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Measuring the Effect of Earthquake Recovery Loans for SMEs from Japan Finance Corporation

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Over two years have passed since the Great East Japan Earthquake occurred. Since the earthquake, the government has implemented many policies for recovery and rehabilitation. Japan Finance Corporation (JFC) has also supported SMEs that suffered direct or indirect damage from the earthquake as much as possible, making special earthquake recovery loans available to them. Now, JFC continues to provide its special loans.

Currently, more than a few damaged areas are still in the process of recovery and rehabilitation. However, concern about the effects brought about by the various political packages is also increasing. In this situation, it seems important to verify the effectiveness of JFC's earthquake recovery loans for SMEs across Japan during the early stage while the memories and records of those days remain intact. Hence, in this paper, we attempt to calculate the effects of the JFC loans during the period of approximately one year after the earthquake disaster.

This paper would not have been possible without the cooperation of the SMEs that responded to the "Questionnaire concerning the Effects of the Great East Japan Earthquake on SMEs" in June 2012 and their participation in subsequent direct interviews. We hereby express our hearty gratitude to those who shared their precious time for the survey.

-Abstract-

The Great East Japan Earthquake affected the economy not only in the directly damaged areas but also across all of Japan. To promote recovery from the disaster, Japan Finance Corporation made special loans available to SMEs damaged by the earthquake with more favorable interest rates and loan conditions than usual. One of the important roles of government is to support recovery from large disasters. However, on the other hand, a suitable effect should be created by policies funded by the governmental budget.

Hence, in this paper, we attempt to calculate the effect on SMEs of JFC's earthquake recovery loans. Although our calculations are tentative due to the many assumptions that need to be made, as a result of the loans during the period of approximately one year from the occurrence of the earthquake until March 2012, we estimate the employment retention effect at 601,887 persons, the sales retention effect at 7,360,300 million yen, and the value added retention effect at 1,711,100 million yen. Although it is necessary to examine the numbers with a certain amount of leeway, we can say that the loans engendered certain economic effects. In addition, the value added retention effect that we calculated exceeds the FY2011 supplementary budget of 486,900 million yen which JFC (through its Loan Sub Unit of the SME Unit, and the Micro and Individual Unit) received mainly for earthquake disaster countermeasures.

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1 The Earthquake and the Action of JFC

The Great East Japan Earthquake affected the economy not only in the directly damaged areas but also across Japan. The Cabinet Office (2011) estimated that the damage to capital stock amounted to between 16 trillion and 25 trillion yen.[1] The size of the disaster can be grasped if one considers that it far exceeds the 9.6 trillion yen loss due to the Great Hanshin Awaji Earthquake in 1995.[2] The Cabinet Office (2011) also calculated the one-year GDP decrease due to the loss of capital stock at 1.25 trillion yen to 2.25 trillion yen and the half-year GDP decrease due to the damaged supply chain at 0.25 trillion yen. Given this, the total decrease would be 1.5 to 2.5 trillion yen, or 0.3% to 0.6% of the annual GDP.[3] However, this figure does not include the effects of the consumption decrease due to the depressed mood of the people after the earthquake, the electric power shortage, economic damage caused by rumors, and the accident at the Fukushima Daiichi Nuclear Power Plant.[4] In reality, the GDP growth rate was minus 0.9% YOY (minus 3.7% annually) during January to March 2011, and minus 0.5% YOY (minus 2.1% annually) during April to June 2011.

Given this situation, as a government financial institution, Japan Finance Corporation[5] (JFC) opened "Special Consultation Counters regarding the Great East Japan Earthquake" at 152 branches all over Japan so as to enable thorough and rapid consultations on loans and repayment plans for SMEs affected by the disaster. These counters were opened on the day when the earthquake occurred.

Also, until the end of March 2012, JFC held special sessions for consultations and explanation of the loan schemes outside the branch offices 1,474 times, and JFC consulted with 261,000 SMEs at the branches and other locations. To support the operations, over 300 officers were dispatched to branches in heavily damaged areas from the headquarters in Tokyo and branches in other areas.

Regarding the loan schemes, JFC prepared special earthquake recovery loans such as the "Great East Japan Earthquake Special Recovery Loan" with more favorable interest rates and loan conditions than usual for SMEs damaged by the earthquake[6] (Table 1). Not only SMEs that suffered damage directly but also

[1] The original data was produced on May 23, 2011, by Economic Research, Cabinet Office. In addition, Disaster Management, Cabinet Office produced the estimation of 16.9 trillion yen on June 24, 2011.

[2] Estimation by Natural Land Agency in February 1995.

[3] The original data is the same as in footnote 1. As for the effects of the supply chain damage, it was assumed that there was no substitute production of parts by other companies.

[4] The Cabinet Secretariat National Policy Unit (2011) estimated the amount of damage due to the accident at Fukushima Daiichi Nuclear Power Plant to be about 5,800 billion yen as of December 19, 2011.

[5] JFC was established in October 2008. The Micro and Individual Unit of JFC succeeded the operation of National Life Finance Corporation (NLFC), the Small and Medium Enterprise Unit succeeded the Japan Finance Corporation for Small and Medium Enterprises (JASME), and the Agriculture, Forestry, Fisheries and Food Business Unit succeeded the Agriculture Forestry and Fisheries Finance Corporation (AFC).

[6] "The Great East Japan Earthquake Recovery Special Loans" started from May 23, 2011. From March 11 to May 22, JFC executed loans for SMEs damaged by the earthquake, utilizing the scheme of existing "Disaster Recovery Loans" and "Safety-Net Loans" with slightly different loan terms and conditions. The special earthquake recovery loans for SMEs, which JFC announced and which are the analysis target of this paper, include those loans made before May 22. For details about the action of JFC in response to the earthquake, refer to Japan Finance Corporation (2012a) p.10.

SMEs with indirect damage, caused by damage to customers or suppliers and by rumors, were included among the SMEs eligible for loans. In addition, loans were made not only to SMEs in the areas that suffered heavy direct damage but also to SMEs all over Japan.[7] Those special earthquake recovery loans for SMEs from JFC amounted to 2,667 billion yen as of March 2012 and another 767 billion yen from April 2012 to March 2013. Currently, JFC continues to provide these special loans[8, 9] (Table 2).

2 Problem Setting

It cannot be overemphasized that one of the important roles of government is to support recovery and restoration following a large disaster such as a massive earthquake. However, on the other hand, a suitable effect should be created by the policies funded by the governmental budget. Verification is necessary concerning what effects were achieved by JFC's special earthquake recovery loans for SMEs, and how these effects were achieved, so that we can provide much more effective support for SMEs and local economies in case another disaster occurs. Hence, in this paper, we attempt to calculate the effects of the JFC loans on the local and national economies, estimating the cumulative positive effects for each SME.

3 Previous Literature

In Japan, government financial institutions and credit guarantee corporations have released the amounts of loans and guarantees, and the number of loans, as an index which shows the effect of public finance. In their analyses referring to economic effects at a macro level, Higano (1984) and Fukuda et al. (1995) showed the cowbell effect, i.e., when the Development Bank of Japan made loans to a company, the loan amount from commercial financial institutions to the company increased. Moreover, Ookusa (2002) found that public support had a significant effect in easing procurement of equipment loans under the situation of a credit crunch. However, attempts to assess each policy effect seldom progressed in the early 2000s. Iwamoto (2004) noted "public financial institutions are just starting to introduce policy review systems, but there is no satisfying evaluation method of the benefit of the policy."

Corresponding to requests for improvement of the review of public programs, some scales, such as public finance's contribution to the foundation and maintenance of SMEs and to the employment and sales growth of SMEs that received loans, have been used in reports of

[7] In Okinawa Prefecture, where JFC does not have a branch office, the Okinawa Development Finance Corporation made similar loans (Okinawa Development Finance Corporation, 2011). However, the loans provided by the corporation are not included in the analysis of this paper.

[8] JFC provides not only loans to SMEs but also special business loans to the agriculture and fishery industries and special education loans to households which were damaged by the earthquake. As this paper concentrates on the effects of SME loans, those loans are not included in this paper.

[9] Since April 2013, JFC has made the special earthquake recovery loans only to the SMEs that have business establishments in the Special Disaster Area. For these loans, the Special Disaster Area is defined by a special law and is not equivalent to the "disaster prefectures" in this paper.

public finance institutions.

For example, National Life Finance Corporation (NLFC) (2006) calculated that, during one year, it made loans for 28,032 new business startups employing 4.3 persons including entrepreneurs and created jobs for 102,000 persons in total. In addition, NLFC (2006) showed that 11.3% of the customer SMEs were able to avoid closure of their businesses using NLFC loans, and the benefit of saving the jobs of the workers was estimated to be 21 billion yen to 111 billion yen.[10] Japan Finance Corporation for Small and Medium Enterprises (JASME) (2003) estimated that a 742 billion yen capital investment made using the equipment loans of JASME created 1,606 billion yen of production-induced effects and 89,000 persons worth of the employment-induced effects in FY2001.[11] Also, it noted that JASME's safety-net loans prevented the loss of employment of 755,000 persons who work for its customer SMEs.[12] Furthermore, as a positive impact of the policy, the Ministry of Finance (2006) pointed out not only the loans themselves but also the creation of job opportunities and sales growth due to projects implemented with loans from the Development Bank of Japan. Those indexes are continuously used in the current Annual Reports of JFC.[13]

On the other hand, Yamori (2010) did an analysis similar to that in NLFC (2006) on credit guarantees by the credit guarantee corporation. Using the data from the questionnaire sent to SMEs in Aichi Prefecture which supposed a situation where there were no special credit guarantees for the Lehman financial crisis recovery, Yamori showed that 12.0% of SMEs that obtained the special guarantees would have given up their business operations without the special guarantees. Keeping these businesses in operation saved 88,000 jobs. Lastly, considering that another 10.7% of SMEs answered that they might have sold important assets or that they would have been forced to restructure their businesses, and considering the existence of the ripple effect of discontinuance of a business, Yamori concluded that the effect of the special guarantees was actually much larger.

