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Ex-ante and ex-post evaluation of zombie firms arising from the EAS program during the COVID-19 pandemic: A study of Japanese SMEs

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Panel Data Research Center, Keio University
2-15-45 Mita, Minato-ku, Tokyo 108-8345, Japan
info@pdrc.keio.ac.jp
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Akira Fukuda
Faculty of Political Science and Economics, Takushoku University
3-4-14 Kohinata, Bunkyo-ku, Tokyo
afukuda@ner.takushoku-u.ac.jp

Isamu Yamamoto
Faculty of Business and Commerce, Keio University
2-15-45 Mita, Minato-ku, Tokyo
yamamoto@fbc.keio.ac.jp

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Ex-ante and ex-post evaluation of zombie firms arising from the EAS program during the COVID-19 pandemic: A study of Japanese SMEs

Akira Fukuda[1] Isamu Yamamoto[2]

Abstract

This study aims to provide an ex-ante and ex-post evaluation of the Employment Adjustment Subsidy (EAS) that the Japanese government extended to unprecedented levels during the COVID-19 pandemic. Using unique monthly data from firm-level surveys conducted by the JILPT and the TDB, we investigate what types of firms applied for the EAS and how their subsequent performance evolved. A key contribution of our study is that we provide an ex-post evaluation of the EAS on firm performance for approximately two years during the pandemic. As in previous studies, we confirm that most of the firms that applied for the EAS were not zombies before the pandemic. However, their subsequent sales were much poorer than those of non-applicant firms even more than a year after the initial application. The feature was conspicuous in 2021, especially for small-scale firms in troubled sectors, unless they received extra support. This suggests that the initial large-scale subsidy was not successful in preventing the zombification of troubled firms during the pandemic.

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[1] Faculty of Political Science and Economics, Takushoku University, afukuda@ner.takushoku-u.ac.jp
[2] Faculty of Business and Commerce, Keio University, yamamoto@fbc.keio.ac.jp

1 Introduction

As the spread of COVID-19 expanded, the Japanese government implemented various support measures for firms whose performance had deteriorated during the pandemic. Among these measures, an exceptionally large-scale provision was introduced for the subsidy rate and maximum amount of the Employment Adjustment Subsidy (EAS). This study aims to provide an ex-ante and ex-post evaluation of the EAS. Using unique monthly data from a firm-level survey conducted by the Japan Institute for Labour Policy and Training (JILPT) and the Teikoku Databank (TDB), we investigate what types of firms applied for the EAS and how their subsequent performance evolved over the following two years.

A key contribution of our study is that by using monthly firm-level panel data, we provide an ex-post evaluation of the EAS on firm performance for approximately two years during the pandemic. Due to a lack of sufficient time length in the microdata, most previous studies did not provide ex-post policy evaluations regarding whether the subsidy improved firm performance in the medium term. For example, Uesugi et al. (2021) and Hoshi, Kawaguchi, and Ueda (2023) focused on ex-ante policy evaluations using pre-COVID-19 credit scores, and so did Morikawa (2021) using labor productivity and total factor productivity (TFP) before the pandemic. One exception is Honda et al. (2023), who investigated the differences in outcomes between March 2019 and March 2021 and found a negative treatment effect of the EAS on the number of employees. However, their annual data analysis was limited to an early-stage evaluation of firm performance during the pandemic.

Contrary to Honda et al. (2023), we provide ex-post policy evaluations on the evolution of monthly sales growth until January 2022. Extending the data for one year would be beneficial in assessing the impact of the subsidy because COVID-19 had prolonged negative impacts on the

Japanese economy. Using firm-level monthly data would allow for a more sophisticated policy evaluation because economic activity in Japan showed significant short-term fluctuations in response to the repeated spread of COVID-19 infections.

As shown in Figure 2, the number of bankruptcies in Japan during the pandemic declined and reached the lowest level since 1990. This suggests that Japanese government policy measures, such as the EAS, were too generous and excessive to prevent bankruptcies during the COVID-19 pandemic. Such excessive government support measures likely helped not only those firms that were temporarily affected by the pandemic but also those firms that were permanently distressed. Therefore, this study explores whether the large-scale EAS led to the emergence of so-called zombie firms during the COVID-19 pandemic.

In the following analysis, we construct approximately two years of monthly firm-level panel data based on the 'Survey on the Impact of COVID-19 on Corporate Management' conducted by the JILPT and the TDB. We first examine which types of firms applied for the EAS during the early stages of the pandemic. We then investigate whether they exhibited adequate sales recovery more than one year after their application. To address endogeneity related to the EAS application, we select firms that did not apply for the EAS but had similar characteristics as a control group using propensity score matching (PSM). We estimate the effects of the EAS by comparing corporate performance between treatment and control groups. We identify the subsidized firms as zombie firms when the treatment group experienced poorer sales growth than the control group, even after a certain period. If troubled firms used the EAS effectively, they would be restructured to adapt to a new environment and effectively recover their sales.

The main results of our analysis are summarized as follows. Implementing logistic regressions with cross-sectional data from the early stages of the pandemic, we first find that the EAS was

appropriately implemented for the firms whose performance worsened during the early stage of the pandemic. In particular, the firms that performed poorly before the pandemic did not apply for the EAS. However, by examining firms' sales growth more than one year after application, we find that the EAS applicant firms had much poorer recovery of sales growth rates than the EAS non-applicant firms. In particular, the poor performance was conspicuous during the third and fourth declarations of state of emergency, which lasted from April to October 2021, and the applicant firms never showed better recovery than the non-applicant firms during the subsequent economic recovery period.

These results suggest that while the EAS may have prevented applications from ex-ante zombie firms, it did not necessarily lead to sustained improvements in corporate sales growth. Support measures like the EAS may have played a role in short-term employment retention and business continuity but resulted in less preferable medium- and long-term corporate sales growth. However, our additional empirical analysis finds that the effects of the EAS on sales growth were heterogeneous across industries and firm sizes. Firms in the information and communications industry, which experienced increased demand during the pandemic, improved their sales growth after applying for the EAS. In contrast, firms in the living-related and amusement services and in the accommodations and food services, which were severely affected during the pandemic, faced difficulty improving their sales growth. Furthermore, smaller firms were less successful in improving their sales growth than larger firms. These findings suggest that firms in troubled industries and smaller enterprises may have been more prone to moral hazard, deteriorating their sales growth.

In literature, concerns about 'zombification' during and after the COVID-19 pandemic have been discussed in many studies, such as Laeven, Schepens, and Schnabel (2020), El Ghoul, Fu,

and Guedhami (2021), Banerjee and Hofmann (2022), Acharya et al. (2022), and Bighelli, Lalinsky, and Vanhala (2022). These studies have pointed out that excessive corporate support measures were not desirable because they would delay restructuring and generate zombie firms in the medium and long term. However, it is not necessarily clear how support measures delayed the recovery of the Japanese firms and resulted in their zombification in the medium and long term.

Our study, based on approximately two years of monthly firm-level panel data, contributes to the literature because most existing studies have analyzed the effects of government support measures using only data from the early stage of the pandemic (Bartlett and Morse 2021; Jibril, Roper, and Hart 2021; Granja et al. 2022; Chetty et al. 2023; Doniger and Kay 2023; Meriküll and Paulus 2023). Moreover, it contributes to a series of studies evaluating Japanese corporate support measures based on unique surveys (Kawaguchi, Kodama, and Tanaka 2021; Fukuda 2023; Honda et al. 2023; Hoshi, Kawaguchi, and Ueda 2023). These existing studies showed that government support measures suppressed employment adjustments during the early stages of the pandemic and enabled business continuity. However, the support measures were more likely to entail a moral hazard in the medium and long run than in the short run. This study offers new insights by focusing on the sustained effects of the EAS on firm performance over approximately two years during the pandemic.

This study also offers new insights into a series of studies on zombie firms in Japan (Hoshi 2006; Caballero, Hoshi, and Kashyap 2008; Fukuda and Nakamura 2011; Imai 2016; Goto and Wilbur 2019). While corporate support measures during the pandemic mitigated the pain of bankruptcies and layoffs in the short term, they may have preserved less productive firms and prevented more productive firms from expanding their businesses. In other words, zombie firms

that were kept alive by corporate support measures may have delayed the process of creative destruction in the Japanese economy.

The remainder of this paper is organized as follows. Section 2 explains the details of the EAS, while Section 3 describes the data used in this study. Section 4 examines the determining factors behind firms applying for the EAS. Section 5 analyzes the impact of the EAS application on subsequent sales growth. Finally, Section 6 provides a summary of the findings and engages in a discussion of the results.

2 EAS

The EAS program provides subsidies to business owners forced to scale down their business operations due to economic reasons, such as business cycle fluctuation and changes in industrial structures. This subsidy supports businesses that retain employees by implementing temporary employment adjustments such as paid leaves, educational training, or secondments. It enables temporary employment retention to prevent social unrest, such as an increase in the unemployment rate, during economic downturns. While it was launched in 1981, there were significant relaxations of eligibility conditions and a substantial increase in subsidy rates during the pandemic. Businesses that experienced the latest monthly decrease in sales or production of more than 5% compared to the same month in the previous year were eligible for support. Under this program, during the pandemic, employers received subsidies of up to 15,000 yen per employee per day, covering 4/5 (SMEs) or 2/3 (large enterprises) of their allowances for temporary suspension of business operations. Furthermore, even among large enterprises, if their sales and other indicators had decreased by 30% or more in the previous three months compared to the same months in the previous year or two, they were eligible for a 100% subsidy if they

retained employees without layoffs. Additionally, SMEs were able to receive a 100% subsidy if they retained employees without layoffs.

