IEB Working Paper 2021/05

TERRORIST ATTACKS, ISLAMOPHOBIA AND NEWBORNS' HEALTH

Grace Armijos Bravo, Judit Vall Castelló

May 2021

Public Policies

IEB Working Paper 2021/05

TERRORIST ATTACKS, ISLAMOPHOBIA AND NEWBORNS' HEALTH

Grace Armijos Bravo, Judit Vall Castelló

Postal Address:
Institut d'Economia de Barcelona
Facultat d'Economia i Empresa
Universitat de Barcelona
C/ John M. Keynes, 1-11
(08034) Barcelona, Spain
Tel.: + 34 93 403 46 46
ieb@ub.edu
http://www.ieb.ub.edu

IEB Working Paper 2021/05

TERRORIST ATTACKS, ISLAMOPHOBIA AND NEWBORNS' HEALTH [*]

Grace Armijos Bravo, Judit Vall Castelló

ABSTRACT: Islamophobia has increased in recent years which can be partly attributed to terrorist attacks perpetrated by jihadist groups. Islamophobia might be a source of stress, being problematic for pregnant (Muslim) women. We examine how stress generated by the 2017 Catalonia (Spain) attacks affected the health of newborns whose mothers are from a Muslim country (as the perpetrators). We use a difference-in-differences-in-differences model comparing newborns whose mothers come from a Muslim country and are residing in a municipality directly affected by the attacks, to other newborns, before-after the attacks. Results show that the share of low-birth-weight babies and deliveries with complications raise significantly by 23.77%, and 13.02%. We document a significant increase in Islamophobia and in emotional distress in our treated group. We conclude that one of the channels contributing to the deterioration of those newborns health is the stress faced by their mothers that resulted from the increase in Islamophobia.

JEL Codes: I14, J15
Keywords: Islamophobia, jihadist terrorism attacks, maternal stress, health at birth outcomes

Grace Armijos Bravo
University of Barcelona & IEB & ESAI Business School-Universidad Espíritu Santo
E-mail: gvarmijos@ub.edu

Judit Vall Castelló
Universitat de Barcelona, IEB & CRES-UPF
E-mail: judit.vall@ub.edu

[*] *We are grateful to participants at internal seminars at IEB - University of Barcelona, Spain; XXXIX Jornadas de Economía de la Salud, Spain; VII International Economics Conference at Universidad Técnica Particular de Loja, Ecuador; II Annual Workshop of LACEA'S Health Economics Network, Peru; 24th Annual LACEA -LAMES Meeting 2019, México; 44th Spanish Economic Association Symposium, Spain; XXVII Encuentro de Economía Pública, Spain; 8th PhD-Student Workshop on Industrial and Public Economics (WIPE), Spain for helpful comments on earlier drafts.

1 Introduction

During the last years, several terrorist attacks have been executed across western countries. For instance, those perpetrated by jihadist groups such as the 9/11 attacks, the bombing at Madrid's biggest train station in 2004, the London bombing of July 2005, the shooting in Paris in January 2015 and November 2015, and others perpetrated in Brussels, Nice and Berlin. In Spain, the last one was in Barcelona – Cambrils (august 2017) with 16 dead and a hundred of injured.

Terrorist attacks impose considerable individual and societal costs (Krueger, 2007). With respect to jihadist attacks, they have generated an increase in the rejection against the Muslim community across countries, which in turns, may generate an increase in islamophobia, especially in the affected cities after a jihadist attack (Elver, 2012; Gould & Klor, 2016; Kaplan, 2006; Swahn et al., 2003).

Islamophobia can be experienced by the Muslim community in many aspects of daily life in terms of feelings of rejection, harassment, fear, hate speech, among others (Amer & Bagasra, 2013; Union of Muslim Communities in Spain, 2018). According to the European Union Agency for Fundamental Rights (2018), as reported in its Second Survey of the European Union on Minorities and Discrimination for Muslims, 39% of the sample felt discriminated because of their origin. Focusing only on women, we see that 35% felt discriminated, which represents an increase of 11 percentage points compared to the same survey in 2008. In addition, 31% of them experienced harassment, 39% have been subjected to inappropriate looks or offensive gestures in the 12 months prior to the survey, and 22% have been subject to insults because of their immigrant and Muslim condition. In addition, there is also some evidence of an increase in hate crimes against Muslims after a jihadist attack (Gould & Klor, 2016; Ivandic, Kirchmaier, Machin, et al., 2019).

This discrimination and stigma may be a source of stress for the immigrant Muslim community living in western countries. This stress is particularly problematic for pregnant Muslim women, even if they do not directly experience the discrimination, because the concern about what might happen would be a considerable source of stress as a post-terrorism-event psychological consequence [1] (Bader & Berg, 2013; Becker & Rubinstein, 2011; DiMaggio & Galea, 2006; Hobfoll, Canetti-Nisim, & Johnson, 2006). There is vast (medical) literature showing that intrauterine exposure to stress has a negative influence on health at birth. For instance, it increases probabilities of low birth weight [2], and complications during pregnancy and delivery (Beydoun & Saftlas, 2008; Khashan et al., 2008; Rondó et al., 2003; Torche, 2011). There is also some economic literature on this regards; for example Black, Devereux, and Salvanes (2016) find that stress leads to worst health at birth outcomes in Norway, and Persson and Rossin-Slater (2018) find that stress during pregnancy depress birth outcomes and raise the risk of perinatal complications.

The aim of this paper, therefore, is to identify the impact of the Catalonia 2017 jihadist terrorist attack on health at birth for newborns whose mothers are from Muslim countries living in affected cities. To do so, we exploit the exogenous source of stress coming from the attacks occurred in Catalonia in august 2017, as the exact location, intensity, and timing were largely unpredicted by the

[1] In addition, terrorism may cause devastating consequences in terms of lost human lives and lost infrastructure. (Bloomberg, Hess, & Orphanides, 2004; Krueger, 2007; Lenain, Bonturi, & Koen, 2002)

[2] According to the World Health Organization (WHO), low birth weight is defined as weighting less than 2500 grams at birth.

general population. We use a difference-in-differences-in-differences strategy to estimate the effect of the attacks on health at birth comparing differences across mother's country of origin, Muslims vs non Muslims (first difference), and mother's municipality of residence, affected vs non-affected cities (second difference), before and after the attacks.

Health conditions at birth, such as birth weight, have been found to be a significant determinant of child and adulthood outcomes in terms of health, education and earnings. For example, Almond, Chay, and Lee (2005), using data for the U.S., found that lower birth weight newborns experience developmental difficulties. Black, Devereux, and Salvanes (2007) found that lower birth weight babies have worse outcomes in terms of educational attainment and adult earnings in Norway. Currie and Vogl (2013) studied the links between fetal health and long-term outcomes for developing countries, and they conclude that health in early life is a more significant determinant in these types of economies. Likewise, Almond and Currie (2011) made an extensive review on the effects of birth weight on socio-economic adult outcomes.

Research assessing the causal link between terrorist attacks and health at birth is scarce. For instance, Camacho (2008) using data for Colombia, assessed the impact of exposure to landmines, as a source of exogenous stress, on birth weight. She found that exposure in the first three months of pregnancy decreases birth weight by 8.7 grams. Despite this result, it should be mentioned that landmines in Colombia were not the primary source of stress for the general population as were car bombs and massacres, as pointed out by Mansour and Rees (2012). Mansour and Rees (2012) estimated the effect of intrauterine exposure to armed conflict on pregnancy outcomes using data on the al-Aqsa Intifada [3]. They found that stress due to the conflict decreases birth weight and increases the probability of having a low birth weight baby. However, as recognized by the authors, other channels in the Palestinian conflict context may be affecting birth weight, such as malnutrition and lack of access to medical facilities, due to mobility restrictions in the region. Quintana-Domeque and Ródenas-Serrano (2017) studied the effects of intrauterine exposure to terrorism in Spain. Focusing on the ETA [4] attacks, they found that exposure to terrorism in the first months of pregnancy has detrimental effects on average birth weight and the fraction of normal babies. Finally, there are other papers that exploit the attacks occurred in September 2001 in New York City and document a negative association between the attacks and health at birth (Berkowitz et al., 2003; Brown, 2012; Eskenazi, Marks, Catalano, Bruckner, & Toniolo, 2007; Smits, Krabbendam, De Bie, Essed, & Van Os, 2006).

Our paper contributes in several ways to two strands of the literature, (i) maternal stress and birth outcomes, and (ii) discrimination and health. Thus, to our knowledge, this is the first attempt to provide causal evidence on the effects of jihadist terrorism on health at birth outcomes. As described before, previous literature has focused on the impact of terrorism on newborns' health as a whole. We rather exploit a new channel through which Muslim pregnant women may be affected, that is, the increased islamophobia that may be a source of stress. As emphasized by Sheridan and Gillett (2005) as part of his research on discrimination, a terrorist attack may influence perceptions that other social groups have about the social group to which the perpetrators belong.

[3] Al-Aqsa Intifada is the name given to describe the armed conflict between Palestinians and Israel between years 2000 and 2004.

