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Imperfect Take-up of COVID-19 Business Support Programs[*]

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Abstract

Not all firms and individuals targeted by government support measures take up the support even when eligible, i.e., take-up is imperfect. Using data on the use by small and medium-sized enterprises in Japan of various business support measures during the COVID-19 pandemic, we examine whether such imperfect take-up is observed and if so, why. Given that the eligibility criteria for the measures were based on the decline in monthly sales from the previous year, we use a regression discontinuity design. Our results show that take-up of all the measures we examine was imperfect except for one, business continuity grants (BCGs). Our results further show that the imperfect take-up of measures other than BCGs was mitigated when firms that were eligible for those other measures also became eligible for a BCG. Results from sub-sample analyses indicate that these findings can be explained by the transaction costs involved in applying for and using these measures and not by information frictions or a lack of knowledge about the measures.

Key words: imperfect take-up, business support programs, COVID-19, transaction costs, information frictions.
JEL classifications: H25, H32, L20

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1. Introduction

Economic policies such as subsidies or tax incentives generally require the intended targets of such policies to apply. However, many studies show that often many of the individuals or businesses targeted by such policies do not apply even when they are eligible (Saez et al. 2009; Zwick 2021l; Cui et al. 2022). This phenomenon is called "imperfect" or "incomplete take-up" in the literature (Moffitt 2003; Currie 2006; Currie and Gahvari 2008). How to resolve this issue became an important practical challenge during the recent COVID-19 pandemic, when governments tried to provide effective support to individuals and businesses adversely affected by the pandemic. Understanding the extent and causes of the imperfect take-up of measures is an important issue to ensure the effective use of policy resources.

Against this background, studies examining such imperfect take-up have provided several explanations that are consistent with the data, which are based on either transaction costs or information frictions. Transaction costs include the administrative costs of applying for a program and of complying with the program regulations (Finkelstein and Notowidigdo 2019), costs associated with possible administrative or tax inspections (Balyuk et al. 2021), and reputational concerns or the risk of stigma associated with using a program (Moffitt 1983; Bhargava and Manoli 2015). Meanwhile, information frictions include the lack of knowledge about the existence and contents of a program (Bhargava and Manoli 2015; Finkelstein and Notowidigdo 2019; Humphries et al. 2020, Cui et al., 2022). However, empirically identifying the reasons underlying imperfect take-up is not straightforward. The biggest obstacle is the observational equivalence of the different theoretical explanations. For example, if we observe that small and medium-sized enterprises (SMEs) are less likely to take advantage of policies than large firms, we still do not know based on this evidence alone whether the imperfect take-up is caused by SMEs' lack of knowledge/literacy regarding a specific policy or their inability to shoulder the transaction costs involved

in applying for a measure. Yet, such identification of the exact mechanism is essential to resolve the imperfect take-up and effectively deploy policy resources to the intended targets. The aim of this study is to address this issue by examining the possible mechanisms resulting in imperfect take-up. To this end, we use detailed information on firms' eligibility for several policy measures, firms' use of those policy measures and the timing of such use, and various firm characteristics obtained through a survey designed by the authors.

Since the outbreak of the COVID-19 pandemic, the Japanese government has been implementing a range of business support programs for firms located in Japan, including the provision of business continuity grants and employment adjustment subsidies, special loan programs by government-affiliated financial institutions (GFIs), and special guaranteed loans by private financial institutions. These policies provide a useful research setting to empirically examine the various potential mechanisms causing imperfect take-up, including the transaction costs of applying for policy support measures and information frictions involved in acquiring knowledge about these measures. As detailed in the following sections, the eligibility criteria of the policies implemented in Japan happen to be quite simple and share a common feature in that the main criterion is the decrease in sales during the pandemic. For example, firms were eligible for business continuity grants if their monthly sales fell below 50% of the previous year's level, while the criterion for employment adjustment subsidies was a 5% decline in year-on-year sales. These criteria make it easy for us to check whether a firm qualified for a particular measure, which helps us to determine if the take-up was indeed imperfect. Another feature of the policies is that once a firm had gathered the necessary information and applied for one of the COVID-19 pandemic related measures, it was relatively easy to apply for another program. The reason is that the information and documents required to apply for the different programs are very similar. Thus, after applying to one of the programs, the transaction costs involved in applying for the other programs were essentially zero. This allows us to examine whether transaction costs play a major role in imperfect take-up. Finally, the various steps of each policy – from its introduction to the start of applications to the provision of support – were spread over a

period of time from early 2020 onward. This allows us to examine whether, instead, information frictions are a more important cause of imperfect take-up, since it can be assumed that knowledge of and about the policy measures increased over time. Thus, if the share of firms using a program increased over time, this suggests that information frictions played a role.

Taking advantage of these aspects of the policy measures, we first test whether take-up of COVID-19-related support measures in Japan was imperfect. Given this was indeed the case, we then examine whether firms that applied for one support measure were more likely to also apply for other measures. This allows us to examine whether transaction costs are one of the possible determinants of imperfect take-up. We further examine how the results differ depending on firm characteristics that are likely to affect firms' ability to bear transaction costs and depending on the timing of the application, which likely determines how much information on a particular policy measure was available. This allows us to examine which of the two factors, transaction costs or information frictions, plays a more prominent role in the imperfect take-up.

Specifically, for this analysis, we use information on whether and when firms became eligible for specific policy measures, whether and when they used a measure and various firm-level attributes to conduct a set of estimations using regression discontinuity design (RDD). We regress a dummy variable representing whether a firm received support through a specific program on a dummy variable representing whether the firm was eligible for that program, which we construct based on the firm's change in sales compared to the same month a year earlier. Focusing on firms that are relatively close to (i.e., just below or above) this sales criterion, we can make inferences about the causal relationship from eligibility to take-up. One important twist in our analysis is that we regress the dummy for the take-up of a program on the eligibility not only for the program in question but also for another program, namely, the provision of business continuity grants, which was the most widely used program during the pandemic. This analysis allows us to examine not only to what extent eligible firms took up individual programs but also whether and how application for a business continuity grant affected firms' take-up of other programs.

Our estimations yield the following results. First, while the take-up of business continuity grants was near perfect, that of other programs was far from perfect. For example, in the case of employment adjustment subsidies, less than 20% of firms falling just within the threshold (i.e., firms whose sales fell by 5% year-on-year) received such subsidies. In contrast, in the case of business continuity grants the take-up rate among eligible firms that was about 70%. The results of the RDD estimations confirm these findings and indicate that the discontinuous increase in the take-up ratios at the threshold is small except in the case of business continuity grants. One possible explanation for our results is that the administrative and other transaction costs of applying for and using special GFI loans, special credit guarantee loans, and employment adjustment subsidies outweighed the potential benefits. For example, compared to business continuity grants, the net gains of employment adjustment subsidies to firms were quite small, since firms needed to bear some of the costs of maintaining jobs. In contrast, business continuity grants took the form of a simple payment, providing firms with a greater incentive to apply.

The second and most important finding of our study is that the use of business continuity grants significantly increased the take-up of the other programs. That is, the probability that firms received employment adjustment subsidies, for example, increased significantly when they became eligible for business continuity grants. Our results imply that firms that applied for business continuity grants subsequently found it less costly to apply for the other programs, suggesting that the transaction costs associated with these programs play a role in explaining their imperfect take-up. An alternative explanation for our results is that they point to information frictions regarding the policy measures. That is, firms may have been unaware of the employment adjustment subsidies but found out about them, and applied for them, after hearing about the business continuity grants, which were the flagship program of the business support programs and salient to many firms.

Therefore, to further examine which of the two explanations, i.e., transaction costs or information frictions, is more relevant, we conduct sub-sample analyses based on firm characteristics and the month when firms became eligible. Our results suggest that transaction costs are a more relevant explanation for

the imperfect take-up than information frictions. For example, we find take-up remained unchanged or even decreased in periods when firms were better informed about the existence of the various policy measures. In sum, our results indicate that, at least during the COVID-19 pandemic in Japan, transaction costs were one important reason for the imperfect take-up of government programs.

The contributions of our empirical study are twofold. First, our study is the first to distinguish between the role of transaction costs and information costs as potential determinants of imperfect take-up. Except for a small number of experimental studies (Bhargava and Manoli 2015; Finkelstein and Notowidigdo 2019), there have been few empirical studies identifying the sources of imperfect take-up, and none have identified transaction costs as a significant determinant. The reason is that theoretical explanations based on transaction costs and information frictions tend to provide the same testable hypothesis. A notable exception is the study by Cui et al. (2022), which identified information frictions as a source of imperfect take-up. Using the introduction of accelerated depreciation for fixed asset investment in China as a natural experiment, they show that firms' tax sophistication and the resources of local tax bureaus were positively associated with claims for accelerated depreciation. Their identification strategy is based on the institutional setting in China, where tax authorities play an important role in disseminating information on taxes. While Cui et al. (2022) focus on the role of information frictions, our study considers both transaction costs and information frictions.

