
Social Determinants of Suicides in the Czech Republic between 1995 and 2010*

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Abstract: The text is concerned with suicides in the Czech Republic. It seeks to determine which social variables, and to what extent, have affected suicidal behaviour since 1989. The authors draw on Durkheim's theory that society prevents suicidal tendencies. They formulate six hypotheses to account for the effects of social variables (year, sex, age, education, and marital status) on suicide rates, which they test using data from 1995 to 2010. Their findings show that time weakens the odds for committing suicides. Regardless of the time, women and people who are young, more educated, and living in a marriage face the lowest risk of suicide. That marriage works as a shield against suicide is especially true for men (its protective function for women is significantly lower). In the period observed, there was a relative increase in the effect of two social variables: middle age (45–69 years) and lower education. The structure of variables explaining suicide rates changed during the time period observed.

Keywords: suicide, suicide rate, social factors, Czech society, time period 1995–2010

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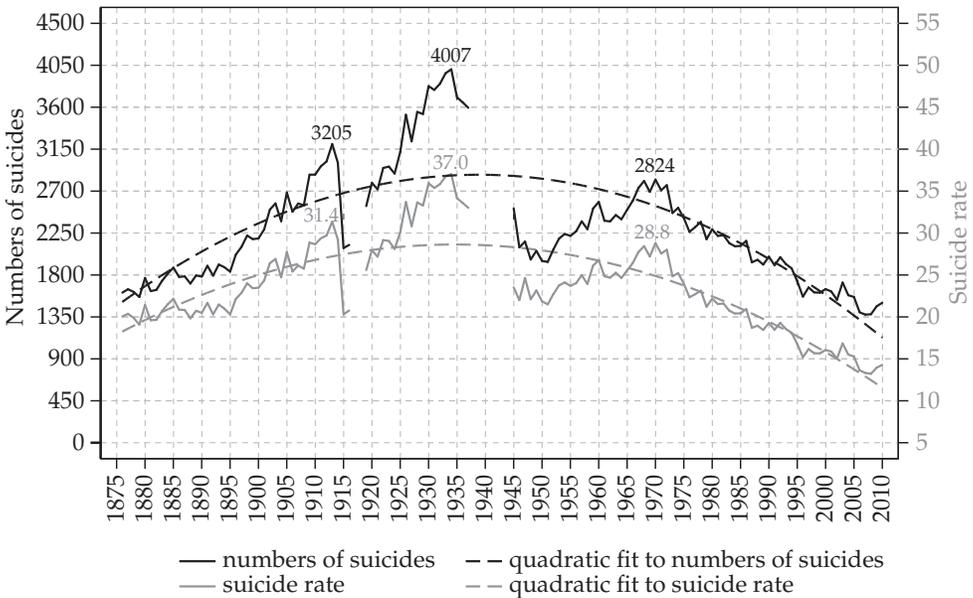
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A high suicide rate as a characteristic of Czech society has been documented as far back as the beginning of the 20th century [Dzúrová and Dragomirecká 2002; Růžička 1968]. We can identify three peaks in the historical development of the suicide rate in the Czech lands (Figure 1). The first one occurs between 1910 and 1915, when the suicide rate was around 30 (the suicide rate indicates the number of suicides per 100 000 people in a given year). The largest number of recorded suicides in this period, 3205 cases, was in 1913. The second, and the highest, peak in the suicide rate occurred between 1930 and 1935. The largest number in this period was in 1934 (with 4007 suicides, which means a suicide rate of 37). The period after the Second World War can be divided into three stages [Dzúrová and Dragomirecká 2002]. First, the suicide rate decreased between 1945 and 1951, then

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Figure 1. Trends in suicides and the suicide rate on the territory of the Czech Republic, 1875–2010



Source: Data since 1945 are available online [see Czech Statistical Office 2012c]. We would like to thank Vladimír Polášek from the Czech Statistical Office for providing us with the data from 1876 to 1937.

it increased until 1970 (this was the third and, so far, the last, peak in the historical development of the suicide rate in the Czech Republic), and then it decreased again. This third stage has continued with yearly variations until today. In 2010, there were 1502 recorded suicides, resulting in a suicide rate of 14.3 [Czech Statistical Office 2012c].

The third of these three stages in the suicide trend started in the ‘normalisation’ period in Czechoslovak society in the 1970s under President Gustáv Husák, following the turmoil of the Soviet occupation in 1968. Normalisation has mostly negative connotations in everyday discourse. However, in terms of the suicide rate this denotation is quite fitting. In the years up to 1989, during which time the Czech lands were in the Soviet sphere of influence, efforts to ‘normalise’ social relations in terms of suicide were successful. In 1989 the political regime changed, the borders opened, and the Czech Republic began its integration with West European countries. Although this post-revolutionary period has been one of deep social change accompanied by the anomie of certain social groups (for more on this, cf. Rabušic and Mareš [1996]), it seems that the social turbulence did not

have a huge effect on the decreasing trend in the suicide rate that started at the beginning of the 1970s (see the quadratic fit to the data in Figure 1).

In this text, we focus on the following variables: time, sex, age, education, and marital status to show how their roles in explaining suicide have changed in Czech society since 1989. The goal of the paper is therefore to show to what extent the social characteristics of individuals (controlled for time) affect suicidal behaviour. In other words, we examine to what extent suicide is socially determined, and how this determination has changed over time, specifically between 1995 and 2010.¹ Despite the fact that our research stems from Durkheim's theory of suicide as a social phenomenon, which is primarily formulated at the social macro-level, our analysis is concerned with the social micro-level. At the end of the 1960s, Gibbs [1968] noted that there are two fundamental questions in research on suicide. First, why does the number of suicides differ between social groups or other units? Second, why does one particular person instead of another commit suicide? The answers to these questions assume an explanation at different social levels (for more on this cf. Berk [2006]). In the first case, causal connections between group characteristics and the suicide rates of these groups are tested; in the second case, researchers analyse causal relations between the suicides of individuals and their social characteristics. Our analysis is concerned with the second case.²

The structure of this text is as follows: first we introduce suicide as a social phenomenon. Then we delineate the role of particular social variables in suicidal behaviour, and we formulate six expectations (hypotheses) about their effects on suicide in contemporary Czech society. We briefly describe our data on suicides and discuss difficulties that are necessary to deal with during the analysis. In the descriptive analysis we construct suicide rates according to particular explanatory variables (year, sex, age, education, and marital status) in our data and we show their explanatory potential. In the multivariate analysis we test the relevance of our six expectations about the social contingency of suicide using binary logistic regression. Our conclusions show that with the passing of time the odds

¹ We only deal with completed suicides for which statistical data are available in the Czech Republic. We will not deal with suicide attempts, even though we know that for a full understanding of suicidal behaviour it is necessary to consider both completed suicides and suicide attempts [cf. Beck et al. 1999; Kessler et al. 2005].

² Of course, there are links between the social macro and micro levels and they influence each other. According to Merton [1975, 1995], each theory aiming to explain a social phenomenon at the macro level, should have support also at the micro level and vice versa. If we identify any causal relation at the macro level, we should also be able to identify corresponding behaviour at the micro level which leads to this relationship. The structure of opportunities limits people's actions on the one hand, but on the other hand the cultural environment forms their goals and values, and in this sense leads to their actions (for more on this, cf. also Coleman [1986, 1990]; Stinchcombe [1975]).

of committing suicide in Czech society have declined. Regardless of the historical time, women, people who are younger, more educated and living in marriage show the lowest odds of committing suicide. Marriage and divorce have different consequences for men and women. While for men marriage reduces the likelihood of suicide and divorce increases it into the extreme, for women we do not observe such a divergent effect of marital status on suicide. Over the observed time period, the effects of two selected social variables have shown relative increases: that of being middle aged (45–59 years) and have a lower level of education (at the vocational level). The structure of the explanatory variables of suicide has been changing in Czech society.

