CONTRIBUTI DI RICERCA CRENOS

SOCIAL CONFORMITY AND SUICIDE

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WORKING PAPERS

2012/07

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Title: SOCIAL CONFORMITY AND SUICIDE

ISBN: 978 88 84 67 731 0

First Edition: March 2012

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www.cuec.it

Social conformity and suicide

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Abstract

We study the relationship between suicide rates and socioeconomic factors by using a panel data at Italian province level in the time span 1996-2005. Our analysis focuses on the impact of social norms on suicidal behaviours. In particular, beyond the usual social correlates of suicide rates, we propose an aggregate measure of social conformity which refers to the religious sphere as an area of conflict between individual and social behaviours. GMM and dynamic spatial panel data approach are implemented to control for serial and spatial autocorrelation.

The results confirm the primary role of family, alcohol consumption and population density in explaining the suicide rates in Italy, while the economic variables, namely income per capita and economic growth, do not appear to have any effects.

PsycINFO Codes: 2220
Jel Codes: C23, D03, R19
Keywords: suicide; family; conformity; social norms.

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Acknowledgments: We are fully grateful to Fausto Galli, Juan de Dios Tena Horrillo, and Antonello Preti for their useful comments and suggestions. The support of the Regional Lombardy Office of the Italian Institute of Statistics (ISTAT) for this research is gratefully acknowledged.

1. Introduction

More than one hundred years after his seminal work, Emile Durkheim still provides the starting point of any sociological study on suicide. According to Durkheim (1893; 1897), the frequency of self-killing in society depends on two factors: social integration and regulation. As a result, four types of suicide can be distinguished: *egoistic*, *anomic*, *altruistic* and *fatalistic suicide*. When social integration is weak, the number of "egoistic" suicides increases first. Indeed, as the integration in the family or in the peer groups decreases, individuals feel more isolated and more vulnerable to suicide, which is viewed as the extreme solution to better their condition. Second, the "anomic" suicides are determined by under-regulated communities, which are endemic in modern society, as moral disorder and deregulation produce a lack of awareness of the self-and of his/her role in society. Third, excessive social integration could lead to a rise in "altruistic" suicides, i.e. the form of suicide where one kills his/her self in order to increase social welfare. Finally, all types of society impose a social order to their members which create a brake to a broad spectrum of impulses, and could incentive "fatalist" suicidal behaviours among people who have low expectations about the future.

According to the aforementioned theory, hence, suicide is a social rather than a psychic fact, and its causes should be searched among the characteristics of the society and its ability to stimulate social cohesion. Suicide is a collective phenomenon driven by social issues not related to individual attitudes and elements. Furthermore, in Durkheim's Theory of Anomie, the normative conflict between past and present plays the main role in explaining suicidal behaviours. In other words, changes in regime determine the overlapping of old and new systems of social rules. Such anomic societies, poised between the old rules no longer applicable and the new ones not yet (perceived as) binding, can not provide a solid guide to the conduct of individuals (Durckheim, 1987; Merton, 1938). From this point of view, it is not the rules *per se* that cause suicidal incidents but their changes over time. On the contrary, the Social Disorganization Theory points to the social disintegration caused by rapid urbanization processes as the main factor in explaining suicide rates. Economic inequality, ethnic and cultural heterogeneity, high residents' mobility and family breakdown affect the social control efficacy of the community. The driving factors of suicide are the structural characteristics of societies and not individual attitude of the victims, which are only precipitating causes.

The relationship between individual and society is also analyzed by Halbwachs (1930) who observes and theorizes, on the one side, the prevalence of anomic suicides in large urban areas due to the absence of social cohesion, and, on the other side, the high frequency of suicidal incidents in rural regions in response to the excessively binding social norms.

Social norms are a collection of rules accepted by the majority community, and, generally, changes in rules or deviation from the established model create a conflict that leads to the marginalization of those who have exhibited deviating (Sherif, 1935). Informal sanctions are in fact provided for those who fail to stick to the rules. As defined by Cialdini and Trost (1998, p. 152): "Social norms are rules and standards that are understood by members of a group, and that guide and/or constrain social behaviour without the force of laws."

In this sense, the causes of suicidal behaviours could be traced in the absence of stable relationship between people, and the rigid and compact social structure. A lack of individualization ensues, and the individual has "so little place in the collective life because he/she is completely absorbed by his/her group" (Durckheim, 1897).

Finally, according to Barbagli (2010), cultural factors play a role in explaining suicidal behaviours. In Europe, for instance, during medieval and modern age, the common belief that suicide is a mortal sin could be a powerful deterrence to commit extreme behaviours. In this sense, Christianity plays a fundamental role in containing suicidal impulses.

This paper contributes to the empirical literature by evaluating the determinants of suicide rates in Italy at province level in the time span 1996-2005, looking at both economic and sociological aspects. Due to its Christians roots, Italy is characterized by lower level of suicide rates than non-Christian countries, like Japan for example. Like other Mediterranean countries like Spain and Greece, Italy presents the lowest suicide rates in Europe (for an international comparison see among others Andrés 2005, Chen et al. 2009, and Noh, 2009). According to Pescosolido and Georgiana (1989), Catholicism offers a high level of integration among individuals facing personal crises, all other things being equal. In this sense, we speculate on the limited role of economic factors in a country with strong social norms and religious ties. In fact, Italian society, historically family-based and conservative, could generate social tensions and marginalization that might lead to suicidal behaviours.

The aim of this paper is to isolate econometrically a type of social norm and to evaluate its impact on suicide rates. In other words, starting from the standard economic model of suicide (Hamermesh and Soss, 1974), which takes into account economic and demographic variables, social indicators are added into the analysis.
The paper is organized as follows. Section 2 discusses in detail the role of social conformity. Section 3 describes data and the econometric framework. The results of the paper are presented in Section 4. Finally, Section 5 concludes the paper.