What impact did the EAS have on corporate performance? Theoretically, it could have positively and negatively affected the sales growth rate in the following period. The positive effect may have arisen because it protected employment and might have prevented the persistent negative impact of temporary shocks on the economy. Generally, rehiring laid-off workers can involve adjustment costs, including retraining costs. Therefore, in cases where negative shocks were considered temporary, protecting employment might have reduced rehiring costs during the subsequent economic recovery period, potentially enabling quick sales recovery from the economic downturn.

Conversely, the negative impact of the EAS during the pandemic may have arisen in those instances where preserving employment prevented firms from adapting to significant structural reforms. Generally, when the economy faces significant structural changes, it is desirable to relocate workers from declining industries to growing industries and transform businesses into more productive sectors. The creative destruction of businesses is essential for achieving significant economic recovery. Therefore, during the pandemic, protecting employment through support measures may have hindered the process of creative destruction, negatively affecting sales during the economic recovery period.

3 Data

In this study, we utilized data from the 'Survey on the Impact of COVID-19 on Corporate Management,' conducted jointly by the JILPT and TDB. The survey was conducted online among 4,074 general business firms, excluding firms with zero employees, registered to be

monitored by TDB. Target firms were selected through stratified allocation into a total of 30 cells by region (10 blocks: Hokkaido, Tohoku, North Kanto, South Kanto, Hokuriku, Tokai, Kinki, Chugoku, Shikoku, and Kyushu) and firm size (three categories: fewer than 100 employees, 100 to 299 employees, and 300 or more employees). As shown in Figure 3, the surveys were conducted in six waves to capture the significant fluctuations during different pandemic phases. Among them, the first to third surveys, conducted in June and October 2020 and February 2021, respectively, captured firm activities in the initial stages of the pandemic. In contrast, the fourth to sixth surveys, conducted in June and October 2021 and February 2022, respectively, focused on firm activities one year after the initial stages of the pandemic. The average response rate across the first to sixth surveys was 32.6%. Since the sample firms predominantly consisted of wholesale, retail trade, and manufacturing, the proportion of firms in the accommodations and food services, and entertainment was lower than the population proportion from the 2016 Economic Census for Business Activity.

To conduct an ex-ante analysis, we utilized information on a firm's subjective answers regarding pre-pandemic sales performance, business continuity prospects, and performance recovery expectations. Specifically, we created monthly firm-level panel data from the panel surveys to evaluate the subsequent corporate performance of those firms that applied for the EAS during the early stage of the pandemic. Each survey asked firms to retrospectively report the monthly sales growth from the same month in the previous year. Therefore, for the firms that responded consistently across the first to sixth surveys, we tracked the evolution of their monthly sales growth rate from the early stages of the pandemic to the period of economic recovery.[3] To

[3] In the first survey, the sales growth rate values for firms that increased their sales growth rate were missing. Therefore, we imputed these values with the average sales growth rate of firms

compare medium-term sales growth for firms that applied for the EAS by September 2020 with those that did not, we exclude those that began applying for the EAS program after September 2020.

In the third survey, we collected information on the month each firm made an employment adjustment[4], such as paid leaves, before applying for the EAS. As shown in Figure 4, firms needed to conduct employment adjustments at their own expense before applying for the EAS. However, firms did not need to submit an employment adjustment plan during the pandemic, which was mandatory under the normal EAS before the pandemic. Therefore, firms implemented employment adjustments with the expectation that they would certainly receive subsidies from the EAS. Based on this certainty, we defined the month in which a firm implemented the employment adjustment as the month in which the firm applied for the EAS. We then focused on firms that applied for the EAS for the first time during the initial stage of the pandemic from April to September 2020. By linking to the TDB's registration data, we collected information on firm characteristics such as industry, region, and firm size as control variables.

In the following analyzes, we utilize the sales growth rate as a proxy variable for corporate performance, primarily for two reasons. First, each survey asked only about sales and labor costs as information related to monthly corporate performance. Given the limited availability of financial data on small and medium-sized enterprises (SMEs), the monthly sales growth rate is

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that increased their sales growth rate in the second and third surveys.

[4] In addition to paid leaves, the EAS program covers employment adjustments through educational training and temporary secondments (in which employees work for another firm while having an employment contract with the originating firm). However, paid leaves were the dominant form of employment adjustments in the program.

essential for a granular analysis. Second, many firms experienced serious declines in sales during the state of emergency period. In contrast, labor costs exhibited relatively limited fluctuations. Under the Japanese employment system, characterized by lifetime employment, significant short-term fluctuations in labor costs, compared to sales, were less likely to occur. Therefore, under a short-term pandemic shock, the second-best option would have been to capture corporate performance using sales growth, accounting for a large portion of the profit growth.

Figure 5 compares the means and 95% confidence intervals of the sales growth rate and labor cost growth rate from January 2020 to January 2022, relative to those in the same month in 2019, between firms that applied for the EAS and those that did not apply using survey data.[5] In January 2020, before the pandemic, there were no significant differences in the sales growth rate and labor cost growth rate between firms that applied for the EAS and those that did not, indicating that the trends in sales and labor costs before the pandemic were similar. However, in the recovery period after the pandemic, starting in October 2021, there were significant differences in sales and labor cost growth rates, suggesting that the EAS did not improve corporate performance.

4 Determinants of EAS application

4.1 Logistic regression analysis using EAS application period

[5] Due to the increase in the consumption tax rates from 8% to 10% starting in October 2019, there was a surge in consumption in September 2019 and a decrease in consumption in October 2019, especially in the retail industry. Therefore, the sales growth rate in September is underestimated, and in October, it is overestimated.

We utilize survey data to elucidate the determinants of EAS application during the initial phase of the COVID-19 pandemic from April to September 2020. Specifically, we estimate the following equation using logistic regression analysis based on cross-sectional data from firms:

$$\Pr(Apply_i) = \psi(\alpha_0 + \alpha_5 Subjective_i + \alpha_1 Industry_i + \alpha_2 Area_i + \alpha_3 EmpSize_i + \alpha_4 CapSize_i) \quad (1)$$

where $\Pr(Apply_i)$ represents the probability that firm i applied for the EAS from April to September 2020. The function $\psi()$ on the right-hand side represents the logistic function, while $Subjective_i$ denotes the subjective variables of firm i. These subjective variables encompass (A) prepandemic sales performance, (B) prospects for business continuity, and (C) expectations for performance recovery.

Specifically, for (A), we use a dummy variable taking 1 for firms that responded that they had 'Poor corporate performance prior to the pandemic' due to the decreased sales growth rate in February to March 2020 during the first survey and 0 otherwise. For (B), we use firm dummy variables for each response (1. Continuing operations under current conditions, 2. Expanding business and continuing operations, 3. Starting a new business and continuing operations, 4. Scaling down business and continuing operations, 5. Ceasing operations, and 6. Uncertain) in the second survey concerning future business continuity prospects. For (C), we use dummy variables for each response (1. Performance was not deteriorated originally, 2. Performance was deteriorated within six months, 3. Performance was expected to recover to the previous level in more than six months but less than a year, 4. Performance was expected to recover to the previous level in more than a year but less than two years, 5. Performance was expected to recover to the previous level in more than two years, 6. No recovery was expected, and 7. Uncertain) in the second survey responding to the question 'When do you expect your firm's performance to recover and return to its previous level? Alternatively, do you think your firm's

performance will not recover?'

In addition to subjective variables, we use dummies to capture firm characteristics such as industry categorized based on the Japan Standard Industrial Classification (JSIC), region divided into ten areas nationwide, capital size, and number of employees, denoted as $Industry_i$, $Area_i$, $CapSize_i$, and $EmpSize_i$, respectively.

4.2 Results of logistic regression analysis

Table 1 reports the results of logistic regressions using a series of subjective variables. The dependent variable is a dummy that takes 1 if the firm applied for the EAS during the early stage of the pandemic and 0 otherwise. The coefficients represent the average marginal effect (AME). Columns 1-4 report the results of logistic regressions using each subjective variable.

Column 1 of Table 1 shows that firms that reported poor prepandemic performance were not necessarily inclined to apply for the EAS. Conversely, as indicated in Column 2, the sales growth rate during the early stages of the pandemic from April to September 2020 had a significantly negative impact on EAS application, indicating that firms with declining sales actively sought EAS assistance. These results suggest that the EAS targeted appropriate firms and prevented applications from prepandemic zombie firms.

