

# THE IMPACT OF TEMPORARY CONTRACTS ON SUICIDE RATES

*Ricard Grèbol Jiménez*

*Advisor: Judit Vall Castelló*

University of Barcelona  
Department of Economics

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## **Abstract**

Temporary contracts have a negative long-term impact on labour outcomes of low-skilled workers. Moreover, temporary contracts can present side effect on health outcomes. Using a restricted version of the Spanish Death Records, I estimate the impact of a liberalisation in the regulation of fixed-term contracts in 1984 on suicide rates. I exploit this natural experiment from a reform implemented in Spain using a cohort regression discontinuity design. I document a large long-term impact on suicides for high school first-level graduates, increasing the suicide mortality rates of the cohorts entering the labour market just after the reform by 26.6%. My results show the importance of identifying the contributing factors to suicide risk of vulnerable populations and have important policy implications for suicide prevention.

**JEL classification:** I12, I18, J41.

**Keywords:** Suicide rates; Job insecurity; Fixed-term contracts

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# 1. Introduction

Suicide is a global phenomenon and the leading external cause of death in high-income countries (OECD, 2018). While the association between unemployment and suicide has been widely studied (Andres, 2005; Andrés and Halicioglu, 2010; Andrés et al., 2011; Cylus et al., 2014; Noh, 2009; Kposowa, 2001), the role of employment protection legislation (EPL)<sup>1</sup> on suicidal behaviour is so far an open question. Addressing this issue is of particular importance for typical high EPL European countries due to their high age-adjusted suicide rates compared to other Regions (WHO, 2019).<sup>2</sup>

A limitation of existing literature is that it uses a dichotomous analysis of unemployment not reflecting the dynamics of employment instability. This type of analysis does not deal with the complexity of the dynamic of employment conditions and only identifies part of the employment instability affecting suicidal behaviour. Job insecurity cannot be limited to the unemployment condition and has to be considered as a many-sided notion that includes the quality of employment, economic conditions, type of contracts, job sector, among others concepts. Caroli and Godard (2016) propose an instrumentation of perceived job insecurity by the stringency of the EPL and find that unstable employment has a negative impact on several health outcomes. Evaluating the impact of EPL on mental health outcomes and suicide rates is a present-day policy-relevant issue because of the seriousness of this phenomenon in the working-age population and the steady increase of job insecurity perception in high-income countries (Burgard et al., 2009).

Throughout the last decades, many European countries have implemented downsizing reforms in their EPL systems, promoting flexibilisation of the labour market through fixed-term contracts. As a consequence of such reforms, labour market segmentation has arisen, whereby some workers enjoy lower employment stability, lack of career development, and low rates of upgrading from temporary contracts to permanent ones (Blanchard and Landier, 2002), while others enjoy high protection and stability. Empirical evidence on the impact of fixed-term contracts or temporary employment on labour market outcomes is mixed. Previous research findings suggest a positive short-run effect but a negative long-run impact of the number of days worked and earnings of low-skilled workers. For Spain, García-Pérez et al. (2019) find that the liberalization of fixed-term contracts increases suddenly the overall

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<sup>1</sup>The Employment Protection Legislation (EPL) refers to the set of regulations limiting the accessibility of firms to hire and fire employees. For instance, this master thesis focuses on the change on use conditions of fixed-term contracts.

<sup>2</sup>European Region has the second-highest age-standardized suicide rates across WHO regions (12.9 per 100.000 individuals) and the undoubtedly highest one for males (21.2 per 100.000 individuals).

number of temporary contracts. Consequently, the yearly earnings losses for low skill workers entering the labour market just after the full implementation of the liberalisation reform amount to 7.3% in the long run, compared to workers entering the labour market before the reform.

In this master thesis, I study the long-term impact of the liberalization of fixed-term contracts on suicide mortality rates. Given the current gaps in the knowledge of working conditions impact on suicidal behaviour, the overall purpose is to assess the impact of a liberalisation in the regulation of fixed-term contracts from a high-income country on completed suicide outcomes of workers by different levels of educational attainment. Particularly, I evaluate the Spanish Labour Market Reform from 1984 which liberalised the use of fixed-term contracts. While Spain has a lower age-standardized suicide mortality rates in comparison to other high-income countries, it is an ideal candidate to evaluate the impact in the long run because of its early liberalisation of fixed-term contracts and its substantial reception (Dolado et al., 2002). Moreover, other European countries implementation of similar liberalisation labour reforms enhances the external validity and the generalizability of my findings.

To shed light on the issue, I use the restricted access version of the *Deaths statistics according to cause of death* from the Spanish Statistical Office (INE) to track cohorts of native workers before and after the reform. I differentiate between gender and educational attainment levels, especially focusing on three different levels of education levels: high school dropouts, high school first-level graduates, and high school second-level graduates. As the minimum legal age to work in Spain is 16 years, I assign the labour market entry of high school dropouts to be 16 and the graduation date for subsequent educational level attainment. I follow the suicide classification criteria by the 10th revision of the International Statistical Classification of Diseases and Related Health Problems, ICD-10 (WHO, 1992) and the population by educational attainment level from the 2011 Spanish Census to built up mortality rates.

One of the main challenges arising in suicide research is methodological issues due to the low base rate of suicide and the complexity and variety of the channels (Conwell et al., 2002). I use a quarter cohort regression discontinuity design (Borghans et al., 2014) around the cohorts entering the labour market one trimester before and after the full implementation of the reform. Limited by data availability<sup>3</sup>, I perform this analysis for reported completed suicides between 2014 and 2018, a period of economic growth in Spain. However, existing literature finds that macroeconomic economic conditions

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<sup>3</sup>INE started reporting the educational attainment level in *Deaths statistics according to cause of deaths* from 2012 onwards under restricted access conditions.

play a role in mental health outcomes and suicide rates (Brainerd, 2001; Breuer, 2015; McInerney et al., 2013). Ideally, I would like to study the impact of the EPL liberalisation reform across individuals in different age groups and educational attainment levels within distinct macroeconomic conditions to answer my research question for a wide variety of conditions.

Several identified risk factors for suicides relate to medical, psychosocial, cultural, genetic, and socioeconomic conditions (Marušič and Farmer, 2001; Mortensen et al., 2000; Phillips et al., 2002). Their significance differs by gender, and adverse labour market outcomes are associated with higher suicide risk in men (Qin et al., 2000,0). In my analysis, I find empirical evidence that low-skilled male workers who entered the labour market in the trimester just after the reform have a larger probability of committing suicide in the long run than those entering just before the reform. I estimate the long-term effect of the reform to amount to an increase in the number of high school first-level male graduates suicides by 26.6% during a period of economic recovery. I find no significant effect of the reform on women or high-school second-level graduates. These results are consistent with prior literature showing that employment instability particularly affects men's health outcomes and that the liberalisation of fixed-term contracts has no significant effect on the working conditions of higher educated workers. However, no significant effect is found neither in high-school dropouts suggesting some unspecified pathways through which fixed-term contracts may affect suicide rates.

I hypothesize that the difference in the impact of the liberalisation reform among high-school dropouts and first-level graduates is due to social priorities across both groups. Phillips and Hempstead (2017) find that relationship problems and drugs addiction are common circumstances for less-educated individuals committing suicide. Whereas, mental health issues and career problems are more prevalent among higher educated workers. This may suggest different types of mechanisms among educational attainment groups due to dissimilarities in priorities, job sectors, or location. However, because of data not reporting the cause of suicide or the job sector of deceased individuals, it is unfeasible to study the determinants in completed suicides by education attainment level in this master thesis. My findings suggest that determining these manifold contributing factors is crucial to disentangle the heterogeneity effects of the impact of the liberalisation of fixed-term contracts on suicide rates and a question of high policy relevance for suicide prevention.

Moreover, I also investigate the long-term impact on drug overdose mortality and find a significant effect of the reform for male high school first-level graduates. This further suggests that the liberalisation in the regulation of fixed-term contracts and the channels through which the reform affects

suicides have an impact as well on other health outcomes.

The key identification assumption used in this master thesis RD design is the continuity assumption around both sides of the reform cutoff point. Previous concerns on this issue for labour market outcomes were addressed using a difference-in-differences specification by García-Pérez et al. (2019). The requirement that the only change at the discontinuity impacting suicides is the studied reform is credible in this particular research as shown by the graphical analysis in Section 3. Additionally, I assess the continuity assumption through two placebo tests. The first one uses a falsification test simulating the reform implementation on an earlier period and the second uses an alternative outcome as a placebo, the External Causes of death due to Accidents.

This master thesis makes, at least, two contributions. First, despite previous literature has evaluated the role of job insecurity and EPL on self-assessed health and health disorders, as far as I am aware, this is the first contribution that can identify the causal impact of EPL and the liberalisation of fixed-term contracts on cause-specific mortality. Some of the existing literature exploring the role of temporary employment on mortality (Kivimäki et al., 2003) or the association between EPL and completed suicides (Kim and Cho, 2017) use non-experimental techniques and non-causal relationship for identification. Instead, I use a cohort RDD that exploits a large labour reform in Spain and I can identify the causal impact of the liberalisation in the regulation of fixed-term contracts on completed suicides. Moreover, most of the previous literature examines the role of unemployment on suicide rates but I estimate the impact of EPL, aiming at better capturing perceived job insecurity.

The second contribution of this master thesis is that I estimate the long-term impact of fixed-term contracts on completed suicides. While previous literature finds a negative impact of fixed-term contracts on labour market outcomes in the long run, the results in this master thesis show the first evidence of the long-term impact of fixed-term contracts on suicide rates. This is an important contribution in terms of policy implications given the recent downsizing reforms in European EPL systems and fixed-term contracts becoming widely adopted. Understanding the contributing factors to suicides is essential for suicide prevention policy and legislation, and examining long-run outcomes allows us to uncover the undocumented effects of fixed-term contracts on health outcomes.