2. Social integration, regulation and conformity

Two core elements characterize Durkheim's standard work "Le Suicide" (1897): the level of social integration and social regulation. The former refers to the degree to which people are connected to each other, the latter indicates the extent to which society has control over the behaviour of its members by norms and tradition.
Durkheim refers to suicide resulting from low levels of regulation as *anomic* suicide, which are presumably endemic in modern societies. Conversely, high levels of social regulations associated with low levels of social integration characterize the *fatalistic* suicide(Durkheim, 1897)[1]: the subjugation and oppression by an overwhelming force that has control over individual action, facilitate suicidal behaviour (Acevedo, 2005; van Bergen et al. 2009).
According to this view, formal control may be *too* strong to the extent that individual beliefs and values are non-aligned with those of society and this, in turn, may produce feelings of resentment and reactance which may lead to attempts to evade the social restriction (Brehm and Brehm, 1981; Burgoon et al., 2002).
In the literature the social correlates of suicide rates are mainly confined to the analysis of the effect of social integration, while less attention, to our knowledge, is devoted to the effect of discrepancies between individual values and social norms.

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[1] Durkheim argues that fatalistic suicides are very rare for the west and emphasizes the social effect of under-regulation typical of the process of modernization (Watt, 2010). However, Dukheim's work is based on examination or records in the late XIX century where registration of non-fatal case of suicidal behavior was rare; moreover later sociologists (Pearce 1989, van Bergen et al. 2009) find in the suicidal behaviour of migrants and ethnic minority a recurrent example of fatalistic suicides.

To represent the relationship between social integration and suicide, many empirical works use the marital status and, in particular, divorces as key indicators of low social integration[2]. Divorce, by leading to social isolation and to dissolution of family ties, constitutes a key example of Durkheim's theory (1893) of social change and suicide. However, prior research establishes a link between divorce and suicide risk only at the individual level (Stack 1982, 2000a, 2000b)[3], while studies at the aggregate level produce mixed results.

On the other hand, Stavrova et al. (2011) emphasize the importance of social norm by underlining the importance of aligning individual and social values for individual well-being. Analyzing personal life satisfaction in 28 OECD countries, they find that the negative effect of unemployment is higher in societies characterized by high social pressure and disapproval for the unemployment status.

According to this view, individuals who are placed in contexts with different values find the integration process much more difficult. In this sense the conformity to the social context is the result of injunctive social norms, to the extent that the individual behaviour is determined by the perception of what others in the community believe to be the correct conduct (Cialdini et al, 1990; Cialdini 2007). In this view conformity may hide *conflicts* between personal and social aspirations, which in turn may lead to irrational and self-destructive actions (Eckersley, 2006).

In this paper we explicitly take into account the relationship between suicide rate and social norms by proposing an index of social conformity which refers to the religious sphere as an area of conflict between individual and social behaviours.

We define social conformity as the behaviour matching what individuals perceive as accepted by their social group. In particular, from the religious perspective, we speculate that the religiousness manifested at

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[2] Other proxies of social (dis-)integration extensively used are number of marriages, the average number of individuals per households, the average consumption of alcohol and drugs, the population density and the average number of births.

[3] Some papers suggest that divorce rates are to be relatively high to have an effect on suicide rates (e.g., Fernquist, 2003) and that analyses have to be based on relatively long time periods to have enough variation in integration to affect the national suicide rate (Agerbo et al. 2011).

the social level does depend both on the individual religious sentiment and on social conformity. We proxy the social and individual religiousness with the frequency of religious marriages over the total number of marriages and church attendance, respectively. We assume that the greater the difference among the two components, the higher the level of social conformity. Indeed, a positivc relationship between social conformity and suicide rates is expected.

3. Empirical model and data description

3.1 The basic model

Following the empirical literature on suicide, this study starts proposing the model illustrated below to explore the relationship between suicide and socio-economic factors for Italian provinces in the time span 1996-2005[4]:

$$SUICIDE_{it} = \beta_0 + \beta_1 GROWTH_{it} + \beta_2 INCOME_{it} + \beta_3 DIVORCE_{it} + \beta_4 MARRIAGE_{it} + \beta_5 HOUSE\_SIZE_{it} + \beta_6 DENSITY_{it} + \beta_7 MIGRATION_{it} + \beta_8 GENDER_{it} + \beta_9 AGE_{it} + \beta_{10} DRUG_{it} + \beta_{11} ALCOHOL_{it} + \beta_{12} REL\_MARRIAGE_{it} + \beta_{13} RELIGION_{it} + \beta_{14} SOCIAL\_FUNDS_{it} + \beta_{15} LATITUDE_i + \beta_{16} YEAR_t + \eta_i + \varepsilon_{it} \quad (1)$$

$SUICIDE_{it}$ is the number of committed suicides per 100,000 inhabitants in the *i*-th province at time *t*. *GROWTH* and *INCOME* indicate the growth rate and level, respectively, of Gross Domestic Product (GDP) per capita at 1995 constant prices. As shown by Brainerd (2001), Cheng et al. (2002) and Neumayer (2003), a negative correlation between suicide rate and economic performance is expected. However, a direct relationship is also found (see Preti and Miotto, 1999, for the Italian case). Rehkopf and Buka (2006) review extensively the relationship between suicide and the socio-economic characteristics at an aggregate level. They observe that 30% of 221 analyses reported in the literature reveal a direct association between the socio-economic character of a region and suicides. For example, performing a cross-section analysis for 30 countries, Jungeilges and Kirchgässnerb (2002) estimate that real per capita income and real economic growth have a positive influence on suicide rates.

[4] AGE, GENDER and LATITUDE are time-invariant.

