Recession, Unemployment, and Suicide in Japan*

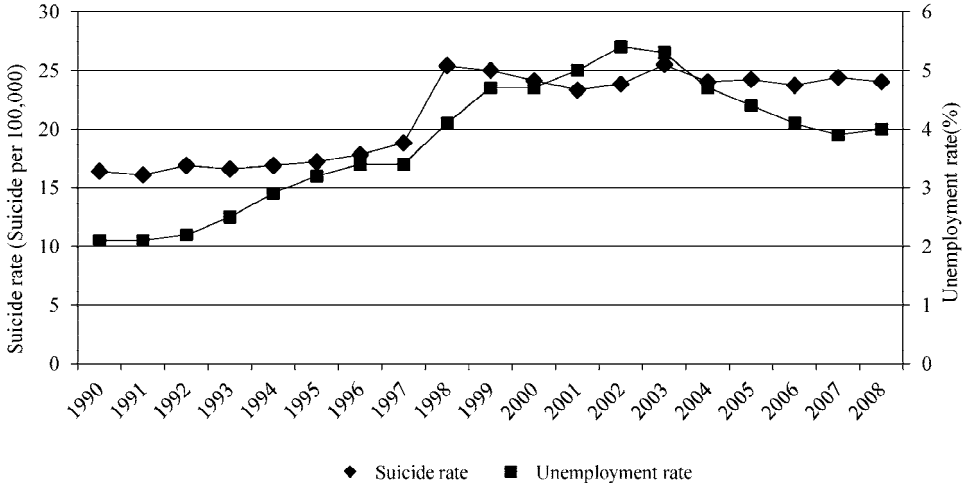
Joe Chen *National Chengchi University*
Yun Cheong Choi *Yonsei University*
Kota Mori *Yale University*
Yasuyuki Sawada *University of Tokyo*
Saki Sugano *University of Tokyo, Japan Society for the Promotion of Science*

Unemployment has become one of the most serious issues in the current labor market in Japan, and empirical studies from the viewpoint of theoretical economics have progressed significantly with regard to determinants for employment and unemployment in Japan. However, empirical studies into various costs of unemployment incurred by individuals, households, and society as a whole have not necessarily been sufficient due to a lack in available individual data in the country. In particular, a strong correlation between the unemployment rate and the suicide rate has been observed in Japan, which suggests that public and private safety nets against unemployment are not functioning well enough. This paper considers the background of the strong correlation between unemployment and suicide in Japan and what sort of strategic responses should be taken from the perspective of labor market policies and social security policies, mainly focusing on three points of view. Firstly, we focus on the characteristics of suicide in Japan, i.e. the sharp increase in the total number of suicides from 1997 to 1998, the fact that the annual number of suicides has remained at a constant level in excess of 30,000 for the more than ten years since 1998, and the gradual increase in younger suicide victims over years. Secondly, the paper introduces research that clarifies the correlation between suicide and unemployment in Japan, based on cross country data, in comparison with other OECD countries. Here, the comparison revealed the fact that in Japan, the suicide rate shows an especially strong correlation with the unemployment rate. Thirdly, the paper demonstrates a strong correlation between the suicide rate and the unemployment rate among men in Japan, based on domestic panel data by prefecture. The association between non-regular job status and suicide are also investigated using a quinquennial panel data. After discussing these three points, the final section provides a consideration on preferable countermeasures against suicide to be taken in the future.

I. Introduction

Unemployment has become one of the most serious issues in Japan's current labor market. The overall unemployment rate in postwar Japan had maintained an extremely low level compared with other OECD countries, but as shown in Figure 1, it showed a sharp rise from 1997 to 1999, in particular. During the economic slowdown in 2001 and 2002, the unemployment rate began to rise again, and following the subsequent decline, it started to

* This paper is an extended version of Sawada, Choi, and Sugano (2010).



Sources: Suicide rates show the number of suicide victims (among 100,000 people), obtained from *Vital Statistics of Japan* by the Ministry of Health, Labour and Welfare. Unemployment rates show overall, nationwide unemployment rates for people aged 15 or over in all industries, and were obtained from the *Labor Force Survey* by the Ministry of Internal Affairs and Communications.

Figure. 1 Changes in Suicide Rates and Unemployment Rates in Japan

rise at the end of 2008, reaching 5.6% in July 2009. Although the rate slightly declined to 4.9% in January 2010, it has remained at a relatively high level. By age group, for both men and women, the overall unemployment rates among those aged between 15 and 24 and those aged between 25 and 34 continued to rise from 1990 to 2003, and reached 10.1% and 7.1%, respectively, in July 2009. The jobs-to-applicants ratio also has declined sharply since 2008, with a rapid expansion of employment adjustments, including the termination of dispatched and non-regular employees' employment contracts.