In addition to the analysis on the probability of giving up businesses, projects, or startups seen in the above papers, Fukanuma and Inoue (2007) estimated the effect of loans using value added as a measure, considering the change in the businesses size and ripple effects on other companies caused by the discontinuance of the businesses, in the situation without public finance. Using questionnaire data and financial statement information from NLFC customers, Fukanuma and Inoue showed that 6.2% of SMEs answered that they might have given up their businesses, and 72.9% answered that the number of employees and/or the sales amount would have

[10] Data was generated by the questionnaire sent to the customers of NLFC in 2004. Benefits are calculated using the average salary data.

[11] The estimation was made on the assumption that SMEs would cancel the projects if there were no JASMEC loans, using the Input-Output Table.

[12] The calculation was made under the assumption that the customers would abandon their business operations (i.e., employment would become zero) without the Safety-Net Loans. Hence, the effects were comparably larger than those of Fukanuma and Inoue (2007) or those of this paper, where it was assumed that SMEs did not necessarily stop operations without the NLFC loans.

[13] Ministry of Finance (2012b) contains similar data.

been affected if they could not have procured loans from NLFC. Then, the paper calculated that the employment retention effect was 1,200,000 persons (380,000 persons, if considering re-entry to other companies), and the salary retention effect was 2,030 billion yen (1,046 billion yen, if considering the existence of re-entry to other companies). Moreover, calculating that the value added retention effect other than salary was 1,164 billion yen for one year and that the value added decrease of other companies due to the ripple effect of the SMEs' operation stoppage was 280 billion yen, Fukanuma and Inoue concluded that the total value added retention effect was 2,490 billion yen.

However, if other companies immediately find substitutes for the products or services no longer produced by the SMEs, the effect in total would be 1,046 billion yen, or just the amount of the lost salary, as reduction of the value added and the ripple effects would not appear. Because immediate substitution is not so easy in the real world, Fukanuma and Inoue concluded that the value added retention effects of NLFC loans would be between 1,046 billion yen and 2,490 billion yen.[14] We utilize a similar analytical method in this paper.

Furthermore, other empirical studies have been conducted. Takezawa, Matsuura, and Hori (2005) examined the effect of the special credit guarantee by the government based on panel data classified by all prefectures. They insisted that the special guarantee decreased bankruptcy temporarily but increased the bankruptcy in the next term and thereafter, and that it is highly probable that the effect was to postpone bankruptcy. On the other hand, in the analysis of Uesugi (2008) and Uesugi, Sakai and Yamashiro (2010) using questionnaire data for SMEs, the special guarantee had the effect of easing credit crunches. Using a similar data set, Fukanuma, Nemoto, and Watanabe (2008) showed that loans from government finance institutions have a positive effect on company growth in their start-up stage.

Lastly, although it is not a direct evaluation of the public finance, Hosono et al. (2012) showed that even if the companies are outside of the core disaster area, the capital investment rate was lower when the main bank was in the disaster area compared to when the main bank was out of that area, utilizing company data following the Great Hanshin Awaji Earthquake. They insist that bank damage due to the disaster further restricted financing for SMEs.

4 Questionnaire

The data for measuring the economic effect of the earthquake recovery loans by JFC was collected using the "Questionnaire concerning the Effect of the Great East Japan Earthquake on SMEs" distributed in June 2012. The methodology is noted in Table 3. The main results are summarized at the end of this paper for reference purposes. The sample consisted of the SMEs to which the SME Unit and the Micro

[14] Also, the authors admitted that the economic effect was tentative because it was calculated based on many assumptions.

and Individual Unit of JFC provided special earthquake recovery loans from March 11, 2011, to March 31, 2012.

It was expected that answers would differ greatly by the location and the damage situation of a company. Therefore, defining the five prefectures of Aomori, Iwate, Miyagi, Fukushima, and Ibaraki as "disaster prefectures", the sample was extracted from eight sub-samples, consisting of "Micro and Individual Unit customers" [15] from "disaster prefectures" or "other than disaster prefectures"[16] "with direct damage" or "with indirect damage" [17], and respectively, "SME Unit customers" from "disaster prefectures" or "other than disaster prefectures" "with direct damage" or "with indirect damage" (Table 4).

Since the number of loans differs in every category, there were large differences among the sub-samples in the extraction rate and in the return rate to the population. Hence, we display the result by the weighted average, estimating the number of answers in the sub-sample by the return rate and the population size in the category.

For reference, among the SMEs to which JFC extended special loans, the number of "with direct damage" SMEs was 13,127 in "disaster prefectures" and 2,825 in "other than disaster prefectures." The former accounted for over 80%. On the other hand, the number of "with indirect damage" SMEs was 6,423 in "disaster prefectures" and 123,683 in "other than disaster prefectures." These data show that there were areas where the damage from the earthquake was comparatively serious in "other than disaster prefectures" such as Chiba Prefecture and that the influence of the earthquake disaster, especially indirect damage, pervaded across the country. [18] In the results, 86.6% of the population of SMEs was in "other than disaster prefectures." Therefore, the economic effect estimated in this paper, which we show later, was larger in "other than disaster prefectures" than in "disaster prefectures."

The attributes of respondent companies are shown in Figure 1. The size of the companies by the number of workers (employees and one entrepreneur) is as follows: "1 - 4 persons" accounts for 29.7%, "5 - 9 persons" 29.9%, and "10 - 19 persons" 20.4%. In total, small companies with 19 or fewer persons account for 80%. The average number of workers is 17.8 persons. As for the type of industry, "manufacturing" accounts for 18.9%, "construction" 18.5%, "service" 15.9%, and so on.

In addition, in order to supplement the questionnaire, we carried out direct interviews from August 2012 to October 2012 with SMEs

[15] As upper limit of loan amount of SME Unit is larger than that of Micro and Individual Unit, the average size of the companies of the former unit is larger than that of the latter unit. Thus, as the attribute of SMEs in each unit may be different, we divide them into the other sub-samples.

[16] Of course, also many of SMEs in "other than disaster prefectures" suffer from the direct or indirect damages of the earthquake.

[17] The sort of the disaster was defined according to what damage recovery the JFC loans were made for. Hence, "with direct damage" SMEs might suffer direct damage, and vice versa. Here, if the SME used the loan for the both kinds of damage recovery, we categorized them as "with direct damage" SMEs.

[18] Since companies' locations were defined according to the address of the headquarters, companies were classified as being in "other than disaster prefectures" when a branch office in the "disaster prefectures" suffered damage and the headquarters was in "other than disaster prefectures."

damaged by the earthquake, including SMEs that replied to the questionnaire. We visited 25 SMEs in Miyagi Prefecture (Sendai City, Shiogama City, and Ishinomaki City) and Fukushima Prefecture (Fukushima City and Koriyama City), which we categorized as "disaster prefectures," and in Yamagata Prefecture (Yamagata City, Sakata City, and Tsuruoka City) which we categorized as "other than disaster prefectures" but which nonetheless appeared to have suffered considerable damage. We will introduce some of the comments from them later.

5 Methodology of the Measurement

5.1 Concept for Measurement

The basic technique used in this paper to measure the economic effect of the special earthquake recovery loans from JFC is based on Fukanuma and Inoue (2007). As measures of evaluation, we used employment, sales, and value added, which were enabled by the loan. The concept for measurement is shown in Figure 2.

Because of the earthquake, the performance of the companies (employment, sales, and value added) declined from point A, defined as the level expected prior to the earthquake, to point B. Although some companies may have experienced improvement in their performance due to damage to their rivals or additional demand for products following the earthquake, we do not take into consideration such situations here. However, in reality, using JFC special loans, the companies' performance recovered to point C. Hence, "C - B" was assumed to be the effect of the JFC loan.

Thus, the data at point C were real data. On the other hand, the data at point A and point B were imaged. In the questionnaire, SMEs were asked to answer questions assuming that "the company could not procure special earthquake recovery loans from JFC." [19]

Estimation was made by dividing companies in two groups: "SMEs that might have stopped operations without JFC loans" and "SMEs that might have continue operations but at a lower performance level without JFC loans." The concepts for calculation of employment, sales, and value added are shown in Figure 3.

First, as for employment, we add the number of workers at SMEs that stopped operation and the amount of employment reduction at SMEs continuing operation. Similarly for sales, we add the sales of SMEs that stopped operation and the sales reduction of SMEs continuing operation; For value added, we summed the value added of SMEs that stopped operation and the reduction in value added of SMEs continuing operation.

5.2 Formula

The formulas are as follow. Details are shown on Table 5. For calculation, we first

[19] Theoretically, if we were to evaluate the effect in a statistically precise manner, we could, for example, have divided the areas with a similar level of damage into two, one where we made public support available and one where we did not make public support available, and could have observed the subsequent differences in these two groups' recovery situations. However, of course, such a method could not be executed in reality.

calculate the average data for each of 8 sub-samples, then sum up considering the population of each classification. In other words, actual calculation of Σ in the formula shown below is finished by totaling not the addition of the data of each SME but the estimation values of eight populations.

5.2.1 Retained Employment

The definition of retained employment is as stated in (i). All data is from the questionnaire.[20]

Retained Employment

$= \Sigma(\text{Employment}_{real} - \text{Employment}_{imagined})$

$= \Sigma(\text{Employment of SMEs stopping operation}_{real})$

$+ \Sigma(\text{Employment of SMEs reducing employment}_{real}$

$- \text{Employment of SMEs reducing employment}_{imagined})$

・・・(i)

5.2.2 Retained Sales

The definition of retained employment is as stated in (ii) and is based on the same concept as retained employment. Here, as well, all data is from the questionnaire.[21]

Retained Sales

$= \Sigma(\text{Sales}_{real} - \text{Sales}_{imagined})$

$= \Sigma(\text{Sales of SMEs stopping operation}_{real})$

$+ \Sigma(\text{Sales of SMEs reduced sales}_{real}$

$- \text{Sales of SMEs reduced sales}_{imagined})$

・・・(ii)

5.2.3 Retained Value Added

The definition of retained value added is as stated in (iii) and is based on the same concept as (i) and (ii).[22]

However, here, because of the limitations of the data from the questionnaire, we used the average value of the customer database of JFC for the net profit before tax, the depreciation expense, and the personnel expenses of the SMEs that stopped operations.

Moreover, for the calculation of SMEs which continue operations but decrease their value added, we directly asked not the level of profit but the amount of decrease of profit (or increase of loss) on the questionnaire.

