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Political institutions and suicide: A regional analysis of Switzerland

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Abstract

The question to what extent governance structure affects people's well-being, here reflected in the decision to commit suicide, remains still largely unknown. This paper examines the effects of political institutions and governance structure on suicide using a balanced panel for 26 Swiss states (cantons) over the period 1980–1998. Our results indicate that stronger popular rights and more fiscal decentralization reduce suicide, while more local autonomy increases it. The effects are not strongly gender-specific. However, we find evidence that the effect of direct legislation is partly transmitted through sub-federal budgets, but not through health sector spending exclusively.

Keywords: Suicide, Direct democracy, Decentralization, Happiness, Well-being

JEL Classification(s): I12, I18, I31, O52, H40

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1 Introduction

The question of what determines people's happiness has recently gained new attention. Present research focuses on either aggregate economic determinants or soft factors of life satisfaction based on social interactions. The most recent contributions emphasize the importance of trust among citizens in society and social networks, on the one hand, and government quality, political stability, or economic reform on the other (Frey and Stutzer, 2000; Brainerd, 2001; Bjørnskov, 2003; Helliwell, 2007). Since this branch of research is still in its infancy, many questions remain unanswered. In particular, recent analyses of the effects of governance structure and political institutions on people's well-being provide an ambiguous and incomplete picture.

More specifically, previous happiness research has been inconclusive on the contribution of stronger participatory rights, political autonomy, and fiscal decentralization – institutions that are hypothesized to lead to policy outcomes closer to local voter preferences. Frey and Stutzer (2000) show a positive impact of direct democracy on individual life satisfaction in Switzerland. In contrast, Dorn et al. (2008), using more recent data from the Swiss Household Panel Survey (SHP), find no significant influence. Similarly, even in an international context, the effect of democratic rights on people's happiness remains ambiguous (Schyns, 2002; Bjørnskov, Dreher and Fischer, 2008c; Dorn et al., 2007), most likely only being influential in rich countries (Bjørnskov, Dreher and Fischer, 2007a, 2008a). As to decentralization, we are only aware of one study by Bjørnskov, Dreher and Fischer (2008b) that tests this factor in a model of life satisfaction, for an international cross-section of more than 60 countries, and identifies fiscal decentralization as conducive to well-being.

Suicidal behavior is often viewed as the flip side of the happiness coin. In a cross-national analysis, Helliwell (2007) shows that the main aggregate determinants of both suicide and self-reported life satisfaction qualitatively exert the same impact. In economics, empirical literature on suicide has relied on Hamermesh and Soss's (1974) theoretical model. In this model, an individual takes her own life when the discounted expected lifetime utility remaining to her falls below some

threshold level. The model then predicts that suicide decreases with those political institutions and governance structures mentioned above that make people better off. Assuming that the principle of rationality also governs at–first–sight–'irrational' choices which affect experienced utility, suicide research is part of happiness research. While surveys on life satisfactions are more likely to address the entire happiness distribution, self-killings are observed most likely for those at the bottom of the personal well-being scale. Assuming rationality, suicide data provide an alternative measure of happiness (or unhappiness) with several advantages over experiments and surveys of happiness.[1] First, as Helliwell (2007) correctly emphasizes, suicide as an "ultimate assessment of life satisfaction" (p. 455) presumably constitutes a more objective, and thus more reliable, indicator of well-being than any survey data on self-assessed happiness. Second, in contrast to life satisfaction, suicide rates are relatively comparably measured across countries and cultures. Third, we also accept Helliwell's (2007) argument that using suicide data mitigates the problem of the potential reverse causation encountered in life satisfaction studies.[2]

As regards the influence of institutions, the status quo of the suicide research is exactly analogous to that described above for happiness research. Thus, the issue to what extent political institutions and governance structures explain variations in societal suicide rates remains unanswered. In this paper, we aim at filling this gap by analyzing the impact of political institutions—particularly local autonomy, fiscal decentralization, and popular rights—on societal suicide rates using a panel data approach for 26 Swiss states (cantons) over the period 1980–1998. Furthermore, as in the U.S., Switzerland's three-tier federal structure, which grants Swiss states great fiscal and political independence from the federal level, results in a variation in political institutions at the state level that we exploit in this analysis. We employ a panel data approach that constitutes a considerable improvement on much previous work in this area that relies on time-series or cross-sectional data only. Finally, in addition to modeling the total suicide rate, we also estimate separate models for men and women, as the underlying determinants of suicide could differ between the sexes (e.g., Qin et al., 2000; Helliwell, 2007; Minoiu and Rodríguez, 2008).

Understanding gender differences might be important to informing appropriate (health) policy formulations.

Our results show that stronger participatory rights in Swiss cantons reduce overall suicide, for both men and women. This result corresponds loosely to the suicide-lowering impact of economic and political freedoms obtained by Jungeilges and Kirchgässner (2002). However, in contrast to corresponding findings in the happiness research (Frey and Stutzer, 2000), more local political autonomy appears detrimental to well-being. Both men and women benefit from more decentralized government spending. However, there is a slight differential impact of these institutions by gender suggesting that the female population gains more than the male. This result is loosely in line with Bjørnskov, Dreher and Fischer (2007b), who showed that giving more political rights to women is beneficial to both men and women, with a stronger effect for females than for males. Finally, a transmission channel analysis with sub-federal government spending data suggests that the beneficial effects of stronger participatory rights go beyond that of increased efficiency and effectiveness in the health sector.

The remainder of this paper is organized as follows. The next section develops the hypotheses on the potential effects of institutions on suicide rates. Subsequently, we summarize the existing empirical evidence, after which we describe our empirical model and methodological approach. The fifth section presents our empirical findings, and the final section concludes the paper.

2 Institutional determinants of suicide

Musgrave (1959) suggests that governments should have three main objectives: income redistribution, macroeconomic stability, and, most important, efficient provision of public goods. Thus, the institutional structure of a state might well have an impact on the extent to which governments can realize these goals and improve citizen well-being, mirrored by the non-occurrence of suicidal behavior. As regards the public goods aspect, according to classical economic theory, political institutions may increase the efficiency and efficacy in the provision of

public health care, lowering suicide rates. This view does not assume rationality of the suicidal person, rather focusing on the supply of the public good 'health care' only.

A different strand of political economy literature relates governance structure to the occurrence of suicide through the median voter hypothesis, focusing on the allocation of goods and resources and their distance from the median voter's preferred policy. The hypothesized relationships in this paper are based on the latter argument.

In the case of the federal country Switzerland, institutions at the state level that affect the allocation of goods and resources by governments include institutions of direct legislation, decentralization between the state-tier and local tiers, and the degree of autonomy at the local level. In our empirical analysis, we exploit the variation in these institutions across 26 Swiss states (cantons).

Institutions of direct democracy are defined as the exertion of direct influence by the citizenry on the political decision-making process through the use of popular initiatives and referenda, both of which serve as a corrective device for government policies. According to the political scientist Keman (2000), federalism is defined as the overlapping of spending authority ('the right to act') with that of political decision-making competency ('the right to decide').[3] However, in this paper, we explicitly treat the concept of fiscal decentralization and that of local political autonomy as separate dimensions. On the one hand, we look at fiscal decentralization—commonly defined as the local authority to make implementation decisions about and through government spending ('the right to act').[4] On the other hand, we view political decentralization, which we prefer to term 'local autonomy', as present when each government level has its own well-defined sphere of political authority and can exert 'the right to decide' without fear of being overruled by a higher government body (Riker, 1964)[5].

Turning to the hypothesized well-being effect of fiscal decentralization, according to public choice theory, we expect fiscal decentralization to improve the (allocation and production) efficiency of government and thus to promote economic development (Oates, 1993).[6] More specifically, in the case of public-spirited governors, efficiency may be achieved by locally

differentiated outputs addressing differences in local median voters' tastes (Hayek, 1939; Oates, 1972; Bardhan, 1997). Potentially, this process is enhanced by 'yardstick competition' that works even in the presence of a revenue-seeking, surplus-maximizing Leviathan (Tiebout, 1956; Salmon, 1987). As a result, growth of the public sector and citizens' fiscal exploitation may be restrained while economic growth through innovation is promoted (Brennan and Buchanan, 1980; Gramlich, 1987). Thus, we hypothesize that fiscal decentralization should increase citizens' well-being:

Hypothesis 1: Fiscal decentralization is negatively associated with suicide rates.