Under such circumstances, empirical studies from the viewpoint of theoretical economics have progressed significantly with regard to determinants for employment and unemployment in Japan (Genda 2004; Imai et al. 2007; Ohta, Genda, and Teruyama 2008; Esteban-Pretel, Nakajima, and Tanaka 2009; Genda, Kondo, and Ohta 2010). These are of importance as research aiming to empirically clarify structures of the Japanese labor market that faced rapid changes in the 1990s, such as increases in the unemployment rate and the number of young people without jobs, expansion of temporary and other non-regular employment, and decreases in self-employed workers and small and medium-sized enterprises. However, empirical studies into various costs of unemployment incurred by individuals, households, and society as a whole have not necessarily been sufficient, due to a lack of available individual data in Japan. If unemployment insurance or other public safety nets, or

various private safety nets including support against unemployment offered by individuals, households, or organizations are functioning well, the costs of unemployment incurred by individuals who have lost their jobs should not be too large. On the other hand, if such public or private safety nets are not functioning well enough, the costs of unemployment are likely to become intensively focused on individuals, often in excess of their capacity. Such intensive imposition of the costs of unemployment may lead to disastrous results, such as suicide.

Hamermesh and Soss (1974) is a pioneering research article in the field of economics on the theme of suicide. They consider suicide as an action resulting from a rational choice, and conclude that a person chooses to commit a suicide when his/her expected lifetime utility falls below his/her personal threshold. Based on such a model, a higher unemployment rate is expected to increase suicides since unemployment not only causes difficulties in the short-term living environment but also increases uncertainties over income that preclude a clear future forecast and creates a decline in lifetime income (Suzuki 2008). Furthermore, unemployment is often associated with mental or physical disorders, which increases the risk of suicide in a complex and serious manner. In reality, many empirical studies have demonstrated a correlation between high unemployment rates and high suicide rates (Platt 1984; Chen et al. 2012; Sawada and Sugano 2009).[1] As can be observed in Figure 1, the correlation between the unemployment rate and the suicide rate is especially strong in Japan. Furthermore, Chen, Choi, and Sawada (2009) indicate that this correlation is larger in Japan than in other OECD countries.

This paper considers the background of the strong correlation between unemployment and suicide in Japan and what sort of strategic responses should be taken from the perspective of labor market policies and social security policies. The composition of this report is as follows. In Section II, the socioeconomic characteristics of suicide in Japan are compiled and their correlation with unemployment is outlined. In Section III, the correlation between suicide and unemployment in Japan is clarified, based on cross country data, in comparison with other OECD countries. In Section IV, their correlation is further analyzed, based on domestic panel data by prefecture. In the final section, preferable countermeasures against suicide are discussed.

II. The Sharp Increase, the Consistency in Subsequent Numbers, and Increasingly Younger Victims: Socioeconomic Characteristics of Suicide in Japan

According to the *Overview of Suicide in 2008* published by the National Police Agency in May 2009, the total number of suicide victims in 2008 was 32,249 (of whom 22,831 were men). The number of suicide victims increased sharply in Japan from 1997 to

[1] See Chen et al. (2012) for an extensive survey of economic studies on suicide.

1998, and thereafter over 30,000 people have killed themselves every year for 11 years in succession. In other words, approximately 90 people died from suicide every day for over ten years. Suicide in Japan has three characteristics, i.e. the sharp increase in the total numbers from 1997 to 1998, the fact that the annual number of suicides has remained at a constant level in excess of 30,000 for the more than ten years since 1998, and the gradual increase in younger suicide victims over the years (Chen et al. 2009b).

Due to such characteristic features, suicide is recognized as one of the most serious social problems in Japan, and various measures to prevent it are now being implemented. As it is widely known that the most frequent factor directly leading to suicide is depression, suicide in Japan has been treated as a problem mainly caused by mental illness such as depression. Based on the aforementioned report by the National Police Agency, the causes or motives of suicide were identified for about 23,000 out of the 32,249 suicide victims in 2008. The most common cause was health problems for about 15,000 victims, followed by financial or life-related problems, family problems, and job problems. Among the 15,000 victims who committed suicide because of health problems, for the largest number, or around 6,000 of them, the reason was depression. Given these facts, various measures have been taken mainly from a psychiatric viewpoint to clarify the mechanism of suicide and prevent it from occurring. On the other hand, the causes of suicide have rarely been explored in great enough depth to touch on the social context that brings about mental illness.

