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How Is Suicide Different in Japan?

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Abstract

In this study, we analyze suicide rates among OECD countries, with particular effort made to gain insight into how suicide in Japan is different from suicides in other OECD countries. Several findings emerged from fixed-effect panel regressions with country-specific time-trends. First, the impacts of socioeconomic variables vary across different gender-age groups. Second, in general, better economic conditions such as high levels of income and higher economic growth were found to reduce the suicide rate, while income inequality increases the suicide rate. Third, the suicide rate is more sensitive to economic factors captured by real GDP per capita, growth rate of real GDP per capita, and the Gini index than to social factors represented by divorce rate, birth rate, female labor participation rate, and alcohol consumption. Fourth, female and elderly suicides are more difficult to be accounted for. Finally, in accordance with general beliefs, Japan's suicide problem is very different from those of other OECD countries. The impact of the socioeconomic variables on suicide is greater in Japan than in other OECD countries; moreover, the empirical result of a significant Gini index in Japan is consistent with individuals' aversion to inequality and relative deprivation, as discussed in the recent literature.

Keywords: Suicide in Japan and OECD countries

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1. Introduction

Sixty-two year-old Toshikatsu Matsuoka, the sitting Minister of Agriculture, Forestry and Fisheries of Japan and a six-times elected member of the House of Representatives, hanged himself on 28 May 2007, hours before he was to face questioning in the Diet over a series of scandals in his political career. Mr. Matsuoka's death underscores the grim facts that in Japan, since 1998, more than 30,000 people have killed themselves each year.[1] This rash of suicides started in the mid-1990s, amid a prolonged period of economic recession. In particular, from 1997 to 1998, the number of suicides jumped by 34.73 percent.[2] Despite the recent economic recovery, Japan's suicide rate remains at an all-time high. In response, Japanese insurance companies have, since 2000, extended the suicide exemption period from the century-old industrial norm of one year, to two or three years. As the latest step in the government's effort to reduce the suicide rate, the "Basic Law of Suicide Prevention" was enacted in June 2006; the Cabinet Office also outlined comprehensive suicide-prevention guidelines in June 2007, setting a reduction target of at least 20 percent by 2016.

Based on the data published by the Japanese Ministry of Health, Labour and Welfare, the total number of deaths by suicide in Japan hit a record high in 2003, and the numbers in the years that have followed have been similarly dismal.[3] Looking across cause-of-death categorizations, in 2006, suicide ranked sixth—higher than the number of people who died of aging, and short of the number of people who had died from accidents.

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[1] In 2006, Japan had a total population of 127.77 million. The suicide numbers used here are published by the National Police Agency, and are slightly higher than those published by the Ministry of Health, Labour and Welfare.

[2] According to the National Police Agency, the total number of suicides in 1997 was 24,391, and 32,863 in 1998.

[3] The number of suicides published by the Ministry of Health, Labour and Welfare is 32,109 in 2003, 30,247 in 2004, 30,553 in 2005, and 29,921 in 2006. As a point of comparison, the numbers of

Looking at death statistics by age group, in 2003, suicide was the number one cause of death for the five (four) groups of males (females) aged 20–44 (15–34), and number two for the two (three) groups of males (females) aged 15–19 and 45–49 (35–49).[4] Nonetheless, the sense of crisis *vis-à-vis* these numbers has been emphasized only in recent years by incidences of group suicides arranged among strangers over the Internet, and by stories of elementary and junior high school students killing themselves because of bullying.

It has been argued that Japan has a "tradition of suicide." Some sociologists argue that the unique "value orientations" of the Japanese culture—such as monism, groupism, accommodationism, and authoritarian familism—contribute to Japan's unusually high suicide rates among industrialized countries.[5] Table 1 presents the ranking of suicide rates per 100,000 people among OECD member countries, from 1998 to 2004.[6] Among the 25 high-income OECD countries, Japan's male (female) suicide rate ranked second-highest (highest) from 1998 to 2001, and highest (second-highest) from 2002 to 2004.[7] Figure 1 presents the time-series plots of Japan's suicide rates, versus the weighted average suicide rates of other OECD countries, from 1950 to 2004. The graphs show that Japan's suicide rates are stubbornly higher than the average of other OECD countries, with a sharp increase after 1998.[8] The breakdown of suicide rates by age group in Figures 2 and 3

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deaths by homicide in 2003, 2004, 2005, and 2006, were 705, 655, 600, and 580, respectively.

[4] According to 2003 Vital Statistics' special report on suicides issued by the Japanese Ministry of Health, Labour and Welfare, 32.8 percent (25.2 percent) of the total deaths of males (females) aged 20–49 were due to suicide.

[5] Please refer to Pinguet (1993) and Iga (1986).

[6] The numbers are calculated based on the World Health Organization (WHO) Mortality Database, 2006. Only two countries' worth of data are available in 2005; we exclude year 2005.

[7] For male suicide rates, among the 25 high-income OECD countries, Finland ranked the highest from 1998 to 2001. For female suicide rates, Switzerland was the highest in 2002; the Republic of Korea ranked the highest in 2003 and 2004. For both males and females, from 1998 to 2004, Greece had the lowest suicide rates.

[8] Although Japan's female suicide rate is consistently higher than the weighted average of other OECD countries, Japan's suicide rate among males is not always as high. For a few years in the mid-1960s and at the beginning of the 1970s, Japan's male suicide rate was close to the OECD weighted average. This "closing gap" in the male suicide rate also happened temporarily at the end

suggests Japan's recent rash of suicides is mainly attributable to a jump in suicide rates among males under age 65; for both elderly males and females (i.e., aged 65 and above), the suicide rates have a converging trend towards the weighted average of other OECD countries.

Despite Japan being an anomaly in terms of its suicide rates, no rigorous empirical study to date has explained how and to what extent suicide in Japan is different from suicide in other countries. In this study, we analyze the suicide rates among OECD countries, and make a particular effort to gain insight into how suicide in Japan is different from suicides in other OECD countries. While utilizing cross-country variations in socioeconomic variables to explain suicide rates is not a novelty, this study is the first to use recent data from all OECD member countries and thus provide insight into how Japan's suicides are different from those in other OECD countries. To take into account the peculiar case of Japan and answer to this "difference in suicide" between Japan and other OECD countries, we employ a cross-country panel regression framework that allows Japan to have a different set of regression coefficients for the explanatory variables.

Several findings emerge from our analysis. First, the impacts of socioeconomic variables vary across different gender-age groups. Second, in general, better economic conditions—such as high income levels and higher economic growth—reduce the suicide rate, while income inequality increases the suicide rate. Third, the suicide rate is more sensitive to economic factors as captured by real GDP per capita, growth rate of real GDP per capita, and the Gini index than to the social factors represented by divorce rate, birth rate, female labor participation rate, and alcohol consumption.[9] Fourth, female and elderly suicides are more difficult to be accounted for than others. Finally, in accordance with

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of the 1980s and in the mid-1990s.

[9] The terms "economic factors" and "economic variables," as used throughout this paper, refer to real GDP per capita, growth rate of real GDP per capita, and the Gini index; the term "social factors" refers to divorce rate, birth rate, female labor participation rate, and alcohol consumption.

general belief, the suicide problem in Japan is very different from those of other OECD countries. The impact of socioeconomic variables such as female labor force participation, per capita GDP, birth rate and unemployment rate is greater in Japan than in other OECD countries. Moreover, the positive and significant coefficient of the Gini index, especially in Japan, suggests the individuals' aversion to inequality and relative deprivation, as discussed in the recent literature (Frey and Stutzer, 2002; Easterlin, 2001; Luttmer, 2005; Fafchamps and Shilpi, 2007).