However, this master thesis has some limitations due to data availability. First, I am not able to explore the impact of fixed-term contracts on suicides in the short-run and for different age groups. This is a relevant question to address as suicide is one of the leading causes of death among young people. Second, my estimations could only evaluate a period of economic growth whereas the impact

during an economic recession is left to be studied. An extensive literature evaluating the effects of negative macroeconomic conditions and unemployment find these periods are associated with an increase of completed suicides. Therefore, evaluating the impact of fixed-term contracts on other economic conditions is important as the effect of fixed-term contracts may depend on these conditions. Third, further research should develop heterogeneity effects of the impact of the fixed-term contracts on suicides. For instance, differences in family structures, job sectors, or locations (e.g., urban, suburban and rural areas) are likely to establish distinct suicide rate outcomes.

The rest of the master thesis is organised as follows. Section 2 outlines the characteristics of the labour reform and the suicide situation in Spain. Section 3 describes the data and the empirical methodology. Empirical results are reported and discussed in Section 4. Section 5 presents some robustness checks and extensions, and Section 6 concludes.

## **2. Temporary contracts and Suicide evolution in Spain**

### **2.1. Spanish EPL and fixed-term contracts liberalisation**

The Workers' Statute introduced in Spain in 1980 designed temporary contracts to be used only for temporary reasons such as seasonal jobs. These restrictions on temporary contracts meant that they were rarely used in the early-1980s. However, aiming job creation due to high unemployment rates, the Spanish government implemented a labour liberalisation reform in 1984<sup>4</sup>. The reform consisted of the liberalisation of temporary contracts and a reduction of dismissal costs. This meant that temporary contracts were no longer required to be only used for temporary reasons but could be signed for all activities and their duration was limited between a minimum of six months and a maximum of three years. Moreover, fixed-term contracts had low dismissal severance payments compared to permanent contracts. On one hand, firing costs at termination were 8 days per salary per year of job tenure in the case of temporary contracts. On the other hand, permanent contracts severance payments depended on whether the cause of dismissal was considered fair or unfair<sup>5</sup>. While unfair cost firing was equal to 45 days of salary per year of job tenure with a maximum of 42 months of wages, for fair dismissals cost firings amount to 20 days with a maximum of one year's wages. As the 1984 labour reform did not

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<sup>4</sup>The reform regulating the temporary contracts was passed in August 1984 but was implemented on October 17th by the *Real Decreto 1989/1984* published in the BOE (Spanish Official State Bulletin).

<sup>5</sup>Dismissal was only considered as fair if the firm was able to argue that the employee was not capable of performing the job tasks or if it was required due to economic or technological reasons.

modify permanent contracts, incentives for firms to employ fixed-term contracts increased and there was a strong substitution of permanent by temporary workers (Aguirregabiria and Alonso-Borrego, 2014).

Temporary contracts represented a low percentage of the total number of non-agricultural private sector employees until the labour reform was passed on the last trimester of 1984 (Mateos and Sebastián, 1988). After the reform, the percentage of temporary employees over total employment increased over time, especially for young workers, and Spain reached soon the first position in the proportion of temporary contracts among OECD countries. For instance, the percentage of temporary employment in Spain was 32.2% in 2000, while the EU<sup>6</sup> average was 12.7%. Temporary employment rates are particularly high among young workers and were already around 70% in the early-1990s. Moreover, temporary contracts were widely adopted very soon after the reform, and their use heavily affected young employees.

In a recent publication, García-Pérez et al. (2019) argue that the Spanish 1984 labour reform and the liberalisation in the regulation of fixed-term contracts had a negative long-term impact on the number of days worked and earnings of low-skilled workers. They find evidence that workers entering the labour market just after the implementation of the reform had a higher chance of having a fixed-term contract than workers entering the labour market a trimester before, and this enhanced a vicious chaining cycle of temporary jobs without upgrading to a permanent one. While the impact was larger in the first 10 years of these workers' careers, the yearly earning losses after 27 years on low-skilled workers still amount to 7.3% due to the liberalisation of fixed-term contracts. While fixed-term contracts enhanced low-skilled young workers to land a first job, it worsened their career paths. The negative long-term effects of the liberalisation of fixed-term contracts are not limited to labour outcomes but other negative side effects, such as an impact on suicide rates of low-skilled workers, occur.

Therefore, to estimate these long-term effects I use a RDD strategy comparing individuals who reach the labour market entry age of 16, or in their graduation date if required, before and after the reform. This empirical strategy allows me to evaluate the long-term impact of the Spanish 1984 labour reform on completed suicides for different educational attainment level groups. This master thesis aims to understand whether entering the labour market under different situations (wide availability or

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<sup>6</sup>OECD data statistics reports the European Union consisting of the 28 member states, including the United Kingdom and states joining after the reported data.



not of temporary contracts) increases long-term vulnerability to suicidal behaviour.

## 2.2. Suicide in Spain

Premature death from suicide in Spain is the current leading external cause of death and responsible for more than twice the traffic accidents deaths. According to OECD latest statistics from 2017, Spain has a yearly suicide rate of 7.0 suicides per 100.000 persons. However, considerable gender differences are common in suicides, and suicides rates in Spain reach 10.9 suicides per 100.000 men while falling to 3.6 for women. Suicide rates differ considerably across developed countries and Spain has a relatively low number of suicides compared to other OECD countries. For instance, the United States has a yearly suicide rate of 14.0 suicides per 100.000 persons, France has a suicide rate of 12.3, and Belgium of 15.9 suicides per 100.000 persons.

During the last decades, the Spanish deaths due to other external causes such as drug consumption or traffic accidents have been successfully prevented through several campaigns<sup>7</sup>. However, Spain has experienced a gradual, but steady, increase in suicides over the years, given the lack of an effective suicide strategy plan<sup>8</sup>. As we can see in Figure 1, suicides are the current leading external cause of death and of particular concern for men, whereas traffic accidents have undergone a substantial and constant decrease over the years.

On the other hand, global effort to address suicide has surged in recent years. In 2014, the WHO published a suicide prevention report: *Preventing suicide: a global imperative* (WHO, 2014), making a call to action for countries to adopt national suicide prevention strategies and suggesting the need for a multisectoral approach in health promotion. Steps for developing suicide prevention strategies have followed and around 40 countries have developed or revised their national strategy<sup>9</sup>. It seems clear that the implementation of suicide prevention through action plans and defined national strategies is necessary to cope with a long-term neglected important health issue. Moreover, these prevention strategies have been recommended to focus on the population as a whole and vulnerable persons in particular. Therefore, understanding the mechanisms impacting on the vulnerability to suicidal

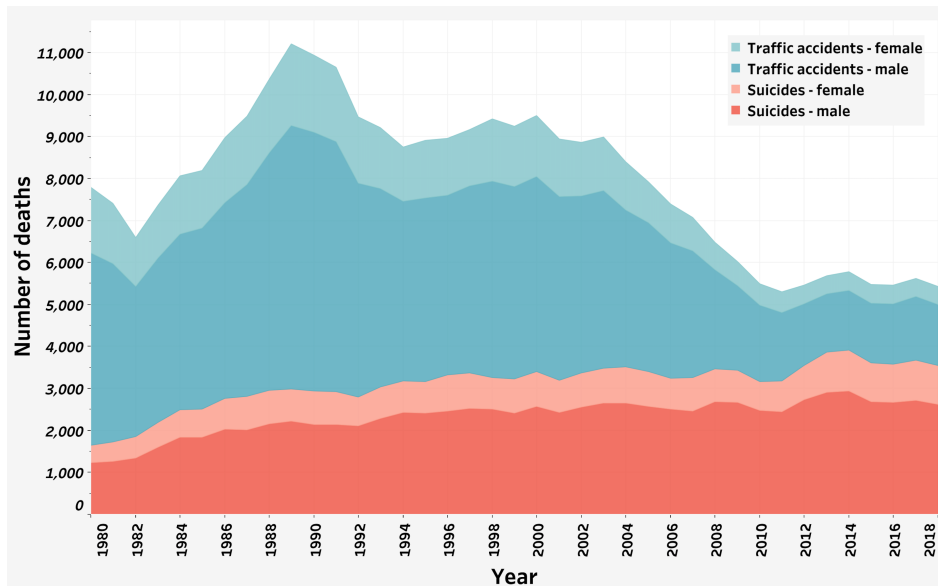
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<sup>7</sup>Spanish government implemented national strategic plans to deal with traffic accidents in 1980 (Plan Nacional de Seguridad Vial) and drug consumption in 1985 (Plan Nacional sobre Drogas).

<sup>8</sup>Spain has historically integrated suicide prevention into their national mental health plan (Estrategia en Salud Mental del Sistema Nacional de Salud). In recent years, suicide prevention has been considered by healthcare professionals and policy-makers as a main priority to deal with in following mental health strategic plans.

<sup>9</sup>For further information on suicide prevention strategic plans, a report aiming to support countries in continuing the progress in preventing suicide and to encourage establishing or revising national suicide prevention strategies was published by WHO in 2018: *National suicide prevention strategies: Progress, examples and indicators*(WHO, 2018).

Figure 1: *Evolution of deaths due to suicide and traffic accident by sex (1980-2018)*



Source: Death statistics according to cause of death from the Spanish Statistical Office (INE).

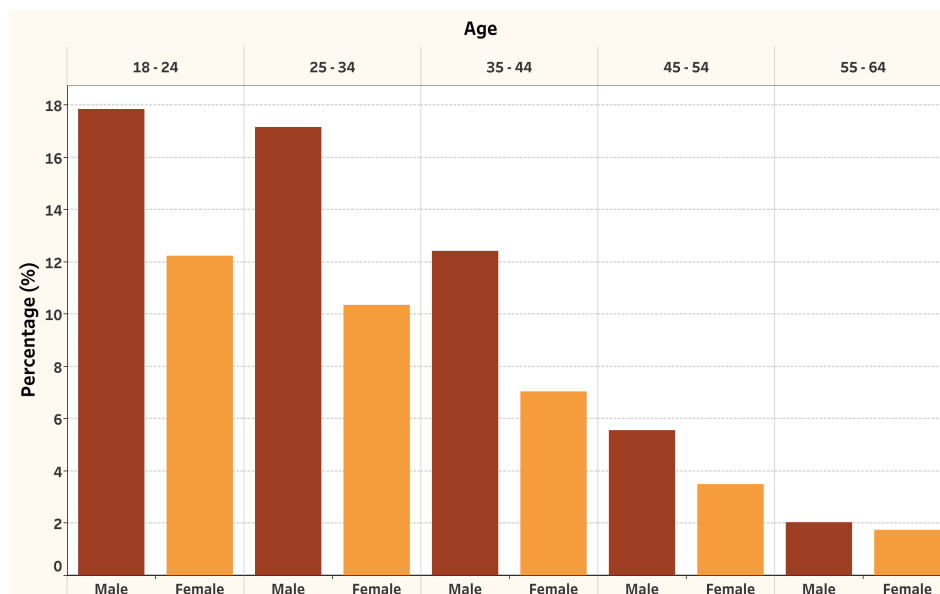
behaviour as the aim of this master thesis will help to boost the effectiveness of prevention policies and action plans taken in place.