Also, we did not take the change in depreciation into account because the question would be much too complicated to answer on the paper questionnaire. We used the JFC database average for personnel expenses as well. Lastly, we

[20] The data is from the FY2011 yearend (the end of March 2012). The "Real" employment is the sum of "the number of executives and full-time employees (except entrepreneur/CEO)" and "the number of part timers," both from the questionnaire, and "1 (entrepreneur/CEO)." The "assumed" number of employees of continuing operations but reduced employees was calculated from the real number of the employees and the reduction of "the number of executives and full-time employees (except entrepreneur/CEO)" and "the number of part timers," when JFC had not made loans were calculated from the data from the questionnaire. Also, the "assumed" number of employees of SMEs that stopped operations is defined as zero.

[21] Data was from FY2011 (April 2011 – March 2012). "Real" sales data was directly asked on the questionnaire (unit: 10 thousand yen). "Supposed" sales of the continuing operation but reducing sales SMEs was calculated with the sales and the percentage of the reduction of the sales when JFC loan did not exist. Sales of the stopped operation SMEs were supposed to be zero.

[22] Data was based on those of the fiscal year 2011 (April 2011 – March 2012).

did not consider the personnel expense reductions without reductions in employment (e.g., salary cuts for executives or employees).

Retained Value Added

$= \Sigma(\text{Value Added}_{real} - \text{Value Added}_{imagined})$

$= \Sigma(\text{Value Added of SMEs stopping operation}_{real})$

$+ \Sigma(\text{Value Added of SMEs reducing value added}_{real}$

$- \text{Value Added of SMEs reducing value added}_{imagined})$

・・・(iii)

5.3 Assumptions for Calculation

For calculation purposes, we set the following assumptions.

5.3.1 Term of Calculation (time period)

Here, we assumed that the influence of the earthquake continued for one year and calculated the effect of the JFC loans during that time. Calculation of employment was based on the point in time about one year after the earthquake (the end of March 2012). Data on Sales and Value Added were collected for one year after the earthquake (from April 2011 to March 2012). In addition, personnel expenses are calculated as of the end of March 2012. A business that has stopped operation is defined as one that has not actively conducted business during the above-mentioned period.

5.3.2 Substitution of Production and Employment

We assumed that other companies would not substitute production (or create sales or value added) even if SMEs stopped operation or decreased production.[23] Also, we supposed that workers who lost their jobs would not work for other companies.

5.3.3. Ripple Effect

We assumed that there was no ripple effect on other companies from stopping operation or decreasing production.

5.3.4 Data

As already explained, because of the limitations of the data, we utilized the JFC database instead of the questionnaire answers for several calculations; however, we supposed that there was no compatibility problem with the data.

Also, for calculations involving SMEs which continued operation but decreased their value added, we assumed that there was no change in depreciation expense and that there was no personnel expense reduction without reduction in employment. Furthermore, we assumed that the sample reflected the population correctly and that the answers to the questions including the data for the "supposed situations" were correct.

6 Results

According to the questionnaire, 27.8% of

[23] Substitutions by the SMEs which answered the questionnaire were taken into account because the "Real" data collected by the questionnaire include the increased sales or values added by the substitution of SMEs' other damaged production.

SMEs replied they would have "stopped operations," 12.0% replied they would have "decreased employees," 28.2% replied they would have "decreased sales," and 26.8% replied they would have "decreased profit" if JFC had not extended the special earthquake recovery loans to them.[24]

Figure 4 displays the result of the calculation of the effect of the special earthquake recovery loans by JFC in combination with other questionnaire data.

We estimate an employment retention effect amounting to 107,349 persons in the "disaster prefectures," 494,538 persons in "other than disaster prefectures," and 601,887 persons. Comparing these numbers with the data on estimated employed persons from the Statistic Bureau's "Labor Force Survey (FY2011)," the employment retention effect of JFC loans amounted to 2.2% of the employment in the "disaster prefectures," 0.9% in "other than disaster prefectures," and 1.0% in total.

The sales retention effect was calculated as 1,205,500 million yen in the "disaster prefectures," 6,1548,00 million yen in "other than disaster prefectures," and 7,360,300 million yen in total. If we compare this with the production data in "Prefectural Accounts (FY2009)" from the Cabinet Office, the effect amounts to 2.1% of production in the "disaster prefectures," 0.8% in "other than disaster prefectures," and 0.9% in total.

Lastly, we estimated that the value added retention effect of the loans was 267,900 million yen in the "disaster prefectures," 1,443,200 million yen in "other than disaster prefectures," and 1,711,100 million yen in total. Also comparing the value added data of the Cabinet Office's "Prefectural Accounts (FY2009)," the share of the value added retention effect against the entire value added was 0.9% of production in the "disaster prefectures," 0.3% in "other than disaster prefectures," and 0.4% in total.

The reason why the percentages of the value added retention effect were small compared with those of employment or sales was supposedly because SMEs' average salary and value added rate are lower than large companies in general.

In addition, as described already, over 80% of the effect occurred at SMEs in "other than disaster prefectures," since 86.6% of the population was in those prefectures.

It would be difficult to evaluate the numbers themselves; however, we will compare them with other JFC data already published. For example, JFC (2012a) estimated that the job creation effect of its business start-up loans is 64,213 jobs per year.[25] The employment retention effect of 601,887 persons obtained in this paper is approximately nine times that figure.

Moreover, Fukanuma and Inoue (2007) estimated that an employment retention effect of 1,200,000 people and a value added retention

[24] The weighted average of the data was used. Multiple answers were possible for "decreased employees," "decreased sales," and "decreased profit," thus some SMEs selected two or three of these options. Moreover, 34.3% of SMEs did not select any of them.

[25] FY2011 data from the Micro and Individual Unit (16,465 companies × average number of workers (3.9 persons)).

effect of 3,194,700 million yen was provided by the NLFC loans for 1,330,000 [26] companies, or all the customers of NLFC. The earthquake recovery loans accounted for about half of the effect, although we calculated the effect using 146,000 SMEs, which is only about 10% of the 1,330,000 companies in the survey above.

7 Contributions and Biases of the Estimation

The estimation in this paper was done utilizing data collected directly from SMEs which were damaged by the earthquake through a questionnaire distributed approximately one year and three months after the disaster, when memories of those days were still clear. Also, the sample size is adequate for analysis, and we made the database more precise by importing data which are difficult to obtain by questionnaire from the JFC customer database.

We can say that this paper made a certain contribution as research that verifies the positive effect of public finance because it calculated numerical values for the special earthquake recovery loans in terms of the three scales of employment, sales, and value added, using the data described above.

On the other hand, since our estimations were made under several assumptions, it is necessary to examine the numbers with a certain amount of leeway. Below, we list the biases of the estimation which should be considered.

7.1 Validity of the Term of the Calculation

We calculated the one-year effect of the disaster and JFC loans in this estimation. However, for example, among those SMEs that answered that they would have stopped operation, some might have abandoned the business completely and some might have restarted operation after six months. The estimated value would be larger if companies stopped business operation more than one year and smaller if less than one year. Thus, depending on the situation, there is a possibility of a bias in either a positive or negative direction to be considered.

7.2 Substitution of Production and Sales by Other Companies

Because the supply chains suffered huge damage from the earthquake, many companies tried to find substitutes for products formerly produced by companies that stopped production by procuring them from other suppliers or producing them within the company itself.

The Ministry of Economy, Trade, and Industry (2011) reported that, one month after the earthquake, 65% of material manufacturing industry companies and 76% of processing manufacturing industry companies were finding substitute suppliers of raw materials, parts, or components, which they had difficulty procuring just after the earthquake.[27]

[26] Data as of the end of March 2006. Loans outstanding amounted to 7,843,900 million yen.

[27] Survey conducted during April 8 to 15, 2011. Respondents consisted of 55 manufacturing companies and 25 retail and service companies. The size of the companies was not indicated; however, they seem to have been large companies considering the contents of the

Through direct interviews with SMEs, we gathered many comments about substitution, such as "because some other laundries stopped operation, we got new customers (Miyagi Prefecture, Laundry Business, 3 Workers)", and "the company owner who decided to give up the business and retire because of the tsunami disaster asked me to provide the necessary commodities to his former customers (Miyagi Prefecture, Food Wholesaler, 25 workers)."[28]

Increases in sales or value added of SMEs that responded to the questionnaire were taken into account; however, substitutions by the other companies were not taken into account. Hence, if the substitutions were made smoothly, the macroeconomic effect might be smaller than indicated by the estimation in this paper.

7.3 Workers' Reentry to Other Companies

Even if employees or entrepreneurs themselves lost their jobs because of the stopped operation or restructuring of SMEs, when they could get jobs at other companies, additional value added was created in the form of their new salary (personnel expenses).[29] In this case, the effect of the special loan from JFC is less than estimated.

However, in reality, it seems that it was difficult to find new jobs immediately, especially in the area heavily damaged by the earthquake. They might be jobless for an extended period of time, or some people, especially older workers, might give up finding new jobs.[30]

7.4 Ripple Effect

In the estimation in this paper, we did not sum up the ripple effect on other companies of stopped operation or decreasing production. If a ripple effect existed, the amount of the effect would be added on the effect of JFC loans estimated herein.[31] However, Fukanuma and Inoue (2007) calculated that the value added retention effect on other companies due to the stopped operation of SMEs would be about 10% of the total value added retention effect without the ripple effect.[32] Thus, the ripple effect does not seem to change the estimated values significantly.

7.5 Reliability of the Answers for an Assumed Situation

In the questionnaire, we asked SMEs to reply assuming "a situation in which JFC had not made the special earthquake recovery loans to your company," and 27.8% of SMEs replied that they would have stopped their operations.

In fact, through the direct interviews with SMEs, we gathered many comments about

report.

[28] However, their sales did not always exceed those before the earthquake.

[29] Fukanuma and Inoue (2007) used the data on the average time period before reentry from the Ministry of Health, Labor and Welfare "Survey on Employment Trends." The average was 2.3 to 4.1 months depending on age and gender.

[30] We did not ask ages of employees on the questionnaire. The average age of the entrepreneur/CEO was 57.6 years, and 47.6% of all were age 60 or older.

[31] Yamori (2010) commented on the existence of the ripple effect although he did not calculate it.

