

Economic and Financial Effects of Credit Guarantee as Means of Policy-Based Finance*

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Abstract

Since the financial crisis that occurred around the year 2000, the presence of credit guarantee as a means of policy-based finance has grown. In the meantime, expectations have tended to fall on credit guarantee programs not only to exert the microeconomic effect of raising the efficiency of finance for small and medium-size enterprises (SMEs) but also to play a role in supporting the entire economy in times of recession. This paper analyzed the relationship between credit guarantee and short-term economic fluctuations on a time series basis through a Granger causality test using panel data. As a result, while we recognized the presence of a causal relationship from real economic factors, such as economic fluctuations to credit guarantee programs, little causality was observed in the opposite direction. Regarding the relationship between finance-related variables, such as gross loans, and credit guarantee, generally speaking, the direction of causality was also only from the former to the latter. In addition, we aggregated and processed particular data related to SMEs in our own way in order to examine the relationship between credit guarantee, particularly in terms of liability assumption, and borrower companies' business performance from the perspective of the impact on economic growth. As a result, we found that the percentage of poorly performing companies was lower among companies that assumed guaranteed liabilities than among ones that did not. As far as the results of our analysis on an aggregated basis, credit guarantee programs do not have an overly large presence. On the whole, we may give the assessment that credit guarantee programs are being operated only to the extent necessary for playing a supplementary role in supporting the real economy.

Keywords: credit guarantee, economic cycles, Granger causality, excess liabilities, zombie companies

JEL Classification: C23, E32, H81, L25

* This article is based on a study first published in the Financial Review No.147, pp. 38-58, Yasuo Goto, 2022, "Economic and Financial Effects of Credit Guarantee as Means of Policy-Based Finance" written in Japanese. This work was supported by JCER Research Grant, JSPS KAKENHI Grant Number JP20H01502, a grant-in-aid from Zengin Foundation for Studies on Economics and Finance, and project research with the Kyoto Institute of Economic Research, Kyoto University (KIER) Joint Usage and Research Center. We are grateful for helpful comments and suggestions by Scott Wilbur (US Treasury), Yoshinori Kawasaki (The Institute of Statistical Mathematics), participants in the review meeting of the Financial Review in the Policy Research Institute, Ministry of Finance. However, any possible errors or opinions are solely those of the authors and do not represent the views of the organizations to which the authors belong or are affiliated, Policy Research Institute, or Ministry of Finance.

I. Introduction

Japan's policy finance system has been managed with an eye on the economic and financial situation from time to time, and has undergone a series of institutional changes. In the past, direct financing by government-affiliated financial institutions themselves was the primary means of facilitating SME (small and medium-sized enterprise) financing, one of the core roles of policy finance, but following the Fiscal Investment and Loan Reform and other institutional reforms, today the credit guarantee system has become much more important.¹ The subject of this paper's analysis is credit guarantee programs implemented with the close involvement of fiscal investment and loan program (FILP) agencies.

While credit guarantee schemes have been introduced in many countries around the world, Japan's system is unique in that it is supported by government credit in the form of fiscal funds, a form of operation that is rare anywhere in the world. Moreover, while the microeconomic effects of reducing market failures and increasing the efficiency of resource allocation in the SME credit market are considered the original policy objectives of the credit guarantee system, there have also been high expectations that the system will play a role in mitigating macroeconomic volatility by supporting SME management. There has been much discussion about the policy effectiveness and efficiency of such a credit guarantee system in Japan, and various system reforms have been implemented in light of the economic and financial situation.

The main objective of this paper is to empirically test the statistical causality between credit guarantees and macro aggregate variables in the interest of the economy-wide impact of credit guarantees. Although there have been many empirical analyses of credit guarantees in Japan in the past, they have focused mainly on microeconomic perspectives, such as the impact on market efficiency, and have lacked a macroeconomic perspective at the aggregate level. This can be attributed to the fact that under the Japanese system, which has strong government involvement, there was a strong interest in efficiency, and the presence of government-affiliated financial institution lending has been significant in the area of policy finance. However, since the financial crisis of the late 1990s, credit guarantees in Japan have greatly increased their presence in terms of both quality and quantity through economic stimulus packages and other measures.

The main conclusions of this paper are as follows. From the perspective of short-term economic fluctuations, we examined Granger causality using prefectural panel data and found that while causality from the real economy, such as business cycles, toward credit guarantees existed, causality from credit guarantees toward business cycles and other variables was almost non-existent. At least from recent data, quantitative trends in credit guarantees appear to be generally within the range of complementary support for the real economy. Furthermore, in order to explore the relationship between credit guarantee programs and

¹ The definition of "SME" is ambiguous and varies depending on the context and occasion. In this paper, the term "SMEs" will be used to refer to all small and medium-sized businesses, including sole proprietorships, from the perspective of the coverage of the credit guarantee system (including figures and tables, below).

firm efficiency at the aggregate level from the viewpoint of long-term economic growth, we checked whether the ratio of over-indebted SMEs differs depending on whether they have a guarantee or not, based on large micro data. The results indicate that the proportion of inefficient heavily indebted firms is relatively lower for firms with guaranteed debt than for firms without such debt. The credit guarantee system does not appear to be a major factor in creating heavily indebted firms.

This paper is structured as follows. Chapter II provides an overview of the credit guarantee system in Japan, focusing on the contents that are relevant to this paper. Chapter III is a survey of empirical studies dealing with credit guarantee programs. In Chapter IV, we analyzed data on credit guarantees in Japan. Using panel data by prefecture, we examined the relationship between macro variables and credit guarantee-related variables through Granger causality tests, and processed and aggregated large micro data to conduct statistical analyses related to firm efficiency. Chapter V is the conclusion of the whole chapter.

II. Overview of Japan's Credit Guarantee System

First, an overview of the credit guarantee system in Japan, which is the subject of this paper's analysis, will be summarized in terms of its policy objectives and structure, its fiscal base, and recent institutional changes.

II-1. Policy Objective and Structure

The credit guarantee system is positioned as one of the important pillars of policy finance, along with direct loans, interest subsidies, and securitization.² The purpose of this mechanism is to facilitate the financing of SMEs by supplementing their credibility, which is limited by their lack of collateral and accumulated information, and by directing funds from private financial institutions to SMEs (Japan Federation of Credit Guarantee Corporations 2020). When a SME borrows funds from a financial institution, it pays a credit guarantee fee to a credit guarantee corporation (CGC, hereafter) to have it act as an official guarantor, and if the SME subsequently defaults on its repayment, the corporation subrogates the financial institution.³ Such a system makes it easier for financial institutions to provide loans to SMEs because the risk of collection is greatly reduced.

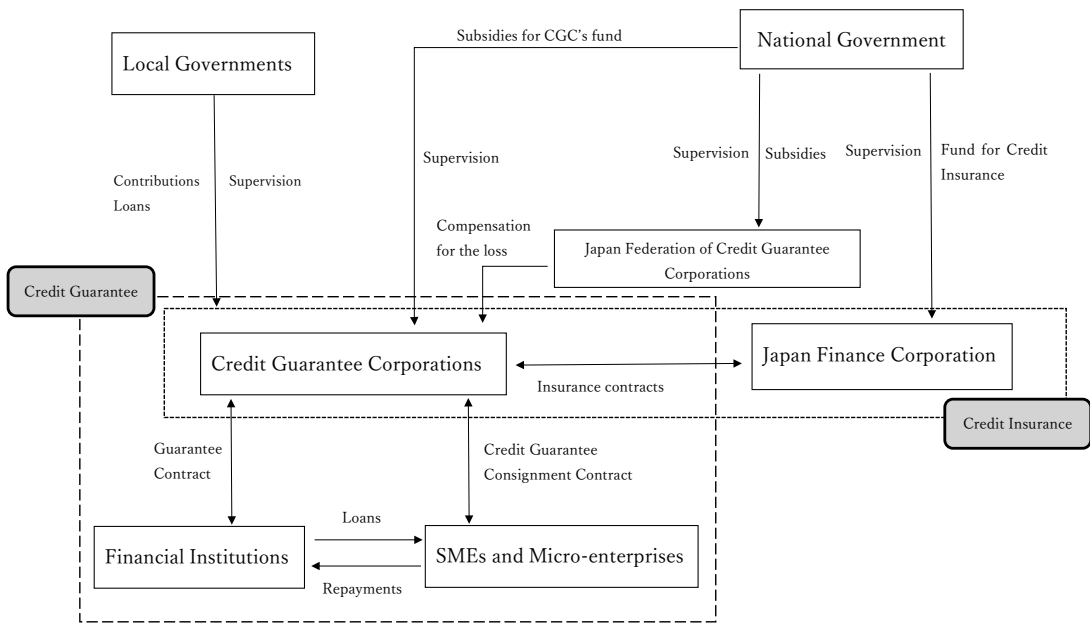
However, depending on the economic situation, defaults may occur more frequently than initially expected, and the guarantee fee income alone may not be sufficient to cover the

² Until around the 1980s and 1990s, the scope of policy finance (or a similar concept, public finance) tended to be limited to direct financial intermediation activities (Kaizuka 1981). In recent years, however, there has been a tendency to include credit guarantee programs in the category of policy finance against the backdrop of their growing significance in the real economy and institutional changes (Iwamoto 2001, Kawate et al. 2006).