Turning to Spain, although Spanish suicide rates are lower than most other developed countries, it is still an important cause of death in all age groups, and particularly concerning working-age people. Suicide rate increases with age, especially for men, and the number of completed suicides peaks for individuals 40-59 years old, age range comprising 41% of completed suicides in 2018. However, youth suicide has received plenty of worldwide attention as is one of the leading causes of death in adolescence and youth adulthood. In Spain, completed suicide is the second leading cause of death among young people but an important serious public health problem across all working-age groups as we can see in Figure 2.

Therefore, I consider that understanding and estimating the EPL impact on completed suicides is relevant for suicide prevention policies and of interest to healthcare institutions. In Spain, the National Health System is highly decentralized to the 17 Spanish Autonomous Communities<sup>10</sup>, which are in charge of the management and provision of health care. Among their functions, the regional governments are in charge of the design and implementation of health-related legislation. However,

<sup>10</sup>Autonomous Communities comprises the 17 administrative units corresponding to the NUTS 3 statistical regions in Spain. The management and provision of health care of the two Autonomous Cities, Ceuta and Melilla, are in charge of the Spanish government.

Figure 2: *Percentage of Suicide on total deaths by age intervals and sex in 2018*



Source: Death statistics according to cause of death from the Spanish Statistical Office (INE).

the Spanish Ministry of Health is responsible for the coordination of national plans, and therefore the development of effective prevention strategy plans will require a multi-actor collaboration at different administrative levels.

### 3. Data and Empirical Strategy

#### 3.1. Data

I use the Death Registers conducted by the Spanish National Institute of Statistics (INE). Under an agreement with the INE, I was granted access to the restricted licence version of the *Death Statistics according to Cause of Deaths* which contains individual death data by the cause of death. This dataset registers all deaths occurred in Spain and, from 2012 onwards, includes individuals educational level attainment. I use data from all available years, 2012 to 2018, and differentiate between two periods depending on macroeconomic conditions<sup>11</sup>. For each death, the dataset contains personal information on the date of death, the country of birth, gender, year and month of birth, the Spanish Autonomous Community of birth and death, educational level attainment and the cause of death. In my sample,

<sup>11</sup>According to the *Encuesta Población Activa (EPA)*, the Spanish Labour Market started registering an increase of employed individuals from the first quarter of 2014 onwards, after six years of decreasing absolute numbers.

I select the cohorts born between 1964 and 1972 so individuals are aged 41-54 during 2012-2018. I exclude foreign-born from the data and, therefore, restrict the analysis to the Spanish native sample.

The information available on the cause of death follows the classification criteria by the 10th revision of the International Statistical Classification of Diseases and Related Health Problems, ICD-10 (WHO, 1992). Moreover, INE provides a reduced list of groups of cause (CIE-10) aggregating by ICD-10 subdivisions. For instance, in this master thesis, I use codes related to the external causes of death (90 to 102) of the INE reduced list CIE-10<sup>12</sup>.

In order to obtain the mortality rates by educational level attainment groups, I combine the deaths dataset with the 2011 Census<sup>13</sup>. I assume the 1st January 2012 population to be similar to the reported in the 2011 Census. For each subsequent year, I extract the number of deaths that occurred during the year to the previous year population by education, gender and quarterly cohort group. Then, I match the obtained populations to the corresponding deaths and calculate the quarterly cohorts mortality rates per 100.000 individuals.

The reform was fully implemented by October 1984 and the quarterly cohorts selected for my analysis depend on the individual educational level attainment and the corresponding age of labour market entry. In the case of high-school dropouts, an entry-age of 16 is considered, as the minimum working age in Spain is set at 16-years-old. However, first-level high school graduates and second-level high school graduates<sup>14</sup> entering the labour market the last trimester of 1984, must have graduated in the summer of 1984. Hence, the first trimester cohorts graduating in 1984 are considered as the entry-age to the labour market for these specific education groups. For instance, the cohort born in the first trimester of 1968 is the first cohort affected by the 1984 reform in the case of first-level high school graduates. In contrast, for second-level high school graduates, the first cohort affected is the cohort born in the first trimester of 1966.

Therefore, I have a total of 53,730 deaths recorded in the sample, 36,438 native males and 17,292 native females, who entered the labour market within four years before or after the 1984 reform could affect them. Of these recorded deaths, 33,017 individuals were born before they could be affected by the reform whereas 20,713 individuals after. A further description of the number of deaths by sex,

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<sup>12</sup>Specifically, code 98 is used for Suicides (classified as X60-X84 in ICD-10), 95 for Drugs Abuse (classified as X41, X42, X44 and X45 in ICD-10) and 92, 93 and 97 are jointly used as a placebo test incorporating external deaths causes attributed to *accidental reasons*

<sup>13</sup>The reference date of the Population Census is the 1st November 2011.

<sup>14</sup>On one hand, for first-level high school graduates are those who graduated from compulsory high school (currently *ESO* in Spain). On the other hand, second-level high school graduates correspond to college-preparatory high school or basic Vocational and Technical Schools (*Bachillerato* and *CFGM*, respectively).

educational attainment level and the causes of deaths can be found in Table 1.

Table 1: *Sample summary*

	High-school dropouts		High-school 1st level grad		High-school 2nd level grad	
	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)
Total deaths	7,934	3,474	17,324	7,571	11,180	6,247
Due to External causes	1,209	254	2,794	589	1,549	466
Suicides	462	100	1,096	290	685	253
Drugs abuse	156	28	344	71	134	28
Accidental	270	65	603	80	308	75

*Source:* Death Statistics according to Cause of Deaths (INE) sample for years 2012-2018 of Spanish natives who are high school dropouts (born between 1964q4 and 1972q3), high school first-level graduates (born between 1964q1 and 1970q4) and high school second-level graduates (born between 1962q1 and 1969q4).

### 3.2. Empirical Strategy

I analyze the effect of the 1984 labour reform on the long-term suicide mortality rates outcomes. The key explanatory variable is the trimester of birth cohort, which determines if those individuals entered the labour market before or after being affected by the liberalisation of fixed-term contracts. The cutoff on the trimester of birth depends on the education group. For high school dropouts, the cutoff is set as the fourth trimester of 1968. Therefore, treated cohorts are those who turn 16 from October to December in 1984 or after, while older cohorts are left untreated as they enter the labour market before the full implementation of the reform. As for first-level high school graduates, the trimester of birth cutoff is defined as the first trimester of 1968 due to their graduation date, whereas for second-level high school graduates is set at the first trimester of 1966. I measure the reform impact by estimating the jump in the suicide mortality rates for the cutoff cohort. It must be stated that the untreated cohorts are also affected by the labour reform some quarters after entering the labour market. However, García-Pérez et al. (2019) argument that the impact on these cohorts is very small because the conditions at labour market entry are of particular relevance on long term career outcomes (Kahn, 2010; Oreopoulos et al., 2012). Moreover, they argue that there is a discontinuous jump in the availability and use of fixed-term contracts in Spain before and after the implementation of the reform.

As existing literature suggests that macroeconomic conditions have an impact on suicide risk, I restrict the analysis to an economic upswing period in Spain (2014-2018). I then collapse the individual-

level data by the trimester of birth control ( $c$ ) and the year of death ( $t$ ). I run a cohort regression discontinuity design (Lee and Lemieux, 2010), including different trends on each side of the cutoff, and add the years of death as a fixed effect to capture macro-level factors:

$$Y_{ct} = \beta_0 + \beta_1 (BirthTrim_c - C) + \beta_2 (BirthTrim_c - C) * after_c + \beta_3 after_c + \phi_t + \epsilon_{ct} \quad (1)$$

where  $C$  is the treatment cut-off set at the first cohorts affected by the reform.  $Y_{ct}$  is the cause-specific mortality rate per 100,000 individuals for each cohort and year of death. A linear cohort trend is included by subtracting the cutoff from the cohort's birth trimester ( $BirthTrim_c - C$ ). Then, I interact the trend with a dummy variable ( $after_c$ ) that captures the cohorts affected by the reform, allowing me to include a different trend only for these cohorts.  $\phi_t$  is a year of death fixed effect and  $\epsilon_{ct}$  is the error term. Standard errors are clustered by cohort.

The impact of the reform is captured by the  $after_c$  variable, a binary variable equal to 1 for cohorts born at the cutoff trimester or after, and equal to 0 for cohorts born before. Therefore, the coefficient of interest is  $\beta_3$ , which estimates the differential effect of the reform in the cause-specific mortality rates for the treated and untreated groups. Under the assumption of continuity around both sides of the reform cutoff point,  $\beta_3$  measures the long-term causal effect of the liberalisation of fixed-term contracts on cause-specific mortality rates (i.e., suicide rates). This key identification assumption was already addressed by García-Pérez et al. (2019) through a differences-in-differences approach for labour market outcomes. I further assess it through two placebo test in Section 4.

Supplementary Appendix Table A1 replicates the results using data for a late-period of economic recession in Spain from 2012 to 2013. However, I consider these estimations are inconclusive due to the limited period analysed and the low number of observations employed.

The bandwidth used for the regression discontinuity analysis is selected to include 16-trimester cohorts before and 16-trimester cohorts after the cutoff. While a larger bandwidth yields more precise estimates, since more cohorts are used, it can lead to a biased estimation of the treatment effect. Therefore, this concern is addressed by reducing the bandwidth in Table 3. The number of bins is limited by the size of the bandwidth as trimester cohorts bins are chosen for a more straightforward interpretation. As a result of the low number of cohorts (32 cohorts), I calculate the standard errors using the Wild Bootstrapping method proposed in Cameron et al. (2008) and p-values are reported in brackets.

