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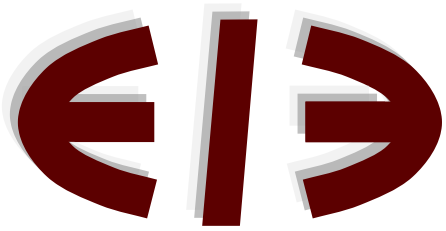
EERI Research Paper Series No 06/2015

ISSN: 2031-4892



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Comparison of Social Trust's Effect on Suicide Ideation between Urban and Non-urban Areas: The Case of Japanese Adults in 2006

June, 2015

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Abstract.

An increasing number of studies have addressed the determinants of suicide. Social capital is a key factor in preventing suicide. However, little is known about the experience of suicide ideation using subjective values. From the viewpoint of suicide prevention, it is worth examining how people think of suicide. This paper attempts to examine the effect of social capital on suicide ideation. Furthermore, the paper compares the effect of social capital between urban and non-urban areas. In this paper, urban areas are equivalent to mega-cities with populations over one million. Non-urban areas are cities with populations of less than one million, towns and villages. Individual-level data from the Japanese General Social Surveys (JGSSs) are used. The survey, which was conducted in 2006, provides information about the subjective value of suicide ideation. The survey was answered by 1,413 subjects with a mean age of 54.5. Of the subjects, 49% were male. Social trust is used to measure the degree of social capital, and the outcome of interest is suicide ideation within the past 5 years. After controlling for various factors, the major findings are that both individual-level social trust and social trust accumulated in one's residential administrative district reduce the probability that one will consider suicide. After dividing the sample into urban and non-urban residents, particularized trust plays a role in deterring suicide ideation in urban areas, while generalized trust plays a role in deterring suicide ideation in non-urban areas. The effect of each type of trust depends on its scarcity in residential areas.

Key words: Social capital; Suicide ideation; Urban

1. Introduction

The seminal work of Durkheim (1951) was the first to analyze suicide in the 19th century from the viewpoint of social science. According to Durkheim (1951), suicide is a predictable consequence of the degree to which one is integrated into society. Hence, the relation between individuals and society should be analyzed when we explore how and why individuals commit suicide. The factors that influence suicide can be divided roughly into non-material human relations, regarded as social factors, and material wealth, regarded as an economic factor. In terms of social factors, to analyze suicide, previous works consider the extent to which suicide is accounted for by social capital (e.g., Putnam 2000; Yamamura 2010; Smith and Kawachi 2014),[1] the sex ratio (Kuroki 2014), the fertility rate (Okada and Samreth 2013), divorce, and marriage (e.g., Kunce and Anderson 2002; Neumayer 2003; Andrés et al. 2011). In contrast, many works consider economic factors, such as public spending (Minoiu and Andrés 2008), inequality (Andrés 2005), and unemployment (e.g., Platt 1984; Yang et al. 1992; Yang and Lester 1995; Breuer 2015).

Japan experienced a remarkable increase in the suicide rate in the mid-1990s. According to the OECD (2013), even though the rates have remained stable since then, the age-standardized rate per 100,000 population of Japan in 2011 was 20.7, remarkably higher than that of the United States in 2011 (12.5). During the mid-1990s, coinciding with the Asian financial crisis, economic stagnation had a detrimental influence on the society of Japan.[2] In Japan in the 21st century, suicide became a more serious issue than in prior centuries; hence, it is crucial to implement measures to prevent suicide.[3] Economic researchers have provided evidence that the increase in the suicide rate was caused partly by the economic conditions (e.g., Koo and Cox 2008; Chen et al. 2009; Inagaki 2010; Kuroki 2010; Sugano and Matsuki 2014, Suzuki et al. 2013; 2014).[4] However, consistent with Durkheim's view, social factors are also significantly related to the suicide rate in Japan (e.g., Yamamura 2010, Andrés et al. 2011; Sugano and Matsuki 2014). Okamoto et al. (2013) attempted to clarify the

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[1] It has been argued that the suicide rate may be high if the level of social capital is high (Kushner and Sterk 2005).

[2] The increase in suicide rates also became an important issue in South Korea, so the issue has been addressed by researchers (Kim et al. 2010). Comparative works on suicide have addressed Japan and Korea (Kim et al. 2011).

[3] Many analyses of suicide have been conducted since the 1970s (e.g., Hamermresh 1974; Yang and Lester 1995; Huang 1996; Viren 1996; Chuang and Huang 1997; Brainerd 2001; Jungeilges and Kirchgassner 2002; Marcotte 2003).

[4] Even prior to the 1990s, economic factors such as unemployment rates have been significantly related to the suicide rate in Japan (Motohashi 1991).

association between area-based social capital and suicide rates in 20 administrative municipalities of Tokyo. They found a significant negative association between social trust and the suicide rate for males, implying that area-based social trust may be associated with decreased suicide rates for males.

Even though existing works analyzing suicide have referred to suicide rates, there seems to be a large gap between the act of suicide and suicide ideation. An incident of suicide is regarded as an extreme case[5]. Therefore, existing works have dealt only with the committing of suicide and do not take into account the intermediate condition between committing suicide and a sound mental condition. To prevent suicide, it is worth investigating how and why individuals consider suicide, even if they do not actually commit suicide. To analyze the intermediate situation, the current paper uses survey data from Japan that provide information on individual-level perceptions of suicide. Furthermore, residential area-level data, such as the degree of social capital, the Gini coefficient of income, and the Gini coefficient of education level in a residential area, are matched with the individual-level data. Then, the association between social and economic factors in a residential area and individuals' suicide ideation is investigated.

The current paper is organized as follows: Section 2 presents a concise explanation of the data and specifies the regression functions. In Section 3, I discuss the results of the estimations. The final section offers concluding observations.