However, there are arguments that support the opposite prediction. More specifically, decentralization might equally cause an underprovision of public goods and efficiency losses because of coordination problems between local jurisdictions, or tax rates falling below the optimal level (the 'race to the bottom') (Brennan and Buchanan, 1980; Tanzi, 1996). A more decentralized governance structure may impede redistributive policies between jurisdictions and individuals, which aim at mitigating the effects of an unequal resource endowment (Prud'homme, 1995). In addition, local governments may not internalize macroeconomic instability spillovers, facilitating an excess accumulation of local debts. Finally, federal governance structures might promote rent-seeking and corruption opportunities (Shleifer and Vishny, 1993). These considerations lead to the contrasting hypothesis:[7]

Hypothesis 2: Fiscal decentralization is positively associated with suicide rates.

Arguments supporting an impact of local (political) autonomy that increases well-being are similar to those in favor of fiscal decentralization. Again, decentralized political decision-making is said to lead to a provision of public goods closer to voter preferences by regional governments that compete for mobile capital and labor (Brennan and Buchanan, 1980; Qian and Roland, 1998). The neo-institutionalists add the view that local autonomy might preserve and promote market functioning (Weingast, 1995). Others stress that it potentially acts as a safeguard to protect the

democratic rights of citizens in general and minorities in particular ('voice' and 'exit') (Hirschman, 1970; Riker, 1975; Elazar, 1995). We therefore hypothesize the following:

Hypothesis 3: Local autonomy is negatively associated with suicide rates.

There are, however, potential drawbacks to local autonomy, again quite analogous to the above mentioned negative aspects of fiscal decentralization. Additional considerations are an unclear distinction of competences between government tiers, reducing political accountability and providing loopholes for Leviathan politicians and bureaucrats (Treisman, 2000b). In addition, overlapping and competing regulations in different tiers (horizontal competition) may potentially be detrimental to governance, particularly affecting law enforcement and legality (Treisman, 2000b). Thus, we formulate a fourth hypothesis:

Hypothesis 4: Local autonomy is positively associated with suicide rates.

Finally, we turn to the hypothesized well-being effects of direct democracy. According to public choice theory, in a representative political system, the policy chosen by politicians might deviate strongly from that preferred by the median voter because of (a) asymmetric information and (b) the rent-seeking behavior of politicians. Nevertheless, it is argued that institutions of direct legislation may mitigate both causes (Feld and Kirchgässner, 2001; Kessler, 2005) not only because they serve as an additional information device for decision-makers, but equally because they exert institutional veto power that prevents excessive budget growth beyond the optimum, log-rolling activities and pork-barrel politics (e.g., Besley and Coate, 2001). Moreover, the provision of public goods is said to be more allocative and producer efficient in direct democracies compared to representative ones (Pommerehne, 1983), resulting in lower tax levels and higher economic growth, which ultimately increase people's happiness (Frey and Stutzer, 2000).[8] Therefore, we assume the following:

Hypothesis 5: Suicide rates are lower in more direct democratic cantons.

3 Empirical evidence

As mentioned in the introduction, suicide literature on the effects of political institutions and governance structure is scant. We are aware of only two studies that come close to such an analysis. Jungeilges and Kirchgässner (2002) use cross-sectional 1975 data for a sample of 30 countries to estimate the effects of socio-economic factors and civil liberties on male and female suicide rates across different age groups. They identify a suicide-lowering effect of civil liberties and economic freedom. More recently Helliwell (2007), using a panel data set, reports a qualitatively identical influence of governance quality as measured by the well-known Kaufman indices. However, to our knowledge, there is no empirical analysis of the impact of either narrowly defined democratic rights or political and fiscal autonomy on suicide rates.

The research field closest to the suicide literature is that of happiness because the occurrence of suicide may overlap with the bottom tail of the life satisfaction distribution. However, as already argued in the introduction, unfortunately, analyses focusing on political institutions and governance structure are equally scant. Mixed findings are present for direct democracy in Swiss cantons as well as for democracy in an international context (Frey and Stutzer, 2000; Dorn et al., 2007, 2008; Schyns, 2002; Bjørnskov, Dreher and Fischer, 2007a, 2008). Helliwell (2003, 2007) identifies a life satisfaction-increasing impact of the quality of governance, government efficiency, and government accountability. Bjørnskov, Dreher and Fischer (2008b) conclude that fiscal decentralization raises well-being independently of the effect of democratic governance structures, while local (political) autonomy appears indirectly beneficial through its mitigation of (otherwise) detrimental government spending.[9]

Another related branch of literature focuses on the determinants of population health. Some empirical work has been carried out on the relationship between political institutions and mortality, particularly infant mortality. In general, such research assumes that democracies and decentralized governments improve public health by allowing for more social capital, better access to information, greater opportunities for empowerment, and better recognition of people's needs

(Franco et al., 2005). For (direct) democracy, a few studies have found empirical support for this hypothesis in both an international context and for Swiss cantons (Lena and London, 1993; Przeworski et al., 2000; Zweifel and Navia, 2000; Barankay, 2001). As regards fiscal and political decentralization, a population health-raising impact was reported by Khaleghian (2003). In contrast to our approach, however, most of these studies focus exclusively on efficiency aspects of the provision of public health care, while we also develop hypotheses in a broader political economy context. However, we also test whether public health care spending transmits institutional effects on suicide.

4 Model, data and variables

4.1 Model and method

In this paper, we estimate a panel data regression model for 26 Swiss states (cantons) for the period 1980 to 1998. Using the subscripts *i* and *t* to refer to the canton and year respectively, we assume the following reduced form:

$$y_{it} = \alpha + X'_{it}\,\beta + Z'_{it}\,\gamma + v_{it} \qquad (1)$$

where y_{it} denotes the natural log of the suicide rate in the corresponding sub-population, α is a constant term, X_{it} is a matrix of controls, Z_{it} contains the variables of interest, and v_{it} is the usual error term. All variables are assumed to be strictly exogenous; that is, shocks today to (aggregate) suicide are assumed not to affect the future values of the regressors. The matrix of controls, X_{it}, includes socio-economic, political, and cultural determinants of suicide. The matrix Z_{it} contains our variables of interest, namely measures of direct democracy, fiscal federalism, and local autonomy. β and γ are the corresponding coefficient vectors to be estimated. Observations are weighted by the square root of the cantonal population to mitigate potential heteroscedasticity problems (Ruhm, 2000; Neumayer, 2004). To adjust the results for age, X_{it} also includes age category variables; specifically, the shares of the state population aged between 25 and 44, between 45 and 64, and 65

years or older. Since a number of studies at micro and macro level provide evidence on the differential effect of socio-economic variables by gender, we estimate the model separately for men and women (e.g., Andrés, 2005; Chuang and Huang, 2007; Minoiu and Rodríguez, 2008).

Commonly, in the empirical analysis of suicide either fixed or random effect estimation techniques have been used (Chuang and Huang, 1997; Neumayer, 2003; Andrés, 2005). The first has the advantage that the estimation is unbiased, even when the explanatory variables are correlated with the unobserved state-specific effects. Unfortunately, for this analysis, because of the de facto time invariance of direct democracy and local autonomy, a fixed effects approach that requires within variation is not appropriate. A drawback of the ordinary least squares (OLS) method is that the model specification must be as complete as possible to prevent an omitted variable bias. We apply OLS with panel corrected standard errors, which are consistent in the presence of heteroscedasticity and serial autocorrelation. This approach follows the majority of empirical analyses for government spending in Swiss cantons, which face the identical methodological problems of time-invariant institutional determinants (e.g. Feld, Fischer and Kirchgässner, 2008; Feld and Kirchgässner, 2001).[10]

4.2 Data and variables

Switzerland: General remarks

Switzerland is a three-tier federal country (local, state and federal tier) with institutions of political decision-making and governance existing at all three levels equally. In contrast to other federal countries, Swiss states (cantons) enjoy a degree of political autonomy that is comparable to that of US states, covering areas such as policing, education, culture, health care, social welfare, schooling and infrastructure, which they finance with their own income and profit taxes whose rates they independently set (Feld, 2000; Germann, 2002). In this paper, we exploit institutional variation across Swiss cantons, holding the institutional framework at the federal level 'constant'. At the cantonal level, we measure the extent of direct democracy that allows the state citizenry to

influence policies of the state governments and parliaments. In this context, fiscal decentralization equally applies to the within-canton governance structure that determines the (spending) relation between the communal and the state administration for each canton. Variation in governance structure, however, also occurs at the communal level, giving rise to local heterogeneity in political institutions within Swiss states. In this study, however, we account for this feature indirectly by aggregating local characteristics to the state level.