Column 3 of Table 1 illustrates the relationship between the one-shot question about prospects for business continuity and EAS application. The prospects for business continuity variables are captured by dummy variables referencing firms indicating that they would 'Continue operations under current conditions.' The results reveal that firms applied for the EAS for positive and negative reasons. Among the positive reasons, some applicant firms responded that they were 'Starting a new business and continuing operations'. These firms actively sought the subsidy by

initiating new ventures aligned with the pandemic's new normal. Conversely, among the negative reasons, some applicant firms responded that they 'Scaled down business and continued operations' or 'Ceased operations'. This finding suggests that the EAS aimed to support employee retention for those businesses facing difficulties in maintaining operations. However, this could hinder labor mobility in the future, possibly leading to the emergence of zombie firms after applying for the EAS.

Column 4 of Table 1 depicts the relationship between the one-shot question about expectations for performance recovery and EAS application. The variables for expectations for performance recovery are captured by dummy variables referencing those firms indicating that their 'Performance was not deteriorated originally.' The results indicate that firms anticipating delayed performance recovery tended to apply for the EAS. Furthermore, firms responding with 'Uncertain expectations for recovery' also tended to apply for the EAS. Firms perceiving delayed performance improvement and those firms uncertain about their business recovery outcomes were inclined to seek EAS support.

Column 5 reports the results of a multivariate logistic regression that includes all variables used in Columns 1-4, indicating that the results remain robust even with all subjective variables. Appendix Figure 1 plots the logistic regression results that remove the subjective variables on the right-hand side of Eq. 1 and use only firm characteristic variables. First, in terms of industry, firms in accommodations, food, living-related and amusement services industries that were negatively affected in the first state of emergency period from April to May 2020 tended to apply for the EAS. Second, in terms of the number of employees, larger firms (50 or more employees) tended to apply for the EAS. However, in terms of capital size, there is no significant difference between large and small firms.

5 EAS and firm performance

5.1 Sales growth in the post-EAS application period

Figure 5 indicates that from the early stage of the pandemic, sales growth of firms that applied for the EAS and those that did not apply diverged, and the significant difference persisted even during the post-pandemic recovery period. However, the subsidy was not randomly assigned to firms; instead, it was endogenously applied based on factors such as the COVID-19 infection situation and firm performance. Therefore, a straightforward comparison between applicant and non-applicant firms, as depicted in Figure 5, retains the endogeneity in EAS application, making it difficult to conclude that the EAS contributed to the continuity of those firms that could recover from the downturn due to the early shock of the COVID-19 pandemic.

Hence, in subsequent analysis, we use PSM to control for firm characteristics, sales conditions, and the determinants of EAS application revealed in Section 4. However, the subjective variables used in the estimations of Section 4 could be considered "bad controls" (Angrist and Pischke 2009, 2014) that might change after EAS application. Consequently, these variables are excluded from the covariates of the PSM model, which employs logistic regression using covariates such as industry, region, number of employees, capital size, monthly dummy variables, sales growth rate at the time of the EAS application, and a dummy variable indicating whether the sales growth rate was below -5%. The last dummy variable is included since a sales growth rate below -5% is a requirement to apply for the EAS. After estimating the propensity scores via logistic regression, one-by-one nearest-neighbor matching is conducted to select the treatment and control groups.

Figure 6 compares the balance of covariates, measured using the absolute standardized mean difference (ASMD), between treatment and control groups before and after PSM. The white points in the figure represent ASMD before matching, while the black points represent ASMD after matching. This figure demonstrates a substantial improvement in the balance of standardized covariates that initially had an absolute difference greater than 0.2, indicating that the selected control group closely resembles the treatment group regarding performance and firm characteristics at the time of application. In subsequent analysis, we assume the independence of potential outcomes of the sales growth rate from the EAS application when conditioned on these covariates and analyze the relationship between the EAS application and the sales growth rate.

Using the post-PSM sample, we examine how the difference in the sales growth rate between the applicant and non-applicant firms evolved one year after the EAS application. Particularly, using cross-sectional samples for each month from April 2021 to January 2022, more than one year after the EAS application, the following regression equation is estimated:

$$\Delta Sale_i = \beta Apply_i + \upsilon_I + \varphi_A + \psi_E + \mu_C + \varepsilon_i \quad (2)$$

The dependent variable, $\Delta Sale_i$, represents the sales growth rate compared to that in the same month in 2019. The explanatory variable, $Apply_i$, represents a dummy variable taking 1 for firm *i* that applied for the EAS between April and September 2020 and 0 otherwise. Additionally, we include industry, region, capital size, and number of employees fixed effects, denoted as υ_I, φ_A, ψ_E, and μ_C, respectively. The coefficient β is the difference in the sales growth rate between firms that applied for the EAS and those that did not, controlling for pre-application corporate performance and firm characteristics. This coefficient can be interpreted as denoting the relationship between EAS application and sustained corporate performance.

We then consider the effect of firms that continued to receive subsidies from the EAS program

one year after application. To assess this effect, we estimate the following regression equation,

$$\Delta Sale_i = \beta Apply_i + \beta_C Apply_i \times Continue_{i,t} + \upsilon_I + \varphi_A + \psi_E + \mu_C + \varepsilon_i \quad (3)$$

where $Continue_{i,t}$ is a dummy variable that takes 1 if firm *i* received subsidies from the EAS program in month *t* and 0 otherwise. The coefficient β_C captures the difference in sales growth rate for firms that continued to receive subsidies from the EAS program compared to firms that have stopped receiving subsidies from the EAS program.

5.2 Estimation results of the differences in the sales growth rate

Figure 7 presents the estimates of the coefficient β from Eq. 2 using cross-sectional samples for each month from April 2021 to January 2022, along with their 95% confidence intervals. The blue line represents the estimation results using the entire sample before PSM implementation, while the red line represents the results using only the post-PSM sample. First, from April to September 2021, encompassing the third to fourth state of emergency declarations, we can see that the negative difference in the sales growth rate between applicant and non-applicant firms was widening. Notably, during the most severe infection situation from August to September 2021, a significant negative difference persisted, regardless of whether PSM had been implemented. This finding suggests that firms that applied for the EAS had worse medium-term corporate performance, even though they retained employees in the initial stage of the pandemic, compared to those that did not apply.

Subsequently, from October 2021 to January 2022, after the state of emergency was lifted, we can see that the difference in the sales growth rate was narrowing but still maintained a negative value. We do not observe a significant positive difference. This finding indicates that even in the pandemic recovery phase, firms that applied for the EAS could not achieve performance

recovery.

Columns 1-10 of Table 2 Panel A detail the estimation results of equation 2 using the post-PSM sample. We do not observe any recovery in the EAS applicant firms from the estimation using all samples from April 2021 to January 2022, replacing the industry FE in Eq. 2 with industry-month FE (see Columns 11 of Tables 2 Panel A).

Table 2 Panel B represents the coefficients β and β_C in Eq.3, which evaluate the difference in sales growth rate between firms that continued to receive subsidies from the EAS program and firms that stopped receiving subsidies. We find that firms that continued receiving the EAS had significantly lower sales growth rates than firms that stopped receiving the EAS. Those firms that stopped receiving the program were not necessarily significantly different from firms that never applied for the EAS. These results suggest that some of the firms that received the EAS program in the early stage of the pandemic were able to recover their sales. In contrast, others were unable to recover their sales and continued to receive subsidies from the EAS program. In other words, it is suggested that the latter firms may have become zombie firms that would not have survived without subsidies from the EAS program.

5.3 Heterogeneous effects of EAS by firm characteristics

We investigate the heterogeneous effects of EAS application across different firm characteristics. Specifically, utilizing the post-PSM sample, we modify the key explanatory variable of Eq. 2 by adding an interaction term between $Apply_i$ and firm characteristics Z_i and estimate the following equation:

$$\Delta Sale_i = \beta_Z Apply_i \times Z_i + \upsilon_I + \varphi_A + \psi_E + \mu_C + \varepsilon_i \quad (4)$$

Here, Z_i represents the firm characteristic dummy variables. We assign dummy variables for

industry, area, capital size, and employee size one by one to Z_i. The coefficient β_Z captures the heterogeneous effect on the sales growth rate between applicant and non-applicant firms by specific firm characteristics. As in the estimation in Section 5.1, we implement PSM before estimating Eq. 4.

5.4 Results of the heterogeneous effects of EAS by firm characteristics

Figure 8 presents the coefficient, β_Z, of the interaction term between $Apply_i$ and firm characteristics Z_i estimated using the cross-sectional sample for each month from April 2021 to January 2022 in Eq. 4, along with their 95% confidence intervals. Panel A of Figure 8 displays the coefficient β_Z of the interaction term for three industries (accommodations and food services, information and communications, living-related and amusement services industries) using Z_i with industry dummies. First, for firms in the information and communications industry, even during the period of the third to fourth states of emergency, from April to September 2021, the sales growth rate shows a significantly positive difference between applicant and non-applicant firms. This finding suggests that alongside the increased demand for digitalization, firms that retained employment through the EAS exhibited the highest level of corporate performance among all firms.

