

The results in Table 5 show that the coefficient γ of the triple difference term (female dummy * post-reform dummy * FDI) is positive and statistically significant in all columns. This indicates that the gender wage gap narrowed due to the interaction between the institutional reform and the firm's degree of

¹⁵ Other influential variables include job category, educational background, years of experience, and employment status. However, since all of these variables have a high number of missing values, this analysis uses monthly scheduled working hours, which has fewer missing values in the samples.

internationalization. Adding the variable for monthly scheduled working hours does not qualitatively change the results. The female dummy is negative and significant across all columns, confirming that female workers' wages are generally significantly lower relative to their male counterparts. The interaction term between the female dummy and the post-reform dummy is positive and statistically significant in all cases except for column (2). While the institutional reform appears to have contributed to a relative improvement in female workers' wages and a narrowing of the gender wage gap to some extent, the robust results of the triple difference term highlight an interaction with the firm's degree of internationalization. This suggests that the effect of the institutional reform in narrowing the gender wage gap was more pronounced in highly internationalized firms. Table 6, which covers the period excluding 2022—when the scope of statutory mandate was expanded—yields broadly similar results.

The estimated coefficient (0.0542) for the interaction term between the female dummy and the post-reform dummy, reported in column (3) of Table 5, represents an average effect common to FDI and non-FDI firms. This captures the extent to which female workers' wages increased relative to male workers after the institutional reform. Since the dependent variable is the logarithm of total wages, this effect can be calculated as $(e^{0.0542} - 1) \times 100 \approx 5.57\%$. In other words, for non-FDI firms, the gender wage gap narrowed by approximately 5.6% following the strengthening of statutory firm-level obligations. On the other hand, the estimated coefficient (0.00915) of the triple difference term (female dummy * post-reform dummy * FDI dummy) represents an additional effect specific to FDI firms. Therefore, the extent of the narrowing in the gender wage gap following the institutional change for FDI firms can be calculated by combining the common effect (0.0542) and the additional effect (0.00915): $(e^{0.0542+0.00915} - 1) \times 100 \approx 6.54\%$. In summary, while non-FDI firms show a reduction effect of approximately 5.6%, FDI firms demonstrate a larger reduction effect of approximately 6.5%.

Similarly, using the estimated coefficients in column (4) of Table 5, we can examine how the effect of narrowing the gender wage gap varies depending on the scale of FDI, as measured by the number of overseas subsidiaries. When the number of overseas subsidiaries is n , we can add the estimated coefficient for the interaction term between female dummy and post-reform dummy (0.0363) to the estimated coefficient of the triple difference term (female dummy * post-reform dummy * $\ln(\text{Number of overseas subsidiaries} + 1)$) (0.0161) multiplied by $\ln(n + 1)$. The average number of overseas subsidiaries among the analyzed

samples is 15.6 firms; however, the distribution is significantly right-skewed. For example, in the case of 1 firm corresponding to the 25% point, it can be calculated as $(e^{0.0363+\ln(1+1)\times 0.0161} - 1) \times 100 \approx 4.86\%$. For the median case of 4 firms, $(e^{0.0363+\ln(4+1)\times 0.0161} - 1) \times 100 \approx 6.42\%$; for the case of 10 firms corresponding to the midpoint between the median and the 75% point, $(e^{0.0363+\ln(10+1)\times 0.0161} - 1) \times 100 \approx 7.78\%$; and for the case of 30 firms corresponding to the midpoint between the 75% point and the 90% point, $(e^{0.0363+\ln(30+1)\times 0.0161} - 1) \times 100 \approx 9.59\%$. This indicates that firms with a larger number of overseas subsidiaries exhibit a more pronounced effect of narrowing the gender wage gap. In particular, firms with only one overseas subsidiary experienced only a limited narrowing of the gender wage gap, below the average level observed for non-FDI firms. In contrast, firms with three or more overseas subsidiaries exhibited a greater narrowing of the wage gap, exceeding the average for non-FDI firms.