Dependent variable

Suicide rates per 100,000 inhabitants are computed by the ratio of the number of completed suicides to the respective cantonal population for the total, male, and female subpopulations for the period 1980–1998. Raw number of suicides and population sizes were taken from the Swiss Federal Statistical Office data (hereafter, BFS). We apply a natural log-transformation to the dependent variable, with the value of 0.01 replacing zeros prior to the transformation.[11] As Table 1 illustrates, for the whole country, the average overall, male, and female suicide rates are 21.99, 32.17, and 12.12, respectively. Clearly, as is the case elsewhere, men tend to have higher suicide rates than women. Table 1 also displays the cantonal means over the observational period, suggesting that suicide rates vary substantially across Swiss cantons (minimum: 16.95; maximum: 33.81).

Focal independent variables

Following the public finance literature (e.g., Akai and Sakata, 2002), this study measures fiscal decentralization as the expenditure share of local levels in combined local and cantonal spending, obtained from the BFS.[12] Across Swiss states, the average local spending share varies from 1 percent in Basel-City to 46 percent in Zurich (see Table 1).

Direct democracy at the state level is measured as a composite index on a continuous 6-point scale, which is constructed as an unweighted average of single assessments of the following institutions: the *constitutional initiative,* the *statutory initiative,* the *statutory referendum*, and the

fiscal referendum (Stutzer, 1999). Smaller values indicate that it is more difficult for individual citizens to make use of their popular rights. Using a composite index has the advantage that interplays among the various institutions are implicitly taken into account. As shown in Tables 1 and 2, the average level of direct democracy is about 4.3, with Geneva being the least (1.63) and Obwalden the most direct democratic (5.65) cantons.

The indicator of local autonomy is based on a 1992 survey of 1856 Swiss communes in which chief local administrators assessed their perceived degree of local autonomy on a 10-point scale, ranging from 1, *no autonomy at all*, to 10, *very high* (Ladner, 1994). The average values for the 26 cantons are taken from Frey and Stutzer (2000) and reprinted in Table 1. The lowest average level of communal autonomy is found in Geneva (3.2), while the highest is reported for Schaffhausen (6.1), followed closely by Obwalden and Zug (both 6.0).

Other independent controlling variables

Based on previous findings in empirical suicide research, we select a set of socio-economic and demographic control variables usually thought to influence suicide rates and that may be correlated with any of our three institutions of interest (for a review, see Lester and Yang, 1997). Some of these employed political, social capital, and cultural variables reflect the specific Swiss context of our study.

As surveyed by Marcotte (2003), all empirical work on suicide follows the sociological framework developed by Durkheim (1951) and the economic theory of suicide by Hamermesh and Soss (1974), which assumes an individual cost-benefit analysis. The economic theory of suicide predicts that improved economic conditions affect personal income, lowering the propensity to commit suicide (Durkheim, 1951; Hamermesh and Soss, 1974).[13] We can expect a substantial correlation between our institutional variables of interest and these economic determinants of suicide as empirical research on Switzerland suggests an enhancing influence of direct democracy and decentralization on economic performance (e.g. Feld and Savioz, 1997; Matsusaka, 2000). The

economic environment is approximated by per capita income level, unemployment rates, and growth in national income, and, in a model extension, sub-federal government spending, all measures obtained from the BFS. As regards income, several aggregate panel data analyses support a suicide lowering hypothesis (Chuang and Huang, 1997, 2007; Brainerd, 2001; Neumayer, 2003a, 2003b), while for unemployment panel data studies have yielded ambiguous results (Chuang and Huang, 1997, 2007; Brainerd, 2001; Neumayer, 2004, 2003a).

Durkheim (1951) claims that enhanced social integration decreases the likelihood of suicide. Traditionally, cities are viewed as more anonymous with looser social networks compared to the countryside (e.g. Qin et al. 2003). Foreigners might be less integrated in their host societies (Helliwell, 2004). On the other hand, stronger citizen empowerment may trigger a worse integration of foreigners, leading to higher suicide rates, as cantons with stronger political rights may develop a self-image shaped by 'Swiss' homogeneity, and, thus, are likely to be ethnically more cohesive (and more xenophobic).[14]. However, for Denmark, Qin et al. (2003) report that male foreigners had a smaller risk of suicide compared to their Danish peers. To capture these two socio-demographic factors, we include the share of persons living in urbanized areas and that of foreigners in the cantonal population, both extracted from the BFS data.

Putnam (2000, 2001) suggests that social capital is an important determinant of subjective well-being. Social capital may significantly decrease suicide probability both in its form of generalized trust in society as well as in its form of vertical trust, such as confidence in a nation's law-making organs (Helliwell, 2003, 2004; Bjørnskov, 2003).[15] A correlation with our variable of interest may be caused by stronger popular rights generating higher levels of generalized or vertical trust, in the first case through political discussion serving as a means of social interaction, and in the second through maintaining a so-called implicit contract between citizenry and government (Freitag, 2006; Frey, 1997; Putnam, 1993).[16] Thus, in order to disentangle the allocation effects of direct democracy from its trust-generating influence, we extract population shares of horizontal and vertical trust from the 1998 wave of the International Social Survey Programme (ISSP, 2001).

Following Uslaner (2005), we assume time invariance of generalized trust; however, unfortunately, for vertical trust, only 1998 values are available.[17]

Already Durkheim (1951) argued that a strong credo exerts a suicide lowering influence through its social cohesion-enhancing influence. Believing in the existence of a life-granting God may also morally contradict taking one's own life. Recent empirical studies support this conjecture, suggesting that the influence of religiosity works both through network effects as well as through attitudes towards life (Neeleman and Lewis, 1999; Hilton et al., 2002; Helliwell, 2004). In the Swiss context, it is the more religious social groups of society that are politically more conservative, aiming at maintaining the status quo, which implies fighting the trend to expand the competences of the federal political institutions at the expense of direct popular rights (Fischer and Schneider, 2008). In this study, we measure religiosity by the share of 'atheists/agnostics' that has been constructed using the ISSP 1998, analogous to the two trust variables. It is measured by the population share of those who answered "I don't believe in God" or "I don't know whether there is a God and I don't believe that there is any way to find out" to the question about which statement "comes closest to expressing what you believe about God" (ISSP 2001, p. 52). [18]

Similarly, suicide rates are hypothesized to increase with age, not only because of a disintegration effect but also due to increasing health care costs that lower the expected life time utility (Hamermesh and Soss, 1974; Chuang and Huang, 1997, 2007). The age composition of the population is taken into account by the proportions of age groups '24–44 years', '45–64 years', and that of elderly people (> 64 years) in the cantonal population (all from the BFS). We also include the size of a canton in terms of population because higher degrees of direct democracy are systematically observed in smaller cantons (see Table 3 correlation coefficient $\rho = -0.68$).

Furthermore, to account for the special cultural structure of Switzerland, we include a dichotomous variable which indicates that the main language spoken in a canton is either French or Italian. Previous empirical studies by, e.g. Frey and Stutzer (2008) and Dorn et al. (2008), show that the dominant language serves as a proxy for a different majority culture, which exerts a differential

influence on the assessment of subjective well-being and correlates with the degree of direct democracy (ρ (romance language, direct democracy) = -0.83).

Summary statistics and variable definitions are reported in Tables 1 and 10, respectively. The raw correlations between direct democracy and the explanatory variables are displayed in Table 3.

5 Results

The regression results for a panel of suicide rates in 26 Swiss states between 1980 and 1998 are reported in Tables 4–6, for the total population and subsamples by gender. Table 4 present the results for the baseline model, in which the economic variables are excluded. Table 5 includes economic factors such as national income and unemployment rate, and social factors such as divorce and fertility rates. Table 6 adds to the baseline model economic factors lagged by one period. The adjusted R-squared and a Wald test of joint significance of all explanatory variables are displayed in the last two rows of the tables.