According to Durkheim (1897), suicide rates are affected by family and social ties that reduce the egoistic suicidal propensity. *DIVORCE* and *MARRIAGE* are the number of divorces and marriages per 100 thousands residents, respectively; *HOUSE_SIZE* indicates the number of individuals per household. Following Neumayer (2003) and Yamamura (2010), we expect that higher number and larger size of families decrease the suicide rate. Yamamura (2010) estimates also a positive impact of divorce on suicide rate.

DENSITY is the number of inhabitants per square kilometre. This variable measures the level of urbanization of each province; we do not have an a priori hypothesis about the impact of urbanization on suicidal behaviours. In fact, on the one hand, urbanization can increase social ties reducing suicide rates (Otsu et al., 2004); on the other hand, especially in big municipalities and metropolitan areas, we can observe poverty and poverty-related phenomena of social exclusion that lead to suicide.

REL_MARRIAGE and *RELIGION* are the share of religious marriages over the total number of marriages and the church attendance in a given province at time *t*, respectively. As long we control for *RELIGION*, this index can be considered as a proxy of social norms. As discussed in the previous section, Italy has a conservative culture with a still strong religious component. In this contest, such social-religious norms can stand for the degree of social convention in a given community or territory. Many analyses have already investigated the relationship between religion and suicidal behaviours at an individual level and an aggregate level, finding a positive effect of strong belief in God and church attendance (Helliwell, 2007). We believe that *REL_MARRIAGE*, controlling to religious sentiment, measures the level of social rules adopted by a given community. Such norms tend to unify society (Durkheim, 1897) but, at the same time, they may lead to social exclusion through different channels. A number of social practices and rituals are generally accepted by many individuals in order to not violate the system of rule in which they live. Such behaviours is caused by fear (and risk) that non-mainstream behaviour could lead to their exclusion or marginalization. This effect can be stronger in Italy due to the low internal mobility, which reduces the incentive to move from one territory to another.. In this view, *REL_MARRIAGE* is inserted in the model in order to capture such social aspects, to the extent that this index is correlated to the level of social convention. It is quite common in Italy to marry in church, whatever the individual religious belief, and to keep to the old traditions. Such common behaviours underline social

convention and conformity, i.e. people that match their own attitudes, beliefs, and behaviours to the ones accepted by their community or social group. Hence, we expect a positive sign of this variable, i.e. the higher the percentage of religious marriages, the higher the value of committed suicide per capita, controlling for the religious sentiment. In this sense, for a given level of church attendance, we expect that the higher the percentage of religious marriage in a given province, the higher the level of social convention and, consequently, of suicide rate.

A different strategy is also performed to hive off the social conformity component from the *REL_MARRIAGE* index. To do so, a two stage approach is run. In the first step, the share of religious marriage is regressed on church attendance along with year dummies. In the second step, the residuals of the first stage are added to the model (1). Such vector of residuals represents the choice to marry in church not explained by religious sentiment. In this way, the residuals are a proxy of *SOCIAL_CONFORMITY* because they measure, on average, the conflict between individual (religious) preference and social convention.

MIGRATION is the number Italian and foreign immigrants arrived in the *i*-th province at time *t*. It measures the decay of social capital in a given province (Yamamura, 2010). Its expected sign is positive.

AGE and *GENDER* indicate the share of people aged less than 20 and over 80 years old, and the share of males over total residents, respectively. Since suicide rates usually decrease among young and very old people and are higher among males than females (Hamermesh and Soss, 1974; Goldsmith et al., 2002; Rehkopf and Buka, 2005; Noh, 2009), we take into account the age/gender composition of the provinces in order to control for the higher propensity to commit suicide of these sub-groups.

ALCOHOL and DRUG indicate the share of people that consume alcohol between meals and the number of drug dealing offences per 100,000 inhabitants; since the consumption of drug and alcohol may be correlated to depression status, positive signs are expected (Noh, 2009).

SOCIAL_FUNDS indicates the amount of resources per capita that local governments allocate for direct social programs, such as combating poverty and social exclusion. Unfortunately, we do not have any information about the effectiveness and efficiency of such programs across Italian provinces. Assuming that better results are obtained in preventing suicide behaviours with larger amounts spent on social programmes, the expected sign is negative.

LATITUDE is the geographic coordinate that specifies the north-south position on the Earth's surface of the province capitals..It is a proxy of climate difference between North and South of Italy. According to the empirical analysis[5], we expect a positive relationship between latitude and suicide rates.
YEAR is a set of time dummy variables; the inclusion of time dummies makes the assumption of no correlation across individuals in the idiosyncratic disturbances more likely to hold (Roodman, 2009).
Finally, $\eta_i$and $\varepsilon_{it}$are the province fixed effect and the error term, respectively; we assume that $E(\eta_i) = 0$, $E(\varepsilon_i) = 0$, and $E(\varepsilon_{it}\eta_i) = 0$.
Table 2 and Table 3 provide detailed information and some descriptive statistics of the variables in use, respectively.

[TABLE 2 HERE]
[TABLE 3 HERE]

All data come from National Institute of Statistics (ISTAT), except for the economic variables (*INCOME* and *GROWTH*) that come from Tagliacarne Institute. All variables are transformed in logarithm term, so the coefficients can be interpreted as elasticities.

3.2 The dynamic panel data: GMM approach
As shown in Figure 1, the four Italian macro-areas (North, Centre, South and Islands) exhibit a similar downward pattern over time (as also highlighted by Preti, 2012), although differences in level are easily detected; the highest and lowest number of suicides per 100 hundred of residents is observed in the North and South of Italy, respectively. Figure 1 indicates that suicide series show a strong *inertia* over time, indicating that in a given province the number of suicides at time *t* is correlated to the one at time *t+1*. In order to confirm this graphical evidence, we start our analysis estimating model (1) with an Ordinary Least Squares (OLS) approach, both random and fixed effect, and we apply the Wooldridge test (Wooldridge, 2002) to check the presence of serial correlation in panel data. The null hypothesis of no serial correlation is rejected. These arguments strongly suggest the useof *k* lagged dependent variables ($SUICIDE_{it-j}$ for j=1,…,k) to remove serial correlation in the residuals. A panel unit root test (Levin, Lin and Chu, 2002) is then

[5] See Helliwell (2004) for a detailed review.

performed to see whether stationarity of the dependent variable in (1), and the null hypothesis of non-stationarity is rejected[6].