³ Credit guarantee corporations are public organizations established under the Credit Guarantee Corporation Law and located in 47 prefectures and 4 cities (Yokohama, Kawasaki, Nagoya, and Gifu). As an implementing agency of the credit guarantee system, they guarantee the debts of SMEs when they borrow business funds, collect funds according to the conditions of the debtor, and provide financial and management counseling and management support for SMEs. For more information, see Japan Federation of Credit Guarantee Corporations (2020).

subrogation payments. For this reason, the government provides financial backup to guarantee corporations through FILP agencies (specifically, Japan Finance Corporation) backed by fiscal funds. This is the framework of credit insurance, which operates in tandem with the credit guarantee system. The entire system linking the credit guarantee function, in which CGCs guarantee debts to financial institutions, and the credit insurance function, in which the JFC reinsures debts through government investment, is collectively referred to as the credit enhancement system. These relationships are illustrated in Figure 1.

Fig 1. The Credit Supplementation System in Japan



(source) Japan Federation of Credit Guarantee Corporations (2020)

The credit guarantee itself is not a scheme unique to Japan; it has been widely introduced in other countries as well. However, the specific operation of the scheme differs from country to country (JFC 2017, Small and Medium Enterprise Agency, Japan 2016, Tahara 2006 etc.).⁴ The fact that the system is linked to the credit insurance system supported by government credit, has a high guarantee rate, and covers a wide range of SMEs is considered to be a major feature of Japan's system in comparison with those of other countries (Kawate et al. 2006).

The original purpose of this system, which is to facilitate the financing of SMEs, is from a microeconomic perspective considered to reduce "market failures" mainly caused by information asymmetries in the area of SME finance and to improve the efficiency of resource allocation.⁵ Information asymmetry can be especially strong during recessions (Bernanke

⁴ Baudino (2020) summarizes the response of public guarantees in various countries to the Covid-19 outbreak.

⁵ See Goto (2013) for the policy rationale for providing financial support to SMEs.

1983). In actual operation, however, credit guarantee programs are often used as part of economic stimulus packages from a macro perspective as well as from a micro perspective of improving market efficiency. This means that the system tends to be heavily used during recessions, leading to a situation where companies default frequently after the credit guarantee is applied. It should be noted that this background exists in the credit complementation system unique to Japan.

II-2. Financial Basis

The main financial basis of the credit supplementation system is the credit guarantee fee paid by the SMEs receiving the loan. However, this system has a framework that incorporates and operates a credit insurance system backed by government funds, and also receives financial support from the government.⁶ Specifically, the measures shown in Table 1 have been established.

Table 1. Financial Support for the Credit Supplementation System by the National Government

Types of Support	Contents
① Compensation for loss	Subsidies paid by the national government to CGCs to allow JFG to cover losses by CGCs resulting from the uninsured portion of subrogated payments made under guarantees in response to specific funding demand designated by the national government.
② Subsidies for the improvement and promotion of business support for SMEs	These are subsidies intended to further bolster initiatives for business and startup supports etc. of SMEs and Micro-enterprises that have already received guarantees from CGCs in collaboration with regional financial institutions. The purpose of such subsidies is to allow SMEs to promote their business improvement.
③ Investment in Japan Finance Corporation (fund for credit insurance)	Funds that the national government invests in JFC in order to strengthen the financial foundations of its credit insurance operations.
④ Subsidies for CGC fund	Subsidies paid by the national government to CGCs in order to ensure a smooth supply of funds to SMEs and Micro-enterprises and strengthen the financial positions of CGCs.
⑤ Loan fund	Funds that the national government lends at low interest rates to CGCs through JFC to enable them to expand the guarantees they offer to SMEs and Micro-enterprises.

(source) Japan Federation of Credit Guarantee Corporations (2020)

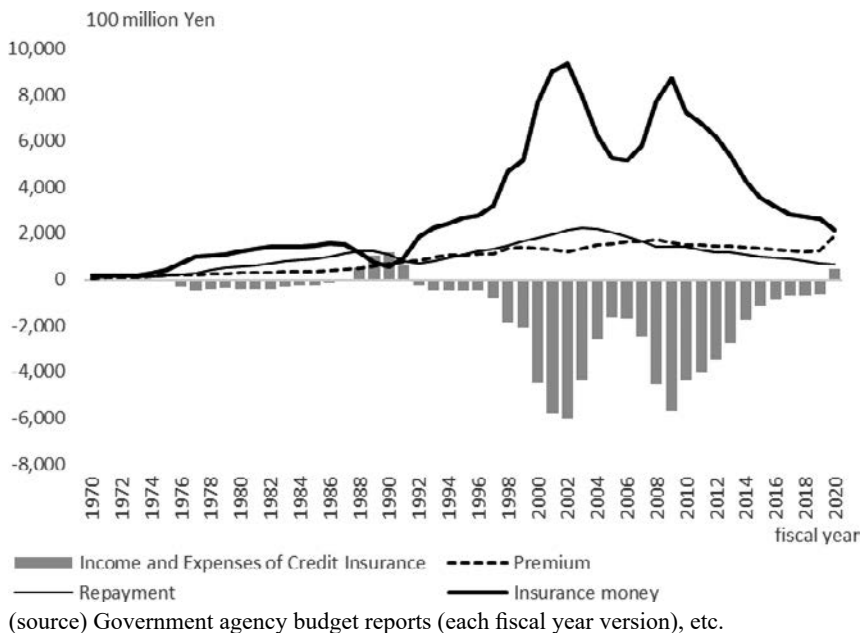
Simply put, it is the government's fiscal funds that ultimately support the credit of the credit guarantee system (or the credit supplementation system as a whole). Although the use of guarantees and the contribution of fiscal funds do not coincide because of the use of financial means, there is a possibility that financial burdens will be incurred if defaults occur frequently in subsequent years, making it difficult to collect the debt. For the government, this means taking on contingent liabilities that may lead to financial burdens in the future.⁷

⁶ The Small and Medium Enterprise Basic Act (Article 25) states, "The government shall take necessary measures to facilitate the supply of funds to small and medium-sized enterprises, (omitted) including the enhancement of credit enhancement business (omitted) and other necessary measures."

⁷ Goto and Oshima (2005) pointed out the institutional and theoretical problems common to such inter-departmental funding relationships among governments (and government-related agencies) in general. Kakinuma and Nakanishi (2013) focus on the credit guarantee system and examine it from a fiscal perspective.