5.1 Baseline model

Total population

In Table 4 we present OLS estimation results with panel-corrected standard errors for the baseline model. Clearly, in column 1, the governance structure variables appear to be significant determinants of suicide rates in the cantonal population. The negative estimate on direct democracy indicates that less suicide occurs in cantons with stronger popular rights (at the 5 percent level). In addition, the degree of fiscal decentralization within a canton exerts a suicide-lowering effect on the overall suicide rate (at the 1 percent level). These results suggest that more spending responsibilities at the local level and stronger political rights lead to a general public good provision closer to local people's preferences, thereby raising citizens' well-being. These findings lend support to *Hypotheses 1* and *5*. In contrast, the positive coefficient estimate for the local autonomy variable

suggests that policy decentralization makes people unhappier (significant at the 1 percent level). Thus, we find empirical support for *Hypothesis 4*, which predicts that more local autonomy is deleterious to people's well-being caused by, for example, an underprovision of public goods and lack of transparency of political competencies. Arguably, in the Swiss context, autonomy at the communal level may well approximate the degree of social cohesion – with stronger cohesion implying stricter social norm enforcement. Notably, this finding contradicts the results by Frey and Stutzer (2000) which could not identify a separate effect of local autonomy for average life satisfaction, based on the entire life satisfaction distribution. This difference shows, again, that institutional impacts on life satisfaction may well be heterogeneous with respect to the percentile of the subjective well-being distribution.

As regards the remaining explanatory variables, more trust among citizens is associated with higher suicide rates. The argument is that any successful suicide could be viewed as an attempted suicide with an unfortunate ending. Attempted suicides may signal a 'cry for help'. The greater the number of individual's social contacts and trust in the potentially benevolent attitude of her peers, the greater the probability of peers receiving and reacting to this signal 'suicide attempt'. As expected, vertical trust exerts a significant negative impact on suicide rates. Atheism is positively correlated with overall suicide rates, which is consistent with empirical evidence from a panel data analysis (Neumayer, 2003b). Non-German speaking cantons are significantly associated with lower suicide rates, suggesting that cultural differences exist across language borders in terms of suicidal behavior (or reporting of mortality causes).[19] Contrary to expectations, there is also a negative link between the degree of urbanization and suicidal behavior. Potentially, health care systems are better developed in cities compared to the countryside. The foreign population appears to have a lower suicide risk. Possibly, Swiss immigration laws might serve as a selection mechanism that ensures only financially well-situated persons or those with a work contract are granted residency.[20] In addition, the effect of population size on suicide rates appears to be zero. Finally, middle-aged persons are at a higher risk compared to other age groups.

Results by gender

The regression results of the baseline model by gender, reported in Table 4, columns 2 and 3, confirm the results for the total population. However, all institutions appear to have a more sizeable impact on female suicide rates than on male suicide rates, with coefficients of direct democracy and fiscal decentralization almost double in size. As regards the control variables, we equally observe differential impacts by gender for most of them, including horizontal and vertical trust in the population, atheism, the dominant language of the canton, the degree of urbanization, and the size of the canton. More specifically, a higher level of trust among citizens appears to impact only female suicide rates, indicating that attempting suicide as a signal to peers may be an incentive particularly for women. Similarly, in both larger and more urbanized cantons, significantly more suicide is committed by women than by men (e.g. Qin et al., 2003). In line with previous research, these findings support the conjectured differences in the underlying stochastic process describing gender specific suicide rates (e.g. Brainerd, 2001).

5.2 Comprehensive model including economic factors

Existing studies provide evidence that direct democracy has a positive influence on economic conditions. For example, estimating an aggregate production function, Feld and Savioz (1997) find economic growth and per capita income to be significantly higher in cantons with stronger popular rights, while Feld, Fischer and Kirchgässner (2008) detect a more equal net income distribution. In both cases, the more favorable outcomes are explained by a higher degree of efficiency in government activities. Analogously, as outlined in our hypothesis section, more local political or fiscal autonomy might equally lead to improved economic conditions.

Because both direct democracy and decentralization may improve well-being through altered economic circumstances, disentangling the direct and indirect effects of governance structure may better reveal their purely institutional impacts. To test this conjecture, in Table 5 we estimate the baseline model augmented with three additional economy-related determinants: national income,

growth of national income, and unemployment rate. If strong indirect institutional effects were present, we should observe losses in statistical significance and substantially reduced coefficient sizes of our variables of interest compared to the baseline model estimates. Table 5 also tests the sensitivity of our results with regards to divorce and fertility rates.[21]

Taken all together, we find no substantially different estimation outcomes for direct democracy, fiscal decentralization and local autonomy between the baseline and the extended models – neither in terms of statistical significance nor in terms of coefficient sizes (Tables 4 and 5). This observation suggests that cantonal wealth, economic growth, and unemployment do not serve as transmission channels for these cantonal institutions – at least when it comes to explaining suicide. These findings are robust to assuming several model specifications with respect to the economic condition measures (columns 1 to 4 in Table 5). The first model assumes that both growth effects of GDP and unemployment may be conditional on their pre-period levels, following the macro-economic growth literature (columns 1 and 2), while the second model investigates present-time level effects only (columns 3 and 4). Among the economic variables, only the (lagged) unemployment rate appears to exert a significant influence, while national income is never decisive for committing suicide (see also Table 6).[22] Again, we find quantitative, but no qualitative gender differences in the institutional impact.

As regards the social integration hypothesis, the positive coefficient on the divorce rate (significant at the 1 percent level) is consistent with our prediction and previous empirical evidence. In contrast, the effect of fertility rates on suicide rates seems to be statistically insignificant. Obviously, in Switzerland, the presence of children does not give rise to social (net) benefits.[23]

5.3 Robustness analysis

We perform several robustness checks to verify whether our results are driven by outliers and or significantly altered by using alternative controls. First, it seems reasonable to assume that individuals take time to respond to changes in socio-economic conditions (Spijker, 2003; Minoiu

and Rodriguez, 2008); for this reason, we use the one-period lagged unemployment rate and national income. Second, we also estimate both models with a dichotomous variable that controls for canton *Appenzell Innerrhoden* (AI), which, even though with its 14,000 inhabitants equaling only the size of a small town, shows extraordinarily high average suicide rates that in some years surpass 50 per 100,000 inhabitants. [24]

The results of the robustness tests are reported in Tables 6 and 7, and, as a comparison with Tables 4 and 5 shows, lagging the economic determinants or excluding potential outliers does not substantially alter our regression results with respect to our variables of interest. The three institutional variables coefficient estimates are robustly statistically significant, again with slightly lower magnitudes for males compared to the female population. Overall, the estimations presented in Tables 6 and 7 support our previous conclusions about the importance of institutions when explaining suicide rates.

5.4 The role of government spending

So far we have observed that stronger political rights and greater degrees of decentralization within a canton appear to reduce the occurrence of suicide in Swiss cantons. Policy outcomes through which political institutions and governance structures affect citizens' well-being and suicidal behavior may be mirrored by the types and amount of public goods produced by governments. Such production of public goods is then reflected in corresponding components of government budgets such as expenses on education, public safety, and public health system, etc.

As shown in Feld and Kirchgässner (2001), Schaltegger (2001), and Fischer (2005), direct democracy and fiscal decentralization exert dampening impacts on sub-federal government spending in Switzerland. In general, the effect is observable for almost all types of budget components, but most prominent for those spending types that relate to policy areas in which the Swiss cantons have been granted political autonomy by the Swiss federal constitution. These areas include public safety (police spending), social safety net (welfare spending), public education

(educational spending), health sector (public health spending), and cultural events (cultural spending).

In principle, these negative correlations between political institutions and government spending, on the one side, and suicide rates, on the other, justify a transmission channel analysis.

According to the median–voter–hypothesis developed by political economists, we would expect that the postulated well-being raising impacts of political institutions and governance structure are mediated through overall government consumption spending. That more general government effectiveness is conducive to well-being has been shown by Helliwell (2007). In such case, all budget components should equally serve as transmission channels of institutional effects on suicide.

In contrast, in line with some empirical health economics literature, the suicide-lowering impacts of direct democracy and fiscal decentralization might simply run through the provision of health care only. Possibly, in Switzerland more direct democratic and decentralized cantons target their health policies more effectively, leading to an earlier detection of 'persons at risk'. Given that the previously observed suicide-lowering effects of governance structure are entirely caused by increased efficacy of the health sector, we should observe that only health spending transmits these institutional effects, but not any other budget component.