[4] ETA is the "Euskadi ta Askatasuna" or Basque Homeland and Freedom, terrorist group in Spain.

We also contribute to the discussion on the negative consequences that jihadist attacks may have on the Muslim community. Several papers have found an increase in hate crimes right after a terrorist attack perpetrated by jihadist groups. For instance, Ivandic et al. (2019) document a causal link between local anti-Muslim hate crimes and jihadist terror attacks in the United Kingdom. Sheridan and Gillett (2005) and Gould and Klor (2016) find the same results for the New York 9/11 attacks. Thus, we provide new evidence on increased Islamophobia as a mechanism behind detrimental health outcomes at birth. In addition, we explore whether Muslim women living in target cities may be affected by increased levels of stress right after a jihadist terrorist attack.

To do so, we take advantage of the attacks as an exogenous surge in discrimination that can be isolated from Muslim mothers' characteristics, and add evidence on the negative effects that discrimination may have on health. Research on this issue is scarce in the economics literature. For instance, Johnston and Lordan (2012) estimate the causal impact of increased Anti-Muslim discrimination on a range of objective and subjective health outcomes for the UK and find that discrimination is linked to worse health outcomes such as blood pressure, cholesterol, body mass index and self-assessed health. Likewise, Maas and Lu (2021) evaluate whether partisan politic discrimination affects health. Their results show that mortality rates for counties that vote for the loser candidate increase after elections. The main mechanism behind this result is increased feelings of social disintegration (stress, anxiety and isolation). In the same line, Samnaliev (2014) examines the link between discrimination, victimization, and social standing on health-related quality of life (HRQL) for sexual orientation minorities, and find that the affected group shows lower HRQL. Additional research has been conducted in the public health and epidemiology literature and, most of these studies, find that discrimination is associated with worse health (Lauderdale, 2006; Williams, Neighbors, & Jackson, 2003).

As an additional contribution, our analysis is implemented at the local level using data from municipalities, rather than at a more aggregate level (provinces or regions) as is usually done in the literature on terrorist attacks and health at birth [5]. In this way, we can take into account that not everyone is equally affected within a province.

Finally, we exploit the exogenous and unpredictable elements of the timing, intensity, and location of the Catalonia 2017 attacks, and apply an identification strategy, triple differences, that allows us to control for two kinds of potentially confounding trends: changes affecting health at birth outcomes of Muslim newborns, unrelated to the attacks, and changes affecting health at birth outcomes of all Muslim and non-Muslims babies living in the treated cities (cities where the attacks where perpetrated).

As a first insight of our results, we find that newborns from immigrant Muslims mothers living in the affected cities have worse health at birth outcomes. In terms of birth weight, they show a higher probability of being born with low weight. Regarding deliveries, there is an increase in the share of complications. Our baseline estimates show that the Catalonia 2017 attack is translated into an increase in the probability of having a low birth weight newborn by 1.60 percentage points, and an increase in the share of complications by 1.47 percentage points. In addition, we find that being exposed (while in utero) to the attacks during the first trimester of gestation is linked to detrimental

[5] See for example Quintana-Domeque and Ródenas-Serrano (2017).

health at birth outcomes, although we also find negative effects on the second and third trimesters. Our results are robust to a battery of robustness checks such as a placebo treatment group, indirect treatment effects (using distance to affected cities) and city-specific effects. Moreover, we provide some evidence on the increase of Islamophobia in the affected zones, relative to the rest of the territory. We find an increase in the rejection against Muslims by 5.46 percentage points and an increase in reported hate crimes after the attacks. Additionally, we find evidence supporting increased levels of stress as well as stress-induced behavioral responses associated to the attacks.

The results will have important policy implications regarding the situation of the immigrant Muslim population living in non-Muslim countries. As mentioned above, newborns' health matters for future socio-economic outcomes such as adult health, earnings and quality of life, and increased discrimination may reinforce the differences already existing between Muslims and non-Muslim. For example, Muslims living in Spain have, on average, lower levels of education than natives, are less likely to find a job due to their religion, and earn lower wages compared to Spaniards with the same degree and in a similar employment position (European Union Agency for Fundamental Rights, 2018). Thus, our results should raise awareness of the potential negative impacts for the Muslim population and should encourage authorities to implement and work towards more anti-discrimination policies that will foster a more inclusive society. Finally, our findings may be an useful tool across countries in which there is a high percentage of Muslim individuals, and have been also affected by terrorist attacks.

The rest of the paper proceeds as follows. Section 2 provides the context of the Catalonia attacks and rejection against Muslims. Section 3 describes the data sets and shows some summary statistics. Section 4 presents the empirical strategy. Section 5 presents the results. In section 6, we present a battery of robustness checks and, in section 7, we assess possible mechanisms. Finally, section 8 concludes with a discussion of the results.

2 Background

2.1 The Catalonia attacks

Catalonia is one of the 19 Regions "Comunidades Autónomas" of Spain. It is made up of four provinces: Barcelona, Girona, Lleida and Tarragona. In August 2017 a group of individuals, using vehicles and knives, executed a terrorist attack in the cities of Barcelona and Cambrils, located in the provinces of Barcelona and Tarragona, respectively (Reinares & García-Calvo, 2017). A jihadist organization assumed the responsibility of these attacks, where, as described by Reinares and García-Calvo (2018), the perpetrators were a group of nine second-generation Muslim youth who were raised and residents of the city of Ripoll, located in the province of Girona.

These attacks took place, first in the city of Barcelona, during the afternoon of August the 17th 2017, when a vehicle was introduced in the pedestrian zone of the popular "Las Ramblas" hitting all the people walking in the area. As a result of this act, thirteen people were killed and more than a hundred injured. Some hours after this attack, the same mechanism was used in a pedestrian walkway in Cambrils, Tarragona. Together, the Catalonia attacks left sixteen dead, without including the

jihadist terrorists killed, and around 140 injured (Reinares & García-Calvo, 2018).

Regarding the terrorist attacks' history in Spain, the last attacks before the Catalonia ones, were in march 2004 in the main train station of the capital, Madrid. Terrorist attacks are unexpected negative events affecting both individuals and society and, therefore, an exogenous source of post traumatic stress and fear among people. Several authors have found that, in addition to the direct consequences of terrorism, such as lost infrastructure and deaths, there are also psychological effects (Becker & Rubinstein, 2011; Galea et al., 2002, 2003; Gidron, 2002; Schuster et al., 2001).

As other European cities had been the target of terrorist attacks before the Catalan tragedy, one may be worried that it could have been easy to predict that additional attacks would follow. However, the exact location, timing, and severity of the attacks were very difficult to predict by the general population living in Spain. This unpredictable character of terrorist attacks allows us to draw reliable conclusions supporting our empirical strategy. (see for example: Jaeger and Paserman (2008), Camacho (2008), and Mansour and Rees (2012) for statements supporting exogeneity in terrorist attacks.).

2.2 Terrorist attacks, Islamophobia, stress and health at birth

As mentioned above, terrorist attacks are violent events that have negative consequences both for society and individuals. When these events are perpetrated by one specific group, the rest of the society may change their perception towards individuals belonging to the same group as the perpetrators (Sheridan & Gillett, 2005). In this sense, the increase in jihadist terrorist attacks executed around the world in the last years have raised rejection levels against the Muslim community, also known as Islamophobia. According to Union of Muslim Communities in Spain (2018), Islamophobia is defined as an unfounded hostility to Islam and, consequently, a feeling of fear and aversion towards all Muslims (or most of them). Islamophobia is a phenomenon that may be experienced in several dimensions, from psychological to physical threats. It comprises expressions of prejudice, stigma, discrimination, critiques of the Islamic religion, hate speech and hate crimes against Muslims (Tartaglia, Rollero, & Bergagna, 2019).

Several authors have studied how, after terrorist attacks perpetrated in the western world, Islamophobia has experienced a dramatic rise. For instance, regarding the 9/11 New York and Washington attacks, Gould and Klor (2016) found that Muslim immigrants living in the affected cities experienced more exposure to hate crimes. In turn, those groups exposed to higher hate crime rates also exhibited lower English proficiency, greater chances of marrying another Muslim and lower female labor force participation rates. Therefore, the authors conclude that the 9/11 attacks generated a reaction against Muslims which, in turn, slowed their rate of assimilation. Swahn et al. (2003) using data from hate related attacks against the Muslim population after the 9/11, found that most of these crimes occurred in the 10 days immediately after the terrorist attacks. In addition, victims were mostly men that experienced Islamophobia in public places such as supermarkets, stores and schools. Sheridan (2006) investigated the levels of self-reported religious discrimination in British Muslims after the 9/11 attacks. She found that indirect discrimination increased by 82% and direct manifestations of Islamophobia increased by 76%. With respect to attacks occurred in Europe, a more recent paper by Ivandic

et al. (2019), using data from the Greater Manchester Police, found an increase in Islamophobic hate crimes right after a jihadist terror attack in Europe.