[32] It estimated that the ripple effect was 279,500 million yen and was 12.6% of the value added retention effect of 2,210,100 million yen.

substitution, such as "I rented a new shop and bought furniture and commodities with the special loan. If there had been no loan, I could not have restarted the business at that time (Miyagi Prefecture, Sporting Goods Retailer, 3 workers)."

However, of course, the responses were in reply to an assumed situation. Because the sample SMEs were customers of JFC and the JFC Research Institute conducted this survey, they might have an incentive to evaluate the effect of the loan more positively. Hence, it is possible that the effect might be overestimate.

For reference, examining similar research, the probability that operations would have stopped without the loans (or guarantees) was as follows. In Fukanuma and Inoue (2007), 6.2% of NLFC customers replied that operations would have stopped, and in Yamori (2010), 18.4% of SMEs replied that they used the special guarantees following the Lehman Shock.[33] The number produced by this paper is larger than those figures.

7.6 Imperfectness of the Data

Since the survey was sent to SMEs that were damaged in some way by the earthquake, we constructed a questionnaire that was as short as possible. Hence, we did not procure data such as "profiles of employees (age, gender, etc.)," or "expected change in the period of stopped operation," "probability of substitution," and "change in depreciation" when they could not have received JFC loans.

Therefore, we omitted some part of the calculations because of the shortage of data, but on the other hand, we imported some data from the JFC database to raise the accuracy.

Of course, we could make more precise estimation if we procured more detailed data by, for example, directly interviewing every SME. However, considering the cost and time of the survey both for the sample SMEs and us, the dataset for this paper may be considered to be suitable.

7.7 Deviation of Population and Respondent Companies

Looking at the difference in the response rate by the company attributes, there is a possibility that the data, such as the average value, etc., deviated slightly from the population. For example, as the larger companies tend to reply more than the smaller ones, the average size of the respondent companies was larger than the average of the population. Hence, the effect could be slightly overestimated.

In order to reduce such bias, we could have divided the categories into more than eight, for example by the size of the companies. However, because the smallest category had only 40 respondent SMEs, the errors may have been magnified if we further divided them. For those reasons, we utilized the original eight sub-samples for calculation purposes.

7.8 Possibility of Alternative Financing

[33] The data was for SMEs with fewer than five workers. It was 12.0% for all SMEs. Moreover, for SMEs fewer than five workers that used usual, or not special, guarantees, the percentage was 14.9%, and for all SMEs was 7.3%.

On the questionnaire, we asked about the hypothetical situation in which special loans from JFC did not exist. Even in such a situation, the lack of JFC loans would have been smaller if companies could have received loans from other finance institutions.

In fact, SMEs replied that, of the additional money that they needed due to the earthquake, 55.2% was procured from JFC, 31.6% from private finance institutions, and 6.2% from public institutions other than JFC, etc. Thus, we observe that they used financial resources other than JFC loans.

Moreover, 14.9% of SMEs replied that they "could procure the same amount of financing" even if they could not obtain JFC loans. However, from direct interviews, we observed several cases in which SMEs chose JFC loans when where they could not foresee the future, such as "in March and April, tourists decreased sharply and the company cash decreased as well. Although the (regional) bank credit line remained, as we did not know when sales would recover, we obtained JFC loans to maintain the the bank credit lines. Subsequently, sales recovered, and we could have survived with only bank loans. However, we believe that it was the best managerial choice to ask JFC to make the special loan at that time (Yamagata Prefecture, Restaurant, 28 Workers)."

7.9 Comparison with Other Support Schemes

Although we do not refer to them in this paper, there are many potential means to support SMEs damaged by disasters, not only loans, but also credit guarantees and subsidies. It will be necessary to make ex-post assessments of the schemes in order to realize effective reconstruction and recovery from disasters with a limited budget.

For reference, only 1.6% of respondent SMEs in the entire sample procured a subsidy. However, this includes 10.3% of the SMEs "with direct damage" in "disaster prefectures," which is larger than in other categories. On the other hand, the figure was 0.5% for SMEs "with indirect damage" even in "disaster prefectures."[34]

7.10 Continuing Special Earthquake Recovery Loans

For more than a few SMEs damaged by the earthquake, the damage due to the disaster is still continuing. There are companies that have just managed to restart their business operations. Now, JFC still continues to provide its special loans although the amount and the number of loans has decreased in recent years.

The estimation covers the special loans until March 2012; however, JFC has continued to make special loans after April 2012. The loan amount from April 2012 to March 2013 was 767,200 million yen, which was 28.8% of the amount until March 2012. Thus, the effect by the

[34] In the sample, some of the SMEs categorized as "with indirect damage" suffered direct damage. If subsidies were mainly paid for recovery from direct damage, the portion of the subsidies which supported recovery from indirect damages might have been much smaller.

JFC loans after the estimation period could be added, as well.

8 Conclusion

In this paper, we attempted to measure the effect of the earthquake recovery loans extended to SMEs by Japan Finance Corporation. As a result, we produced certain numbers concerning the employment retention effect, the sales retention effect, and the value added retention effect.

As described, although it cannot be denied that the estimated values contain biases due to the limitations of the questionnaire and the estimation methodology, we believe that we employed the best possible methodology considering the conditions at the time. We understand that the calculated numbers may contain both positive and negative biases. However, it can be agreed that there were certain economic effects.

Nonetheless, in order to fully evaluate the validity of a policy like the government earthquake recovery loans that we analyzed in this paper, we probably should consider not only the positive economic effect or benefit but also the cost incurred by the government to execute the policy.

The issue of how the total cost should be integrated also arises. For instance, if we assume a cost of 486,900 million yen, which was the amount of the FY2011 supplementary budget that JFC (through its Loan Sub Unit of the SME Unit, and the Micro and Individual Unit) received mainly for the purpose of earthquake disaster countermeasures, then the value added retention effect we calculate exceeds the cost.[35]

Detailed data is still lacking on companies and areas that suffered significant damage from the earthquake. It is our hope that future research will focus on the effects of the earthquake disaster, the tools for restoration and recovery from it, and so on, by utilizing government statistics or other questionnaire data.

We would like to thank Professor Masao Nakata of Seijo University, who provided abundant beneficial advice on the plan and execution of the survey and the preparation of this paper. Also, Professor Tadanobu Nemoto of Chuo University, Professor Wako Watanabe of Keio University, and Associate Professor Satoshi Miwa of Tohoku University kindly provided us with assistance on methodological matters. Moreover, at the Informal Research Meeting on Financial Intermediation hosted by the JFC Research Institute and Hitotsubashi University on March 21, 2013, we received many comments from an economic perspective from participants including Professor Gregory Udell of Indiana University, Professor Alberto Zazzaro of Marche Institute of Technology, Dr. Arito Ono, Senior Economist at Mizuho Research Institute, and Dr. Daisuke Miyakawa, Associate Senior Economist at Research Institute of Capital Formation,

[35] The cost is the total amount of the first through fourth Supplementary Budget for Fiscal Year 2011. For details, refer to Japan Finance Corporation (2012b) and Ministry of Finance (2012a).

Development Bank of Japan. We hereby thank these academicians and economists for their kind and sincere assistance.

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Table 1　The Great East Japan Earthquake Recovery Special Loans from JFC

Target	Loan Amount	Loan period	Interest rate
SMEs that suffered direct or indirect damage (including SMEs within the caution zone, planned evacuation zone, and emergency evacuation preparation zone of the nuclear power accident, and those damaged by harmful rumors.)	Maximum of 720 million yen (plus a separate loan limit of 300 million yen)	Equipment loan: Maximum 15 years, grace period up to 3 years (maximum of 20 years for separate loan amount, grace period up to 5 years) Working Capital Loan: Maximum 8 years, grace period up to 3 years (maximum of 15 years for separate loan amount, grace period up to 5 years)	Reduction of up to 0.5% from the standard rate (reduction by 1.4% from the standard rate for a maximum of 100 million yen for the first 3 years)

Source: JFC Website

Note: Loan conditions differ depending on the extent of the damage. Application of an expansion measure may require submission of a Disaster Certificate or other documents.

Table 2 JFC Earthquake Recovery Loans for SMEs

	Term	
	From Mar. 11, 2011, to Mar. 31, 2012	From Apr. 1, 2012, to Mar. 31, 2013
Micro and Individual Unit	145,361 14,432	47,961 4,721
SME Unit	18,236 12,240	3,650 2,950
Total	163,597 26,672	51,611 7,672

Source: The author.

Note: 1 The upper figure is the number of loans, and the lower figure is the amount of the loans (Unit: 100 million yen).

2 The number of loans are not equal to the number of SMEs, because some customers procured two or more loans.

Table 3 Methodology of the "Questionnaire concerning the Effect of the Great East Japan Earthquake on SMEs"

Date	June 2012
Sample	SMEs that procured Earthquake Recovery Loans from JFC during Mar. 11, 2011, to Mar. 31, 2012.
Method	Questionnaires were sent and returned by mail
Responses	3,207 (Response rate: 22.9%)

Table 4　Sample and Population

	Micro and Individual Unit		SME Unit		Total	
	Disaster Prefectures	Other than Disaster Prefectures	Disaster Prefectures	Other than Disaster Prefectures	Disaster Prefectures	Other than Disaster Prefectures
With Direct Damage	**12,166** 3,000 (24.7%) **587** (4.8%) [19.6%]	**2,372** 2,000 (84.3%) **230** (9.7%) [11.5%]	**961** 392 (40.8%) **151** (15.7%) [38.5%]	**453** 204 (45.0%) **76** (16.8%) [37.3%]	**13,127** 3,392 (25.8%) **738** (5.6%) [21.8%]	**2,825** 2,204 (78.0%) **306** (10.8%) [13.9%]
With Indirect Damage	**6,161** 2,000 (32.5%) **562** (9.1%) [28.1%]	**115,052** 3,000 (2.6%) **654** (0.6%) [21.8%]	**262** 98 (37.4%) **40** (15.3%) [40.8%]	**8,631** 3,306 (38.3%) **907** (10.5%) [27.4%]	**6,423** 2,098 (32.7%) **602** (9.4%) [28.7%]	**123,683** 6,306 (5.1%) **1,561** (1.3%) [24.8%]
Total	**135,751** 10,000 (7.4%) **2,033** (1.5%) [20.3%]		**10,307** 4,000 (38.8%) **1,174** (11.4%) [29.4%]		**146,058** 14,000 (9.6%) **3,207** (2.2%) [22.9%]	

Upper figure: Number of SMEs in the population.
Middle figure: Number of SMEs that were sent the Questionnaire. Figure in ( ) is the sampling fraction.
Lower figure: Number of respondents. Figure in ( ) is the sampling fraction against the population. Figure in [ ] is the response rate.