This section aims at analyzing the potential transmission channels of these institutions' impacts on suicide, trying to discriminate the median–voter–argument from the efficiency–in–health–care–view. To empirically test the claim that public goods provision of Swiss cantons serves as transmission channel of the institutional effects for suicidal behavior, we augment our baseline model with the according government spending variables (measured per capita) that relate to the areas of autonomous cantonal and local political decision-making described above. Transmission channel effects should be present when the coefficients of the mediated institutional determinants appear largely reduced in size and/or loose their significance at conventional levels – compared to the baseline specification that excludes government spending. Notably, higher suicide rates might trigger a policy response by the cantonal and local governments, possibly giving rise to endogeneity

with respect to our measures of government activity. However, due to a lack of exogenous instrumental variables we present OLS results only.

Nevertheless, the various government spending components may exert suicide-reducing impacts of their own, as previous empirical research suggests. In general, government consumption spending on, e.g., culture, security, and schooling may affect people's perceptions of how generously the state government values their material and non-material well-being. In particular, according to Feld, Fischer and Kirchgässner (2008), welfare spending may measure not only the extent of factual 'government generosity' in terms of redistributive activities in any given canton, but also government's preferences for social fairness, which will affect satisfaction levels, hence rates of suicide. As regards health care spending, empirical analyses of suicide for the US suggest that the level of effort exerted by the state government is suicide-reducing (Minoiu and Rodríguez, 2008). Studies by Hill and Pebley (1989) and Wimberly (1990) show that more government spending is associated with lower levels of infant mortality.

Table 8 presents the OLS estimation results with panel-corrected standard errors and indicates what type of government spending components (education, welfare, security, health care, or culture) may serve as transmission channel for the previously observed institutional impacts. The estimated coefficients for decentralization and local autonomy and their significance levels appear quite unchanged across the equations, suggesting that little of their impact is transmitted through sub-federal government spending. In contrast, the estimates for direct democracy suggest that almost all budget components mediate its influence (Table 8, columns 1 to 6). Its coefficients are insignificant and considerably reduced in size – except for the welfare spending regression. With correlations among the budget component spending measures ranging between 0.52 and 0.79 (see Table 9), we estimate a model in which all spending variables are jointly included. The estimates support our conclusion that the effect of direct democracy is mediated through sub-federal government budgets. Throughout Table 8, expenditures not only on health, but also on education and culture appear significantly associated with suicide rates, and tests of joint significance suggest that all other spending components are equally decisive. This finding contradicts the view that only

the provision of public health care mediates institutional effects. However, the positive sign of some spending estimates may indicate a reverse causality problem, biasing the vector of estimated coefficients.

Taken all together, our transmission channel analysis in Table 8 suggests that the effects of spending decentralization and local political autonomy are not mediated through local and cantonal budgets. In contrast, most of the impact of direct democracy is transmitted through almost all government spending components. Returning to our two hypotheses presented in the beginning of this section, we find no evidence that the suicide-lowering effect of direct legislation works exclusively through an improved or better targeted health care system. Rather, these findings are in support of the median voter hypothesis.

6 Conclusions

This paper analyzes the impact of direct democracy, local autonomy, and spending decentralization on suicide rates by exploiting variations in the political institutions and governance structure of 26 Swiss states between 1980 and 1998.

Our empirical results show that for the total population, stronger popular rights and more fiscal decentralization reduce suicide, while more local autonomy increases it. The former two findings are perfectly in line with the very scarce empirical literature on the effects of decentralization and popular rights on life satisfaction, as reported in Bjørnskov, Dreher and Fischer, (2008b), Dorn et al. (2007), and Frey and Stutzer (2000). However, the latter result for local political autonomy contradicts it.

Quantitatively, the institutional effects on female suicidal behavior appear larger compared to the male one, suggesting a heterogeneous impact of governance structure with respect to gender. This result is somewhat in line with suicide studies focusing on government activity, but also with life satisfaction snslyses focusing on political discrimination of women (Bjørnskov, Dreher and

Fischer, 2007b; Minoiu and Rodríguez, 2008). This gender-specific difference remains even when a possible mediation through changes in economic conditions is taken into account.

From a classical economics perspective, the beneficial impact of direct democracy may manifest in a more efficient or more effective provision of public goods. In consequence, direct democracy may lower suicide rates – even if no rational cost-benefit analysis by the suicide victim is assumed – mainly working through a better targeted health policy. However, a supplementary investigation with sub-federal government spending data suggests that the impact of direct democracy is not mediated through the health sector, clearly contradicting the 'efficiency–in–health–sector–hypothesis'. In contrast, the models suggest that all main activities of sub-federal government equally transmit the suicide-lowering effects of direct legislation.

From a theoretical perspective, it would be appropriate produce separate models of suicide for different age groups. It is to say, when studying suicide, specific socio-economic circumstances might affect potential suicide victims more during childhood than during adulthood status. A more detailed analysis will be necessary to understand gender differences, particularly in an international context, and formulate appropriate policies. As we present an ecological study, an important implication is that the determinants at the individual level effects might be different from those at population level, which constitutes a limitation to our interpretation. Further research is also needed employing alternative and differing measures of well-being that relate to mental and physical health, as the effect of institutions may well be heterogeneous.

Since the fall of the communist regimes, the world has welcomed the democratization process in Eastern Europe, assuming that the whole population will profit from these new institutions. However, our suicide research for Swiss cantons suggests that benefits from democracy and decentralized spending systems are not equally distributed across genders. These results imply that changes in the political institutions and governance structure in any one country may well affect the various population groups in different ways.

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[1] As Oswald (1997) states, suicide data cannot be generated in laboratory experiments.

[2]Many individual determinants of life satisfaction may well be subject to simultaneity bias. For instance, persons showing happiness in the past might be more likely to be married at the present time, more likely to be employed, even to live longer, and so on. In contrast, there is no way suicide in the past could affect today's sociodemographic characteristics (other than they no longer count among the living).

[3] Similarly, Brennan and Buchanan (1980), distinguish two dimensions of federalism, namely (i) joint assignment of functions and (ii) local-level taxing power.

[4] Alternative definitions are based on local revenue or local revenue from own tax sources.

[5] In political science, this concept is also referred to as decision decentralization (e.g., Treisman, 2000b).

[6] See Martínez Vazquez and McNab (2003) for supporting literature on the producer efficiency aspect. Particularly for Switzerland, more fiscal decentralization in public education was found to lead more efficient provision of public education (Barankay and Lockwood, 2005).

[7] For empirical evidence of the beneficial impact of federalism on GDP growth, see, e.g., Akai and Sakata (2002), Thiessen (2003), Freinkman and Yossifov (1999); on income level see, e.g., Lane and Ersson (2000); on investment rate, see, e.g., Lancaster and Hicks (2000). Conflicting results have been presented by, e.g., Zhang and Zou (1998), Xie et al. (1999), and Woller and Phillips (1998). Inconclusive results are also obtained for the impact of federalism on public sector size (Gil Canaleta et al., 2002; Cameron, 1978; Ehdaie, 1994). For its impact on regional income disparities and income redistribution, see, e.g., Gil Canaleta et al. (2002); on corruption, see Treisman (2000a), Fisman and Gatti (2002); on governance, see Dreher (2006); on human capital accumulation, see Treisman (2000b).

[8] For empirical support of these effects, see, e.g., Matsusaka (2000), Feld and Kirchgässner (2001), Feld, Fischer and Kirchgässner (2008), Feld and Savioz (1997), Fischer (2005), and Frey and Stutzer (2000).

[9] Similarly, Ferriss (2002) reports a happiness increasing impact of personal autonomy in a human relationship context.

[10] An alternative approach is to cluster observations on the state level, accounting for within-group correlation. The main findings of this paper are robust to using this alternative estimation method.

[11] This procedure affects 0.35 percent of male suicide rate observations and 3.32 percent of observations in the female sample. Zero values were recorded particularly in smaller cantons, especially in Appenzell Innerrhoden (5 obs.), Uri (4 obs.), Obwalden (3 obs.), Glarus, Jura, and Nidwalden (1 ob. each) for female suicide rates, but only in two cases for male suicide rates (Glarus and Nidwalden, 1 ob. each).

[12] In Switzerland, local spending and revenue shares are correlated more than 0.9.

[13] Unemployment might have a direct or indirect suicide rate-increasing effect, the one working through the creation of social distress and the other through a reduction of personal income.