Fig. 2 shows the long-term income and expenditures of JFC, which is responsible for re-insurance under the credit supplementation system.⁸ The balance of income and expenditure was generally stable and balanced until the mid-1990s, but claims payments increased sharply from the late 1990s against the backdrop of the economic downturn caused by the financial crisis, and worsened sharply through FY2002. It once showed an improving trend as the economy began to recover, but deteriorated again in FY2008 due to the economic downturn caused by the financial crisis and other factors. Since FY2010, it had been gradually improving, and in FY2020, achieved a surplus for the first time in 29 years. However, this is largely due to a temporary improvement in income and expenditures, including an increase in insurance fee income amid a sharp increase in the use of credit guarantees due to the COVID-19 pandemic, and a reduction in bankruptcies (and thus insurance claims payments) supported by large-scale public support for SMEs. In the long run, the balance is likely to deteriorate again. As described above, reflecting the economic conditions of the time, the insurance balance has repeatedly fluctuated significantly, mainly due to increases

Fig 2. Income and Expenses of Credit Insurance



⁸ Government agencies responsible for credit insurance operations have undergone several changes. In the past, the Small Business Credit Insurance Corporation, which was established under the Small Business Credit Insurance Corporation Act of 1958 and fully funded by the government, was responsible for credit insurance operations, but with the enactment of the Small and Medium Enterprise Corporation (JASMEC) Act in 1999, it was transferred to JASMEC. In 2004, JASMEC was merged with the Industrial Infrastructure Development Fund, etc. to form the Organization for Small and Medium Enterprises and Regional Innovation, based on the Organization for Small and Medium Enterprise and Regional Innovation Act, and at the same time, the SME credit insurance business, etc. was transferred to Japan Finance Corporation for Small and Medium Enterprise (JASME). In October 2008, JASME was dissolved, and the credit insurance business was taken over by the Japan Finance Corporation (JFC), which continues to this day.

and decreases in insurance claim payments. If we take a broad view of the long-term trend, we can summarize that the insurance balance has deteriorated significantly since the financial crisis at the end of the 1990s, and that the system has been supported for a long time by the fiscal fund.⁹

II-3. Institutional Changes since the Heisei Era

The credit supplementation system has a long history, starting with the enactment of the Small and Medium-sized Enterprise Credit Insurance Act in 1950. Since then, the system has undergone appropriate institutional changes, and especially since the financial crisis of the late 1990s, major institutional developments have continued. These have all been accompanied by policy issues and have been the subject of policy and academic debate. The following section summarizes the major institutional developments since the Heisei era.

II-3-1. Special Credit Guarantee Program (during FY1998-2000)

In August 1998, in response to the financial and economic situation of the time, the Cabinet approved the Outline of Measures against Reluctance to Lend by Small and Medium-sized Enterprises (SMEs). In response, the Special Guarantee Program for Financial Stability of Small and Medium Enterprises (Special Credit Guarantee Program) was established in October 1998 with a total quota of 20 trillion yen. Initially, the program was established with a deadline of the end of March 2000, but the deadline was extended for one year to the end of March 2001, and an additional 10 trillion yen was added to the total guarantee amount, bringing the total guarantee amount to 30 trillion yen. Under this program, CGCs guarantee 100% of loans taken out by SMEs from financial institutions. Although CGCs were required to examine the borrowers, it is often pointed out that this was virtually a no-examination process. While this system is believed to have had a dramatic effect on the cash flow of SMEs and to have contributed significantly to curbing bankruptcies, there are also many critical opinions that it may have created a moral hazard among financial institutions and borrowing companies.

II-3-2. Increased Flexibility in Guarantee Fee Rates (in 2006)

When SMEs use the credit guarantee system, they are required to pay a uniform credit guarantee fee regardless of their business and financial conditions (1.35% for unsecured guarantees and 1.25% for secured guarantees). However, it was strongly pointed out that such a uniform fee rate would be relatively expensive for businesses with good management and financial conditions, and that it might cause what economists call adverse selection, where businesses with higher credit risk are more likely to use the credit guarantee system, or it might undermine the motivation of small and medium-sized businesses to make man-

⁹ The government's investment was about 5 billion yen around 1970, and 30-40 billion yen around 1980. Since the beginning of the 1990s, it has remained at around 10-20 billion yen.

agement efforts. In order to resolve these concerns, a measure was taken in April 2006 to make the guarantee fee rates more flexible, with nine categories of variable rates, taking into account the credit risk of SMEs.¹⁰

II-3-3. Introduction of a Responsibility-sharing System (in 2007)

In October 2007, a responsibility-sharing system (partial guarantee) was introduced in which financial institutions and CGCs shared the credit risk. Until then, in principle, CGCs had guaranteed 100% of the loan amount, but with the exception of some loans, financial institutions were now required to bear the equivalent of 20% of the credit risk. This measure was taken in response to concerns that a 100% guarantee would lead to lax screening and credit management by financial institutions. It was hoped that if there was a possibility of even partial losses on loans, financial institutions would conduct screening and credit management as rigorously as they would for their own proprietary loans. However, not all of the credit-guaranteed loans were shifted to the new system, and the guarantees for small businesses and safety-net guarantees were still 100% guaranteed.¹¹

II-3-4. Special Measures during Economic Downturn

Since it was recognized that special credit guarantees had, at least in the short term, a supportive effect on the economy, special support measures for credit guarantee programs have often been provided during major economic shocks since the 2000s. Specifically, the “Emergency Guarantee Program for Responding to Soaring Raw Material Prices (Emergency Guarantee Program)” was established in October of that year in response to the financial crisis in September 2008 (ended in March 2011). In addition, in response to the Great East Japan Earthquake in March 2011, the Great East Japan Earthquake Reconstruction Emergency Guarantee was implemented in May of the same year, and the Safety Net Guarantee for the spread of the new coronavirus after 2020 was implemented in March of the same year ((i) designation of all regions for Safety Net Guarantee No. 4, (ii) expansion of business types for No. 5 (i) designation of all regions under Safety Net Guarantee No. 4, (ii) expansion of the industry under Safety Net Guarantee No. 5,¹² and (iii) implementation of crisis-related guarantee¹³). All of these measures were implemented in a short period of time from the outbreak of the crisis to the response to the crisis, indicating the flexible nature of

¹⁰ This is a scheme that utilizes the Credit Risk Database (CRD) collected and managed by the CRD Association (a general incorporated association). The CRD collects anonymous data on borrowers (SMEs) numbering in the millions and measures the credit risk of SMEs (see Chapter IV for details).

¹¹ Safety Net Guarantee (Business Stability Related Guarantee) is a cash management support program for “specified SMEs” defined in Article 2, Paragraph 5 of the SME Credit Insurance Law, which is a separate guarantee from the general guarantee in the event that the SMEs are experiencing difficulties in stabilizing their business. There are categories 1-8 in accordance with the factors specified in the SME Credit Insurance Law.

¹² Safety Net Guarantee No. 5 is a guarantee of the full amount of borrowings, separate from the general framework, for areas where a wide range of industries have been affected. In contrast, No. 5 guarantees 80% of the debt in a separate line from the general framework for industries that have been particularly severely affected.

the special response.

II-3-5. Partial Revision of the Credit Insurance Act, etc. (in 2017)

The Credit Guarantee Reform Bill was passed in 2017 to further expand financial support for SMEs through the credit guarantee program, and the new program began in 2018. This expansion includes not only support by the government itself, but also financing by private financial institutions. After the expansion of emergency support and other measures, there was an increasing awareness of the problem that Japan's previous credit guarantee system might have protected SMEs too much, and that this may have reduced the incentive for private financial institutions to provide support. While the revisions included the creation of crisis-related guarantees and specific management succession-related guarantees, and the expansion of guarantees for start-up companies, the basic policy was to achieve an appropriate distribution between areas where only the government could do it and areas where private financial institutions should do it.¹⁴

II-4. Use of Credit Guarantees

Against the backdrop of these institutional changes and macroeconomic conditions, the use of credit guarantees has changed significantly. The following is an overview of the long-term and short-term trends in terms of amount up to the present.

II-4-1. Long-term Trends

In the past, government-affiliated financial institutions had a larger macro presence in the policy finance area than credit guarantees, both in terms of outstanding balance and in terms of their function in economic stimulus programs. The situation changed during the financial crisis of the late 1990s, after which credit guarantees greatly increased their presence. Since then, credit guarantees have continued to play a major role whenever major economic shocks have occurred. In terms of volume, before the financial crisis, lending by government financial institutions exceeded the amount of credit guarantees, but after the financial crisis, the relationship between the two has reversed, and has continued to the present (Fig. 3).

II-4-2. Recent Trends

In recent years, the use of credit guarantees has remained around 10 trillion yen for acceptances and 20 to 30 trillion yen for the outstanding balance (Fig. 4). The subrogation rate (subrogation payments divided by the balance of guaranteed liabilities) has been on a down-

¹³ The crisis-related guarantee came into effect in April 2018. This is a system to support SMEs in the event of financial turmoil or other unforeseen circumstances, when objective indicators such as DI of financial position deteriorate as quickly and sharply as they did at the time of the financial crisis in 2008 or the Great East Japan Earthquake in 2011, and it is confirmed that a significant credit contraction is occurring nationwide for SMEs, and when the government finds it necessary to take measures to support SMEs, etc.

¹⁴ The background and purpose of the institutional revision and its detailed contents are described in Yamori (2019).