[FIGURE 1 HERE]

Furthermore, a reverse causality between suicide and social funds is strongly expected. For example, high suicide rates in a given region could motivate public intervention in order to reduce social illness; as a result, by using OLS approach in model (1), the coefficient associated to *SOCIAL_FUNDS* can be downward biased.

The presence of the lagged dependent variable and the lack of strict exogeneity between suicide rates and one explanatory variable, does not allow to use the OLS method to estimate model (1) (Roodman, 2009). A possible solution is given by the Generalized Method of Moments (GMM) that gives a consistent estimator of β using the lagged value of the dependent and explanatory variables as instruments. In this analysis, the System GMM estimator is applied, which seems to perform better than the linear first-differenced GMM in small samples (Blundell and Bond, 1998; Roodman, 2009).

In general, the GMM estimator assumes that residuals are serially uncorrelated, i.e. $E(\varepsilon_{it}\varepsilon_{is})=0$ for $i=1,...,N$ and $s=t$, and that the initial conditions of the dependent and all explanatory variables at time $t_0$are predetermined. In addition, the System GMM estimator requires a mean stationary restriction on the initial condition of the variables in use, which implies that, in the time span analyzed, the units are close enough to their steady-state: in other words, changes in the instrumenting variables are assumed to be uncorrelated with the individual-specific effect.

A crucial assumption for the validity of GMM estimates is that the instruments are exogenous. The Sargan (1958) test of over identifying restrictions checks the overall validity of the instruments: failure to reject the null hypothesis gives support to the model. In our case, since the robust standard errors are estimated, in order to correct for heteroskedasticity or cross-correlation in the residuals, the Sargan test is inconsistent. Hence, the Hansen (1982) test is performed under the null hypothesis of the joint validity of the instruments. An other important issue is the Arellano-Bond (1991) test for autocorrelation of the

[6] The statistics tests are provided by the authors upon request.

residuals, which tests whether the differenced error term is first and second order correlated. Failure to reject the null hypothesis of no second-order autocorrelation indicates that the residuals are not serially correlated.

3.3 The spatial dynamic panel data approach

Figure 2 indicates an inhomogeneous distribution of suicide rates in Italy, with some spatial clusters with similar level of suicides. A higher concentration of suicides is found in the North of Italy, especially along the Alpine regions, in Umbria-Tuscany and in Sardinia, while, in general, the South and the Centre of Italy exhibit low suicide attitude. Such disparities between North and South of Italy can be explained by strong structural differences in terms of culture, social capital and economic condition. Another explanation comes from the conservative culture of the South of Italy, historically more related to Christianity, which could generate two opposite effects on the suicide series. On the one hand, religion can be a deterrence to suicidal behaviours and incidents; on the other hand, the church opposition to suicide and resulting low social tolerance for such behaviours, could lead to an underreporting of suicidal incidents by families (Chishti et al., 2003).

[FIGURE 2 HERE]

The spatial clusters of figure (1) could indicate the presence of spatial autocorrelation, which is the case when the number of suicides in a given province is correlated to the suicides observed in the neighbouring areas. Unfortunately, spatial dependence can lead to unbiased standard estimates (Elhorst, 2003) due to the non diagonal structure of the disturbance term. By using the residuals of the OLS regression of equation (1), the Moran I test is run for each year (Anselin, 1988). Notably, the null hypothesis of no spatial autocorrelation is always rejected[7].

In order to take into account spatial autocorrelation, a new model has to be implemented. The general spatial process is the following (Baltagi et al., 2007):

$$y_{it} = X_{it}\beta + u_{it} \qquad (2)$$

[7] The statistics tests are provided by the authors upon request.

where

$$u_t = \mu + \varepsilon_t \quad (3)$$

$$\varepsilon_t = \lambda W\varepsilon_t + \nu_t \quad (4)$$

$$\nu_t = \rho\nu_{t-1} + e_t \quad (5)$$

$$\phi = \frac{\sigma_\mu^2}{\sigma_\varepsilon^2} \quad (6)$$

The model considers serial correlation on each spatial unit over time (5), and spatial dependence between spatial units at each time period (4). In the model, *y* is the dependent variables (SUICIDE), *X* is the set of covariates in equation (1), *W* is the weighted matrix. In this study, a row-standardized distance matrix is used; the distance between two provinces is measured as the Euclidian metric between their centroids.

Depending on the restrictions on the parameters we can combine error features in different ways, giving rise to various nested specifications. For $\phi \neq 0$ and $\phi = 0$, we obtain a random effects model and fixed effects model, respectively. For $\rho \neq 0$ and $\lambda = 0$, the model incorporates serial correlation. Finally, $\rho = 0$ and $\lambda \neq 0$, we have a spatial autoregressive model. For $\rho \neq 0$ and $\lambda \neq 0$, we obtain a standard linear model.

Baltagi et al. (2007) proposes a set of tests in order to check the validity of spatial component, serial component and random effects component in the dynamic spatial panel data approach, respectively. In this way, the statistical tests give a formal indication of whether one can estimate a simpler model than the general one.

4. Results

In a first stage, equation (1) is regressed by using the basic OLS approach. Initially, random and fixed effects models are performed (from now on FE and RE, respectively) and the Hausman test indicates RE as the preferred model.