Source: The author.

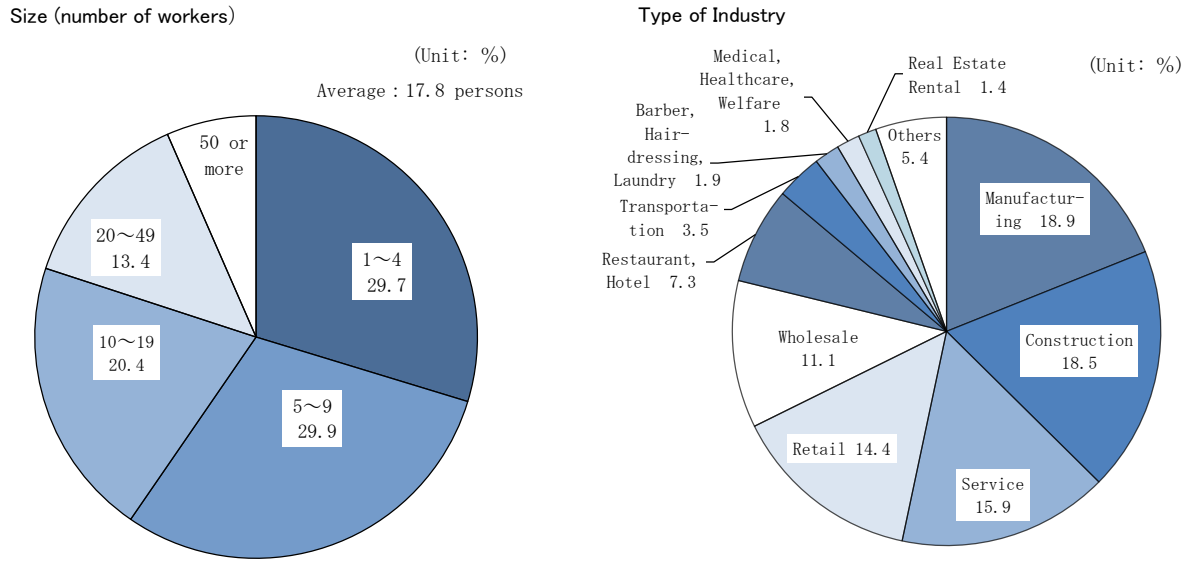
Notes: 1 The data does not represent the number of loans but the number of SMEs. Hence, it differs from that on Table 2.

2 We extracted SMEs to send questionnaires to each sub-sample. The results are calculated with weights according to the population data estimated using the sample fraction against the population.

3 "Disaster Prefectures" are the prefectures of Aomori, Iwate, Miyagi, Fukushima, and Ibaraki. "Other than Disaster Prefectures" include all other prefectures. Okinawa Prefecture is not included in the sample.

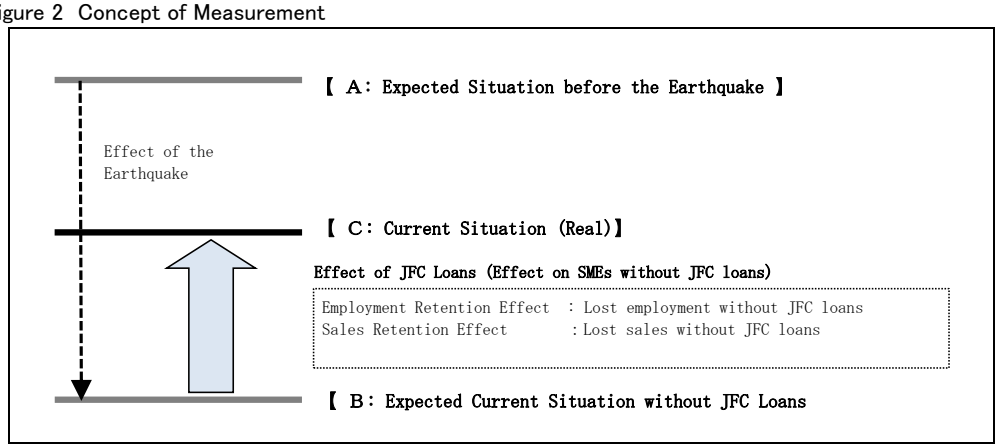
4 "Direct damage" and "Indirect Damage" refer to the type of damage to which the JFC loan was applied. When companies used the loan for both types of damage, they were categorized as SMEs with direct damage.

Figure 1 Attributes of Respondent SMEs



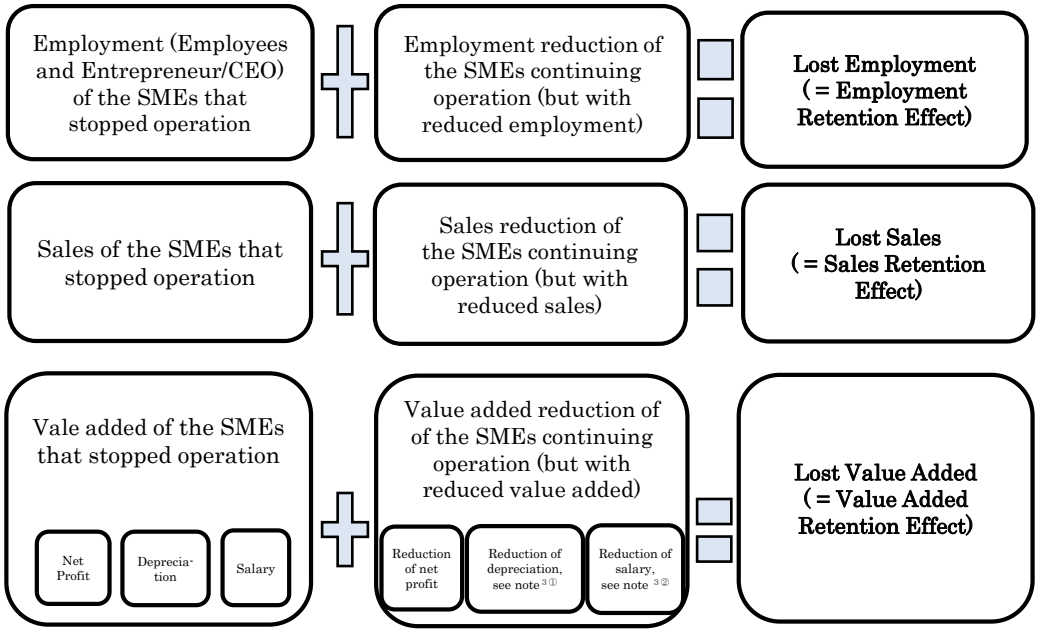
Source: Japan Finance Corporation Research Institute's "Questionnaire concerning the Effect of the Great East Japan Earthquake on SMEs" (June 2012)
Note: Workers include employees and the entrepreneur/CEO.

Figure 2 Concept of Measurement



Source: The author.

Figure 3　Concept of Calculation



Source: The author.

Notes: 1　Calculations are based on the assumption that the effect of the earthquake continued for one year.

2 It is assumed that there is no substitutional production by the other companies, and no workers find employment at other compaines.

3 The assumptions below are made when calculating the value added of the SMEs continuing operation.

① No change in depreciation (the amount of reduction is "0").

② Reduction of salary is the amount of the salaries of employees who were reducted. There was no change in the salary of the employees who were not reducted.

Table 5 Formula

① Retained Employment

$$\text{Retained Employment} = \Sigma(\text{Employment}_{real} - \text{Employment}_{imagined})$$
$$= \Sigma(\text{Employment of SMEs stopping operation}_{real}) + \Sigma(\text{Employment of SMEs reducing employment}_{real} - \text{Employment of SMEs reducing employment}_{imagined}) \quad \cdots(i)$$

where

$$\Sigma(\text{Employment of SMEs stopping employment}_{real})$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs stopping operation}) \times \text{Average}(\text{number of employees of SMEs stopping operation}_{real})\} \quad \cdots(ia)$$

$$\Sigma(\text{Employment of SMEs with reduced employment}_{real} - \text{Employment of SMEs with reduced employment}_{imagined})$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing employment}) \times \text{Average}(\text{number of employees of SMEs reducing employment}_{real} - \text{number of employees of SMEs reducing employment}_{imaged})\} \cdots(ib)$$

Here, employment / employees is the total number of hired employees plus the entrepreneur/CEO.

② Retained Sales

$$\text{Retained Sales} = \Sigma(\text{Sales}_{real} - \text{Sales}_{imagined})$$
$$= \Sigma(\text{Sales of SMEs stopping operation}_{real}) + \Sigma(\text{Sales of SMEs with reduced sales}_{real} - \text{Sales of SMEs with reduced sales}_{imagined}) \quad \cdots(ii)$$

where

$$\Sigma(\text{Sales of SMEs stopping operation}_{real})$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs stopping operation}) \times \text{Average}(\text{Sales of SMEs stopping operation}_{real})\} \quad \cdots(iia)$$

$$\Sigma(\text{Sales of SMEs reducing sales}_{real} - \text{Sales of SMEs reducing sales}_{imagined})$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing sales}) \times \{\text{Average}(\text{Sales of SMEs reducing sales}_{real} - \text{Sales of SMEs reducing sales}_{imagined})\}$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing sales}) \times \text{Average}(\text{Sales of SMEs reducing sales}_{real} \times \text{Average percentage of sales reduction}_{imagined})\} \quad \cdots(iib)$$

