

RIETI Policy Discussion Paper Series 22-P-021

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The Research Institute of Economy, Trade and Industry https://www.rieti.go.jp/en/

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Abstract

This study uses original firm survey data on the use of support policies related to the COVID-19 pandemic linked with government statistics on Japanese firms and documents supported firms' productivity and wages before the COVID-19 pandemic. The results indicate that the firms that used support policies had lower productivity and wages long before the pandemic as compared to the firms that did not. Firms that used multiple policy measures and those that repeatedly used support policies tended to show additionally lower performance. The results suggest that firm support policies may have the side effect of preserving inherently inefficient firms and that such a problem may increase in severity as support policies become prolonged.

Keywords: COVID-19, support policy, productivity, cleansing effect, reallocation effect JEL Classification: D24, H25, L25

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^{*} This study is supported by the JSPS Grants-in-Aid for Scientific Research (18H00858, 20H00071, 21H00720). I am grateful to the Ministry of Economy, Trade and Industry for providing the micro data of the Basic Survey of Japanese Business Structure and Activities used in this study.

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1. Introduction

The COVID-19 pandemic has had a serious impact on business activities, particularly on industries involving interpersonal contact. Against this backdrop, since the spring of 2020, various policy support measures have been implemented, including financial assistance by governmental financial agencies, employment assistance subsidy, and subsidies to sustain business for small and medium-sized firms.¹ This study uses survey data on Japanese firms linked with official firm statistics to analyze the performance over the past several years of firms that have taken advantage of various COVID-19-related support policies.

Generally, the adoption of emergency relief policies to avoid excessive bankruptcy and closures is justified in response to unanticipated temporary shocks. However, it is also important to note that excessive bailouts may undermine economic efficiency and negatively impact future economic growth and productivity. Since Schumpeter, the "cleansing effect" of recession has been pointed out, in which inefficient firms exit the market during recessions to improve the efficiency of the overall economy (e.g., Caballero and Hammour, 1994; Foster *et al.*, 2016). Many empirical studies show that the "reallocation effect" through exit of low-productivity firms and expansion of market share of high-productivity firms strengthens during recessions (e.g., Davis and Haltiwanger, 1990; Griliches and Regev, 1995; Baily *et al.*, 2001; Foster *et al.*, 2001; Disney *et al.*, 2003; Carreira and Teixeira, 2008). Previous studies have also revealed that the survival of "zombie firms" negatively impacts the economy (e.g., Caballero *et al.*, 2020).² A survey article on economics research on the COVID-19 crisis (Goldstein *et al.*, 2021) points out that the analysis of zombie firms, which increased with the spread of COVID-19, is one of the key research agendas for the future.

During the COVID-19 pandemic, not only Japan but also many other countries adopted various

¹ Japanese policy in the early stage of the COVID-19 pandemic is compactly summarized by Ando *et al.* (2020).

 $^{^{2}}$ However, some studies do not confirm that zombie firms have a negative macroeconomic impact (e.g., Schivardi *et al.*, 2022).

support measures for firms going through hard times, and an increasing number of empirical studies have been conducted on these policies.³ In the United States, many studies evaluate the effects and efficacy of the Paycheck Protection Program (PPP), which provided forgivable loans for small businesses during the COVID-19 pandemic as part of the Coronavirus Aid, Relief, and Economic Security Act (e.g., Chetty *et al.*, 2020; Hubbard and Strain, 2020; Bartik *et al.*, 2021; Autor *et al.*, 2022; Granja *et al.*, 2022). These studies generally indicate that the PPP was effective to improve survival of small businesses, but that the PPP was not well targeted.