## 4. Results

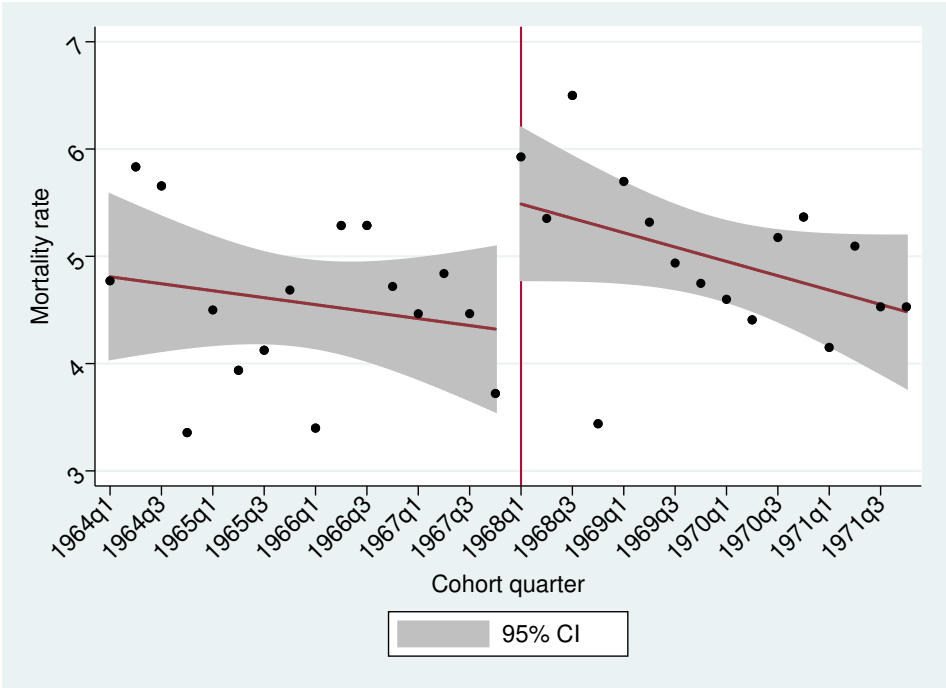
I will estimate the long-term impact of the liberalization of fixed-term contracts on suicide. Particularly, I focus on answering if the wide availability of fixed-term contracts leads to an increase in suicides mortality rates in the long run.

First, to assure that the reform increased the number of fixed-term contracts and non-permanent contracts in the long run, I rely on the estimates by García-Pérez et al. (2019). They analyse the impact of the reform on the annual number of fixed-term contracts and all non-permanents contracts held by male high-school dropouts and find a strong increase because of the introduction of a laxer fixed-term contract regulation. Specifically, they find an increase of 14.6% fixed-term contracts and 17.7% non-permanent contracts per year in the long run. They do not find any effect on high school second level graduates. Therefore, entering the labour market after the liberalisation of fixed-term contracts increased the probability of holding a fixed-term contract in the long run for low-skill workers. This large long-term effect suggests that the reform led a group of low-skilled workers on a worse career path without upgrading from temporary employment to a permanent contract. It is thus consistent with the model by Blanchard and Landier (2002). In their theoretical model, they point out that the coexistence of fixed-term and permanent contracts can offset the gains of flexibilisation. While the liberalisation and reduction on firing costs of fixed-term contracts induce firms to contract more entry-level workers, it lowers the bargaining power of temporary workers who can easily get fired. As the firing costs in permanent jobs are left unchanged, firms are less prone to upgrade temporary employees to permanent contracts. As a result, low productivity jobs are recurrently filled with fixed-term contracts. Therefore, low skilled workers entering the labour market after the fixed-term contract liberalisation are put on a worse career path compared to the prior cohorts. Next, in my empirical work, I explore the long-term side effects of the partial labour market reform on suicide rates.

To that end, I differentiate between different groups, which allows me to use the cohort regression discontinuity design of Eq.(1) to estimate the causal effect of the reform on them. To provide preliminary descriptive evidence on the effects of the reform, Figure 3 shows the evolution of the suicide mortality rates for the high school first level male graduates cohorts entering the labour market before and after (indicated with a vertical line) the liberalisation of fixed-term contracts during the analysis period 2014-2018. The figure shows quarterly suicide mortality rates expressed as deaths per 100,000 individuals and a linear fit model for each cohort type. It provides preliminary evidence that reform

has fostered an increase in the suicide mortality rate of cohorts entering the labour market after the full implementation of the fixed-term contract liberalization reform. Particularly, a significant and positive coefficient on *after* for high school first level male graduates can be appreciated by the jump in suicide mortality rates at the cutoff trimester cohort.

Figure 3: *Suicide mortality rates - Spain-born high school 1st level male grad (2014-2018)*



*Notes:* The figure shows the evolution of the quarterly suicide mortality rate as deaths per 100000 individuals during 2014-2018 for Spain-born males. The vertical line indicates the first cohort (1968q1) affected by the 1984 labour reform for high school 1st level graduates.

*Source:* Death Statistics according to Cause of Deaths and the 2011 Census from the Spanish Statistical Office (INE).

On one hand, Supplementary Appendix Figure A1 shows the same graphs for high school dropouts and high school second level graduates. However, it is not found any descriptive evidence on the effects of the reform in these education groups. On another hand, Supplementary Appendix Figure A3 provides the suicide mortality patterns for females in the three analysed educational attainment level groups and no effect of the reform is observed neither.

As mentioned, Table 2 presents the results of the estimation of suicide mortality rates for different educational level attainment and sex during Spain’s economic recovery from 2014 to 2018. First, I



estimate the specification including all individuals and controlling for *women* (columns (1), (4) and (7)). Then, I report the results separated by sex. Moreover, high school dropouts, born between the fourth trimester in 1964 and the third trimester in 1972, are reported in Columns (1) to (3). The estimations for high school first level graduates, born between the first trimester in 1964 and the fourth trimester in 1971, are reported in Columns (4) to (6). Finally, estimations for high school second level graduates, born between the first trimester in 1962 and the fourth trimester in 1969, are reported in Columns (7) to (9).

Table 2: *Suicide mortality rates (2014-2018)*

	High-school dropouts			High-school 1st level grad			High-school 2nd level grad		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)	Both (7)	Male (8)	Female (9)
<b>After</b>	-0.231 [0.76]	-0.434 [0.8]	-0.0267 [1]	0.640** [0.04]	1.214*** [<0.01]	0.0662 [0.96]	0.0337 [0.8]	0.277 [0.8]	-0.210 [0.84]
<i>Trend</i>	-0.0196 [0.68]	0.00719 [0.84]	-0.0464 [0.24]	-0.0171 [0.52]	-0.0324 [0.44]	-0.00195 [1]	0.0136 [0.8]	-0.0346 [0.56]	0.0618 [0.36]
<i>Trend × After</i>	-0.0207 [0.76]	-0.0851 [0.44]	0.0438 [0.56]	-0.0294 [0.36]	-0.0346 [0.4]	-0.0242 [0.52]	-0.0387 [0.4]	0.0197 [0.84]	-0.0972 [0.2]
<i>Women</i>	-3.330** [0.04]			-3.395** [0.04]			-2.655** [0.04]		
<i>Constant</i>	6.163*** [<0.01]	2.741* [0.08]	0.782** [0.04]	4.699*** [<0.01]	4.587*** [<0.01]	1.415*** [<0.01]	4.852*** [<0.01]	4.031*** [<0.01]	2.241*** [<0.01]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	320	160	160	320	160	160	320	160	160
$R^2$	0.316	0.245	0.0297	0.552	0.0526	0.0429	0.267	0.0381	0.0254
Pre-Reform mr	3.38	5.19	1.57	3.01	4.57	1.46	3.10	4.46	1.75

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school dropouts (born between 1964q4 and 1972q3) in Columns 1 to 3, high school first level graduates (born between 1964q1 and 1971q4) in Columns 4 to 6 and high school second level graduates (born between 1962q1 and 1969q4) in Columns 7 to 9, and population data from the Spanish Census 2011.

I find that the reform had a positive impact on the quarterly suicide mortality rates for high school first-level graduates males at conventional significance levels (column (5)). This effect corresponds to a 26.6% increase on the suicide rates in the long run by high school first level male graduates who entered the labour market after the liberalization of fixed-term contracts. The fact that the effect is driven by males is supportive of previous literature findings that employment instability particularly affects men's health outcomes. This large impact on suicides is likely because low-skilled cohorts entering the

labour market under lax fixed-term contract legislation, had worse long-term labour outcomes in the long run.

The main channel through which the suicide rates of high school first level graduates increase is by changing the nature of the first contract when entering the labour market. Existing literature highlights the strong impact of first employment on the future career. The liberalisation in the regulation of fixed-term contract affected especially the first contract of low skill young workers while the effect on higher educated workers was not as strong. Thus, I believe that this provides evidence that one of the main channels that explain the large impact on suicide rates estimates in column (5) is the change in the first type of contract when entering the labour market and the negative labour outcomes that followed in the long run.

Furthermore, the *after* coefficient is not significant for high school dropouts (columns (1) to (3)) and high school second level graduates (columns (7) to (9)). The latter is expected due to long-term labour outcomes of this education group not being particularly affected by the reform. However, high school dropouts were strongly affected by the liberalisation of fixed-term contracts, hence the lack of an impact on suicide rates may indicate different types of mechanisms among educational level attainment. A larger impact from the reform is expected on high school first level graduates as suicides due to career issues are more common for this education group than for high school dropouts according to the literature. Nevertheless, for future research, it is important to understand and disentangle the channels through which the liberalisation of fixed-term contracts affect low skilled workers and different education groups.

I also report in the Supplementary Appendix Table A1 the specifications for a late-period of economic recession in Spain from 2012 to 2013. The preliminary descriptive evidence for this period are found in Supplementary Appendix Figure A2 and Figure A4 for males and females, respectively. As mentioned, one of the main challenges arising in suicide research is the low base rate of deaths. I consider that the number of suicides observed in some education group cohorts during this limited period is too low and consequently, these estimations are inconclusive for an economic recession period.