The social determinants of suicide

The fact that suicide rates vary across countries, but at the same time remain comparatively constant in each country, led Durkheim [2005] to believe that suicide is a social phenomenon *sui generis*. Durkheim states: 'At any given moment the moral constitution of society establishes the contingent of voluntary deaths' [2005: 63]. Hidden behind the moral constitution of society, there is social integration and regulation, which protect individuals from suicide. If there are rapid social changes or revolutionary events, social integration and regulation may weaken, and society may lose its protective capability, and the number of suicides can increase. This, however, does not have to occur at the level of society as a whole and may instead occur within certain groups. We can then identify suicidogenic currents whose 'normality' or 'abnormality' is determined by the moral state of the society.³

Based on Durkheim's theory, previous research, historical development, and the possibilities suggested by the available data on suicides (more on the data in the methodological section), we formulated six hypotheses, which we test in the analytical part of this text. The first hypothesis concerns the development of suicide over time, and the remaining five are concerned with the influence on suicide of sociodemographic characteristics such as sex, age, education, marital status, and the interaction of marital status and sex. None of the hypotheses considers suicide as a personal characteristic of the individual, that is, as something that would stem from one's psyche; rather, suicide is considered a phenomenon whose causes can be observed at the level of social characteristics.

³ On this basis, Durkheim formulated the well-known system of suicide classification, which distinguishes between egoistic, altruistic, anomic, and fatalistic suicide (for more on this, see Durkheim [2005]).

The effect of time on suicides

According to Durkheim, the suicide rate increases during social turbulence. In the time observed (1995–2010), significant social changes occurred, especially at the beginning of this period, when social norms were changing in many respects. During this time, part of the society seemed to be anomic [Rabušic and Mareš 1996]. Nevertheless, as time passed, the post-revolutionary development settled down. By 2010, the social changes that influenced and altered everyday actions were not as significant as they had been at the beginning of the 1990s. For this reason, we expect that the passage of time has had the effect of decreasing the chances of suicide in contemporary Czech society. In our first hypothesis we therefore assume that *the chances of committing suicide decreased over the observed time period (1995–2010)*.

The effect of sex on suicide

Our second hypothesis stems from the finding that women have a lower probability of committing suicide than men [cf. Pampel 1998; Austin, Bologna and Dodge 1992]. The differentiation in suicide rates according to sex was just as valid in Durkheim's time as in 1990, when a number of studies identified higher suicide rates in men compared to women in 41 out of 42 countries researched [cf. Travis 1990, cited in Stack 2000a]. The reasons for the lower number of suicides among women compared to men were summarised by Stack [2000a].⁴ However, some sociologists dispute Durkheim's conclusions on the differentiation in suicide rates by sex [cf. Nolan, Triplett and McDonough 2010; Kushner and Sterk 2005]. These authors are convinced that Durkheim did not take into account unsuccessful attempted suicide, which is more common among women. According to such critics, the inclination towards or vulnerability to suicide does not differ significantly between men and women. Moreover, they assert that this varying inclination, by sex, did not change during the course of the 20th century, despite the fact that women's participation in the labour market in Western countries increased.

⁴ The reasons are as follows: (1) the rate of alcoholism is about five times lower in women than in men; (2) women are more religious; (3) women are more inclined than men to attempt suicide than to complete suicide; (4) women are more adaptable, because they internalise a larger number of social roles during their lives; (5) women are able to identify depression more often and earlier; (6) relatedly, women are more likely to seek specialist help for depression; (7) women have stronger support resources within their social environment; (8) masculinity is culturally perceived as impulsive, strong, and decisive, which may increase suicidal tendencies in men; (9) historically, women have had more limited access to suicidal instruments; (10) a man's failure to fulfil his primary social role (financial security) is more visible than a women's failure to fulfil her primary social role (for more on this, cf. Stack [2000a]).

Růžička [1968] has identified the differences between the suicidal behaviour of men and women in the Czech Republic. According to the masculinity index that he has constructed, the numbers of suicides by men exceed those of women. In 1931–1934, the value of this index amounted to three in favour of men. The number of suicides among men later decreased (in 1947–1949 the value of the masculinity index fell to 2.2). In 1960–1990 the masculinity index ranges between 2.2 and 2.8 [Dzúrová and Dragomirecká 2002]. Based on these findings, we are convinced that sex is a factor that plays a role in suicidal behaviour in the Czech Republic and cannot be overlooked. In our second hypothesis we therefore predict that *women, compared to men, have lower chances of committing suicide in Czech society, and this ratio between men and women has not changed over time.*

The effect of age on suicide

A number of studies have shown a positive relationship between age and the suicide rate. Durkheim stated, ‘not only is suicide very rare during childhood but it reaches its height only in old age’ [2005: 50]. He concluded that the reason is the weak social integration of individuals in the old age. When age was combined with sex, the linearity of this relationship proved ambiguous [Girard 1993]. The relationship is valid for men, but among women the highest number of suicides occurs in middle age, and does not increase from then on, despite the fact that in later life their social isolation tends to increase as they tend to outlive their spouse.

The effect of age on suicides has been changing in West European countries in recent years. The number of suicides has been decreasing among elderly men and women. In contrast, it has been increasing among young people, especially young men. This suggests the increase in the cohort effect on suicides. Stockard and O’Brien state: ‘The recently born cohorts seem much more vulnerable to suicide at a younger age than was the case in cohorts born earlier’ [2002: 854]. Pampel [1996] has shown that there is also a relationship between the size of birth cohorts and the suicide rate. Using aggregated data from eighteen economically developed countries, he showed that the larger the birth cohorts are—which means that their members have more limited access to economic resources—the higher the suicide rate is. He found the effect of the size of the cohort especially among men and in countries with an individualistic culture (such as the countries of Western Europe and the United States). The effect was strongest in the 1950s and 1960s, with a decrease in the ensuing decades.

The suicide rate is considered to be a function of age in the Czech lands. According to Růžička [1968], in the Czech context the suicide rate increases linearly with age; according to Polášek [1996] and Dzúrová and Dragomirecká [2002], it even increases exponentially after the age of 65. In our third hypothesis we therefore predict that *the chances of committing suicide increase with age, and therefore*

the suicide rate is highest in the oldest age group, and the ratio of the effects on suicide between age groups remains the same over time.

The effect of education of suicide

Durkheim related education to the erosion of traditional values, the spread of secularisation, and the rise of liberal thought. He especially perceived secularisation to be a cause of the rise in suicides among educated people. Gillis [1994] analysed the increasing literacy of French society between 1854 and 1914 (i.e. during Durkheim's lifetime) in relation to violent crimes. In this time period, the number of violent crimes decreased, but the number of suicides increased notably. Gillis' interpretation is that the violence which had been 'directed outside' turned 'inside' as the violence by an individual against himself. Thus, Gillis confirms Durkheim's theory that an increase in the average level of education in the population does not affect the suicide rate; rather, it is a sign of a societal change in values which affects the suicide rate. However, according to Stack [2000b], while this conclusion may be valid for Durkheim's times, in contemporary Western societies there is no longer a connecting line between education, secularisation, and suicides.