In contrast, for applicant firms in the living-related, and amusement services, there was a significantly negative impact on the sales growth rate, compared to non-applicant firms, during the third to fourth state of emergency periods due to the reduced number of consumer outings. Particularly intriguing is the case of the accommodations and food services. For applicant firms, despite exhibiting a significantly positive difference in the sales growth rate compared to non-applicant firms during the third to fourth state of emergency periods, a significantly negative

difference emerged from October to November 2021 when the state of emergency was lifted. During the pandemic, additional government support measures specifically targeted firms in accommodations and food services to stimulate domestic travel and support local businesses. The temporary increase in demand for these firms might have initially boosted corporate performance; however, as the effect gradually wore off, corporate performance might have declined (for other industries, see Appendix Table 2).

Panel B of Figure 8 illustrates the coefficient β_Z of the interaction term estimated using Z_i with dummy variables for three employee size categories (less than 100, 100 to less than 1,000, and 1,000 or more employees). For large applicant firms with over 1,000 employees, there was a significantly positive difference in the sales growth rate compared to non-applicant firms during the third to fourth state of emergency declarations. In contrast, for medium-sized firms with 100 to less than 1,000 employees, there was a significantly negative difference in the sales growth rate compared to non-applicant firms. The EAS provides support not only for paid leaves but also for educational training and temporary secondments. Therefore, large firms with extensive business networks may have various productivity-enhancing options through the EAS. Furthermore, moral hazards may be less likely to occur in larger firms because of the higher costs associated with detecting fraudulent use of EAS. No noteworthy effects are observed for other firm characteristics, such as region and capital size (see Appendix Tables 3 and 4).

6 Conclusions

After exploring the factors influencing the EAS application during the early stage of the COVID-19 pandemic, this paper investigated the medium-term effects of the EAS on sales growth. Through logistic regression analysis, we found that the sales growth rates of the

applicant firms recovered much slower than those of the non-applicant firms during the third to fourth state of emergency declarations. We also found that the sales growth rates of the applicant firms never exceeded those of the non-applicant firms even after the states of emergency were lifted. When examining the industry-level effects of the EAS, firms in the information and communications industry were able to improve their sales growth. However, firms in the living-related and amusement services and accommodations and food services had serious difficulty in recovering sales growth without additional government support. Furthermore, smaller firms were less successful in utilizing the EAS to recover their sales growth. These findings provided valuable insights for policymakers and practitioners in designing effective employment support programs.

Several agendas remain for future work. First, due to data limitations, we are unable to identify zombie firms using definitions based on borrowing interest rates, as outlined in studies like Caballero, Hoshi, and Kashyap (2008) and Acharya et al. (2022). In the ex-ante analysis, we rely on subjective criteria to determine whether a firm's performance was poor before the COVID-19 pandemic. Second, as described in Section 2, the industrial composition of SMEs in our sample slightly differs from that of the Economic Census. We thus need to check whether similar results can be obtained for a more representative sample. Finally, several firms dropped out of our panel surveys. Due to data limitations, we could not see why these firms dropped out, but future analyzes should consider why they dropped out from the sample.

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Figures

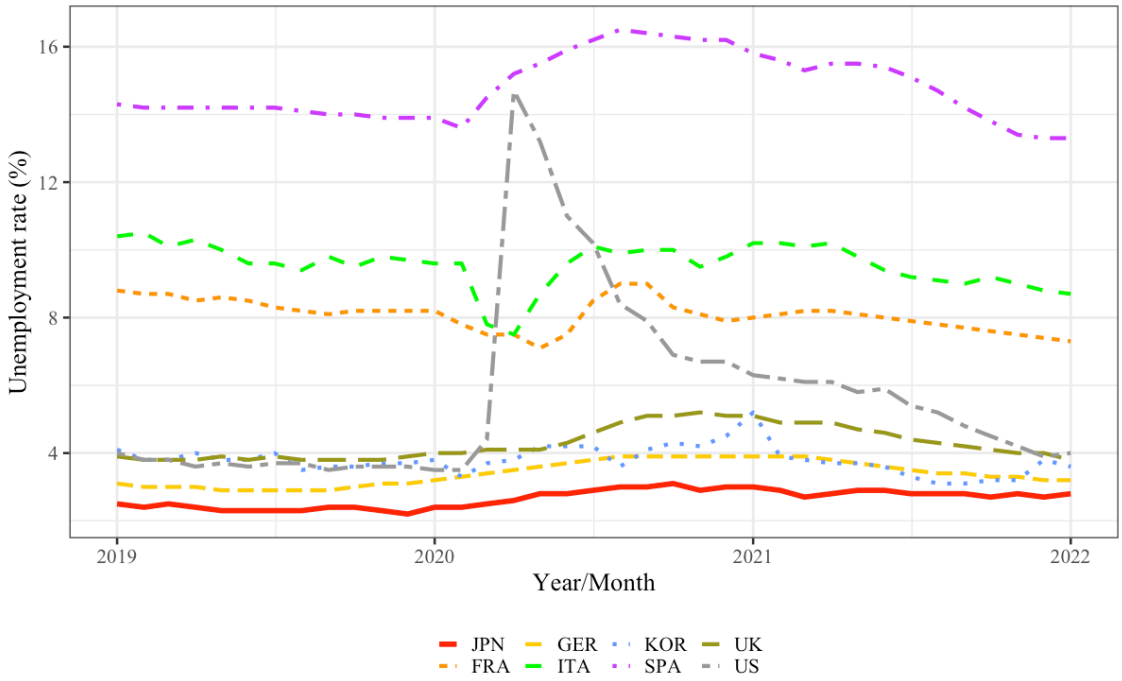


Figure 1. Unemployment rate during the COVID-19 pandemic in OECD countries

Note: This figure plots the evolution of the unemployment rate during the COVID-19 pandemic in OECD member countries.

Source: OECD.stat

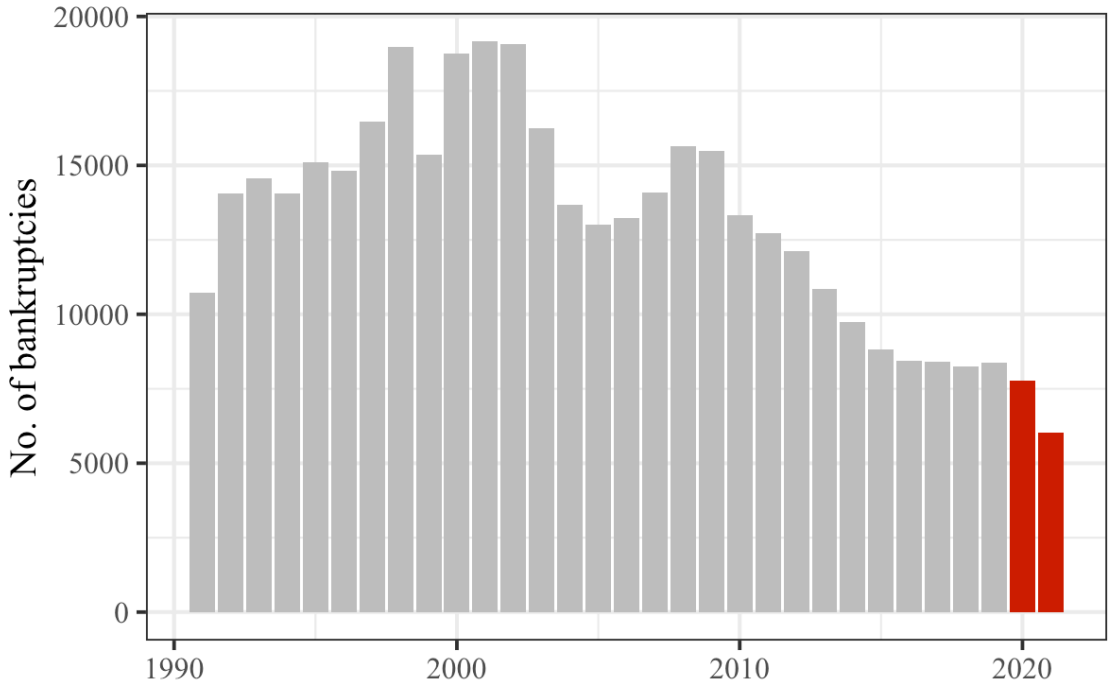


Figure 2. Number of bankruptcies among Japanese firms

Note: This bar graph plots the number of bankruptcies among Japanese firms. The red bars represent the period 2020-2021 during the pandemic.

Source: "National Corporate Bankruptcy Situation," TOKYO SHOKO RESEARCH, LTD.