## 5. Robustness checks and Extensions

### 5.1. Robustness tests

The particular cohort regression discontinuity design used on this master thesis can be problematic on several issues. In consequence, several robustness tests follow the main results for high school first-level male graduates to address these possible concerns. The issues I deal with are: (i) the right size of the bandwidth, (ii) the functional form, and (iii) continuity assumption at the cutoff point.

In my main results, I include 16-trimester cohorts before and 16-trimester cohorts after the full implementation of the reform. As a robustness test, I assess the risk of bias from observations far from the cutoff point by reducing the bandwidth. In this nonparametric method, I limit the analysis to a closer surrounding of the cutoff, where local linear regressions are more likely, and estimate the treatment effect as local randomization. I reduce the bandwidth to 12-trimester cohorts and 8-trimester cohorts as shown in Table 3<sup>15</sup>.

In both cases, the impact of the reform on suicide rates is positive and similar for males. On one hand, the *after* coefficient for the 12 trimesters bandwidth represents a 21.9% increase in the suicides rates (column (2)). On the other hand, the *after* coefficient for the 8 trimesters bandwidth represents a 32.5% increase in the suicides rates (column (5)). Although all estimates indicate a large impact of the liberalisation in the regulation of fixed-term contracts on the suicide rates in the long run, the stronger impact shown when the 8 trimesters bandwidth is employed reinforces the causal reasoning. While the rectangular kernel used in this master thesis RDD has a more straightforward interpretation, in the light of the results of the robustness test carried out, a triangular kernel weighting could be considered in a future revision of the methodology employed. Nevertheless, I conclude that the large impact of the liberalisation in the regulation of fixed-term contracts on suicide rates is robust to bandwidth selection.

An other concern to address is the functional form of the *trend* variable employed in the main results specifications. In my analysis, I use linear trends to estimate the local average treatment effect on suicides around the cutoff point. As a robustness test, I test different functional forms for the *trend* variable to minimize specification bias from the possibility of an incorrect linear functional form, which

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<sup>15</sup>In this master thesis, the bandwidth is chosen by examining the distribution of the suicide rate in Figure 3 and only multiple of cohort-years (8, 12 and 16 trimesters) are selected because of easy interpretation of the results. I expect that an optimal bandwidth selection of the cross-validation criterion (Imbens and Lemieux, 2008) would report similar results.

Table 3: *Reducing bandwidth - Suicide mortality rates (2014-2018)*

	12 trimestres bandwidth			8 trimestres bandwidth		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)
<b>After</b>	0.592** [0.04]	1.000* [0.08]	0.183 [0.44]	0.501 [0.24]	1.433*** [<0.01]	-0.432 [0.2]
<i>Trend</i>	0.00860 [0.84]	0.0143 [0.84]	0.00291 [0.8]	0.0466 [0.84]	-0.0408 [0.44]	0.134*** [<0.01]
<i>Trend</i> × <i>After</i>	-0.0718* [0.08]	-0.0837 [0.24]	-0.0600 [0.24]	-0.121 [0.52]	-0.0974 [0.88]	-0.146 [0.16]
<i>Women</i>	-3.408* [0.04]			-3.492** [0.04]		
<i>Constant</i>	4.917*** [<0.01]	4.164*** [<0.01]	1.541*** [<0.01]	4.984*** [<0.01]	4.625*** [<0.01]	1.851*** [<0.01]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	240	120	120	160	80	80
$R^2$	0.561	0.0789	0.0715	0.584	0.159	0.0952
Pre-Reform mr	3.11	4.56	1.66	2.98	4.41	1.55

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school first-level graduates, born between 1965q1 and 1970q4 (12 trimestres bandwidth) and between 1966q1 and 1969q4 (8 trimestres bandwidth), and population data from the Spanish Census 2011.

are reported in Table 4. Specifically, I use a parametric strategy changing the order of the polynomials to a second and third degree for trimester cohort trends. The different orders of the *trend* variable are interacted with the *after* dummy variable. Thus, the terms of the polynomial (slopes) estimated below the threshold are allowed to be different from the slopes estimated above the cutoff point.

In Table 4 is shown the high school first-level male graduates specifications using second and third degree polynomials for the trimester cohorts *trend* variable. The large impact of the liberalisation in the regulation of fixed-term contracts on male suicide rates is robust to the inclusion of higher order polynomial trends (columns (2) and (4)). Even so, the linear regression specification is selected as it reports the minimum Akaike Information Criteria (AIC) among all the estimated models<sup>16</sup>.

Finally, I also perform placebo tests in order to address concerns on the identification assumption and, hence, to check the random assignment around the threshold.

<sup>16</sup>The *cgmwildboot* Stata package does not allow to estimate the AIC. The models' corresponding AIC values were estimated without calculating the standard errors using the Wild Bootstrapping method proposed in Cameron et al. (2008) and are available upon request.

Table 4: *Polynomial trends - Suicide mortality rates (2014-2018)*

	2nd polynomial			3rd polynomial		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)
<b>After</b>	0.572 [0.28]	1.283*** [<0.01]	-0.140 [0.6]	0.941* [0.08]	2.512*** [<0.01]	-0.630 [0.32]
<i>Trend</i>	0.0803 [0.68]	0.0524 [0.84]	0.108 [0.16]	-0.133 [0.52]	-0.626** [0.04]	0.361 [0.24]
<i>Trend</i> × <i>After</i>	-0.199 [0.16]	-0.230 [0.32]	-0.168* [0.08]	-0.0470 [1]	0.215 [0.4]	-0.309 [0.44]
<i>Trend</i> <sup>2</sup>	0.00609 [0.4]	0.00530 [0.6]	0.00689 [0.2]	-0.0271 [0.4]	-0.100** [0.04]	0.0463 [0.2]
<i>Trend</i> <sup>2</sup> × <i>After</i>	-0.00160 [1]	0.00161 [0.8]	-0.00482 [0.72]	0.0411 [0.36]	0.144** [0.04]	-0.0615* [0.08]
<i>Trend</i> <sup>3</sup>				-0.00138 [0.36]	-0.00441* [0.08]	0.00164 [0.2]
<i>Trend</i> <sup>3</sup> × <i>After</i>				0.000986 [0.52]	0.00289 [0.24]	-0.000920 [0.8]
<i>Women</i>	-3.395** [0.04]			-3.395** [0.04]		
<i>Constant</i>	4.959*** [<0.01]	4.813*** [<0.01]	1.710*** [<0.01]	4.672*** [<0.01]	3.899*** [<0.01]	2.050*** [<0.01]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	320	160	160	320	160	160
<i>R</i> <sup>2</sup>	0.554	0.0564	0.0496	0.555	0.0738	0.0561
Pre-Reform mr	3.01	4.57	1.46	3.01	4.57	1.46

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school first-level graduates (born between 1964q1 and 1971q4) and population data from the Spanish Census 2011.

I simulate the implementation of the reform to take place in a pre-reform period (4 years before) in Table 5. This allows me to examine if discontinuities are present at a different unexpected point of the assignment variable. As expected the local estimates are insignificant and the placebo reform does not show an impact for the prior period analysed. While other fake thresholds can be checked, I consider this falsification test and the descriptive corroboration from Figure 3 to be evidence of the lack of discontinuities at other trimester cohorts.

Furthermore, as a second placebo test, I check if other outcomes that are unlikely related to the reform are affected at the cutoff point. I consider the External Causes of death due to Accidents is an ideal candidate for the placebo test. Specifically, the placebo outcome comprises numbers 92, 93 and

Table 5: *Falsification test: Pre-reform four years - Suicide mortality rates (2014-2018)*

	Both (1)	Male (2)	Female (3)
<b>After</b>	-0.0157 [1]	-0.216 [0.84]	0.185 [0.52]
<i>Trend</i>	0.0394 [0.2]	0.0681 [0.2]	0.0108 [0.64]
<i>trend</i> × <i>after</i>	-0.0566 [0.2]	-0.100 [0.2]	-0.0127 [0.72]
<i>Women</i>	-3.199** [0.04]		
<i>Constant</i>	4.482*** [<0.01]	5.461*** [<0.01]	1.251*** [<0.01]
Year FE	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort
Observations	320	160	160
$R^2$	0.525	0.0312	0.0729
Pre-Reform mr	2.85	4.50	1.20

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population. Placebo reform settled 4 year prior the actual reform, first cohort affected 1964q1.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school first-level graduates (born between 1960q1 and 1967q4) and population data from the Spanish Census 2011.

97 of the INE reduced list CIE-10. They consist of falls, accidental drowning and submersion, other accidental threats to breathing and other types of unclassified accidents. Table 6 reports the estimates for the placebo test on the alternative outcome. The impact of the reform on the placebo outcome is insignificant for all specifications including for high school first-level male graduates (column (5)).

These placebo tests reinforce my conclusion that the liberalisation in the regulation of fixed-term contracts had a large causal impact on the suicide rates of high school first-level male graduates in the long run.

Table 6: *Placebo test: External Causes due to Accidents mortality rates (2014-2018)*

	High-school dropouts			High-school 1st level grad			High-school 2nd level grad		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)	Both (7)	Male (8)	Female (9)
<b>After</b>	0.427 [0.32]	0.463 [0.48]	0.391 [0.64]	0.102 [0.64]	-0.0146 [1]	0.218 [0.6]	0.412 [0.2]	0.476 [0.68]	0.347 [0.16]
<i>Trend</i>	-0.0106 [0.88]	-0.0100 [0.96]	-0.0112 [0.92]	-0.0214 [0.32]	-0.0253 [0.44]	-0.0175 [0.44]	-0.00120 [0.92]	-0.00337 [1]	0.000957 [1]
<i>Trend × After</i>	0.00779 [0.96]	0.00797 [1]	0.00761 [0.92]	0.0102 [0.68]	0.00745 [0.8]	0.0130 [0.56]	-0.0594 [0.16]	-0.0752 [0.32]	-0.0435 [0.24]
<i>Women</i>	-2.144** [0.04]			-2.314** [0.04]			-1.510** [0.04]		
<i>Constant</i>	2.774*** [<0.01]	2.229*** [<0.01]	1.043** [0.04]	2.652*** [<0.01]	2.669*** [<0.01]	0.322* [0.08]	2.067*** [<0.01]	2.305*** [<0.01]	0.600*** [<0.01]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	320	160	160	320	160	160	320	160	160
$R^2$	0.159	0.0156	0.0410	0.494	0.0634	0.0346	0.276	0.0498	0.0464
Pre-Reform mr	1.88	2.93	0.83	1.64	2.89	0.38	1.34	2.15	0.54

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school dropouts (born between 1964q4 and 1972q3) in Columns 1 to 3, high school first-level graduates (born between 1964q1 and 1971q4) in Columns 4 to 6 and high school second-level graduates (born between 1962q1 and 1969q4) in Columns 7 to 9, and population data from the Spanish Census 2011.