In Japan, suicides have traditionally been attributed to mental health illness. To combat the rising suicide rate, the government has looked to improve mental health status and medical services, e.g., through guidelines and provisions for the management of depression, as issued by the Ministry of Health, Labour and Welfare. Our empirical results, which touch upon the significant correlation of suicide rates with a wide variety of socioeconomic variables, suggest that such attention may not be sufficient to the effective prevention of suicide. The recently enacted "Basic Law of Suicide Prevention" calls for comprehensive suicide prevention measures, and the empirical results of this paper support such a policy-making direction in Japan.

The rest of this paper is organized as follows. Section 2 briefly describes the related studies and empirical models employed in the literature. An estimation model and the data used in this study are described in Section 3, and in Section 4, our empirical results and analyses are presented. Section 5 offers concluding remarks.

2. Literature Review

While sociologist Durkheim's *Le Suicide* (1897) spawned numerous sociological theories and empirical studies to explain suicide, it did not attract economists' attention until Hamermesh and Soss (1974) christened an economic theory *of* suicide. Despite the

fact that many psychologists and doctors consider suicide an irrational behavior, Hamermesh and Soss—and most (if not all) of the economic models that followed—consider suicide a rational behavior, by which one maximizes his or her discounted expected lifetime utility. Nevertheless, Yang (1989, 1992), in one of the first attempts to integrate economic and sociological approaches, shows that social factors such as age, religion, and divorce rates also affect suicide rates (Chuang and Huang, 2003). These early empirical studies demonstrate that suicide cannot be explained away as an irrational behavior, and they establish a link between socioeconomic factors and suicide rates. As more detailed data has become available, recent work has extended to show that there is much variation among the suicide patterns of different gender-age groups in response to these factors.

2.1. Factors affecting suicide

Hamermesh and Soss' economic theory on suicide predicts that income level has a negative effect on suicide rate, while unemployment rate has a positive effect. Using their framework, let $V(a,Y^P,Z)$ represent the discounted expected lifetime utility of an individual with utility function $U(a,Y^P,Z)$, at age a with permanent income Y^P and other attributes Z. An individual commits suicide when the discounted expected lifetime utility falls below some threshold level. Accordingly, Hamermesh and Soss apply a decision rule under which an individual commits suicide if and when $V(a,Y^P,Z) + b \leq 0$, where b is a random variable representing an individual's taste for living—or, conversely, his or her aversion to suicide. Then, the fraction of individuals in the cohort born at time (t-a) who commit suicide at age a is:

$$S(a) = F\,[-V(a,Y^P,Z)], \tag{1}$$

where $F(\cdot)$ is the cumulative density function of b. Unemployment can be introduced as a predictor of future disposable income; therefore, it signals changes in permanent income. The model then predicts that suicide decreases with income and increases with unemployment and age, because high income level and low unemployment rate increase expected lifetime utility and decrease the benefit of committing suicide. Many empirical studies support this view (Brainerd, 2001; Neumayer, 2003; Chuang and Huang, 1997, 2003; Andres, 2005). However, Durkheim (1897) hypothesizes that higher income levels increase independence (the opposite of social integration) and leads to a *higher* suicide rate. Along this line, Lester (1996) and Unnithan *et al.* (1994) state that economic development increases rates of suicide; Jungeilges and Kirchgassner (2002) point out that economic growth may reduce happiness and general welfare, and it therefore leads to higher suicide rates.

In spite of disputes on the effect of income level on suicide, researchers agree that income inequality leads to higher suicide rates. Relatively deprived individuals may feel more stress, leading to poor health conditions and ending in suicide directly, or indirectly through alcohol abuse or smoking (Wilkinson, 1997; Stack, 2000a, 2000b; Andres, 2005). Nonetheless, most empirical studies (Neumayer, 2004; Andres, 2005) fail to find a statistically significant relationship between income inequality and suicide rate. In order to verify the nexus between inequality and suicide, we incorporate a measure of income inequality as one of the other attributes Z of equation (1). An inclusion of inequality in the utility function implies that people derive utility not only from their own income or consumption but also from faring better than their peers—possibly due to individuals' inherent aversion to inequality and relative deprivation (Fafchamps and Shilpi, 2007). Indeed, there is plenty of supportive evidence of inequality aversion in experimental and empirical economics and psychology (Alesina and MacCulloch, 2004; Blanchflower and

Oswald, 2004; Frey and Stutzer, 2002; Easterlin, 2001; Luttmer, 2005; Fafchamps and Shilpi, 2007; Ohtake and Tomioka, 2004; Thurow, 1971).[10]

As to other socioeconomic factors considered in *Z*, from Durkheim's point of view—which is followed by Yang (1989, 1992), Chuang and Huang (1997), Brainerd (2001), and Neumayer (2003)—individuals are integrated into a social group that is regulated by its norms and conventions. Therefore, marriage and birth rates, as factors that strengthen family ties and social integration, are expected to have negative effects on suicide rates. On the other hand, divorce rate and alcohol consumption, which suggest a lack of such integration, are expected to have positive effects on suicide rates. Meanwhile, the impact of female labor participation on suicide rate is less clear. If female labor participation reduces family ties, it has a positive effect on suicide rate; however, if working women enjoy social integration as well as financial benefits as a result of their careers, it can reduce their suicide rate (Stack, 1998). The net effect of female labor force participation on suicide rate has been unclear and rife with mixed signs in empirical studies (Yang, 1992; Chuang and Huang, 1997; Neumayer, 2003; Andres, 2005).[11] Following the Beckerian tradition, we may integrate theses social factors—not only the divorce rate, but also the birth rate and female labor participation—into an individual's utility function in equation (1), to enrich Hamermesh and Soss' theoretical model.

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[10] While this study examines the relationship between income inequality and suicide, there are studies, including Helliwell (2007), that examine the relationship between subjective well-being measures and suicide rates. To make connections between this study and Helliwell (2007), we can hypothesize a negative correlation between income inequality and subjective well-being measures. Then, the positive association between income inequality and suicide rates as supported by the existing literature is consistent with the negative association between subjective well-being measures (life satisfaction measures) and national average suicide rates, as shown in Helliwell (2007).

[11] In Yang (1992), the female labor force participation rate is (significantly) negative for both white and non-white female suicide rates, but positive for the non-white male suicide rate and insignificant for the white male suicide rate. In Chuang and Huang (1997), the effect is negative for the total population, but insignificant for both the male and female groups. In Neumayer (2003), the effect is positive in a small sample, but insignificant in a large sample; in Andres (2005), the effect is insignificant.

2.2. Studies focused on Japan

The bulk of existing research focusing on suicide in Japan is conducted in the fields of epidemiology and psychiatry. Among those existing studies, Watanabe *et al.* (2006) and Koo and Cox (2006) are conducted from an economic viewpoint and are closed, related to this study. Watanabe *et al.* (2006) show that unemployment and personal bankruptcy are decisive factors behind the male suicide rate. Koo and Cox (2006), using time-series data from Japan to investigate the relationship between the suicide and unemployment cycles, find that the relationship between the suicide rate and the unemployment rate is significantly positive for both males and females. Also related to this study, Akechi *et al.* (2006) find that there is a U-shaped association between alcohol consumption and subsequent suicide; analyzing prefecture-level data between 1953 and 1986, Motohashi (1991) finds that the frequency of suicide is associated with the unemployment rate; and Stack (1996) shows that news on suicide has a significant correlation with the national-level suicide rate.

Yet, neither the prefecture-level panel analysis of Watanabe *et al.* (2006) nor the time-series analysis by Koo and Cox (2006) can provide insights into how suicide in Japan is different from suicides in other OECD countries, or what factors may lead to that difference. For our main purpose of identifying Japan-specific determinants of suicide, unless a careful "cross-country" empirical study is undertaken, the peculiarity of suicides in Japan cannot be accounted for.