However, as analyzed in detail in the *2008 White Paper on Suicide*, causes of suicide are not limited to depression, but involve various risk factors, and it is highly possible that the socioeconomic structure in itself is a part of the problems that generates such risk factors. These include discord in the family, debt, physical illness, poverty, working environment, and unemployment. The *2008 White Paper on Suicide* points out that each victim had four risk factors on average, and these factors formed a chain that led him/her to commit suicide. Therefore, unless measures to eliminate such risk factors are taken along with treatment for depression, efforts to prevent suicide could be less than effective. In reality, health problems and depression are considered to be at the very final stages leading to suicide, and socioeconomic context or problems with the socioeconomic structure that drive a person to commit suicide often tend to be hidden. Unless these context and structures are clarified, it will likely be impossible to establish any effective measures to prevent suicide.

1. The Sharp Increase in the Total Number of Suicides

One of the characteristics observed in the trends of suicide rates in Japan as shown in Figure 1 is the sharp increase in the total number of suicide victims during the financial crisis from 1997 to 1998, as the number rose by around 35%, from 24,391 to 32,863 suicides.[2] Due to the prolonged recession after the burst of the bubble economy, Yamaichi Securities Co., Ltd. collapsed into bankruptcy in 1997, and Long-Term Credit Bank of

[2] Based on the *Overview of Suicides in 2008* (May 2009) by the National Police Agency.

Table 1. Decomposition of Suicide Growth Rate from 1997 to 1998
(The Number of Suicide Victims by Job Type)

	Year	
	1997	1998
Number of suicide	24,391	32,863
Suicide growth rate		34.73%
Self-employed		5.44
Managial officials		0.81
Employed		9.28
Housemakers		2.02
Jobless people		15.07
Students		0.82
Unknown		1.29

Source: Suicide Analysis Project Team (2008).

Japan failed in 1998. The increase in the number of suicides was especially noticeable in March of 1998. March is the closing month of the fiscal year, and in particular in 1998, the financial authorities strengthened their inspections into financial institutions' capital adequacy ratios, which precipitated many financial institutions into credit crunches or credit withdrawal, triggering the bankruptcy of a number of small and medium-sized businesses and micro-enterprises. According to empirical studies by Watanabe et al. (2006) and by Kyoto University (2006) that analyzed monthly time series data of male suicide victims from July 1997 to December 2004, monthly changes in the number of completely unemployed men and the bankruptcy of companies with total liabilities of 10 million yen or more have an extremely strong correlation with monthly changes in the number of male suicide victims. These studies show that the number of male suicide victims increased sharply in March 1998, in particular, in tandem with increases in unemployment and corporate bankruptcies around the close of the fiscal year. This sharp increase in the number of suicide victims in Japan at the time of the financial crisis from 1997 to 1998 suggests the significance of correctly ascertaining the socioeconomic context of suicide.

What age group and job category brought about the dramatic 35% increase that occurred during 1997 and 1998? We decompose the increase in the number of suicides by the contribution ratio of each group for quantitative understanding and consideration (Suicide Analysis Project Team 2008; Chen et al. 2009a).[3] When breaking down the increase from 1997 to 1998 by age group, around 25% of the aforementioned 35% was due to the 45 or

[3] See Mori et al. (2011) for the decomposition techniques.

Table 2. Decomposition of Suicide Growth Rate from 1997 to 1998
(The Number of Suicide Victims by Motive)

	Year	
	1997	1998
Number of suicide	24,391	32,863
Suicide growth rate		34.73%
Family		3.36
Health		12.75
Economic or financial		10.26
Employment related		2.65
Relationship		0.68
School		0.31
Others		2.24
Unknown		2.48

Source: Suicide Analysis Project Team (2008).

over age group, showing the significant contribution of middle-aged victims to the overall increase in the suicide rate. Table 1 shows the breakdown of contribution ratios by job category among the rate of increase (34.73%). The highest is the contribution ratio of unemployed people, at 15.07%, followed by that of employed people at 9.28%, and that of self-employed people at 5.44%. It should be noted that the unemployed here include elderly retirees, but these results imply that the sharp increase in the number of suicides at the time of financial crisis in Japan was closely related to unemployment.

Table 2 also shows the breakdown of contribution ratios by motive among the rate of increase. Out of the 34.73% increase, 12.75% of suicides were due to health problems and 10.26% were due to financial or life-related problems. This is in line with the fact that the most common direct cause of suicide in Japan is depression, but at the same time, the significant contribution ratio of financial or life-related problems matches with the possibility that socioeconomic context and structural problems, such as unemployment, debt, poverty, and working environment, are hidden factors behind depression.