The estimation results of the quadruple difference using Equation (2) are shown in Table 7. In all columns, the coefficient of the quadruple difference term (female dummy * post-reform dummy * target firm dummy * FDI) δ is not statistically significant. Interpreting these results in conjunction with Tables 5 and 6 suggests that while firms with a higher degree of internationalization experienced a narrowing of the gender wage gap following the institutional change, no significant differences were observed based on whether firms were subject to the statutory mandate. Although small and medium-sized firms were only required to make voluntary efforts toward compliance, and it was foreseeable that the scope of statutory mandate would be expanded in the future. Considering this point, we can interpret that the interaction between the institutional reform and the firm's degree of internationalization extended broadly across the entire firm landscape, including non-target firms, driven less by statutory enforcement and more by anticipation of future inclusion and social pressure amid the growing momentum for promoting women's active engagement.

Furthermore, to confirm the above results, we perform an event study analysis based on Equation (4) and summarize the results in Figures 1 and 2. In both figures, the estimated value of γ_t in Equation (4) is visualized as the reference value (=0) for 2020, the year of the institutional change under study. The results in Figures 1 and 2 confirm a trend peaking in 2020. However, when using the FDI dummy, it consistently declined after 2020, although it remained above the levels observed in 2017 and 2018. When using the number of overseas subsidiaries, there is a drop in 2021 before subsequently rising again. Considering these two figures together, we confirm that the institutional reform had a significant impact on FDI firms.

Specifically, firms with a larger number of overseas subsidiaries experienced a greater relative increase in female workers' wages relative to male workers, resulting in a narrowing of the gender wage gap.

4.2. The Impact of Geographic Distribution of FDI and Time Zone Differences

In the previous section's analysis, as a measure of the firm's degree of internationalization, we focused on the presence or absence of FDI and the scale of FDI measured by the number of overseas subsidiaries. However, the impact of the institutional reforms on the gender wage gap may also differ depending on how a firm geographically expands its business through FDI. In particular, the greater the time difference between Japan and the country or region where an overseas subsidiary is located, the more disadvantageous it is likely to be for female workers who are less flexible in accommodating work outside regular hours due to the time difference. Consequently, the relative improvement in female's wages through institutional reforms is likely to be weaker. Therefore, as an additional analysis, we construct an indicator capturing the time zone differences in firms' overseas operations and examine whether a greater time zone difference reduces the effect of the institutional reforms on narrowing the gender wage gap, while considering the interaction with the firm's degree of internationalization. The time zone difference indicator in this study was constructed as a weighted average, using the average time difference from Japan set by region (Asia = 0 hours, Europe = 8 h, North America = 14 h) and weighted by the number of overseas subsidiaries per region for each firm. Firms primarily operating in Asia exhibit smaller time zone differences, whereas those with numerous subsidiaries in North America show larger differences. For firms with no overseas subsidiaries, the time zone difference is defined as zero.

Table 8 shows the results of re-examining the interaction between the 2020 institutional reform and the firm's degree of internationalization by incorporating the time zone difference indicator into Equation (1) to form a quadruple difference structure. The sample period is 2016–2022, and the estimation results are based on the quadruple difference incorporating the time zone difference indicator into the estimation as in Table 5. The quadruple difference term of our interest (female dummy * post-reform dummy * FDI * time zone difference) is negative and statistically significant in all columns. This indicates that as the time zone difference in a firm's overseas operations increases, the effect of the interaction between the institutional reforms and the firm's degree of internationalization on narrowing the gender wage gap tends to diminish.

Furthermore, the triple difference term (female dummy * post-reform dummy * FDI) highlighted in Table 5 remains consistently positive and significant in Table 8, confirming the robustness of the previous estimation.

4.3. Impact of the COVID-19 Pandemic

Because the analysis incorporates industry-year fixed effects, the macro-level impact of the COVID-19 pandemic is already controlled for. However, there is concern that when estimating the coefficient γ of the triple difference term in Equation (1), the “impact of the COVID-19 pandemic on wages specifically for female employed by FDI firms” may be confounded with the “effect of the 2020 institutional reform” that we aim to capture.