Studies in the European countries include Cros et al. (2021), Gourinchas et al. (2021), and Kozeniauskas et al. (2022). Cros et al. (2021), in an analysis of French firms, show that even during the COVID-19 pandemic, a selection mechanism is at work in which firms with lower productivity and higher debt levels go out of business. They point to the policy challenge of continuing to support productive and viable firms, while gradually ceasing to support unsustainable ones. Gourinchas et al. (2021) evaluate the cost-effectiveness of business continuity support policies during the COVID-19 crisis for firms in 13 European countries. They find that generous support measures curbed bankruptcies of small and medium-sized firms, but that they were poorly targeted in the sense that many policy resources were allocated to firms that could have survived without the policies. They then state that possible methods, such as imposing a temporarily higher tax rate on the future profits of firms that have used bailout measures, could be considered. Kozeniauskas et al. (2022) analyze the cleansing effects of the COVID-19 recession on Portuguese firms, including the relationship with government support policies-a moratorium on debt payments, government provision of credit, tax deferral, and subsidies for job retention. They argue that more productive firms are less likely to receive government support, and the government policies of subsidizing firms weaken the cleansing effect of the recession.

Studies on Japanese firms include those by Hoshi *et al.* (2022), Miyakawa *et al.* (2021), and Morikawa (2021). Using a combination of survey data on Japanese firms and corporate financial information, Hoshi *et al.* (2022) show that firms with lower credit scores prior to the COVID-19 pandemic were more likely to use support measures. Miyakawa *et al.* (2021) compare simulated estimates from pre-pandemic data with actual post-pandemic data for firm exits. They find that

³ Philippon (2021) provides a theoretical analysis of efficient government intervention during a severe recession, focusing on firm bailouts during the COVID-19 crisis. Elenev *et al.* (2022), by calibrating a general equilibrium model, quantitatively evaluate the efficacy of government bailouts to prevent firm bankruptcies in the United States during the COVID-19 crisis.

various firm support measures may suppress firm exit. Morikawa (2021), through an analysis linking data from an original survey of firms and data from the Basic Survey of Japanese Business Structure and Activities (Ministry of Economy, Trade and Industry), shows that the productivity of firms that used various support measures was lower as of FY2018 compared to firms that did not use them.

This study analyzes the productivity and wages of firms that have taken advantage of COVID-19-related support measures, using data from about 3,000 firms collected through a survey of firms conducted in the fourth quarter of 2021. The contributions of this study differ from those of Morikawa (2021) and Hoshi *et al.* (2022) in that it uses information on actual policy use in FY2020 and FY2021 (up to the time of the survey) to analyze firms that have repeatedly used support measures, and it includes wage levels as well as productivity in its analysis. The inclusion of wages in the analysis is important because raising wages has become a central economic policy issue in Japan.

The remainder of this paper is organized as follows. Section 2 describes the data and methodology used in this study. Section 3 reports the results of the analysis of productivity and wages, and Section 4 summarizes the conclusions and discusses future research topics.

2. Data and Method

This study uses a dataset that links microdata from the Basic Survey of Japanese Business Structure and Activities (BSJBSA) with the Survey of Corporate Management and Economic Policy (SCMEP). The BSJBSA, conducted by the Ministry of Economy, Trade, and Industry, is a representative official firm survey in Japan that accumulates annual statistics for all Japanese firms with 50 or more regular employees and capital of 30 million yen or more engaged in mining, manufacturing, electricity and gas, wholesale, retail, and several service industries. Approximately 30,000 firms are surveyed annually. This study calculates total factor productivity (TFP) and mean wages from the data available in the BSJBSA.

The SCMEP is a survey designed by the author and conducted by the Research Institute of Economy, Trade, and Industry (RIETI) from October to December 2021, contracted out to Tokyo Shoko Research, Inc. The survey was sent to 15,000 firms selected from the BSJBSA population list, and 3,194 firms responded (21.3% response rate). The survey question used in this study was

whether the firms used support policies related to the COVID-19 pandemic in FY2020 and FY2021. The specific wording of the question was: "Please select which of the following support policies associated with the COVID-19 your firm has used." The eight policies surveyed were: (1) financial assistance from governmental financial agencies, (2) employment assistance subsidy, (3) subsidy to sustain business (FY2020 only), (4) subsidy for supporting business rent (FY2020 only), (5) business restructuring subsidy (FY2021 only), (6) industry and employment stabilization subsidy, (7) exemption from local taxes and social insurance premium payments, and (8) reduction of property tax. **Table 1** reports the percentages of firms that used these policy measures among the firms that responded to the SCMEP.