Fig 3. The Long-term Transition of Credit Guarantee Amount and Loans by Government-affiliated Financial Institution (Based on the Balance)

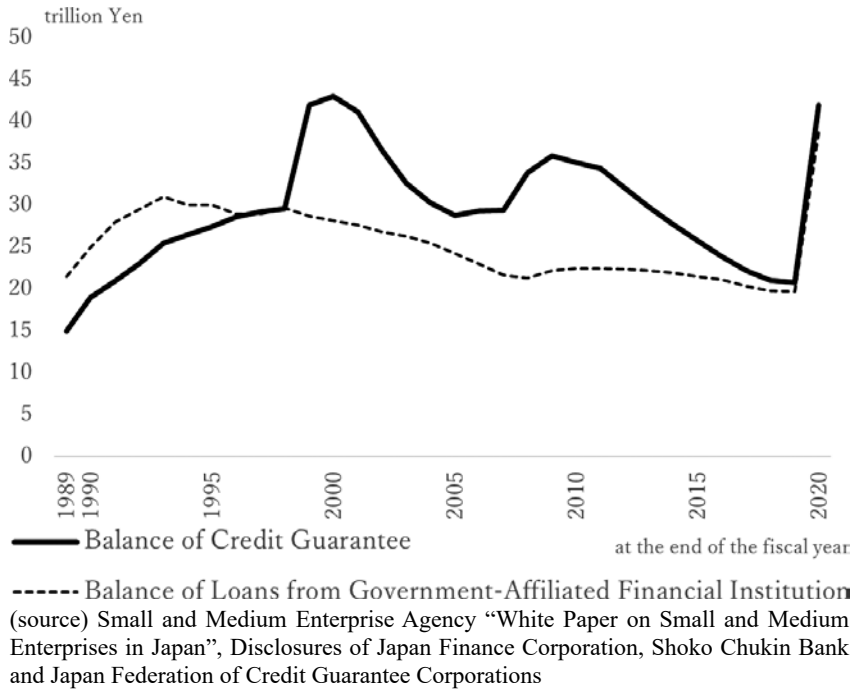
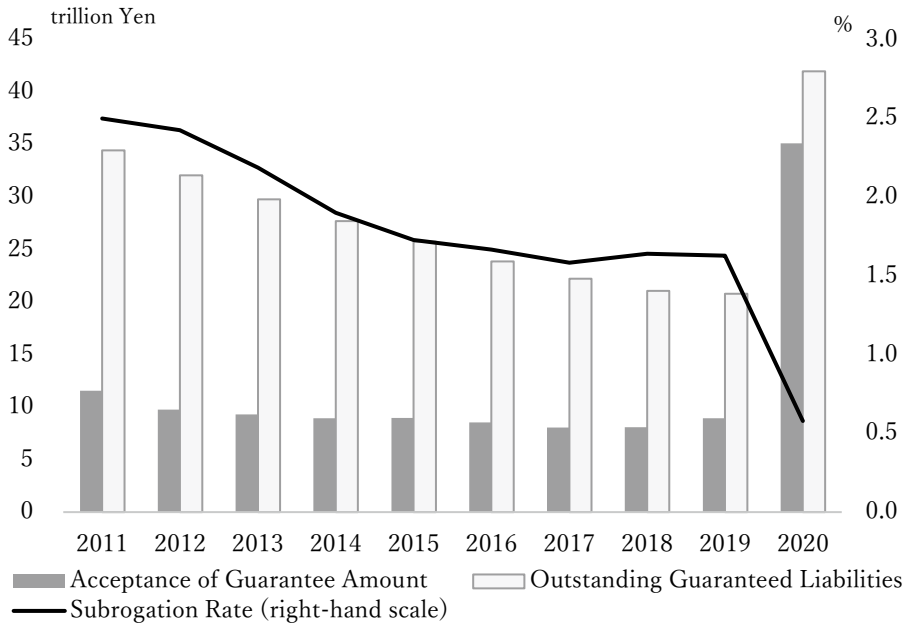


Fig 4. Credit Guarantee Usage and Subrogation Rate



(source) Japan Federation of Credit Guarantee Corporations’ website.

ward trend from the 2% level to the 0% level. In FY2020, however, both the amount of acceptances and the outstanding balance increased rapidly against the backdrop of the pandemic, and the subrogation rate plummeted due to the resulting expansion of the denominator.

About 1.55 million firms used credit guarantees in FY2020, which corresponds to around 43% of all SMEs in Japan.¹⁵ About 90% of these firms are small firms with 20 or fewer employees. This means that credit guarantees in Japan are widely used, especially by small firms.

III. Literature Review

Since credit guarantees are widely introduced in various countries, numerous empirical analyses have been conducted around the world from the perspective of the effectiveness of policy interventions in improving market efficiency and the effectiveness of the system.¹⁶ Such previous studies include, for example, Craig et al. (2008), who found a significant positive correlation between the amount of guaranteed loans and employment by region in the United States; Cowling and Mitchell (2003), who used individual data from the United Kingdom to examine the effect of credit guarantee programs on stimulating SME growth through reducing capital market imperfections; Zecchini and Ventura (2009), who showed that credit guarantees led to SMEs' access to credit markets and lower borrowing costs in Italy; Song (2014), who empirically analyzed the relationship between debt guarantee programs and SME growth in Canada; Kang et al. (2008), who dealt with the impact of credit guarantees on the survival and management performance of SMEs in Korea; Adhikary et al. (2019), who analyzed the relationship between credit guarantee programs, growth, and firm value in Indonesia using firm and industry data; Zhang and Ye (2010), who examined the effectiveness of China's credit guarantee program from the perspective of risk-sharing and other factors, and a very wide variety of other empirical analyses.

A large body of research has also been accumulated on Japan's credit guarantee system. Most of these are concerned with the policy effects and effectiveness of emergency measures and system changes. Of particular interest is the aforementioned special credit guarantee system, which was introduced in the late 1990s on a temporary basis. Konishi and Hasebe (2002) conducted a regression analysis of whether or not the special credit guarantee led to a reduction in bankruptcies and the promotion of lending by private financial institutions, using aggregate-level quarterly data and prefecture-by-prefecture panel data since the 1970s.

¹⁵ The total number of SMEs in the denominator is based on figures in the "White Paper on Small and Medium Enterprises" (calculated by the Small and Medium Enterprise Agency).

¹⁶ Although only empirical analyses are surveyed here, there are a number of theoretical studies on credit guarantees. For example, Stiglitz and Weiss (1981) argued that policy interventions such as credit guarantee programs improve efficiency because adverse selection due to information asymmetry makes it difficult for low-risk firms to access capital markets. Other studies include Mankiw (1986), who argued that public credit guarantees could increase the supply of funds, and de Meza and Webb (1987), who argued that under a credit guarantee system, excess investment due to credit being extended to firms that incur expected losses for the lender would rather reduce economic efficiency (1987), among others.

As a result, the authors argued that while the short-run effect of the guarantee on the avoidance of bankruptcies was recognized, no medium- to long-term effect was observed. On the other hand, the effect of the increase in loans was confirmed. In contrast, Matsuura and Takezawa (2001) conducted a panel data analysis of the relationship between the balance of loans to SMEs and the balance of special guarantees by prefecture for the two years 1998 and 1999, when the special guarantees were implemented, and concluded that the introduction of the special guarantee program did not contribute to an increase in lending to SMEs.

Using their own micro data, Uesugi et al. (2010) examined the liquidity availability and ex-post managerial performance of firms that used the special guarantee program. For the former, the effect lasted only a few years for firms that received credit from undercapitalized banks, although it appears to have contributed to liquidity availability. They also found that the ex-post performance of firms that used the system tended to be generally inferior, except for some firms with large net assets. Okuma and Mori (2008) and Harimaya (2012) examined regional differences in credit guarantees, focusing on the subrogation rates of financial institutions after the introduction of the special credit guarantee.

There are also a number of studies on emergency guarantee programs after the financial crisis in 2008. For example, Ono et al. (2013), based on the results of an empirical analysis using firm-bank matching data, point out the possibility that main banks have an incentive to reduce credit risk by replacing their own loans with guaranteed loans to firms whose business is likely to deteriorate, in relation to the emergency guarantee program. Saito and Tsuruta (2018), using credit guarantee data by financial institution after the start of the emergency guarantee program, show that a high subrogation rate is positively correlated with the ratio of guaranteed debt to outstanding loans, suggesting that credit risk was transferred from financial institutions to CGCs.