2. Data and Estimation Framework

2.1. Data

In the current paper, Japanese General Social Survey (JGSS) data are used. These are individual-level data.[6] The JGSS used a two-stage stratified sampling method and was conducted from 2000 to 2012. For the JGSS, random sampling of

[5] The number of completed suicides was larger for males than for females, while the number of attempted suicides is larger for females than for males (e.g., Andrews and Lewinsohn 1992; Garrison et al. 1993; Moscicki et al. 1998; Moscicki 2001). Furthermore, diagnoses of depressive disorders are also more frequently found for females than for males even though females account for a much smaller proportion of completed suicides (e.g., Rich et al. 1986; Rich et al. 1988; Henriksson et al. 1995). It should be noted that information bias may exist when suicide ideation is used as the outcome variable instead of completed suicide.

[6] Data for this secondary analysis, "Japanese General Social Surveys (JGSS), Ichiro Tanioka," were provided by the Social Science Japan Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, the University of Tokyo.

adults has been used throughout Japan, suggesting that the data used in this paper can be considered representative of the general Japanese population. The paper uses only the data collected in 2006 because this was the only survey to include a question about suicide ideation. Table 1, which shows the number of observations, indicates that there are 2,105 respondents and that, among them, 1,413 respondents answered the questions used in the estimation of the model exhibited in column 2 of Table 5. As 67.1% of the respondents answered the questions, the selection bias is not serious. The JGSS questionnaire includes standard questions concerning an individual's characteristics via face-to-face interviews. The data cover information related to marital status and demographic (age and sex), annual household income,[7] years of schooling, age, prefecture of current residence, prefecture of residence at 15 years of age, and the size of the residential area. A Japanese prefecture is the equivalent to a state in the United States or a province in Canada. There are 47 prefectures in Japan. Furthermore, a prefecture consists of cities, towns, and villages. In other words, various local governments, such as those of cities, towns, and villages, exist in each prefecture. In the data, residential areas can be divided into: (1) mega cities with a population over one million, (2) cities with a population between one million and 0.2 million, (3) cities with a population below 0.2 million, and (4) towns and villages.[8] To compare the role of trust in suicide ideation between urban and non-urban areas, all parts of Japan are divided into urban and non-urban areas. In the current paper, an urban area is equivalent to a mega-city with a population of over one million. The remaining urban areas include medium-sized cities and so are defined as non-urban areas rather than as rural areas. Table 1 presents the data structure showing the number of observations used for the estimations.

Key variables included in the JGSS 2006 are experience of suicide ideation and social capital-related variables. With regards to perceptions of suicide, one of the survey questions asked, "In the past 5 years, have you thought of committing suicide at least once?" Respondents could choose one of three responses: 1 (Never), 2 (Not in the past 5 years but have before that), or 3 (Yes). The responses allow me to quantify the experience of suicide ideation even if suicide has not been committed.

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[7] In the original dataset, annual earnings were grouped into 19 categories, and we assumed that everyone in each category earned the midpoint value. For the top category of "23 million yen and above," I assumed that everybody earned 23 million yen. Of the 1,262 observations used in the regression estimations, there were only 18 observations in this category. Therefore, the problem of top coding should not be an issue here.

[8] In Japan, local governments with populations over 50,000 are defined as cities.

The percentage of suicides in Japan was 0.02% (OECD 2013). Roughly, this means that the number of potential suicides was 300 times larger than the number of those who actually committed suicide in Japan.

As a proxy for social capital, one of the survey questions asked, "Generally speaking, would you say that most people can be trusted?" Respondents could choose one of three responses: 3 (Yes), 2 (Depends), or 1 (No).[9] According to Putnam (2000), social capital is defined as the features of a social organization, such as networks and norms, and social trust facilitates coordination and cooperation. In the current paper, social trust is used to measure the degree of social capital. As argued by Uslaner (2002), trust is categorized into generalized trust (trust in most people) and particularized trust (trust in members of the group to which one belongs), which should be considered separately. Individual-level generalized trust is measured by the response to the question indicated above.

Because information on the respondents' residential prefecture and residential area size was obtained, the average value of generalized trust can be calculated for each residential area. Table 2 lists the average value for each residential area. As shown in Table 2, 13 prefectures include a mega-city with a population larger than one million. Hence, if there is a mega-city in a prefecture, the average value of generalized trust not only in urban areas but also in non-urban areas can be obtained for that prefecture. In the case of Hokkaido, there is only one mega-city (Sapporo); average generalized trust can be calculated for Sapporo (an urban area) and for other areas in Hokkaido (non-urban areas). Besides Hokkaido, in most cases, when a prefecture includes a mega-city, there is only one mega-city in the prefecture. Therefore, residential mega-cities can be identified. In the exceptional case of Kanagawa Prefecture, there are two mega-cities (Yokohama and Kawasaki). If two cities were located in different parts of the prefecture, there would be the possibility of a distinctly different average trust level between the two cities. In such a case, the average value of trust in the two cities would not reflect the trust level in the surrounding areas where respondents reside. However, Yokohama and Kawasaki adjoin each other and thus can be thought of as forming a single urban area. Therefore, the average values reported by respondents residing in these two cities can be identified. If there is no mega-city in a prefecture, the average value of trust applies to non-urban areas, not to urban areas. The samples used in calculating average generalized trust are based on JGSS data collected in 2000, 2001, 2002,

[9] Kuroki (2011) used the JGSS data to examine the relation between generalized trust and happiness levels.

2003, 2005, 2006, and 2008 because generalized trust data could be obtained for these years; however, suicide ideation data are available only in the 2006 survey. There are 3,639 observations for urban areas and 15,213 for non-urban areas. Therefore, the number of observations for the calculation of average generalized trust is far larger than the number of observations for the regression estimations. Mohnen et al. (2011) suggested a method to predict neighborhood social capital. This method is useful when the sample size is too small to calculate average neighborhood social capital accurately. However, JGSS allows the use of a large sample to calculate it.