Islamophobia, with its discrimination and stigma, may be a source of stress that can negatively affect health (Samari, 2016). In fact, several studies have found a relation between Islamophobia and increased levels of stress (Haque, Tubbs, Kahumoku-Fessler, & Brown, 2019; Samari, Alcalá, & Sharif, 2018). This exposure to stress is particularly problematic for pregnant Muslim women who, in addition, are more easily identified as Muslims. Intrauterine exposure to stress has been linked to worse health outcomes at birth such as birth weight and complications. This, in turn, may be a source of disparities in socio-economic outcomes later on in life (in adulthood).

3 Data and variable definitions

3.1 Main sources

Regarding **birth records in Catalonia**, we use administrative data provided by the National Institute of Statistics [6] (INE) from 2015 to 2018. In this data set the unit of observation is a live birth. We construct our sample according to the mother's province of residence; that is, we consider all entries that report that a mother's province of residence is one of the four provinces in Catalonia.

For every unit of observation, we have information on weight (in grams), month and year of birth, gender, whether the delivery was by C-section, complications during delivery and gestational length (in weeks). With this information, we construct our outcomes of interest: birth weight (in grams), an indicator of low birth weight (LBW) that takes the value of one for weight below 2,500 grams, an indicator of pre-term delivery when the gestational length is less than 37 weeks, an indicator variable for complications during delivery, an indicator of the sex of the newborn (1 for females and zero otherwise), and an indicator of deliveries through a c-section. We also have information regarding the mother of the child: her country of birth, municipality and province of residence, age, and level of education [7]. Unfortunately, the administrative records do not have any information regarding mothers' risky behaviours, such as alcohol consumption, smoking or prenatal health care use.

To identify the trimester of pregnancy in which mothers were exposed to the attacks, and therefore, the in-utero exposure to stress, we use gestational age (in weeks). This measure is estimated (by healthcare professionals) as the period between the first date of the last menstrual cycle (which is also considered the conception date) and the date of birth. In this way, the accuracy of the gestational age is crucial for our estimates of trimester of exposure. However, we are not concerned about the reliability of this variable, as Spain uses international guidelines to estimate the conception date [8]. Thus, we use the reported gestational age and the date of birth to calculate the estimated conception date and, then, the trimester of gestation relative to the date of the attacks. Following Álvarez-Aranda, Chirkova, and Romero (2020), the first trimester is calculated from the estimated conception date until

[6] INE, www.ine.es

[7] Mothers' level of education is only available for some years. In fact, for more than 50% of the observations the value is missing.

[8] In addition, in Spain all pregnant women have free access to prenatal care and to professional care during childbirth. For the years of analysis, 99.38% of all births took place in hospitals.

week 13; the second trimester ranges from weeks 14 to 26 of gestation; and the third trimester goes from week 27 until birth.

To identify whether a mother was exposed to the attacks during the first, second or third trimester of pregnancy, we construct a categorical variable with four groups. The first category includes mothers who were exposed to the attacks during the first trimester of pregnancy, the second one consists of mothers exposed in the second trimester, the third group includes mothers exposed during the third trimester of gestation, and the fourth group includes mothers that were not exposed. As one may be concerned about fertility responses, we limit the sample to births that were conceived before the attacks in all our models.

To assess possible mechanisms, we make use of four data sets. First, we employ data from the survey on **"Attitudes toward immigration"**, waves VIII, IX, and X from the "Centro de Investigaciones Sociológicas" of Spain. We use this data in order to examine changes in the rejection against Muslims living in affected cities after the 2017 Catalonia attacks. In these surveys, respondents (only Spaniards) are asked about their feelings towards all immigrants as well as towards specific groups of the immigrant population, such as Muslims. Other general questions are also asked. Wave VIII corresponds to the year 2015, IX to 2016 and wave X to September 2017 [9], which is a great fit for the time horizon of our analysis. This survey is nationally representative and samples all 52 Spanish provinces, including municipalities with more than 100,000 inhabitants.

Second, we use administrative data on **Reported hate crimes** [10] provided by the Catalan Police, "Mossos d'Esquadra", for years 2015 to 2017 [11]. We have information on the total number of hate crimes reported in the Region of Catalonia at the municipality level and for every month for each of the three years included (2015, 2016 and 2017). To be used as a placebo test, we also use administrative records on falsification crimes; a type of crime that includes documents forgery, identity usurpation and other related crimes, across Catalan police areas. As a final data source on hate crimes, we use administrative records provided by the "Ministerio del Interior" in which we are able to identify the nationality of the victim. This dataset is provided at the province level and for years 2015 to 2018.

To analyze the relation between the attacks and reported stress among women living in affected cities, we use data from the **Catalan Health Survey (ESCA, in Spanish)** for years 2015 to 2018 (as mentioned above, there is no health information available in the birth records data). ESCA provides information regarding health and health care use outcomes. It is conducted in several waves within a year, allowing us to precisely identify the pre and post attacks period. It samples all Catalan Health Areas (AGA) which include one or more municipalities.

3.2 Treatment and control groups

As mentioned in the introduction, our main approach compares differences across Muslim vs. non-Muslim mothers (first difference) and mother's municipality of residence, affected vs non-affected cities (second difference), before and after the attacks.

[9] For this survey, the last year available is 2017.

[10] According to the "Mossos d'Esquadra" hate crimes are define as *"criminal offenses where victims are selected based on his or her race, national origin, ethnicity, religion, language, sexual orientation or other similar factors."*

[11] To date, 2017 is the last year available for external use.

Regarding the first difference, we use the variable that identifies the mother's country of birth (from INE birth records) in order to construct the treatment group (Muslim mothers). We classify a woman as born in a Muslim country when in that country: 1) there is a majority or strict majority of Muslims (followers of the religion of Islam) or 2) the distinction between religion and the state is not clear. Therefore, our treatment group includes only immigrant Muslim mothers, as defined by the country in which they were born (following the definition above). Thus, when we mention "Muslim" mothers, we are referring to this definition. We always select mothers according to their country of birth [12]. For the control group, we consider all other immigrant women (born in a country that is not Spain and it does not qualify for the Muslim country definition above) who had a child in the period of analysis, excluding mothers born in Spain.

Using these definitions, we have 28,682 live births (conceived before the attacks) from immigrant Muslim mothers, which represents 38.21% of the total live births from non-Spanish born mothers living in Catalonia for the years 2015-2018, as shown in Table 1. In the appendix section, in table A1 we show the list of countries from which Muslim mothers come from (in our sample) along with the share of population that is Muslim in each of these countries. We do something similar with the non-Muslim group and present, in figure A1, the distribution of countries in which these mothers were born.

Table 1: Live births in Catalonia

Mother's country of origin	**Freq.**	**Percent**	**Cum.**
Not Muslim	46,388	61.79	61.79
Muslim	28,682	38.21	100.00
Total live births	75,070	100.00	

Elaboration: The Authors.
Source: National Registry of live births in Spain (INE, 2018).

For the second difference, our treated cities group is constructed according to mothers' municipality of residence. Thus, we define as "treated cities" those that directly received the attacks, Barcelona and Cambrils. We also include the municipality of Ripoll in this group of treated cities, as the perpetrators of the attacks were Muslim residents (and raised) in this particular city, which is also likely to be a strong source of Islamophobia for Muslim residents in this municipality. The non-affected cities group consist of all other municipalities in Catalonia that did not receive the attacks (and were not home of the perpetrators). For example, if a mother's city of residence is Cambrils, this live birth is considered as in the "treated cities group".

3.3 Descriptive Statistics

Table 2 shows summary statistics for the sample analyzed. We have split the sample by treated vs. untreated cities, Muslim vs. non-Muslim mothers in the pre- and post-periods. For instance, we see that for babies born from Muslim mothers before the attacks, mean birth weight was 3,336.69 grams;

[12] As the reader might wonder, with this definition we are using only first-generation Muslims, but by comparing them with other immigrants we avoid, to a large extend, the inclusion of second-generation immigrants born in Spain in the control group. In any case, we are unable to identify second generation Muslims in the birth records data.

the share of low birth weight newborns was 5.60%; the share of pre-term deliveries, complications and c-sections was 4.24%, 10.51% and 24.86%, respectively.

Table 2: Descriptive statistics. Means

Variables	**Muslim**		**Non-Muslim**		**Treated cities**		**Non-treated cities**	
	Before	After	Before	After	Before	After	Before	After
Newborns outcomes								
Birth weight (in grams)	3,336.69	3,329.08	3,287.02	3,297.76	3,276.09	3,283.84	3,314.53	3,318.65
LBW indicator	0.0560	0.0579	0.0677	0.0641	0.0691	0.0652	0.0615	0.0606
Female indicator	0.4790	0.4885	0.4889	0.4874	0.4862	0.4836	0.4844	0.4890
Childbirth characteristics								
Share of pre-terms	0.0424	0.0391	0.0631	0.0524	0.0561	0.0522	0.0549	0.0451
Share of complications	0.1051	0.1010	0.1184	0.1106	0.1167	0.1101	0.1118	0.1063
Share of c-sections	0.2486	0.2283	0.2847	0.2809	0.2899	0.2952	0.2634	0.2482

Elaboration: The Authors.
Source: National Registry of live births in Spain (INE, 2018).