[14] Systematic empirical evidence for this claim is missing. However, support for the extreme-right populist party SVP appears stronger in cantons in which institutions of direct legislation are better developed: the correlation coefficient between the share of seats held by the SVP in the Swiss national parliament, disaggregated to the state level, with our measure of direct democracy is about 0.4.

[15] Generalized trust might also work through its beneficial impact on economic performance, educational attainment, and health (Knack and Keefer, 1997; Coleman, 1988; Helliwell, 2007). For the impact of social capital on adult mortality, see Kawachi et al. (1997), and vertical trust through a government's fiscal performance and quality (Helliwell, 2003, 2004; Schaltegger and Torgler, 2005).

[16] At the aggregate level, confidence in political institutions of a country appears to be correlated with generalized (horizontal) trust (Knack and Keefer, 1997).

[17] Trust among citizens is measured as the cantonal share of people who indicate the two highest categories out of four to the question of whether they believe that people can, in general, be trusted. The indicator of vertical trust is the percentage of residents expressing "complete confidence" or "a great deal of confidence" in the Swiss national parliament.

[18] The other possible statements include "I don't believe in a personal God, but I do believe in a Higher Power of some kind", "I find myself believing in God some of the time, but not at others", "While I have doubts, I feel that I do believe in God", I know God really exists and I have no doubts about it".

[19] This result contradicts the cultural differences in self-reported life satisfaction identified by Dorn et al. (2008).

[20] This statement also applies for EU citizens prior to 2004.

[21] According to Wilkinson (1996), income inequality plays a major role for population health. For a comprehensive recent review of the literature in this area, see Deaton (2003) and Lynch et al. (2004). However, we abstained from reporting the test for income inequality due to large number of missing values in our GINI coefficient, which is based on biannual cantonal aggregated tax records until 1996 only. However, its impact is not significant, which is in support of Leigh and Jencks (2007)'s most recent panel data analysis for a set of rich countries.

[22] The suicide lowering influence of unemployment rate may be explained by social norm effects which give rise to heterogeneous disutility from unemployment (see Luechinger, Meier, and Stutzer, 2008).

[23] In Switzerland, the financial burden imposed by child rearing is extraordinarily high in comparison to other developed countries in that child benefits are low and costs for childcare cannot be deducted.

[24] The city of Basel, whose extreme fiscal decentralization value results from its city-state status, might be a potential outlier; however, its dummy was never significant in the regressions.

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Tables

Table 1

Average suicide rates and institutions for 26 Swiss cantons, 1980–1998

#	Abbr.	Canton	Average suicide rate	Average male suicide rate	Average female suicide rate	Direct democracy	Fiscal decentralization	Local autonomy	Latin dummy
1	ZH	Zurich	23.72	33.47	14.52	4.17	0.46	5.4	0
2	BE	Bern	23.79	35.63	12.56	3.56	0.40	4.6	0
3	LU	Luzern	19.02	28.53	9.76	4.38	0.40	4.1	0
4	UR	Uri	18.01	28.57	7.32	5.36	0.15	5.4	0
5	SZ	Schwyz	16.28	24.19	8.26	5.05	0.44	4.6	0
6	OW	Obwalden	20.76	28.82	12.54	5.65	0.35	6.0	0
7	NW	Nidwalden	16.95	22.73	10.99	4.94	0.31	5.5	0
8	GL	Glarus	17.81	24.60	10.90	5.50	0.21	5.6	0
9	ZG	Zug	18.09	26.77	9.56	4.84	0.40	6.0	0
10	FR	Fribourg	24.01	36.07	11.97	2.49	0.27	4.2	1
11	SO	Solothurn	22.65	34.26	11.38	5.60	0.44	4.9	0
12	BS	Basel-Stadt	28.05	37.65	19.66	4.48	0.01	5.5	0
13	BL	Basel-Landschaft	22.74	32.25	13.49	5.60	0.24	4.3	0
14	SH	Schaffhausen	24.50	34.39	15.26	5.29	0.41	6.1	0
15	AR	Appenzell ARH	26.72	41.98	11.99	5.37	0.42	5.8	0
16	AI	Appenzell IRH	33.81	49.77	17.37	5.25	0.22	5.0	0
17	SG	St. Gallen	22.18	32.87	11.82	3.51	0.42	4.9	0
18	GR	Graubünden	21.27	31.14	11.69	4.71	0.41	5.8	0
19	AG	Aargau	21.76	31.43	12.18	5.28	0.39	4.9	0
20	TG	Thurgau	20.91	32.18	9.81	4.66	0.37	5.9	0
21	TI	Ticino	14.02	20.75	7.92	1.93	0.33	4.3	1
22	VD	Vaud	24.15	35.13	13.97	2.42	0.33	4.7	1
23	VS	Valais	19.99	29.60	10.62	3.35	0.37	5.5	1
24	NE	Neuchatel	25.89	39.86	12.96	2.71	0.37	3.7	1
25	GE	Geneva	22.91	30.41	16.13	1.63	0.17	3.2	1
26	JU	Jura	21.64	33.28	10.47	3.71	0.30	4.0	1
		Average	21.99	32.17	12.12	4.29	0.33	5.00	0.27

Note. The local autonomy data are for the year 1994.

Table 2

Summary statistics (N = 442)

Variable	Mean	Standard deviation	Minimum	Maximum
Suicide rate (log)	3.06	0.32	1.90	4.12
Male suicide rate (log)	3.40	0.64	-4.61	4.50
Female suicide rate (log)	2.26	1.22	-4.61	3.86
Direct democracy	4.30	1.22	1.50	5.83
Latin dummy	0.27	0.44	0.00	1.00
Confidence in parliament	0.24	0.14	0.06	0.74
Social trust	0.71	0.12	0.50	1.00
No belief in god	0.16	0.11	0.00	0.48
Life has no meaning	0.54	0.18	0.00	1.00
Local autonomy	5.00	0.77	3.20	6.10
Fiscal decentralization	0.33	0.11	-0.01	0.49
National income	3.23	0.20	2.87	3.99
Growth national income	0.01	0.03	-0.07	0.09
Gini coefficient of inequality	30.12	2.46	24.12	39.49
Unemployment rates	1.53	1.76	0.00	7.60
Foreign population	0.15	0.07	0.05	0.38
Urbanization	0.60	0.24	0.14	1.00
Female foreign population	0.13	0.06	0.04	0.35
Male foreign population	0.17	0.07	0.06	0.42
Population (log)	11.92	1.11	9.45	13.98
% female of population (log)	11.24	1.13	8.75	13.31
% male of population (log)	11.21	1.10	8.77	13.26
% of population 25–44 years	0.30	0.02	0.23	0.35
% female of population 25–44 years	0.29	0.02	0.21	0.34
% male of population 25–44 years	0.31	0.02	0.24	0.36
% of population 45–64 years	0.22	0.02	0.19	0.27
% female of population 45–64 years	0.22	0.02	0.19	0.27
% male of population 45–64 years	0.22	0.02	0.18	0.27
% population aged 65 and over	0.14	0.02	0.10	0.21
% female of population aged 65 and over	0.17	0.03	0.12	0.25
% male of population aged 65 and over	0.12	0.02	0.08	0.16

Table 3

Partial correlations of direct democracy (N =442)

Variable	Direct democracy
Fiscal decentralization	0.047
Local autonomy	0.259***
Social trust	0.340***
Confidence in parliament	-0.574***
No belief in God	-0.022
Latin dummy	-0.826***
Foreign population (%)	-0.469***
Population (%)	-0.683***
% of population 25-44 years	-0.028
% of population 45-64 years	0.451***
% of population > 65 years	-0.326***

Notes: ***Significant at 1%

Table 4

Baseline model

	(1) Overall	(2) Male	(3) Female
Direct democracy	-0.056**	-0.044*	-0.091**
	[2.50]	[1.70]	[2.38]
Fiscal decentralization	-0.552***	-0.474**	-0.978***
	[3.59]	[2.25]	[4.13]
Local autonomy	0.077***	0.067***	0.082**
	[4.29]	[3.38]	[2.05]
Social trust	1.199***	0.657	1.622***
	[5.74]	[1.46]	[3.12]
Confidence in parliament	-1.071***	-1.149***	-2.280***
	[6.73]	[5.11]	[4.85]
No belief in God	1.221***	1.366***	0.921*
	[5.57]	[4.17]	[1.73]
Latin dummy	-0.161***	-0.085	-0.360***
	[2.78]	[1.32]	[3.37]
Urbanization	-0.117	0.049	0.695***
	[0.98]	[0.24]	[2.88]
Foreign population	-0.900***	-1.271***	-0.671*
	[5.17]	[4.74]	[1.74]
Population	-0.001	0.049	0.088*
	[0.05]	[0.95]	[1.87]
Age 25-44 years (%)	2.323*	-0.722	-0.231
	[1.78]	[0.33]	[0.09]
Age 45-64 years (%)	2.16	-0.287	-1.317
	[1.34]	[0.10]	[0.44]
Age > 65 years (%)	0.769	0.14	-0.776
	[0.95]	[0.11]	[0.48]
Observations	494	494	494
Number of groups	26	26	26
Adjusted R squared	0.987	0.973	0.833
p-value Wald test	0.000	0.000	0.000

Notes: The dependent variable is the natural logarithm of the suicide rate (per 100,000 population). All estimations were carried out using STATA 9.2. A constant term and time fixed effects are included but not reported. Observations are weighted by the corresponding square root of the population. Panel-corrected and robust Z-statistics in brackets. *significant at 10%., **significant at 5%, ***significant at 1%.