In the following, we focus our analysis on the three most frequently used policies: financial assistance, employment assistance subsidy, and subsidy to sustain business. Financial assistance programs offer low- or zero-interest loans provided by governmental financial agencies such as the Japan Finance Corporation and the Shoko Chukin Bank. The subsidy targets small- and medium-sized firms experiencing pandemic-related sales declines. Employment assistance subsidy supports firms' efforts to maintain employment. Following the onset of the pandemic, the subsidization rate increased significantly in April 2020, to prevent an increase in unemployment.⁴ Specifically, for small and medium-sized firms with sales that declined by more than 5%, the subsidization rate was set to 100% of the maximum. Even for large firms, the maximum subsidy rate increased to 75%. The subsidy program to sustain business began in May 2020, delivering a maximum of two million yen to small and medium-sized firms, which demonstrated a drop in sales of more than 50%. This subsidy was discontinued in FY2021 and replaced by a business restructuring subsidy. It should be mentioned that a significant number of firms (58.0% of the SCMEP sample) have used at least one of these three policies, but only 7.8% have used all three.

The SCMEP data was linked to the BSJBSA panel data for FY2014-FY2019 and used in the analysis. Specifically, we ran simple ordinary least squares (OLS) regressions to observe TFP and wages in the pre-pandemic period (FY2014 to FY2018) for firms that used support policies.⁵ The baseline OLS estimation is expressed as equation (1), where the subscript i is the firm and t is the year. The estimation pools five years of data and controls for firm size (*Size*: log of number of

⁴ Employment assistance subsidy is similar to furlough schemes adopted in many European countries during the COVID-19 pandemic.

⁵ The figures of FY2019 were not used in the baseline estimates, because the impact of COVID-19 is included from January to March 2020.

full-time employees), three-digit industry (γ_j), and year (λ_t). Obviously, our interest lies in the coefficients of the support policy dummies (*Policy_i*) described above.

$$Y_{it} = \alpha_0 + \alpha_1 Policy_i + \alpha_2 Size_{it} + \gamma_i + \lambda_t + u_{it}$$
(1)

Among the dependent variables (Y_{ii}), TFP is calculated non-parametrically for each three-digit industry of the BSJBSA using the index number method, with value added as output, tangible fixed asset stock, and labor input (hours) as inputs.⁶ The real (price-adjusted) value-added and tangible fixed assets are calculated using the deflator from the National Accounts (Cabinet Office). The mean wages are calculated by dividing the total salaries (including bonuses) by the number of regular employees. Because a higher ratio of part-time workers underestimates hourly wages, the full-time equivalent number available in the BSJBSA is used as the number of part-time employees. TFP and average wage are expressed as logarithms. **Table 2** presents the summary statistics of these variables.

In summary, we compare the productivity and wages of firms that used COVID-19-pandemicrelated policies in the five years before the pandemic with those of firms that did not use policies. In addition, we provide annual estimates for the period FY2014-FY2019 and observe changes in firm performance prior to the pandemic.

3. Results

Table 3 presents the estimation results for the productivity. Controlling for firm size, threedigit industry, and year, TFP in the five years prior to the pandemic was on average -18.4%, -10.8%, and -8.8% lower, respectively, for firms that used financial assistance (Column (1)), employment assistance subsidy (Column (2)), and subsidy to sustain business (Column (3)) than for non-users.⁷ **Figure 1** illustrates the evolution of the coefficients estimated by year, including

⁶ Since data on working hours are not available in the BSJBSA, labor input was calculated using data on working hours (full-time and part-time workers) for each industry from the Monthly Labour Survey (Ministry of Health, Labour and Welfare), and multiplied by the number of full-time workers and part-time workers in each firm. TFP is measured using the entire sample of the BSJBSA, not just firms that responded to the SCMEP.