Second, this study has practical implications for the design of business support measures aiming to mitigate adverse shocks like the COVID-19 pandemic. Governments around the world introduced a range of measures to deal with the economic downturn caused by the pandemic, such as the provision of financing support and job retention programs (OECD 2020a, 2020b). To what extent such measures were actually used or not and why is of great interest to governments. Some studies on business support programs during the pandemic indicate that take-up tended to be imperfect. Specifically, Humphries et al. (2020), Balyuk et al. (2021), Granja et al. (2022), and Bartik et al. (2020) detect imperfect take-up of the Paycheck Protection Program (PPP) in the United States, a support program for SMEs during the pandemic. While these studies

provide evidence for the sources of imperfect take-up such as unawareness of the PPP (Humphries et al., 2020), wariness of the government's powers to investigate PPP recipients (Balyuk et al., 2021), and concerns about administrative complexity and eligibility (Bartik et al., 2020), they do not report that transaction costs acted as a source of imperfect take-up. Unlike these studies focusing on the PPP, we examine whether transaction costs play a role to show that transaction costs common across multiple programs acted as a source of imperfect take-up. Such a detailed illustration of how imperfect take-up is induced and resolved can help in the design of effective policy measures by, for example, allowing potential applicants of a program to reuse the information they provided for another program.

The remainder of this study is organized as follows. Section 2 provides a brief outline of the institutional background to the COVID-19 pandemic-related policies in Japan. Next, Section 3 discusses the data and methodology used in our analysis, while the empirical results are presented in Sections 4 and 5. Section 6 concludes.

2. Institutional background: Support programs for SMEs during the COVID-19 pandemic

The Japanese government established several support programs to assist firms in distress due to the COVID-19 pandemic. These programs include subsidized loans provided by GFIs or private financial institutions, grants, subsidies, moratoriums on debt repayment, a grace system for tax and social insurance fee payments, and the protection of small subcontractors. Some measures were available to all firms, while others targeted SMEs only. Among the measures targeting SMEs that suffered from the COVID-19 pandemic, this study focuses on four measures that were the most widely used during the pandemic. Most importantly for our analysis, the eligibility criteria for the four measures differed. The following subsections explain each of these measures in detail.

2.1. Special loan programs by GFIs

After the onset of the COVID-19 pandemic in March 2020, GFIs extended special loans to SMEs called

"Special Loans to Deal with the Impact of the COVID-19 Pandemic." The three GFIs in charge of these loans are the Japan Finance Corporation, the Shoko Chukin Bank, and the Okinawa Development Finance Corporation. Firms approved for these loans were able to obtain unsecured loans with a discount on the interest rate for the first three years as well as a grace period (of up to five years) for the repayment of the principal.[1] In addition, until the end of September 2022, firms whose sales had declined substantially could obtain "de facto interest-free" loans.[2] Unlike the special guaranteed loans that we will elaborate on below, these loans are not covered by credit guarantees and hence guarantee-fee free.

For a firm to be eligible for these special loans, its sales must have declined by at least 5% year-on-year in the most recent month or in any month during the most recent three months. Eligibility for "de facto interest-free" loans was linked to firms' size. Specifically, micro sole proprietorships were eligible if their sales declined by 5% or more, micro corporations were eligible if their sales had declined by 15% or more, and other SMEs if their sales had declined by 20% or more.[3]

2.2. Special guaranteed loans by private financial institutions

In addition to the special loan programs by GFIs, the Japanese government in April 2020 set up a special loan program by private financial institutions. From May 2020, private financial institutions extended special loans with preferential terms to distressed SMEs called "de facto zero-interest zero-collateral loans." The government incentivized private institutions to extend such loans by providing credit guarantees. The ratio of credit covered by credit guarantee corporations, which are financially backed by the government, is 100% in most cases, implying that private financial institutions bear no credit risks. Similar to the special loan programs by GFIs, some of the firms approved for special guaranteed loans by private financial

[1] The discount from the standard interest rate was 0.9 percentage points. Note that this standard rate set by GFIs was already discounted in the sense that it was 0.3–0.4 percentage points lower than the average interest rate set by private financial institutions. For a detailed comparison of GFI and private sector interest rates in Japan, see Uesugi, Uchida, and Iwaki (2020).

[2] These loans are interest-free for the first three years. They are called "de facto interest-free" because borrower firms first make interest payments to the GFIs and then get reimbursed by the Organization for Small and Medium Enterprises and Regional Innovation, one of the government agencies in charge of implementing SME policies.

[3] Micro corporations are defined as corporations in the retail, wholesale, and service industries with no more than 5 employees and in other industries (e.g., manufacturing) with no more than 20 employees.

institutions could obtain "de facto" zero-interest, zero-collateral, and zero-guarantee fees loans.[4] This special loan program ended at the end of March 2021.

To be eligible, firms' sales had to have declined by at least 5% year-on-year in the most recent three months. To what extent interest payments and guarantee fees were subsidized also depended on the year-on-year decline of sales. They were fully subsidized for all sole proprietorships as well as for SMEs whose year-on-year sales declined by at least 15%.[5] For SMEs whose sales declined between 5% and 15%, half of the guarantee fees were subsidized, but they did not receive any interest rate discount.

2.3. Business continuity grants

From May 2020 to February 15, 2021, the government provided one-time grants to distressed firms to help them continue business operations.[6] The grant amount was 2 million yen for corporations and 1 million yen for sole proprietorships. The business continuity grants targeted not only SMEs but also mid-sized non-SMEs – specifically, corporations with paid-in capital of no more than 1 billion yen or with no more than 2,000 employees. To be eligible, firms' year-on-year sales had to have declined by at least 50% in any month from January 2020 to the date of application.

2.4. Employment adjustment subsidies

From April 2020 to November 2022, the Japanese government augmented the employment adjustment program providing partial subsidies for expenses for leave allowances and off-the job training. Specifically, while such subsidies were available during normal times, the government increased the upper limit of the subsides and the ratio of expenses covered by the program during the pandemic. The coverage ratio differed

[4] In some cases, SMEs made interest payments to a bank that provided a special loan but were later reimbursed by the local government.

[5] Interest payments were subsidized for the first three years of a loan contract and guarantee fees were subsidized for the entire contract period.

[6] There was another, related program called "business continuity subsidies for micro businesses." Although this program did not specifically support firms hit by the COVID-19 pandemic, there was a special program that provided a one-time lump sum of 1 million yen or 0.5 million yen to firms that took measures to prevent COVID-19 infections to help them to continue their business. There were no specific eligibility criteria in terms of the decline in sales. This program ended on February 15, 2022.

depending on firm size, whether firms maintained employment, and firms' year-on-year decline in sales during the pandemic. For example, SMEs that did not lay off any employees received 90% or 100% of the furlough payment, while SMEs that laid off some employees received 80%.[7]

For firms to be eligible, their sales had to have declined by at least 5% year-on-year in the most recent month. In addition, to receive 100% of the furlough payment, sales had to have declined by at least 30% on average in the most recent three months.

3. Empirical approach

3.1 Definitions and hypotheses

Receiving grants and subsidies will increase firms' cash flow, while obtaining interest-free loans will improve their credit availability. Therefore, if firms knew about the existence and contents of the programs, and the transaction costs involved in applying for and using the programs were sufficiently small, we would expect a substantial share of eligible firms to take up the programs. On the other hand, if firms did not know about the programs or the transaction costs in applying for and using the programs were relative large compared to the benefits of using the programs, we would expect many of them not to apply even if they were eligible. Therefore, in our analysis below, we regard the take-up of a program to be imperfect when we fail to find a substantial increase in the take-up of a support program when firms reach the eligibility threshold of that program. Moreover, when we find a discontinuous and substantial increase in the take-up of a particular program when firms reach the threshold of another program, we say that the imperfect take-up is mitigated by the presence of the other support program.

There are mainly two possible reasons for imperfect take-up. The first is transaction costs, which include the administrative costs of preparing an application, compliance costs for the program regulations, reputational concerns with regard to using the programs, and the costs associated with possible inspections

[7] The coverage ratio for large firms was 75% for those that did not lay off any employees and two-thirds for those that laid off some employees.

by the administrative or tax authorities.[8] Due to the characteristics of these costs, we presume that they are usually overhead and do not significantly increase as a firm applies for more programs. If these overhead costs outweigh the benefits of using a single program, firms may wait until the benefits of using multiple support measures exceed the costs associated with their use. We refer to this explanation that transaction costs play an important role in the imperfect use of support programs as the "transaction cost hypothesis."