In addition to the average value of generalized trust, individual-level trust is considered in the paper. However, there is possibility of a collinearity problem between individual trust and average trust in residential areas. To solve this problem, following Suzuki et al. (2012), cluster-mean centering trust is used in the analysis instead of simple individual trust. As shown in Table 3, general trust (cluster-mean centering trust or I_GENERAL TRUST) is defined as individual-level trust minus average generalized trust (R_GENERAL TRUST). If individual-level trust is smaller than R_GENERAL TRUST, I_GENERAL TRUST has a negative value. Therefore, in Table 3, the minimum value of I_GENERAL TRUST is a negative value.

Further, a proxy for particularized trust is also captured as follows. In 1996, the Japan Broadcasting Corporation conducted a survey on the consciousness and behaviors of prefecture residents (Japan Broadcasting Corporation 1997). One of the survey questions asked, “Do you trust community members?” Respondents could choose one of three responses: “yes,” “unsure,” or “no.” I calculated the rates for those who answered “yes” within a prefecture. The rate of trust in community members can be used as a proxy for particularized trust in residential prefecture (PARTICULAR TRUST). It is used to measure social capital in the current research. I assume here that PARTICULAR TRUST was stable over time. I obtained a proxy for each of the 47 prefectures, although residential area size cannot be identified. Hence, PARTICULAR TRUST does not differ between urban and non-urban areas within the same prefecture. Therefore, compared with R_GENERAL TRUST, PARTICULAR TRUST is less accurate. The possibility of a measurement error for PARTICULAR TRUST should be noted. R_GENERAL TRUST, I_GENERAL TRUST, and PARTICULAR TRUST are used as proxies for social capital.

Table 4 shows a comparison of key variables between urban and non-urban areas. There is no significant difference in suicide ideation. PARTICULAR TRUST

is larger in non-urban areas than in urban areas, and the difference is statistically significant. In contrast, the value of generalized trust is larger in urban areas than in non-urban areas, and the difference is statistically significant. Therefore, it is interesting to observe that the scarcity of trust differs between urban and non-urban areas according to the type of trust.

Gini coefficients for prefecture-level household income were calculated using data from the National Survey of Family Income and Expenditure, conducted by the Ministry of Internal Affairs and Communications (1999, 2004). These surveys are conducted every 5 years. The Gini in 2004 does not appropriately capture the effect of economic inequality. As explained previously, the data were collected in 2006. To examine suicide ideation within the previous 5 years, reported between 2001 and 2006, social and economic conditions before 2004 should also be considered. In addition, there seems to be a time lag between economic conditions and suicide ideation. Furthermore, this paper examines not only suicide ideation in the previous 5 years but also suicide ideation not in the previous 5 years but before that. In this case, it is necessary to consider the economic situation before 2001 at least. These are the reasons that the Gini in 2004 and in 1999 are jointly used for the estimations. In addition to the Gini coefficient of income, the Gini coefficient of education level in each prefecture in 2000 was constructed by Hojo (2009). I also used the education Gini to capture inequality in one's place of residence.

2.2. Estimation Strategy

Table 1 lists the definition and basic statistics for variables used for estimation in the current paper. The estimated function of the baseline model takes the following form:

$$\text{SUICIDE\_2 (or SUICIDE\_3)}_{imn} = \alpha_0 + \alpha_1 \text{PARTICULAR TRUST}_m + \alpha_2 \text{R\_GENERAL TRUST}_{mn} + \alpha_3 \text{I\_GENERAL TRUST}_{imn} + \alpha_4 \text{HIGH SCHOOL}_{imn} + \alpha_5 \text{COLLEGE}_{imn} + \alpha_6 \text{UNIVERSITY}_{imn} + \alpha_7 \text{AGE}_{imn} + \alpha_8 \text{MALE}_{imn} + \alpha_8 \text{INCOM}_{imn} + \alpha_9 \text{GINI\_99}_m + \alpha_{10} \text{GINI\_04}_m + \alpha_{11} \text{GINI\_EDU}_m + \alpha_{12} \text{MARRY}_{imn} + \alpha_{13} \text{CHILD}_{imn} + \alpha_{14} \text{UNEMP}_{imn} + u_{imn},$$

where SUICIDE_2 and SUICIDE_3 represent the dependent variable in individual *i*, prefecture *m* and urban area (or non-urban area) *n*, respectively. Regression parameters are represented by α. As explained previously, values for suicide ideation range from 1 to 3. The values are ordinal, but they reflect qualitative

rather than quantitative difference. Therefore, the multinomial logit model is used to conduct the estimations. The error term is represented by u_{imn}, which is assumed to follow logistic distribution. It is reasonable to assume that the observations may be spatially correlated within a prefecture, as the preference of one agent may well relate to the preference of another in the same prefecture. To consider such a spatial correlation in line with this assumption, I used the Stata cluster command and calculated z-statistics using robust standard errors. The advantage of this approach is that the magnitude of spatial correlation can be unique to each prefecture.

To examine the association between social trust and suicide ideation, PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST are included. PARTICULAR TRUST captures residential area-level particularized trust, while R_GENERAL TRUST captures residential area-level generalized trust because their values are common for respondents who resided in the same residential area. I_GENERAL TRUST captures individual-level generalized trust. Following the arguments of Yamamura (2010) and Smith and Kawachi (2014), the signs of these coefficients are expected to be negative.

Inequality is thought to increase social isolation between people of different classes. Inevitably people are more likely to consider suicide in an unequal society (Andrés 2005).[10] Such an inference is supported by empirical works conducted in Japan (Chen et al. 2009; Inagaki 2010).[11] Furthermore, differences in education level influence individuals' preferences and behavior. Highly educated people can discuss literature, classical music, and cultural history more competently than less educated people. Inevitably, highly educated people tend to form groups to share and enjoy their cultivated tastes. Less educated people cannot be members of such groups. As a consequence, society is likely to be divided according to education level. Overall, not only income inequality but also educational inequality is thought to reduce interpersonal exchange, increasing the likelihood of suicide. To examine this issue, GINI_99, GINI_04, and GINI_EDU are included. Income inequality is negatively associated with trust level (Ichida et al. 2009).