⁷ The percentages are calculated as $exp(\alpha_1)$ -1.

FY 2019. Since productivity in FY2019 may be affected by the impact of the COVID-19 pandemic from January to March 2020, the trend through FY2018 appears to have been a gradual expansion of the productivity gap. ⁸

When the three policies are used simultaneously as explanatory variables, the coefficients of all three policies are significantly negative at the 1% level (Column (4)). However, the magnitude of the coefficients is very large for financial assistance, followed by employment assistance subsidy, and lastly for subsidy to sustain business.

Since financial assistance and employment assistance subsidies were provided in both FY2020 and FY2021, Columns (5) and (6) of the table show the estimation results using as an additional explanatory variable whether the firms used these policies for two consecutive years (a dummy for repeated users). The coefficients are significantly negative, meaning that firms that continued to use these policies during the pandemic had a much lower TFP before the onset of the pandemic. This result suggests that prolonged support policies may excessively relieve low-productivity firms.

While various factors affect firm productivity, **Appendix Table A1** shows the results of the estimation, with additional information on the composition of the workforce available in the dataset used in this study. As for the composition of workers, we use (1) the share of part-time workers in the total number of regular employees from the BSJBSA as the ratio of non-standard workers, and (2) the ratio of employees with four-year university or postgraduate degrees collected from the SCMEP as the ratio of workers is negative, and the coefficient of the ratio of non-standard workers is negative, and the coefficient of the ratio of university or higher education is positive, both at high significance levels. When these variables are added, the absolute values of the coefficients for each support measure are slightly smaller (approximately 0.02 smaller), but they are still all negative at high significance levels, meaning that there is no essential difference in the conclusion.

Table 4 presents the estimation results using mean wages as the dependent variable. Although the size of the coefficients is smaller than the TFP estimates, controlling for firm size, industry, and year, the wage levels of firms that used financial assistance (Column (1)), employment

⁸ However, when estimates with a cross-term of policy use dummy*time trend are performed using the FY2014-2018 pooled data, the coefficient of the cross-term was statistically insignificant.

⁹ The number of part-time workers is the full-time equivalent. The percentage of workers with a university or higher education is same for each year, as there are no figures for each year.

assistance subsidy (Column (2)), and subsidy to sustain business (Column (3)) in the five years before the pandemic were on average -10.9%, -7.0% and -5.1% lower, respectively. Figure 2 illustrates the evolution of the coefficients obtained from year-by-year estimations. The figure shows a pattern similar to that of productivity. ¹⁰

When all three policies are used as explanatory variables simultaneously (Column (4)), the coefficients for all three policies are significantly negative, but the significance level of the coefficient for the subsidy to sustain business is low (10% level). The size of each coefficient shows the same pattern as in the productivity estimation, with the coefficient of financial assistance being the largest. Columns (5) and (6) of the table show the results of the estimation of financial assistance and employment assistance subsidies being used as an additional explanatory variable whether the firm used these policies for two consecutive years (dummy for repeated users), indicating that firms that continued to use these policies during the COVID-19 pandemic had further low wage levels prior to the pandemic.

The estimation results using the ratio of non-standard workers and the ratio of university or higher education as additional explanatory variables are presented in **Appendix Table A2**. As with the productivity estimation results, the coefficients for each support measure are slightly smaller than when these worker composition variables are added but are significantly negative at the 1% level, except the subsidy to sustain business when all three policies are included simultaneously.