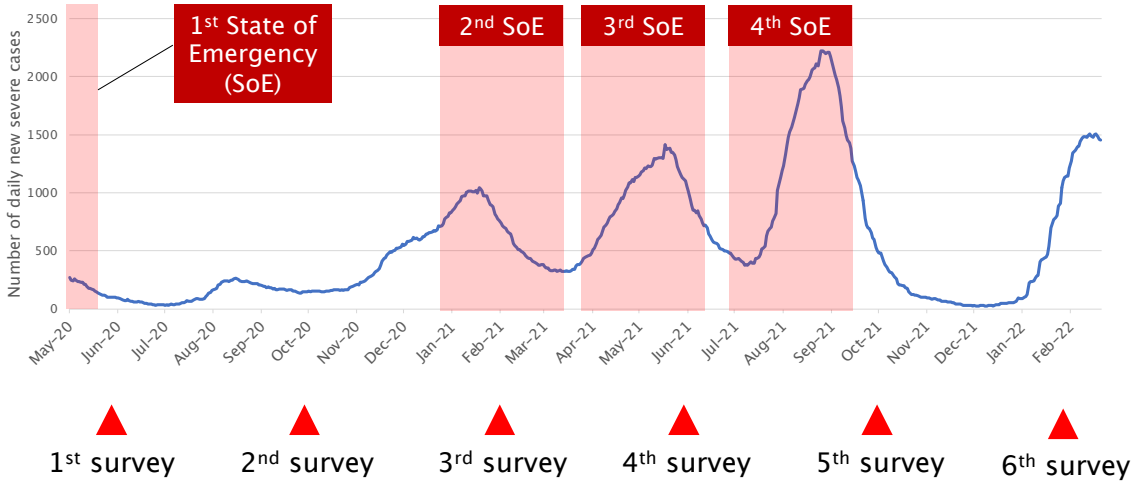


Figure 3. Timeline of the panel survey in the context of the COVID-19 pandemic in Japan

Note: This figure shows the timeline of the panel survey, the development of the COVID-19 pandemic, and the duration of the states of emergency. The curve in the background indicates the number of daily new severe cases in Japan.

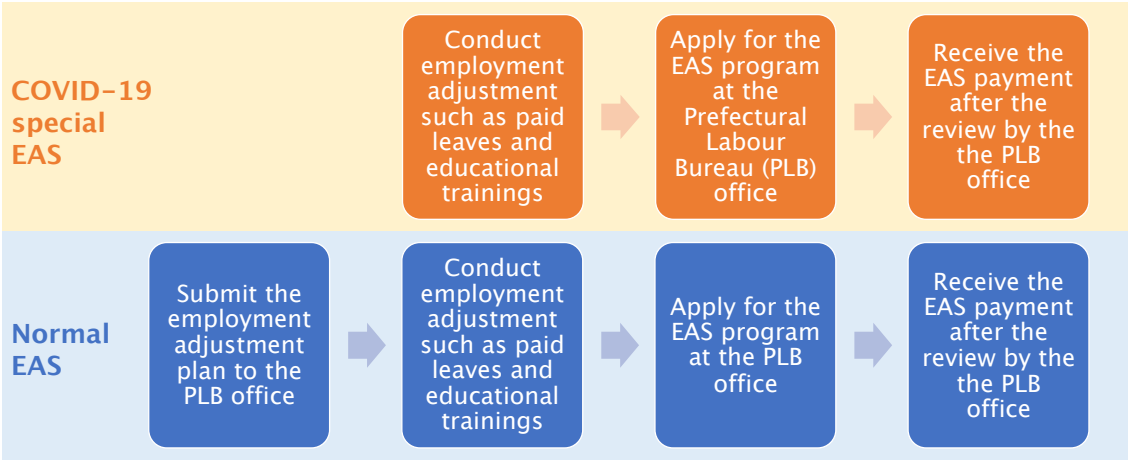


Figure 4. Procedure for qualifying for the EAS

Note: This figure shows the procedure for qualifying for the EAS during the COVID-19 pandemic and during the normal period.

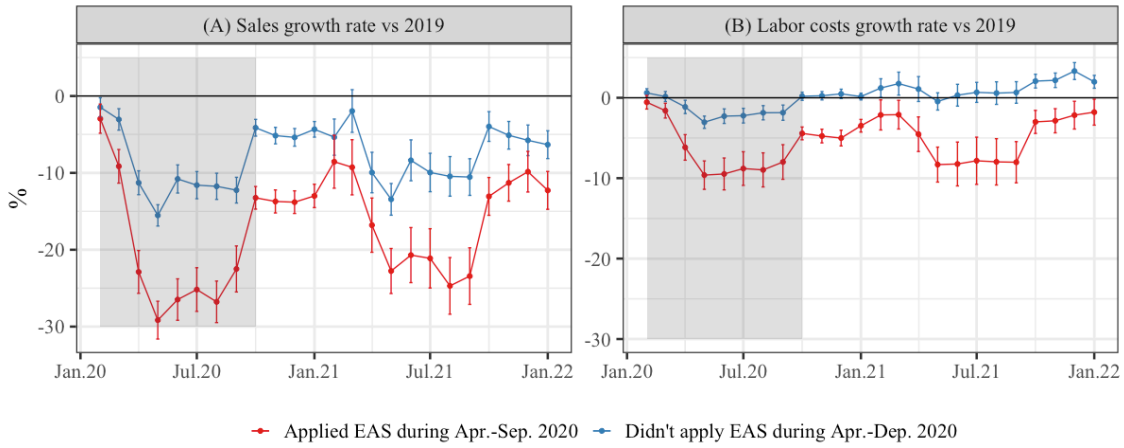


Figure 5. Sales and labor cost growth rates of EAS applicant and non-applicant firms

Note: This figure compares the means and 95% confidence intervals of the sales growth rate and labor cost growth rate from January 2020 to January 2022, relative to those in the same month in 2019, between firms that applied for the EAS and those that did not apply. The grey area represents the period when applicant firms applied for the EAS.

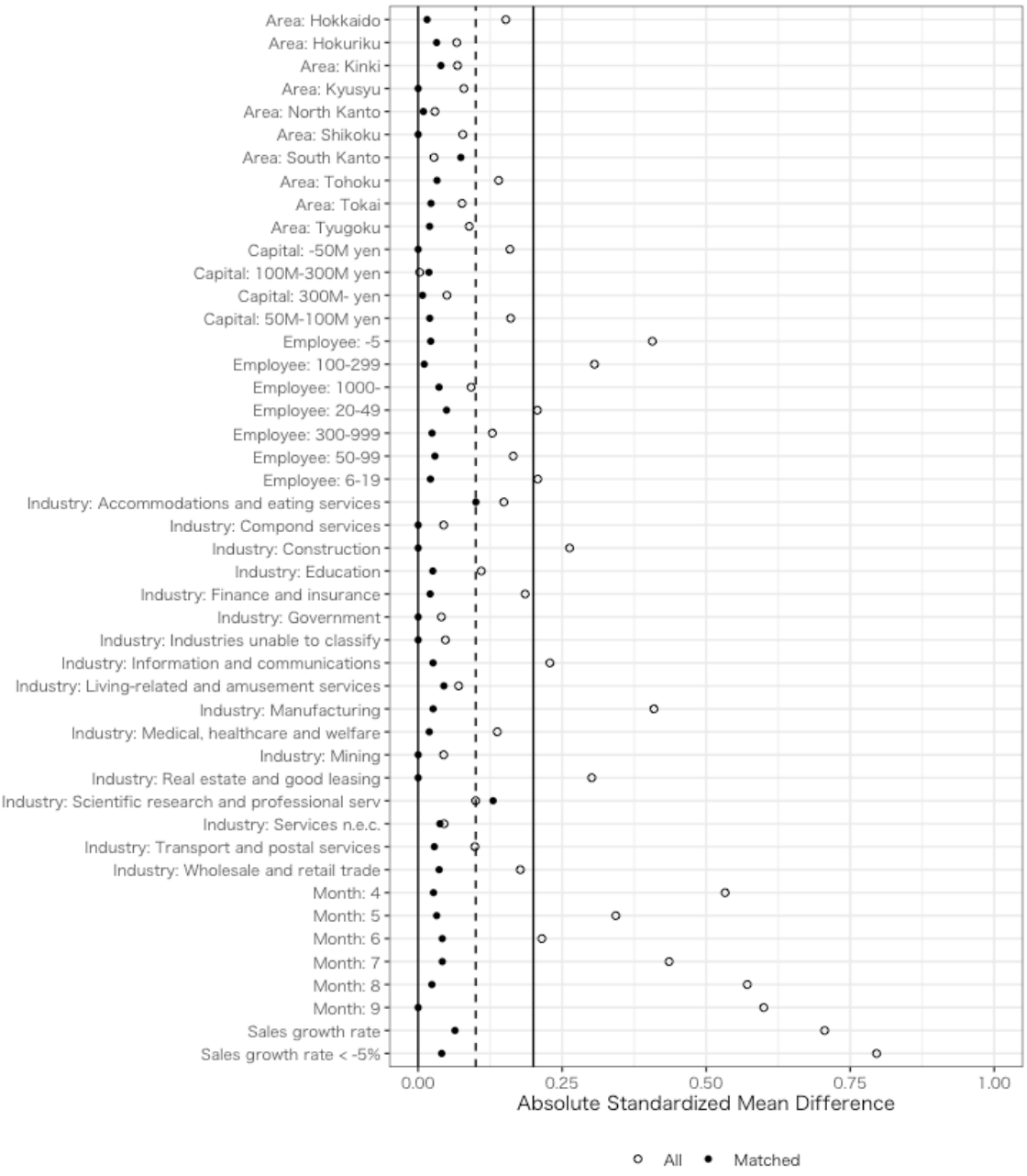


Figure 6. Covariate balance check for PSM

Note: This figure compares the balance of covariates, measured using the ASMD, between treatment and control groups before and after PSM. The white points in the figure represent ASMD before matching, while the black points represent ASMD after matching.