Table 5

Model with economic factors included, robustness with fertility and divorce rates

	(4) Male	(5) Female	(6) Male	(7) Female	(8) Male	(9) Female
Direct democracy	-0.048**	-0.113**	-0.049**	-0.114**	-0.045*	-0.114**
	[1.99]	[2.15]	[2.09]	[2.46]	[1.75]	[2.12]
Fiscal decentralization	-0.642**	-1.100***	-0.542**	-1.063***	-0.737***	-1.009***
	[2.28]	[4.85]	[2.20]	[5.12]	[2.65]	[4.21]
Local autonomy	0.080***	0.116*	0.076***	0.114**	0.076***	0.099
	[4.05]	[1.96]	[4.10]	[2.20]	[4.27]	[1.56]
Social trust	0.52	1.813***	0.655	1.789***	0.434	1.636**
	[1.04]	[2.67]	[1.51]	[3.05]	[0.90]	[2.18]
Confidence in parliament	-1.252***	-2.863***	-1.237***	-2.523***	-1.089***	-3.002***
	[4.38]	[4.77]	[4.71]	[4.44]	[3.73]	[4.80]
No belief in god	1.261***	0.841	1.350***	0.963*	0.894**	0.239
	[3.30]	[1.59]	[3.95]	[1.89]	[2.18]	[0.29]
Latin dummy	-0.076	-0.381***	-0.091	-0.416***	-0.088	-0.356**
	[1.22]	[2.58]	[1.36]	[3.13]	[1.37]	[2.29]
Urbanization (%)	0.326	1.153***	0.185	0.900***	0.181	1.185***
	[1.06]	[3.22]	[0.69]	[2.86]	[0.66]	[3.28]
Foreign population (%)	-1.159***	-0.685*	-1.126***	-0.527	-1.590***	-1.209*
	[4.18]	[1.65]	[4.73]	[1.39]	[4.66]	[1.81]
Population (%)	0.063	0.081	0.051	0.073	0.053	0.076
	[1.16]	[1.31]	[1.05]	[1.39]	[0.99]	[1.28]
Age 25-44 years (%)	-1.285	-1.000	-1.077	-0.321	-2.924	2.493
	[0.57]	[0.34]	[0.51]	[0.12]	[1.31]	[0.62]
Age 45-64 years (%)	-1.591	-2.505	-0.68	-1.202	-4.326	1.154
	[0.50]	[0.71]	[0.25]	[0.40]	[1.17]	[0.30]
Age > 65 years (%)	-0.25	-1.418	0.007	-1.212	-1.188	0.942
	[0.16]	[0.84]	[0.01]	[0.75]	[0.72]	[0.37]
National income -Lag	-0.238	-0.301			-0.271	-0.335
	[1.24]	[1.17]			[1.48]	[1.38]
GDP growth	-0.139	-0.973			-0.067	-0.82
	[0.19]	[0.99]			[0.09]	[0.85]
Unemployment rate- Lag	-0.039*	-0.072***			-0.035*	-0.085***
	[1.80]	[2.68]			[1.74]	[3.34]
Growth of unemployment rate	0.007	-0.042			0.015	-0.039
	[0.19]	[0.75]			[0.41]	[0.68]
National Income			-0.149	-0.252		
			[0.84]	[1.13]		
Unemployment rate			-0.025	-0.026		
			[1.21]	[0.93]		
Fertility rate					-8.656	15.331
					[1.03]	[1.48]
Divorce rate					0.230***	0.055
					[3.75]	[0.46]
Observations	464	464	494	494	464	464
Number of groups	26	26	26	26	26	26
Adjusted R squared	0.9696	0.7252	0.9727	0.8156	0.9625	0.7195
p-value Wald test	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The dependent variable is the natural logarithm of the suicide rate (per 100,000 population). All estimations were carried out using STATA 9.2. A constant term and time fixed effects are included but not reported. Observations are weighted by the corresponding square root of the population. Panel-corrected and robust Z-statistics in brackets.

*significant at 10%. **significant at 5%;.***significant at 1%.

Table 6

Regressions with economic determinants lagged by one period

	(1) Overall	(2) Male	(3) Female
Direct democracy	-0.064***	-0.052**	-0.119**
	[2.86]	[2.15]	[2.37]
Fiscal decentralization	-0.636***	-0.632**	-1.153***
	[3.75]	[2.34]	[5.23]
Local autonomy	0.085***	0.083***	0.120**
	[4.48]	[4.39]	[2.11]
Social trust	1.191***	0.598	1.831***
	[5.11]	[1.29]	[2.88]
Confidence in parliament	-1.178***	-1.291***	-2.871***
	[6.47]	[4.72]	[4.97]
No belief in god	1.182***	1.302***	0.849*
	[5.27]	[3.58]	[1.67]
National income -Lag	-0.081	-0.25	-0.319
	[0.71]	[1.34]	[1.31]
Unemployment rate -Lag	-0.021	-0.038*	-0.070***
	[1.52]	[1.88]	[2.73]
Latin dummy	-0.165***	-0.088	-0.391***
	[2.64]	[1.36]	[2.79]
Urbanization (%)	0.047	0.334	1.153***
	[0.35]	[1.18]	[3.53]
Foreign population (%)	-0.911***	-1.155***	-0.731*
	[5.20]	[4.54]	[1.82]
Population (%)	0.003	0.059	0.079
	[0.12]	[1.16]	[1.36]
Age 25-44 years (%)	1.705	-1.379	-0.95
	[1.19]	[0.63]	[0.33]
Age 45-64 years (%)	1.384	-1.436	-2.235
	[0.82]	[0.49]	[0.69]
Age > 65 years (%)	0.311	-0.393	-1.581
	[0.37]	[0.26]	[0.94]
Observations	468	468	468
Number of groups	26	26	26
Adjusted R-squared	0.985	0.970	0.756
p-value Wald test	0.000	0.000	0.000

Notes: The dependent variable is the natural logarithm of the suicide rate (per 100, 000 population). A constant term and time fixed effects are included but not reported Observations are weighted by the square root of the corresponding population. Panel-corrected and robust Z-statistics in brackets.. *significant at 10%, **significant at 5%, ***significant at 1%.