In addition to these analyses focusing on time-limited measures for credit guarantees, there have also been studies that address universal issues related to the system, such as Yamori (2004), which examines the possibility that public credit guarantees create moral hazard for financial institutions. In any case, as can be understood from the above survey, the central interest in empirical analysis of credit guarantees in Japan has been microeconomic concerns such as market efficiency. This is probably due not only to the microeconomic function of the credit guarantee system, which is essentially to improve the efficiency of resource allocation, but also to the fact that, especially in Japan, government funds are embedded at the core of the system.

IV. Data Analysis

Most of the empirical studies on credit guarantees in Japan have dealt with microeconomic issues such as improving market efficiency, which is the original purpose of the system. However, today, when the macroeconomic presence of credit guarantees is increasing in the form of economic stimulus packages, etc., it is highly significant to check their relationship with the overall economy at the aggregate level. In this chapter, we analyze recent

trends in credit guarantees from the perspective of short-term macroeconomic fluctuations using aggregate-level panel data by prefecture. Specifically, we examine the relationship between credit guarantees and macro aggregate variables in the framework of Granger causality. Furthermore, in order to explore the relationship between the credit guarantee system and firm efficiency at the aggregate level from the perspective of long-term economic growth, we also uniquely process and aggregate large SME data to confirm whether the ratio of inefficient SMEs with excessive debt differs depending on the existence of a debt guarantee.

IV-1. Causality in Short-term Fluctuations

IV-1-1. Data Description

The period covered by the Granger causality analysis conducted in this study is FY 2011-2020, and for some data, the period is slightly shorter due to availability constraints, which will be explained later. The source of the credit guarantee-related data is the Small and Medium Enterprise Agency's "Utilization of Credit Guarantee Programs." We used the respective fiscal year averages of the balance of guaranteed obligations and subrogation rates listed in "Actual Guarantees by Credit Guarantee Association" (FY2018-2020) and "Subrogation Payments by Credit Guarantee Association" (before FY2017) in that report. Values for four cities (Yokohama, Kawasaki, Nagoya, and Gifu) were combined into the prefecture in which they are located. Since there is an association in every prefecture, it is possible to conduct a statistical analysis based on panel data for 47 prefectures as shown here.

The variables for examining the statistical relationship with these credit guarantee-related variables can be broadly classified into two categories: those related to the real economy and those related to finance. Three indices were used as variables related to the real economy: The first is the business confidence of SMEs. Specifically, it is the annual average of the DI of business conditions (all industries) in the "Survey of Business Conditions of Small and Medium-sized Enterprises" conducted by the Small and Medium Enterprise Agency and the Organization for Small & Medium Enterprises and Regional Innovation, Japan.¹⁷ The second variable is the annual average of the effective job offer rate in the "Status of Employment Placement" by the Ministry of Health, Labour and Welfare (MHLW).

As the third variable, we also used real gross prefectural product from the Cabinet Office's "Prefectural Accounts." However, these statistics are always published late, and the period of the most recent two fiscal years is shorter than that of other data.

As for financial data, we first used the annual average of domestic bank loans from the Bank of Japan's "Deposits, Cash, and Loans by Prefecture." In addition, as official loans by government-affiliated financial institutions, we extracted the amount of loans for each fiscal year from the disclosure magazines of Japan Finance Corporation (for 46 prefectures other

¹⁷ The Cabinet Office's Indexes of Business Conditions (coincident index), which the Japanese government uses as a basis for making official judgments about the state of the business cycle, is a composite of 10 indicators that are expected to fluctuate at roughly the same time as the economy. The effective job offer rate is one of the indicators used.

than Okinawa Prefecture) and Okinawa Development Finance Corporation. The average of the end of the fiscal year and the end of the previous fiscal year was considered as the value for the fiscal year. The data period of the public loan amount is one year shorter than the whole period, with the latest being FY2019, due to the limitation of the actual publicly available data. The above real economy-related and finance-related indicators are arranged in a panel format for each of the 47 prefectures. Descriptive statistics for each are shown in Table 2.

Table 2. The Descriptive Statistics of the Benchmarks (Original Series) used for Analysis

		Unit	Mean	Standard Deviation	Obs.	Period (Fiscal Year)
Related to Credit Guarantee	Amount of Credit Guarantee	100 million Yen	5,917	7,501	470	2011-2020
	Subrogation Rate	-	0.0160	0.0064	470	2011-2020
Related to Real Economy	Business Confidence of SMEs	points	-20.88	8.35	470	2011-2020
	Effective Job Offer Rate	times	1.19	0.36	470	2011-2020
	GDP	trillion Yen	11.3	16.1	376	2011-2018
Related to Finance	Net Increase of Total Loan	100 million Yen	2,920	10,727	470	2011-2020
	Public Loaning	100 million Yen	1,440	1,790	423	2011-2019

(note) Subrogation rate is calculated by dividing the subrogation amount by outstanding guaranteed liabilities, and it is not converted into percentage.

(source) By the author, referring to each of these statistics.

IV-1-2. Analytical Methods

In this analysis, we focused on the statistical causality among the variables and verified the existence of Granger causality to confirm it. However, the data used here are not long time-series data as in the usual analysis of Granger causality, but are characterized by the fact that they are in panel form with observed values for each of the 47 prefectures. Taking advantage of these characteristics of the data, this paper examines panel-type Granger causality following the framework of Mishra et al. (2010). For example, to examine the causality between the amount of credit guarantees (ΔCG with first-order difference) and SME business sentiment (ΔBC with first-order difference), we first estimate equations (1) and (2) below, where E_{t-1} is the error correction term derived from the cointegration relation. If the null hypothesis that the coefficient of the lag term ΔBC_{it-s} is zero in equation (1) is rejected, we consider that there is a causal relationship from ΔBC (business confidence) to ΔCG (credit guarantee amount) in Granger's sense. The reverse (i.e., causality from ΔCG to ΔBC) is determined in the same way.

$$\Delta CG_{it} = \alpha_{CG,i} + \sum_s \beta_{CG1,is} \Delta CG_{it-s} + \sum_s \beta_{CG2,is} \Delta BC_{it-s} + \gamma_{CG,i} E_{t-1} \quad (1)$$

$$\Delta BC_{it} = \alpha_{BC,i} + \sum_s \beta_{BC1,is} \Delta BC_{it-s} + \sum_s \beta_{BC2,is} \Delta CG_{it-s} + \gamma_{BC,i} E_{t-1} \quad (2)$$

IV-1-3. Results of Causality Test

(1) Stationarity Test

Since stationarity of data is required when testing for Granger causality, it is necessary to test for stationarity in advance and, if necessary, process the data by, for example, calculating factorial differences. Here, the judgment is based on the unit root test using the standard LLC test (Levine, Lin and Chu Test). The results are shown in Table 3. Of the two variables related to credit guarantees, the level of the amount of credit guarantees is evaluated to be non-stationary but stationary at the first-order difference. For this reason, the first-order difference data are used in this analysis. On the other hand, since the subrogation rate is stationary as a level variable in the original series, no data processing is applied.

Table 3. Results of LLC Unit Root Test

(i) Credit Guarantee-related variable

Variable		t value	p value
Amount of Credit Guarantee	Level	1.58129	0.9431
	Difference	-5.6892	0.0000
Subrogation Rate	Level	-12.1345	0.0000
	Difference	-14.4242	0.0000

(ii) Variables Related to Real Economy and Finance

Variable		t value	p value	Variable		t value	p value
Business Confidence of SMEs	Level	1.49871	0.9330	Net increase of Loan	Level	2.02587	0.9786
	Difference	-8.88228	0.0000		Difference	-18.7692	0.0000
Effective Job Offer Rate	Level	-21.7986	0.0000	Public Loan	Level	-5.40526	0.0000
	Difference	-5.67568	0.0000		Difference	-16.7856	0.0000
GDP	Level	13.8596	1.0000				
	Difference	-15.3302	0.0000				

As for the real economy-related and finance-related variables that are the counterpart of the credit guarantee-related variables, the level of the original series is nonstationary for small business confidence, GDP, and net increase in loans, but the first-order difference is stationary. For this reason, we used first-order difference data for all of them. On the other hand, for the ratio of job offers to applicants and public loans, both the level and the first-order difference are stationary. While the level variable was used for the job openings ratio, the factorial data was used for public loans, taking into account the contrast with the net increase in loans.