2.3. Data and empirical methods in the literature

Many studies use country-specific time-series data to study the effects of socioeconomic factors on suicide rates (Hamermesh and Soss, 1974; Kreitman and Platt,

1984; Yang, 1992; Neumayer, 2004; Koo and Cox, 2006). In comparison, Jungeilges and Kirchgassner (2002) use 1975 data from 30 countries, to estimate the effects of socioeconomic factors and civil liberty on male and female suicide rates, across different age groups. More recent studies use panel data sets (Yang and Lester, 1995; Brainerd, 2001; Neumayer, 2003; Andres, 2005); the advantage of doing so is the ability to control for unobserved country-specific heterogeneities, as well as unobserved time-specific factors, to avoid spurious regression results. Both fixed effect and random effect models have been used (Chuang and Huang, 1997; Neumayer, 2003; Andres, 2005). In addition, since different countries may have different trends in suicide rates, unobserved country-specific and/or time-specific variables may generate omitted variable bias. To mitigate this problem, time-variant, country-specific factors can be further controlled by using a country-specific time-trend variable, as in Andres (2005).

3. Empirical Model and Data

3.1. Empirical model

We estimate the following fixed effects regression equation, using panel data from OECD countries:

$$\log S_{it} = X_{it}\gamma + \alpha_i + \beta_t + \delta_i T + \varepsilon_{it}, \quad (2)$$

where i and t index countries and years, respectively. The dependent variable, $\log S_{it}$, is the natural log of the suicide rate; X_{it} is a set of proxy variables for permanent income and other attributes, including income inequality, in equation (1). We postulated that X_{it} is a vector of socioeconomic factors that includes real GDP per capita, growth rate of real GDP per capita, Gini coefficient, female labor participation rate, birth rate, divorce rate,

and per capita alcohol consumption. The regression controls for unobserved country-specific and time-specific fixed effects by adding α_i and β_t, respectively. In addition, it controls for unobserved country-specific but time-variant effects, by allowing the country-specific coefficient, δ_i, for the linear time trend, T. The final term, ε_{it}, is an error term.

Estimations are carried out separately for the male and female groups. For each gender, additional estimations are carried out for three different age groups: age 25–44, 45–64, and 65 years and older. Furthermore, to compare Japan's suicide patterns with those of other OECD countries, we allow a Japan dummy variable to interact with socioeconomic factors and compare the fitness of these two settings. Finally, the random effect counterpart of the regression equation is also estimated.

3.2. Data

The data set covers all OECD countries over the period of 1980–2003. Table 2 lists the definitions of the variables used in this study, together with their sources. Raw numbers pertaining to suicide and population by gender-age groups were taken from the World Health Organization (WHO) Mortality Database. [12] The suicide rate per 100,000 inhabitants for a specific gender-age group is calculated by the ratio of the number of suicides to the population of that group. Furthermore, for both total male and total female groups (not separated by age), suicide rates are converted into age-standardized suicide rates per 100,000 inhabitants, using the world standard population figures published by

[12] We acknowledge the importance of the potential differences in the reporting of suicides over time and across OECD countries. Despite this concern, as long as the differences in the suicide reporting system across countries are consistent and time-invariant, they are captured by the country fixed effects. Changes over time in each country can also be controlled for to a certain extent by the country-specific time-trend variable. Finally, if there is some change over time that is the same across OECD countries, the time-trend variable captures its impacts.

WHO.[13] By conducting this adjustment, differences in age structure across countries and over time can be controlled by age-standardized suicide rates. In other words, there is no need to include the share of specific age-groups in the analysis (Neumayer, 2003).

The economic variable real GDP per capita was taken from the Penn World Table 6.2, and growth rates are calculated based on real GDP per capita. Unemployment rate was taken from the OECD Health Data. As a proxy for income inequality, Gini coefficients based on different definitions are taken from the United Nations University's World Income Inequality Database (WIID). The average Gini coefficients employed in this study are the average across the different Gini coefficients of each country and year by year; therefore, they are time-variant and country-specific.[14] As to social variables, birth rates measured as a ratio of live birth to total population are taken from the WHO Mortality Database. The divorce rate, measured by the ratio of the number of divorce to the total population, was taken from the United Nations Common Database. Female labor participation rate, measured as a percentage of females out of the total labor force, was taken from the World Development Indicators of the World Bank. For alcohol consumption, the sales data of pure alcohol in liters per person over 15 years of age are taken from the OECD Health Data. However, Japanese alcohol consumption data are missing many observations, so we had to calculate it by using annual alcohol sales data from the Japanese National Tax Agency.

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[13] Unadjusted suicide rates give an equal weight to each suicide, while adjusted suicide rates give different weights to the suicide rates of each age group, based on the world standardized age structure. This reduces the influence of country-specific age structure on total population suicide rate.

[14] UN/WIDER WIID provides multiple series of Gini coefficients for each country, depending on the different definitions of income, area coverage, and unit of measurement (Andres, 2005; WIID, 2007). The database is comprehensive and also includes estimates made by Klaus Deininger and Lyn Squire (1996). This research uses the average of these multiple series as a proxy for income inequality. Although this approach has been quite widely used in the empirical literature—not only in the suicide literature but also in many other economic studies—and the WIID is the most well complied data for the Gini index, it may still lead to biased estimates due to noise and mis-measurement problems. This may also be the reason why some empirical studies have reported

Table 3 presents the summary statistics of suicide rates and socioeconomic variables.[15] The average male suicide rates are approximately twice the average female suicide rates in Japan, and around three times those of all other OECD countries. Across all gender-age groups, Japan's average suicide rates are higher than those of all the OECD countries. For both Japan and all OECD countries, male and female suicide rates increase with age. Regarding economic variables, the average of real GDP per capita is lower in Japan than for all OECD countries, while Japan's average growth rate is slightly higher and its Gini index is roughly the same. Japan's average unemployment rate is much lower than that of other OECD countries. Regarding social variables, the averages of female labor force participation rate, divorce rate, and alcohol consumption are lower in Japan while the average birth rate is the same.

4. Estimation Results

4.1. Basic results

The estimation results of the fixed effect model with country-specific time trends, using data from all OECD countries, are shown in Table 4. Note that the estimation in Table 4 restricts all the socioeconomic factors so that they have the same marginal effects on suicide rates (i.e., same regression coefficients) for all OECD countries. Table 5 shows the estimation results of the fixed-effects model with a country-specific time trend; it allows for a different set of regression coefficients for Japan.[16] Hence, the estimation results in Table 4 can be considered restricted versions of those in Table 5. When comparing the overall performance of these two regressions, adding Japan's interaction

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mixed results regarding the effect of income inequality on suicides.

[15] Due to missing data, out of 30 OECD member countries, three countries (Iceland, Mexico, and Turkey) dropped out of the estimation. Furthermore, the data covers only up to 2003.

terms improves the fitness of the model, quantified by R^2, across all gender-age groups. F tests reject the null hypothesis that socioeconomic factors affect suicide rates of different countries equally for the male group, males aged 25–44, and males aged 45–64.[17] This confirms the common belief that suicide in Japan is somewhat of an anomaly among industrialized countries.