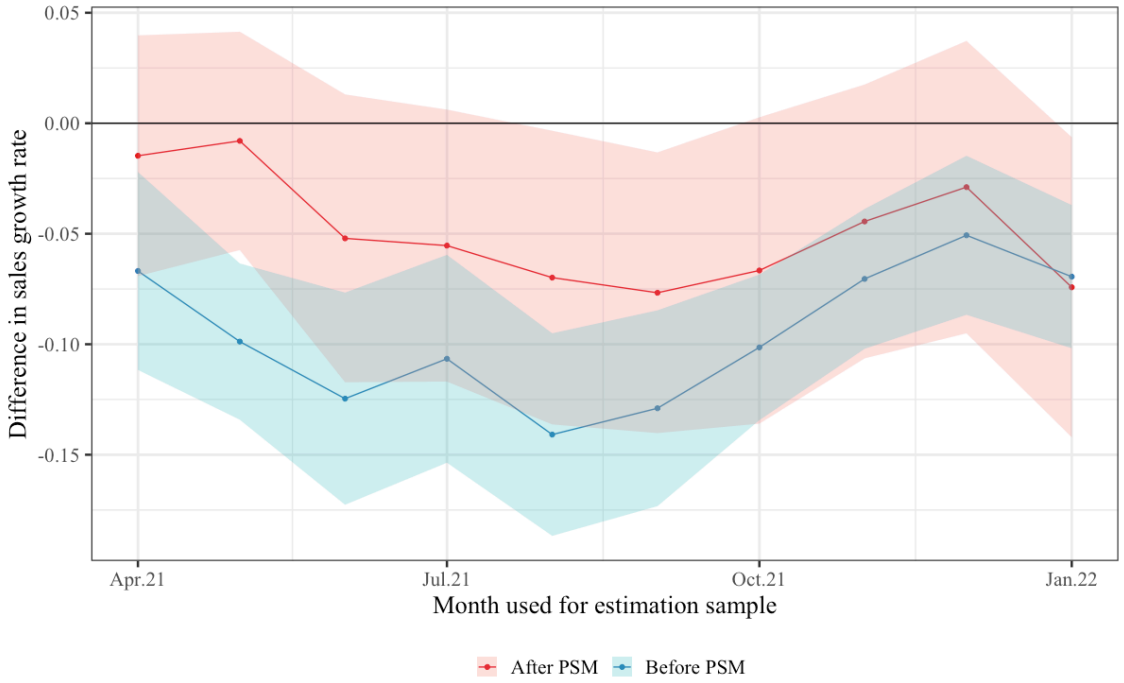
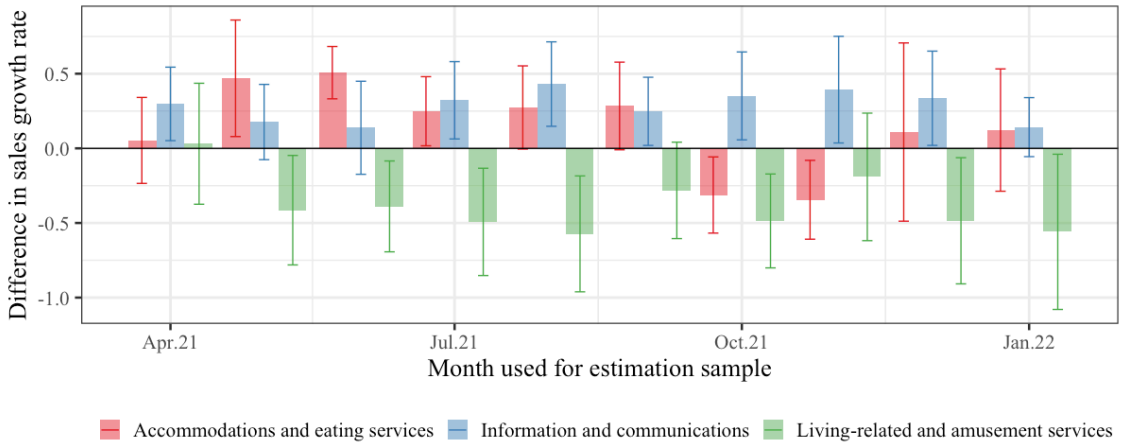


Figure 7. Effects of EAS application on the sales growth rate

Note: This figure plots the estimates of the coefficient β from Eq. 2 using cross-sectional samples for each month from April 2021 to January 2022, along with the 95% confidence intervals. The blue line represents the estimation results using the full sample before PSM implementation, while the red line represents the results using only the post-PSM sample.

Panel A: Heterogeneous effects of EAS by industry



Panel B: Heterogeneous effects of EAS by number of employees

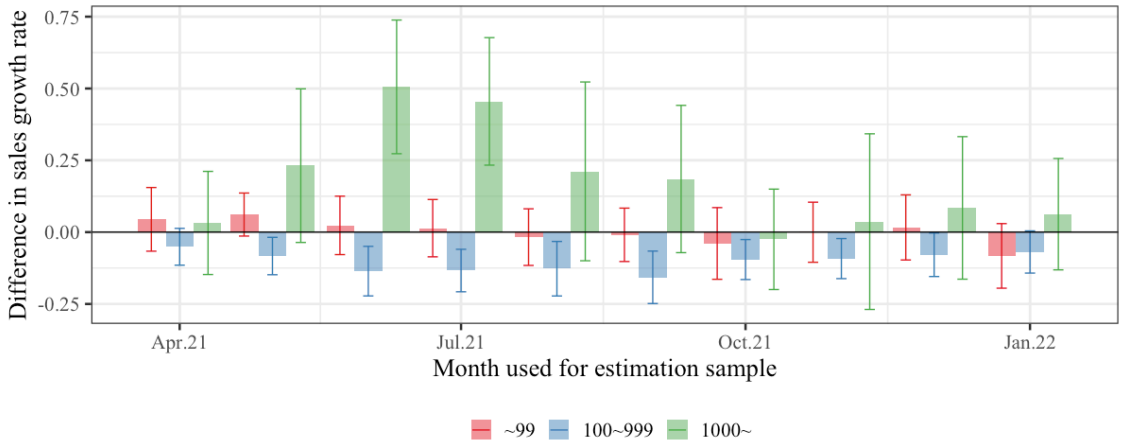


Figure 8. Heterogeneous effects of EAS on the sales growth rate by firm characteristics

Note: This figure presents the coefficient β_Z of the interaction term between $Apply_i$ and firm characteristics estimated using the cross-sectional sample for each month from April 2021 to January 2022 in Eq. 4, along with their 95% confidence intervals. Panel A uses three industries (accommodations and food services, information and communications, and living-related and amusement services industries) dummy variables, denoted as Zi. Panel B uses three employee size categories (less than 100, 100 to less than 1,000, and 1,000 or more employees) dummy variables, denoted as Z_i.

Tables

Table 1. Determinants of EAS application

Dependent variable: Applied to the EAS programme from April to September 2020					
	(1)	(2)	(3)	(4)	(5)
Panel A: Pre-pandemic sales performance					
Poor performance before pandemic	-0.045				-0.043
	(0.068)				(0.063)
Average sales growth rate from Apr. to Sep. 2020		-0.626***			-0.532***
		(0.057)			(0.089)
Panel B: Prospects for business continuity					
(ref: Continuing operations under current conditions)					
Expanding business			0.018		0.079
			(0.056)		(0.055)
Starting a new business			0.342***		0.202***
			(0.064)		(0.072)
Scaling down business			0.35***		0.334***
			(0.123)		(0.11)
Ceasing operations			0.596***		0.594***
			(0.021)		(0.02)
Uncertain			-0.088		-0.079
			(0.071)		(0.072)
Panel C: Expectations for performance recovery					
(ref: Performance was not deteriorated originally)					
Recover in >= 6 months				0.34***	0.28***
				(0.07)	(0.075)
Recover in 6-12 months				0.355***	0.241***
				(0.051)	(0.063)
Recover in 12-24 months				0.418***	0.273***
				(0.054)	(0.066)
Recover in < 24 months				0.367***	0.227***
				(0.07)	(0.078)
No recovery expected				0.265***	0.041
				(0.102)	(0.095)
Uncertain				0.248***	0.204***
				(0.055)	(0.067)
Industry	Yes	Yes	Yes	Yes	Yes
Area	Yes	Yes	Yes	Yes	Yes
Capital size	Yes	Yes	Yes	Yes	Yes
Employment size	Yes	Yes	Yes	Yes	Yes
Obs.	692	1076	692	691	691
AIC	912.68	1221.31	870.83	886.70	822.18

Note: This table presents the results from logistic regressions of EAS application on a series of subjective variables. The dependent variable is a dummy that takes 1 if firms that applied for the

EAS from April to September 2020 and 0 otherwise. The coefficients represent the AME. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