## 5.2. Drugs Abuse mortality

While the main interest of the master thesis are suicides due to being the leading external cause of death, the reform can have a long-term effect on other cause-specific mortality rates as well. Therefore, in Table 7, I present a preliminary analysis of the mortality rates due to drug overdose as an example of the liberalisation reform having an impact through similar channels than for suicides.

Mortality rates due to drug overdose are much lower compared to suicides for the cohorts analysed by the proposed cohort regression discontinuity design. Moreover, large differences in patterns of drug use between women and men are common, and male mortality rate due to drug overdose is much higher than for women. In Spain, a national strategic plan to deal with drug consumption, *Plan Nacional sobre Drogas*, was adopted by the Spanish government in 1985. However, during the decade of the 1990s Spain register record-high drug overdose deaths because of a heroin epidemic, in which young male adults were a particularly susceptible target.

I estimate the same baseline specification than in Table 2 but changing the dependent variable to drug overdose quarterly mortality rates. Specifically, the analysed outcome consists on the code 95 of the INE reduced list CIE-10 (psychoactive substances and drug abuse), which is composed of ICD-10 following codes: X41, X42, X44, X45. Different specifications according to the educational attainment level and sex are reported as for suicides mortality rates. A further preliminary descriptive evidence can be found in the Supplementary Appendix Table A5.

Table 7: *Drugs Abuse mortality rates (2014-2018)*

	High-school dropouts			High-school 1st level grad			High-school 2nd level grad		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)	Both (7)	Male (8)	Female (9)
<b>After</b>	0.225 [0.44]	-0.0440 [1]	0.494 [0.32]	0.414* [0.08]	0.803** [0.04]	0.0254 [0.56]	0.0964 [0.6]	-0.0428 [1]	0.236 [0.32]
<i>Trend</i>	0.0411 [0.16]	0.0884 [0.16]	-0.00617 [0.52]	0.00876 [0.64]	0.00413 [0.96]	0.0134 [0.32]	0.0144 [0.64]	0.0241 [0.68]	0.00466 [0.8]
<i>Trend × After</i>	-0.0654 [0.12]	-0.137 [0.12]	0.00591 [0.88]	-0.0229 [0.24]	-0.0226 [0.6]	-0.0232 [0.32]	-0.0249 [0.6]	-0.0209 [0.76]	-0.0289 [0.36]
<i>Women</i>	-1.161** [0.04]			-1.117** [0.04]			-0.738** [0.04]		
<i>Constant</i>	1.456*** [<0.01]	1.666* [0.08]	0.0848 [0.72]	1.240*** [<0.01]	0.978*** [<0.01]	0.610*** [<0.01]	0.922** [0.04]	0.878 [0.12]	0.227 [0.28]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	320	160	160	320	160	160	320	160	160
$R^2$	0.168	0.136	0.0394	0.300	0.114	0.0660	0.139	0.0303	0.0232
Pre-Reform mr	0.80	1.42	0.18	0.70	1.10	0.30	0.52	0.87	0.18

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death Statistics according to Cause of Deaths (INE) sample of Spanish natives who are high school dropouts (born between 1964q4 and 1974q3) in Columns 1 to 3, high school first-level graduates (born between 1964q1 and 1970q4) in Columns 4 to 6 and high school second-level graduates (born between 1962q1 and 1969q4) in Columns 7 to 9, and population data from the Spanish Census 2011.

The positive and significant *after* coefficient in column (5) indicates that there is a jump around 73% of the mortality rate due to drug overdose of the high school first-level male graduates cohorts after the full implementation of the liberalization reform. This really strong impact on drug overdose deaths is potentially upwards biased and more observations would be needed for a reliable causal estimation. Nevertheless, it is an other indicator that the liberalisation in the regulation of fixed-term contracts had a negative impact on health outcomes in the long run. Thus, even if the specification estimates are less precise, it reinforces the need for future research about the role of Employment Protection



Legislation (EPL) on long-run health outcomes.

## 6. Conclusion

Suicide is a serious public health problem and one of the leading causes of death in the working-age population of developed countries. This master thesis aims to determine the long-term effect on suicide rates of entering the labour market after the full implementation of a liberalisation reform in the regulation of fixed-term contracts. As argued by Blanchard and Landier (2002), this type of partial reforms and the coexistence of fixed-term contract with permanent ones, have a negative impact on long-term labour outcomes of low skilled workers. For Spain, García-Pérez et al. (2019) find that the long-term impact of the Spanish liberalization reform in 1984 amount to a 7.3% yearly earning losses for low skilled workers. As this worse career paths due to the reform are expected to have side effects on health outcomes, this work focuses on the impact of the liberalisation in the regulation of fixed-term contracts on suicide rates.

I evaluate the impact on suicide mortality rates of the reform using a restricted licence version of the *Death Statistics according to Cause of Deaths* from the Spanish National Institute of Statistics (INE). I find that the trimester cohorts of native male high school first-level graduates who entered the labour market after the implementation of the reform had higher suicide rates in the long run compared to the cohorts that entered the labour market just before. Specifically, entering the labour market after the liberalisation in the regulation of fixed-term contracts leads to a 26.6% increase in suicide rates in the long run. The main channel of this negative long-term effect is through a larger probability of getting a first temporary contract after the reform and, hence, following a worse career path for low skilled workers.

Thus, my findings indicate that a laxer regulation of fixed-term contracts in Spain increased the long-term suicide rates for high school first-level male graduates. I also find a large impact of the reform on drug overdose mortality rates, indicating that other health outcomes might be also affected by the reform. Overall, these results suggest that sudden changes in Employment Protection Legislation (EPL) can have large long-term effects on health outcomes, and particularly on suicide rates. Reasonably, this analysis addresses a question of high policy relevance for suicide prevention.

Many questions remain open for future research. As my analysis is limited by data availability to an economic recovery period, a relevant question to address is how the impact may differ under an

economic recession period. Moreover, it is crucial to understand the conditions (e.g., family structures, job sectors or location) that strengthen the negative impact of the liberalisation reform, and for which specific education groups. This would allow policymakers and healthcare professionals to identify potential vulnerable individuals to suicidal behaviour and boost the effectiveness of prevention policies and action plans adopted.

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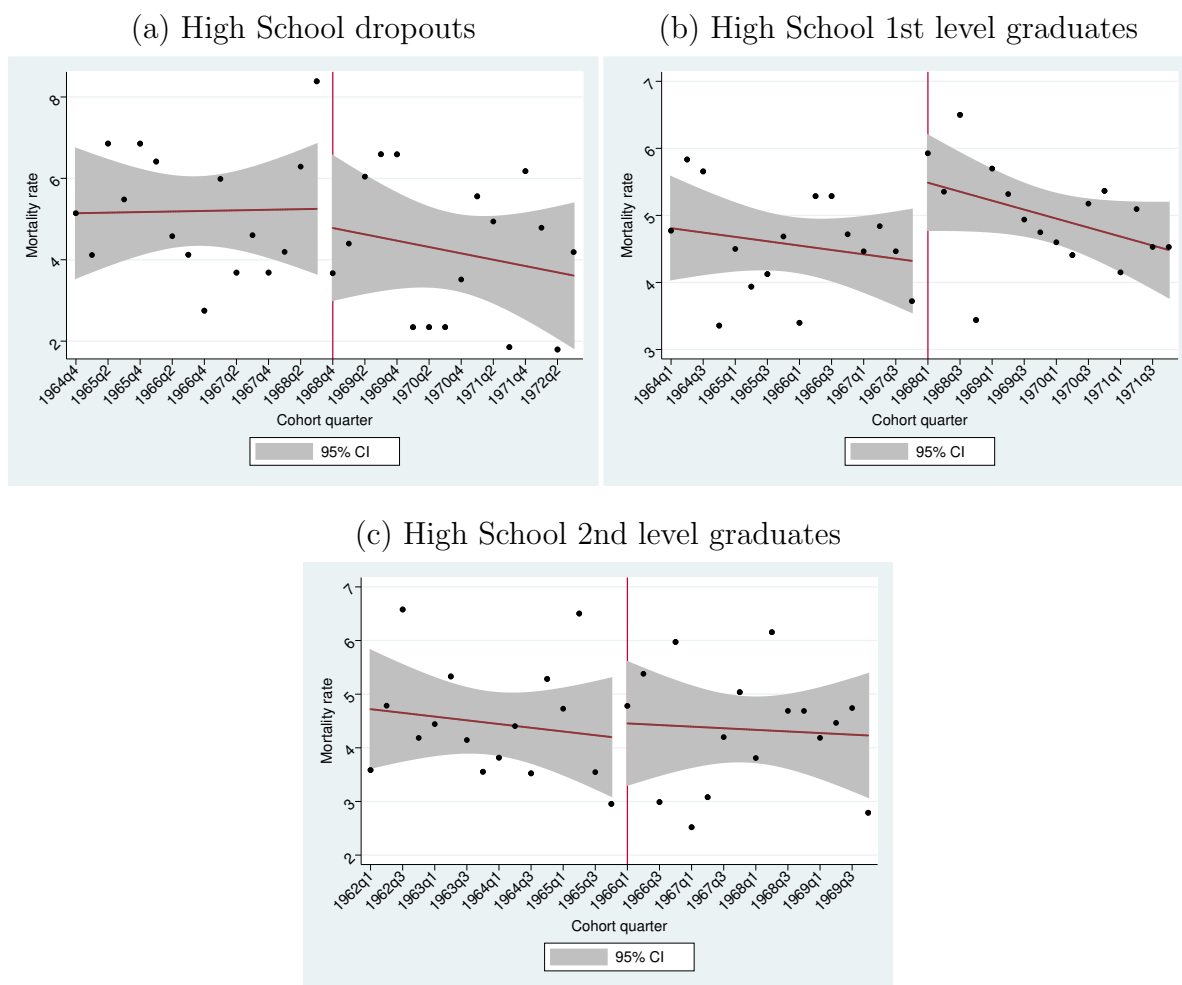
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## Appendix