For all OECD countries, real GDP per capita is negatively associated with the suicide rate for the male group, males aged 45–64, and females aged 65 and above. The growth rate of real GDP per capita is negatively associated with suicide rate, but only for females aged 25–45. The Gini index, as a proxy for income inequality, is positively associated with the suicide rate for the male group, males aged 45–64, and males aged 65 and above.[18] These results support the hypothesis that better economic conditions—such as high income level and higher economic growth—reduce the suicide rate, while income inequality increases the suicide rate. However, the unemployment rate is statistically insignificant; this is consistent with the result in Andres (2005), where data from 15 European countries were used.[19] The significance and magnitudes of real GDP per capita, growth rate of real GDP per capita, Gini index, and unemployment rate were similar, whether the Japan interaction terms were added or not.

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[16] We do not present the coefficients of country and year fixed effects, nor country-specific time trends, in Tables 4 and 5. However, those estimates are available upon request.

[17] F statistics are 4.68, 2.56 and 4.12, for the male group, males aged 25-44, and males aged 45–64, respectively. The null hypothesis is rejected at the 95 (F statistics = 1.84) and 99 percentiles (F statistics = 2.51).

[18] There is a concern that the Gini coefficients we constructed may not be able to capture the real effect of inequality due to aggregation. We also chose the longest Gini coefficients available for each country, and allowed country-specific parameters. However, the regression results are similar to the one presented in this study.

[19] There are some potential explanations for the insignificance of the unemployment rate. First, it is a consequence of multi-collinearity of economic variables. Second, it can be the result of a bias due to an omitted variable problem. Third, the unemployment rate is indeed insignificant (e.g., well-designed unemployment insurance).

Meanwhile, divorce rate is positively associated with the suicide rate for males aged 24–44 and 45–64, but becomes statistically insignificant as the Japan interaction terms are included in the regression.[20] This suggests that positive signs of these two male groups may have been overestimated due to the strong effect of one specific country, Japan. The birth rate is positively associated with the suicide rate for males aged 65 and above, when the Japan interaction terms are not included in the estimation. This is inconsistent with the existing theory that birth improves family ties and social integration, and thus leads to a lower suicide rate. It may suggest an intergenerational transfer in the burden of child-bearing. In any case, this positive sign associated with the birth rate becomes statistically insignificant when the Japan interaction terms are added; hence, the positive result of birth rate may have captured the effect of some omitted variables. Finally, female labor participation rate and alcohol consumption appear to be statistically insignificant.

This discussion suggests that the effects of socioeconomic factors vary, depending on gender and age.[21] Overall, there exists much variation in female suicide rates and in the suicide rates of elderly males and females that the model fails to account for. Furthermore, the suicide rate is more sensitive to economic factors such as real GDP per capita, growth rate of real GDP per capita, and Gini index than to social factors such as the divorce rate, the birth rate, female labor participation rate, and alcohol consumption.

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[20] The referee pointed out that marriage measures may be included to explain suicide patterns in addition to divorce rates. First, we acknowledge that marriage rate and older ages at marriage may be correlated with suicide rates. However, this correlation may be captured by our socioeconomic variables, divorce rate, and female labor force participation rate. The simple correlation check using our data sample also supports this. This may validate the use of divorce rate and female labor force participation rate in the existing literature on suicide.

[21] As the referee pointed out, we acknowledge that youth suicide is a serious issue. While this study does not present separate regression results for this group, they are available upon request from the authors. First, suicides of those under 25 are a relatively small portion of the total number of suicides. Second, for this group, very few coefficients are statistically significant; therefore, socioeconomic variables used for other age groups may not suffice in explaining suicide patterns among those under the age of 25. We think that certain contributors—such as stress from school work, peer pressure, increased social and family disruptions, high youth unemployment, and

Turning to the case of Japan, real GDP per capita is negatively associated with suicide rates across all groups. The growth rate is negatively associated with the suicide rate across all gender-age groups, except females aged 45–64, and 65 and above. The Gini index is positively correlated with the suicide rate across all gender-age groups, except males aged 25–44 and females aged 65 and above. The empirical results of the positive and significant coefficient of the Gini index in Japan supports the view that individuals have an aversion to inequality and relative deprivation (Frey and Stutzer, 2002; Easterlin, 2001; Luttmer, 2005; Fafchamps and Shilpi, 2007). Meanwhile, the female labor participation rate is positively associated with the suicide rate for all gender-age groups. One plausible explanation is the added worker effect which states that unemployment of a household member increases labor supply of another household member (Lundberg, 1985). With Japanese household panel data, Kohara (2007) finds that the involuntary unemployment of a husband induces extended labor supply of his wife, especially among the households with low financial assets. This suggests that female labor force participation captures economic difficulties of Japanese household. An alternative explanation is that when women participate in the labor market, the decrease in family ties and domestic care for family members, as well as the additional stress from outside jobs, outweighs the beneficial effect of increasing social integration.

The birth rate is negative for Japan, except for males and females aged 45–64 (insignificant), while it is not significant for other OECD countries. This implies that social integration and family ties through the presence of children reduce the suicide rate in Japan, and that the effect is stronger in females than in males, and in younger and older generations (aged 25–44 and aged 65 and above) than in the middle-age generation (aged 45–64). This makes sense, because males and the middle-age generation bear the majority

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increased access to means of self-harm—play more important roles with youth than those socioeconomic variables we consider in this study.

of the financial cost of child-bearing. The divorce rate is positively associated with the suicide rate, but only for males aged 25–44—suggesting that men are vulnerable to stress arising from divorce. Alcohol consumption is positively associated with the suicide rate of the male group, and males aged 65 and above. The negative relationship between the suicide rate of females aged 65 and above and alcohol consumption is somewhat surprising. Clarifying whether it is indeed real, or spurious due to some omitted variable, requires more detailed data.

Moreover, with Japan dummy interaction terms, time trends become significantly positive for males aged 45–64, while for all other groups, the parameters remain insignificant. This implies that unobservable factors—such as the additional impact of the "credit crunch" and the resultant increase in personal bankruptcies in 1997–98—in increasing the suicide rate among males aged 45–64 may have been captured by a Japan-specific time-trend coefficient. The difference with Japan's specific coefficients of socioeconomic variables such as per capita GDP, GDP growth rate, and divorce rate are largely significant for the male groups aged 25–44 and 45–64. According to recent data from the Family Income and Expenditure Survey by the Ministry of Internal Affairs and Communications, households headed by the age 25–64 group occupy 95 percent of all the households in Japan, and their income share is more than 97 percent. Moreover, the majority of households are headed by males. For these reasons, males aged 25–64 years play a major role in the national economy, and it therefore stands to reason that economic conditions will have larger impacts on this group than other gender-age groups.

These findings suggest that the suicide problem in Japan is very different from that of other OECD countries. Overall, the suicide rate in Japan is more responsive to economic factors such as real GDP per capita, growth rate of real GDP per capita, and changes in the Gini index. Moreover, the impacts of social factors such as the divorce rate, birth rate, female labor participation rate, and alcohol consumption on Japan's suicide rate

are noticeably different from the impacts of those same factors on the suicide rates of other OECD countries.