In Czech society, we can find a significantly higher rate of suicide among men with a primary education compared to university graduates [Rychtařiková 2002]. Compared to women with a primary education, men in the same category committed suicide five to six times more often. A lower suicide rate was not observed among female university graduates in comparison with women with a primary education [Rychtařiková 2002]. In our fourth hypothesis we expect that *people with the lowest level of educational achievement (primary education) have the highest chances of suicide in Czech society. Suicidal tendencies weaken as the level of achieved education rises. The ratio between the effects of education on suicide does not change over time.*

The effect of marital status on suicide

Durkheim placed a great deal of emphasis on family integration. According to him, married people are the most socially integrated (and if they have children, their integration is higher than those without children; cf. Breault [1986]), followed by the widowed and the divorced. Those never married are the least integrated. A number of studies analysing aggregated data show that the higher the divorce rate in a society, the higher the suicide rate [Stack 1980; Berk 2006]. Although the ontological status of aggregated data is not the same as that of individual data, the analyses of individual data produce similar conclusions. According to Stack [2000b], more than 80% of these analyses show a higher suicide rate among the divorced than among married persons.

The results of longitudinal studies of suicide based on aggregated data are, compared to the analyses of individual data, somewhat unclear. Half of them show a positive correlation between the divorce rate and the suicide rate, while the other half does not support this conclusion [Stack 2000b]. Lester [1994] studied the suicide rate in 21 European countries between 1950 and 1985. In ten countries the divorce rate predicted the suicide rate, but not in the other countries. Agerbo, Stack and Petersen [2011] analysed longitudinal data from 1906 until 2006. They defend the range of the data by referring to the fact that the time period after 1950 is characterised by increasing divorce rates and weakening religiosity, which was not the case in the first half of the 20th century. Their analysis confirms that the high occurrence of divorce was and still is (for the whole of the 20th century) a predictor of a high suicide rate.

The analysis of longitudinal data on suicide at an individual level is uncommon [cf. Kposowa, Singh and Breault 1994]. Nevertheless, virtually all of these analyses show a positive relationship between the divorce rate and the suicide rate. However, most of these surveys were based on small samples and this must be taken into account [Stack 2000b].

In the Czech Republic, marital status was not analysed in relation to the suicide rate for a long time. For this reason, Růžička [1968] worked only with predictions. He states on their basis that between 1947 and 1948 the number of suicides among married men was by 19% lower than the number predicted, while for bachelors the number of suicides was 28% higher than predicted. Among widowers the number was higher by as much as 78%. Married women experienced a suicide rate 21% lower than expected, while among unmarried and widowed women suicides exceeded the expected number by 23% and 25%, respectively. Analyses of newer data, which include marital status, show similar results. We find the lowest suicide rate among married people regardless of their age [Dzúrová and Dragomirecká 2002; Daňková 2003]. The highest suicide rate is found among widowed men, with a maximum in the oldest age group, 65–84 years [Dzúrová and Dragomirecká 2002]. The highest suicide rate for women under the age of 65 is found among the divorced, whereas the highest rate for those over the age of 65 is found among widows.

In the light of these conclusions, we predict that marriage weakens suicidal tendencies in our fifth hypothesis. We think that those who are married have a *lower chance of committing suicide compared to those who are unmarried, widowed, or divorced, and the ratio between the groups delineated by marital status did not change during the observed time.*

Since Durkheim postulated that marriage has a protective function particularly for men, we supplement this hypothesis with another statement: the effect of marital status on the suicide rate is not the same across the whole population. It differs for men and women. Men profit from marriage significantly more than women. Marriage provides them stronger protection from suicidal tendencies than it does for women. However, men lose this protection when they get di-

vorced. Pampel [1998] states that men's social integration outside the family is much more difficult than it is for women, who are able to create interpersonal connections in public more easily than men. In our sixth and final hypothesis we therefore predict that *men living in a marriage have lower chances of committing suicide than women living in a marriage, but divorced men have higher chances of committing suicide than divorced women*. In other words, we expect an interaction between family status and sex, which provides a foundation for the fact that marriage and divorce have different suicidal consequences for Czech men and women.

Data on suicides

The data on committed suicides were provided to us by the Institute of Health Information and Statistics of the Czech Republic (IHIS CR). The data come from the processing of death certificates, which are filled in for every deceased person. Until 1993, the ninth revision of the International Classification of Diseases (ICD-9) was in use; from 1994 the ICD-10 has been used, which includes data on diagnoses X60-X84. Džúrová and Dragomirecká [2002] state that although the number of suicides increased with the new classification, the total number of suicides still remains underestimated (and therefore distorted), because suicide as the cause of death is only confirmed when there is a piece of clear evidence about an intentional act.⁵

The data from the death certificates originate as follows: When a person dies, a doctor fills in a death certificate (a 'DED' according to the Institute of Health Information and Statistics). If a post-mortem is not ordered, one copy of the DED is sent to the funeral home, one stays in the medical institution, and

⁵ According to Pescosolido and Mendelsohn [1986], three types of distortion can be found in the data on suicides: (1) random error, (2) uniform underreporting, and (3) systematic misreporting. The last of the three types represents the biggest risk. Random error lacks a formula, and therefore no specific set of cases is excluded. In uniform underreporting, coefficients seem to be less significant, but their proportions remain the same. Systematic misreporting, however, discredits the findings due to prejudices against suicide which are present in the given society. This distortion follows from the definition of the suicide, which is culturally and historically contingent. The data on suicides from the Czech Republic are an illustrative example. The data are published by the Czech Statistical Office, the Institute of Health Information and Statistics, and the Czech Police [Džúrová, Růžička and Dragomirecká 2006; Daňková 2003]. However, these sources offer different numbers. For example, between 1996 and 2000, the CSO recorded 8106 suicides, IHIS reports 7618 cases, and the Police records show 6178 cases. The cause of this discrepancy would deserve a separate quantitative or qualitative sociological analysis (the cause could be the different definitions of suicide used by these organisations). Nevertheless, if we deal with trends, they are more or less the same across all types of data, even though they vary in intensity (they shift up or down, depending on the numbers).

two copies are sent to the register office. If a post-mortem is ordered, there is an intermediate step between the medical institution and the register office, and that is the post-mortem. The doctor carrying it out receives all copies of the DED, and additional information about the causes of death is filled in during the post-mortem. The DED then continues to the register office and the funeral director. The register office fills in the death certificate. The DED remains at the register office, and the death certificate is sent to the Czech Statistical Office and the IHIS CR. Demographic information about the deceased is retrieved by the doctor, and therefore it comes directly from the DED [IHIS ČR 2006].