The second possibility is that potential user firms are unaware of the existence or contents of the support programs. In this case, firms do not apply for the programs even when they are eligible, and therefore the take-up ratio does not increase substantially when firms reach the eligibility threshold for a program. On the other hand, if there is another, prominent support program and firms become aware of not only this program but also the other programs, they would simultaneously apply for the prominent program and the other programs that they had previously been unaware of.[9,10] We refer to this explanation that

[8] In the case of the measures implemented during the COVID-19 pandemic, reputational costs may have been small, for two reasons. First, it was evident that business conditions deteriorated due to the pandemic rather than poor management. Second, the government actively promoted the use of measures to lessen the adverse impact of the pandemic on the economy.

[9] During the period of economic crisis caused by the COVID-19 pandemic, the government set up a website to provide information on various types of business support measures for small and medium enterprises by different government agencies. Therefore, once a firm had accessed the website to learn about one of the support programs, it would also know about the existence of the other programs.

[10] It is likely that the business continuity grants led firms to use the other support measures more often than did the other three support measures. As explained in Section 2, among the four support programs, it was the business continuity grants whose eligibility requirement (a monthly sales decrease of 50% or more) was the most stringent. Therefore, all firms that were aware of the continuity grants and used them were able to apply for the other three programs, while the reverse was not necessarily the case.

information frictions play an important role in the imperfect use of support programs as the "information friction hypothesis."

3.2 Presence and mitigation of imperfect take-up

To examine whether imperfect take-up is observed and whether it is mitigated by another program, we mainly employ the regression discontinuity approach, for the following reasons. First, we can take advantage of the fact that the eligibility criteria for the business continuity grants, the special GFI loans, the special guaranteed loans, and the employment adjustment subsidies all focused on the year-on-year decline in monthly sales. Second, using this approach, we can control for the demand for the support programs. It is likely that the size of demand for special GFI loans, special credit guarantee loans, and employment adjustment subsidies depended on the extent of damage inflicted by the pandemic. Although the size of business continuity grants was the same across firms (except for sole proprietorships), the extent of liquidity shortages and hence how valuable the grants were to firms likely also depended on the extent of damage firms suffered as a result of the pandemic. Therefore, we can safely assume that the demand for the programs for firms that fall within a narrowly defined band around the eligibility thresholds is virtually the same.

We start by examining whether firms took up each of the programs when they reached the eligibility threshold for the program. Specifically, we employ the regression discontinuity approach and estimate the following equation:

$$Y_i^j = \alpha + \beta^j Eligible_i^j + \varepsilon_i^j, \quad (1)$$

where Y_i^j is a dummy that takes the value of unity if firm *i* reports using program *j* and zero otherwise.[11] $Eligible_i^j$ stands for the firm's eligibility for program *j*, represented by the binary variable $1(MinSales_i \leq s^j)$. For *j*, we have business continuity grants, special GFI loans, special credit guarantee loans, and employment adjustment subsidies. $MinSales_i$ is the minimum of the ratio of monthly sales compared to the previous year for the period between February and August 2020, the period immediately after the outbreak of the COVID-19, and s^j is the eligibility threshold, which differs across the programs. We express the threshold as the ratio of monthly sales compared to a year earlier. Specifically, s^{BCG} is 50%, that is firms' sales must have fallen below 50% of the previous year's level, while s^{GFI} is 85% for micro firms and 80% for other SMEs, s^{SCG} is 85%, and s^{EMP} is 95% or 70% depending on the extent of the subsidies.[12] These numbers indicate that the eligibility criterion was strictest for the business continuity program, i.e., firms' monthly sales had to have dropped by half or more following the outbreak of the pandemic. To estimate Equation (1), we employ several different bandwidths around s^j, namely, $\pm 2\%$, $\pm 5\%$, $\pm 10\%$, and $\pm 15\%$.

We examine if the coefficient on $Eligible_i^j$, β^j, is positive, significant, and substantial in size. If firms know about a program and the transaction costs for applying for and using it are sufficiently small, we expect β^j to be positive. On the other hand, if firms do not know about the program and/or the transaction costs are relatively large, we expect β^j to be either insignificant or significant but only small

[11] One related issue is whether we should use a dummy for application to a program rather than a dummy for its use. Using the same RIETI firm survey, Honda et al. (2023, Table 2) find that the rejection rates for these business support programs were very low. Therefore, we would expect the results to be quite similar if we were to use information on firms' application to the programs.

[12] In the case of $s^{EMP} = 70\%$, we use the minimum average sales over the latest three months relative to those in the previous year based on the eligibility criterion of EMP.

in size, which would indicate that there is only a limited discontinuous increase at the threshold where firms become eligible.

Note that a possible issue is that firms may have misreported their sales in the survey. Such misreporting would affect the identification of whether firms were eligible, i.e., $Eligible_i^j$, and could result in a potential bias in the estimated β^j. In Section 4.1, we explain how such misreporting would show up in the data, while in Section 4.4, we discuss the econometric implications.

Next, if we find that take-up of one of the business support programs at its eligibility threshold is imperfect, we examine whether such imperfect take-up is mitigated by the existence of another program. In other words, we test if the likelihood of take-up of a program increases discontinuously when firms satisfy the eligibility criterion for another program. As shown, the threshold for s^{BCG} is the lowest (=strictest) among the four programs. Therefore, firms that were eligible for business continuity grants were also eligible for the special GFI loans, the special credit guarantee loans, and the employment adjustment subsidies. Consequently, we examine whether the use of the other three support programs discontinuously increased at the threshold value of s^{BCG}. More specifically, we employ the following three equations:

$$Y_i^j = \alpha + \beta^j Eligible_i^{BCG} + \varepsilon_i^j, \tag{2}$$

$$Y_i^j = \alpha + \beta^j Eligible_i^{BCG} + Controls_i + \varepsilon_i^j, \text{ and} \tag{3}$$

$$Y_i^j = \alpha + \beta^j Eligible_i^{BCG} + P\left(MinSales_i, \gamma_l^j\right) \times Eligible_i^{BCG} + P\left(MinSales_i, \gamma^j\right) + \alpha^j X_i + \varepsilon_i^j. \tag{4}$$

We estimate all three and examine if β^j is statistically significant. We estimate Equations (2) and (3) for bandwidths of $\pm 2\%$ and $\pm 3\%$ around s^{BCG}, while we estimate Equation (4) for the entire sample.

As control variables in Equation (3), we employ the log of sales in 2019 and the ratio of current assets to total assets. In Equation (4), $P(MinSales_i, \gamma)$ represents polynomials for $(MinSales_i - s^{BCG})$ up to the second degree for the entire range of $MinSales_i$, while X_i represents a vector of firm characteristics. Specifically, we include the current asset-to-current liability ratio (Current Ratio) and the log of sales (LnSales), both of which are as of 2019, i.e., before the pandemic.

To confirm that the eligibility threshold $s^{BCG} = 50\%$ has a significant effect on the take-up ratios not only of business continuity grants but also of the other three programs, we further implement a placebo test by estimating Equation (2) using $s^{Placebo}$ that takes slightly different values from s^{BCG}.

3.3 Reason for imperfect take-up: Information frictions versus transaction costs

Next, we explore the mechanism how the imperfect take-up emerges and how it is mitigated. To test which of the information friction and transaction cost hypotheses has greater explanatory power, we perform several additional estimations. First, we implement estimations based on the regression discontinuity design by splitting the sample using variables for firm characteristics. Based on the transaction cost hypothesis, firms with greater managerial quality are more likely to be able to shoulder overhead costs such as administrative, reputational, and inspection costs, which are virtually the same regardless of the number of programs a firm applies for. We therefore expect larger firms and firms that had a business continuity plan (BCP) in place to be more likely to have the capacity to shoulder these costs. Consequently, we expect these firms to be more likely take up support programs when they are eligible. More specifically, at the threshold where subsidies and loans (the special GFI loans, the special credit guarantee loans, and the employment adjustment subsidies) become available, the take-up ratio for these firms is expected to be greater than for smaller firms or firms that have not formulated a BCP. On the other hand, the increase in the utilization rate of subsidies and special loans at the eligibility threshold for business continuity grants is expected to be smaller for these large firms and firms that have formulated a BCP. It should be noted, however, that firm

size may reflect not only firms' ability to shoulder such transaction costs but also information frictions, since small firms may not be able to acquire information on the existence and contents of these support programs. Therefore, we cannot distinguish the two channels only from the sub-sample analysis based on firm size.

Second, to examine the information friction hypothesis, we perform similar estimations based on the regression discontinuity design splitting the sample in terms the intensity of firms' relationship with their bank. In the case of the PPP in the United States, several studies show that a close relationship with lender banks positively affected the use of the PPP by target firms (Balyuk et al. 2021, Granja et al. 2022).[13] If the banks that firms transact with provide information on the programs, take-up is likely to be higher among firms that have a close relationship with their bank, while transaction costs are less likely to change with the closeness of firm-bank relationships.[14]

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[13] Meanwhile, examining a government credit certification program in Portugal and using a firm survey, Bonfim et al. (2023) found that about two-thirds of the firms first heard about the program from their bank.