Variables capturing the individual economic effects are as follows: HIGH SCHOOL, COLLEGE, and UNIVERSITY are dummies for those whose final graduation level is high school, junior college, and university, respectively. INCOM

[10] In contrast, a clear association between income inequality and suicide cannot be observed in many works (Rehkoph and Buka 2006; Leigh and Jencks 2007; Suzuki et al., 2014).

[11] A review article by Rehkoph and Buka (2006) suggested that most studies have reported no association between income inequality and suicide.

and UNEMP stand for household income level and an unemployment dummy, respectively. If an improvement in economic conditions reduces the probability that people will consider suicide, the signs of the former two variables will become negative, while that of the latter will become positive. To capture the effect of age, marital-related influence, and the existence of children, AGE, MARRY, and CHILD are incorporated, respectively.

3. Estimation and Discussion of Empirical Results

Tables 5, 6, and 7 list the results based on the full sample, an urban sample, and a non-urban sample, respectively. In each table, the upper part reports the results when SUICIDE_3 is the dependent variable, while the lower part lists the results when SUICIDE_2 is the dependent variable. SUICIDE_3 is limited to suicide ideation within the previous 5 years, so the independent variables are thought to reflect appropriately their effect on suicide ideation. In contrast, SUICIDE_3 captures suicide ideation before the previous 5 years. Therefore, to take the example of respondents aged 70 years in 2006, it is necessary to consider the social and economic conditions in 1956 if they experienced suicide ideation only at 20 years of age. However, independent variables cannot appropriately capture them because the economic and social conditions in Japan in 1956 were remarkably different from the current conditions. Therefore, the estimation results for SUICIDE_3 are more reliable than those for SUICIDE_2. It is difficult to interpret the results of SUICIDE_2. Hence, in this paper, the results for SUICIDE_3 are the main focus. For migrants from other prefectures, SUICIDE_2 and SUICIDE_3 are thought to be associated with the former residential prefecture rather than the current residential prefecture. Overall, migrants cannot be reasonably included in the sample. As explained in the previous section, I was able to obtain information regarding the respondents' current prefecture of residence and their prefecture of residence at 15 years of age. If the current prefecture of residence is different from the prefecture of residence at 15, a respondent can be defined as a migrant. As a robustness check, estimations are conducted using not only the full sample but also the sample excluding migrants. Columns 1 and 2 present results based on the sample including migrants, while columns 3 and 4 present results based on the sample excluding migrants. In columns 1 and 3, all the control variables are included as independent variables. As alternative specifications, in columns 2 and 4, GINI_99, GINI_04, GINI_EDU, MARRY, CHILD, and UNEMP are not included as a robustness check. GINI_99, GINI_04, and GINI_EDU are thought to be associated

with PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST because income inequality is related to the degree of trust among people (Leigh 2006a; 2006b). Inevitably, collinearity between proxies for trust and various Gini variables exist. Hence, to solve the collinearity problem, Gini variables are excluded. Some respondents did not respond to the questions associated with MARRY, CHILD, and UNEMP, so the sample size increases when these variables are not included.

I now turn to the results for SUICIDE_3 in the upper part of Table 5. Looking at the social capital-related variables PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST reveals that the coefficients are all negative. Furthermore, PARTICULAR TRUST and I_GENERAL TRUST are statistically significant in columns 1–4. With respect to the results for SUICIDE_2 in Table 5, PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST show negative signs for coefficients in all columns. This implies that social capital plays an important role in preventing suicide by causing people not to consider suicide. That is, social capital is thought to cure the mental weakening regarded as the cause of suicide in its early stages. Apart from this, most of the other variables do not show statistical significance in any column, with the exception of AGE, MARRY, INCOM, and UNEMP. The significant negative sign of MARRY indicates that personal ties with one's husband (or wife) seem to play a critical role in reducing suicide ideation. Inconsistent with previous works (e.g., Andrés 2005; Koo and Cox 2008; Chen et al. 2009; Inagaki 2010; Kuroki 2010; Sugano and Matsuki 2014; Breuer 2015), the negative sign of UNEMP does not show that unemployment leads to suicide ideation. This implies that suicide ideation is distinctly different from committing suicide. The significant positive sign of INCOM shows that people with higher income tend to experience suicide ideation. Existing works examine the influence of unemployment and income on actual suicide rates, while the current work investigates its influence on potential suicide probability by using data on subjective perceptions of suicide. As mentioned previously, the suicide rate in Japan is only 0.02% (OECD 2013), which is equivalent to 1 out of 300 people considering suicide at some point within the previous 5 years. That is, the number of those who have actually committed suicide is very small, although about 20% of people have considered suicide. Therefore, income and unemployment may be critical determinants for advanced cases, but not for cases in an early stage.

In this paper I concentrate on key variables because most variables do not show statistical significance. Let me turn to the results based on the urban sample. In the sample, there are no unemployed persons, so UNEMP cannot be calculated.

According to the results for SUICIDE_3 in Table 6, PARTICULAR TRUST exhibits a negative sign and statistical significance in all columns. In contrast, R_GENERAL TRUST and I_GENERAL TRUST show a negative sign, but they are not statistically significant in most cases when migrants are included. R_GENERAL TRUST and I_GENERAL TRUST show mostly positive signs when migrants are excluded. Considering the social capital-related variables jointly leads me to argue that, in urban areas, particularized trust contributes to the prevention of suicide ideation, but generalized trust does not. As for the variables used to capture inequality, it is interesting to observe that GINI_99 and GINI_EDU have a positive sign and are statistically significant in column 3 when SUICIDE_3 is the dependent variable and in columns 1 and 3 when SUICIDE_2 is the dependent variable. In contrast, GINI_04 does not show statistical significance in any column. Income inequality in 1999 is considered to have a greater influence on people's suicide ideation within the previous 5 years in 2006 than in 2004. This is plausible if people experienced suicide ideation mainly between 2001 and 2003. Overall, the results for proxies for inequality imply that inequality in society provides a motive to consider suicide in urban areas. Furthermore, the absolute values of GINI_EDU are about three times larger than those of GINI_99. I interpret this as suggesting that inequality in education plays a greater role than income inequality in dividing society and thus isolates people to the extent that they may consider suicide. That is, in urban areas, social division caused by inequality in education is more critical in providing a motive for suicide ideation in an early stage than income inequality.