③ Retained Value Added

$$\text{Retained Value Added} = \Sigma(\text{Value Added}_{real} - \text{Value Added}_{imagined})$$
$$= \Sigma(\text{Value Added of SMEs stopping operation}_{real}) + \Sigma(\text{Value Added of SMEs reducing value added}_{real} - \text{Value Added of SMEs reducing value added}_{imagined}) \quad \cdots(iii)$$

where

$$\Sigma(\text{Value Added of SMEs stopping operation}_{real})$$
$$= \Sigma(\text{Revenue of SMEs stopping operation}_{real}) + \Sigma(\text{Depreciation of SMEs stopping operation}_{real}) + \Sigma(\text{Total Salary of SMEs stopping operation}_{real})$$
$$= \Sigma[(\text{number of SMEs in the Population} \times \text{percentage of SMEs stopping operation}) \times \{\text{Average}(\text{Revenue of SMEs stopping operation}_{real}) + \text{Average}(\text{Depreciation of SMEs stopping operation}_{real}) + \text{Average}(\text{Total Salary of SMEs stopping operation}_{real})\}] \quad \cdots(iiia)$$

$$\Sigma(\text{Value Added of SMEs reducing value added}_{real} - \text{Value Added of SMEs reducing value added}_{imagined})$$
$$= \Sigma(\text{Revenue of SMEs reducing value added}_{real} - \text{Revenue of SMEs reducing value added}_{imagined}) + \Sigma(\text{Depreciation of SMEs reducing value added}_{real} - \text{Depreciation of SMEs reducing value added}_{imagined}) + \Sigma(\text{Total Salary of SMEs reducing value added}_{real} - \text{Total Salary of SMEs reducing value added}_{imagined})\}$$
$$= \Sigma[(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing value added}) \times \{\text{Average}(\text{Revenue of SMEs reducing value added}_{real} - \text{Revenue of SMEs reducing value added}_{imagined}) + \text{Average}(\text{Depreciation of SMEs reducing value added}_{real} - \text{Depreciation of SMEs reducing value added}_{imagined}) + \text{Average}(\text{Total Salary of SMEs reducing value added}_{real} - \text{Total Salary of SMEs reducing value added}_{imagined})\}] \quad \cdots(iiib)$$

In real calculations for (iiia) and (iiib), we utilized the formulas (iiia') and (iiib') because of the lack of data.

$$\Sigma(\text{Value Added of SMEs stopping operation}_{real})$$
$$= \Sigma\{(\text{number of SMEs in the Population} \times \text{percentage of SMEs stopping operation})$$
$$\times \text{Average}(\text{Net profit before tax of SMEs stopping operation}_{real}$$
$$+ \text{Depreciation of SMEs stopping operation}_{real} + \text{Total Salary of SMEs stopping operation}_{real})\} \quad \cdots(\text{iiia'})$$

$$\Sigma(\text{Value Added of SMEs reducing value added}_{real} - \text{Value Added of SMEs reducing value added}_{imagined})$$
$$= \Sigma(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing net profit})$$
$$\times \text{Average}(\text{reduction of net profit of SMEs reducing net profit})$$
$$+ \Sigma(\text{number of SMEs in the Population} \times \text{percentage of SMEs reducing employees})$$
$$\times \text{Average}(\text{per person labor cost of SMEs reducing employees})$$
$$\times \{\text{Average}(\text{number of employees of SMEs reducing employees}_{real})$$
$$- \text{Average}(\text{number of employees of SMEs reducing employees}_{imagined})\} \quad \cdots(\text{iiib'})$$

Figure 4 Result of the Calculation

【Lost Employment = Employment Retention Effect】

Disaster Prefectures	107,349 persons	(2.2% of the employment in the area: 4,776,000 persons)
Other than Disaster Prefectures	494,538 persons	(0.9% of the employment in the area: 58,166,000 persons)
Total	601,887 persons	(1.0% of the total employment: 6,2942,000 persons)

【Lost Sales = Sales Retention Effect】

Disaster Prefectures	1,205,500 million yen	(1.8% of the sales in the area: 65,194,700 million yen)
Other than Disaster Prefectures	6,154,800 million yen	(0.7% of the sales in the area: 864,249,600 million yen)
Total	7,360,300 million yen	(0.8% of the total sales: 929,444,300 million yen)

【Lost Value Added = Value Added Retention Effect】

Disaster Prefectures	267,900 million yen	(0.8% of the gross product of the area 34,931,800 million yen)
Other than Disaster Prefectures	1,443,200 million yen	(0.3% of the gross product of the area 460,705,900 million yen)
Total	1,711,100 million yen	(0.3% of GDP: 495,637,700 million yen)

Source: Calculated by the author. Macro data are from the Ministry of Internal Affairs and Communication's "Labor Force Survey" (FY2011) and the Cabinet Office's "Prefectural Account"(FY2010).

Appendix: Main Results of the "Questionnaire concerning the Effect of the Great East Japan Earthquake on SMEs"

For reference purposes, we present data on SMEs such as the level of damage due to the earthquake, performance before and after the earthquake, and financing, etc., collected through the "Questionnaire concerning the Effect of the Great East Japan Earthquake on SMEs," which is the source of data used for analysis in this paper.

The methodology is noted in Table 3, the sample is shown in Table 4, and the attributes of respondent companies are shown in Figure 1 of this paper.

Herein, we present data in four categories: "A: disaster prefectures & with direct damage," "B: disaster prefectures & with indirect damage," "C: other than disaster prefectures & with direct damage," and "D: other than disaster prefectures & with indirect damage." All data in the appendix is the weighted average, the same as in the main body of the paper.

1 Level of Damage due to the Earthquake

The percentage of SMEs with direct damage due to the earthquake is shown in Appendix Figure 1. The average amount of direct damage is in Appendix Figure 2. According to the definition, the percentage is 100% for "A: disaster prefectures & with direct damage," and "C: other than disaster prefectures & with direct damage." However, 15.9% of respondents under "B: disaster prefectures & with indirect damage," and 3.9% of respondents under "D: other than disaster prefectures & with indirect damage" answered that they suffered some direct damage due to the earthquake, although JFC loans were made for the recovery from indirect damage.

The average amount of direct damage of category A was 35.5 million yen and that of C was 37.9 million yen. There was no significant difference in where they were situated in terms of how much direct damage they suffered. This is because, as described later, although category C received less damage at the headquarters (the location is defined based on the headquarters' location), some companies have branch offices or factories in the disaster area that received direct damage that was relatively large scale.

On the other hand, the amount of direct damage in categories B and D, to which JFC made loans for recovery from the indirect damage, is relatively small.

In answer to the question of what specific direct damage they received, 42.8% answered "equipment at the headquarters," 35.4% answered "headquarters' building," and 22.0% answered "equipment outside the headquarters."

Examining each category, we find that "A: disaster prefectures & with direct damage" suffered a higher level of damage to equipment or headquarters' buildings than other categories. On the other hand, "C: other than disaster prefectures & with direct damage" suffered relatively more damage outside the headquarters

(Appendix Figure 3). It is supposed that some SMEs situated in the "other than disaster prefectures" have branch offices or factories in the disaster prefectures.

As for indirect damage, 47.4% experienced "effects from the direct or indirect damage to customers or suppliers," 37.1% experienced "lack of commodities or materials", and 33.4% experienced "reluctance of consumers to buy " (Appendix Figure 4).

Looking at categories, SMEs in disaster prefectures tend to more often select each specific indirect damage; however, SMEs in other than disaster prefectures more often select "reluctance of consumers to buy " and "lack of electric power".

Concerning damage to customer companies, directly damaged SMEs have more customer companies with direct damage than do indirectly damaged SMEs, and SMEs in disaster prefectures have more customer companies with direct damage than those in other than disaster prefectures (Appendix Figure 5). This tendency is the same for the direct damage to suppliers (Appendix Figure 6). In other words, the data show that SMEs with a large amount of damage tend to have customers or suppliers with a large amount of damage.

2 Business Performance before and after the Earthquake

Next, we examine the business performance of SMEs utilizing sales, number of workers (employees and the entrepreneur/CEO), and profit level (percentage of SMEs with positive profit) during the three fiscal years before and after the earthquake. The periods are FY2010 (April 2010 to March 2011) (actual figures), FY2011 (April 2011 to March 2012) (actual figures), and FY2012 (April 2012 to March 2013) (forecast figures).

Because the earthquake occurred on March 11, 2011, most of the period in FY2010 is before the earthquake; however, some earthquake effects may appear in the data. FY2011 is the year just after the earthquake and corresponds to the period during which we calculated the JFC loan effect in the main body of the paper. The data for FY 2012 is forecast data as of June 2012, when the questionnaire was prepared.

Although not every company ends its accounting period in March, we asked every respondent SME, including sole proprietors, to provide answers for the three periods above so that we could compare and collate the data.

As for number of workers, we set the reference periods "just before the earthquake," "the end of March 2012," and "the end of March 2013."

Sales in each category tend to increase in every period except for category D in FY2011 (Appendix Figure 7). On the other hand, the number of workers decreased in FY2011 (or at the end of March 2012) for every category. However, it is forecast that FY2012 figures will almost recover to the level of FY2010 (Appendix Figure 8).

The profit level showed a clearer negative effect from the earthquake. The percentage of SMEs with positive profit declined

to 49.0% in FY2011, from 62.6% in FY2010 (Appendix Figure 9). However, from another perspective, half of SMEs increased profit even though they suffered from the earthquake. Moreover, in FY2012, the percentage is forecast to recover to 60.4%, almost the same level as in FY2010.

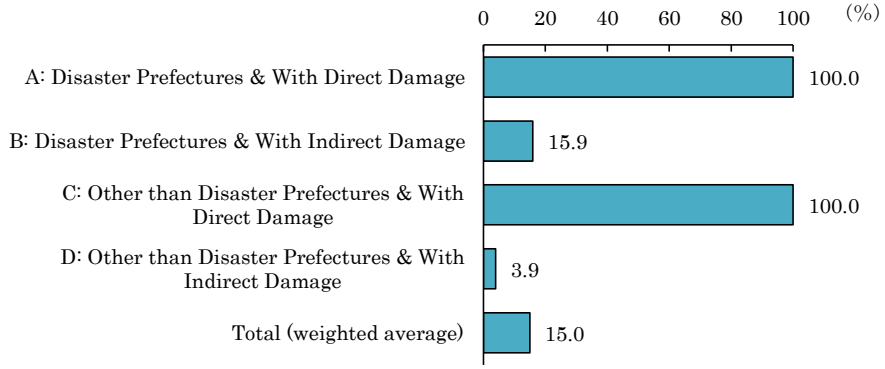
3 Funding

We ask the amount of cash needed from outside because of the earthquake damage. Category A answered that, on average, they needed 16.6 million yen for equipment procurement and 19.2 million yen for additional working capital, or 35.8 million yen in total (Appendix Table 1). Also, category C replied 20.1 million yen for equipment procurement and 30.1 million yen for additional working capital, or 50.2 million yen in total. These data show that SMEs with direct damage need not only to fund equipment but also almost an equal or significantly larger amount of additional working capital. On the other hand, the cash demand from SMEs with indirect damage is mainly for working capital.