4 Empirical Strategy

As mentioned before, jihadist terrorist attacks have increased the rejection against the Muslim community. This increased rejection has been shown in the literature to be higher in affected places. In this sense, the underlying intuition is that the attacks should primarily affect Muslim women living in the affected cities and should have no effect on other groups of women. At this point, we must acknowledge that one of the control groups (Muslim women living in non-affected cities) might also be affected to a certain extent by the increase in Islamophobia. However, due to the larger distance to the place of the attacks, the impact should be smaller than for our treated group of Muslim mothers in affected cities.

To assess the impact of the attacks on health at birth outcomes, we rely on a difference in differences in differences (DDD) approach. We compare differences across mother's country of origin (first difference), and mother's municipality of residence (second difference), before versus after the attacks. The first difference compares Muslims vs. non-Muslims mothers (excluding Spanish-born mothers), and the second difference compares affected vs. non-affected cities.

Our baseline specification is a DDD regression relating health at birth outcomes for newborn i, whose mother's municipality of residence is m, conceived in month t, year y, and whose mother's country of origin is c, as follows,

$$\begin{aligned} Y_{imtyc} = {} & \alpha + \beta_1 TreatedCity_m + \beta_2 Post_{ty} + \beta_3 Muslim_c + \beta_4 TreatedCity_m * Post_{ty} \\ & + \beta_5 TreatedCity_m * Muslim_c + \beta_6 Muslim_c * Post_{ty} \\ & + \boldsymbol{\theta TreatedCity_m * Post_{ty} * Muslim_c} + \delta_m + \rho_t + \gamma_y + \tau_c + \epsilon_{imtyc} \end{aligned} \tag{1}$$

Where Y_{imtyc} represents a birth outcome for a live birth conceived prior to the attacks. As outcomes we use: birth weight (in grams), low birth weight, prematurity, complications (during labor), c-section,

and following Brown (2012), we use whether the newborn is a female since intrauterine exposure to stress may reduce male births (Catalano, Bruckner, Marks, & Eskenazi, 2006).

$TreatedCity_m$ takes the value of one when mother's municipality of residence is Barcelona, Cambrils or Ripoll, $Post_{ty}$ is an indicator of the occurrence of the attacks (1 if child was born after the august 2017 attacks and conceived up to right before the attacks), and $Muslim_c$ is a dummy variable taking the value of 1 for mothers born in a Muslim country and zero for mothers born in a different country (except Spain). Thus, the treatment group includes all mothers whose country of origin is a Muslim one and are residents of one of the treated cities. The coefficient of interest is $\boldsymbol{\theta}$, which captures the effect of the terrorist attacks on newborns from Muslim mothers living in the treated cities. We include month ρ_t, year γ_y of conception fixed effects, to account for potential common time shocks affecting the outcomes, mother's country of birth τ_c fixed effects, and mother's municipality of residence δ_m fixed effects, by doing this, we use variation at the local level, rather than province level, as not everyone is equally affected within a province. We cluster standard errors at the mother's municipality of residence, since this is the level at which the effect takes place, accounting for any unobserved common group effects (Cameron, Gelbach, & Miller, 2008; Wooldridge, 2006).

For the estimates in which we distinguish the trimester of pregnancy at the time of the attacks, we run the same specification as in equation (1), but classify the exposure to the attacks (event) according to the trimester of gestation in which the woman was. Thus, in this case we have three coefficients of interest, $\boldsymbol{\theta_1}$, $\boldsymbol{\theta_2}$, and $\boldsymbol{\theta_3}$ that represent the effect (on birth outcomes) of being exposed to the attacks during the first, second or third trimester of pregnancy respectively, for Muslim mothers living in treated cities.

The difference in difference estimator provides an unbiased estimate of the treatment if, in the absence of the treatment, the outcomes in the two groups (control and treatment) would have followed parallel trends, before and after the attacks. Our identification strategy is based on several pillars. First, the source of stress coming from the attacks is completely exogenous. Although, the threat of attacks was, in general, expected across western countries, the exact location, timing, and severity of a terrorist attack would have been impossible to predict by the general population living in Spain. Second, even though Muslim and non-Muslim mothers might differ in terms of observable characteristics, we do not expect these differences to change as a result of the attacks. In addition, we are comparing across immigrant population (excluding natives). Third, the DDD model allows us to control for two kinds of potentially confounding trends: changes affecting health at birth outcomes of Muslim newborns, unrelated to the attacks, and changes affecting health at birth outcomes of all Muslim and non-Muslim babies living in the treated cities. Fourth, to support our econometric strategy we perform several robustness checks. For example, we allow pregnant women whose city of residence is not affected to also be exposed to the attacks by using linear distance to the closest affected municipality; we re-estimate equation (1) excluding Barcelona, Ripoll, and Cambrils cities (one at a time), to test whether our results are mostly driven by one city. Finally, we perform a placebo test using a fake treatment group.

It has been established in the literature that women may change their behaviour when faced to potential threats to their integrity. However, as we mentioned before, the timing of any attack

is unpredictable and, therefore, the possibility that women change their place of residence is very unlikely in our analysis (in addition, our post-event period includes only 1 year). In any case, to ensure the reliability of our model, it is important to analyze if there have been major changes to Muslim immigration after the attacks. In other words, we test whether Muslim women leave or emigrate, which could lead to selective selection in our sample. We present several evidence to proof that this is not the case; first, we do not see an (absolute) increase in the number of Muslim women leaving the country (emigration). Second, we do not see that net emigration slowed down during the period of analysis (2015 to 2018). In the appendix section, in table A2, we provide data on emigration and net immigration of Muslim[13] women obtained from the National Institute of Statistics in Spain. One might also be concerned that other channels rather (or in addition to) than stress may be the main driving forces. However, in Spain's context universal health coverage is guaranteed to all pregnant women, regardless of immigration status. For example, in our sample 99.38% of births took place in hospitals. In addition, the Catalonia attacks did not affect the provision of health services at any level of care. Therefore, it seems plausible that the main driving force in our context is the stress affecting Muslim mothers.

5 Effects on health at birth

5.1 Baseline results

Table 3 shows the estimates of equation (1). We report results for a battery of health at birth outcomes: birth weight, share of low birth weight newborns, share of pre-term childbirths, whether there were complications during labor, share of female babies, and share of c-sections. All regressions include mother's municipality of residence fixed effects, month and year of conception fixed effects, and mother's country of origin fixed effects [14]. Standard errors are clustered at the mother's municipality of residence level.

Starting with newborns' health outcomes, we get the expected direction in all the coefficients. We see a decrease in birth weight of 12.89 grams (though not significant), and a significant (at a 1% level) increase in the share of low birth weight babies by 1.60 percentage points for our group of interest. Related to the average birth weight for immigrant Muslim mothers (living in the affected cities) before the attacks, which was 3,282.19 grams, the effect is translated into a decrease of 0.39% and an increase of 23.77% in the share of low birth weight newborns.

With regards to childbirth characteristics, we get a positive coefficient for the share of pre-term newborns, though not significant. For the complications during labor, we find a significant increase of 1.47 percentage points which, compared to the pre-attacks mean, is translated into an increase of 13.58% in the share of complications for immigrant Muslim mothers living in affected cities. We also see a positive significant result for the share of female newborns (however, as we will show in the robustness check section - event study, we do not interpret the result of this outcome as causal due

[13] In here, a women is considered Muslim using the same definition of our baseline equation (equation (1))

[14] Regarding mothers' country of origin FE, given the sample size, one may be concerned about the number of observations per country across treatment and control cities and over time, which is important in order to understand which mothers are contributing to identification. In order to show that our results are robust to this potential issue, we re-estimate equation (1) excluding these FE's. Results are very similar and are available upon request.

Table 3: Baseline Estimates Birth Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**C-Section**
DDD City*Muslim*Post	**-12.8937**	**0.0160*** **	**0.0058**	**0.0147** **	**0.0233***	**0.0122**
	(13.2413)	(0.0059)	(0.0046)	(0.0073)	(0.0118)	(0.0092)
Interaction City*Post	-2.9874	-0.0036	0.0085**	-0.0020	-0.0106	0.0155**
	(6.6793)	(0.0047)	(0.0034)	(0.0057)	(0.0068)	(0.0060)
Interaction City*Muslim	4.2772	0.0007	-0.0010	0.0075	-0.0145**	-0.0074
	(14.3387)	(0.0041)	(0.0034)	(0.0046)	(0.0057)	(0.0062)
Interaction Muslim*Post	-15.8251	0.0018	0.0077*	0.0012	0.0052	-0.0155*
	(10.6027)	(0.0056)	(0.0042)	(0.0069)	(0.0103)	(0.0090)
Mean dependent variable	3,282.19	0.0673	0.0427	0.1129	0.4705	0.2736
% Effect	**-0.39%**	**23.77%**	**13.58%**	**13.02%**	**4.95%**	**4.46%**
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	65,519	65,519	75,070	75,070	75,070	75,070

Notes: OLS estimates of equation (1). Outcomes for the live births from mothers whose region of residence is Catalonia (includes the provinces of Girone, Barcelona, Lleida and Tarragona). Standard errors are clustered at the mother's municipality of residence level, 121 clusters. The row "mean dependent variable" shows the mean for the treated group before the Catalonia attacks (August 2017).
***p<0.001, **p<0.05, *p<0.10, respectively

to the existence of a pre-trend) . For instance, there is a 4.95% increase (with respect to the pre-attacks mean) in the share of female babies from (immigrant) Muslim mothers living in affected cities. Regarding c-sections, we do not find any significant result, even though the coefficient of interest has the expected (positive) sign.