The variables that can be retrieved from the death certificate are the following: *sex, age, marital status, education, and place of residence* (classified by the permanent address of the deceased). These are anonymised individual data. The total size of the dataset, and therefore also the overall size of the population of those who committed suicide between 1990 and 2010, is 34 663 cases. Education is the most problematic variable. First, this variable is available in the data only from 1995. Next, the number of cases with education not identified increased towards the end of the time period. If there were 11 such cases in 1995, in 2010 there were 521. The turning point in recording education happened in 2007. Prior to that year, the number of unidentified cases was low.⁶

The data from the death certificates show only successfully committed suicides. In the data it is impossible to control the primary cause that is the number of people that are exposed to the phenomenon.⁷ Because of this we simulated the exposed population with respect to the variables available in the data on suicides using data from the Labour Force Survey (LFS).⁸

⁶ It is not exactly clear why this is so. Nevertheless, in 2006 a manual for filling in the DED was published, and it may have added to the 'lack of discipline' in filling out the DED. Also, in the same year educational materials for doctors were created using an EU grant, which were supposed to emphasise the importance of the statistics. An automated coding system called IRIS and a validation tool have also been introduced [Daňková 2012]. Unfortunately, it seems that these changes had a rather negative effect on identifying the level of education of those who committed suicide.

⁷ For example, the number of people with primary education is smaller than the number of people with vocational education, which also means that the number of suicides in the first category is smaller than the number in the vocational education category. However, with respect to the size of these educational categories, the relative number of suicides among people with primary education is higher than among those with vocational education.

⁸ The LFS is an annual continuous survey of a random sample of households carried out since 1993. The data are collected as a rotating panel where each unit household participates in the survey for five consecutive quarters, where one quarter is understood to be 13 reference weeks. Therefore, 20% of the sample changes each quarter [Czech Statistical Office 2012b]. We created the reference groups for the groups of those who committed suicide, weighed on the entire Czech population, from each fourth quarter.

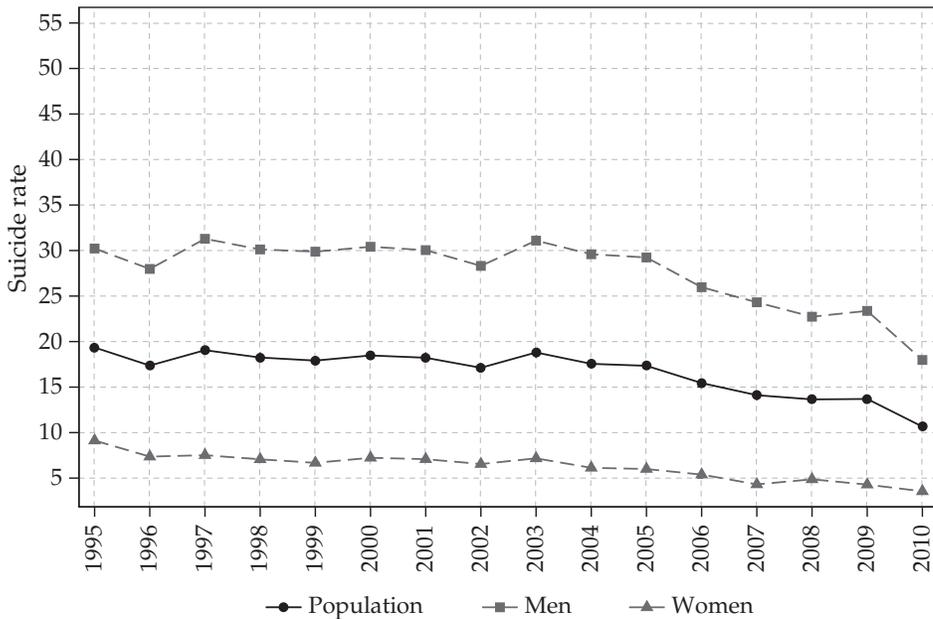
We proceeded as follows: first we selected from the LFS data variables that are present in the data on suicides: *year, sex, age, education, and marital status (the place of residence unfortunately is not present in the LFS data)*. Then we recoded these variables so that their categories corresponded to the categories in the data matrix on suicides. Because the data on suicides include the *education* variable only from 1995, we excluded the previous years, and focused on the time period between 1995 and 2010. The *sex* variable contains two categories (man, woman). The *age* variable was limited to 15–80 years. The *marital status* variable contains four categories (single, married, divorced, widowed), and the *education* variable also contains four categories (primary, vocational, secondary school, and university). We used an integrated weight for persons to weigh the LFS data with respect to these categories to the Czech population.⁹ Then we merged the LFS data according to the variable categories with the data on suicides. In this way we obtained information on how many suicides were committed from populations of what size, and also how many suicides with respect to the studied variables were not committed. For the number of suicides committed and the size of the exposed population according to each particular explanatory variable for the first and last years included in our data (1995 and 2010); see Appendix A (data from the remaining years can be provided upon request).

Descriptive analysis of suicides in 1995–2010

Given the fact that we know the population that was exposed to suicides only in terms of the variables researched, our results both from the descriptive and the multivariate analysis are valid only with respect to these variables. In our first hypothesis we predict that during the years 1995–2010, the chances of suicide in Czech society decreased. In the second hypothesis we state that sex plays a key role in explaining suicide in Czech society. Figure 2 shows the development of the suicide rate (the number of suicides per 100 000 people) in our data for the whole population, as well as for men and women separately. The overall suicide rate decreased between 1995 and 2010, both among men and women. At the same

⁹ A weight correction was necessary for the years 1995–1997, which counted a lower number of inhabitants than that provided by the Czech Statistical Office [Czech Statistical Office 2000]. Therefore, we multiplied the weight in these three years by coefficients that were calculated from the final size of the population in each year. The proportions between the individual variables were preserved. A verification was carried out by comparing the number of men and women, which in the dataset corresponds with the values reported by the CSO, in the given time period. We are aware that an exposed population created in this way may not precisely resemble the real population of the Czech Republic. However, we think that for our purpose it is precise enough, and that the result would not differ significantly if the data from the 1991, 2001, and 2011 official censuses were used, because the weights used in the LFS data reflect annual variations in the population.

Figure 2. Suicide rate by sex, 1995–2010



Source: IHIS CR, LFS; authors' calculations.

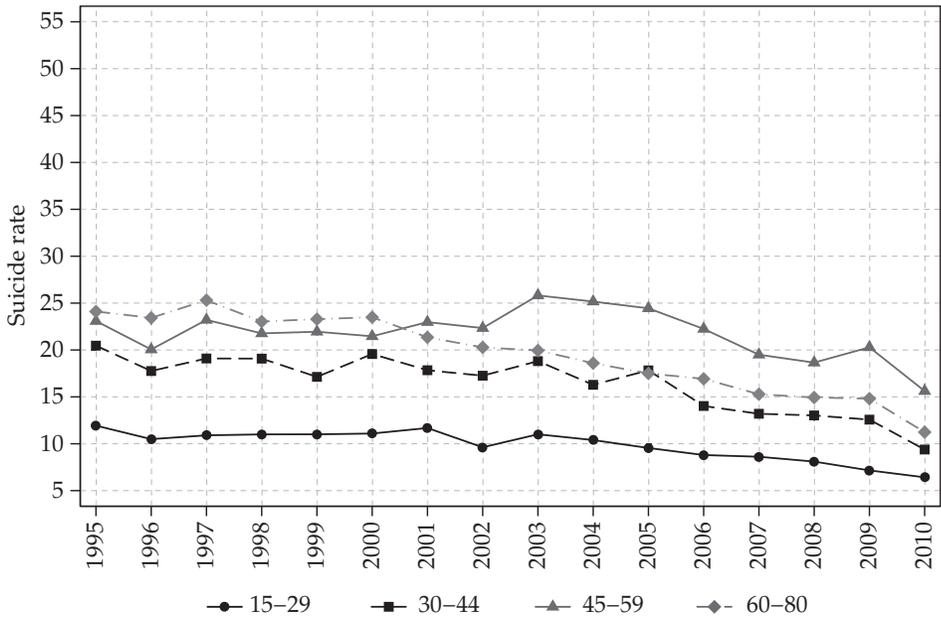
Note: Suicide rate shows the number of suicides committed per 100 000 people.

time, the suicide rate among men was markedly higher than among women. Both time and sex seem to be indispensable factors in explaining the chances of suicide in the recent history of Czech society.