So, how they procure the money they needed? Because every respondent SME received special loans from JFC, on average 55.2% of the cash needed was procured from JFC (Appendix Table 2). Of the remaining, 31.6% was procured from "private financial institutions," and 6.2% was procured from "public sector bodies besides JFC." The contributions of "subsidies" (1.6%) and "insurance benefits" (0.8 %) were very small.

By category, category A received significantly more "subsidies" (10.3%) and "insurance benefits" (3.4%) than the other categories.

Appendix Figure 1　Percentage of SMEs with Direct Damage due to the Earthquake



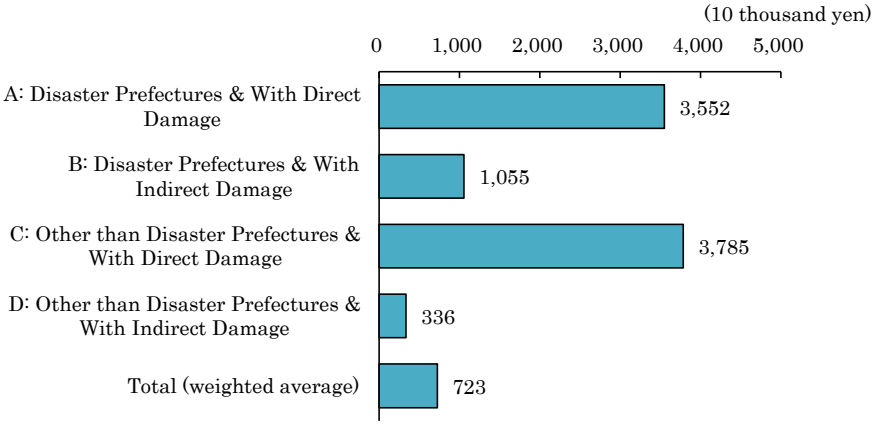
Source: Japan Finance Corporation Research Institute's "Questionnaire concerning the Effect of the Great Eastern Japan Earthquake on SMEs" (June 2012) The source is the same for the figures below.

Notes: 1 Categories A and C are 100 % according to the definition.

2 The categories are defined by the type of damage for which the recovery loans were made. Hence, categories B & D may have suffered direct damage.

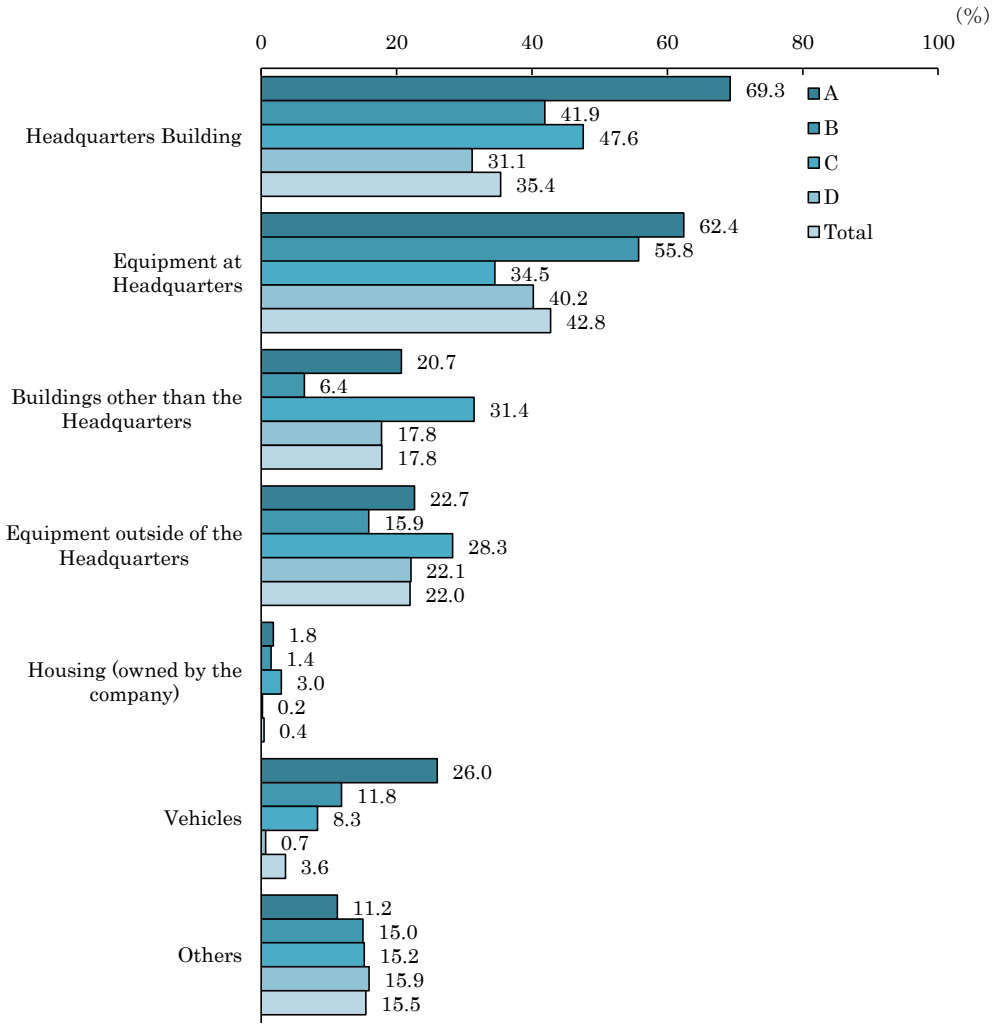
3 Sample size is omitted because we use weight values. The same shall apply hereafter.

Appendix Figure 2　Average Amount of Direct Damage



Note: Figures represent the average of the data of SMEs that suffered direct damage.

Appendix Figure 3　Specific Direct Damage (multiple answers possible)

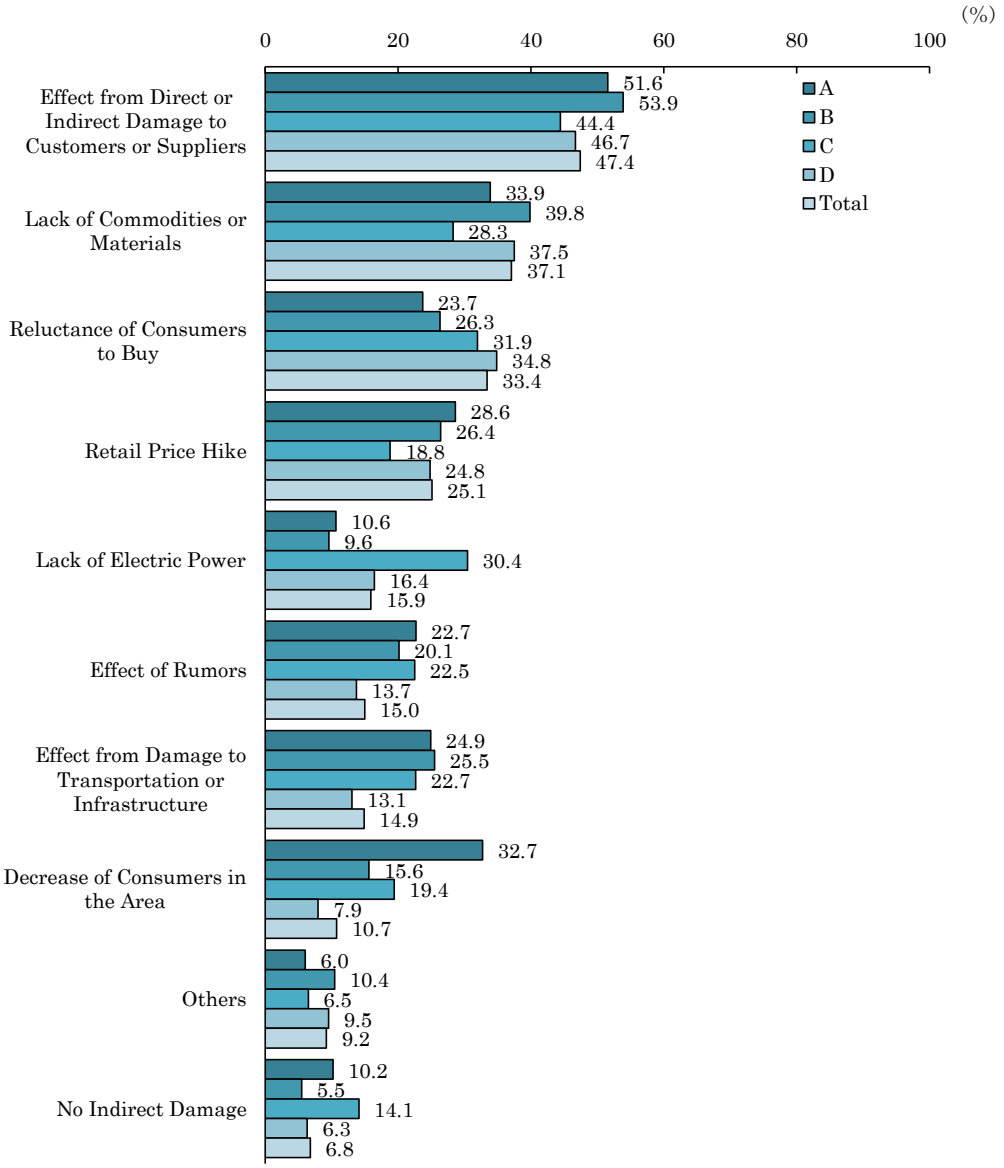


Notes: 1 The answers are from SMEs that suffered direct damage.