2. The Consistently High Numbers and Increasingly Younger Victims

Secondly, it is effective to analyze trends in suicide rates after the sharp increase from 1997 to 1998 so as to ascertain another feature, the fact that the annual number of suicides has remained at a constant level in excess of 30,000 for the more than ten years since 1998. Table 3 shows the breakdown of the growth rate of the number of suicide victims from 1998 to 2007 (-1.918%) by age group. The overall rate decreased slightly, but the suicide rate for

Table 3. Decomposition of Suicide Growth Rate from 1998 to 2007
(Suicide Rate by Age Group and Population)

Suicide growth rate	Aged 00-19	Aged 20-39	Aged 40-59	Aged 60-79	Aged 80 or over
-1.918%	-0.659	2.606	-4.393	0.796	0.167

Source: Chen et al. (2009a).

middle-aged people, which had played a central role in the increase from 1997 to 1998, contributed negatively, subduing the overall number and rate of suicides. Instead, the suicide rates for those in their 20s and 30s have increasingly contributed to the overall increase and offset the negative contribution of the middle-aged group. This is the third feature of suicide in Japan, i.e. an increase in younger suicide victims, which has worked to produce the second feature, the consistency in the number of suicides in Japan.

III. Characteristics of Suicide and Unemployment in Japan and Comparison with Other OECD Countries

According to the World Health Organization (WHO), approximately 3,000 people commit suicide every day, and about every 30 seconds, one suicide-related death is reported.[4] Furthermore, based on the tabulation by the WHO, Japanese suicide victims amounted to 24 per 100,000 people in 2004 (35.6 per 100,000 men and 12.8 per 100,000 women), more than double of the figures for the United States for 2002 (11 per 100,000 people; 17.9 per 100,000 men and 4.2 per 100,000 women), and representing a significantly higher level than other developed countries.[5] We tried to clarify the correlation between suicide and unemployment in Japan through such international comparison.

Chen, Choi, and Sawada (2009) clarified determinants and characteristics of suicide in Japan based on data for 21 OECD countries from 1980 to 2000 that allow for an international comparison. More specifically, multiple linear regression analysis is conducted by using the suicide rate as a dependent variable and various socioeconomic indices as explanatory variables.[6] These explanatory variables include per capita GDP levels, per capita GDP growth rates, unemployment rates, female labor participation rates, birthrates, divorce

[4] WHO (2007) "World Suicide Prevention Day," on September 10, 2007 (http://www.who.int/mediacentre/news/statements/2007/s16/en/index.html).

[5] The highest figures in the world for 2004 were those for Lithuania (40.2 per 100,000 people; 70.1 per 100,000 men and 14.0 per 100,000 women). For Russia, the figures for 2004 were 34.3 per 100,000 people (61.6 per 100,000 men and 10.7 per 100,000 women). These figures are based on WHO (2007) "Country Reports and Charts Available" (http://www.who.int/mental_health/prevention/suicide/country_reports/en/index.html).

[6] See Chen, Choi, and Sawada (2008 and 2009) for data sources.

rates, and the Gini coefficient, which shows inequality of income.[7] Furthermore, this paper makes its estimates presuming that these factors affect Japan differently than other countries, and the international comparison based on multiple linear regression analysis has revealed the following three points. Firstly, correlation between socioeconomic variables and the suicide rate varies by gender and age group. In particular, compared with the suicide rate for men, the rates for women and older people show a weaker correlation with socioeconomic variables. Secondly, the suicide rates are generally lower in countries with better economic conditions, which have achieved high economic growth or whose people enjoy high income, as well as in countries where income equality has been achieved. Thirdly, it became clear that the suicide rate in Japan has a stronger correlation with economic conditions compared with other OECD countries. In Japan, economic variables, such as recessions, high unemployment rates, and income inequality, are more closely related to the suicide rate than social variables, such as the divorce rate, birthrate, female labor participation rate, and alcohol consumption.[8]

Based on the regression coefficient employed by Chen, Choi, and Sawada (2009), the positive correlation observed between high unemployment rates and high suicide rates in Japan, i.e. that for men, a 1% point rise in the overall unemployment rate is accompanied by an approximately 25-per-100,000-person increase in the number of suicide victims, is statistically significant. While the correlation is not statistically significant for women, it is for men, and particularly for men aged 65 or over, who show a high coefficient for the unemployment rate of 39 per 100,000 people. According to the Oaxaca analysis conducted by Chen, Choi, and Sawada (2009), around 19% of the differences in suicide rates between Japan and other OECD countries from 1980 to 2000 can be explained by stronger influence of the unemployment rate on the suicide rate in Japan.

In addition, the female employment rate and the suicide rate show a positive correlation in Japan, with the tendency being especially notable among older men and younger women (aged 25 to 44). Kohara (2007) indicates that when the head of household (husbands) lose their jobs against their will, their spouses' (wives') labor supply is apt to increase, in particular, among poor households with low levels of financial assets. The female employment rate can therefore be used as an indicator to show households' poverty levels, and the positive correlation between the female employment rate and the suicide rate observed here may accurately indicate economic difficulties caused by unemployment of their

[7] Furthermore, in order to eliminate false correlations due to time trends and features unique to individual countries, fixed effects for countries and yearly linear trends are also added. See Chen, Choi, and Sawada (2009) for data sources.