In Figure 3 we can see the development of the suicide rate according to age. The suicide rate for the age group aged 60–80 years decreased, and, significantly, fell below the suicide rate for the 45–59 age group. The turning point came in 2001. According to our third hypothesis, age should play a significant role in the explanation of suicides. We predict that suicidal tendencies rise in direct proportion to age and regardless of time. The effect of age on suicide is indispensable in our data and it would be a mistake not to take age into account when explaining suicides, but it does not seem that the relationship between age and suicide is positively linear in our data. The suicide rate among young people is markedly lower than among older people, but between 2000 and 2010 we find the highest suicide rate in the age group of 45–59 years.

The highest suicide rate, according to education, was, until 2003, found in the category of those who completed only primary education. After 2003, the

Figure 3. Suicide rate by age group, 1995–2010

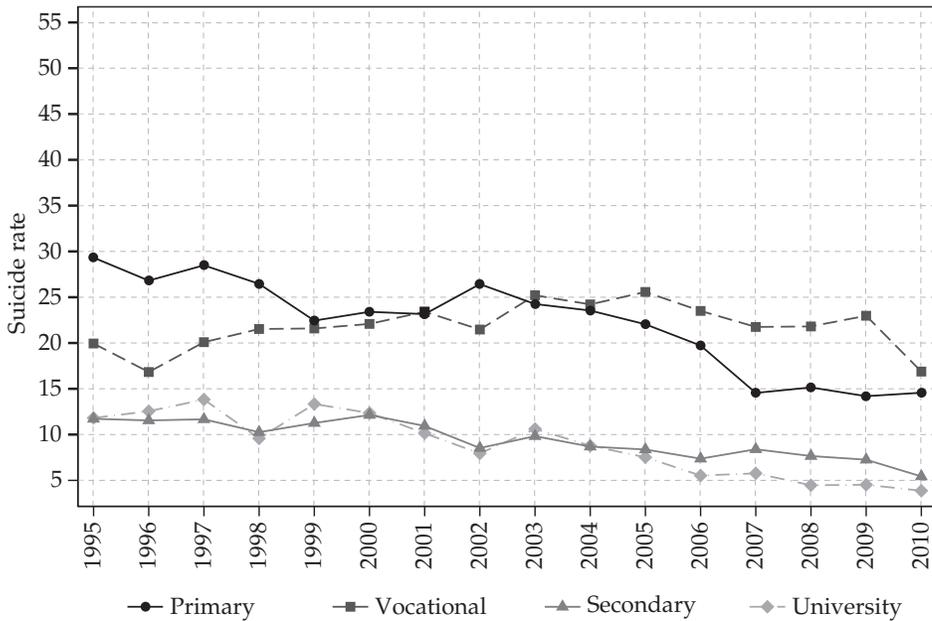


Source: IHIS CR, LFS; authors' calculations.

Note: Suicide rate shows the number of suicides committed per 100 000 people.

highest suicide rate is found among people with vocational education (Figure 4). Except for the vocationally educated, the suicide rate exhibited a decreasing tendency in all categories between 1995 and 2010. We do not consider this tendency to be a result of the increasing number of cases where education was not determined, because suicide rates decreased linearly over the whole time period, whereas the curve of unidentified cases refracted and rose sharply only in 2007 (for more on this, see the data description). Compared to people without a secondary school diploma, people with high school diploma and university-level education showed markedly lower suicide rates over the entire time period. Our fourth hypothesis predicts that people with the lowest education (primary) have the highest chances of committing suicide. The suicidal tendencies of people with higher education weakened over the whole time period between 1995 and 2010. Even though the curves in Figure 4 do not indicate this indirect relationship, we still conclude that education was a factor in the suicide rates in Czech society during the period observed. The most important distinction here seems to be between those who do and those who do not have a secondary school diploma,

Figure 4. Suicide rate by education level, 1995–2010



Source: IHIS CR, LFS; authors' calculations.

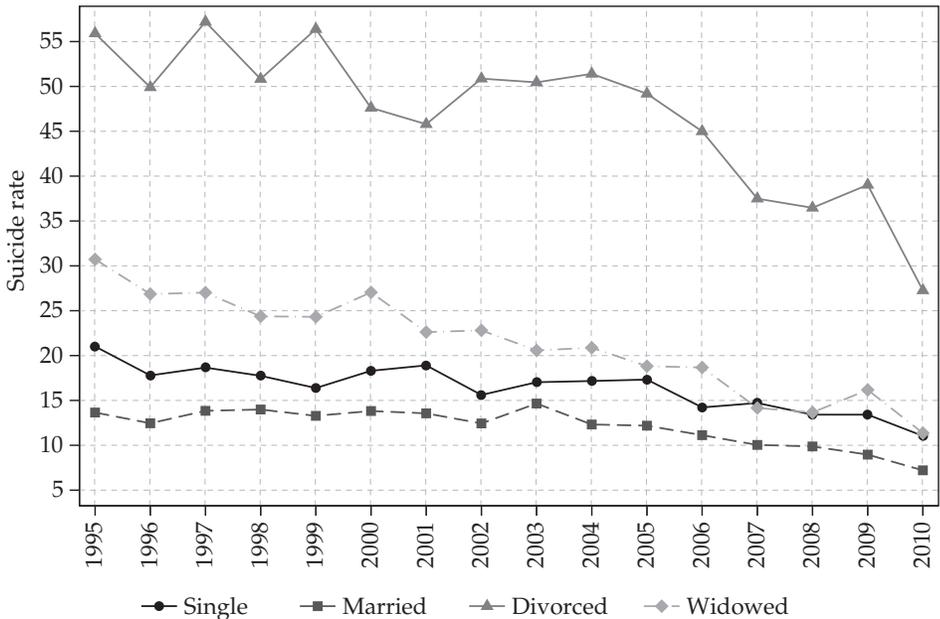
Note: Suicide rate shows the number of suicides committed per 100 000 people.

which markedly weakens suicidal tendencies in this group compared to people with lower levels of education.

Our data show significant variations in suicide rates according to marital status (Figure 5). The lowest suicide rate is found among married people. After the year 2000, the suicide rate decreased in every marital status category. According to our fifth hypothesis, marriage weakens suicidal tendencies. This conclusion is valid in our data for the whole time period observed. Moreover, it is also valid that other categories of marital status differentiate suicide rates: we find a lower suicide rate among unmarried than among widowed people, and by far the highest suicide rate is found among people who are divorced.

To summarise the descriptive analysis, all the explanatory variables differentiate the suicide rate in our data. Therefore, they are all relevant variables for an analysis of suicides in Czech society. The analysis below focuses on what the real effects of these variables are and how these effects have changed over the years under investigation (1995–2010). It is only with the help of this analysis that we can control the effects of all the variables explaining suicides against each other, indicate their changes over time, and test our hypotheses.