[14] Unfortunately, the RIETI survey did not ask firms about the sources of information on the business support programs they use. However, there is evidence that banks play an important role in delivering necessary information on government subsidies to SMEs. Specifically, SME Support Japan, a government-affiliated body falling under the SMEA, reports statistics on applications and applications accepted for Subsidies for Business Restructuring. Applications for Subsidies for Business Restructuring need to be accompanied by a business plan verified by a Certified Organization for the Support of SME. Management Innovation, which can be a financial institution, an accountant firm, a chamber of commerce, etc. In addition to verifying business plans, Certified Organizations provide support to SMEs in their management and also play a role in providing information on subsidies and other government programs for SMEs. As for the fifth public offering of the Subsidies for Business Restructuring, for example, there were 21,035 applications, of which 9,707 were accepted (Bureau of Subsidies for Business Restructuring, 2022). By type of Certified Organization, financial institutions account for the largest share of applications (40%) and applications accepted (42%), followed by tax accountants and certified public accountants (22% and 18% of

Third, we examine the information friction hypothesis further by implementing estimations for sub-periods depending on when firms became eligible. It is plausible to assume that the more time has passed since the start of the COVID-19 pandemic, the more firms will be aware of the existence of the support measures.[15] Therefore, we expect the imperfect use to decline over time. For example, suppose that firms obtained information on a particular support measure, say, employment adjustment subsidies, when they applied for another measure, such as business continuity grants. Then the use ratio of employment adjustment subsidies would exhibit a discontinuous jump at the eligibility threshold for business continuity grants as well as at the threshold for employment adjustment subsidies. However, since such information effects should diminish over time, the jump at the business continuity grant threshold should be smaller and the jump at the employment adjustment subsidies threshold should be larger in later months of the analysis. In contrast, if transaction costs matter, then the jump at the business continuity grant threshold would be unchanged regardless of the months a firm uses the support measures.

Specifically, for each month m from April to August 2020, we first define $Eligible_i^{j,m}$ as firm *i*'s eligibility for program *j* in month *m*, represented by the binary variable $1\left(MinSales_i^m \leq s^j\right)$, where $MinSales_i^m$ denotes the minimum of sales relative to the previous year over the period from February to month *m*, 2020. Then, we examine to what extent the use ratio jumps at the eligibility criteria of the program and business continuity grants during the two months *m* and *m*+1 by estimating the following two equations for each *m* and *j*:

$$Y_i^{j,m} = \alpha + \beta^{j,m} Eligible_i^{j,m} + \varepsilon_i^{j,m}, \tag{5}$$

and

applications and applications accepted), and chambers of commerce (13% and 13%). The large share of financial institutions indicates that banks play a significant role in providing information on business support programs in Japan.

[15] Bonfim et al. (2023) found that in the case of the Portuguese government credit certification program the take-up rates increased over time.

$$Y_i^{j,m} = \alpha + \beta^{j,m} Eligible_i^{BCG,m} + \varepsilon_i^{j,m}, \quad (6)$$

where $Y_i^{j,m}$ is a dummy that takes the value of unity if firm *i* reports using program *j* in month *m* or *m*+1 and zero otherwise. According to the information friction hypothesis, $\beta^{j,m}$ in Equation (5) should become larger over time while $\beta^{j,m}$ in Equation (6) should become smaller over time.

3.4 Data

The data used in this study are mostly taken from the "Survey on the Status of Firms under the COVID-19 Pandemic," a firm survey conducted by the Research Institute of Economy, Trade and Industry (RIETI) in November 2020, and which we refer to as the "RIETI survey" hereafter. The authors of this paper were actively involved in the design of the survey. We also use firms' financial data taken from the database of Tokyo Shoko Research (TSR), a major credit research firm in Japan. The RIETI survey was sent to 20,000 firms. The selection procedure for these firms was as follows. First, RIETI selected firms that responded to one of the past RIETI surveys conducted in February 2008, February 2009, and October 2014, and that were operating as of November 2020.[16] The number of these firms is 8,310. In addition, it chose 11,690 firms from the TSR database such that the industry composition of the sample firms was close to that of the 2016 Economic Census for Business Activity conducted by the Ministry of Internal Affairs and Communications and the Ministry of Economy, Trade and Industry, and the firm size distribution in terms of the number of employees was close to that of past RIETI surveys. The survey targeted corporations and did not include proprietorships. We think that the distribution of the sample of the RIETI survey is fairly

[16] The past RIETI surveys conducted in February 2008, February 2009, and October 2014 were the "Survey on Inter-firm and Firm-Bank Transaction," the "Survey on Inter-firm and Firm-Bank Transactions during the Financial Crisis," and the "Survey on the Aftermath of the SME Financing Facilitation Act," respectively.

close to that of Japanese corporations contained in the Economic Census, although there is a slight tilt toward larger firms compared to the Census.

The number of firms that responded to the RIETI survey is 4,718 for a response rate of 23.6%. The response rate is somewhat lower for firms in the real estate industry, accommodations, eating and drinking services, and for larger firms with more than 100 employees. Among firms that responded, we exclude 25 firms for which we were unable to obtain information on their basic characteristics (e.g., their industry classification code). As a result, we have a maximum of 4,693 firms for the empirical analysis, although the number of observations differs depending on additional sample selection criteria and the number of missing observations for dependent variables we use in our estimations, which we explain below.

The RIETI survey asked about a variety of issues with respect to firms' business conditions (such as the rate of change in sales) during the COVID-19 pandemic and how firms responded to the pandemic in terms of employment, investment, financing, and so on. Most importantly for the analysis in this study, the survey asked whether firms used the various business support programs during the COVID-19 pandemic. In addition, we use financial data from the TSR database to add some control variables in the estimations.

4. Results

This section presents our estimation results and examines whether the take-up of support programs is discontinuous not only at the eligibility threshold for a particular program itself but also at the thresholds for other programs.

4.1 Illustration of the use of the four business support programs

Before presenting our estimation results, we look at some basic statistics to illustrate the interrelationships of the use of the four programs. Table 1 shows the number of firms using each program in column (1) and

the number of firms using only that program in column (2). Columns (3) through (6) show the number of firms using other programs simultaneously. These summary statistics show that a minority (6% to 23%) of the firms using each program use only that program, indicating that it is common for firms to use multiple programs.

(Table 1 here)

Next, Table 2 describes the relationship between the use of business continuity grants and the use of each of the other three support programs. The sample in the table is limited to firms that experienced a maximum monthly sales decline of 50% or more, meaning that these firms were eligible for all four programs. Panel (a) shows the take-up and non-take-up ratios of special GFI loans among firms that did and did not use business continuity grants. The use ratio of special GFI loans was only 15% among firms that did not use business continuity grants, while it was 42% among those that did. Panels (b) and (c) show the corresponding results for special credit guarantee loans and employment adjustment subsidies. The patterns are very similar to those in Panel (a). To summarize, firms that used business continuity grants were more likely to simultaneously use the other programs than firms that did not.

(Table 2 here)

Lastly, Figure 1 shows the take-up ratios of the programs for different monthly sales levels relative to sales in the previous year at 10% intervals. This is a graphical illustration of the relationship between the use of the support programs and the extent of the sales decline, which will be more closely examined in the following subsections. The dots close to a red vertical line show the change in the take-up ratio of each

program when firms pass the eligibility threshold for the program. Similarly, the dots close to a blue vertical line show the change in the use ratio of a support program (other than business continuity grants) when a firm passes the eligibility threshold for business continuity grants.

(Figure 1 here)

Figure 1(a) shows that the take-up ratio of business continuity grants increased discontinuously around the program's eligibility threshold. The take-up ratios of special GFI loans, special credit guarantee loans, and employment adjustment subsidies shown respectively in Panels (b), (c), and (d) also increased discontinuously around the red vertical line. However, the increase is not as large as that observed in Panel (a). On the other hand, there appears to have been a discontinuous increase in the take-up ratio of these three programs around the blue vertical line.

Note here that in all the panels there are non-negligibly positive take-up ratios on the right of the red vertical lines, where firms are supposed to be ineligible for a program. In the RIETI survey, some firms reported a drop in monthly sales that was insufficient to make them eligible for a support program but said that they actually used the program. We regard the gap between firms being identified as eligibility and the actual use of the program as caused by reporting errors by firms, which may be intentional or unintentional. We will discuss the potential impact of these measurement errors on the estimation results in Section 4.4.

Overall, the above results indicate that firms tended to use multiple programs simultaneously and that, in particular, firms that used business continuity grants were more likely to use the other three programs than firms that did not use continuity grants. Regarding the take-up ratios of individual support programs, the use ratios of the three programs other than business continuity grants increase discontinuously when firms pass the eligibility thresholds for continuity grants as well as the program itself. In the

subsequent subsections, we will examine in detail the changes in the take-up of the programs around the eligibility thresholds.