[TABLE 3 HERE]

Table 3 shows the results of the OLS approach. As shown in column (1), the economic variables (economic growth and income per capita) do not seem to have any effect on suicide rates. These results are analogous to the ones of Detotto and Sterzi (2011) for the Italian case.

Then, we observe that a 1% increase in the number of marriages and in the average size of households, *ceteris paribus*, reduces the number of suicide by 0.48% or 2.04%, respectively. Both phenomena lead to an increase in social ties and individuals could find benefits from such family structures, in terms of financial and emotional support. This findings support Durkheim theories whereby strong family ties reduce individual suicidal attitudes.

Interestingly, population density is negatively correlated to suicide rates. A one-percent increase in population density decreases suicides by 0.19%. Probably, low density urban areas suffer from low levels of social contact, leading to a higher number of suicides. Furthermore, on the one hand, small communities may invest less in social programs aimed at assisting people with discomfort; on the other hand, in small communities depressed people are unlikely to be helped to recover by medication. In fact, they stay invisible because they fear feeling unwanted and unaccepted by their own community.

MIGRATION, *GENDER* and *AGE* do not have any significant impact on the number of suicides; it is reasonable that these factors might play a role at an individual level, while at an aggregate level, like in present analysis, they might not have any descriptive power.

The consumption of drug and alcohol positively affects the suicide rates, although only the *ALCOHOL* coefficient is significant. A 1% increase in heavy alcohol consumers causes a rise in suicides by 0.30%.

Then, *SOCIAL_FUNDS* and *LATITUDE* coefficients have the expected sign, even if they are not significant. However, the *SOCIAL_FUNDS* estimate can be downward biased due to the existence of a bidirectional causality between this variable and the number of suicides. In fact, we guess that as a higher number of suicides is observed, more resources are spent by local governments in social programs.

Finally, the *REL_MARRIAGE* coefficient is positive and significant: according to our results, an increase in the share of religious marriages leads to a 0.22%. increase in the number of suicides. Notably, *RELIGION* is not significant, while *REL_MARRIAGE* is positive and significant at 10% level. As discussed above, the share of religious marriage, controlling for the aggregate religious attendance, becomes a proxy of social conformity in a given province. Such result confirms the impact of social norms on suicidal behaviours.

In order to check the robustness of our results, we eliminate, in turn, *REL_MARRIAGE* and *RELIGION* from our model and re-estimate it

(clolumns 2 and 3). As expected, column (3) in Table (3) indicates that religious attendance has still no effects on suicide rates.
Finally, we apply a two stage approach in order to separate the two driving factors, conformity and religious sentiment, from the *REL_MARRIAGE* variable. In the first stage, we regress RELIGION on *REL_MARRIAGE*. The residuals of such model represent the component of the religious marriages series not explained by religious sentiment. Then, we re-estimate equation (1) inserting the obtained vector of residuals, which could be a proxy of social conformity, instead of *REL_MARRIAGE*. Column (4) in Table (3) indicate that the coefficient associated to the vector of first stage residuals is not significant.
However OLS estimates may suffer of the omitted variable problem: as we noted in the previous section, all suicide series have a similar downward trend and seem to have a strong *inertia* over time. For this reason, a GMM approach is applied in order to obtain a consistent estimator of β in equation (1) inserting the lagged values of the dependent in our model.
Table (4) shows the results of the System GMM estimation. The Hansen (1982) test for the joint validity of the instruments gives support to the model. In addition, the Arellano Bond test (1991) indicates that residuals are not serially correlated. The first two rows indicate the first and second lagged dependent variable.

[TABLE 4 HERE]

Looking at column (1), the coefficients are quite similar to those of the basic OLS estimation, except for income per capita, whose coefficient is now positive and significant at 10% level, and the number of marriages, which is not significant anymore. Hence, a one-percent increase in income per capita raises suicides by 0.37%.
According to our estimates, if the long-run equilibrium is assumed, the elasticities may be obtained by dividing each of the estimated coefficients by $(1-\beta_1-\beta_2)^{-1}$, where β_1 and β_2 are the coefficients of the lagged dependent variables. Following this reasoning, the long run impact of income per capita and alcohol consumption on suicide in Italy is about 0.51% and 0.47%, respectively, while the long run impact of household-size and density is -2.16% and -0.20%, respectively.

Controlling for endogenous factors, the *SOCIAL_FUNDS* coefficient becomes significant; a rise in the annual budget spent in social programs reduces the suicide by 0.21% (0.29% in the long run).
REL_MARRIAGE is still positive and highly significant. Its short and long run impact is 0.40% and 0.55%, respectively. In other words, a one-percent increase in the share of religious marriages leads to an increase in suicides by 0.40% in the short run, and 0.55% in the long run. As before, in order to separate the religion effect from the conformity one, we eliminate, in turn, *RELIGION* and *REL_MARRIAGE* from our model (columns 2 and 3). *REL_MARRIAGE* is still significant, while *RELIGION* is not.
In last column of table 4 we apply a two stage approach as before. The residuals of the first stage regression of *RELIGION* on *REL_MARRIAGE* are included in the model; the associated coefficient (*SOCIAL_CONFORMITY*) is positive (0.36% in the short run, and 0.49% in the long run) and significant at 1% level.
As described in section 3, spatial clusters and Moran I test indicate the presence of spatial autocorrelation that could lead to biased estimates. A dynamic spatial panel data is run in order to correct both for spatial and serial autocorrelation. Such models take into account serial correlation on each spatial unit over time as well as spatial dependence between the spatial units at each point in time. In addition, the model allows for heterogeneity across the spatial units using random effects. Baltagi et al. (2007) propose a set of tests for serial correlation, spatial autocorrelation and random effects, as well as a joint test, in a spatial error correlation framework.
Table 5 shows the results of such model. The last four rows represent the Lagrange Multiplier tests as proposed by Baltagi et al. (2007). The diagnostic tests confirm the use of a dynamic spatial panel data approach. The statistical significance of λ, ρ and ϕ is a further check of the goodness of the model. All the estimates are obtained performing a Maximum Likelihood method[8].