Overall, results in table 3 reveal that intrauterine exposure to stress faced by immigrant Muslim mothers living in the cities affected by the 2017 Catalonia terrorist attacks has detrimental effects on newborns' health. Something that is worth mentioning is that an attack such as the one analyzed here, might affect stress levels of all mothers in the region. This means that the control group (non-Muslim mothers) may not be totally unaffected by the event studied here. In any case, the negative effect we find is a lower bound. In addition, our results are supported by the medical literature that shows that increased levels of stress in pregnant women may lead to an unbalance in hormones that affect fetal grow and increases the probability of complications during labor, as well as birth weight. (De Weerth & Buitelaar, 2005).

These findings are in line with other estimates available in the literature measuring the effects of terrorism on birth outcomes, that find negative effects on birth weight and an increased share of complications during delivery (Camacho, 2008; Mansour & Rees, 2012; Quintana-Domeque & Ródenas-Serrano, 2017). We find similar results in terms of magnitude, significance and direction of the estimated effects.

5.2 Trimester of pregnancy

Following the literature on terrorism and health at birth as well as the medical literature, we distinguish the trimester of gestation and exposure to stress. In table 4 we show the estimates for the six different

health at birth outcomes according to the trimester of exposure to stress.

Table 4: Birth Outcomes and trimester of pregnancy

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**C-Section**
DDD City*Muslim*Trim1	**-10.7676**	**0.0227*** **	**0.0233*** **	**-0.0026**	**0.0293** **	**0.0234** **
	(19.6477)	(0.0070)	(0.0045)	(0.0104)	(0.0146)	(0.0108)
DDD City*Muslim*Trim2	**-27.8500**	**0.0181***	**0.0013**	**0.0204** **	**0.0345** **	**-0.0184***
	(17.3327)	(0.0093)	(0.0087)	(0.0098)	(0.0150)	(0.0101)
DDD City*Muslim*Trim3	**-3.2481**	**0.0074**	**-0.0075**	**0.0268*** **	**0.0089**	**0.0252** **
	(13.2372)	(0.0060)	(0.0047)	(0.0085)	(0.0104)	(0.0104)
Interaction City*Event	-3.4581	-0.0034	0.0087**	-0.0020	-0.0108	0.0155**
	(6.7104)	(0.0048)	(0.0034)	(0.0057)	(0.0068)	(0.0059)
Interaction City*Muslim	4.6706	0.0006	-0.0011	0.0075	-0.0144**	-0.0074
	(14.3009)	(0.0041)	(0.0034)	(0.0046)	(0.0057)	(0.0062)
Interaction Muslim*Event	-15.8182	0.0019	0.0077*	0.0012	0.0052	-0.0155*
	(10.6170)	(0.0056)	(0.0042)	(0.0069)	(0.0103)	(0.0090)
Treated City	-54.7534***	0.0296***	-0.0062***	-0.0635***	-0.0254***	-0.0673***
	(7.3064)	(0.0022)	(0.0019)	(0.0027)	(0.0035)	(0.0041)
Muslim	-50.8355	-0.0015	0.0456**	-0.0562	0.1225*	-0.0619
	(60.3267)	(0.0464)	(0.0183)	(0.0403)	(0.0685)	(0.0890)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
F-test						
Ho: $\theta_{trim1}= \theta_{trim2}= \theta_{trim3}$	1.34	4.97***	58.50***	3.52**	2.99*	16.03***
p-value	0.2688	0.0084	0.0000	0.0328	0.0543	0.0000
Observations	65,519	65,519	75,070	75,070	75,070	75,070

Notes: OLS estimates considering the trimester of gestation. Outcomes for the live births from mothers whose region of residence is Catalonia (includes the provinces of Girone, Barcelona, Lleida and Tarragona). Standard errors are clustered at the mother's municipality of residence level, 121 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively.

From table 4, we see that intrauterine exposure to stress across the three trimesters of gestation has detrimental effects on health at birth for newborns from (immigrant) Muslim mothers living in affected cities. In terms of statistical significance, from the F-statistics tests of equality of coefficients, we find that there is no evidence that the coefficients are the same across trimesters of pregnancy for all the outcomes, except for birth weight.

Regarding exposure during the first trimester, we find an increase in the share of low birth weight babies by 2.27 percentage points, an augmented share of pre-term newborns (2.33 percentage points), a higher share of female newborns, and an increased share of deliveries through c-sections (2.93, and 2.34 percentage points, respectively). For the second trimester of gestation, we also find detrimental effects on low birth weight, an increase in the share of complications as well as in the female ratio by 2.04 and 3.455 percentage points, respectively. With respect to newborns' sex early in pregnancy, it has been shown that exposure to stress while in utero may be more dangerous for male fetuses. Thus, Sanders and Stoecker (2015) find that males are more vulnerable to side effects of maternal stress in utero, and Catalano et al. (2006) show evidence supporting male fetal loss as a consequence of exposure to stress. The conclusions of this papers are also in line with the medical literature that suggests that the probability of having a miscarriage is much higher early in the pregnancy. Finally,

in the last trimester of pregnancy, we also find an increased share of complications during delivery and a higher share of c-sections by 2.68 and 2.52 percentage points, respectively.

Our results are consistent with others in the literature that find that exposure to terrorism (particularly early in the pregnancy stage) is linked to negative health at birth outcomes (Camacho, 2008; Mansour & Rees, 2012; Quintana-Domeque & Ródenas-Serrano, 2017). However, we also find detrimental effects on the second and third trimester. This is in line with a number of studies that highlight that there is no consensus on whether we should expect prenatal exposure to stress to have a differential effects across trimesters (Mansour & Rees, 2012; Persson & Rossin-Slater, 2018).

6 Robustness checks of baseline results

This section includes several robustness checks for our main results from equation (1). First, we conduct an event study design to support the hypothesis of no differential pre-trends. Second, we examine whether our results hold when we allow pregnant women whose cities of residence are not affected to be also exposed to increased Islamophobia. Third, we explore whether our results are driven by one of the three cities. Finally, we perform a placebo test, in which we change the treatment group (Muslim mothers).

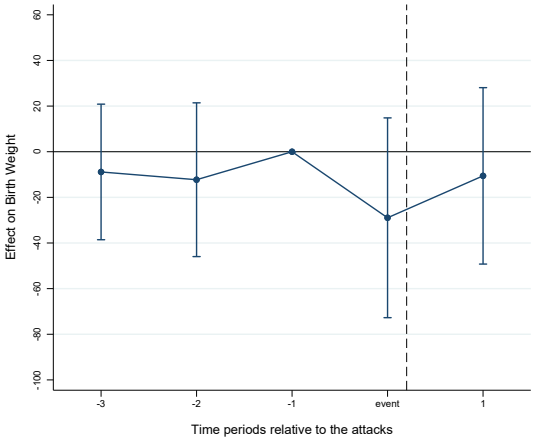
6.1 Event Study Estimates

To evaluate possible differential pre-trends between the treatment and control groups, we conduct an event study version of equation (1) for all the outcomes. For this, we generate three pre-attacks and two post-attacks periods (as dummy variables), both on an annual basis [15]. We set the period before the attacks (t=-1) as the omitted category. In this specification, we also include month, year of conception fixed effects, municipality of residence fixed effects and mother's country of birth fixed effects. Figure 1 depicts the set of pre/post-attacks coefficients of the triple interaction (DDD) for the six health at birth outcomes, along with their 95 percent confidence intervals.

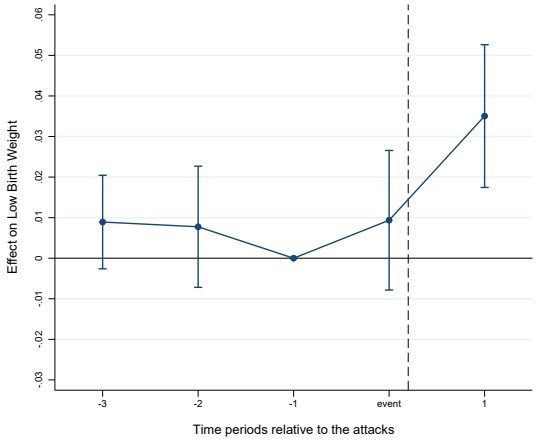
Overall, the set of pre-attack coefficients of the triple interaction are statistically indistinguishable from zero, with the exception of the very last period in the case of the share of female newborns. Regarding birth weight, the indicator of low birth weight, prematurity, complications during labor and c-sections, we do not find any significant coefficient for the triple interaction term in the pre-attack periods. In addition, we see that after the attacks there is an increase in detrimental health at birth outcomes, as indicated by the positive and statistically significant coefficients for the share of low birth weight newborns, prematurity, and the complications during labor indicator, which is in line with our baseline results. Regarding the results of the share of female newborns, due to the existence of one significant pre-attack coefficient, we do not interpret the results of this outcome as a causal impact of the attacks.