Previous studies have highlighted that the COVID-19 pandemic affected male’s and female’s wages differently. Some studies suggest that female suffered greater negative impacts than male (Singh et al. 2022). Other studies, however, report that male experienced stronger negative impacts (Liang et al. 2022). While previous studies offer differing perspectives, they consistently suggest that the “impact of the COVID-19 pandemic on female’s wages” warrants careful consideration. However, this “impact of the COVID-19 pandemic on wages specific to female” is accounted for in Tables 5, 6, and 8, for example, by including the interaction term between the female dummy and the post-reform dummy. Moreover, to the best of the authors’ knowledge, no existing studies have indicated that the impact of the COVID-19 pandemic on wages varies according to the firm’s degree of internationalization through outward FDI. Therefore, empirical evidence regarding the “impact of the COVID-19 pandemic on wages specific to female employed by FDI firms” does not currently exist, and the concerns in distinguishing the triple difference term mentioned above may be negligible.

That said, the event study plot, for example, indicates that the relative wages of female at FDI firms declined from 2020 to 2021, likely reflecting the impact of the COVID-19 pandemic. Firms with a greater number of overseas subsidiaries exhibited a recovery in female’s relative wages from 2021 to 2022. This may also suggest that such firms recovered more quickly from the pandemic, thereby accelerating the shift toward higher wages for female workers in the context of mandatory initiatives promoting women’s active engagement. In any case, further robustness checks are required regarding the distinction of the triple difference term.

5. Conclusion

This paper focused on the interaction between the institutional reform promoting women's active engagement and the firm's degree of internationalization while examining whether firms engaged in overseas operations via outward FDI narrowed the within-firm gender wage gap following such institutional changes. Using a dataset linking individual worker wages to the FDI status of the parent firm to which their workplace belonged, we conducted empirical analysis by employing the triple difference and the quadruple difference methods.

The analysis first revealed that following the institutional reform that strengthened statutory requirements for firm initiatives to promote women's active engagement, the gender wage gap narrowed significantly more within firms engaging in FDI relative to those that did not. Furthermore, this trend was found to be stronger among firms with a greater number of overseas subsidiaries. Second, no significant difference was observed based on whether firms were subject to the statutory mandate. This suggests that the effects of the institutional reform were not limited to the target firms subject to the statutory mandate but may have extended to non-target firms outside its scope, through signaling effects and the anticipated expansion of the mandate's scope in the future. Third, the effect was found to be weaker among firms with a broader geographic scope of business expansion and greater time zone differences from Japan.

The results indicate that institutional interventions aimed at promoting women's active engagement have a stronger impact in highly internationalized firms, particularly when the time difference with their overseas subsidiaries is small, leading to a more pronounced narrowing of the gender wage gap. This suggests that internationalized firms may be more responsive to institutional reform as being more adaptable in facilitating within-firm labor reallocation between male and female workers and implementing workplace transformations toward a more gender-equitable work environment. In contrast, the findings also suggest that as overseas expansion increases time zone differences, the need for communication with overseas subsidiaries outside regular working hours intensifies, making it relatively more difficult to implement flexible labor adjustments between male and female workers and improve working conditions for female employees.

The analysis in this paper clarifies the impact of the interaction between the institutional interventions and the firm's internationalization on domestic labor markets, presenting policy implications for institutional design. In particular, the finding that the effects of institutional reform may have extended beyond legally designated targets through social signaling suggests that, in the design and implementation of such institutions, ensuring overall predictability and social legitimacy may be more critical than drawing boundaries around its scope. Furthermore, for firms expanding overseas operations, we confirmed a tendency toward reduced effectiveness of the institutional reform due to time zone differences with overseas subsidiaries. Therefore, to reliably achieve the institution's intended effect, it is advisable to also consider the firm's overseas expansion status and the international business environment.