[8] Per capita GDP shows a negative correlation with the suicide rate for both men and women. That is, low income is closely related to high suicide rates. Such a tendency is especially notable in middle-aged and older men (those aged 45 to 64 and those aged 65 and over). Furthermore, low economic growth rate shows a strong correlation with high suicide rates, and this is especially notable with middle-aged and older men (those aged 45 to 64 and those aged 65 or over) and women aged 25 to 44. These groups are highly likely to be vulnerable to the risk of income reduction.

spouses, or a correlation between the suicide rate and the poverty of single-female-parent households.

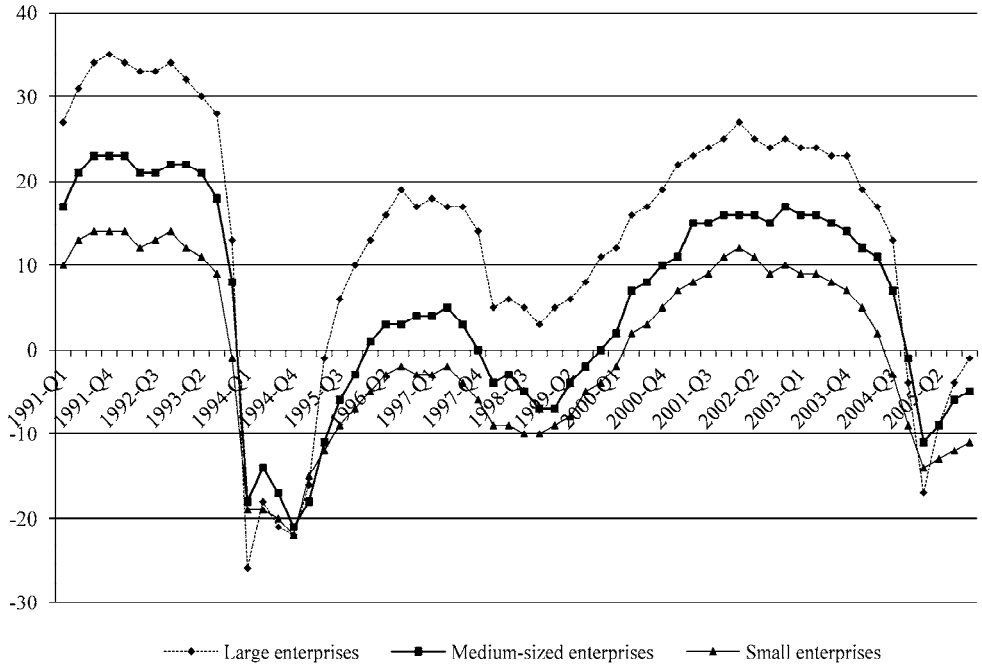
These study results suggest that quantifiable socioeconomic variables are correlated to the suicide rate more strongly in Japan than in other OECD countries, and that there is a high possibility that suicides in Japan are brought about by financial factors, in particular. The unemployment rate has been identified as one of the most significant of those financial factors. This means that the national government should play a more significant role through measures to counter unemployment, setting observable indices as its policy targets.

IV. Correlation between Suicide and Unemployment in Japan after the Financial Crisis

Let us further analyze the characteristics of suicide in Japan, i.e. the sharp increase in the total number, the consistency in the subsequent numbers, and the increase in younger suicide victims. As a means to examine how the credit crunch occurred, as this is considered to be the characteristic feature of the financial crisis from 1997 to 1998 in Japan, it is effective to utilize the Short-Term Economic Survey of Enterprises in Japan (*Tankan*), a statistical survey of enterprises conducted and published quarterly by the Bank of Japan. Figure 2 shows the results obtained, based on the *Tankan* survey, by subtracting the contribution ratios (%) of enterprises responding that financial institutions' lending attitudes were "sever" from the contribution ratios (%) of enterprises responding that they were "accommodative." Lower figures indicate severer attitudes on the part of financial institutions. In the first quarter of 1998, the index showed a dramatic drop, which is considered to reflect the occurrence of the credit crunch and credit withdrawal. Similar tendencies can be observed in the DI relating to target enterprises' financial positions.

The rise in the suicide rate in Japan since 1998 has come in tandem not only with the rise in the unemployment rate as shown in Figure 1, but also with the deterioration of debt problems caused by the credit crunch and credit withdrawal, as shown in Figure 2. In March 1998, in particular, the number of male suicide victims increased significantly along with the increase in unemployment and corporate bankruptcies around the close of the fiscal year. Careful analysis is further required to conclude whether the credit crunch and credit withdrawal actually had a *causal connection* with the increase in suicides of small and medium-sized business owners and self-employed workers at the beginning of 1998 and the increase in suicides among the jobless, which had increased due to corporate downsizing, but there is clearly a strong *correlation* among these variables.