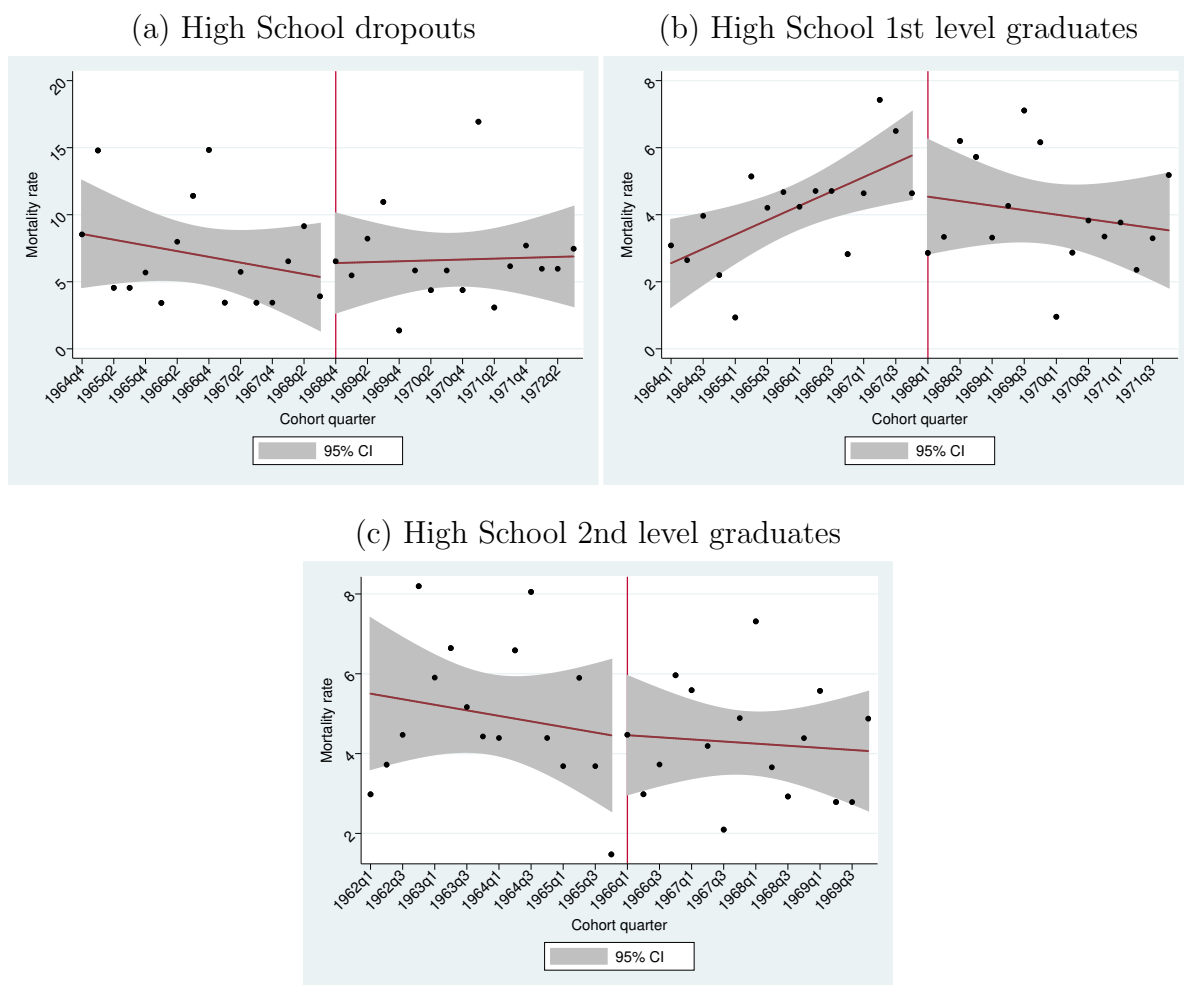
Figure A1: Evolution of Spain-born males suicide mortality rates (2014-2018)



*Notes:* The figure shows the evolution of the quarterly suicides mortality rate as deaths per 100000 individuals during 2014-2018 for Spain-born males. The vertical line indicates the first cohort affected by the labour reform for the respective education level.

*Source:* Death Statistics according to Cause of Deaths and the 2011 Census from the Spanish Statistical Office (INE).

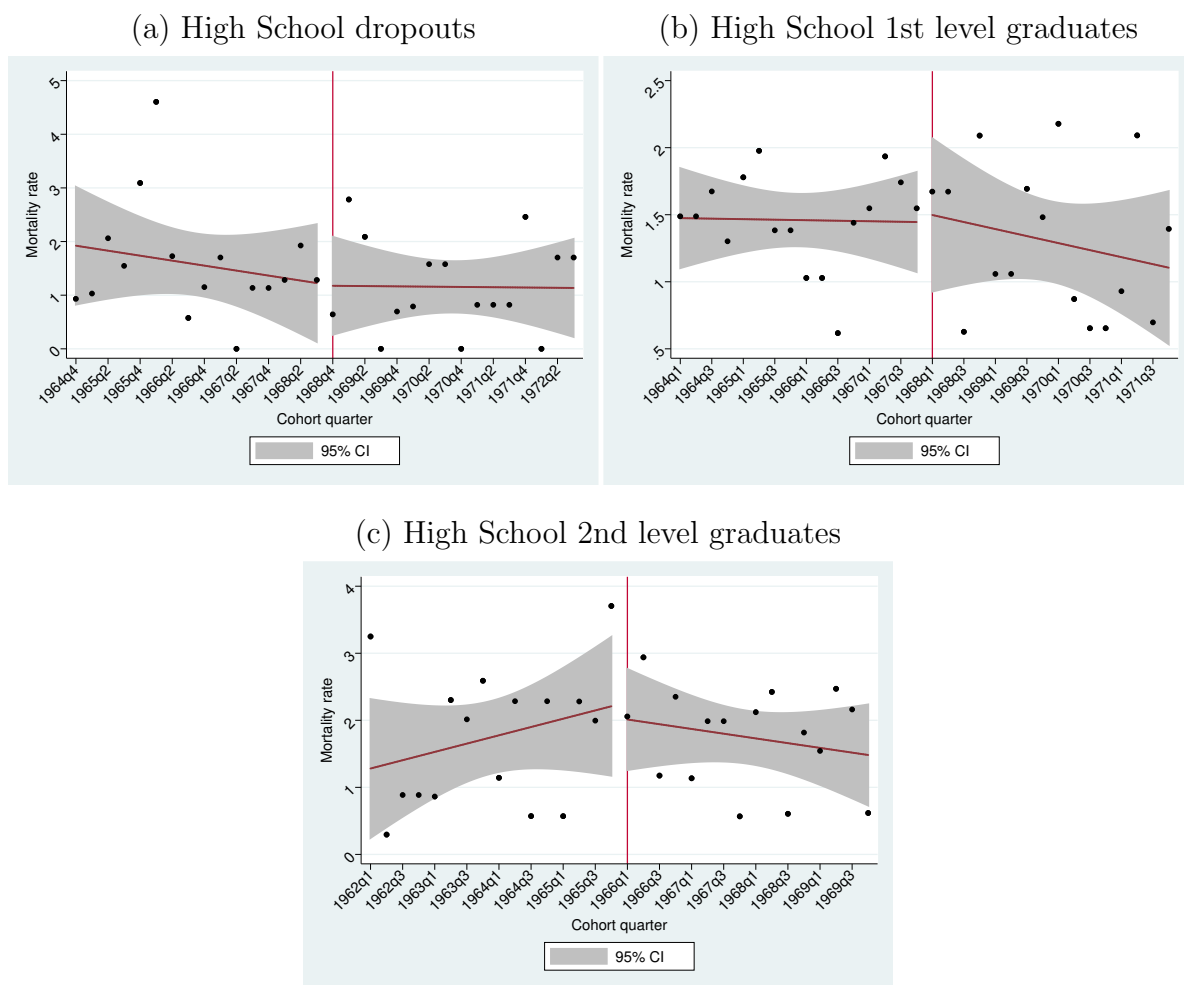
Figure A2: Evolution of Spain-born males suicide mortality rates (2012-2013)



*Notes:* The figure shows the evolution of the quarterly suicides mortality rate as deaths per 100000 individuals during 2012-2013 for Spain-born males. The vertical line indicates the first cohort affected by the labour reform for the respective education level.

*Source:* Death Statistics according to Cause of Deaths and the 2011 Census from the Spanish Statistical Office (INE).