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Table 1. Effects of the interaction between the 2016 and 2020 institutional reforms and FDI on the gender wage gap: Triple difference

Explanatory variable	Dependent variable FDI variable	(1) ln (Total wage) FDI dummy	(2) ln (Total wage) ln(No. Subsid.)
Female dummy * Post-2016 dummy * FDI		-0.0314*** (0.0121)	0.0244*** (0.00876)
Female dummy * Post-2020 dummy * FDI		0.0171*** (0.00534)	0.0300*** (0.00386)
Female dummy		Yes	Yes
FDI		Yes	Yes
Female dummy * Post dummy		Yes	Yes
Female dummy * FDI		Yes	Yes
Post dummy * FDI		Yes	Yes
Industry-year fixed effect		Yes	Yes
Parent firm fixed effect		Yes	Yes
Number of observations		1,122,249	276,117
R-squared		0.597	0.626

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2015–2022.

Table 2. Effects of the interaction between the 2016 and 2020 institutional reforms and FDI on the gender wage gap: Quadruple difference (considering target firm dummy)

Explanatory variable	Dependent variable FDI variable	(1)	(2)
		ln (Total wage) FDI dummy	ln (Total wage) ln(No. Subsid.)
Female dummy * Post-2016 dummy * Target firm dummy * FDI		-0.0657** (0.0333)	-0.203*** (0.0521)
Female dummy * Post-2020 dummy * Target firm dummy * FDI		-0.0141 (0.0143)	0.0126 (0.0232)
Female dummy		Yes	Yes
Target firm dummy		Yes	Yes
FDI		Yes	Yes
Female dummy * Post dummy		Yes	Yes
Female dummy * Target firm dummy		Yes	Yes
Female dummy * FDI		Yes	Yes
Post dummy * Target firm dummy		Yes	Yes
Post-reform dummy * FDI		Yes	Yes
Target firm dummy * FDI		Yes	Yes
Female dummy * Post dummy * Target firm dummy		Yes	Yes
Female dummy * Post dummy * FDI		Yes	Yes
Female dummy * Target firm dummy * FDI		Yes	Yes
Post dummy * Target firm dummy * FDI		Yes	Yes
Industry-year fixed effect		Yes	Yes
Parent firm fixed effect		Yes	Yes
Number of observations		1,122,249	276,117
R-squared		0.597	0.626

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and

the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2015–2022.

Table 3. Confirmation of the parallel trend assumption in the analysis of the 2020 institutional reform:

Triple difference

Explanatory variable	Dependent variable FDI variable	(1) ln (Total wage) FDI dummy	(2) ln (Total wage) ln(No. Subsid.)
Female dummy * Trend * FDI		0.00613 (0.00428)	-0.00247 (0.00283)
Female dummy		-0.475*** (0.0109)	-0.578*** (0.0277)
FDI		0.0139 (0.0164)	0.00782 (0.0136)
Female dummy * Trend		0.00988*** (0.00263)	0.0204*** (0.00678)
Female dummy * FDI		-0.0210 (0.0175)	0.0442*** (0.0115)
Trend * FDI		0.00140 (0.00261)	-0.00457*** (0.00148)
Industry-year fixed effect		Yes	Yes
Parent firm fixed effect		Yes	Yes
Number of observations		371,940	112,446
R-squared		0.625	0.638

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2019.

Table 4: Confirmation of the parallel trend assumption in the analysis of the 2020 institutional reform:

Quadruple difference (considering target firm dummy)