As shown in the results for SUICIDE_3 in Table 7, the social capital-related variables PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST all show a negative sign in columns 1–4. Further, R_GENERAL TRUST and I_GENERAL TRUST generally show statistical significance, with the exception of R_GENERAL TRUST in columns 1 and 3. In contrast, PARTICULAR TRUST is not statistically significant, with the exception of column 3. In addition, regarding the results for SUICIDE_2 in Table 7, the results for PARTICULAR TRUST, R_GENERAL TRUST, and I_GENERAL TRUST are similar to those for SUICIDE_3. These led to the notion that, in non-urban areas, generalized trust contributes to the prevention of suicide ideation, but particularized trust does not. Regarding inequality in the estimation of SUICIDE_3, GINI_99 and GINI_04 are not statistically significant in any column. Therefore, in non-urban areas, income inequality cannot be considered a key factor that causes suicide ideation. In contrast, GINI_EDU shows a positive sign in columns 1 and 3. Further, GINI_EDU

is statistically significant when migrants are excluded. It follows from the observations that education equality, rather than income inequality, is a critical factor that influences people's suicide ideation in non-urban areas.

The key findings are as follows: particularized trust plays a role in deterring suicide ideation in urban areas, whereas generalized trust plays a role in deterring suicide ideation in non-urban areas. As is exhibited in Table 4, particularized trust is scarcer in urban areas, whereas generalized trust is scarcer in non-urban areas. Particularized trust is thus more valuable in urban areas, whereas generalized trust is valuable in non-urban areas. Therefore, the effect of each type of trust depends on its scarcity in residential areas. From the discussion thus far, I suggest that public policy to form trust to deter suicide ideation should differ according to area. In urban areas, it is important to form particularized trust through face-to-face communication within the residential community. In non-urban areas, it is important to form generalized trust toward unknown people by enhancing interactions with unknown people.

4. Concluding Remarks

Many works have attempted to examine the determinants of suicide. However, these works analyzing suicide are mainly based on suicide rates in administrative districts, such as states, prefectures, and municipalities. Cases of suicide are very rare compared with cases in which people experience suicide ideation. Most people who have considered suicide do not commit it. From the viewpoint of preventing suicide, it is valuable to investigate how and why individuals consider suicide even if they do not actually commit suicide. Therefore, the current paper uses survey data from Japan to analyze the issue.

The main findings are that both particularized trust and generalized trust accumulated in one's place of residence are negatively associated with suicide ideation. After dividing the sample into urban and non-urban residents, the results differ by area: in urban areas, particularized trust was found to contribute to deter suicide ideation, whereas generalized trust does not. In contrast, in non-urban areas, generalized trust was found to deter suicide ideation, whereas particularized trust does not. I interpreted this as implying that particularized trust is scarcer and thus valuable in reducing social isolation in urban areas, whereas generalized trust is scarcer and thus valuable in non-urban areas. Therefore, the scarcity of trust in each area should be addressed to remedy the problem of suicide ideation.

Because of data limitations, the residential area unit is large, so the average trust

level in a residential area is roughly measured. It is desirable to measure the average trust level in smaller area units in future works. This paper concentrates on the trust level in residential areas among people of working age. Many respondents work in the daytime. Inevitably, workplace social capital is thought to play a key role in preventing suicide and thus is valuable to consider. Social capital is observed to improve health status (e.g., Yamamura 2011, Fiorillo and Sabatini 2015). Cao et al. (2015) used individual-level data from urban China to show that trust was significantly associated with geriatric depression, although social participation was not correlated with geriatric depression. In contrast, in Nordic countries a trust in neighbors failed to show a significant association with depression for adults over 65 years of age (Forsman et al. 2012). These results imply that the role of trust varies according to the society. Hence, it is important to examine the relation between trust and suicide ideation in Western countries from a comparative viewpoint. These are remaining issues to be addressed in future works.

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Table 1. Data structure

Total observations = 2105	
Observations used for estimations.	
Model 1 = 1,262	(903)
Model 2 = 1,413	(1,013)

Urban		Non-urban	
Model 1 = 267	(161)	Model 1 = 995	(742)
Model 2 = 330	(199)	Model 2 = 1,083	(814)

Notes: Numbers in parentheses are the numbers of observations if migrants are excluded.

Table 2. Average generalized trust in each respondent's place of residence

	Prefecture	Urban	Non-urban		Prefecture	Urban	Non-urban		Prefecture	Urban	Non-urban
1	Hokkaido	2.06	2.08	21	Gifu		2.11	41	Saga		2.09
2	Aomori		2.04	22	Shizuoka	2.02	2.10	42	Nagasaki		2.05
3	Iwate		2.08	23	Aichi	2.13	2.09	43	Kumamoto		2.05
4	Miyagi	2.07	2.05	24	Mie		2.08	44	Oita		2.12
5	Akita		2.08	25	Shiga		2.02	45	Miyazaki		2.13
6	Yamagata		2.09	26	Kyoto	2.03	2.13	46	Kagoshima		2.16
7	Fukushima		2.13	27	Osaka	2.08	2.11	47	Okinawa		2.03
8	Ibaragi		2.06	28	Hyogo	2.13	2.08		Observations	3,639	15,213
9	Tochigi		2.01	29	Nara		2.03				
10	Gumma		2.03	30	Wakayama		1.99				
11	Saitama	2.04	2.11	31	Tottori		2.07				
12	Chiba	2.09	2.11	32	Shimane		2.09				
13	Tokyo	2.12	2.12	33	Okayama		2.11				
14	Kanagawa	2.17	2.13	34	Hiroshima	2.10	2.05				
15	Niigata		2.18	35	Yamaguchi		2.09				
16	Toyama		2.15	36	Tokushima		2.08				
17	Ishikawa		2.15	37	Kagawa		1.99				
18	Fukui		2.11	38	Ehime		2.07				
19	Yamanashi		2.09	39	Kochi		2.07				
20	Nagano		2.08	40	Fukuoka	2.12	2.00				

Notes: JGSS data from 2000 to 2008 are used to calculate the average value of generalized trust. "Urban area" is defined as a

mega-city with a population over 1 million people. A “non-urban area” is a city with a population below 1 million people, a town, or a village.