Table 7

Regressions without outliers

	AI excluded			BS excluded		
	(1)	(2)	(3)	(4)	(5)	(6)
	Overall	Male	Female	Overall	Male	Female
Direct democracy	-0.060***	-0.050**	-0.128***	-0.055**	-0.054**	-0.128**
	[2.65]	[2.07]	[2.80]	[2.36]	[2.24]	[2.26]
Fiscal decentralization	-0.600***	-0.560**	-1.226***	-0.631***	0.055	-0.682
	[3.45]	[2.20]	[6.43]	[2.99]	[0.20]	[1.24]
Local autonomy	0.082***	0.078***	0.148***	0.077***	0.04	0.101*
	[4.14]	[3.60]	[2.97]	[3.85]	[1.56]	[1.79]
Social trust	1.224***	0.65	2.088***	1.141***	0.447	1.705***
	[5.44]	[1.39]	[3.74]	[5.00]	[0.94]	[2.73]
Confidence in parliament	-1.097***	-1.240***	-2.289***	-1.160***	-0.839***	-2.362***
	[6.30]	[4.53]	[4.29]	[5.79]	[3.54]	[4.26]
No belief in god	1.262***	1.376***	1.655***	1.164***	1.687***	1.250*
	[5.17]	[4.07]	[4.51]	[4.86]	[3.77]	[1.75]
National income	-0.052	-0.162	-0.364	-0.074	-0.206	-0.334
	[0.46]	[0.97]	[1.61]	[0.58]	[1.10]	[1.30]
Unemployment rate	-0.014	-0.027	-0.038	-0.016	-0.034	-0.031
	[0.94]	[1.31]	[1.38]	[1.04]	[1.52]	[1.03]
Latin dummy	-0.162**	-0.092	-0.435***	-0.162**	-0.014	-0.405***
	[2.52]	[1.34]	[3.36]	[2.46]	[0.16]	[2.79]
Urbanization (%)	-0.04	0.2	0.990***	0.068	0.012	0.769**
	[0.29]	[0.75]	[3.03]	[0.45]	[0.06]	[2.04]
Foreign population (%)	-0.827***	-1.124***	-0.186	-0.821***	-0.943***	-0.276
	[4.59]	[4.81]	[0.51]	[4.23]	[4.37]	[0.64]
Population (%)	0.000	0.051	0.057	0.005	0.056	0.067
	[0.01]	[1.04]	[1.14]	[0.20]	[1.11]	[1.16]
Age 25-44 years (%)	1.702	-1.088	-2.954	1.850	-1.685	0.228
	[1.14]	[0.53]	[1.18]	[1.37]	[0.76]	[0.08]
Age 45-64 years (%)	1.771	-0.843	-1.951	0.497	-0.451	-0.263
	[1.09]	[0.30]	[0.64]	[0.26]	[0.18]	[0.07]
Age > 65 years (%)	0.502	-0.095	-2.890*	1.091	-2.830	-2.722
	[0.55]	[0.07]	[1.92]	[0.86]	[1.20]	[0.94]
Observations	475	475	475	475	475	475
Number of groups	25	25	25	25	25	25
Adjusted R-squared	0.985	0.969	0.777	0.987	0.9698	0.831
p-value Wald test	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The dependent variable is the natural logarithm of the suicide rate (per 100, 000 population).

A constant term and time fixed effects are included but not reported Observations are weighted by the square root of the corresponding population. Panel-corrected and robust Z-statistics in brackets.. *significant at 10%, **significant at 5%, ***significant at 1%.

Table 8

Regression results for baseline model with government spending

	(1) Overall	(2) Overall	(3) Overall	(4) Overall	(5) Overall	(6) Overall	(7) Overall
Direct democracy	-0.056**	0.005	-0.041*	-0.030	-0.028	-0.024	-0.003
	[2.50]	[0.19]	[1.66]	[1.26]	[1.08]	[0.91]	[0.12]
Fiscal decentralization	-0.552***	-0.407**	-0.569***	-0.526***	-0.423***	-0.497***	-0.294*
	[3.59]	[2.51]	[3.74]	[3.33]	[2.84]	[3.26]	[1.86]
Local autonomy	0.077***	0.085***	0.079***	0.059***	0.057***	0.055***	0.087***
	[4.29]	[4.57]	[4.27]	[3.17]	[2.99]	[2.95]	[4.04]
Education		0.401***					0.501***
		[3.33]					[3.56]
Welfare			0.059				-0.062
			[0.94]				[0.95]
Security				0.112			-0.155
				[1.30]			[1.41]
Health					0.179***		0.101
					[3.02]		[1.50]
Culture						0.100**	0.05
						[2.40]	[1.05]
Observations	494	494	494	494	494	494	494
Number of groups	26	26	26	26	26	26	26
Adjusted R-squared	0.99	0.9868	0.9873	0.9872	0.9869	0.9875	0.9858
p-value Wald test	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chi2-test (DirDem, gov. spend.)		15.2893	6.1709	5.9419	17.015	11.6777	43.088
(p-value)		(0.00)	(0.05)	(0.05)	(0.00)	(0.00)	(0.00)
Chi2-test (gov. spending)							22.28
(p-value)							(0.002)

Notes: The dependent variable is the natural logarithm of the suicide rate (per 100,000 population). All estimations were carried out using STATA 9.2. A constant term and time fixed effects are included but not reported. Observations are weighted by the corresponding square root of the population. Panel-corrected and robust Z-statistics in brackets.
*significant at 10%. **significant at 5%;.***significant at 1%.

Table 9

Simple correlations among the government spending components (in log form)

	Education	Welfare	Health	Culture	Security
Education	1				
Welfare	0.76	1.00			
Health	0.73	0.79	1.00		
Culture	0.68	0.61	0.79	1.00	
Security	0.73	0.69	0.77	0.77	1

Notes: All correlations are significant at 1%

Table 10

Variable definitions and sources

Variable	Source
Total, male and female suicide rates Unit of measurement: 100,000 population. Thus, it represents the total number of suicides per 100,000 population.	Swiss Federal Statistical Office (BFS)
Direct democracy Index of direct democracy. The index ranges from 1 to 6, and higher values correspond to more democracy.	Stutzer (1999)
Latin dummy Takes value 1 if the dominating language of canton is either French or Italian	Own calculations
Local autonomy Index of local autonomy in 1992 measured at the local level, aggregated to the cantonal level	Ladner (1994)
Fiscal decentralization Share of local spending in general cantonal spending	Swiss Federal Statistical Office (BFS)
No belief in God Cantonal share responding "I don't believe in God" or "I don't know whether there is a God and I don't believe that there is any way to find out" to the question about "which statement comes closest to expressing what you believe about God?"	International Social Survey Programme (ISSP), 1998
High confidence in parliament Cantonal share responding "complete confidence" or "a great deal of confidence" to the question "How much confidence do you have in the national parliament?"	International Social Survey Programme (ISSP), 1998
High trust among citizens Cantonal share responding "people can almost always be trusted" or "people can usually be trusted" to the question "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people ?"	International Social Survey Programme (ISSP), 1998
Cantonal share of divorced persons in residential population. Unit of measurement: the normalization is 1,000	Swiss Federal Statistical Office (BFS)
Per capita national income Log of national income disaggregated to the cantonal level, divided by the cantonal population Unit of measurement: Swiss francs (constant 1980)	Swiss Federal Statistical Office (BFS)
Unemployment rate Cantonal share of registered unemployed persons in active residential population.	Swiss Federal Statistical Office (BFS
Income inequality – Gini coefficient The unit is the household. Gini coefficient calculated on the basis of official tax records, pretax income	Swiss Federal Tax Administration (FTA)
Growth national income Growth rate in national income between t_0 and t_{-1}	Swiss Federal Statistical Office (BFS)
Fertility rate Number of live births in t / female permanent residential population between 15 and 54	Swiss Federal Statistical Office (BFS)
Foreign population Cantonal share of foreign permanent residents in total population, gender adjusted	Swiss Federal Statistical Office (BFS)
Total population Log of cantonal permanent population	Swiss Federal Statistical Office (BFS)
Urbanization Cantonal share of residents living in cities of 10,000 inhabitants or larger in total population	Swiss Federal Statistical Office (BFS)
% of population age 25–44 Cantonal share of residents aged 25 to 44 years in total population, gender adjusted	Swiss Federal Statistical Office (BFS)
% of population age 45–64 Cantonal share of residents aged 45 to 64 years in total population, gender adjusted	Swiss Federal Statistical Office (BFS)
% of population age >65 Cantonal share of residents 65 years or older in total population, gender adjusted.	Swiss Federal Statistical Office (BFS)
Education Log of combined local and cantonal expenditures for public education, per capita, deflated to 1980.	Swiss Federal Statistical Office (BFS)
Welfare Log of combined local and cantonal expenditures for welfare transfers, per capita, deflated to 1980.	Swiss Federal Statistical Office (BFS)
Security Log of combined local and cantonal expenditures for police and security, per capita, deflated to 1980.	Swiss Federal Statistical Office (BFS)
Culture Log of combined local and cantonal expenditures for cultural events, per capita, deflated to 1980.	Swiss Federal Statistical Office (BFS)
Health Log of combined local and cantonal expenditures for public health care per capita, deflated to 1980.	Swiss Federal Statistical Office (BFS)

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