Explanatory variable	Dependent variable FDI variable	(1)	(2)
		ln (Total wage) FDI dummy	ln (Total wage) ln(No. Subsid.)
Female dummy * Trend * Target firm dummy * FDI		-0.0122 (0.00997)	0.0232 (0.0155)
Female dummy		-0.485*** (0.0137)	-0.705*** (0.0744)
Target firm dummy		0.0187 (0.0153)	0.0458 (0.0724)
FDI		0.0621** (0.0291)	0.0681 (0.0576)
Female dummy * Trend		0.0145*** (0.00334)	0.0627*** (0.0184)
Female dummy * Target firm dummy		0.0118 (0.0173)	0.124 (0.0792)
Female dummy * FDI		-0.106*** (0.0365)	0.102* (0.0612)
Trend * Target firm dummy		-0.00497* (0.00270)	-0.00749 (0.0148)
Trend * FDI		-0.00393 (0.00640)	-0.0135 (0.0104)
Target firm dummy * FDI		-0.0370 (0.0301)	-0.0580 (0.0575)
Female dummy * Trend * Target firm dummy		-0.00516 (0.00422)	-0.0418** (0.0196)
Female dummy * Trend * FDI		0.0194** (0.00900)	-0.0258* (0.0152)
Female dummy * Target firm dummy * FDI		0.0799** (0.0405)	-0.0569 (0.0623)
Trend * Target firm dummy * FDI		0.00486 (0.00687)	0.00914 (0.0105)
Industry-year fixed effect		Yes	Yes
Parent firm fixed effect		Yes	Yes
Number of observations		481,767	122,099
R-squared		0.613	0.633

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2019.

Table 5. Effects of the interaction between the institutional reforms and FDI on the gender wage gap:

Triple difference (2016–2022)

Explanatory variable	(1)	(2)	(3)	(4)
	Dependent variable FDI variable	ln (Total wage) ln (No. Subsid.)	ln (Total wage) FDI dummy	ln (Total wage) ln (No. Subsid.)
Female dummy * Post dummy * FDI	0.0175*** (0.00535)	0.0298*** (0.00387)	0.00915** (0.00369)	0.0161*** (0.00279)
Female dummy	-0.436*** (0.00229)	-0.504*** (0.00671)	-0.343*** (0.00146)	-0.409*** (0.00491)
FDI	0.0317*** (0.00695)	-0.0105* (0.00629)	0.0232*** (0.00482)	0.0101** (0.00506)
Female dummy * Post dummy	0.0356*** (0.00296)	0.00497 (0.00869)	0.0542*** (0.00188)	0.0363*** (0.00624)
Female dummy * FDI	-0.00411 (0.00417)	0.0357*** (0.00284)	-0.0440*** (0.00297)	0.0121*** (0.00218)
Post dummy * FDI	-0.0110*** (0.00332)	-0.0109*** (0.00214)	-0.0228*** (0.00264)	-0.00572*** (0.00184)
ln(Monthly scheduled working hours)	..	..	0.927*** (0.00202)	0.928*** (0.00571)
Industry-year fixed effect	Yes	Yes	Yes	Yes
Parent firm fixed effect	Yes	Yes	Yes	Yes
Number of observations	1,068,492	261,179	1,059,091	259,498
R-squared	0.597	0.626	0.808	0.764

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2022.

Table 6. Effects of interaction between the institutional reforms and FDI on the gender wage gap: Triple difference (2016–2021)

Explanatory variable	(1)	(2)	(3)	(4)
	Dependent variable FDI variable	ln (Total wage) ln (No. Subsid.)	ln (Total wage) FDI dummy	ln (Total wage) ln (No. Subsid.)
Female dummy * Post dummy * FDI	0.0254*** (0.00600)	0.0290*** (0.00435)	0.00889** (0.00414)	0.0139*** (0.00312)
Female dummy	-0.435*** (0.00232)	-0.504*** (0.00676)	-0.344*** (0.00148)	-0.412*** (0.00497)
FDI	0.0209** (0.00813)	-0.0255*** (0.00734)	0.00993* (0.00559)	0.00354 (0.00628)
Female dummy * Post dummy	0.0238*** (0.00330)	0.00147 (0.00972)	0.0516*** (0.00210)	0.0365*** (0.00701)
Female dummy * FDI	-0.00410 (0.00423)	0.0360*** (0.00286)	-0.0437*** (0.00303)	0.0140*** (0.00221)
Post dummy * FDI	-0.0115*** (0.00378)	-0.0116*** (0.00244)	-0.0269*** (0.00300)	-0.00724*** (0.00210)
ln(Monthly scheduled working hours)	..	..	0.924*** (0.00223)	0.929*** (0.00628)
Industry-year fixed effect	Yes	Yes	Yes	Yes
Parent firm fixed effect	Yes	Yes	Yes	Yes
Number of observations	870,556	211,948	862,802	210,620
R-squared	0.599	0.630	0.806	0.764

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2021.