Table 3. Descriptive statistics

	Variables	Definition	Mean	Std. Dev	Max	Min
	SUICIDE_3	Question: In the past 5 years, have you thought of committing suicide at least once? Choices for respondents are as follows: 1 (never), 2 (not in the past 5 years but have before that), or 3 (yes) In response to the question above, Suicide 3 is 1 if respondent chooses 3. Suicide 2 is 0 if respondent does not choose 3 (%).	0.12	0.01	1	0
	SUICIDE_2	In response to the question above, Suicide 2 is 1 if respondent chooses 2. Suicide 3 is 0 if respondent does not choose 2 (%).	0.06	0.005	1	0
#	PARTICULAR TRUST	Rate of those who trust community members within a residential prefecture: rate of those whose reply to the question (%).	46.6	4.3	59.3	40.1
##	R_GENERAL TRUST	Respondent's individual level of generalized trust. Question: Generally, would you say that most people can be trusted? Choices for respondents are as follows: 3 (yes), 2 (depends), 1 (no). Average value of residential area is R_GENERAL TRUST.	2.09	0.04	2.18	1.98

	I_GENERAL TRUST	Responding to the question above, respondent's choice is GENERAL TRUST. I_GENERAL TRUST is calculated as GENERAL TRUST − R_GENERAL TRUST.	0.06	0.54	1.01	−1.18
	HIGH SCHOOL	It is 1 if final graduation level is high school; otherwise 0.	0.46	0.49	1	0
	COLLEGE	It is 1 if final graduation level is junior college; otherwise 0.	0.12	0.32	1	0
	UNIVERSITY	It is 1 if final graduation level is university or graduate school; otherwise 0.	0.20	0.39	1	0
	AGE	Age.	54.5	14.7	89	21
	MALE	Male dummy: 1 if respondent is male; otherwise 0.	0.49	0.50	1	0
	INCOM	Household income. [a]	638.4	411.3	2,300	0
#	GINI 99	Gini coefficient of household income within a residential prefecture in 1999.	29.6	1.3	35.3	27.5
#	GINI 04	Gini coefficient of household income within a residential prefecture in 2004	30.3	1.2	34.5	27.5
#	GINI_EDU	Gini coefficient of education within a residential prefecture in 2000 (sourced from Hojo 2009). With the following formula (Hojo 2009), it is possible	9.9	0.30	11.1	9.2

	to determine the Gini education coefficient: $$\frac{1}{k}\left(\sum_{i=2}^{8}\sum_{j=1}^{i-1} p_i \lvert y_i - y_j \rvert p_j\right)$$ where p_i is the proportion of the population older than 20 in each schooling category *i.* There are 8 schooling categories. y is years of schooling in each category *i.* k is the average number of years of schooling and calculated as follows: $$k = \left(\sum_{i=1}^{8} p_i\, y_i\right)$$				
MARRY	Dummy for a married person: 1 if respondent is married; otherwise 0.	0.90	0.29	1	0
CHILD	Number of children.	1.96	0.90	6	0
UNEMP	Dummy for unemployment: 1 if respondent is unemployed; otherwise 0.	0.004	0.07	1	0

Notes: Sample is used for estimation model 1, and migrants are included. As exhibited in Table 1, observations total 1,262. # suggests that the variable is a prefecture-level variable. ## suggests that the variable is defined at the urban (or non-urban) area level in each prefecture if the prefecture can be divided into urban and non-urban areas; otherwise, it is a prefecture-level variable.

[a] In tens of thousands of yen.

Source: Ministry of Health, Labor and Welfare (various years) Jinko Dotai Tokei Tokushu Hokoku.

Asahi Shinbunsha (various years). *Minryoku: TODOFUKEN-BETSU MINRYOKU SOKUTEI SHIRYOSHU*. Tokyo: Asahi-Shinbunsha.

Table 4. Mean difference of key variables between urban and non-urban areas

Variables	Urban	Non-urban	Absolute t-value
Suicide1	0.81	0.83	0.45
Suicide2	0.12	0.11	0.45
Suicide3	0.06	0.05	0.93
PARTICULAR TRUST (%)	44.1	47.2	44.8***
Generalized trust	2.11	2.08	2.28**

** and *** indicate significance at the 5 and 1 percent level, respectively.

Table 5. Full sample: regression results on suicide ideation (multinomial logit model)

		SUICIDE_3			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.08**	−0.05*	−0.11**	−0.06*
	TRUST	(0.08**	(0.05**	(0.11**	(0.06**
##	R_GENERAL	−4.38	−4.94**	−1.74	−3.24
	TRUST	(4.38ER	(−2.15)	(1.745)	(3.245)
	I_GENERAL	−0.40**	−0.43**	−0.40**	−0.39*
	TRUST	(0.40**	(0.43**	(0.40**	(0.39**
	HIGH SCHOOL	−0.37	−0.32	−0.33	−0.33
		(.37SCH	(.32SCH	(.33SCH	(.33SCH
	COLLEGE	−0.44	−0.04	−0.31	0.10
		(−0.82)	(−0.11)	(−0.54)	(0.18)
	UNIVERSITY	−0.05	−0.12	0.21	0.15
		(0.05RS	(0.12RS	(0.49)	(0.37)
	AGE	−0.05***	−0.04***	−0.04***	−0.03***
		(−6.34)	(−5.13)	(−4.30)	(−3.15)
	MALE	0.05	0.05	0.09	0.03
		(0.20)	(0.24)	(0.25)	(0.11)
	INCOM	0.54*	0.23	0.62**	0.53**
		(1.87)	(0.81)	(2.08)	(1.97)
#	GINI 99	0.06		0.12	
		(0.45)		(0.84)	
#	GINI 04	−0.03		−0.10	
		(0.0304		(0.1004	
#	GINI_EDU	0.53		0.78*	
		(1.19)		(1.74)	
	MARRY	−1.20***		−0.90***	
		(−3.48)		(−2.76)	
	CHILD	0.16		0.25**	
		(1.23)		(2.07)	
	UNEMP	−11.6***		−12.1***	
		(−19.5)		(−19.3)	