Therefore, let us proceed to clarifying the correlation between the suicide rate and the unemployment rate and corporate bankruptcies through regression analysis, using panel data by prefecture. Here, we use two types of data, i.e. quarterly panel data and annual panel data.



Source: Short-Term Economic Survey of Enterprises in Japan (Bank of Japan).

Figure 2. DI of the Lending Attitudes of Financial Institutions

1. Analysis Using Quarterly Panel Data by Prefecture

The quarterly data used here are for the two years from the first quarter of 1997 to the fourth quarter of 1998. The dependent variable is the number of male suicide victims per 1,000 people by prefecture, based on data from the National Police Agency. As explanatory variables, we obtained overall unemployment rates by prefecture from reference materials for the *Labor Force Survey*, and the monthly number of bankruptcies among small and medium-sized enterprises by prefecture from data of the Organization for Small & Medium Enterprises and Regional Innovation, JAPAN. Furthermore, in order to diminish the endogeneity bias caused by the correlation between the bankruptcy variable and error terms in the regression analysis, the DI of the lending attitudes of financial institutions and the DI of financial positions from the *Tankan* survey are used as manipulated variables for the bankruptcy variable. We obtained the DIs from each branch of the Bank of Japan and allocated the same figures to the prefectures covered by each branch to use them as panel data by prefecture. These diffusion indices vary significantly depending on supply-side factors that fluctuate due to changes in the system, such as the strengthening of capital adequacy requirements imposed on financial institutions by the financial authorities. They are thus considered to have a weaker correlation with the suicide rate and can be used as

Table 4. Regression Analysis of Suicide Rates Using Quarterly Panel Data
(Dependent variable: Number of male suicide victims per 1,000 people)

	(1)	(2)	(3)	(4)
	Fixed Effect Regression	Fixed Effect Regression	IV (lending attitude DI)	IV (financial position DI)
Unemployment rate	0.42426***	0.35452***	-0.09331	-0.13141
	[0.106]	[0.106]	[0.180]	[0.191]
N of bankruptcy#		0.07200***	0.75033***	0.81379***
		[0.023]	[0.133]	[0.149]
Constant	0.01273***	0.00807**	-0.01759**	-0.02043**
	[0.004]	[0.004]	[0.008]	[0.009]
Prefecture fixed effect	YES	YES	YES	YES
Quarter fixed effect	YES	YES	YES	YES
Observations	376	376	301	301
R-squared	0.083	0.111		
Number of prefectures	47	47	39	39

Note: Figures in parentheses are robust standard errors. *, **, and *** represent levels of 10%, 5%, and 1%, respectively, showing statistically significant figures. # represents the endogeneity variable and the instrumental variables (IV) used are the DI of the lending attitudes of financial institutions in (3) and the DI of financial positions in (4). Both of these diffusion indices were collected from data from each branch of the Bank of Japan.

manipulated variables. In addition, in order to diminish the bias from under specification, estimates including fixed effects (FE) by prefecture are also presented.

Analysis results are compiled in Table 4. The model that excludes the number of bankruptcies shows a strong correlation between the overall unemployment rate and the suicide rate. On the other hand, when the number of bankruptcies is taken into consideration, the number itself represents a strong positive correlation with the suicide rate, but the correlation between the overall unemployment rate and the suicide rate disappears. This can be construed as meaning that the strong positive correlation between the sharp rise in the unemployment rate and the credit crunch and increasing bankruptcies brought about the sharp rise in the suicide rate from 1997 to 1998. During this period, the bankruptcy of small and medium-sized enterprises, in particular, seems to have been closely related to suicide.

2. Analysis Using Annual Panel Data by Prefecture

Next is an analysis using annual panel data by prefecture from 1997 to 2005. As in the case of the analysis using quarterly data, the dependent variable is the number of male

Table 5. Regression Analysis of Suicide Rates Using Annual Panel Data by Prefecture

(Dependent variable: Number of male suicide victims per 1,000 people)

	(1)	(2)	(3)	(4)	(5)	(6)
	Fixed Effect Regression	Fixed Effect Regression	IV (lending attitude DI)	IV (financial position DI)	IV (lending attitude DI)	IV (financial position DI)
Unemployment rate	4.12399***	2.82208***	3.97797***	4.14139***	2.68050***	2.45169***
	[0.276]	[0.468]	[0.394]	[0.316]	[0.567]	[0.755]
N of bankruptcy#	-0.01675	0.04527***	0.36487***	0.09230	0.23708	0.45709
	[0.019]	[0.017]	[0.109]	[0.074]	[0.179]	[0.362]
Constant	0.19194***	0.17153***	0.10055***	0.16867***	0.13167***	0.07860
	[0.013]	[0.016]	[0.032]	[0.023]	[0.046]	[0.090]
Prefecture fixed effect	YES	YES	YES	YES	YES	YES
Year fixed effect	NO	YES	NO	NO	YES	YES
Observations	423	423	364	364	364	364
R-squared	0.373	0.654				
Number of prefectures	47	47	42	42	42	42