4. Conclusion

This study uses a survey dataset of over 3,000 Japanese firms linked to official firm statistics to analyze the performance over the past five years of firms that took advantage of the major COVID-19-related support policies. The main findings are summarized as follows. First, comparing the performance of firms that used support policies during the pandemic with that of non-users, productivity and mean wages were lower before the pandemic. Second, firms that used multiple policies and those that continuously used support policies tended to have lower

¹⁰ However, when estimates with a cross-term of policy use dummy*time trend are performed, the coefficient of the cross-term was not statistically significant.

productivity and wages.

These results indicate that poorly performing firms were more strongly affected by the decline in economic activity due to the COVID-19 pandemic. In this respect, relief policies may reduce firm bankruptcies and unemployment. However, the results also confirm that firm support policies in emergency situations not only help firms that have temporarily fallen on hard times, but also have the side effect of preserving inherently inefficient firms. The results also suggest that such a problem may be more serious as support policies become prolonged. Although it is difficult to properly target firms when establishing support policies in times of emergency, it may be possible to design policies that temporarily impose a higher tax rate on the future profits of firms that use the policies, as discussed in some studies, or link support eligibility to past tax payment performance.

The analysis in this study is limited to past performance of policy-using firms. An analysis of the *ex-post* performance of policy-using firms is an important issue for future research.

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		(1)	(2)
	FY	Using firms	Repeated user
Financial assistance	2020, 21	24.0%	6.2%
Employment assistance subsidy	2020, 21	49.3%	25.7%
Subsidy to sustain business	2020	18.2%	
Subsidy for supporting business rent	2020	12.4%	_
Business restructuring subsidy	2021	2.0%	
Industry and employment stabilization subsidy	2020, 21	1.0%	1.0%
Exemption of local taxes and social insurance premiums payments	2020, 21	2.8%	2.8%
Reduction of property tax	2020, 21	10.8%	10.8%

Table 1. The percentages of firms using COVID-19-related support policies

Notes: N=3,123. Column (1) indicates the percentage of firms that used the support program at least once in FY2020 or FY2021. Column (2) shows the percentage of firms that used the program in both years (repeated users).

Table 2. Summary statistics of the dependent variables

	Mean	Std. dev.	Nobs.
TFP	-0.0866	0.4247	13,781
Mean wages	1.4709	0.3641	14,048

Note: Calculated from the pooled data from FY2014 to FY2018.

	(1)	(2)	(3)	(4)	(5)	(6)
Financial assistance	-0.2038 ***			-0.1819 ***	-0.1935 ***	
	(0.0086)			(0.0087)	(0.0095)	
(Repeated user)					-0.0413 ***	
					(0.0156)	
Employment subsidy		-0.1147 ***		-0.0775 ***		-0.0810 ***
		(0.0083)		(0.0084)		(0.0098)
(Repeated user)						-0.0708 ***
						(0.0103)
Subsidy to sustain business			-0.0918 ***	-0.0273 ***		
			(0.0099)	(0.0098)		
In Employee	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Year dummeis	yes	yes	yes	yes	yes	yes
Nobs.	13,781	13,781	13,781	13,781	13,781	13,781
Adj R-squared	0.0880	0.0658	0.0575	0.0950	0.0883	0.0689

Table 3. Use of support policies and TFP

Notes: OLS estimations with robust standard errors are given in parentheses. ***: p<0.01. Estimated from pooled data for FY2014-FY2018.

	(1)	(2)	(3)	(4)	(5)	(6)
Financial assistance	-0.1149 ***			-0.1011 ***	-0.1079 ***	
	(0.0070)			(0.0071)	(0.0077)	
(Repeated user)					-0.0282 **	
					(0.0130)	
Employment subsidy		-0.0721 ***		-0.0514 ***		-0.0491 ***
		(0.0065)		(0.0066)		(0.0076)
(Repeated user)						-0.0483 ***
						(0.0083)
Subsidy to sustain business			-0.0522 ***	-0.0138 *		
-			(0.0079)	(0.0080)		
In Employee	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Year dummeis	yes	yes	yes	yes	yes	yes
Nobs.	14,048	14,048	14,048	14,048	14,048	14,048
Adj R-squared	0.2471	0.2389	0.2339	0.2511	0.2473	0.2408

Table 4. Use of support policies and wages

Notes: OLS estimations with robust standard errors are given in parentheses. ***: p<0.01, **: p<0.05, *: p<0.10. Estimated from pooled data for FY2014-FY2018.