(2) Granger Causality

Using the amount of credit guarantees as a variable related to credit guarantees, we con-

ducted panel-type Granger causality tests on the relationship with the variable under analysis for all 47 prefectures and for 44 prefectures excluding the three metropolitan prefectures (Tokyo, Osaka, and Aichi). The model was designed with one and two lag periods, respectively.

First, we examine the results for variables related to the real economy (Table 4). As for the relationship with business confidence of SMEs, there is a causal relationship from business confidence to the amount of credit guarantees, but not vice versa. However, a bidirectional causal relationship is observed for prefectures outside the metropolitan area. While business confidence of SMEs in urban areas is affected by a variety of factors and the effect of credit guarantees is relatively small, the effect of credit guarantees may be large in rural areas.

As for the relationship with the effective job offer rate, which is positioned as a consistent indicator of the business cycle, a causal relationship from the effective job offer rate to the amount of credit guarantee exists in all prefectures and in all 44 prefectures, but the inverse relationship is not confirmed. While the business cycle affects the trend of credit guarantees, it is interpreted that, at least during the period covered by this study, credit guarantees did not have enough impact to influence the overall economy.

Looking at the results on SME business confidence and effective job offer rate as a whole, causality from the real economy side to the amount of credit guarantee is clearly observed, while the reverse relationship is difficult to find, except for SME business confidence in rural areas. However, although it is positioned as just a reference indicator due to the short data period, a unidirectional causality from the amount of credit guarantees to GDP is observed on a basis for all prefectures. The statistical causality from credit guarantees to the real economy may vary depending on the period covered and the variables used, and should be evaluated within a certain range.

Next, with regard to finance-related variables, the relationship with total lending is two-way causality for all prefectures, whereas the relationship is unidirectional from total lending for the 44 prefectures excluding Tokyo and other prefectures. While the relationship between trends in total lending and credit guarantees is almost clear, there is no evidence that credit guarantees have such an effect that they are primed to change overall lending, at least in the rural areas. This is not only due to the quantitative reason that the weight of guaranteed loans in total loans is limited, but also because of the possibility of a substitutive relationship with non-guaranteed loans.¹⁸ Although the analysis methods and data differ, the present results can be interpreted as compatible with the conclusion of Matsuura and Takezawa (2001) that special credit guarantees had little effect in boosting lending to SMEs.¹⁹

The relationship with public loans is also generally similar to that of total loans. The results for all prefectures and 44 prefectures show a causal relationship from public loans to credit guarantees in general. On the other hand, the reverse relationship holds for all prefec-

¹⁸ The ratio of outstanding guarantees to total loans (domestic bank total) was about 4% at the end of March 2020.

¹⁹ However, this is only a quantitative relationship regarding overall lending, and the impact on the economy may vary depending on the size of the support effect on firms that have received credit guarantees.

Table 4. Results of Panel Granger Causality Tests: Relationship to the Amount of Credit Guarantees

prefectures	lags	H ₀ : X does not Granger cause Y		F-value	p-value	causality	obs.	period: fiscal year	
		X	Y						
all prefectures	1	SMEs' business confidence credit guarantee	credit guarantee SMEs' business confidence	29.9502 2.1395	0.0000 0.1444	***	376	2011-2020	
	2	SMEs' business confidence credit guarantee	credit guarantee SMEs' business confidence	19.6453 0.6285	0.0000 0.5340	***	329		
	1	effective job offer rate credit guarantee	credit guarantee effective job offer rate	87.3527 0.1586	0.0000 0.6907	***	376	2011-2020	
	2	effective job offer rate credit guarantee	credit guarantee effective job offer rate	43.9014 0.7103	0.0000 0.4922	***	329		
	1	GDP credit guarantee	credit guarantee GDP	0.2021 19.4217	0.6534 0.0000	***	282	2011-2018	
	2	GDP credit guarantee	credit guarantee GDP	0.1110 3.8477	0.8950 0.0227	**	235		
	1	net increase in total loans credit guarantee	credit guarantee net increase in total loans	29.5620 23.8560	0.0000 0.0000	***	376	2011-2020	
	2	net increase in total loans credit guarantee	credit guarantee net increase in total loans	15.7430 6.0004	0.0000 0.0028	***	329		
	1	outstanding public loans credit guarantee	credit guarantee outstanding public loans	2.2837 10.2358	0.1317 0.0015	***	329	2011-2019	
	2	outstanding public loans credit guarantee	credit guarantee outstanding public loans	12.5759 18.9570	0.0000 0.0000	***	282		
	44 prefectures	1	SMEs' business confidence credit guarantee	credit guarantee SMEs' business confidence	37.8931 2.9527	0.0000 0.0866	*** *	352	2011-2020
		2	SMEs' business confidence credit guarantee	credit guarantee SMEs' business confidence	27.9565 0.0000	0.0000 0.0000	*** ***	308	
		1	effective job offer rate credit guarantee	credit guarantee effective job offer rate	129.3750 1.2759	0.0000 0.2594	***	352	2011-2020
		2	effective job offer rate credit guarantee	credit guarantee effective job offer rate	68.3672 0.5475	0.0000 0.5790	***	308	
		1	GDP credit guarantee	credit guarantee GDP	0.0666 0.3798	0.7966 0.5382		264	2011-2018
		2	GDP credit guarantee	credit guarantee GDP	0.5490 0.7370	0.5783 0.4797		220	
1		net increase in total loans credit guarantee	credit guarantee net increase in total loans	4.1556 0.0050	0.0422 0.9439	**	352	2011-2020	
2		net increase in total loans credit guarantee	credit guarantee net increase in total loans	13.7752 0.0802	0.0000 0.9229	***	308		
1		outstanding public loans credit guarantee	credit guarantee outstanding public loans	12.8007 0.0167	0.0004 0.8972	***	308	2011-2019	
2		outstanding public loans credit guarantee	credit guarantee outstanding public loans	10.1058 0.9129	0.0001 0.4027	***	264		

(note 1) The table is shown below. The p-value here is the value related to the result of the test of the null hypothesis H_0 that X does not Granger cause Y (the coefficient of the lag term of the variable corresponding to X is zero). *** if significant at less than 1%, ** if between 1% and 5%, and * if between 5% and 10%, are indicated in the "Causality" column. This implies that X Granger causes Y in the combination of X and Y for which significance is shown.

(note 2) The "period" is the period of the original data used in the estimation. The number of observations in the estimation is less than the product of the number of years in the period multiplied by the number of prefectures, since operations such as calculating the difference of the time series data and using a lag term in the estimation equation are added.

tures, but not for the 44 prefectures. The mechanism behind the time-series relationship between (1) official loans and (2) credit guarantees, both of which are instruments of policy finance, is an issue to be examined in the future, but we would like to discuss a possible hypothesis below. The difference in the institutional structure of the government-affiliated financial institutions, which are directly linked to economic measures such as stimulus packages as an institution implementing policy-based financing, while the credit guarantee involves the step of examination by private financial institutions and CGCs, may be responsible for the differences in the results of the analysis. In addition, the differences by region may simply be due to the fact that, quantitatively, the weight of rural areas in policy finance is relatively high.²⁰

Table 5 shows the results when the subrogation rate is used as a representative variable for credit guarantees. In general, a bidirectional causal relationship can be observed with business cycle-related indicators.²¹ While it is easy to understand that changes in economic conditions affect the status of subrogation payments, the inverse relationship may not be obvious. However, taking into account that the number of corporate bankruptcies tends to precede the overall business cycle, the existence of a statistical causality from subrogation payments to the business cycle is not necessarily unnatural.²²

The relationship between the subrogation rate and finance-related variables shows only bidirectional causality with respect to total lending in the 44 prefectures, and no causality in either direction can be confirmed for the case of all prefectures or for the case using public lending in the 44 prefectures. Considering the background to these results, for example, the analysis using public lending is as follows. Although the subrogation rate is positioned as a credit guarantee-related variable implemented as part of policy finance, the government itself has little room for active manipulation in real time. Public lending, on the other hand, is a strong direct reflection of the government's policy stance. The empirical results may represent differences in these decision mechanisms. In contrast, total lending is basically determined endogenously in the interconnected mechanism of the economy as a whole, along with subrogation payments, and it might be possible to hypothesize that causality can be observed between the two. In the present analysis, we found that a bidirectional relationship exists in the case of the 44 prefectures. In the analysis for the same 44 prefectures, the one-way relationship for the amount of credit guarantee seen earlier was caused by total loans, but for subrogation payments, the relationship is two-way. The endogenous relationship with the economy as a whole may be stronger at the "exit" stage of subrogation payments than at the "entrance" stage of guarantee acceptance. Although this paper does not go further into the study of the specific mechanism, it is an interesting subject for future research.