Note: Figures in parentheses are robust standard errors. *, **, and *** represent levels of 10%, 5%, and 1%, respectively, showing statistically significant figures. # represents the endogeneity variable and the instrumental variables (IV) used are the DI of the lending attitudes of financial institutions in (3) and (5) and the DI of financial positions in (4) and (6). Both of these diffusion indices were collected from data from each branch of the Bank of Japan.

suicide victims per 1,000 people by prefecture, based on data from the National Police Agency. As explanatory variables, we obtained overall unemployment rates by prefecture from reference materials for the *Labor Force Survey*, and the annual number of bankruptcies among small and medium-sized enterprises by prefecture from data from the Organization for Small & Medium Enterprises and Regional Innovation, Japan. Herein also, the bankruptcy variable is treated as the endogeneity variable, and the DI of the lending attitude of financial institutions and the DI of financial positions from the *Tankan* survey are used as manipulated variables for this.

Analysis results are compiled in Table 5. In all cases, the overall unemployment rate shows a strong positive correlation with the suicide rate, but no correlation can be observed between the number of bankruptcies and the suicide rate. This indicates a strong correlation between the unemployment rate and two characteristics of suicide from 1997 to 2005, i.e. the consistent numbers and the increase in younger suicide victims.

3. Employment Status and Suicide

The panel regression analysis for the association between non-regular job status and suicide of men aged 25 to 39 and aged 40 to 54 is conducted. In the past two decades, the number of the workers who engage in non-regular jobs has been increasing since 1990s. Employment status of non-regular workers is relatively insecure and they tend to be paid less than regular workers. Hence, the hypothesis that suicide rate increases as the fraction of non-regular workers increases is tested.

The dependent variables are the numbers of suicides of men aged 25 to 39 and aged 40 to 54 per 1,000 persons taken from *the Vital Statistics*. The key explanatory variable is the fraction of regular workers in the total number of workers for each age group, obtained from the Employment Status Survey by the Ministry of Internal Affairs and Communications in 1992, 1997, 2002, and 2007. The fraction of workers in the total population for each age group is included as well, as a proxy for unemployment rate.[9]

The first four columns of Table 6 show the results of the regression analysis for men aged 25 to 39. The ratios of regular workers to workers and workers to population for 25 to 39 are negatively associated with the suicide rates as expected. The coefficients, however, become insignificant when time fixed effects are used. The results in the last two specifications where the indices for age 40 to 54 are controlled to mitigate the bias due to omitted variables, show the same results for fixed effect specifications.

In columns (5) - (8) of Table 6, the results of the regression analysis for men aged 40 to 54 show a similar pattern as in Table 6. However, the coefficient of the fraction of non-regular workers becomes insignificant when the indices of younger generation are controlled.

[9] This ratio is by definition smaller than unemployment rate due to the larger denominator. For men in working ages, however, the two indices exhibit quite strong correlation.

Table 6. Regression Analysis of Suicide Rates Using Quinquennial Panel Data by Prefecture

Dependent variable:	Number of suicide victims male aged from 25 to 39 per 1,000 people				Number of suicide victims male aged from 40 to 54 per 1,000 people			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fraction of workers in population (male aged 25-39)	-0.70168**	-0.18250	-0.88635**	-0.35272			-2.27521***	-1.09507*
	[0.299]	[0.455]	[0.385]	[0.471]			[0.522]	[0.614]
Fraction of regular workers (male aged 25-39)	-1.02957***	-0.10528	-1.10315***	-0.18227			-0.45634	-0.36943
	[0.172]	[0.401]	[0.214]	[0.415]			[0.291]	[0.542]
Fraction of workers in population (male aged 40-54)			0.37460	0.78198	-5.01350***	-0.91153	-2.20331***	-0.47925
			[0.489]	[0.557]	[0.418]	[0.697]	[0.664]	[0.727]
Fraction of regular workers (male aged 40-54)			0.06924	0.07418	-1.02577**	0.13159	-0.25657	0.29502
			[0.364]	[0.389]	[0.461]	[0.495]	[0.495]	[0.508]
Constant	1.85441***	0.60031	1.67917***	0.02873	6.08558***	1.28467	5.30626***	2.06327**
	[0.188]	[0.501]	[0.336]	[0.689]	[0.376]	[0.810]	[0.456]	[0.900]
Prefecture fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	NO	YES	NO	YES	NO	YES	NO	YES
Observations	188	188	188	188	188	188	188	188
R-squared	0.530	0.558	0.532	0.565	0.646	0.739	0.705	0.746
Number of prefectures	47	47	47	47	47	47	47	47

Note: Figures in parentheses are robust standard errors. *, **, and *** represent levels of 10%, 5%, and 1%, respectively, showing statistically significant figures.