Figure 1. Trend in TFP of firms using support policies

Note: The figure plots the year-by-year estimation coefficients for the policy use dummies. Firm size and three-digit industry are controlled for.



Figure 2. Trend in wages of firms using support policies

Note: The figure plots the year-by-year estimation coefficients for the policy use dummies. Firm size and three-digit industry are controlled for.

	(1)	(2)	(3)	(4)	(5)	(6)
Financial assistance	-0.1810 ***			-0.1641 ***	-0.1705 ***	
	(0.0089)			(0.0091)	(0.0099)	
(Repeated user)					-0.0440 ***	
					(0.0166)	
Employment subsidy		-0.0957 ***		-0.0622 ***		-0.0734 ***
		(0.0087)		(0.0087)		(0.0101)
(Repeated user)						-0.0468 ***
						(0.0105)
Subsidy to sustain business			-0.0775 ***	-0.0238 **		
•			(0.0103)	(0.0102)		
Non-standard ratio	-0.4256 ***	-0.4221 ***	-0.4384 ***	-0.4140 ***	-0.4236 ***	-0.4193 ***
	(0.0278)	(0.0282)	(0.0284)	(0.0277)	(0.0278)	(0.0282)
University or higher	0.3850 ***	0.3923 ***	0.3990 ***	0.3808 ***	0.3859 ***	0.3914 ***
	(0.0203)	(0.0205)	(0.0207)	(0.0201)	(0.0203)	(0.0205)
In Employee	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Year dummeis	yes	yes	yes	yes	yes	yes
Nobs.	11,516	11,516	11,516	11,516	11,516	11,516
Adj. R-squared	0.1531	0.1327	0.1269	0.1578	0.1535	0.1340

Appendix Table A1. Use of support policies and TFP controlling the composition of employees.

Notes: OLS estimations with robust standard errors are given in parentheses. ***: p<0.01, **: p<0.05. Estimated from pooled data for FY2014-FY2018.

	(1)	(2)	(3)	(4)	(5)	(6)
Financial assistance	-0.0975 ***			-0.0885 ***	-0.0933 ***	
	(0.0071)			(0.0072)	(0.0079)	
(Repeated user)					-0.0178	
					(0.0133)	
Employment subsidy		-0.0550 ***		-0.0379 ***		-0.0405 ***
		(0.0062)		(0.0064)		(0.0075)
(Repeated user)						-0.0303 ***
						(0.0082)
Subsidy to sustain business			-0.0362 ***	-0.0059		
			(0.0080)	(0.0081)		
Non-standard ratio	-0.6311 ***	-0.6285 ***	-0.6378 ***	-0.6246 ***	-0.6303 ***	-0.6266 ***
	(0.0235)	(0.0235)	(0.0237)	(0.0234)	(0.0234)	(0.0235)
University or higher	0.2415 ***	0.2444 ***	0.2489 ***	0.2385 ***	0.2419 ***	0.2438 ***
	(0.0134)	(0.0135)	(0.0136)	(0.0133)	(0.0134)	(0.0135)
ln Employee	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes
Year dummeis	yes	yes	yes	yes	yes	yes
Nobs.	12,031	12,031	12,031	12,031	12,031	12,031
Adj. R-squared	0.3427	0.3351	0.3319	0.3448	0.3428	0.3359

Appendix Table A2. Use of support policies and wages controlling the composition of employees.

Notes: OLS estimations with robust standard errors are given in parentheses. ***: p<0.01. Estimated from pooled data for FY2014-FY2018.