Table 7. Effects of the interaction between the institutional reforms and FDI on gender wage gap:

Quadruple difference (considering target firm dummy, 2016–2022)

Explanatory variable	(1)	(2)	(3)	(4)
	Dependent variable ln (Total wage) FDI variable FDI dummy	ln (Total wage) ln (No. Subsid.)	ln (Total wage) FDI dummy	ln (Total wage) ln (No. Subsid.)
Female dummy * Post dummy	-0.0140 (0.0144)	0.0124 (0.0232)	0.0118 (0.0114)	-0.0141 (0.0198)
* Target firm dummy * FDI				
Female dummy	-0.426*** (0.00349)	-0.464*** (0.0192)	-0.346*** (0.00254)	-0.405*** (0.0171)
Target firm dummy	0.00133 (0.00680)	-0.0453 (0.0336)	0.00933* (0.00502)	0.0299 (0.0299)
FDI	0.0320*** (0.0116)	-0.0624*** (0.0241)	-0.00553 (0.0102)	-0.00959 (0.0213)
Female dummy * Post dummy	0.0242*** (0.00465)	0.0329 (0.0276)	0.0463*** (0.00335)	0.0120 (0.0235)
Female dummy * Post dummy	-0.0126*** (0.00447)	-0.0417** (0.0206)	0.00437 (0.00306)	-0.00222 (0.0179)
Female dummy * FDI	-0.0356*** (0.00970)	0.000926 (0.0159)	-0.0584*** (0.00802)	-0.000562 (0.0143)
Post dummy * Target firm dummy	-0.00917** (0.00408)	0.00418 (0.0240)	-0.00351 (0.00318)	-0.0408* (0.0217)
Post dummy * FDI	-0.00612 (0.00893)	-0.00458 (0.0181)	0.00907 (0.00807)	-0.0345** (0.0167)
Target firm dummy * FDI	-0.00205 (0.0118)	0.0530** (0.0239)	0.0311*** (0.0104)	0.0209 (0.0211)
Female dummy * Post dummy	0.0154*** (0.00588)	-0.0310 (0.0292)	0.0106*** (0.00401)	0.0266 (0.0245)
* Target firm dummy				
Female dummy * Post dummy * FDI	0.0278** (0.0131)	0.0183 (0.0228)	-0.00327 (0.0107)	0.0295 (0.0196)
Female dummy * Target firm dummy * FDI	0.0371*** (0.0107)	0.0357** (0.0162)	0.0151* (0.00864)	0.0124 (0.0145)
Post dummy * Target firm dummy * FDI	-0.00310 (0.00967)	-0.00639 (0.0182)	-0.0331*** (0.00857)	0.0293* (0.0167)
ln(Monthly scheduled working hours)	..	..	0.927*** (0.00202)	0.928*** (0.00571)
Industry-year fixed effect	Yes	Yes	Yes	Yes
Parent firm fixed effect	Yes	Yes	Yes	Yes
Number of observations	1,068,492	261,179	1,059,091	259,498
R-squared	0.597	0.626	0.808	0.764

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2022.