4.2 Take-up of support programs at their eligibility thresholds

This subsection presents our estimation results of the regression discontinuity model around the eligibility threshold(s) for each of the four programs.[17] We employ Equation (1) as our estimation model. Table 3 presents the results.

(Table 3 here)

Panel (a) shows the results for business continuity grants. The eligibility threshold for the use of grants is $s^{BCG} = 50\%$. Panel (b) shows the results for special GFI loans. The eligibility threshold for the use of these loans depends on firms' size: for small firms, the threshold is $s^{GFI} = 85\%$, while for medium-sized firms it is $s^{GFI} = 80\%$. Next, Panel (c) presents the results for special credit guarantee loans. The eligibility threshold is a single value, $s^{SCG} = 85\%$. Finally, Panel (d) shows the results for employment adjustment subsidies. Since the extent of those subsidies differs depending on the degree of sales decline, we employ two threshold values, $s^{EMP} = 95\%$ and $s^{EMP} = 70\%$.

The results in Panel (a) differ substantially from those in Panels (b) to (d). Panel (a) shows significantly positive coefficient estimates for the threshold for all bandwidths. In contrast, the coefficient estimates in Panels (b) to (d) are positive and significant only for relatively wide bandwidths such as $\pm 10\%$

[17] Appendix Table 1 shows summary statistics for the variables employed in the estimations. Note that the samples employed in this section are subsets of the sample used for these summary statistics.

or $\pm 15\%$, while they are mostly insignificant for narrow bandwidths such as $\pm 2\%$ or $\pm 5\%$.When we set the bandwidth to $\pm 15\%$, the size of the coefficient estimates is similar across the three programs: 0.096 and 0.138 in Panel (b), 0.122 in Panel (c), and 0.142 and 0.100 in Panel (d). However, these values are substantially smaller than those in the business continuity grants estimation.

In sum, the discontinuous increase in the take-up ratio at the eligibility thresholds for the three support programs other than business continuity grants is significant only when we adopt wide bandwidths. Further, even when the increase is significant, it is relatively limited in size and smaller than that for business continuity grants. Therefore, we conclude that take-up of the three support programs – the special GFI loans, the special credit guarantee loans, and the employment adjustment subsidies – at their own eligibility thresholds is imperfect even though the rejection rates of applications for these programs were very low.[18]

One possible explanation for our results is that the administrative and other transaction costs of applying for and using the three programs other than business continuity grants outweighed the potential benefits. While business continuity grants took the form of a simple payment, to obtain employment adjustment subsidies, for example, firms needed to bear some of the costs of maintaining jobs. Moreover, firms eligible for business continuity grants were more likely to suffer from liquidity shortages.

4.3 Take-up of support programs at the eligibility threshold for business continuity grants

Next, we focus on the take-up ratios of all four support programs around the eligibility threshold for business continuity grants. For this purpose, we estimate Equations (2) through (4) and show the results in Table 4. Panel (a) shows the results for business continuity grants.[19] In all specifications, including the specification employing the entire sample and including polynomials to absorb nonlinearity off around the

[18] See footnote 16.

[19] Note that the result in Column (1) of Table 4(a) is a replication of that in Column (1) of Table 3(a).

threshold value, the coefficient estimates for the eligibility threshold are positive and statistically significant. This indicates a significant discontinuous increase in the take-up ratio at the threshold value. The magnitude of the coefficient varies depending on the specification and ranges from 0.317 to 0.588.

(Table 4 here)

Next, we examine whether the take-up ratios of the other three programs increase at the eligibility threshold of business continuity grants and to what extent they increase. Panels (b) through (d) show the results. In all panels, the coefficient estimates are significant and positive in Columns (1) and (2). These results are for the smallest bandwidth, that is, $\pm 2\%$ around s^{BCG}, and provide evidence for the discontinuous and sharp increase in the take-up ratio of these other programs at the threshold for business continuity grants.

The magnitude of the coefficients (ranging between 0.15 and 0.34) in these columns is smaller than those obtained for business continuity grants in Panel (a) (0.35-0.37). Among the three programs, the increase in the take-up ratio is largest for employment adjustment subsidies (0.29-0.34), followed by special GFI loans (0.26-0.27) and special credit guaranteed loans (0.15). Further, the coefficient estimates in Tables 4(b) through (d) are larger than those in the corresponding panels in Table 3. This means that for these loan and employment subsidy programs, the increase in the use ratio when firms reach the threshold for the business continuity grant program is substantially larger than the increase in the take-up ratio at the programs' own eligibility thresholds. Only a limited number of firms started using the programs at the thresholds set by the government. Instead, the use increased discontinuously as firms reached the criterion set for another program.

It should be noted that we do not find significant coefficient estimates in Column (7) in Panels (b) through (d), in which we employ the entire sample and include polynomials to absorb nonlinear behavior

in the take-up ratios off around the threshold of s^{BCG}. We interpret that this is due to the failure of the polynomials to appropriately capture the patterns in the use ratios of the three programs. Even though the size of the discontinuous increases in the use ratios of the programs around their own eligibility thresholds is not large, it is statistically significant. These discontinuous increases may not be correctly absorbed by the polynomials in the model given by Equation (4) and may have caused some bias in the coefficient estimates.

To summarize, the discontinuous increase in the take-up ratios for the three support programs at the eligibility threshold for business continuity grants is positive, significant, and substantial in size. It can be said that the imperfect take-up of the three support programs observed in the previous subsection is mitigated by the existence of the business continuity grants program.

4.4 Discussion on measurement errors

A potential concern is that the results in Sections 4.2 and 4.3 may be biased due to possible measurement errors in the survey. In fact, there are two potential types of measurement error with regard to reported sales: unintentional misreporting by respondent firms that is uncorrelated with the eligibility criteria, and strategic misreporting by firms that intentionally reported in the survey that they were eligible. Starting with the former, respondent firms may have accidentally misreported sales. As Figure 1 shows, some firms whose sales were above the threshold and hence not eligible for the program, responded that they used it. This indicates that such mismeasurement of sales is not negligible.[20] This type of mismeasurement of sales would attenuate the coefficients for the eligibility variables in Equations (1) to (4) as long as the measurement errors are not correlated with eligibility. Therefore, measurement errors may at least partly account for the insignificant or small coefficients for the own threshold in Equation (1). In

[20] Another possible reason is that firms misreported the policy measures they used.

contrast, the positive coefficients on $Eligible_i^{BCG}$ for the other programs in Equations (2) to (4) strongly indicate that take-up was indeed imperfect despite the possible attenuating effect.

Turning to the mismeasurement of sales due to strategic misreporting, firms may have underreported their sales to the authorities to become eligible for a program, and such firms may also underreport their sales in the survey out of fear of government inspection.[21] In this case, we would obtain large coefficients for programs' own threshold in Equation (1). Moreover, since, except in the case of business continuity grants, firms have no incentives to misreport their sales as having fallen to 50% or less of the previous year's level to be eligible for the programs, we would obtain small coefficients on the eligibility for business continuity grants for the other programs in Equations (2) to (4). Therefore, our results with small coefficients on program's own threshold in Equation (1) and large coefficients on the business continuity threshold in Equations (2) to (4) are unlikely to be driven by such strategic misreporting.

4.5 Placebo tests

In the previous subsection we found statistically significant increases in the take-up ratios at the eligibility threshold $s^{BCG} = 50\%$ not only for business continuity grants but also for the other three programs. In order to confirm that the threshold has an effect on the take-up ratios of these programs, we implement placebo tests by introducing placebo eligibility thresholds of slightly below or above 50% for all four support programs. We employ Equation (2) for the estimation and present the results in Table 5. For $s^{Placebo}$, we use 40%, 47%, 48%, 53%, 54%, and 60%, with a bandwidth of either±2% or ±3%. We set the threshold values and the bandwidths so as not to include $s^{BCG} = 50\%$ in the band that we employ for the estimations.

[21] To what extent firms actually underreported sales to become eligible is unclear, since such underreporting would be fraud and hence punishable when discovered.

(Table 5 here)

Table 5 shows that the coefficients on $Eligible^{Placebo}$ are almost all insignificant, with the exception of a negative coefficient on the placebo threshold slightly below s^{BCG} for business continuity grants and the marginally positive coefficient on the placebo threshold slightly above s^{BCG} for special credit guarantee loans. Overall, the results of the placebo tests support our finding that firms' sales falling below the threshold of business continuity grants has an impact on their use of all the programs.

5. Examination of the reason for imperfect take-up

In the previous section, we provided evidence for imperfect take-up of the various business support measures. For special GFI loans, special credit guarantee loans, and employment adjustment subsidies, there was a rather small discontinuous increase in take-up ratios at their own eligibility thresholds. In contrast, the take-up ratios for these support measures substantially increased at the eligibility threshold of the other support measure, the business continuity grants, mitigating the imperfect take-up of the three other support programs. In this section, we conduct additional analyses to examine the reasons for the imperfect take-up.