Figure 5. Suicide rate by marital status, 1995–2010



Source: IHIS CR, LFS; authors' calculations.

Note: Suicide rate shows the number of suicides committed per 100 000 people.

Multivariate analysis of the social determinants of suicide

Suicide is the dependent variable. It is a categorical variable of two values, 0 and 1. The value 0 means that suicide did not occur, 1 means that suicide occurred. We use binary logistic regression to explain this variable. This statistical technique identifies the effects of the independent variables on the dependent variable. The analysis is divided into three steps that result in three estimated logit models.

In the first step, we focused on the question whether the effect of time on suicide is categorical or linear, and to determine this we estimated two basic logit models that included all the explanatory variables (year, sex, age, education, and marital status). In the first model time was represented as a categorical variable, while in the second it was represented as an interval variable. Comparative statistical tests of these two models showed that the model with the interval variable much more accurately described the data in the analysis.¹⁰ Table 1 shows the statistical coefficients of this first model.

¹⁰ The difference in the BIC criterion among the two models was -103.4 in favour of the

In the second step, our goal was to find out whether the effect of variables explaining suicides changed over time (between 1995 and 2010), and if so, then how. Therefore, we added interactions between all the explanatory variables and time (years) to logit model 1. For the second to fifth hypotheses we predicted that the ratios between the effects of all the explanatory variables would not change over time, and therefore that these interactions should not be statistically significant. The interactions between sex and time and also between marital status and time were not statistically significant, a finding consistent with our hypotheses. However, the other interactions, between age and time and between education and time were statistically significant. We therefore estimated the model again, but without the two interactions that were not statistically significant, and with only the interactions that were statistically significant. The statistical coefficients of Model 2 are shown in Table 1.

In the third step, we focused on the differences in the effect of sex on suicide according to marital status. Our sixth hypothesis predicted that this effect would differ for men and women in relation to marital status. We therefore estimated a model that is identical to Model 2, but in addition it includes the interaction between sex and marital status. The statistical coefficients of this Model 3 are also shown in Table 1.¹¹

Model 1 is the most parsimonious and model 3 is the most accurate. Comparing their BIC criteria shows that model 3 provides the most information about the phenomenon of suicide (the BIC value is the lowest in this model). According to 'traditional' inference statistics, this model also most accurately reproduces the data. We therefore interpret our data following Model 3. Compared to Model 1, Model 3 includes selected interactions between explanatory variables and time. The intensity of the effects of these explanatory variables changed over time. This means that, over the observed period, the structure of selected variables explaining suicide changed. We therefore do not accept the general prediction about the parallel development of the effects of all the explanatory variables, which is included in hypotheses 2 to 5. Compared to Model 2, Model 3 predicts that the effect of sex on suicide is influenced by marital status. This means that when speaking of the effect of sex on suicide, it is necessary to take marital status into account.

In our first hypothesis we predicted that the effect of time on suicide would be negative. The coefficient by time shows the probability of committing suicide in time.¹² This is specifically for unmarried men aged 15 to 29 years with primary

parsimonious model, that is, the second model. Comparing the L^2 and pseudo- R^2 produced the same conclusion.

¹¹ The main effects of individual variables almost did not change with the addition of the interactions, which is a sign of their robustness.

¹² With respect to interpretation, the key figures in a logit model are regression coefficients (b), and their exponents (e^b). Regression coefficients can take any negative or positive value; the higher the positive value of a regression coefficient, the stronger the

education (the reference category for the particular explanatory variables). Between 1995 and 2010, the probability decreased 0.96 times (by four percent) every year. Over the fifteen-year period (2010–1995) the chances of suicide among this group of men therefore decreased by 14% (calculated as: $\exp[-0.04] \times 15$).

Model 3 does not include the interaction between sex and time, so the decrease in the chances of suicide are the same for women. However, compared to men, women have a markedly lower probability of suicide (0.21 times). In our second hypothesis we predicted this differentiation by sex. We therefore accept the second hypothesis and conclude: Women have significantly lower chances of committing suicide than men in Czech society. And because the chances of suicide among men and women decreased during the observed time period with the same intensity, the ratio of the probability between men and women did not change.

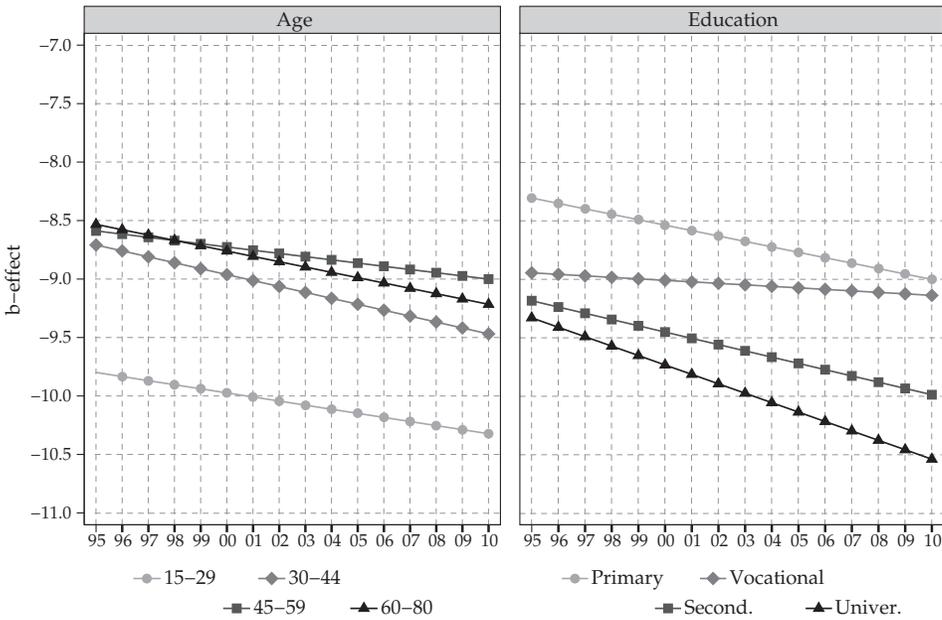
The third prediction is that the chances of suicide should increase in direct proportion to age over the whole time period (Hypothesis 3). The main effects associated with age suggest this expectation is correct. The older the age group, the higher chances of suicide (3.02 times for the 30–44 age group, 3.33 times for the 45–59 age group, and 3.58 times for the 60–80 age group, compared to those aged 15–29 years). However, between 1995 and 2010 there was a change in the size of these effects. While the interaction coefficients for the 30–44 and 60–80 age groups are negative, the interaction coefficient for those of middle age (45–59 years) is positive. Therefore, over the observed time the structure of the chances of suicide changed with respect to age. This is illustrated in Figure 6. The left panel of the graph (age) shows the model's prediction of the development of the regression coefficients b for each age group (the lower the negative number, the lower the effect of the age group on suicide). With the exception of middle age (45–59 years), the age group effects decreased with almost the same intensity. The turning point was around the year 2000, when the middle-age effect started to dominate over the effect of the oldest age group (60–80 years). By 2010, this change was prominent: the linear relationship between age and suicide ceased to be valid. Middle age as a stage in life had become a stronger social determinant of suicidal behaviour than the stage of retirement. We reject our third hypothesis about the positive relationship between age and suicide.

positive relationship between the independent and dependent variables (0 indicates the non-existence of a relationship; a negative value refers to a negative relationship). The exponents of regression coefficients take only positive values. We interpret them as odds ratios (OR). In this case, a value of 1 means, the chances for a change in the dependent variable do not change. Values higher than 1 for the independent variable show an increase in the chances for a change in the dependent variable, and values lower than 1 in the independent variable show a decrease in the chances for a change in the dependent variable (for more on logistic regression, cf. Long [1997]; Powers and Xie [2000]; Hosmer and Lemeshow 2001; Long and Freese [2006]; Mitchel [2012]).