²⁰ In terms of the recent values, 44 prefectures other than the three urban prefectures accounted for about 67% (FY2020) of the total credit guarantee balance, while the weight of public loans amounted to 79% (FY 2019).

²¹ The causal relationship with GDP is weak here as well. However, considering that the GDP data used in this study is two years shorter than most of the other series and that GDP is a highly volatile statistic due to statistical errors, this analysis should be kept only as a reference and carefully analyzed after further accumulation of data.

²² For example, some local governments use the number of bankruptcies as the leading series in the regional business condition indexes compiled by each prefecture.

Table 5. Results of Panel Granger Causality Tests: Relationship to the Subrogation Rate

prefectures	lags	H ₀ : X does not Granger cause Y		F-value	p-value	causality	obs.	period: fiscal year
		X	Y					
all prefectures	1	SMEs' business confidence	subrogation rate	29.8225	0.0000	***	423	2011-2020
		subrogation rate	SMEs' business confidence	10.0191	0.0017	***		
	2	SMEs' business confidence	subrogation rate	18.8753	0.0000	***	376	
		subrogation rate	SMEs' business confidence	9.1289	0.0001	***		
	1	effective job offer rate	subrogation rate	143.9970	0.0000	***	423	2011-2020
		subrogation rate	effective job offer rate	4.9545	0.0266	**		
	2	effective job offer rate	subrogation rate	67.7335	0.0000	***	376	
		subrogation rate	effective job offer rate	9.6098	0.0001	***		
	1	GDP	subrogation rate	1.9902	0.1593		329	2011-2018
		subrogation rate	GDP	0.0060	0.9382			
	2	GDP	subrogation rate	0.7335	0.4811		282	
		subrogation rate	GDP	0.2847	0.7525			
	1	net increase in total loans	subrogation rate	2.6578	0.1038		423	2011-2020
		subrogation rate	net increase in total loans	2.4485	0.1184			
	2	net increase in total loans	subrogation rate	1.2777	0.2799		376	
		subrogation rate	net increase in total loans	0.1423	0.8674			
1	outstanding public loans	subrogation rate	0.1011	0.7507		376	2011-2019	
	subrogation rate	outstanding public loans	1.1518	0.2839				
2	outstanding public loans	subrogation rate	0.0348	0.9659		329		
	subrogation rate	outstanding public loans	0.1365	0.8725				
44 prefectures	1	SMEs' business confidence	subrogation rate	24.5376	0.0000	***	396	2011-2020
		subrogation rate	SMEs' business confidence	8.8701	0.0031	***		
	2	SMEs' business confidence	subrogation rate	15.6376	0.0000	***	352	
		subrogation rate	SMEs' business confidence	8.1735	0.0003	***		
	1	effective job offer rate	subrogation rate	128.0780	0.0000	***	396	2011-2020
		subrogation rate	effective job offer rate	4.7308	0.0302	**		
	2	effective job offer rate	subrogation rate	61.0495	0.0000	***	352	
		subrogation rate	effective job offer rate	10.0700	0.0001	***		
	1	GDP	subrogation rate	1.3313	0.2495		308	2011-2018
		subrogation rate	GDP	0.2250	0.6356			
	2	GDP	subrogation rate	1.2807	0.2796		264	
		subrogation rate	GDP	0.7585	0.4694			
	1	net increase in total loans	subrogation rate	2.8302	0.0933	*	396	2011-2020
		subrogation rate	net increase in total loans	4.2165	0.0407	**		
	2	net increase in total loans	subrogation rate	8.2320	0.0003	***	352	
		subrogation rate	net increase in total loans	3.3697	0.0355	**		
1	outstanding public loans	subrogation rate	0.2066	0.6497		352	2011-2019	
	subrogation rate	outstanding public loans	0.4948	0.4823				
2	outstanding public loans	subrogation rate	0.1621	0.8504		308		
	subrogation rate	outstanding public loans	0.2289	0.7956				

(note) The same notes on the table apply as in the previous table.

IV-2. Calculation of the Ratio of Heavily Indebted Firms

The above analysis using prefectural panel data verified the statistical causality of the relationship between credit guarantees and short-term economic fluctuations. In the following section, we present an analysis based on our own processing and aggregation of large-scale individual data with an awareness of the question of whether credit guarantees impede

the efficiency of the SME sector from the perspective of long-term economic growth.

IV-2-1. Data

The data used in the analysis are micro data from the Credit Risk Database (CRD), which is provided in anonymous form by members of financial institutions and CGCs throughout Japan and covers detailed information on the finances, attributes, and defaults of SMEs.²³ The CRD Association, which collects and manages the data, was established in 2001 (initially as a private organization, now as a general incorporated association) mainly by CGCs nationwide as an organization that collects management data (financial and non-financial data and default information) on SMEs. Due to the nature of the data, it is limited to “SMEs with borrowings,” and although the number of firms varies from year to year depending on the availability of data, in each year the sample includes several hundred thousand to more than one million firms. Because the data covers a wide range of industries and regions, and because the number of firms included in the data is huge, it is possible to secure sufficient observations even if the sample is extracted along with the presence of answers to questions regarding the variables used in the analysis.

The CRD contains data on the amount of debt guaranteed. Although most of the data used in this study are missing values, tens to hundreds of thousands of companies still report their outstanding balances every year.²⁴ It should be noted, however, that the amount of debt guaranteed includes not only guarantees by CGCs, but also those by various government-related organizations and individuals.²⁵ Though credit guarantees are the core of guarantee liabilities in Japan, given such nature of the data, it is appropriate to take the results here as secondary evidence only.²⁶

The period covered by the data used in this study is the 10-year period from 1998, when the special credit guarantee was launched, to 2007, just before the collapse of Lehman Brothers in 2008.²⁷ The population used in the analysis is about 280,000 firms that responded to the question on the amount of the guarantee and had all the other variables necessary for the analysis. Descriptive statistics on these firms are shown in Table 6. The median sales and number of employees are 150 million yen and 8 persons, respectively, indicating that the sample population consists mainly of small firms.

²³ See Shikano (2008), Xu and Tsuruta (2006), and Maehara (2013) for explanations on the CRD data, and CRD Association (2011) for the establishment and structure of the CRD Association and developments since its establishment, respectively. Although the data are originally intended to be used only for business purposes, such as basic data for credit risk measurement models provided to members (CGCs, regional financial institutions, etc.), we have received special permission to use the data for academic research purposes only.

²⁴ In the data approved for use in this study, the distribution ranges from about 69,000 firms (1995) to about 404,000 (2004).

²⁵ Personal guarantees (guarantees by the owner of the company himself/herself) for borrowings by SMEs have long been considered problematic because they cause various problems for the vitality of the firm and the livelihood of the owner when the firm’s management becomes difficult. Under these circumstances, the government (the Small and Medium Enterprise Agency and the Financial Services Agency) has been encouraging the review of personal guarantees by establishing the “Study Group on Personal Guarantees, etc. for SMEs” in 2013 to discuss measures to be taken.

²⁶ See Tsuchiya (2021) for a detailed discussion of the analytical treatment of credit guarantee data in the CRD.

²⁷ Following the financial crisis in 2008, a policy called the Financing Facilitation Act was implemented, which seems to have had an extremely large impact on the management of SMEs. The economic effects of this policy are an important research topic that should be analyzed separately from the subject of this paper, credit guarantees.

Table 6. Sample Firms Profile: Descriptive Statistics

Variable	Unit	Mean	Standard Deviation	Median	Obs.	Period
Years since Established	Years	25.5	15.9	25.0		
Revenue	million Yen	687.4	2,430.5	152.0		
Ordinary Profit	million Yen	13.1	164.3	1.0	3,362,239	1995-2007
Numbers of Regular Employees	persons	22.5	255.1	8.0		

(source) By the author, referring to CRD database.