Table 8. Effects of the interaction between the institutional reforms and FDI on the gender wage gap:

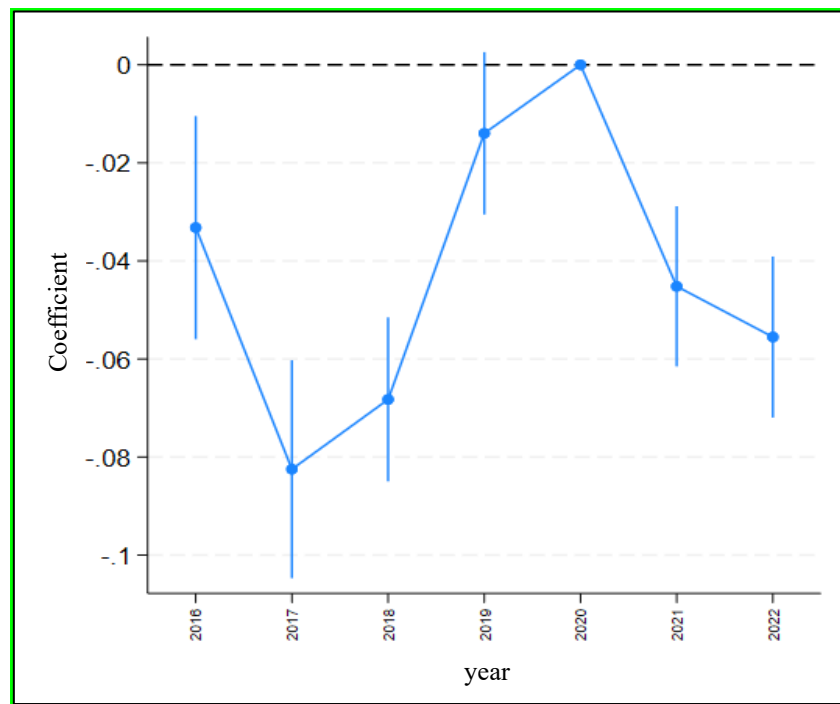
Quadruple difference incorporating time zone differences (2016–2022)

	(1)	(2)	(3)	(4)
Dependent variable	ln (Total wage)	ln (Total wage)	ln (Total wage)	ln (Total wage)
FDI variable	FDI dummy	ln (No. Subsid.)	FDI dummy	ln (No. Subsid.)
Explanatory variable				
Female dummy * Post dummy	-0.00449*** (0.00158)	-0.00439*** (0.00138)	-0.00201* (0.00106)	-0.00276*** (0.000892)
* FDI * Time zone difference				
Female dummy	-0.436*** (0.00229)	-0.552*** (0.00816)	-0.343*** (0.00146)	-0.427*** (0.00587)
FDI	0.0300*** (0.00731)	-0.0286*** (0.00854)	0.0196*** (0.00506)	-0.0110* (0.00663)
Time zone difference	0.000151 (0.00116)	-0.0121*** (0.00303)	0.00245*** (0.000808)	-0.00441** (0.00208)
Female dummy * Post dummy	0.0355*** (0.00296)	-0.00835 (0.0103)	0.0542*** (0.00188)	0.0271*** (0.00730)
Female dummy * FDI	-0.00782 (0.00488)	0.0782*** (0.00458)	-0.0477*** (0.00342)	0.0269*** (0.00333)
Female dummy * Time zone difference	..	0.0128*** (0.00219)	..	0.00561*** (0.00147)
Post dummy * FDI	-0.00251 (0.00392)	-0.0174*** (0.00369)	-0.0219*** (0.00313)	-0.00246 (0.00303)
Post dummy * Time zone difference	..	-0.00732*** (0.00189)	..	0.000172 (0.00140)
FDI * Time zone difference	..	0.00523*** (0.00147)	..	0.00499*** (0.00120)
Female dummy * Post dummy * FDI	0.0268*** (0.00620)	0.0521*** (0.00604)	0.0127*** (0.00425)	0.0271*** (0.00410)
Female dummy * Post dummy	..	-0.00186 (0.00282)	..	0.000912 (0.00182)
* Time zone difference				
Female dummy * FDI	0.00197* (0.00120)	-0.0101*** (0.000992)	0.00188** (0.000838)	-0.00357*** (0.000685)
* Time zone difference				
Post dummy * FDI	-0.00340*** (0.000900)	0.00236*** (0.000729)	-0.000569 (0.000702)	-0.000550 (0.000573)
* Time zone difference				
ln(Monthly scheduled working hours)			0.927*** (0.00202)	0.927*** (0.00572)
Industry-year fixed effect	Yes	Yes	Yes	Yes
Parent firm fixed effect	Yes	Yes	Yes	Yes
Number of observations	1,068,492	261,179	1,059,091	259,498
R-squared	0.597	0.627	0.808	0.764