4.2. The Oaxaca decomposition

To quantify the relative contributions of different factors to the overall differences in suicide rates between Japan and other OECD countries, we employ the standard Oaxaca decomposition. Based on the regression equation (2), the formula of the Oaxaca decomposition is as follows:

$$\begin{aligned} \overline{\log S}^{OECD} - \overline{\log S}^{Japan} &= \overline{X}^{OECD}\gamma^{OECD} - \overline{X}^{Japan}\gamma^{Japan} + \overline{Z}^{OECD} - \overline{Z}^{Japan} \\ &= \underbrace{\Delta\overline{X}\cdot\gamma^{Japan}}_{endowment\ \ difference} + \underbrace{\overline{X}^{OECD}\cdot\Delta\gamma}_{coefficient\ \ difference} + \Delta\overline{Z} \end{aligned} \tag{3}$$

The left-hand side of equation (3) is the difference in the average log suicide rates between Japan and other OECD countries. X is the vector of observed determinants of suicide rates, γ is the vector of the coefficients of socioeconomic variables, and the term Z includes the fixed-effects and country-specific time trends. Δ denotes the first difference operator. Then, equation (3) can be rewritten as:

$$\underbrace{\overline{\log S}^{OECD} - \overline{\log S}^{Japan} - \Delta Z}_{adjusted\ difference} = \underbrace{\Delta\overline{X}\cdot\gamma^{Japan}}_{endowment\ difference} + \underbrace{\overline{X}^{OECD}\cdot\Delta\gamma}_{coefficient\ difference} \tag{4}$$

With equation (4), we are able to analyze which factors contribute most to the adjusted difference in suicide between Japan and other OECD countries, and to what extent. The decomposition results are shown in Table 6. The adjusted difference in the left-hand side of equation (4) is –9.86, which can be decomposed into the difference in endowment

($\Delta\overline{X} \cdot \gamma^{Japan}$), 1.99, and the difference in the coefficients ($\overline{X}^{OECD} \cdot \Delta\gamma$), –11.85.[22] This decomposition suggests that the difference in adjusted male suicide rates is mainly due to the difference in coefficients—that is, the different responsiveness of socioeconomic factors between the two groups, i.e., Japan and other OECD countries.[23] Among socioeconomic factors with positive coefficients, female labor force participation and the unemployment rate are leading factors relating to Japan's high suicide rate, which also contribute to the difference in suicide rates between Japan and other OECD countries. Meanwhile, among factors with negative coefficients, real GDP per capita and birth rate are leading factors associated with Japan's high suicide rate and hence the difference in suicide rates between Japan and other OECD countries. Similar patterns appear in the case of the pooled female group. Since the empirical results show that the suicide rate in Japan is significantly correlated with a wide variety of socioeconomic variables, effective suicide prevention requires comprehensive measures against downside risk originating from associated socioeconomic problems. Such measures may include a review of the current unemployment insurance scheme; updates to the credit insurance and subsidized loan programs for small- and medium-size enterprises, which are vulnerable to recessions; a general expansion of livelihood protection and income-support programs; complementary supports that mitigate stress and burden related to female labor market participation, such as improved provisions for public child day care; and policy measures to tackle the dwindling birth rate (Date and Shimizutani, 2007).

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[22] Since Japan's suicide rates are higher, on average, than those of other OECD countries, the left-hand sides of equations (3) and (4) become negative.

[23] The difference in the coefficients explains 120 percent of the difference (= –11.85/–9.86)·100%) while the difference in the endowments explains only –20 percent of the difference (= 1.99/–9.86)·100%).

5. Conclusion

In this study, we analyzed suicide rates among OECD countries, and made a particular effort to gain insight into how suicide in Japan differs from suicide in other OECD countries. The results suggest that the effects of socioeconomic factors on suicide rate vary, depending on gender and age. In general, better economic conditions—such as high income level and higher economic growth—reduce suicide rate, while income inequality increases suicide rate. Unlike the results of previous studies, we found the effect of unemployment rate on suicide rate to be statistically insignificant. Moreover, the suicide rate is more sensitive to economic factors such as real GDP per capita, growth rate of real GDP per capita, and Gini index than to social factors captured by divorce rate, birth rate, female labor participation rate, and alcohol consumption. We also found that female and elderly suicides are more difficult to be accounted for.

In accordance with general belief, the suicide problem in Japan is very different from those of other OECD countries. The suicide rate in Japan is more responsive to economic factors; moreover, the impacts of social factors on suicide rates are insignificant in other OECD countries, and in Japan, the marginal effect of the female labor participation rate is positively associated with Japan's suicide rate, while it is insignificant in other OECD countries. Also, in Japan, the birth rate is negative (insignificant in other OECD countries); the divorce rate is positively associated with suicide rate, but only for middle-age (aged 25–44) males; and alcohol consumption is positively associated with the suicide rate for males, with the effect being strongest for elderly males (aged 65 and above).

Amidst all the myth and folklore about suicide in Japan, the empirical results show that socioeconomic variables explain well the anomaly of Japanese suicide. Indeed, it has been hypothesized that the recent suicide epidemic mentioned at the beginning of this paper is related to the economic recession, in the wake of the so-called "lost decade" in

Japan in the 1990s, after the burst of the bubble (Koo and Cox, 2006). Further, the collapse of the mega-banks in 1997 caused a crisis in the domestic financial sector, which is often referred to as a typical example of "credit crunch" (Woo, 2003). Existing studies show that the negative impact of the credit crunch in Japan damaged small firms disproportionately, leading to debt insolvencies and personal bankruptcies among many small business owners. Indeed, the number of applications for personal bankruptcies jumped from 43,545 in 1993 to 122,741 in 1999 (Sawada *et al.*, 2007). The social stigma and mental depression associated with personal debt and bankruptcy has led to a dramatic increase in suicides. Along this line, West (2003) suggests that it is crucial for suicide prevention programs to prompt the building of an efficient and socially acceptable insolvency mechanism. In fact, the recently enacted "Basic Law of Suicide Prevention" calls for a comprehensive measure for suicide prevention. While it is yet to be seen how comprehensive the implementation of the law will be, the findings of this paper support such policy-making in Japan.

Finally, this study re-emphasizes the heterogeneities of suicide by gender and across different age groups, as pointed out by Andres (2005). Moreover, it highlights the heterogeneity in suicide patterns in different countries. The regression results demonstrate that fixed-effect coefficients in themselves are not enough to uncover the differences in social structures; they call for scientists' care and vigilance in interpreting empirical results when utilizing aggregated cross-country data. In light of this limitation, future research on the determinants of suicide requires disaggregated and preferably individual-level data. An ongoing project surveying family members of suicide victims, conducted through a joint effort of the authors and Lifelink, a Tokyo-based non-for-profit organization, provides an unprecedented opportunity in the field of suicide study. Some preliminary results thereof are available in Chen, Choi, and Sawada (2007).

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Table 1. Ranking of Suicide Rates among OECD Countries: 1998–2004

	Males						
	1998	1999	2000	2001	2002	2003	2004
Australia	12	13	14	13	15	13	–
Austria	4	4	4	4	4	8	5
Belgium	–	–	–	–	–	–	–
Canada	17	10	19	18	18	–	–
Czech Republic	8	8	9	8	11	7	6
Denmark	15	15	15	17	–	–	–
Finland	2	2	2	2	3	4	3
France	6	6	7	7	7	6	–
Germany	14	16	17	14	14	10	8
Greece	26	27	26	27	25	19	16
Hungary*	1	1	1	1	1	1	–
Iceland	20	21	6	15	20	16	11
Ireland	10	18	11	10	12	11	10
Italy	23	24	23	24	22	–	–
Japan	3	3	3	3	2	2	1
Luxembourg	16	14	12	21	9	14	9
Mexico*	–	–	–	–	–	–	–
Netherlands	22	22	22	23	21	17	13
New Zealand	9	12	13	12	–	–	–
Norway	19	19	18	20	19	15	12
Poland*	–	7	8	6	6	5	4
Portugal	25	26	25	22	17	12	–
Republic of Korea	7	11	16	11	8	3	2
Slovakia*	11	9	10	9	10	–	–
Spain	21	25	24	26	24	18	15
Sweden	13	17	20	16	13	–	–
Switzerland	5	5	5	5	5	9	7
Turkey*	–	–	–	–	–	–	–
United Kingdom	24	23	–	25	23	–	14
United States of America	18	20	21	19	16	–	–
# of countries	26	27	26	27	25	19	16

Notes:
1. For both male and female, suicide rates per 100,000 people are calculated using the number of suicides and population data from the WHO Mortality Database, 2006. The rates are not adjusted. The ranking is done by sorting the computed suicide rates.
2. * denotes countries absent from the World Bank's 2006 list of high-income countries.