[TABLE 6 HERE]

[8] Unfortunately, such approach does not allow to control for the endogenous relationship between suicides and social funds.

The four estimation procedures (columns 1-4), yield similar results to the previous ones, indicating that our results are quite robust and do not depend on the estimation method in use.
In conclusion, we observe serial and spatial correlation in suicide series. Such findings could indicate the presence of latent variables that might drive the suicidal behaviours over time and space. Controlling for these factors, we see that family plays a fundamental role in explaining differences in suicide rates among Italian Provinces. To be more precise, the higher the number of marriages and the average family size in a given province, the lower the number of suicides observed.
Population density is negatively correlated to suicides, while alcohol consumption positively affects suicidal behaviours. Finally, the share of religious marriages has a positive impact on the number of suicides. This result is robust to the inclusion of a religion index, confirming our hypothesis that the enforcement of social norms and the presence of conformity may have an effect on suicide rates.

5. Conclusions

The relationship between socio-economic variables and suicidal rates has been widely analyzed by scholars, under the hypothesis of the sociological and economic model of suicide. Following this approach, suicide rates react to changes in the economic variables, like income per capita and unemployment, and in the socio-demographic factors, like number of marriages, average number of family members and so on. According to Durkheim's theory, such aspects are just on side of the coin. In fact, society plays a fundamental role in driving suicidal incidents through different channels.
To our knowledge, the impact of social norms on suicidal behaviours have not been fully analyzed, despite their importance in the theoretical literature. The adoption of social norms can produce two opposite effects on society. On the one hand, social norms could increase the social cohesion reducing suicidal behaviours, but, on the other hand, they could work as a brake to individual impulses and attitudes, reducing individual utility. According to the latter point, changes in rules or deviation from the established norms could create a conflict that might lead to the marginalization of those who deviate from "standard" behaviours.
Unfortunately, social norms are a complex phenomenon, and a number of formal and informal rules may govern the individuals. Probably, the measurement and identification complexities have represented a limit to

the implementation of social norms indices in the econometric models (Stutzer and Lalive, 2004). We try to bridge this gap by using a panel data at Italian province level in the time span 1996-2005. We identify a type of social norm that we call *Social Conformity* and that directly concerns the religious sphere. In particular, we consider the religiousness expressed at social level as the consequence both of personal religious orientation and of social conformity. These two aspects are proxied by the frequency of religious marriages over the total number of marriages and church attendance, respectively. We speculate that the greater the difference between the two components, the higher the level of social conformity. Performing GMM and dynamic spatial panel data approaches, which control for serial and spatial autocorrelation, social conformity increases suicide rates..

Our study indicates also that family structure, alcohol consumption and population density drive suicide rates in Italy, while the economic variables, namely income per capita and economic growth, do not seem to produce any effects..

When interpreting these results, one should be aware of some caveats. The most important is that we focus on a specific aspect of social conformity, the adherence to social norms in the religious sphere. Although religion is an all-pervasive force in Italy, this calls for complementary analysis using different aspects of social conformity. The second caveat is that the proxy of individual religiousness might hide an aspect of conformity too, to the extent that people go to church not for religious belief but to conform to social behaviour.

Both aspects can be linked to the use of aggregate data, which reduce the availability of some important information and the explanative power of our models. In light of this limitation, future research requires preferably individual-level data and opportune surveys analyses.

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Table 1. Description of the variables

Name	Description	Source
SUICIDES	Number of committed suicide per 100,000 inhabitants	Istat
INCOME	GDP per capita in real terms (euro 2000)	Tagliacarne
GROWTH	GDP growth per capita in real terms (euro 2000)	Tagliacarne
DIVORCE	Number of divorce per 100,000 inhabitants	Istat
MARRIAGE	Number of marriages per 100,000 inhabitants	Istat
FAMILY_SIZE	Number of inhabitants per family	Istat
DENSITY	Number of inhabitants per square kilometres	Istat
AGE	Share of people aged over 80 years and before 20 years	Istat
GENDER	Share of male inhabitants	Istat
MIGRATION	Number of immigrants (both from other Italian provinces and abroad), arrived in a given year, over total inhabitants	Istat
ALCOL	Share of people that consume alcohol between meals	Istat
DRUG	Number of drug dealing offences per 100,000 inhabitants	Istat
REL_MARRIAGE	Share of religious marriage	Istat
RELIGION	Share of people that go to church at least one time a week	Istat
SOCIALFUND	Amount of resources per capita that local governments allocate for direct social programs	Istat
LATITUDE	Latitude of each capital province	Istat

Table 2. Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
SUICIDES	1,030	7.58	3.61	0.00	23.32
GROWTH	1,030	0.01	0.03	-0.48	0.12
INCOME	1,030	15,393.67	4,005.42	7,119.16	26,452.31
DIVORCE	1,030	129.24	56.37	0.17	441.93
MARRIAGE	1,030	456.30	65.33	232.20	978.42
HOUSE-SIZE	1,030	39,211.48	3,611.65	31,217.34	50,329.55
DENSITY	1,030	244.30	330.80	36.54	2,661.62
MIGRATION	1,030	0.03	0.01	0.00	0.05
GENDER	1,030	0.49	0.00	0.46	0.50
AGE	1,030	38.64	1.80	34.78	42.32
DRUG	1,030	57.68	45.19	10.30	907.70
ALCOHOL	1,030	0.25	0.07	0.11	0.55
REL. MARRIAGE	1,030	0.74	0.12	0.09	0.94
RELIGION	1,030	0.74	0.12	0.41	0.94
SOCIAL FUNDS	1,030	0.69	1.33	0.00	11.32
LATITUDE	1,030	178.9	10.91	153.9	193.8