[15] As births may be seasonal, and we want to exploit all the time horizon we have available, we have constructed the pre/post-attacks periods using "year base" categories. Thus, we have three (annual) pre-attack time periods and two post-attack periods.

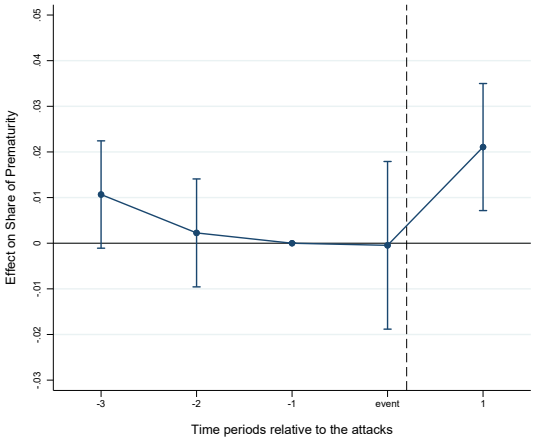
Figure 1: Event study graphs of baseline estimates



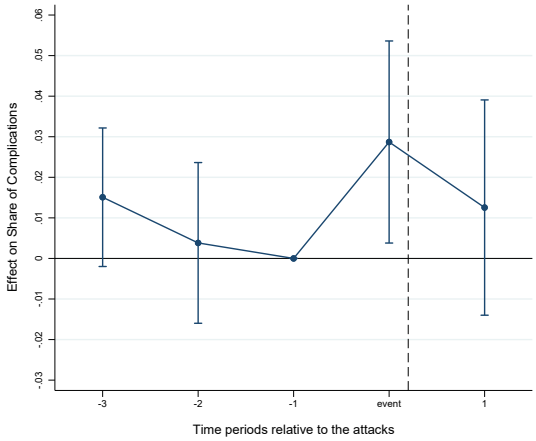
(a) Birth Weight



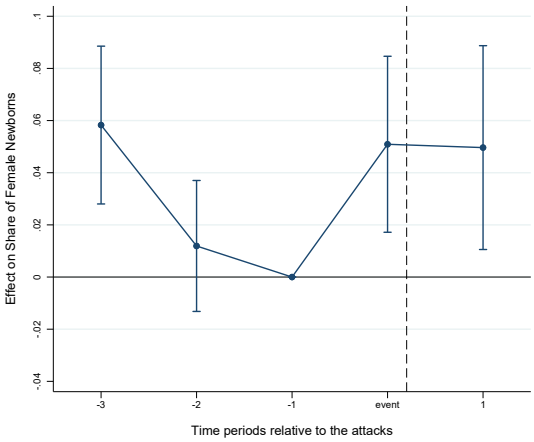
(b) Low Birth Weight



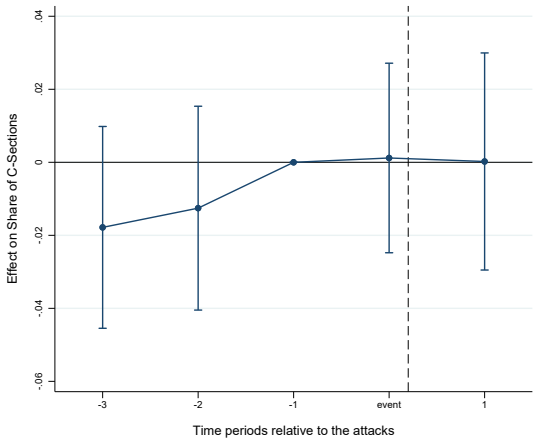
(c) Prematurity



(d) Complications



(e) Female



(f) C-Section

Notes: Figure shows the set of coefficients corresponding to the triple interaction term from the event study versions of equation (1). Points estimates are shown along with their 95 percent confidence intervals. Reference category is one period prior to the attacks.
Standard errors are clustered at the mothers' municipality of residence level, 121 clusters.

6.2 Allowing other cities to be exposed

Our baseline specification establishes that only immigrant Muslim women living in affected cities are exposed to increased Islamophobia after the attacks and, consequently, to this source of stress. Nevertheless, it may be the case that Muslim women living in neighboring cities may also experience increased rejection and therefore this may also affect their newborn's health. To test whether this channel is affecting our results, we allow mothers whose municipality of residence is not one of the affected to also be exposed to stress coming from increased Islamophobia after a jihadist attack.

To do so, we re-estimate equation (1) replacing the dummy "Treated City" with a measure of distance to the treated cities. From here, we generate their pairwise interactions as well as the triple interaction. We use linear distances calculated using the latitudes and longitudes of every municipality in Catalonia. To every live birth, we assign the minimum distance between the mother's municipality of residence to Barcelona, Cambrils or Ripoll. In other words, we compute linear distances from mother's municipality to Cambrils, to Barcelona and to Ripoll and among these three, we choose the shortest distance. To model the distance, we follow Quintana-Domeque and Ródenas-Serrano (2017) and use a negative exponential form supporting the assumption that Muslim women will be more affected the closest they are to the places of attacks.

The results using this measure of distance are shown in table A3 of the Appendix section. We can see that, overall, we obtain consistent results in terms of the direction of the estimated coefficients. For instance, we find significant detrimental effects in terms of birth weight, low birth weight, and the share of female newborns. It is important to notice that we are using a continuous measure of exposure for the affected cities rather than a binary measure, so that we are losing precision in some of our coefficients and the results are less significant. In any case, they point towards similar conclusions, in most of the cases, than our baseline findings.

6.3 Excluding cities from treated group

In this subsection we explore whether our results hold when we exclude from the sample the city of Barcelona, Ripoll, and Cambrils, one at a time. We re-estimate equation (1) excluding, first, live births from Barcelona, then from Ripoll, and finally from Cambrils.

For the case of Barcelona, we might be worried that this city may be driving our results as it might have been more exposed to Islamophobia by the media, and also because it is the most populated city in Catalonia (specially if we compare it with Cambrils and Ripoll). To test this, we exclude all live birth from women living in Barcelona during the period of analysis. To support our empirical strategy, we should find statistically significant detrimental effects on health at birth outcomes. In table A4 of the appendix section, we report the results of the above specification. In general, we obtain negative effects on health outcomes. For instance, we see a large decrease in birth weight for Muslim women living in Cambrils and Ripoll after the attacks. We also find an increase in the share of c-sections by 6.05 percentage points. For the complications during labor indicator, low birth weight and prematurity, even if the coefficient is not significant, it has the expected sign. Overall, we see that the negative effects are not washed out when we exclude all live birth from women living in Barcelona despite the fact that we are eliminating a large number of observations in the treated group.

Second, we test the robustness of our findings by excluding Ripoll from the treated cities group. Ripoll is considered an affected municipality because the perpetrators of the attacks were all raised there. However, their treatment nature may not be the same as the other cities. Table A5 in the appendix shows the results of this exercise. We find the expected signs in all the coefficients of interest: we document an increase in the share of low birth weight babies by 1.49 percentage points and an increase in the share of complications and the female ratio by 1.34 and 2.13 percentage points, respectively.

Finally, as an additional robustness check, we do the same exercise excluding live birth from Cambrils. Results of these estimates are shown in table A6. From here, we see that we get the expected signs for the coefficient of interest across all outcomes. In addition, we find detrimental statistically significant differences in the share of low birth weight newborns (1.63 percentage points), deliveries with complications (1.66 percentage points) and in the share of female newborns (2.80 percentage points). Therefore, we show that after excluding the observations from the city of Cambrils, the baseline effects are maintained.

6.4 Placebo

We conduct a placebo test to indirectly assess the common time trend assumption. We estimate equation (1) using an alternative treatment group. We assign as placebo treatment units mothers born in Latin American countries and drop from the analysis those observations corresponding to Muslim mothers. The control group remains the same; live births from other immigrant mothers (excluding Spanish mothers). Because we expect that the increased stress due to Islamophobia affects mainly Muslim mothers living in the treated cities, we should not find an effect on Latin American pregnant women living in the same cities. Otherwise our identification strategy would be challenged. Thus, we re-estimate equation (1) using the group of Latin American immigrant women that had a live birth (conceived before the attacks) in Catalonia during the period of analysis as the treated group. Results of this exercise are shown in table 5.