Table 1. Ranking of Suicide Rates among OECD Countries: 1998–2004 (cont.)

	Females						
	1998	1999	2000	2001	2002	2003	2004
Australia	16	18	15	16	15	13	–
Austria	6	3	4	4	8	7	5
Belgium	–	–	–	–	–	–	–
Canada	17	15	17	18	17	–	–
Czech Republic	15	17	13	15	14	9	11
Denmark	9	10	9	8	–	–	–
Finland	5	7	5	5	5	5	4
France	7	5	7	7	6	6	–
Germany	13	14	11	10	11	8	8
Greece	26	27	26	27	25	19	16
Hungary*	1	1	1	1	4	4	–
Iceland	18	16	12	12	10	16	7
Ireland	20	19	20	19	19	12	12
Italy	22	23	23	23	22	–	–
Japan	2	2	2	2	2	2	2
Luxembourg	12	8	19	11	7	17	10
Mexico*	–	–	–	–	–	–	–
Netherlands	11	13	10	17	13	11	9
New Zealand	10	11	21	14	–	–	–
Norway	14	12	14	13	12	10	6
Poland*	–	20	18	21	16	15	13
Portugal	25	25	25	24	18	14	–
Republic of Korea	3	6	6	6	3	1	1
Slovakia*	24	22	16	20	21	–	–
Spain	21	26	24	26	24	18	15
Sweden	8	9	8	9	9	–	–
Switzerland	4	4	3	3	1	3	3
Turkey*	–	–	–	–	–	–	–
United Kingdom	23	24	–	25	23	–	14
United States of America	19	21	22	22	20	–	–
# of countries	26	27	26	27	25	19	16

Table 1. Ranking of Suicide Rates among OECD Countries: 1998–2004 (end)

	Males and Females						
	1998	1999	2000	2001	2002	2003	2004
Australia	12	16	15	16	15	13	–
Austria	4	4	4	5	6	7	5
Belgium	–	–	–	–	–	–	–
Canada	17	13	20	19	16	–	–
Czech Republic	9	9	9	9	10	8	7
Denmark	11	11	12	13	–	–	–
Finland	3	3	3	2	3	4	3
France	7	6	6	6	7	6	–
Germany	14	17	14	15	13	10	8
Greece	26	27	26	27	25	19	16
Hungary*	1	1	1	1	1	1	–
Iceland	20	20	7	17	20	16	9
Ireland	13	19	13	12	14	11	12
Italy	23	24	23	24	22	–	–
Japan	2	2	2	3	2	2	2
Luxembourg	15	10	16	20	8	15	10
Mexico*	–	–	–	–	–	–	–
Netherlands	21	22	22	22	21	17	13
New Zealand	8	12	18	14	–	–	–
Norway	18	18	19	18	19	12	11
Poland*	–	8	8	7	9	9	6
Portugal	25	26	25	23	18	14	–
Republic of Korea	6	7	10	8	5	3	1
Slovakia*	16	15	11	10	11	–	–
Spain	22	25	24	26	24	18	15
Sweden	10	14	17	11	12	–	–
Switzerland	5	5	5	4	4	5	4
Turkey*	–	–	–	–	–	–	–
United Kingdom	24	23	–	25	23	–	14
United States of America	19	21	21	21	17	–	–
# of countries	26	27	26	27	25	19	16

Table 2. Variables and Data Sources

Variable	Definition	Source(s)
Suicide rate	Per 100,000 persons rate	WHO Mortality Database (last updated 17 November 2006)
Birth rate	Live birth to total population	
Population	—	
Per capita GDP	Real GDP	Penn World Table 6.2, 2006
Per capita GDP growth rate	Real GDP growth rate	
Unemployment rate	Percent of total labor force	OECD Health Data 2005 Additional source for alcohol consumption (only for the Japanese data): National Tax Agency, Japan
Alcohol consumption	Liters per person aged 15 and above	
Divorce rate	Percent of total population	United Nations Common Database, 2007
Gini coefficient	Average of Gini indices, from different definitions	World Income Inequality Database, V 2.0b, May 2007
Female labor participation	Percent of total labor force	World Development Indicators, 2006

Table 3. Summary Statistics

	Mean	Std. Dev.	Min	Max
Suicide Rates: all OECD countries (number of observations: 312)				
Total (males and females)	14.43	5.99	2.79	38.24
Males	21.78	9.06	4.81	59.18
Males aged 25–44	26.15	11.27	6.29	70.98
Males aged 45–64	30.70	14.95	6.37	89.07
Males aged 65 and above	40.01	19.83	8.83	124.55
Females	7.09	3.53	0.76	20.18
Females aged 25–44	7.74	3.77	0.77	21.64
Females aged 45–64	11.42	6.46	1.04	40.35
Females aged 65 and above	13.25	9.57	1.23	47.97
Suicide Rates: Japan (number of observations: 14)				
Total (males and females)	17.87	2.62	13.84	21.77
Males	24.20	3.83	19.36	30.20
Males aged 25–44	25.02	4.23	19.14	32.80
Males aged 45–64	40.53	8.08	32.26	58.05
Males aged 65 and above	48.12	7.08	35.92	57.63
Females	11.53	1.91	8.32	14.19
Females aged 25–44	9.91	1.99	6.44	12.25
Females aged 45–64	16.09	1.73	13.05	19.20
Females aged 65 and above	35.53	7.08	23.90	44.15
Socioeconomic variables: All OECD countries (number of observations: 312)				
Gini index	30.94	4.68	16.63	45.30
Real GDP per capita	1.86	0.68	0.52	4.86
Per capita GDP growth rate	0.05	0.03	–0.07	0.17
Unemployment rate	0.07	0.04	0.01	0.24
Female labor force participation rate	43.06	3.20	34.55	48.08
Birth rate	1.62	0.25	1.13	2.18
Divorce rate	2.25	0.91	0.30	5.20
Alcohol consumption	10.10	2.71	4.60	19.70
Socioeconomic variables: Japan (number of observations: 14)				
Gini index	30.29	2.53	24.80	35.00
Real GDP per capita	1.58	0.53	0.87	2.31
Per capita GDP growth rate	0.06	0.04	–0.01	0.12
Unemployment rate	0.03	0.00	0.02	0.04
Female labor force participation rate	39.95	0.72	38.75	40.72
Birth rate	1.62	0.16	1.38	1.81
Divorce rate	1.46	0.20	1.21	1.92
Alcohol consumption	8.21	0.79	6.67	9.22

Table 4. OECD Countries Regression Results

	Male	Female	M25–44	M45–64	M65-	F25–44	F45–64	F65-
Real GDP per capita	–0.38**	–0.35	–0.32	–0.38**	–0.22	–0.20	–0.31	–1.02**
	(0.15)	(0.22)	(0.21)	(0.16)	(0.19)	(0.24)	(0.36)	(0.40)
Growth rate of real GDP per capita	–0.05	–0.06	–0.09	–0.02	0.05	–0.78**	0.50	0.41
	(0.33)	(0.50)	(0.43)	(0.51)	(0.32)	(0.35)	(1.26)	(0.77)
Unemployment rate	–0.15	0.53	–0.28	0.54	–0.35	0.56	1.32	–0.38
	(0.57)	(0.98)	(0.72)	(0.56)	(0.68)	(1.25)	(1.27)	(1.42)
Female labor force participation rate	–0.01	–0.02	–0.02	0.00	–0.02	–0.03	0.01	–0.04
	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.06)	(0.04)	(0.05)
Birth rate	0.14	0.10	0.04	0.20	0.22*	0.12	0.23	–0.26
	(0.12)	(0.17)	(0.12)	(0.14)	(0.12)	(0.23)	(0.23)	(0.37)
Divorce rate	0.07	0.02	0.09*	0.10*	0.00	0.04	–0.04	0.11
	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)	(0.07)	(0.06)	(0.09)
Alcohol consumption	0.01	0.02	0.02	0.01	0.00	–0.02	0.03	0.04
	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.05)	(0.04)	(0.04)
Gini index	0.01**	0.00	0.00	0.01**	0.01**	0.00	0.00	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Number of observations	312	312	313	313	312	313	313	312
Number of countries	27	27	27	27	27	27	27	27
R-squared	0.794	0.787	0.741	0.761	0.683	0.675	0.652	0.653

Notes:
1. The estimation is done with country fixed effect, time fixed effect, and country-specific linear time trend which are not shown in the table.
2. Robust standard errors in parentheses.
3. * denotes significance at 10%; ** denotes significance at 5%; *** denotes significance at 1%.