Table 3. OLS Regression results on suicide

	(1) OLS	(2) OLS	(3) OLS	(4) OLS-IV[1]
Growth	-0.12	-0.10	-0.08	-0.09
Income	0.30	0.27	0.30	0.27
Divorce	0.00	0.00	0.01	0.00
Marriage	-0.48***	-0.46***	-0.46***	-0.45***
Household-size	-2.04***	-1.86***	-1.86***	-1.76***
Density	-0.19***	-0.18***	-0.20***	-0.18***
Migration	-0.06	-0.07	-0.07	-0.07
Gender	-0.19	-0.16	-0.59	-0.24
Age	-0.92	-0.79	-0.94	-0.75
Drug	0.05	0.05	0.05	0.05
Alcohol	0.30**	0.32**	0.26*	0.31**
Rel. Marriage	0.22*	0.24**		
Religion	0.16		0.20	
Social conformity				0.20
Social funds	-0.12	-0.11	-0.11	-0.11
Latitude	-0.01	0.17	0.05	0.24
Constant	0.19	-0.56	-0.41	-1.22
Year dummies	Yes	Yes	Yes	Yes
Number of observation	1,030	1,030	1,030	1,030
R^2	0.75	0.74	0.74	0.75

Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. [1]OLS-IV indicates the two stage approach. In the first step, REL_MARRIAGE is regressed on RELIGION, controlling for year dummies. In the second step, the residuals of the first stage are added to the model.

Table 4. System-GMM regression results on suicide

	(1) GMM	(2) GMM	(3) GMM	(4) GMM-IV[3]
Suicide (-1)	0.18***	0.18***	0.17***	0.18***
Suicide (-2)	0.09**	0.09**	0.09**	0.09**
Growth	0.01	0.00	0.09	0.01
Income	0.37*	0.36*	0.33	0.33
Divorce	-0.01	-0.01	-0.01	-0.01
Marriage	-0.37	-0.36	-0.38	-0.36
Household-size	-1.58***	-1.51***	-1.28**	-1.36**
Density	-0.15***	-0.14***	-0.16***	-0.14***
Migration	-0.11	-0.11	-0.12	-0.11
Gender	-1.86	-1.86	-1.69	-1.83
Age	-0.94	-0.87	-0.99	-0.81
Drug	0.04	0.04	0.04	0.03
Alcohol	0.34**	0.35**	0.25	0.35**
Rel. Marriage	0.38***	0.40***		
Religion	0.07		0.12	
Social conformity				0.36***
Social funds	-0.21**	-0.21**	-0.19**	-0.20**
Latitude	-0.68	-0.61	-0.46	-0.46
Constant	1.53	1.23	0.77	0.21
Year dummies	Yes	Yes	Yes	Yes
Number of observation	824	824	824	824
Arellano-Bond (1)	-5.11***	-5.12***	-5.14***	302.72***
Arellano-Bond[1] (2)	-0.13	-0.18	-0.04	-0.19
Hansen test[2]	66.99	71.55	73.13	70.62

Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively.. [1]Arellano-Bond (1991) statistic test under the null hypothesis of no second-order autocorrelation in the residuals. [2]Sargan (1958) and Hansen (1982) statistic tests under the null hypothesis of the joint validity of the instruments. [3]OLS-IV indicates the two stage approach. In the first step, REL_MARRIAGE is regressed on RELIGION, controlling for year dummies. In the second step, the residuals of the first stage are added to the model.

Table 5. Dynamic spatial panel data regression results on suicide

	(1) SDPD	(2) SDPD	(3) SDPD	(4) SDPD-IV[5]
Growth	-0.09	-0.07	-0.05	-0.07
Income	0.34	0.31	0.33	0.27
Divorce	-0.01	-0.01	-0.01	-0.01
Marriage	-0.39**	-0.38**	-0.37**	-0.38**
Household-size	-2.08***	-1.90***	-1.87***	-1.75***
Density	-0.19***	-0.18***	-0.20***	-0.18***
Migration	-0.04	-0.05	-0.05	-0.04
Gender	-0.46	-0.45	-0.73	-4.04
Age	-0.86	-0.74	-0.84	-0.65
Drug	0.06*	0.07	0.06*	0.06
Alcohol	0.30**	0.31**	0.26*	0.29**
Rel. Marriage	0.25**	0.27**		
Religion	0.17		0.19	
Social conformity				0.35***
Social funds	-0.05	-0.11	-0.11	-0.10
Latitude	-0.03	0.17	0.03	0.18
Constant	6.28	5.32	5.51	5.55
Year dummies	Yes	Yes	Yes	Yes
Number of observation	1,030	1,030	1,030	1,030
λ	0.14**	0.14**	0.15**	0.14*
ρ	0.19***	0.19***	0.18***	0.19***
ϕ	0.46***	0.46***	0.44***	0.45***
LM(C1) test[1]	48.62***	48.25***	52.51***	52.37***
LM(C2) test[2]	10.14***	10.10***	10.27***	10.07***
LM(C3) test[3]	8.95***	8.78***	8.95***	8.78***
LM(J) test[4]	334.17***	332.45***	333.38***	337.18***

Standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. [1]Baltagi, Song, Jung and Koh (2007) LM test under the null hypothesis of no serial correlation. [2]Baltagi, Song, Jung and Koh (2007) LM test under the null hypothesis of no spatial correlation. [3]Baltagi, Song, Jung and Koh (2007) LM test under the null hypothesis of no random effects. [4]Baltagi, Song, Jung and Koh (2007) LM jointed test under the null hypothesis of no serial correlation, spatial correlation and random effects. [5]OLS-IV indicates the two stage approach. In the first step, REL_MARRIAGE is regressed on RELIGION, controlling for year dummies. In the second step, the residuals of the first stage are added to the model.