Overall we find that none of the health at birth outcomes are statistically significant, except for c-sections (although it is negative: thus, it has the opposite sign compared to the baseline results). In addition, the DDD coefficients for all the outcomes (except the share of female) are in the opposite direction compared to the baseline results. Regarding the share of female, even if we find a positive coefficient, it is not statistically significant and much smaller than our baseline estimates. Thus, we conclude that there is no evidence of differential effects of the attacks on Latin American mothers living in affected cities, which supports our empirical strategy.

Altogether, we believe our identification strategy is robust to the several robustness tests that we have estimated. Our results hold when we allow mothers living close to affected cities to be exposed to the attacks-related stress; when excluding Barcelona, Ripoll, and Cambrils (one at a time) from the treated cities group. Our results are also robust to a placebo test, in which we replace the treatment group by one that should not be affected. Finally, the event study estimates add validity to our econometric strategy.

Table 5: Robustness Check - Placebo test

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**(C-Section)**
DDD City*Latin*Post	**10.0650**	**-0.0111**	**-0.0024**	**-0.0050**	**0.0088**	**-0.0237***
	(16.6348)	(0.0092)	(0.0074)	(0.0091)	(0.0147)	(0.0125)
Interaction City*Post	-9.3292	0.0028	0.0102*	0.0007	-0.0157	0.0289***
	(11.4172)	(0.0069)	(0.0057)	(0.0058)	(0.0120)	(0.0080)
Interaction City*Latin	-13.2252	0.0194***	0.0112***	0.0009	-0.0181**	-0.0004
	(8.7302)	(0.0038)	(0.0035)	(0.0056)	(0.0070)	(0.0070)
Interaction Latin*Post	-16.8169	0.0076	0.0111	0.0010	0.0043	0.0042
	(15.7449)	(0.0086)	(0.0069)	(0.0091)	(0.0144)	(0.0125)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	42,031	42,031	46,388	46,388	46,388	46,388

Notes: OLS estimates of equation (1). In the placebo estimation the treatment group is made up with mothers born in Latin American countries. Controls are mothers born in other foreign countries. Standard errors are clustered at the mother's municipality of residence level, 121 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively

7 Assessing Mechanisms

Our main hypothesis is that Muslim women may be facing an increase in Islamophobia due to the terrorist attacks perpetrated by jihadist groups, and this effect may be particularly salient in the cities where the attacks occur. We test this hypothesis using three alternatives. First, by examining whether there is an increase in the rejection against Muslims; second, we explore whether (reported) hate crimes increased as a consequence of the attacks. Finally, we assess the relation between the attacks and maternal stress, and whether stress may induce behavioral responses.

7.1 Rejection against Muslims

For the Islamophobia analysis, we use data from the Survey "Attitudes towards immigration" conducted by the *Centro de Investigaciones Sociológicas* of Spain for the years 2015, 2016 and 2017. The three waves of the survey are nationally representative and sample individuals aged 18 years and older that hold the Spanish nationality. It provides information on the perception of the Spanish population on immigration. The advantage of using this survey for our analysis is that the 2017 wave was conducted during the month of September, just one month after the attacks.

First, we assess whether there is an increase in rejection against the Muslim population. We use a question that asks Spaniards whether there is a specific group of immigrants for which they feel antipathy. The respondents can mention any group without being limited to pre-established categories. Using the responses to this question, we construct our first outcome variable, a dummy *"Muslim"* taking the value of 1 when respondents mention any group that refers to the Muslim population, [16] and zero otherwise. Second, we assess whether negative feelings about immigration have increased after the attacks in affected relative to non-affected areas. We rely on a question that asks Spanish whether they consider immigration to be a positive or a negative issue for Spain. Using the responses

[16]For example: Moroccan, Muslims, Islamists, "moro".

to this question, we construct a dummy variable that is one when respondents declare immigration as "negative" for the country, and zero otherwise. Third, we explore any changes in hate speech [17] as a consequence of the attacks. We use information from a question asking Spaniards whether, in the last weeks, they have seen or heard any offensive comments against immigrants.

As can be noted, just the first outcome allows us to directly identify rejection against the Muslim community due to restrictions in data availability as well as the contents of the questions asked in the survey. The other two outcomes are targeted to all immigrants, and we use them as an indirect measure of increased rejection against the Muslim community (as they are also included in the immigrant group).

To assess whether the level of rejection increased in the affected cities after the attacks, we need to look at the municipality level. However, in this particular dataset the lowest geographical level available is the province and, thus, we construct a dummy variable taking the value of one for the provinces to which the affected municipalities belong (Girona, Tarragona and Barcelona), and zero otherwise. Thus, for this subsection, the treated group is made up of the provinces that include the cities affected by the attacks.

To formally explore our hypothesis, we use a difference-in-differences approach to test whether there is an increase in the rejection against immigrants and Muslims in the affected provinces after the attacks in Catalonia (relative to non affected provinces). To do so, we estimate the following equation,

$$Y_{ipt} = \alpha + \beta_1 Province_p + \beta_2 Post_t + \boldsymbol{\beta_3 Province_p * Post_t} + \delta_p + \gamma_t + \epsilon_{ipt} \tag{2}$$

Where Y_{ipt} represents the "rejection against immigrant" outcome of individual i in province p in year t. $Province_p$ is the variable for the control - treatment group, and takes the value of one for the affected provinces, and zero otherwise. $Post_t$ is a dummy variable taking the value of one for the post attacks period, 2017, and zero otherwise. The coefficient of interest is $\boldsymbol{\beta_3}$, which captures the effect of the terrorist attacks on the outcomes of interest. We include time fixed effects γ_t to account for potential common time shocks affecting the outcomes. We also include province fixed effects δ_p to account for any time invariant shock across provinces. We cluster standard errors at the level of treatment (province). Probability weights are included to take into consideration the survey design.

Before moving on to the regression results, we first plot the raw trends of the three outcomes in figure A2 of the appendix section. Panels (a), (b) and (c) show that, after the attacks, there is an increase in the Islamophobia-related outcome in the treated locations. In addition, trends between affected and non-affected provinces look parallel before the attacks. With respect to regression results, table 6 presents the estimates of equation (2). Column (1) shows an increase in the share of nationals feeling antipathy towards Muslims in the provinces of Barcelona, Tarragona and Girona (relative to other Spanish provinces) by 5.46 percentage points after the Catalonia 2017 attacks. This effect

[17] Hate speech comprises any abusive or threatening speech or writing that expresses prejudice against a particular group, especially on the basis of race, religion, or sexual orientation (Definition taken from the Oxford Dictionary).

represents an increase of 22.84% with respect to the pre-attacks mean. This result supports the statement that, after a terrorist attack perpetrated by a jihadist group, the affected places experience an increase in the rejection against the Muslim community.

From column (2), we infer that the attacks increased the share of Spaniards having a negative feeling about immigrants by 5.60 percentage points in affected provinces relative to the non-affected ones. This represents an increase of 14.20% with respect to the average pre-attacks share of respondents having a negative feeling about immigration (which was 39.43%). Column (3) shows that, regarding hate speech, the difference between affected provinces and the rest has increased by 5.24 percentage points after the attacks. This represents a positive variation of 10.66% with respect to the pre-attacks mean in the treated group (provinces).

Table 6: Effects of Catalonia 2017 Attacks on Perception towards Immigration

	(1)	**(2)**	**(3)**
	Rejection Muslim	**Neg feeling**	**Hate Speech**
DD Province*Post	**0.0546****	**0.0560****	**0.0524****
	(0.0261)	(0.0209)	(0.0258)
Treated Provinces	-0.0819***	0.1029***	0.0944***
	(0.0084)	(0.0092)	(0.0143)
Post (September 2017)	-0.0060	-0.0754***	-0.1911***
	(0.0131)	(0.0218)	(0.0343)
Mean dependent variable	0.2391	0.3943	0.4917
% Effect	**22.84%**	**14.20%**	**10.66%**
Province FE	x	x	x
Year FE	x	x	x
Observations	6,959	5,588	7,334

Notes: OLS estimates of equation (2). Column (1) shows the result for the share of rejection against Muslim. Column (2) shows results for negative feeling towards immigration and Column (3) the share of hate speech against immigrants. Standard errors are clustered at the province level, 50 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively.

As shown above, we have presented evidence supporting an increase in Islamophobia after the terrorist attacks, which is in line with our expectations of the channels affecting Muslim pregnant women. These results are consistent with other papers examining how hate crimes (against Muslims) increase after a terrorist attack perpetrated by a jihadist group, as described in section 2. Moreover, the general negative feeling about immigration also increases in treated provinces (compared to the control group), as well as hate speech against immigrants.