Table 5. OECD Countries Regression Results with Japan Dummy

	Male	Female	M25–44	M45–64	M65-	F25–44	F45–64	F65-
Real GDP per capita	–0.31**	–0.32	–0.26	–0.31*	–0.16	–0.17	–0.28	–1.00**
	(0.15)	(0.24)	(0.21)	(0.15)	(0.19)	(0.26)	(0.37)	(0.42)
(Japan effect)	–1.50***	–1.20***	–1.21***	–1.39***	–1.57***	–1.26**	–1.07*	–0.96
	(0.18)	(0.35)	(0.26)	(0.29)	(0.49)	(0.51)	(0.52)	(0.78)
Per capita GDP growth rate	0.09	–0.10	0.05	0.17	0.07	–0.81**	0.47	0.32
	(0.35)	(0.53)	(0.46)	(0.54)	(0.35)	(0.38)	(1.32)	(0.81)
(Japan effect)	–5.33***	–5.14**	–2.87***	–5.62**	–5.24**	–8.79**	–2.35	–1.95
	(1.38)	(2.35)	(0.98)	(2.08)	(1.97)	(4.26)	(2.67)	(2.64)
Unemployment rate	–0.04	0.50	–0.17	0.72	–0.39	0.52	1.34	–0.43
	(0.60)	(1.01)	(0.77)	(0.55)	(0.70)	(1.28)	(1.32)	(1.44)
(Japan effect)	24.93**	24.98	14.77	21.02	39.05***	52.36*	–1.25	6.61
	(9.21)	(16.43)	(8.72)	(13.14)	(13.62)	(29.73)	(18.51)	(17.96)
Female labor force participation rate	–0.01	–0.02	–0.02	0.00	–0.02	–0.03	0.01	–0.04
	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.06)	(0.04)	(0.05)
(Japan effect)	0.33***	0.49***	0.34***	0.18**	0.56***	0.75***	0.24*	0.34**
	(0.06)	(0.11)	(0.07)	(0.08)	(0.11)	(0.17)	(0.14)	(0.15)
Birth rate	0.05	0.11	–0.05	0.08	0.18	0.13	0.22	–0.25
	(0.09)	(0.20)	(0.11)	(0.11)	(0.12)	(0.24)	(0.27)	(0.38)
(Japan effect)	–1.60***	–2.57**	–1.60***	0.25	–3.04***	–4.24**	–0.43	–2.51**
	(0.48)	(0.98)	(0.55)	(0.59)	(0.76)	(1.61)	(1.17)	(1.04)
Divorce rate	0.04	0.02	0.06	0.07	–0.01	0.04	–0.05	0.11
	(0.04)	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)	(0.06)	(0.09)
(Japan effect)	–0.01	–0.43	0.54***	–0.30	–0.14	–0.73	–0.17	–0.12
	(0.25)	(0.43)	(0.16)	(0.39)	(0.35)	(0.66)	(0.43)	(0.49)
Alcohol consumption	0.02	0.01	0.03	0.01	0.01	–0.02	0.02	0.05
	(0.02)	(0.03)	(0.02)	(0.04)	(0.04)	(0.06)	(0.04)	(0.04)
(Japan effect)	0.10*	0.01	0.04	0.15*	0.09	0.07	0.01	–0.14**
	(0.05)	(0.07)	(0.03)	(0.08)	(0.06)	(0.12)	(0.11)	(0.06)
Gini index	0.01**	0.00	0.00	0.01**	0.01*	0.00	0.00	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
(Japan effect)	0.01***	0.02***	0.01	0.00	0.02**	0.02**	0.02***	0.01
	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Number of observations	312	312	313	313	312	313	313	312
Number of countries	27	27	27	27	27	27	27	27
R-squared	0.824	0.792	0.763	0.792	0.694	0.681	0.655	0.654

Notes:
1. The estimation is done with country fixed effect, time fixed effect, and country-specific linear time trend which are not shown in the table.
2. Robust standard errors in parentheses.
3. * denotes significance at 10%; ** denotes significance at 5%; *** denotes significance at 1%.
4. "(Japan effect)" represents the coefficient for the interaction term between a Japan dummy variable and each explanatory variable.

Table 6. The Oaxaca Composition of the Adjusted Difference in Suicide Rates for the Male and Female Groups

Males	Endowment		Gap in coefficient	
Adjusted difference (–9.86)	$\Delta\overline{X}\cdot\gamma^{Japan}$	Proportion to the adjusted difference	$\overline{X}^{OECD}\cdot\Delta\gamma$	Proportion to the adjusted difference
Per capita GDP	–0.51	5.13	2.78	–28.18
Per capita GDP growth rate	0.05	–0.50	0.26	–2.63
Unemployment rate	1.20	–12.14	–1.87	18.94
Female labor participation	1.01	–10.24	–14.38	145.85
Birth rate	–0.01	0.10	2.59	–26.31
Divorce rate	0.03	–0.30	0.01	–0.11
Alcohol consumption	0.21	–2.17	–0.97	9.84
Gini coefficient	0.01	–0.09	–0.28	2.82
Sum	1.99	–20.22	–11.85	120.21

Females	Endowment		Gap in coefficient	
Adjusted difference (–13.78)	$\Delta\overline{X}\cdot\gamma^{Japan}$	Proportion to the adjusted difference	$\overline{X}^{OECD}\cdot\Delta\gamma$	Proportion to the adjusted difference
Per capita GDP	–0.43	3.09	2.22	–16.13
Per capita GDP growth rate	0.05	–0.36	0.25	–1.82
Unemployment rate	1.23	–8.90	–1.87	13.58
Female labor participation	1.46	–10.57	–20.88	151.54
Birth rate	–0.02	0.11	4.17	–30.28
Divorce rate	–0.32	2.34	0.97	–7.02
Alcohol consumption	0.05	–0.38	–0.14	1.03
Gini coefficient	0.01	–0.09	–0.53	3.82
			0.00	
Sum	2.03	–14.76	–15.81	114.72