5.1 Dividing the sample in terms of firm characteristics and firms' relationship with their banks

We start by focusing on the transaction cost hypothesis described in Section 3.1. The transaction cost hypothesis predicts that take-up is likely to be higher among firms with more financial and operational resources and those endowed with managerial ability since they can shoulder the costs for applying for a business support program. As a proxy for operational resources, we use firm size and divide the sample

into small and large firms based on whether firms' sales before the pandemic were smaller or larger than the median value of sales in the sample. As a proxy for managerial ability, we use whether firms have a BCP or not. Then, for each subsample, we perform estimations based on the regression discontinuity design. Based on the transaction cost hypothesis we would expect take-up to be higher among large firms or firms with a BCP. Therefore, the increase in the take-up of a support measure at its own eligibility threshold should be greater among large firms or firms with a BCP than among small firms or firms without a BCP. On the other hand, the increase in the take-up of one of the three other measures at the eligibility threshold for business continue grants should be smaller for large firms and firms with a BCP.

Table 6 shows the results when we divide the sample and run the regressions for the subsamples. Panel (a) presents the results when the use of special GFI loans is used as the dependent variable, Panel (b) those for special credit guarantee loans, and Panel (c) those for employment adjustment subsidies. Columns (1) and (2) in each panel show the coefficients on the eligibility for business continuity grants while Columns (3) and (4) present the coefficients on the eligibility for each program. Columns (2) and (4) show the coefficients for large firms and firms with a BCP, while Columns (1) and (3) show those for small firms and firms without a BCP. The transaction cost hypothesis implies that the coefficients in Column (1) should be larger than those in Column (2), while the coefficients in Column (3) should be smaller than those in Column (4). In the table, we show inequalities consistent with this expectation in black, and those opposite to the expectation in red.[22]

(Table 6 here)

[22] We show inequalities in Table 6 when one coefficient is statistically significant and the other is insignificant or both coefficients are significant but have opposite signs.

The results indicate that most of the inequalities between coefficients are consistent with the transaction cost hypothesis, with one exception.[23] Where comparable, the coefficients in Column (1) are larger than those in Column (2), while the coefficients in Column (3) are smaller than those in Column (4). Note, however, that the results are also consistent with the information friction hypothesis in that large firms or firms with a BCP are more likely to have the capacity or ability to obtain information on these support measures.

Next, in order to address this issue, we examine the information friction hypothesis independently by splitting the sample in terms of the density of firms' relationship with their primary bank. To measure the density of the relationship, we count the number of activities a firm answered in the survey it does to strengthen the relationship with its primary bank, such as submitting its annual balance sheet and monthly cash flow tables, consulting about managerial issues, maintaining regular contact with bank branch managers, and participating in workshops organized by the bank. If the information friction hypothesis holds and banks are major information providers, take-up is likely to be higher among firms with a strong relationship with their bank. We therefore expect the increase in the utilization rate at the eligibility threshold for support measures for firms with a strong bank relationship to be larger than that for firms with a weak bank relationship and the increase in the utilization rate at the eligibility threshold for business continuity grants to be smaller than that for firms with a weak relationship.

(Table 7 here)

[23] The exception is that the increase in the take-up of special GFI loans at the business continuity grant eligibility threshold is larger for large firms than for small firms.

Table 7, which has the same format as Table 6, shows the results. Columns (2) and (4) show the coefficients for firms with a strong relationship with their bank, while Columns (1) and (3) show the coefficients for firms with a weak relationship. Looking at the results, however, we find that the inequalities are often the opposite of what we would expect based on our hypothesis. Therefore, the results do not provide any support for the information friction hypothesis.

5.2 Dividing the sample by the month of eligibility

In this subsection, we test the information friction hypothesis by conducting sub-period estimations depending on when firms became eligible. Table 8 presents the estimation results for Equations (5) and (6). Panels (a), (b), and (c) show the results for the use of special GFI loans, special credit guarantee loans, and employment adjustment subsidies, respectively. Columns (1) to (5), in which we use eligibility for business continuity grants as the explanatory variable, show the coefficient estimates for eligibility for the grants. In each of the columns, we use firms that became eligible and firms that became close to being eligible during the period shown in the column heading as the sample and examine whether eligible firms used the program at most one month after they became eligible. Column (1), for example, shows the coefficient estimates when we use firms that became eligible and firms that became close to being eligible from February to April and examine whether eligible firms used the program from April to May. Columns (6) to (10), in which we use eligibility for the program itself (and not business continuity grants) as the explanatory variable, show the coefficient estimates for eligibility for the program itself. The structure of Columns (6) to (10) is similar to Columns (1) and (5). According to the information friction hypothesis, we would expect the coefficients to gradually become smaller from Column (1) to Column (5) and larger from Column (6) to Column (10).

(Table 8 here)

However, the results in Table 8 mostly are inconsistent with the information friction hypothesis. Columns (1) to (5) of Panel (a) show that over the period from April to September the coefficients are largest in June-July, which conflicts with the prediction that the coefficients become smaller over time. Further, the coefficients in Columns (6) to (10) are all insignificant, which neither supports nor rejects the hypothesis. Panels (b) and (c) show similar results.

To summarize, the results of the subsample analysis in this section provide several pieces of evidence supporting the transaction cost hypothesis. In contrast, we find no supportive evidence for the information friction hypothesis positing that imperfect take-up is due to a lack of information about the existence of support measures.

6. Conclusion

Firms and individuals targeted by government policy measures often do not apply to take advantage of such measures even when they are eligible – i.e., the take-up of such measures is imperfect. The various business support programs implemented in Japan during the COVID-19 pandemic provide a good research setting for investigating the extent and reasons for such imperfect take-up among firms, since the eligibility criteria for the programs are straightforward and similar across programs in that they focus on the year-on-year decrease in monthly sales. Using data on the use of these measures by small and medium-sized enterprises in Japan, we examine whether such imperfect take-up is observed and, if so, why.

Employing a regression discontinuity design, we find the following. First, the increase in take-up at programs' own eligibility threshold is insignificant or only small for all programs we examine except business continuity grants. Second, for the three programs other than business continuity grants, there are significant and large jumps at the threshold for business continuity grants. Third, both the small jumps at

programs' own threshold and the large jumps at the business continuity grant threshold are particularly pronounced for small firms and firms without a business continuity plan. Fourth, both the small jumps at programs' own threshold and the large jumps at the business continuity grant threshold do not diminish over time from the introduction of the programs. Overall, our results indicate that take-up of these programs was imperfect and that this is due to the transaction costs involved in applying for and using the programs such as administrative costs and tax inspection, and not by information frictions or a lack of knowledge about the existence of programs.

Our empirical results suggest that transaction costs likely play a major role in the imperfect take-up of government programs. This result has several practical policy implications. For example, urgent programs such as the pandemic response measures should be designed to minimize the transaction costs involved so that target entities receive the support they need. One specific way to achieve this goal is to make the application procedure as simple as possible. To this end, the government should identify potential recipients and proactively approach them, especially during an emergency situations such as a pandemic. Such efforts should help to reduce the imperfect take-up of government support measures.

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Table 1: Number of firms using the business support programs

	Number of firms using the program	Number of firms using this program only	Special loans by GFIs	Special credit guarantee loans	Business continuity grants	Employment adjustment subsidies
Special loans by GFIs	1076	68	---	563	588	553
Special credit guarantee loans	1813	416	563	---	772	677
Business continuity grants	1638	241	588	772	---	748
Employment adjustment subsidies	1383	223	553	677	748	---

Table 2: Take-up of multiple business support programs

Panel (a)

		Special GFI loans		
		Non-users	Users	Total
Business continuity grants	Non-users	85%	15%	100%
	Users	58%	42%	100%
	Total	68%	32%	100%

Panel (b)

		Special credit guarantee loans		
		Non-users	Users	Total
Business continuity grants	Non-users	70%	30%	100%
	Users	36%	64%	100%
	Total	48%	52%	100%

Panel (c)

		Employment adjustment subsidies		
		Non-users	Users	Total
Business continuity grants	Non-users	71%	29%	100%
	Users	49%	51%	100%
	Total	56%	44%	100%

Note: The sample is limited to firms whose MinSales ranges between 48 and 50.