Source: Compiled by the author based on the Wage Census (Ministry of Health, Labour and Welfare) and the BSJBSA (Ministry of Economy, Trade and Industry).

Note: Robust standard errors are listed in parentheses under the estimated coefficients. The ***, **, and * attached to the estimates indicate p-values of 0.01, 0.05, and 0.1 or less, respectively. The analysis period is 2016–2022.

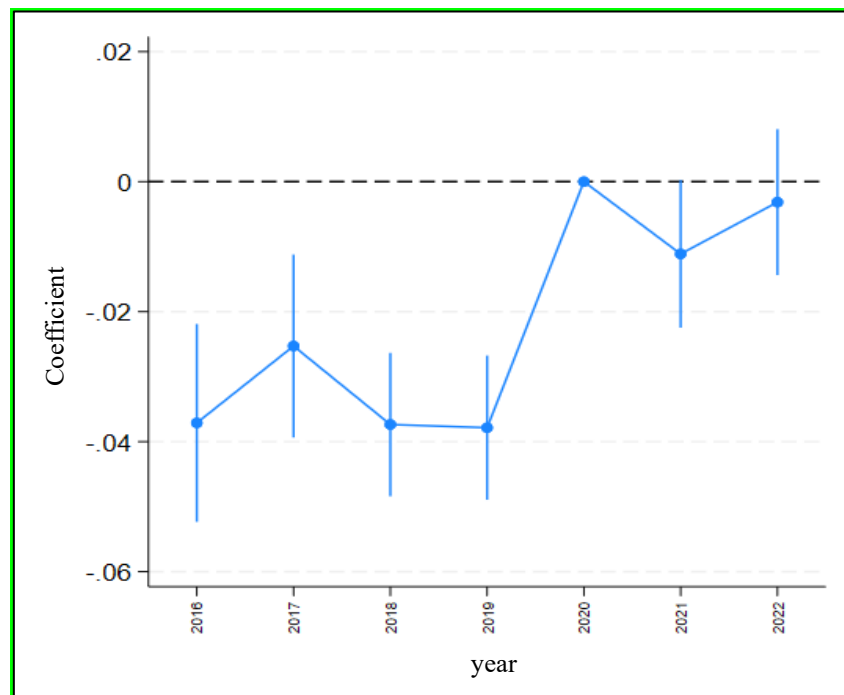
Figure 1. Event study: Plot of estimated coefficients using FDI dummy



Source: Compiled by the author based on the Ministry of Health, Labour and Welfare's "Basic Survey on Wage Structure," and the Ministry of Economy, Trade and Industry's "Basic Survey of Japanese Business Structure and Activities."

Note: For each year, the estimated coefficients of the interaction term between the annual dummy (excluding the base year 2020), the female dummy, and the FDI dummy are plotted. The vertical line indicates the 95% confidence interval. The analysis period is 2016–2022.

Figure 2. Event study: Plot of estimated coefficients using the number of overseas subsidiaries



Source: Compiled by the author based on the Ministry of Health, Labour and Welfare's "Basic Survey on Wage Structure," and the Ministry of Economy, Trade and Industry's "Basic Survey of Japanese Business Structure and Activities."

Note: For each year, the estimated coefficients of the interaction term between the annual dummy (excluding the base year 2020), the female dummy variable, and $\ln$ (number of overseas affiliates) are plotted. The vertical line indicates the 95% confidence interval. The analysis period is 2016–2022.