Figure 1. Time-Series Plot of Suicide Rates: Japan vs. Other OECD Countries

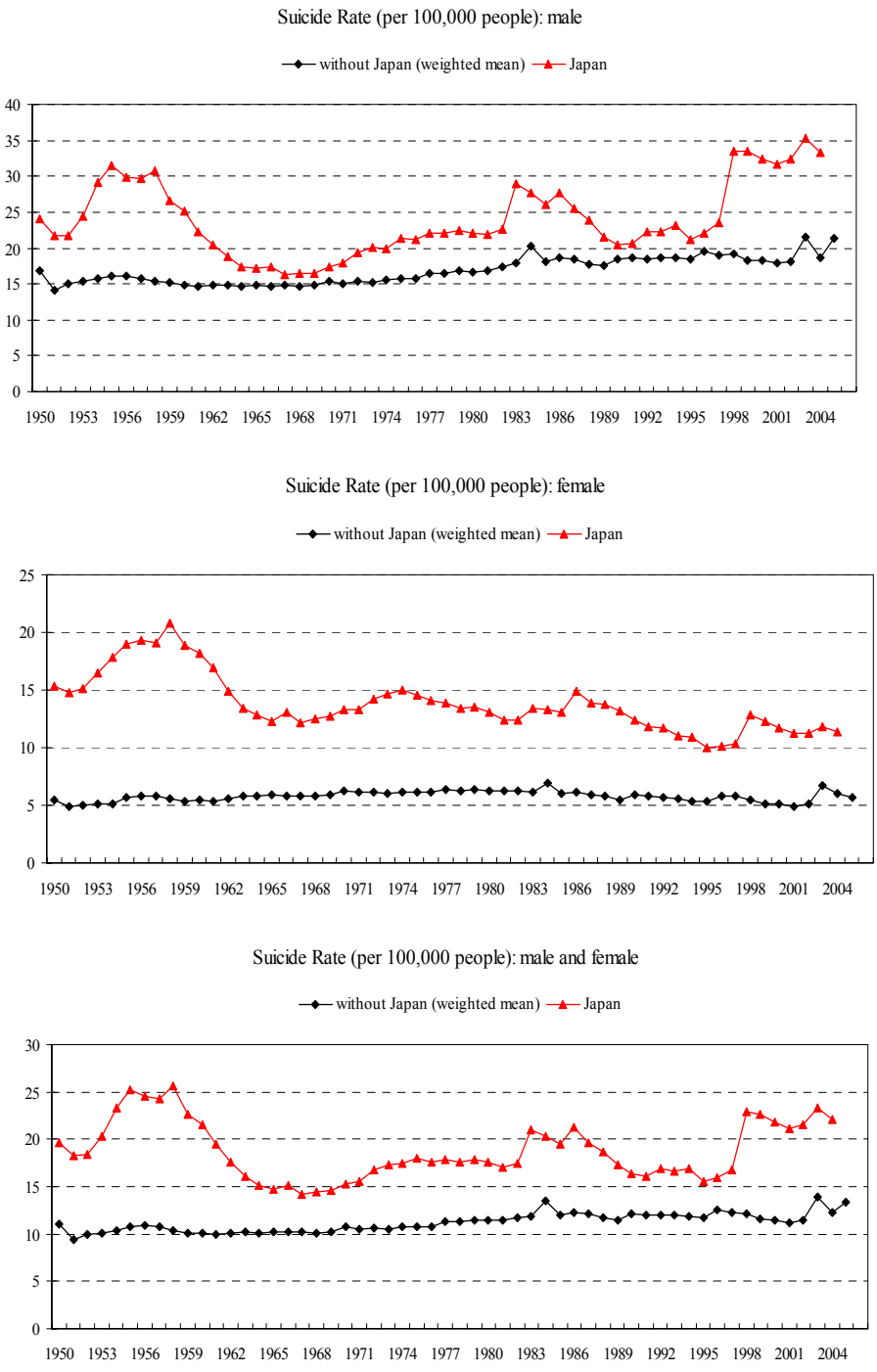
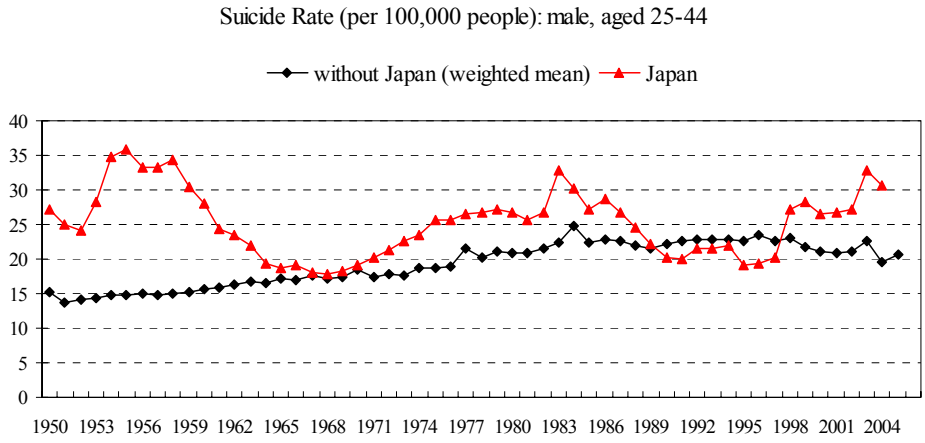
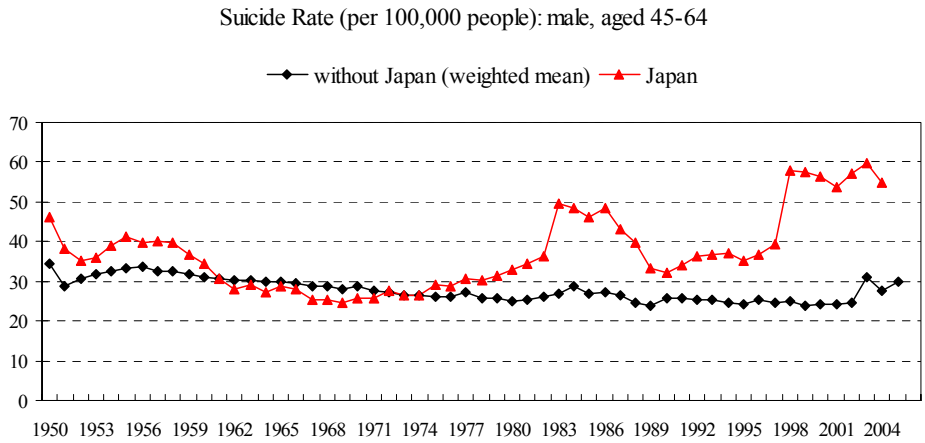


Figure 2. Time-Series Plot of Suicide Rates: Japan vs. Other OECD Countries, Male





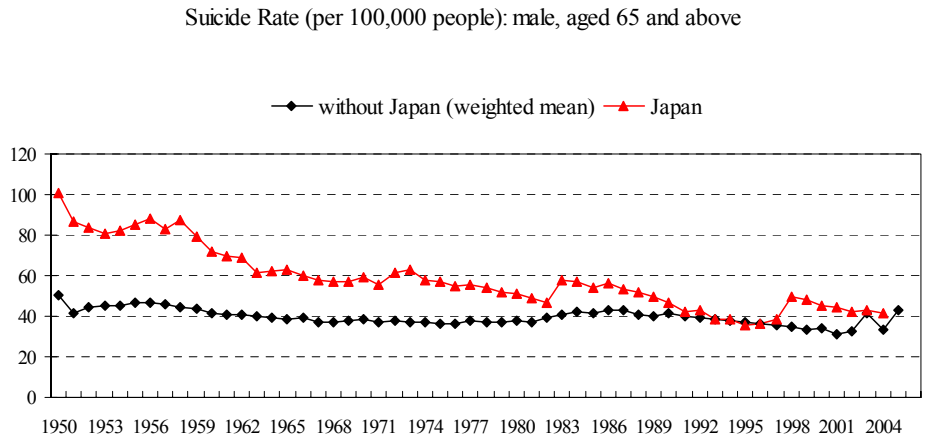


Figure 3. Time-Series Plot of Suicide Rates: Japan vs. Other OECD Countries, Female