Table 3: Estimations of the take-up of business support programs at their eligibility thresholds

Panel (a) Business Continuity Grants

Bandwidth	±2%pt	±5%pt	±10%pt	±15%pt
Sample	All	All	All	All
	(1)	(2)	(3)	(4)
$Eligible^{BCG}\_50$	0.349***	0.350***	0.470***	0.539***
	(0.061)	(0.042)	(0.030)	(0.026)
Constant	0.556***	0.481***	0.337***	0.283***
	(0.028)	(0.025)	(0.019)	(0.016)
Observations	352	524	936	1,134
R-squared	0.085	0.116	0.213	0.279

Panel (b) Special GFI loans

Bandwidth	±2%pt		±5%pt		±10%pt		±15%pt	
Sample	All	Medium-sized	All	Medium-sized	All	Medium-sized	All	Medium-sized
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	s^{GFI}=85	s^{GFI}=80	s^{GFI}=85	s^{GFI}=80	s^{GFI}=85	s^{GFI}=80	s^{GFI}=85	s^{GFI}=80
$Eligible^{GFI}\_85$	-0.094*		0.029		0.067***		0.096***	
	(0.053)		(0.028)		(0.023)		(0.018)	
$Eligible^{GFI}\_80$		0.003		0.070*		0.095***		0.138***
		(0.072)		(0.039)		(0.028)		(0.025)
Constant	0.119***	0.122***	0.103***	0.109***	0.085***	0.100***	0.070***	0.092***
	(0.027)	(0.026)	(0.020)	(0.021)	(0.016)	(0.018)	(0.013)	(0.016)
Observations	159	188	545	362	829	643	1,261	825
R-squared	0.020	0.000	0.002	0.009	0.010	0.018	0.021	0.036

Panel (c) Special credit guarantee loans

Bandwidth	±2%pt	±5%pt	±10%pt	±15%pt
Sample	All	All	All	All
	(1)	(2)	(3)	(4)
	s^{SCG}=85	s^{SCG}=85	s^{SCG}=85	s^{SCG}=85
$Eligible^{SCG}$_85	-0.079	0.036	0.088***	0.122***
	(0.085)	(0.040)	(0.033)	(0.026)
Constant	0.347***	0.305***	0.281***	0.262***
	(0.043)	(0.029)	(0.024)	(0.019)
Observations	159	546	822	1,259
R-squared	0.005	0.001	0.009	0.017

Panel (d) Employment adjustment subsidies

Bandwidth	±2%pt		±5%pt		±10%pt		±15%pt	
Sample	All	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	s^{EMP}=95	s^{EMP}=70	s^{EMP}=95	s^{EMP}=70	s^{EMP}=95	s^{EMP}=70	s^{EMP}=95	s^{EMP}=70
$Eligible^{EMP}$_95	-0.013		0.066**		0.114***		0.142***	
	(0.070)		(0.029)		(0.027)		(0.026)	
$Eligible^{EMP}$_70		0.074		0.054		0.070**		0.100***
		(0.070)		(0.042)		(0.029)		(0.025)
Constant	0.134***	0.343***	0.073***	0.371***	0.072***	0.362***	0.071***	0.364***
	(0.038)	(0.059)	(0.018)	(0.032)	(0.020)	(0.021)	(0.021)	(0.017)
Observations	115	226	441	548	618	1,112	921	1,575
R-squared	0.000	0.005	0.012	0.003	0.028	0.005	0.033	0.010

Table 4: Estimations of take-up of programs at the eligibility threshold for business continuity grants

Panel (a) Business continuity grants

Bandwidth	±2%pt			±3%pt			Entire
Sample	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Eligible^{BCG}$	0.349***	0.368***	0.369***	0.344***	0.358***	0.317***	0.588***
	(0.061)	(0.058)	(0.087)	(0.053)	(0.051)	(0.074)	(0.026)
lnSales		-0.090***	-0.101***		-0.093***	-0.102***	
		(0.014)	(0.021)		(0.013)	(0.020)	
CurrentRatio			0.001			-0.002	
			(0.017)			(0.017)	
MinSales-50							-0.002**
							(0.001)
(Minsales-50)^2							0.000
							(0.000)
$Eligible^{BCG}$*(MinSales-50)							-0.005**
							(0.002)
$Eligible^{BCG}$*(Minsales-50)^2							-0.000***
							(0.000)
Constant	0.556***	1.512***	1.616***	0.538***	1.526***	1.618***	0.118***
	(0.028)	(0.146)	(0.243)	(0.027)	(0.138)	(0.229)	(0.020)
Observations	352	340	170	393	381	196	3,214
R-squared	0.085	0.191	0.208	0.096	0.206	0.204	0.497

Panel (b) Special GFI loans

Bandwidth	±2%pt			±3%pt			Entire
Sample	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Eligible^{BCG}$	0.263***	0.272***	0.185*	0.177***	0.182***	0.103	0.045
	(0.066)	(0.067)	(0.099)	(0.057)	(0.058)	(0.081)	(0.062)
lnSales		-0.001	-0.034		0.002	-0.018	
		(0.016)	(0.025)		(0.015)	(0.023)	
CurrentRatio			-0.028			-0.024	
			(0.018)			(0.018)	
MinSales-50							-0.000
							(0.007)
(Minsales-50)^2							-0.000
							(0.000)
$Eligible^{BCG}$*(MinSales-50)							-0.004
							(0.008)
$Eligible^{BCG}$*(Minsales-50)^2							0.000
							(0.000)
Constant	0.262***	0.274	0.710**	0.265***	0.244	0.516*	0.273***
	(0.029)	(0.170)	(0.290)	(0.029)	(0.163)	(0.267)	(0.057)
Observations	303	294	149	343	334	175	2,254
R-squared	0.050	0.054	0.046	0.028	0.029	0.023	0.025

Panel (c) Special credit guarantee loans

Bandwidth	±2%pt			±3%pt			Entire
Sample	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Eligible^{BCG}$	0.154**	0.154**	0.037	0.083	0.082	-0.063	0.009
	(0.071)	(0.072)	(0.105)	(0.062)	(0.062)	(0.088)	(0.064)
lnSales		-0.026	-0.052**		-0.025	-0.044*	
		(0.016)	(0.025)		(0.016)	(0.023)	
CurrentRatio			-0.028			-0.025	
			(0.019)			(0.019)	
MinSales-50							-0.002
							(0.007)
(Minsales-50)^2							-0.000
							(0.000)
$Eligible^{BCG}$*(MinSales-50)							-0.004
							(0.007)
$Eligible^{BCG}$*(Minsales-50)^2							-0.000
							(0.000)
Constant	0.502***	0.779***	1.155***	0.496***	0.768***	1.049***	0.502***
	(0.031)	(0.178)	(0.289)	(0.031)	(0.170)	(0.271)	(0.059)
Observations	310	304	155	350	344	180	2,438
R-squared	0.015	0.022	0.036	0.005	0.012	0.028	0.023

Panel (d) Employment adjustment subsidies

Bandwidth	±2%pt			±3%pt			Entire
Sample	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Eligible^{BCG}$	0.341***	0.293***	0.320***	0.342***	0.309***	0.274***	0.046
	(0.078)	(0.078)	(0.117)	(0.067)	(0.067)	(0.098)	(0.095)
lnSales		0.063***	0.057**		0.062***	0.060**	
		(0.017)	(0.028)		(0.017)	(0.026)	
CurrentRatio			-0.018			-0.019	
			(0.020)			(0.019)	
MinSales-50							-0.005
							(0.015)
(Minsales-50)^2							0.000
							(0.001)
$Eligible^{BCG}$*(MinSales-50)							0.000
							(0.015)
$Eligible^{BCG}$*(Minsales-50)^2							-0.000
							(0.001)
Constant	0.382***	-0.279	-0.228	0.385***	-0.273	-0.274	0.434***
	(0.034)	(0.188)	(0.321)	(0.033)	(0.180)	(0.305)	(0.091)
Observations	251	241	117	279	269	134	1,263
R-squared	0.072	0.113	0.109	0.085	0.125	0.105	0.010

Table 5: Placebo tests

	Business continuity grants			Special GFI loans			Special credit guarantee loans			Employment adjustment subsidies		
Bandwidth=	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt
$s^{placebo}$=	47	46	40	47	46	40	47	46	40	47	46	40
$Eligible^{placebo}$	-0.113**	-0.081	0.104	-0.053	-0.030	-0.050	0.012	-0.014	-0.026	-0.061	0.063	0.215
	(0.055)	(0.052)	(0.101)	(0.079)	(0.072)	(0.128)	(0.079)	(0.072)	(0.126)	(0.085)	(0.078)	(0.130)
Observations	183	220	176	158	191	151	159	193	155	120	145	125
R-squared	0.022	0.011	0.006	0.003	0.001	0.001	0.000	0.000	0.000	0.004	0.005	0.022

	Business continuity grants			Special GFI loans			Special credit guarantee loans			Employment adjustment subsidies		
Bandwidth=	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt	±2%pt	±3%pt	±2%pt
$s^{placebo}$=	53	54	60	53	54	60	53	54	60	53	54	60
$Eligible^{placebo}$	-0.048	0.005	0.054	0.033	-0.006	0.016	0.198*	0.144	0.144	0.103	0.071	-0.107
	(0.074)	(0.059)	(0.057)	(0.101)	(0.088)	(0.078)	(0.110)	(0.094)	(0.094)	(0.131)	(0.112)	(0.124)
Observations	93	127	217	90	124	212	92	125	205	61	83	92
R-squared	0.005	0.000	0.004	0.001	0.000	0.000	0.034	0.019	0.011	0.010	0.005	0.008

Table 6: Estimations of take-up of programs at the eligibility threshold for business continuity grants and programs' own threshold, by firm size and existence of a business continuity plan

Panel (a) Special GFI loans

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{GFI}_85		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Firm size	Small		Large	Small		Large
	0.158	<	0.387***	-0.016		0.051
	(0.097)		(0.091)	(0.050)		(0.034)
Business continuity plan	No		Yes	No		Yes
	0.246***		0.311**	-0.000	<	0.079*
	(0.079)		(0.120)	(0.035)		(0.044)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{GFI}_85 as the explanatory variable.