IV-2-2. Analytical Methods

Using this data, we identify inefficient and heavily indebted firms with excessive debt as proposed by Caballero et al. (2008) and Fukuda and Nakamura (2011). This concept is referred to as “zombie firms.” In this paper, we refer to them as heavily indebted firms to soften the impact of the word “zombie.” The key to the identification is the minimum required interest for firm i in period t , calculated as in equation (3) below ($I_{i,t}^*$)²⁸

$$I_{i,t}^* = r_t^S \times B_{i,t-1}^S + \left(\frac{1}{5} \sum_{j=0}^4 r_{t-j}^L \right) \times B_{i,t-1}^L + \min(r_{t-4}^C, \dots, r_t^C) \times Bond_{i,t-1}$$

$I_{i,t}^*$: minimum required interest, $r_t^{S/L/C}$: interest rate (S : short, L : long, C : corporate bond),

$B_{i,t}^{S/L}$: borrowings from banks, $Bond_{i,t}$: issued amount of corporate bonds

This value, calculated using the prime rate for short- and long-term interest rates, is interpreted as “the minimum amount of interest that would normally be paid.” Caballero et al. (hereafter CHK) considered firms that actually paid less than this amount to be inefficient, i.e., being exempted from paying interest by financial institutions. However, in usual lending, even good firms with high credit ratings are generally subject to low interest rates, reflecting their low credit risk. Taking these and other factors into account, Fukuda and Nakamura (hereafter FN) assume that “pre-tax income is less than the minimum required interest rate” and that “borrowing has increased from the previous period or actual interest is less than the minimum required interest rate.”

Using each of these criteria, we first identified heavily indebted firms. We then checked whether there was a difference in the proportion of heavily indebted firms in each group of firms that had a guarantee obligation (firms that reported a positive value) and those that did not (firms that reported zero amount rather than no response). Here, we treat the group of firms that reported a positive value for the balance of guaranteed debt as the group of firms

²⁸ The period corresponding to each balance in equation (3) is the end of the previous period ($j-1$), which is assumed to be the beginning of the period in question.

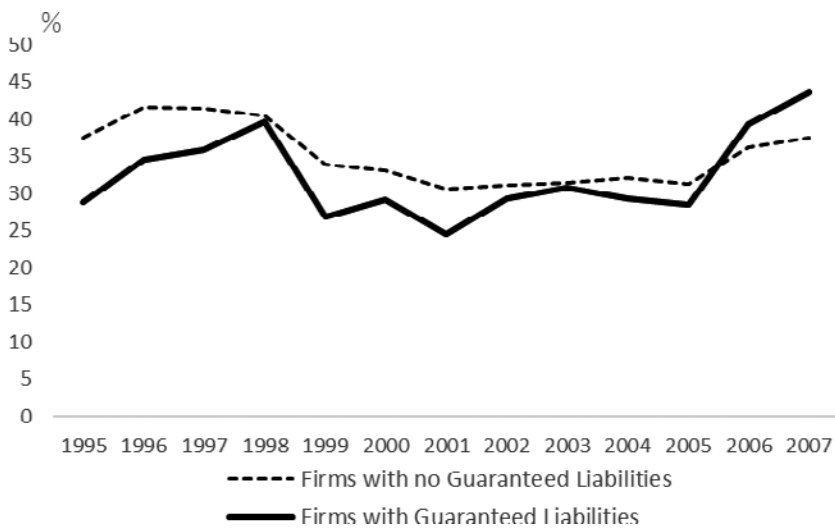
that use credit guarantees and the group of firms that reported a zero value as the group of firms that do not use credit guarantees.

IV-2-3. Results of Calculation of the Ratio of Heavily Indebted Firms

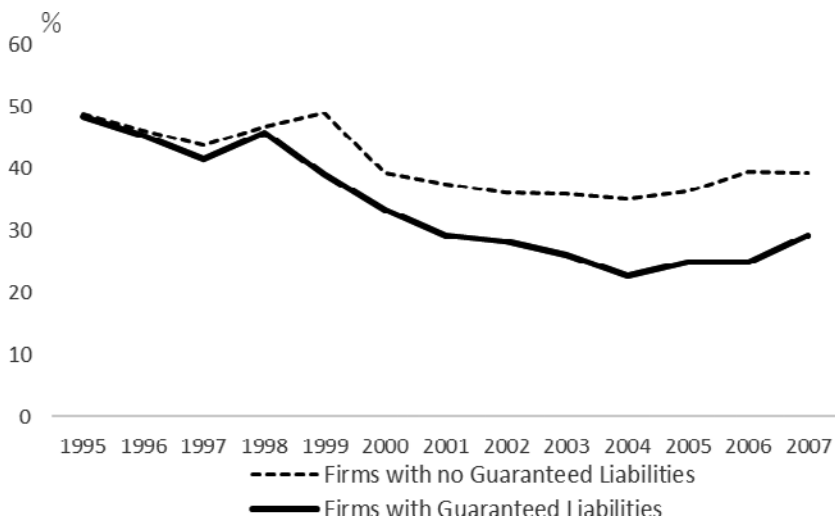
The results are shown in Figure 5, and although the shape of the graph differs between the CHK and FN criteria due to the different identification conditions, both criteria share a

Fig 5. Comparison of Highly Indebted Company Ratio

(i) CHK definition



(ii) FN definition



(note) CHK: identification criterion by Caballero, Hoshi and Kashyap (2008),
 FN: identification criterion by Fukuda and Nakamura (2011)

common feature in that the ratio of heavily indebted firms is almost consistently lower for firms with guaranteed liabilities. At first glance, it may appear that the ratio of heavily indebted firms is too high under both criteria. However, in general, the ratios tend to be high for Japanese SMEs with low profitability, and the results of this study do not indicate that the ratios are at particularly unnaturally high levels. In particular, the ratio tends to be even higher for small firms, which are included in the CRD data in large numbers.

The above results do not seem to indicate that firms with credit guarantees tend to be more heavily indebted and inefficient than the group of non-guaranteed firms as a whole. At least in terms of group comparisons, the weight of firms with better managerial performance is higher for firms with guarantees than for firms without guarantees, as far as the present criteria are concerned. This is presumably because the screening process of the credit guarantee system, which is basically a step of examination by financial institutions and CGCs, is functioning. However, in addition to the points to keep in mind regarding the data as mentioned earlier, it is also necessary to check the situation after the introduction of the special credit guarantee program. Furthermore, it should be noted that this analysis is an ex-post comparison that divides groups of firms by the presence or absence of a guarantee, and does not extract the effect itself. The identification of such pure policy effects is a topic for future research, which should be done using appropriate data and methods, while also relating it to firm dynamics (entry, exit, and growth).

V. Conclusion

In this paper, from a macroeconomic perspective, we conducted an empirical analysis of the statistical causality of Japan's credit guarantee system, which is increasingly expected to play a role in supporting the economy during recessions, with respect to short-term economic fluctuations, using real data. Granger causality was confirmed using prefectural panel data, and while causality from the real economy, such as the business cycle, to credit guarantees existed, there was no strong causality from credit guarantees to business cycle fluctuations etc. At least in recent years, quantitative trends in credit guarantees seem to be generally passive in response to the real economy. Similarly, with regard to the relationship with finance-related variables, causality was observed from finance-related variables to credit guarantee-related variables, but the reverse relationship was scarce.

Furthermore, from the perspective of long-term economic growth, the relationship between the credit guarantee program and firm performance was confirmed by processing and aggregating data from a large database of SMEs, with a particular focus on the size of the debt burden. The results show that the group of firms that receive debt guarantees have relatively less poor managerial performance than the group of firms that do not receive such guarantees. Taking the results as a whole, we did not observe any evidence that the credit guarantee system in Japan, which is becoming a common tool for economic stimulus, is in a state of over-presence leading the business cycle, or that it is a breeding ground for inefficient firms.

However, this analysis is only a verification of a specific method based on limited data. There are many issues that should be studied further in the future. In particular, there is much room to explore the relationship with other economic variables at the macro-aggregate level, such as the spillover mechanism of policy effects, in addition to the conventional microeconomic perspective on Japan's credit guarantee system, which is becoming more macroeconomically oriented. In addition, the long-term effects of credit guarantees on firm performance also need to be carefully examined in relation to firm dynamics and other factors. The same is true for measures implemented on a large scale at specific times, such as special and emergency guarantees, which have already attracted a great deal of attention. We hope that the awareness of the issues raised in this paper will lead to further research and contribute to the sound development of Japan's credit guarantee system.

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