2 The definitions of categories A through D are the same as those for Appendix Figure 1. The same shall apply hereafter.

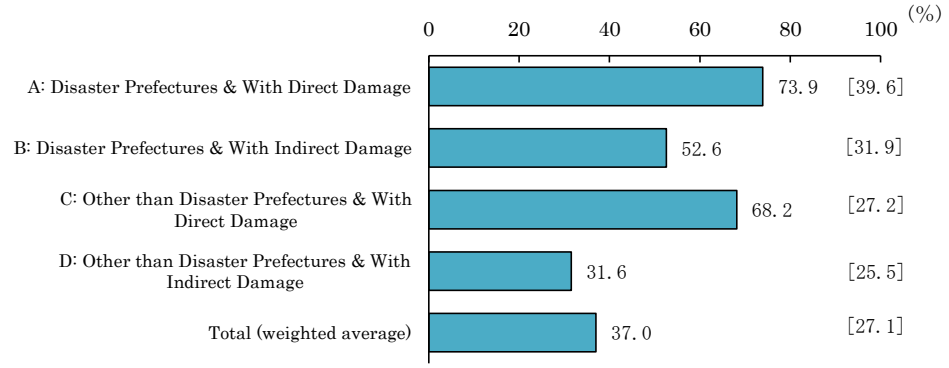
3 The total may exceed 100% because multiple answers are possible.

Appendix Figure 4　Specific Indirect Damage (multiple answers possible)



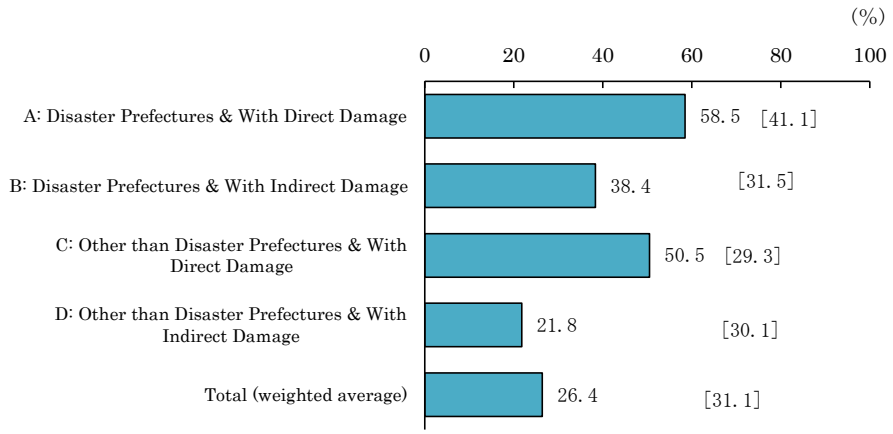
Notes: 1　Figures include SMEs with no indirect damage.
2　The total may exceed 100 % because multiple answers are possible.

Appendix Figure 5　Percentage of SMEs Whose Customer Companies Suffered Direct Damage



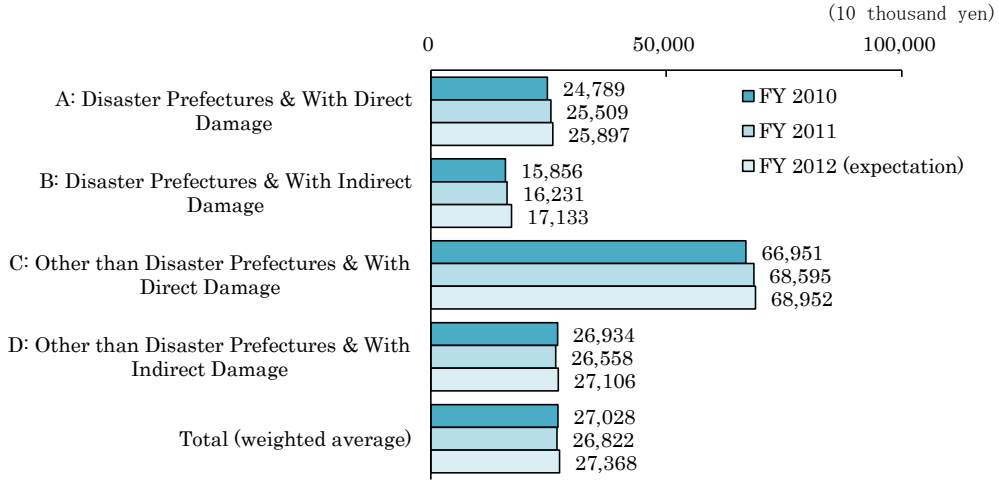
Notes: 1　Answers are from SMEs that sell to companies, in addition to or rather than consumers.
2 The figures in [　] represent the percentage of the respondents' sales amounts to customer companies with direct damage out of total sales.

Appendix Figure 6　Percentage of SMEs Whose Supplier Companies Suffered Direct Damage

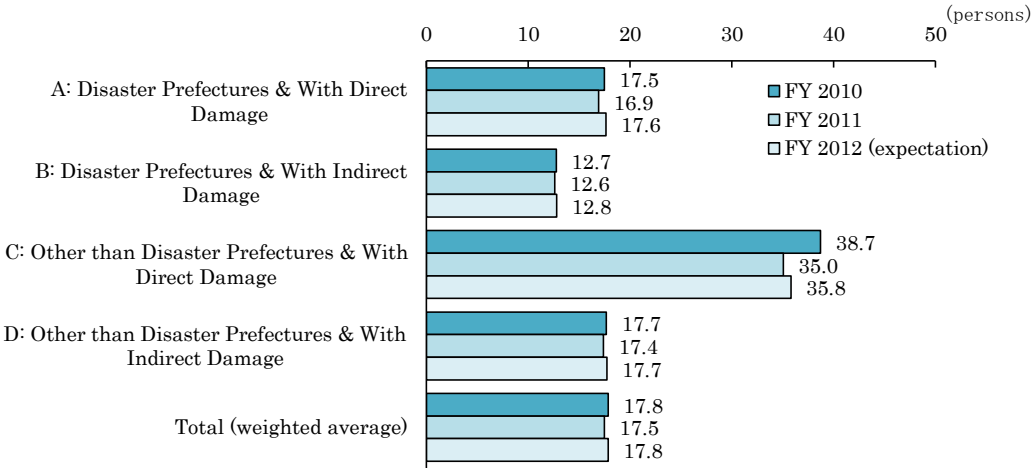


Note: The figures in [ ] represent the percentage of the respondents' procurement amount from the supplier companies with direct damage out of total procurement.

Appendix Figure 7　Average Sales

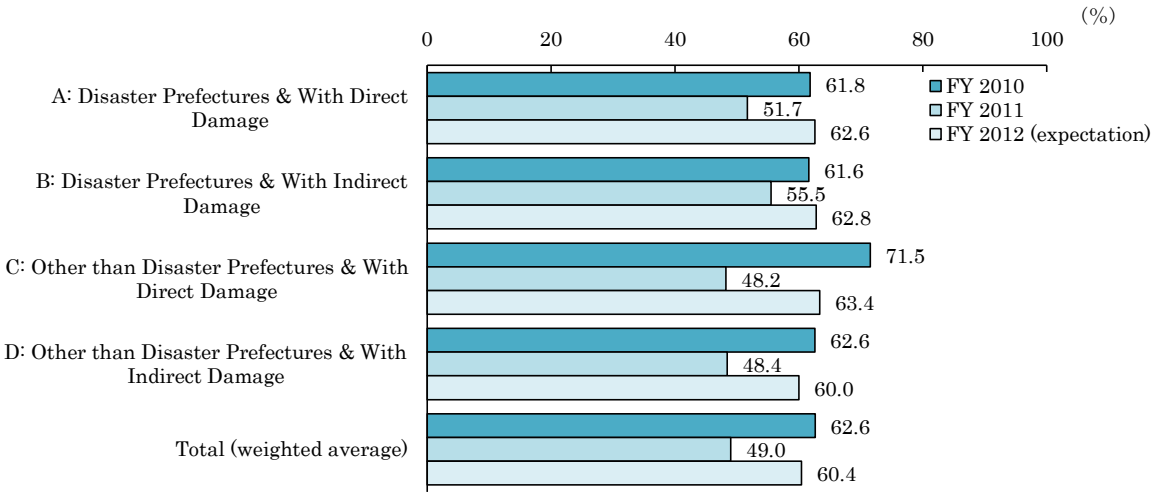


Appendix Figure 8　Average Number of Workers



Note: Workers include employees and the entrepreneur/CEO.

Appendix Figure 9　Percentage of Companies with Positive Profit



Appendix Table 1　Amount of Money Needed Additionally due to the Earthquake

(Unit: 10 thousand yen)

	Equipment Procurement	Working Capital	Total
A: Disaster Prefectures & With Direct Damage	1,661	1,916	3,577
B: Disaster Prefectures & With Indirect Damage	267	1,456	1,723
C: Other than Disaster Prefectures & With Direct Damage	2,006	3,013	5,020
D: Other than Disaster Prefecture & With Indirect Damage	159	2,201	2,360
Total (weighted average)	334	2,159	2,493

Appendix Table 2　Procurement Money Needed Additionally due to the Earthquake (Amount and Proportion)

(Unit: 10 thousand yen, %)

	Japan Finance Corporation (JFC)	Private Finance Institutions	Public Sectors besides JFC	Subsidies	Insurance Benefits	Managers / Executives	Others	Total
A: Disaster Prefectures & With Direct Damage	1,651	1,393	253	410	135	119	15	3,976
	(41.5)	(35.0)	(6.4)	(10.3)	(3.4)	(3.0)	(0.4)	(100.0)
B: Disaster Prefectures & With Indirect Damage	1,079	775	76	11	7	102	7	2,056
	(52.5)	(37.7)	(3.7)	(0.5)	(0.4)	(5.0)	(0.3)	(100.0)
C: Other than Disaster Prefectures & With Direct Damage	2,775	1,595	355	156	49	111	39	5,081
	(54.6)	(31.4)	(7.0)	(3.1)	(1.0)	(2.2)	(0.8)	(100.0)
D: Other than Disaster Prefectures & With Indirect Damage	1,605	864	174	9	12	111	23	2,797
	(57.4)	(30.9)	(6.2)	(0.3)	(0.4)	(4.0)	(0.8)	(100.0)
Total (weighted average)	1,609	922	180	48	24	111	22	2,915
	(55.2)	(31.6)	(6.2)	(1.6)	(0.8)	(3.8)	(0.7)	(100.0)

Note: The data here are not necessarily equal to the data on Appendix Table 1.