Table 1. Estimated coefficients of the binary logistic regression model for data on suicides committed between 1995 and 2010 in the Czech Republic—first part

Explanatory variables	Categories	Model 1				Model 2				Model 3			
		b	z	P>z	e ^b	b	z	P>z	e ^b	b	z	P>z	e ^b
Year	1995–2010	-0.03	-22.72	0.00	0.97	-0.04	-11.1	0.00	0.96	-0.04	-11.03	0.00	0.96
Sex	man	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	woman	-1.70	-91.47	0.00	0.18	-1.70	-91.25	0.00	0.18	-1.58	-38.30	0.00	0.21
Age	15–29 years	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	30–44 years	0.98	36.03	0.00	2.67	1.10	23.67	0.00	3.01	1.11	23.71	0.00	3.02
	45–59 years	1.27	43.67	0.00	3.56	1.20	26.32	0.00	3.32	1.20	26.36	0.00	3.33
	60–80 years	1.19	38.52	0.00	3.29	1.27	27.09	0.00	3.55	1.28	27.29	0.00	3.58
Education	primary	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	vocational	-0.41	-22.92	0.00	0.66	-0.68	-20.68	0.00	0.51	-0.67	-20.55	0.00	0.51
	secondary	-0.95	-44.24	0.00	0.39	-0.87	-21.6	0.00	0.42	-0.87	-21.57	0.00	0.42
	university	-1.29	-38.56	0.00	0.28	-1.00	-16.24	0.00	0.37	-0.99	-16.10	0.00	0.37
Marital status	single	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	married	-0.83	-35.21	0.00	0.44	-0.83	-35.2	0.00	0.43	-0.86	-34.95	0.00	0.43
	divorced	0.62	23.97	0.00	1.86	0.61	23.41	0.00	1.84	0.67	24.96	0.00	1.95
	widowed	0.04	1.06	0.29	1.04	0.03	0.85	0.40	1.03	0.14	3.57	0.00	1.15
Year*Age	30–44 years					-0.02	-3.32	0.00	0.98	-0.02	-3.24	0.00	0.98
	45–59 years					0.01	1.59	0.11	1.01	0.01	1.90	0.06	1.01
	60–80 years					-0.01	-2.26	0.02	0.99	-0.01	-2.27	0.02	0.99

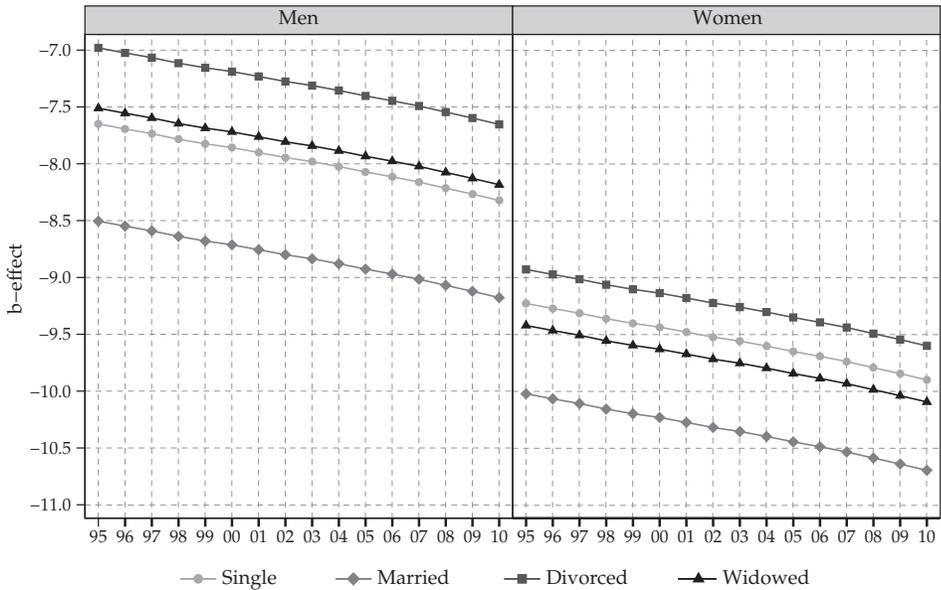
Figure 6. Trends in b-effects of age and education on suicide, 1995–2010 (model predictions)



Source: IHIS CR, LFS; authors' calculations.

According to the fourth prediction, the highest chances of committing suicide should have been found among people with a primary level of education (Hypothesis 4). This category serves as a reference in the model. All the others have a negative value of the estimated main effect, which is lower in each subsequent category. The chances of committing suicide were 49% (0.51 times) lower for people with vocational education, 58 % (0.42 times) lower for secondary-school graduates, and 63% (0.37 times) lower for university graduates than for people with primary education. Nevertheless, this relationship weakened over time. The interaction effect was positive for people with a vocational education, whereas it was negative for secondary-school and university graduates. The right panel in Figure 6 (education) shows the development of the regression coefficients *b* for each educational group (model prediction). The effect of vocational education compared to the other categories weakened markedly less. In other words, the relative significance of this educational category in explaining suicide increased. Following the model's prediction, in 2010 this effect was virtually identical to that of the primary education category. People in the higher educational categories (with a secondary-school diploma or university) still had lower chances of sui-

Figure 7. Change in b-effect of marital status on suicide by sex, 1995–2010 (model predictions)



Source: IHIS CR, LFS; authors' calculations.

cide than the lower educational categories. Given the fact that the relative effect of vocational education increased at the expense of the other educational categories, we reject our fourth hypothesis of the inverse relationship between education and the chances of suicide.

Hypothesis 5 postulated that marriage weakens chances of suicide. We do not reject this prediction, because people who are unmarried, widowed, or divorced have far higher chances of committing suicide than people living in a marriage. The suicide rate for the widowed people is 15 percent higher than that of unmarried people, but the worst case here is the group of the divorced. Their chances of suicide are 95% (1.95 times) higher than those of unmarried people and as much as 362% (4.62 times, calculated as: $\exp[0.86+0.67]$) higher than people living in a marriage.

The interaction between sex and marital status tests our sixth and final hypothesis, according to which marriage and divorce do not have the same consequences for men and women with respect to their suicidal behaviour (Hypothesis 6). The chances of married women committing suicide are 6% higher (1.06 times) than those of married men; this effect is not statistically significant. The chances of divorced women committing suicide are 31% lower (0.69 times) than

those of divorced men. The chances of divorced men committing suicide are 45% higher than those of divorced women (calculated as $1/0.69$). The difference in the protective function of marriage with respect to sex is demonstrated in Figure 7. This graph shows the model's prediction of the effects of marital status for men and women, revealing that marital status conditions the chances of suicide markedly less among women than among men. At the same time, the difference between divorced and married men is large and it remained constant between 1995 and 2010. We therefore do not reject Hypothesis 6 on the different effects of marriage on suicide for men and women. Marriage protects men from suicide more than women; for men, divorce is a strongly determining factor in suicidal behaviour, compared to women.