These empirical results provide several implications. First, the ratio of regular workers does exhibit a significant correlation with suicide of younger generation. This might explain recent trend of increasing younger suicide victims in Japan. The result becomes, however, insignificant when time fixed effect is controlled. This may come from limited information due to the lack of continuous time series data. Therefore, further investigation is needed to confirm the causal relationship. Second, the relationship between regular work status and suicide is not necessarily significant for men aged 40 to 54.

V. Conclusion

Lastly, we would like to discuss effective measures to counter suicide, taking into consideration the correlation between the unemployment rate and the suicide rate that has been verified through the abovementioned analyses. Regarding the necessity of countermeasures against suicide, the large number of suicide victims in Japan should in and of itself be evidence of the need for prompt action, and the significant damage that suicide causes to society cannot be overlooked, either. Firstly, suicide causes a financial loss to the whole society, in that the contribution that victims would have made to production activities is lost forever. The Suicide Analysis Project Team 2008 estimated this financial loss by calculating the total amount of wages that suicide victims would have acquired thereafter if they had not died. Based on this calculation, the accumulated loss of profit due to the suicides of people aged 20 to 65 for the ten years from 1998 to 2007 amounts to around 22 trillion yen. This 22 trillion yen, which does not include any loss in a broader sense, such as the emotional distress of the bereaved, should be considered to be the minimum financial loss. Secondly, according to Chen et al. (2009b), there are approximately five bereaved family members per suicide in Japan; the total number of minors who have lost a parent due to suicide is around 90,000 and the total number of surviving family members is around 3 million. This means that one in every 40 people has lost a family member due to suicide in Japan. These survivors often suffer from severe mental strain, but are left isolated and with various legal and financial burdens. Such social costs related to suicide, or external diseconomy, make it even more valid for the national government to get actively involved in preventing suicide.

Japan's Basic Act on Suicide Prevention came into force in October 2006, and the framework under which the national government responsibly promotes measures to prevent or counter suicide started to function. However, measures have so far been promoted mainly in the field of psychiatric treatment, and comprehensive countermeasures have not been properly taken based on the idea that financial situations and other social factors may trigger suicide attempts. As mentioned in this paper, economic and financial conditions are closely related to suicide in Japan. If problems with employment or unemployment or problems related to finances, multiple debts, or cosigners drive people into depression or suicide attempts, it is indispensable to resolve those financial problems, just as it is to provide such

people with psychiatric treatment of depression (Chen, Choi, and Sawada 2007).

Especially since the so-called Lehman Shock in September 2008, Japanese society has been struggling in a recession, and this kind of deterioration in the economic environment makes it crucial to have countermeasures against suicide. As mentioned above, the overall unemployment rate in Japan marked a record high in July 2009. According to the *Tankan* survey by the Bank of Japan, as shown in Figure 2, the DI of the lending attitudes of financial institutions deteriorated rapidly, especially for small and medium-sized enterprises, from the fourth quarter of 2008 to the first and second quarters of 2009, which is reminiscent of the financial crisis from 1997 to 1998. All these facts mean that Japan is now in a socioeconomic environment that carries a heightened risk of suicide. In order to take countermeasures at an early stage under such circumstances, the national government needs to actively cope with employment/unemployment problems and the financial problems of small and medium-sized enterprises, as well as to design and implement complete policies that will effectively prevent suicide.

As pointed out by Shimizu (2009), concrete support measures for unemployed people contain the following problems at present. For example, if a person loses his job and his house, incurs multiple debts, and eventually comes to suffer from depression, he will need to receive psychiatric treatment for his depression, visit and consult with a legal professional about paying off his debts, and apply for temporary housing and look for a job at a public job-placement office. It is unrealistic to expect a person who is jobless and suffering from psychological problems to handle these things all by himself. Therefore, it is indispensable to integrate these services and establish counters for mental health consultations and free legal services at such places as public job-placement offices, and to take comprehensive measures to prevent suicide among the unemployed.

From such point of view, the "one-stop service" provided at the end of 2009 as one of the measures for unemployed people deserves further attention. Its aim was to provide comprehensive services at the counter of a public job-placement office, enabling people to handle all of the procedures for livelihood support in one stop, from the job search, applications for housing and public assistance, and loan applications, to mental health consultations. Promoting these comprehensive measures will require not only the efforts of the national government and local officials in charge of welfare policy; the cooperation of NPOs and other private bodies will also be indispensable. Further strengthening coordination among such related parties will be one of the challenges in promoting measures to prevent suicide among the unemployed.

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