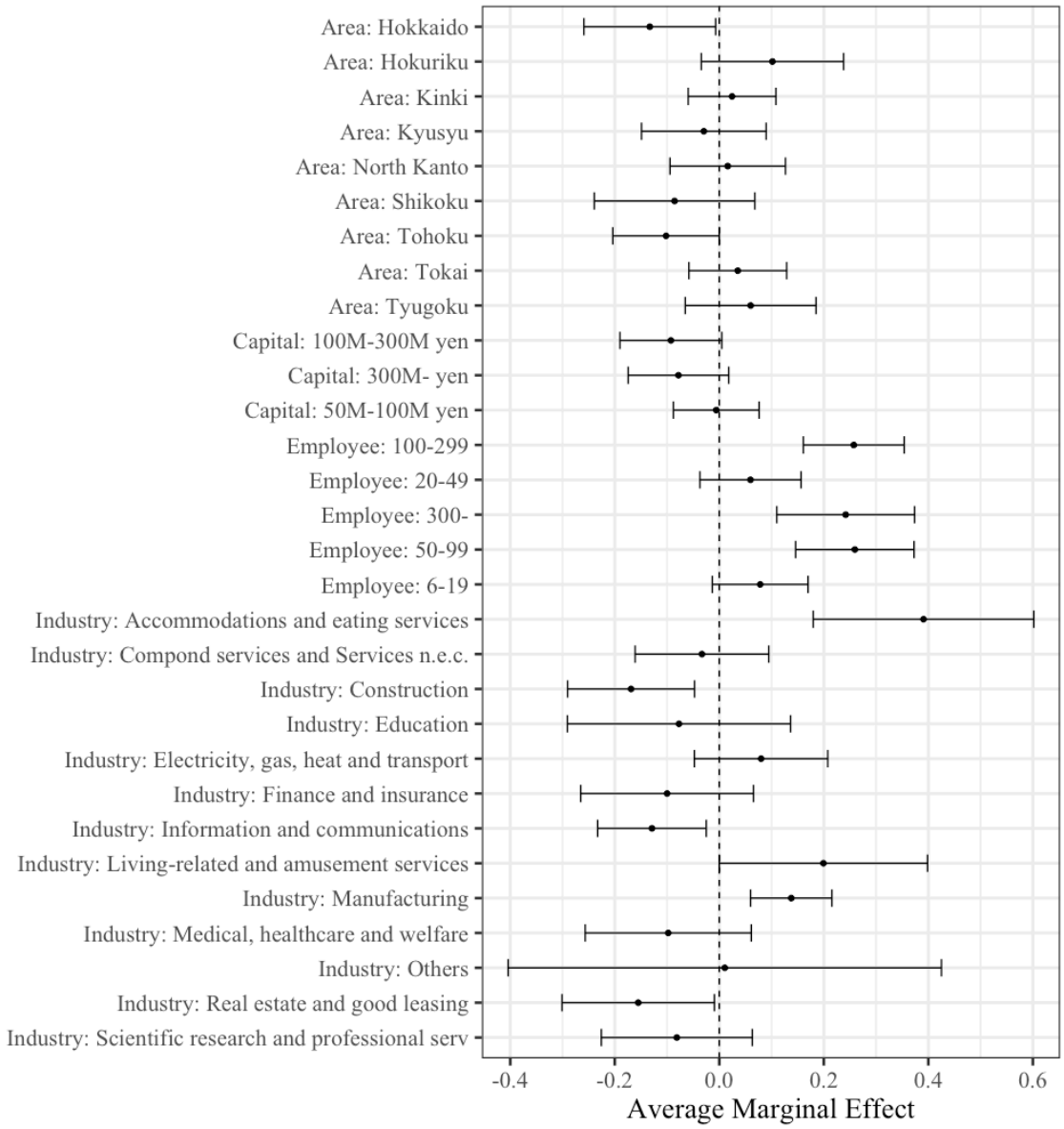
Table 2. Effects of EAS application on the sales growth rate

Dependent Var.:	Sales growth rate compared to the same month in 2019										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sample period:	Apr. 21	May. 21	Jun. 21	Jul. 21	Aug. 21	Sep. 21	Oct. 21	Nov. 21	Dec. 21	Jan. 22	Apr.21-Jan.22
Panel A											
$Apply_i$	-0.015	-0.008	-0.052	-0.055*	-0.070**	-0.077**	-0.067**	-0.045	-0.029	-0.074**	-0.048***
	(0.029)	(0.025)	(0.033)	(0.031)	(0.034)	(0.033)	(0.034)	(0.030)	(0.033)	(0.032)	(0.010)
Observations	401	564	398	397	394	452	400	401	399	399	4,205
R2	0.180	0.117	0.124	0.119	0.104	0.130	0.072	0.103	0.062	0.136	0.107
Panel B											
$Apply_i$	0.019	0.024	-0.006	-0.008	-0.004	-0.019	-0.009	-0.019	-0.006	-0.050	-0.008
	(0.032)	(0.029)	(0.035)	(0.036)	(0.037)	(0.036)	(0.037)	(0.033)	(0.036)	(0.034)	(0.011)
$Apply_i$ x $Continue_{i,t}$	-0.084**	-0.084**	-0.139***	-0.116***	-0.192***	-0.158***	-0.157***	-0.078*	-0.085*	-0.099**	-0.117***
	(0.038)	(0.034)	(0.040)	(0.041)	(0.045)	(0.043)	(0.045)	(0.042)	(0.049)	(0.049)	(0.013)
Observations	400	550	388	387	384	447	394	395	393	393	4131
R2	0.195	0.132	0.167	0.143	0.148	0.158	0.106	0.117	0.072	0.148	0.129
Area FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
EmpSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CapSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-month FE	No	No	No	No	No	No	No	No	No	No	Yes

Note: This table presents the estimates of the coefficient β from Eq. 2 (Panel A), and coefficients β and β_C from Eq. 3 (Panel B) using the post-PSM sample. Columns 1-10 represent results using the cross-sectional sample for each month from April 2021 to January 2022, while column 11 represents results using all samples from April 2021 to January 2022. Apply is a dummy that takes 1 if firms that applied for the EAS from April to September 2020 and 0 otherwise. Continue is a dummy that takes 1 if firms that continued to receive the EAS in month t and 0 otherwise. **, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix

Appendix Figure 1. Determinants of EAS application



Note: This figure plots the logistic regression results that remove the subjective variables on the right-hand side of Eq. 1 and use only firm characteristics. The dependent variable is a dummy variable that takes 1 if a firm applied for the EAS from April to September 2020 and 0 if the firm did not apply for the program between April 2020 and January 2022. The coefficients represent the AME.

Appendix Table 1. Descriptive statistics

	Obs.	Mean	SD	1st Quar.	Median	3rd Quar.
Panel A: Cross-sectional data (during applying EAS)						
Apply to EAS	1076	0.361	0.48	0	0	1
Average sales growth rate from Apr. to Sep. 2020	1076	-0.157	0.223	-0.25	-0.117	-0.0124
Poor performance before pandemic dummy	692	0.079	0.271	0	0	0
Prospects for business continuity dummies						
Continuing operations under current conditions	691	0.726	0.446	0	1	1
Expanding business	691	0.122	0.327	0	0	0
Starting a new business	691	0.071	0.257	0	0	0
Scaling down business	691	0.016	0.125	0	0	0
Ceasing operations	691	0.001	0.038	0	0	0
Uncertain	691	0.064	0.244	0	0	0
Expectations for performance recovery dummies						
Not deteriorated originally	692	0.133	0.34	0	0	0
Recover in >= 6 months	692	0.094	0.292	0	0	0
Recover in 6-12 months	692	0.254	0.436	0	0	1
Recover in 12-24 months	692	0.217	0.412	0	0	0
Recover in < 24 months	692	0.094	0.292	0	0	0
No recovery expected	692	0.033	0.179	0	0	0
Uncertain	692	0.175	0.38	0	0	0
Panel B: Panel data (after appliyng EAS)						

	Before PSM											
	EAS applicant						Non-EAS applicant					
	Obs.	Mean	SD	1st Quar.	Median	3rd Quar.	Obs.	Mean	SD	1st Quar.	Median	3rd Quar.
Sales growth rate	9606	-0.144	0.294	-0.3	-0.1	0	16494	-0.061	0.279	-0.2	0	0.04
Labor costs growth rate	9728	-0.044	0.187	-0.1	0	0	16756	0.009	0.138	0	0	0
	After PSM											
	EAS applicant						Non-EAS applicant					
	Obs.	Mean	SD	1st Quar.	Median	3rd Quar.	Obs.	Mean	SD	1st Quar.	Median	3rd Quar.
Sales growth rate	4524	-0.137	0.281	-0.28	-0.1	0	3063	-0.096	0.312	-0.2	-0.04	0.03
Labor costs growth rate	4558	-0.047	0.179	-0.1	0	0	3072	-0.003	0.167	0	0	0.1

Note: This table summarizes the firm-level survey data in the analysis. Panel A represents variables used in the analysis in Section 4 for the EAS program application period from April to September 2020. Panel B represents variables used in Section 5 for the post-EAS program application period from September 2020 to January 2022. Panel B compares variables for EAS program applicant and non-applicant firms before and after the propensity score matching was implemented.