		SUICIDE_2			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.03	−0.02	−0.01	−0.01
	TRUST	(0.03CU	(0.02CU	(0.01CU	(0.01CU
##	R_GENERAL	−4.30**	−5.34***	−2.44	−3.35
	TRUST	(4.30**	(5.34**	(2.44**	(3.35**
	I_GENERAL	−0.35**	−0.29*	−0.34	−0.31*
	TRUST	(0.35**	(0.29**	(0.34**	(0.31**
	HIGH SCHOOL	−0.26	−0.22	−0.24	−0.15
		(.26SCH	(.22SCH	(.24SCH	(.15SCH
	COLLEGE	0.04	−0.01	0.04	0.02
		(0.13)	(−0.06)	(0.11)	(0.08)
	UNIVERSITY	−0.14	−0.24	−0.25	−0.44
		(0.14RS	(0.24RS	(0.25RS	(0.44RS
	AGE	−0.02***	−0.03***	−0.03***	−0.03***
		(−4.31)	(−5.31)	(−4.96)	(−5.74)
	MALE	−0.24	−0.23	−0.14	−0.07
		(0.24**	(0.23**	(0.14**	(0.07**
	INCOM	−0.33	−0.27	−0.17	−0.17
		(0.33**	(0.27**	(0.17**	(0.17**
#	GINI 99	0.02		−0.06	
		(0.23)		(0.06)9	
#	GINI 04	−0.06		−0.06	
		(0.0604		(0.0604	
#	GINI_EDU	0.04		−0.05	
		(0.12)		(−0.15)	
	MARRY	0.06		0.07	
		(0.20)		(0.20)	
	CHILD	−0.10		−0.08	
		(0.10)D		(0.08)D	
	UNEMP	1.16		0.25	
		(1.19)		(0.22)	
	Log pseudolikelihood	−656.8	−764.6	−471.8	−545.5
	Observations	1,262	1,413	903	1,013

Notes: The reported values of INCOM are multiplied by 1,000 for convenience of interpretation. Values in parentheses are z-statistics obtained by the robust standard error clustered on residential prefecture. # suggests that the variable is a prefecture level variable. ## suggests that the variable is defined at the urban (or non-urban) area level in each prefecture if the prefecture can be divided into urban and non-urban areas; otherwise, it is a prefecture-level variable. *, **, and *** indicate significance at the 10, 5, and 1 percent level, respectively. In all estimations, constants and dummies for size of residential place are included, but the results are not reported.

Table 6. Urban sample: regression results for suicide ideation (multinomial logit model

		SUICIDE_3			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.37***	−0.23***	−0.28*	−0.20*
	TRUST	(.2.65)	(*2.83)	(.1.90)	(.1.87)
##	R_GENERAL	−5.59	−3.17	−21.4	3.89
	TRUST	(.1.08)	(−0.77)	(11.56)	(0.70)
	I_GENERAL	−0.82*	−0.46	0.09	0.37
	TRUST	(.1.93)	(.1.34)	(0.15)	(0.76)
	HIGH SCHOOL	−0.73	−0.12	−0.25	0.02
		(71.03)	(10.28)	(20.28)	(0.04)
	COLLEGE	0.24	0.90	0.004	0.82
		(0.30)	(1.61)	(0.01)	(0.74)
	UNIVERSITY	−0.16	0.32	0.20	0.76**
		(.0.21)	(0.61)	(0.16)	(2.13)
	AGE	−0.04**	−0.02	−0.03	−0.01
		(−2.02)	(−1.26)	(−0.77)	(−0.26)
	MALE	−0.01	−0.15	0.10	−0.23
		(0.30)	(−0.30)	(0.12)	(−0.31)
	INCOM	1.14	0.19	1.87**	0.56
		(1.26)	(0.24)	(2.01)	(0.66)
#	GINI 99	0.28		1.28**	
		(1.10)		(2.48)	
#	GINI 04	−0.02		0.47	
		(.0.72)		(1.48)	
#	GINI_EDU	1.50		3.51**	
		(1.42)		(2.08)	
	MARRY	−1.12		−2.19***	
		(−1.54)		(−3.68)	
	CHILD	0.65**		0.98**	
		(2.28)		(2.02)	
	UNEMP				

		SUICIDE_2			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.11	0.04	−0.27**	0.02
	TRUST	(.1.28)	(0.90)	(.2.12)	(0.35)
##	R_GENERAL	−5.73	−0.70	−20.4*	−1.62
	TRUST	(.1.22)	(.0.14)	(01.74)	(.0.22)
	I_GENERAL	−0.85***	−0.26	−0.77	0.04
	TRUST	(*2.61)	(.1.09)	(.0.76)	(0.08)
	HIGH SCHOOL	−1.52**	−1.18**	−2.31***	−1.15*
		(52.08)	(12.34)	(32.98)	(11.74)
	COLLEGE	−1.06	−1.16	−1.49	−0.99
		(−0.99)	(−1.53)	(−1.14)	(−1.09)
	UNIVERSITY	−0.94	−1.13**	−1.43	−1.17**
		(.1.09)	(.2.12)	(.1.60)	(.2.05)
	AGE	−0.05***	−0.04***	−0.05***	−0.04***
		(−4.59)	(−5.12)	(−3.29)	(−3.31)
	MALE	−0.36	−0.43*	0.36	0.22
		(.1.54)	(.1.67)	(1.19)	(0.63)
	INCOM	0.08	−0.03	0.88	−0.10
		(0.08)	(.0.06)	(0.89)	(.0.15)
#	GINI 99	0.47***		0.79*	
		(3.24)		(1.77)	
#	GINI 04	−0.27		−0.24	
		(1.50)		(.0.89)	
#	GINI_EDU	1.74***		3.63***	
		(2.89)		(3.27)	
	MARRY	0.79		14.1***	
		(0.67)		(19.1)	
	CHILD	0.28		0.31	
		(0.95)		(0.94)	
	UNEMP				
	Log pseudolikelihood	−128.3	−180.7	−74.8	−101.6
	Observations	267	330	161	199