Discussion and conclusion

In the introduction, we asked the following question: to what extent do selected social variables influence suicidal behaviour in Czech society, and how have their effects changed over time? We analysed data from 1995 to 2010 about completed suicides and we have shown that time weakens the chances of committing suicide. This decline is not unique. It was observed in the 1990s and at the beginning of the first decade of the 21st century in most Western as well as Central European countries, although suicidal chances varied markedly among these countries [cf. Chishti et al. 2003].

Individual characteristics, such as sex, age, education, and marital status influence (and therefore to some extent explain) suicidal behaviour in the Czech Republic. The least endangered by suicidal tendencies include groups such as women, younger, more educated people and those who are married. By 2010, the highest chances of suicide had been found not among the oldest age group, which was the case in 1995, but among the middle aged (45–59 years). The relative effect of middle age (compared to other age categories) has increased. Recent evidence from the United States suggests the same conclusion: there is a substantial increase in the suicide rate among middle-aged adults [Phillips et al. 2010; Baker et al. 2013]. According to experts from the CDC (Centers for Disease Control and Prevention) that analysed mortality data from the National Vital Statistics System (NVSS) from 1999–2010 in the United States, the 'annual, age adjusted suicides rate among persons aged 35–64 years increased 28.4%, from 13.7 per 100.000 population in 1999 to 17.6 in 2010' [CDC 2013: 321]. In European Union countries, a similar trend has been observed over recent years in Ireland for men and women [Corcoran and Nagar 2010] and in Finland, only for women [Voracek, Loibl and Kandrychyn 2007].

According to Durkheim [2005], the risk of suicide in modern society is highest among the oldest age groups, because social integration decreases as age increases. Becoming a widow or widower usually contributes to this situation,

because it reduces social integration. However, our analysis has shown that the oldest age groups in the Czech Republic are not the most vulnerable with respect to suicide. If we remain faithful to Durkheim's theory, we would be led to believe that the integration of Czech senior citizens has increased significantly in recent years.¹³

The relative chances of suicide have increased not only among middle-aged people (45–59 years), but also among those with vocational education. Why has this occurred? Clearly, additional research will be needed to fully understand this new phenomenon. One of the known contributing factors to rising suicide rates generally is economic downturn or economic crisis [cf. Reeves et al. 2012; Luo et al. 2012]. If we look at Czech household debt since 1997, we can see that it has risen significantly. At the end of 2007, the amount of debt Czechs owed commercial banks was fourteen times higher than in 1997 [Czech Statistical Office 2008]. The number of bankruptcies has risen along with debt levels. In 2001, 4302 cases of personal bankruptcy were filed; in 2008, there were 554 128 such cases [Executors Chamber... 2009]. It cannot be ruled out that the risk of suicide has increased among the middle aged and those with vocational education precisely due to increasing levels of debt for many Czechs.

Besides increased chances in middle-aged adults and people with vocational training, we find extremely high chances of suicide among divorced men, while the lowest chances have been observed among people who are married. Marriage as a shield against suicide works especially among men (its protective function is not so distinct among women). Compared to women, divorce is a strong determining factor in men's suicidal behaviour.

All of our findings show that suicide is not distributed evenly across the Czech population, that is, independent of people's social characteristics. Suicide was socially contingent in Durkheim's times, and it is contingent today as well. But our analysis has shown that the structure of the explanatory variables (i.e. social contingency) in suicidal behaviour has changed over time. In particular, the rise of the effect of middle age remains a relevant topic for future sociological research.

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¹³ For more on this question, cf. *Czech Elderly in International Comparison* [Czech Statistical Office 2012a] or Vidovičová and Kafková [2012].

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Appendix

The number of suicides committed and the size of the exposed population in the years 1995 and 2010, sorted by individual explanatory variables from the dataset

		1995			2010		
		Suicide			Suicide		
		yes	no	Total	yes	no	Total
Sex	man	1 198 <i>0.03%</i>	3 962 606 <i>99.97%</i>	3 963 804 <i>100%</i>	771 <i>0.02%</i>	4 287 362 <i>99.98%</i>	4 288 133 <i>100%</i>
	woman	385 <i>0.01%</i>	4 216 228 <i>99.99%</i>	4 216 613 <i>100%</i>	157 <i>0.00%</i>	4 417 366 <i>100.00%</i>	4 417 523 <i>100%</i>
Age	15–29 years	284 <i>0.01%</i>	2 378 996 <i>99.99%</i>	2 379 280 <i>100%</i>	130 <i>0.01%</i>	2 024 025 <i>99.99%</i>	2 024 155 <i>100%</i>
	30–44 years	445 <i>0.02%</i>	2 174 343 <i>99.98%</i>	2 174 788 <i>100%</i>	233 <i>0.01%</i>	2 481 985 <i>99.99%</i>	2 482 218 <i>100%</i>
	45–59 years	457 <i>0.02%</i>	1 978 891 <i>99.98%</i>	1 979 348 <i>100%</i>	332 <i>0.02%</i>	2 125 158 <i>99.98%</i>	2 125 490 <i>100%</i>
	60–80 years	397 <i>0.02%</i>	1 646 604 <i>99.98%</i>	1 647 001 <i>100%</i>	233 <i>0.01%</i>	2 073 560 <i>99.99%</i>	2 073 793 <i>100%</i>
Education	primary	597 <i>0.03%</i>	2 035 189 <i>99.97%</i>	2 035 786 <i>100%</i>	193 <i>0.01%</i>	1 323 989 <i>99.99%</i>	1 324 182 <i>100%</i>
	vocational	643 <i>0.02%</i>	3 223 320 <i>99.98%</i>	3 223 963 <i>100%</i>	521 <i>0.02%</i>	3 085 560 <i>99.98%</i>	3 086 081 <i>100%</i>
	secondary	265 <i>0.01%</i>	2 260 364 <i>99.99%</i>	2 260 629 <i>100%</i>	166 <i>0.01%</i>	3 054 208 <i>99.99%</i>	3 054 374 <i>100%</i>
	university	78 <i>0.01%</i>	659 961 <i>99.99%</i>	660 039 <i>100%</i>	48 <i>0.00%</i>	1 240 971 <i>100.00%</i>	1 241 019 <i>100%</i>
Marital status	single	390 <i>0.02%</i>	1 855 055 <i>99.98%</i>	1 855 445 <i>100%</i>	283 <i>0.01%</i>	2 561 059 <i>99.99%</i>	2 561 342 <i>100%</i>
	married	707 <i>0.01%</i>	5 176 462 <i>99.99%</i>	5 177 169 <i>100%</i>	337 <i>0.01%</i>	4 670 692 <i>99.99%</i>	4 671 029 <i>100%</i>
	divorced	296 <i>0.06%</i>	529 116 <i>99.94%</i>	529 412 <i>100%</i>	241 <i>0.03%</i>	883 534 <i>99.97%</i>	883 775 <i>100%</i>
	widowed	190 <i>0.03%</i>	618 201 <i>99.97%</i>	618 391 <i>100%</i>	67 <i>0.01%</i>	589 443 <i>99.99%</i>	589 510 <i>100%</i>
Total	1 583 <i>0.02%</i>	8 178 834 <i>99.98%</i>	8 180 417 <i>100%</i>	928 <i>0.01%</i>	8 704 728 <i>99.99%</i>	8 705 656 <i>100%</i>	