Appendix Table 2. Heterogeneous effects of EAS by industry

Dependent Var.:	Sales growth rate compared to the same month in 2019									
Sample period:	Apr. 21	May. 21	Jun. 21	Jul. 21	Aug. 21	Sep. 21	Oct. 21	Nov. 21	Dec. 21	Jan. 22
Industry interacted with *Apply i*										
ref: Wholesale and retail trade										
Accommodations and eating services	0.053	0.469**	0.507***	0.249**	0.274*	0.284*	-0.313**	-0.345**	0.109	0.123
	(0.147)	(0.199)	(0.089)	(0.118)	(0.142)	(0.150)	(0.130)	(0.135)	(0.305)	(0.209)
Construction	0.327**	0.103	0.082	0.133	0.027	-0.026				
	(0.149)	(0.152)	(0.137)	(0.208)	(0.221)	(0.239)				
Education	0.290	-0.277	-0.129	0.009	0.013	0.109	-0.116	0.261*	0.143	0.038
	(0.218)	(0.216)	(0.190)	(0.210)	(0.219)	(0.250)	(0.175)	(0.151)	(0.117)	(0.145)
Finance and insurance	0.267*	0.168	0.338	-0.066	0.165	0.073	0.485***	0.277	-0.050	-0.090
	(0.161)	(0.159)	(0.273)	(0.162)	(0.174)	(0.140)	(0.156)	(0.231)	(0.401)	(0.246)
Industries unable to classify	-0.072	-0.367***				-0.205**	-0.066	0.149**	-0.221***	0.089
	(0.064)	(0.053)				(0.100)	(0.086)	(0.072)	(0.080)	(0.093)
Information and communications	0.298**	0.176	0.138	0.322**	0.431***	0.248**	0.351**	0.393**	0.336**	0.142
	(0.126)	(0.129)	(0.159)	(0.132)	(0.144)	(0.117)	(0.150)	(0.182)	(0.161)	(0.101)
Living-related and amusement services	0.031	-0.414**	-0.389**	-0.493***	-0.573***	-0.282*	-0.486***	-0.191	-0.485**	-0.559**
	(0.207)	(0.187)	(0.155)	(0.183)	(0.198)	(0.165)	(0.161)	(0.218)	(0.216)	(0.265)
Manufacturing	-0.040	-0.028	-0.123**	-0.087	-0.077	-0.153***	-0.096*	-0.075	-0.045	-0.088*
	(0.038)	(0.038)	(0.048)	(0.053)	(0.053)	(0.054)	(0.054)	(0.055)	(0.058)	(0.051)
Medical, healthcare and welfare	-0.172	-0.050	0.066	0.110	0.068	0.074	-0.050	-0.034	-0.177	-0.003
	(0.294)	(0.237)	(0.100)	(0.102)	(0.155)	(0.157)	(0.117)	(0.123)	(0.164)	(0.250)
Real estate and good leasing	-0.010	0.111				0.099	-0.208	-0.279	-0.152	-0.455
	(0.141)	(0.205)				(0.420)	(0.329)	(0.383)	(0.455)	(0.329)
Scientific research and professional services	0.185	0.080	-0.081	-0.072	-0.035	-0.100	0.136	-0.198**	0.133	0.064
	(0.183)	(0.147)	(0.145)	(0.109)	(0.150)	(0.146)	(0.130)	(0.098)	(0.124)	(0.216)
Services n.e.c.	-0.384**	-0.119	-0.165	-0.162	-0.235	-0.255**	-0.036	0.054	-0.156	0.081
	(0.177)	(0.082)	(0.118)	(0.099)	(0.163)	(0.129)	(0.145)	(0.154)	(0.117)	(0.081)
Transport and postal services	-0.044	-0.024	-0.109	-0.082	-0.162	-0.170	-0.147**	-0.109*	-0.201**	-0.005
	(0.084)	(0.088)	(0.108)	(0.118)	(0.134)	(0.119)	(0.073)	(0.061)	(0.079)	(0.097)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EmpSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CapSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	401	564	398	397	394	452	400	401	399	399
R2	0.223	0.147	0.160	0.150	0.146	0.159	0.122	0.147	0.106	0.162

Note: This table presents the coefficient β_Z of the interaction term between $Apply_i$ and the industry dummy variable estimated using the cross-sectional sample for each month from April 2021 to January 2022 in Eq. 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix Table 3. Heterogeneous effects of EAS by area

Dependent Var.:	Sales growth rate compared to the same month in 2019									
Sample period:	Apr. 21	May. 21	Jun. 21	Jul. 21	Aug. 21	Sep. 21	Oct. 21	Nov. 21	Dec. 21	Jan. 22
Area interacted with $Apply_i$										
ref: South Kanto										
Hokkaido	0.035	-0.096	-0.066	-0.235	-0.115	-0.076	-0.018	0.052	0.108	-0.185
	(0.148)	(0.183)	(0.159)	(0.158)	(0.211)	(0.212)	(0.093)	(0.175)	(0.161)	(0.213)
Hokuriku	0.021	-0.119	0.125	-0.110	-0.091	-0.180	0.063	0.006	-0.025	0.121
	(0.128)	(0.087)	(0.129)	(0.087)	(0.108)	(0.111)	(0.155)	(0.187)	(0.119)	(0.076)
Kinki	-0.005	0.029	-0.138	-0.042	-0.116	0.004	-0.121	-0.075	-0.038	-0.042
	(0.064)	(0.066)	(0.085)	(0.074)	(0.094)	(0.077)	(0.083)	(0.075)	(0.087)	(0.064)
Kyusyu	-0.164*	-0.057	-0.090	-0.053	-0.169	-0.137	-0.039	0.026	-0.047	-0.015
	(0.094)	(0.079)	(0.104)	(0.111)	(0.140)	(0.141)	(0.120)	(0.096)	(0.113)	(0.109)
North Kanto	-0.024	-0.083	-0.009	0.123	0.047	-0.011	0.104	0.071	-0.016	-0.137
	(0.106)	(0.078)	(0.117)	(0.114)	(0.113)	(0.116)	(0.101)	(0.116)	(0.125)	(0.133)
Shikoku	-0.127	0.145	0.008	0.033	0.094	-0.111	-0.128	0.012	0.168	-0.169
	(0.092)	(0.133)	(0.175)	(0.168)	(0.187)	(0.195)	(0.158)	(0.099)	(0.184)	(0.140)
Tohoku	0.038	-0.070	-0.222**	-0.209*	-0.112	-0.104	-0.125	-0.202	-0.178	-0.163
	(0.134)	(0.103)	(0.112)	(0.107)	(0.092)	(0.105)	(0.151)	(0.146)	(0.222)	(0.160)
Tokai	0.059	-0.036	-0.017	-0.051	-0.025	-0.169*	-0.019	-0.057	-0.030	0.012
	(0.079)	(0.065)	(0.104)	(0.100)	(0.104)	(0.095)	(0.097)	(0.082)	(0.101)	(0.094)
Tyugoku	0.053	-0.005	-0.112	-0.095	-0.090	-0.208	-0.192	0.157	-0.110	-0.312*
	(0.094)	(0.135)	(0.131)	(0.130)	(0.157)	(0.129)	(0.117)	(0.154)	(0.093)	(0.173)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EmpSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CapSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	401	564	398	397	394	452	400	401	399	399
R2	0.188	0.125	0.138	0.130	0.108	0.140	0.078	0.113	0.069	0.150

Note: This table presents the coefficient β_Z of the interaction term between $Apply_i$ and the area dummy variable estimated using the cross-sectional sample for each month from April 2021 to January 2022 in Eq. 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix Table 4. Heterogeneous effects of EAS by capital size

Dependent Var.:	Sales growth rate compared to the same month in 2019									
Sample period:	Apr. 21	May. 21	Jun. 21	Jul. 21	Aug. 21	Sep. 21	Oct. 21	Nov. 21	Dec. 21	Jan. 22
Capital size interacted with *Apply*$_i$										
ref: -50M yen										
50M-100Myen	0.012	0.005	-0.094	-0.060	-0.052	-0.084	-0.107	-0.031	-0.057	-0.109
	(0.062)	(0.056)	(0.074)	(0.073)	(0.092)	(0.079)	(0.090)	(0.099)	(0.089)	(0.090)
100M-300Myen	0.060	0.049	0.040	0.0008	0.039	-0.032	-0.073	-0.089	0.056	0.074
	(0.086)	(0.085)	(0.101)	(0.092)	(0.112)	(0.110)	(0.079)	(0.082)	(0.092)	(0.069)
300M-yen	-0.069	-0.085	-0.202**	-0.145*	-0.195**	-0.197**	-0.005	-0.035	-0.025	-0.140**
	(0.053)	(0.075)	(0.100)	(0.081)	(0.094)	(0.081)	(0.054)	(0.057)	(0.067)	(0.067)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EmpSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CapSize FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	401	564	398	397	394	452	400	401	399	399
R2	0.183	0.120	0.134	0.120	0.105	0.130	0.067	0.101	0.063	0.135

Note: This table presents the coefficient β_Z of the interaction term between $Apply_i$ and the capital size dummy variable estimated using the cross-sectional sample for each month from April 2021 to January 2022 in Eq. 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.