Panel (b) Special credit guarantee loans

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{SCG}_85		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Firm size	Small		Large	Small		Large
	0.211**	>	0.091	0.075		0.015
	(0.100)		(0.104)	(0.069)		(0.051)
Business continuity plan	No		Yes	No		Yes
	0.153*	>	0.156	0.056		-0.024
	(0.083)		(0.140)	(0.051)		(0.064)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{SCG}_85 as the explanatory variable.

Panel (c) Employment adjustment subsidies

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{EMP}_95		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Firm size	Small		Large	Small		Large
	0.328***		0.183*	0.063	<	0.074*
	(0.094)		(0.102)	(0.040)		(0.041)
Business continuity plan	No		Yes	No		Yes
	0.325***	>	0.199	0.050	<	0.091*
	(0.079)		(0.129)	(0.035)		(0.050)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{EMP}_95 as the explanatory variable.

Table 7: Estimations of take-up of programs at the eligibility threshold for business continuity grants and at programs' own threshold, by relationship with their primary bank

Panel (a) Special GFI loans

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{GFI}_85		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Number of types of firm-main bank relationships	Low		High	Low		High
	0.141	<	0.335***	0.029		0.026
	(0.097)		(0.090)	(0.032)		(0.043)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{GFI}_85 as the explanatory variable.

Panel (b) Special credit guarantee loans

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{SCG}_85		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Number of types of firm-main bank relationships	Low		High	Low		High
	0.217**	>	0.050	0.130**	>	-0.049
	(0.108)		(0.089)	(0.052)		(0.058)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{SCG}_85 as the explanatory variable.

Panel (c) Employment adjustment subsidies

	Coefficients on Eligible^{BCG}			Coefficients on Eligible^{EMP}_95		
Variables used for splitting the sample	(1)		(2)	(3)		(4)
Number of types of firm-main bank relationships	Small		Large	Small		Large
	0.325***		0.251***	0.075**	>	0.057
	(0.103)		(0.091)	(0.036)		(0.045)

Note: The bandwidth is ±2%pt when we employ Eligible^{BCG} and ±5%pt when we employ Eligible^{EMP}_95 as the explanatory variable.

Table 8: Estimations of take-up of programs at the eligibility threshold for business continuity grants and at programs' own threshold, by month when they became eligible

Panel (a) Special GFI loans

	Coefficients on Eligible^{BCG}						Coefficients on Eligible^{GFI}_85				
	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)
Month when firms became eligible	February–April	February–May	February–June	February–July	February–August	Month when firms became eligible	February–April	February–May	February–June	February–July	February–August
Eligible^{BCG}	0.060	0.119**	0.150***	0.117***	0.011	Eligible^{GFI}_85	0.066	-0.025	-0.070	-0.046	-0.024
	(0.062)	(0.056)	(0.045)	(0.040)	(0.038)		(0.044)	(0.038)	(0.044)	(0.042)	(0.023)

Panel (b) Special credit guarantee loans

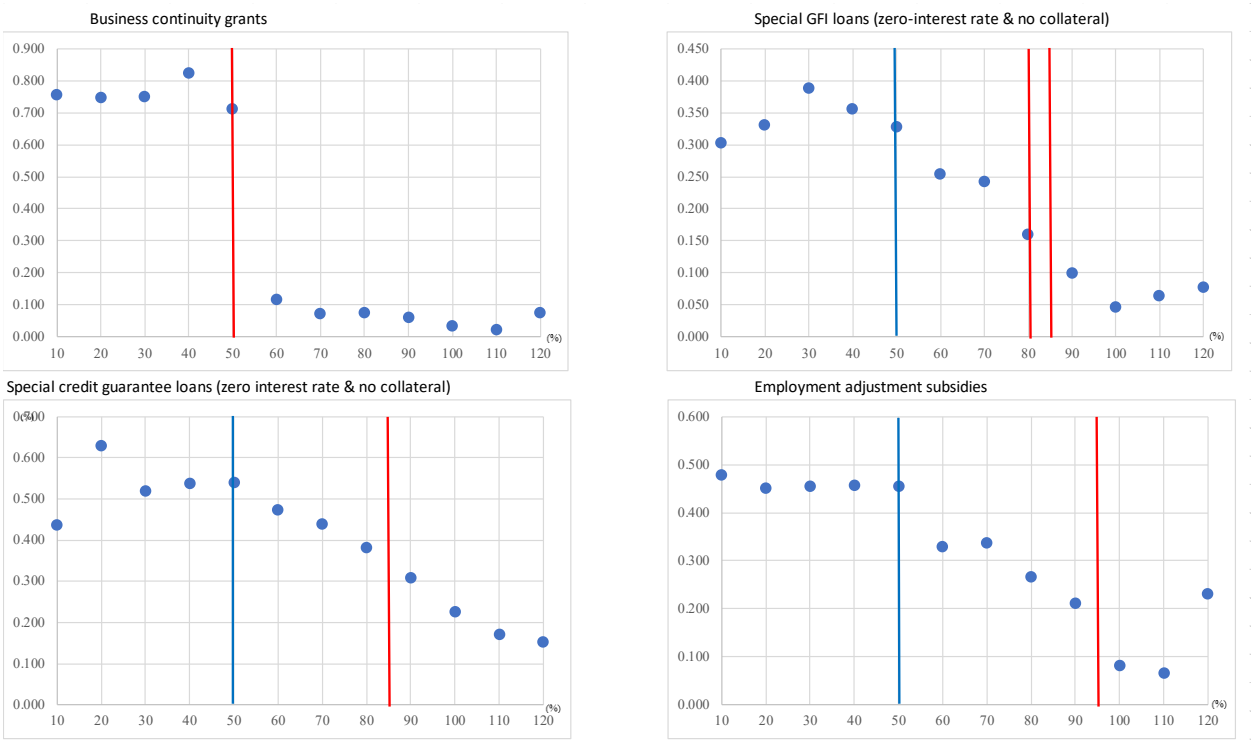
	Coefficients on Eligible^{BCG}						Coefficients on Eligible^{SCG}_85				
	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)
Month when firms became eligible	February–April	February–May	February–June	February–July	February–August	Month when firms became eligible	February–April	February–May	February–June	February–July	February–August
Eligible^{BCG}	-0.016	0.102*	0.044	0.025	0.010	Eligible^{SCG}_85	0.008	-0.007	-0.008	0.009	0.062
	(0.053)	(0.056)	(0.052)	(0.045)	(0.041)		(0.041)	(0.048)	(0.052)	(0.051)	(0.049)

Panel (c) Employment adjustment subsidies

	Coefficients on Eligible^{BCG}						Coefficients on Eligible^{EMP}_95				
	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)
Month when firms became eligible	February–April	February–May	February–June	February–July	February–August	Month when firms became eligible	February–April	February–May	February–June	February–July	February–August
Eligible^{BCG}	0.002	0.151***	0.190***	0.100**	0.106**	Eligible^{EMP}_95	0.052**	-0.025	0.017	0.081**	-0.033
	(0.032)	(0.053)	(0.055)	(0.046)	(0.051)		(0.023)	(0.024)	(0.032)	(0.033)	(0.055)

Note: For the estimations for Columns (1) and (6), for example, we use firms that became eligible and firms that became close to being eligible from February to April and examine whether eligible firms used the program from April to May.

Figure 1: Take-up ratios of the programs for different monthly sales levels relative to sales in the previous year at 10% intervals



Appendix Table 1: Summary statistics for variables used in the estimations

	N	sd	mean	min	p25	p50	p75	max
Special GFI loans	3757	0.452	0.286	0.000	0.000	0.000	1.000	1.000
Special credit guarantee loans	3837	0.499	0.473	0.000	0.000	0.000	1.000	1.000
Business continuity grants	3828	0.495	0.428	0.000	0.000	0.000	1.000	1.000
Employment adjustment subsidies	3700	0.484	0.374	0.000	0.000	0.000	1.000	1.000
$Eligible^{BCG}$	4718	0.422	0.232	0.000	0.000	0.000	0.000	1.000
lnSales	4557	1.824	11.000	1.946	9.903	11.002	12.179	15.551
CurrentRatio	2437	2.237	1.947	0.002	0.784	1.255	2.161	14.662

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