Figure A3: Evolution of Spain-born females suicide mortality rates (2014-2018)

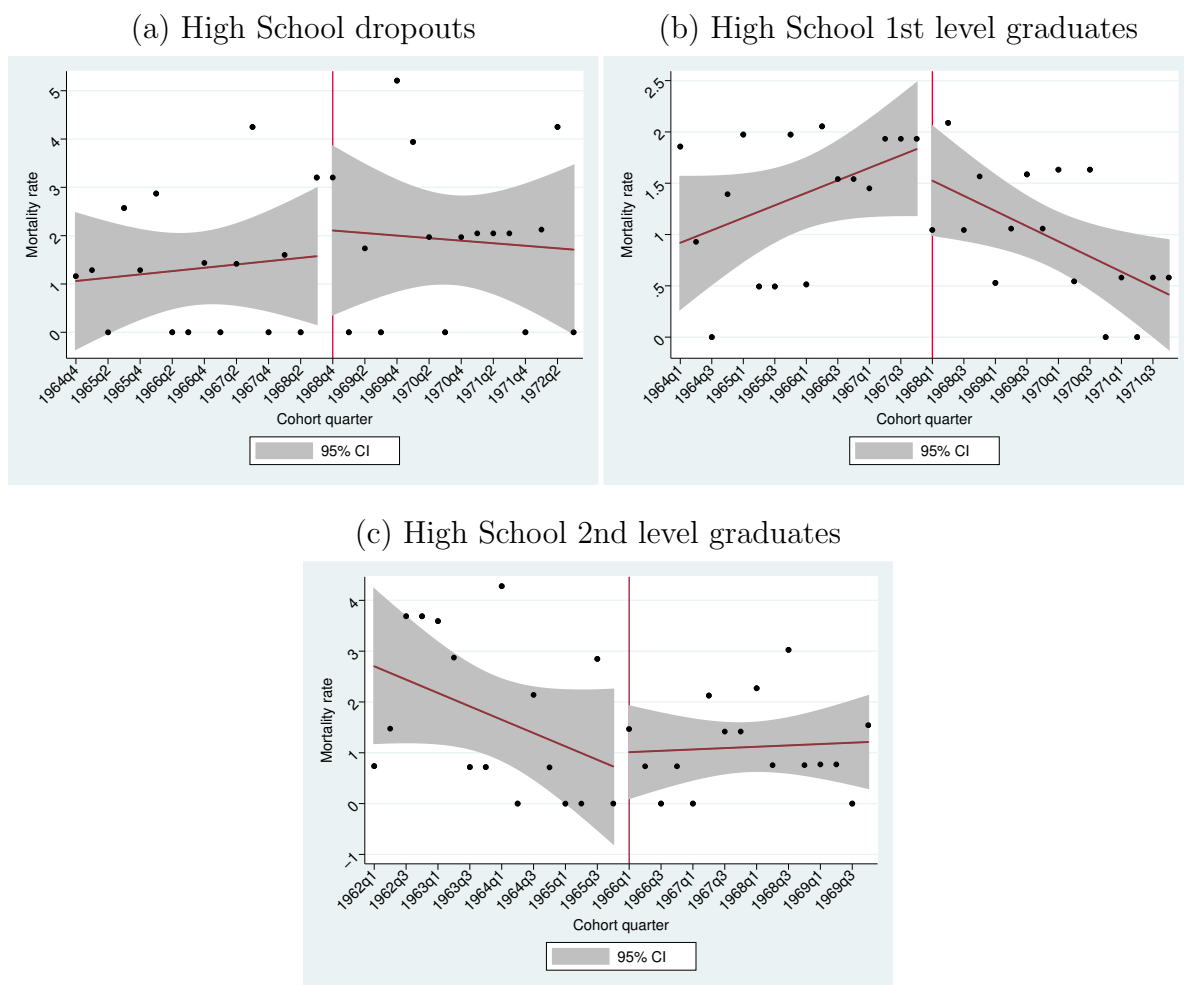


*Notes:* The figure shows the evolution of the quarterly suicides mortality rate as deaths per 100000 individuals during 2014-2018 for Spain-born females. The vertical line indicates the first cohort affected by the labour reform for the respective education level.

*Source:* Death Statistics according to Cause of Deaths and the 2011 Census from the Spanish Statistical Office (INE).



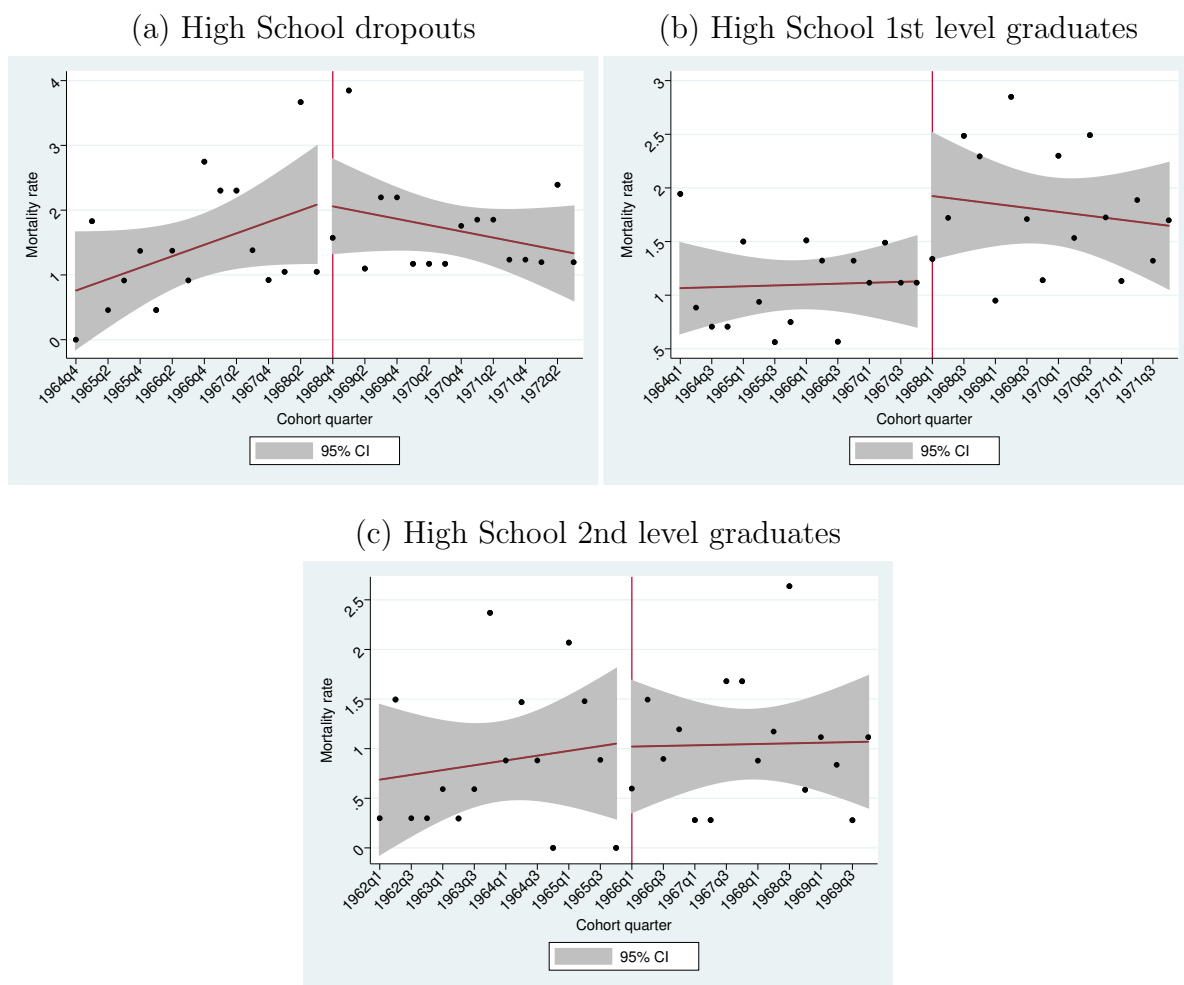
Figure A4: Evolution of Spain-born females suicide mortality rates (2012-2013)



*Notes:* The figure shows the evolution of the quarterly suicides mortality rate as deaths per 100000 individuals during 2012-2013 for Spain-born females. The vertical line indicates the first cohort affected by the labour reform for the respective education level.

*Source:* Death statistics according to cause of death and the 2011 Census from the Spanish Statistical Office (INE).

Figure A5: Evolution of Spain-born males mortality rates due to drug overdose (2014-2018)



*Notes:* The figure shows the evolution of the quarterly suicides mortality rate as deaths per 100000 individuals during 2014-2018 for Spain-born males. The vertical line indicates the first cohort affected by the labour reform for the respective education level.

*Source:* Death Statistics according to Cause of Deaths and the 2011 Census from the Spanish Statistical Office (INE).

Table A1: *Suicide mortality rates (2012-2013)*

	High-school dropouts			High-school 1st level grad			High-school 2nd level grad		
	Both (1)	Male (2)	Female (3)	Both (4)	Male (5)	Female (6)	Both (7)	Male (8)	Female (9)
<b>After</b>	0.827 [0.32]	1.126 [0.56]	0.528 [0.52]	-0.800 [0.2]	-1.230 [0.28]	-0.301 [0.32]	0.195 [0.88]	0.0507 [1]	0.340 [0.6]
<i>Trend</i>	-0.0897 [0.44]	-0.214 [0.52]	0.0343 [0.64]	0.137** [0.04]	0.214*** [<0.01]	0.0609 [0.12]	-0.100 [0.32]	-0.0695 [0.6]	-0.131 [0.16]
<i>Trend × After</i>	0.0930 [0.48]	0.247 [0.28]	-0.0606 [0.6]	-0.208* [0.08]	-0.281* [0.08]	-0.135** [0.04]	0.0939 [0.48]	0.0431 [0.96]	0.145 [0.12]
<i>Women</i>	-5.189** [0.04]			-2.924** [0.04]			-3.207** [0.04]		
<i>Constant</i>	5.786*** [<0.01]	4.625* [0.08]	1.758** [0.04]	5.290*** [<0.01]	5.962*** [<0.01]	1.693*** [<0.01]	4.150*** [<0.01]	4.431*** [<0.01]	0.661 [0.56]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Observations	128	64	64	128	64	64	128	64	64
$R^2$	0.3574	0.0434	0.0347	0.533	0.139	0.1987	0.399	0.0320	0.0932
Pre-Reform mr	4.14	6.96	1.32	2.77	4.16	1.38	3.35	4.98	1.72

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

*Notes:* Robust standard errors are clustered at the cohort level and calculated using the wild bootstrapping method proposed in Cameron et al. (2008), p-values are reported [in brackets]. FE by year of death. Mortality rates reported as deaths per 100000 population.

*Source:* Death statistics according to cause of death (INE) sample of Spanish natives who are high school dropouts (born between 1964q4 and 1974q3) in Columns 1 to 3, high school first-level graduates (born between 1964q1 and 1970q4) in Columns 4 to 6 and high school second-level graduates (born between 1962q1 and 1969q4) in Columns 7 to 9, and population data from the Spanish Census 2011.