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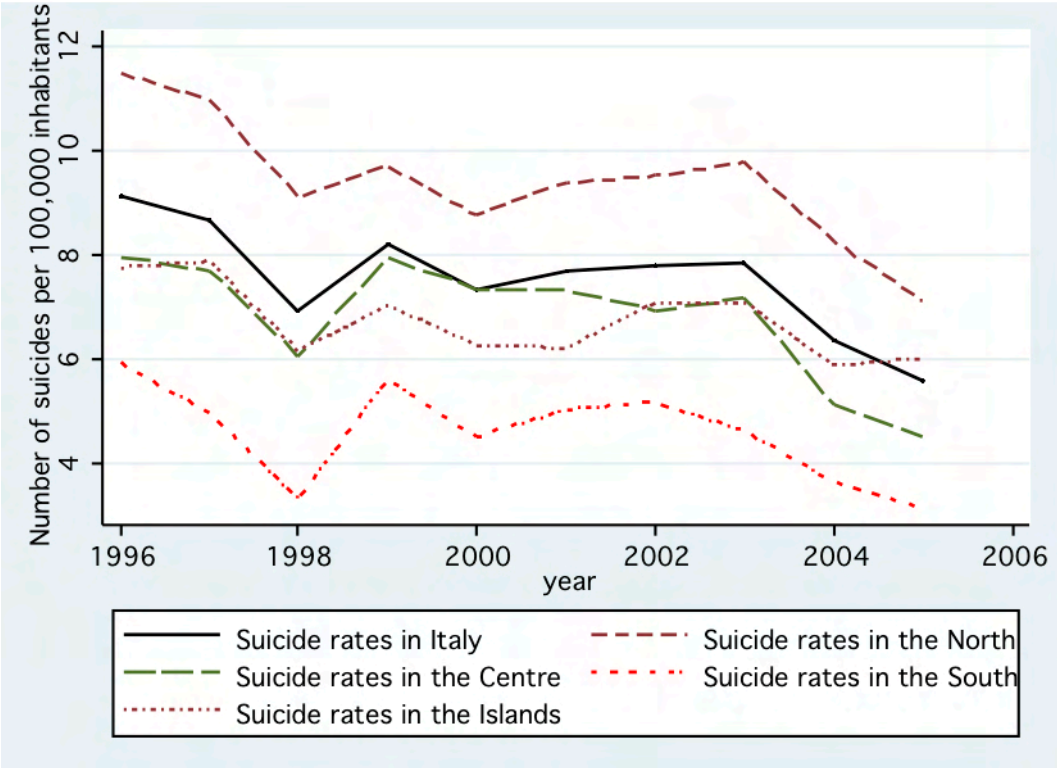
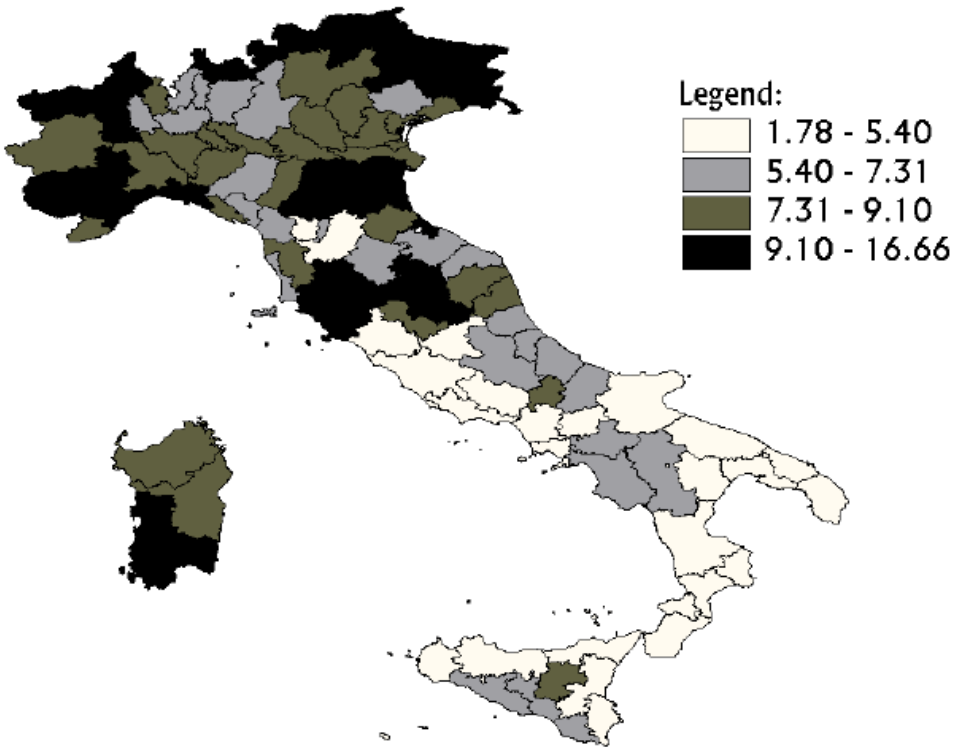
Figure 1. Suicide rates in Italy and its macro-areas (North, Centre, South and Islands)



North Regions: Aosta Valley, Emilia-Romagna, Friuli-Venezia-Giulia, Liguria, Lombardy, Piedmont, Trentino, Sudtirol, Veneto. Centre Regions: Abruzzi, Lazio, Marche, Tuscany, Umbria. South Regions: Apulia, Basilicata, Calabria and Campania. Islands: Sardinia and Sicily.

Figure 2. Average number of suicides per 100,000 inhabitants in Italy (1996-2005)



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Finito di stampare nel mese di Maggio 2012
Presso **Copy…Right! studio grafico & stampa digitale**
Via Turritana 3/B – Tel. 079.200395 – Fax 079.4360444
07100 Sassari

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ISBN 978-88-84-67-731-0