Notes: In the sample, there are no unemployed persons, and UNEMP cannot be calculated. The reported values of INCOM are multiplied by 1,000 for convenience of interpretation. Values in parentheses are z-statistics obtained by the robust standard error clustered on residential prefecture. # suggests that the variable is a prefecture-level variable. ## suggests that the variable is defined at the urban (or non-urban) area level in each prefecture if the prefecture can be divided into urban and non-urban areas; otherwise, it is a prefecture-level variable. *, **, and *** indicate significance at the 10, 5, and 1 percent level, respectively. In all estimations, constants and dummies for size of residential place are included, but the results are not reported.

Table 7. Non-urban sample: regression results on suicide ideation (multinomial logit model)

		SUICIDE_3			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.05	−0.03	−0.09**	−0.04
	TRUST	(0.05CU	(0.03CU	(0.09**	(.1.32)
##	R_GENERAL	−4.39	−5.59*	−2.54	−5.39**
	TRUST	(4.39ER	(51.92)	(2.542)	(.1.97)
	I_GENERAL	−0.31*	−0.41**	−0.52**	−0.58***
	TRUST	(0.31*R	(0.41**	(0.52**	(.2.84)
	HIGH SCHOOL	−0.35	−0.36	−0.45	−0.41
		(.35SCH	(.36SCH	(.45SCH	(40.95)
	COLLEGE	−0.52	−0.33	−0.37	−0.03
		(−0.89)	(−0.56)	(−0.60)	(−0.05)
	UNIVERSITY	−0.13	−0.26	0.07	−0.03
		(0.13RS	(−0.55)	(0.14)	(−0.07)
	AGE	−0.05***	−0.04***	−0.05***	−0.04***
		(−6.43)	(−5.69)	(−5.60)	(−4.77)
	MALE	0.11	0.19	0.11	0.16
		(0.45)	(0.84)	(0.35)	(0.56)
	INCOM	0.42	0.23	0.53*	0.54*
		(1.30)	(0.69)	(1.72)	(1.92)
#	GINI 99	0.02		0.04	
		(0.21)		(0.31)	
#	GINI 04	−0.02		−0.13	
		(0.0204		(0.1304	
#	GINI_EDU	0.54		1.05**	
		(1.15)		(2.30)	
	MARRY	−1.17***		−0.63	
		(−3.10)		(−1.33)	
	CHILD	0.05		0.13	
		(0.35)		(0.89)	
	UNEMP	−11.0***		−11.1***	
		(−17.3)		(−17.6)	

		SUICIDE_2			
		Including migrants		Excluding migrants	
		(1)	(2)	(3)	(4)
#	PARTICULAR	−0.02	−0.02	−0.001	−0.01
	TRUST	(0.02CU	(21.28)	(.0.07)	(00.53)
##	R_GENERAL	−5.56***	−6.16***	−2.56	−3.52*
	TRUST	(5.56**	(.3.72)	(.1.16)	(.1.67)
	I_GENERAL	−0.23	−0.30	−0.29	−0.39*
	TRUST	(0.23ER	(.1.53)	(.1.32)	(.1.87)
	HIGH SCHOOL	−0.02	−0.01	0.01	0.01
		(.02SCH	(01202)	(0.02)	(0.05)
	COLLEGE	0.25	0.23	0.27	0.22
		(0.71)	(0.66)	(0.56)	(0.50)
	UNIVERSITY	0.01	−0.05	−0.27	−0.38
		(0.02)	(−0.14)	(.0.47)	(.0.68)
	AGE	−0.02***	−0.02***	−0.03***	−0.03***
		(−3.39)	(−3.88)	(−4.08)	(−4.19)
	MALE	−0.20	−0.19	−0.19	−0.13
		(0.20**	(−1.19)	(.0.94)	(.0.66)
	INCOM	−0.35	−0.31	−0.22	−0.18
		(0.35**	(0.31**	(.0.62)	(.0.57)
#	GINI 99	−0.07		−0.10	
		(0.0799		(.1.19)	
#	GINI 04	0.01		−0.01	
		(0.16)		(.0.16)	
#	GINI_EDU	0.01		−0.15	
		(0.04)		(−0.37)	
	MARRY	−0.07		−0.04	
		(−0.23)		(−0.12)	
	CHILD	−0.18		−0.13	
		(0.18)D		(.1.00)	
	UNEMP	1.15		0.16	
		(1.23)		(0.14)	
	Log pseudolikelihood	−517.3	−578.0	−381.9	−429.4
	Observations	995	1,083	742	814

Notes: The reported values of INCOM are multiplied by 1,000 for convenience of interpretation. Values in parentheses are z-statistics obtained by the robust standard error clustered on residential prefecture. # suggests that the variable is a prefecture-level variable. ## suggests that the variable is defined at the urban (or non-urban) area level in each prefecture if the prefecture can be divided into urban and non-urban areas; otherwise, it is a prefecture-level variable. *, **, and *** indicate significance at the 10, 5, and 1 percent level, respectively. In all estimations, constants and dummies for size of residential place are included, but the results are not reported.