To support the robustness of the results of this subsection, we conduct a placebo test and perform an event study design. For the placebo test, we focus on the outcome of rejection against Muslims, as it is the only direct measure of Islamophobia available. We define a placebo outcome using the same question of the survey as in column (1) of Table 6. This new outcome measures the rejection of Spaniards against immigrants coming from Latin American countries. To do this, we construct a dummy variable taking the value of one when respondents declare that they feel antipathy against an immigrant born in a Latin American country (and zero otherwise), and re-estimate equation (2). Results of this estimates are shown in table 7. The intuition behind using a placebo outcome is to

test an outcome that, theoretically, should not be affected by the attacks (treatment) (Yamamoto, 2016). In this case, we expect that Latin American immigrants should not be affected by the attacks in terms of increased rejection against them. From table 7, we see that the difference-in-differences coefficient is not significant and goes in the opposite direction, which supports our hypothesis and provides reliability on the robustness of the identification strategy. In addition, in figure A3 of the appendix section, we provide the raw trends of this placebo outcome. As it can be seen, prior to the attacks, rejection against Latin American immigrants was higher in non-affected provinces and, after the attacks, the raw trend does not show an increase in affected provinces.

Table 7: Placebo outcome

	Rejection Latin American
DD Province*Post	**-0.0033**
	(0.0066)
Treated Provinces	0.0266***
	(0.0024)
Post (September 2017)	0.0156***
	(0.0051)
Province FE	x
Year FE	x
Observations	6,959

Notes: The outcome variable is made up by the rejection against immigrants coming from Latin American countries. Robust standard errors in parentheses clustered at the province level (50 clusters).
***p<0.001, **p<0.05, *p<0.10, respectively.

For the event study design, we use pre-attacks years to provide evidence in support of the parallel trends assumption. Due to data availability, we only have 3 time periods to conduct the analysis. With this in mind, we replace the variable $Post_t$ by years dummies and take as the omitted category the period before the attacks (t=-1). From table 8, we find no evidence of differential pre-trends in any of the outcomes, which adds validity to the results in this subsection.

Table 8: Event study design for Rejection against Immigrants

	(1)	**(2)**	**(3)**
	Rejection Muslim	**Neg feeling**	**Hate Speech**
Treated Province, t-2	0.0411	0.0354	-0.0055
	(0.0293)	(0.0243)	(0.0465)
Treated Province, event	0.0751*	0.0736**	0.0496*
	(0.0385)	(0.0221)	(0.0289)
Province FE	x	x	x
Year FE	x	x	x
Observations	6,959	5,588	7,334

Notes: Event study design for the Rejection against immigrants outcomes. The omitted category is one year before the attacks (t=-1). Standard errors are clustered at the province level, 50 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively.

7.2 Hate Crimes

As mentioned throughout the paper, Islamophobia can be experienced in several ways. One of the elements that can capture Islamophobia is reported hate crimes. To assess whether hate crimes have increased as a consequence of jihadist terrorist attacks in affected cities we use two sources of administrative data. First, we rely on data from the Catalan Police on reported hate crimes for the years 2015, 2016 and 2017. The data is aggregated at the month-year level for municipalities in Catalonia. It includes reported hate crimes regardless of their origin, this means that they can be due to Islamophobia, sexual orientation, ethnicity rejection, and others. Despite the fact that we are not able to isolate Islamophobia-related hate crimes, we can still use the data to estimate an indirect measure of those types of hate crimes. In addition, we can look at the most local level, municipality, which fits very well with our econometric identification.

We formally test whether the number of hate crimes increased after the attacks in affected relative to non-affected cities by estimating a difference-in-differences (DD) model that compares treated cities (Barcelona, Cambrils and Ripoll) to non-affected cities in Catalonia before and after the attacks. To do this, we estimate the following equation,

$$\begin{aligned} Y_{imt} = \alpha + \beta_1 TreatedCity_i + \beta_2 Post_{mt} + \boldsymbol{\beta_3 TreatedCity_i * Post_{mt}} \\ + \delta_i + \gamma_m + \rho_t \epsilon_{imt} \end{aligned} \tag{3}$$

Where Y_{imt} is the natural logarithm of the total number of reported hate crimes in municipality i, in month m in year t. $TreatedCity_i$ is the dummy for the control-treatment group taking the value of one for affected municipalities, and zero otherwise; $Post_{mt}$ is an indicator taking the value of one for the post attacks period, and zero otherwise. $\boldsymbol{\beta_3}$ is our coefficient of interest and captures the effects of the attacks on local hate crimes. We also include municipality fixed effects δ_i, month γ_m and year ρ_t fixed effects. We cluster standard errors at the municipality level.

Table 9, panel (A) presents the estimates of equation (3). We find a significant increase of (approximately) 26.19% in local hate crimes in affected cities after the attacks compared to non-affected cities, which supports our hypothesis of increased Islamophobia after a jihadist attack. To test the robustness of these results, we perform two placebo tests and an event study model of equation (3). For the placebos, first, we define a different treated group where the "fake" affected cities are Lleida, Girona, Tarragona and Badalona. Second, we estimate a placebo outcome to show that our results are not driven by a general rise in crimes.

Regarding the first placebo, we choose the above mentioned municipalities as, in the case of the first three, they are the capital of the provinces and, therefore, the most representative. In the case of Badalona, we select it because it is geographically close to Barcelona and it is also a big city. With this variable definition, we re-estimate equation (3) excluding the observations from the "real" treated group, and get the results shown in table 9, panel (B). The estimates of the placebo treated group show a non-statistically significant result for the interaction term. This result supports our empirical strategy as we don't expect to find significant differences between (placebo) units and the control group after the attacks. With the second placebo, we test whether the increase in reported

hate crimes can be explained by a general increase in crimes across municipalities in Catalonia. For this, we use falsification crimes as a placebo outcome [18]. The underlying intuition is that we should not expect a positive significant result in the DD coefficient. To formally test this, we re-estimate equation (3) where the outcome is the natural logarithm of the total number of reported falsification crimes in the police area i, in month m in year t. Results are shown in table 9, panel (C). We find a non-significant reduction in this type of crimes. This estimate supports our hypothesis of increased hate crimes as a plausible consequence of Islamophobia, rather than a general increase in crimes in affected cities after the attacks. With respect to the event study specification, we find one significant coefficient in the very last pre-attacks periods, as shown in the appendix in table A7. However, we must keep in mind that this outcome includes all types of hate crimes.

Table 9: Hate Crimes and Placebo Tests

	(A)	**(B)**	**(C)**
	Actual treated group	**Placebo treated group**	**Placebo outcome**
DD Treated City*Post	**0.2619***	**0.1926**	**-0.1241**
	(0.1478)	(0.2245)	(0.1040)
Treated City	0.1814***	0.7112***	0.5043***
	(0.0205)	(0.0312)	(0.0140)
Post attacks	0.1690***	0.1693***	-0.0517
	(0.0350)	(0.0348)	(0.0696)
Municipality FE	x	x	x
Month FE	x	x	x
Year FE	x	x	x
Observations	7,308	7,236	4,060
Number of clusters	203	200	60

Notes: Panel (A) presents the estimates of equation (3) where the outcome variable is the natural logarithm of the total number of reported hate crimes in the Catalonia Region using the actual treated units. Panel (B) shows estimates of the natural logarithm of the total number of reported hate crimes using the placebo treated group. Robust standard errors in parentheses clustered at the municipality level. The number of clusters is indicated on the last row of the table.
Panel (C) shows results of equation (3) where the outcome is the natural logarithm of falsification crimes reported in Catalonia. In this estimates, standard errors are clustered at the "Área básica policial" level due to the structure of the data.
***p<0.001, **p<0.05, *p<0.10, respectively.

As a second exercise to see whether hate crimes have changed after the attacks, we use administrative records provided by the "Ministerio del Interior", which is the institution in charge of compiling all criminal records in the country. This administrative data set includes all reported hate crimes in Spain between 2015 and 2018. These records have the advantage that the nationality of the victim is reported. Thus, we are able to identify hate crimes against individuals that have a Muslim nationality. We define a victim as Muslim in the same way than in our baseline specification. In this data set the unit of observation is the hate crime for which we have information on the province, time, and nationality of the victim. Despite the data is at the province level instead of at the municipality level, we believe that this exercise adds important evidence on the increase in hate crimes against Muslims after the attacks.

[18] As mentioned in previous sections, falsification crimes include documents forgery, identity usurpation and other related crimes

We have designed two econometric strategies to see whether hate crimes change after the attacks, (i) a difference in differences estimator in which we compare hate crime rates against Muslim in affected provinces vs. non-affected, before and after the attacks, and (ii) a triple difference in differences setting that estimates hate crime rates comparing Muslim victims vs. other immigrant victims (excluding Spanish individuals), in affected provinces vs. non-affected provinces, before vs. after the attacks. Formally, we estimate two separate regressions of the form:

$$Y_{pnt} = \alpha + \beta_1 TreatedProv_p + \beta_2 Post_t + \boldsymbol{\beta_3 TreatedProv_p * Post_t} + \delta_p + \gamma_n + \rho_t \epsilon_{pnt} \tag{4}$$

$$\begin{aligned} Y_{pnt} = {} & \alpha + \beta_1 TreatedProv_p + \beta_2 Post_t + \beta_3 Muslim_n + \beta_4 TreatedProv_p * Post_t \\ & + \beta_5 TreatedProv_p * Muslim_n + \beta_6 Muslim_n * Post_t \\ & + \boldsymbol{\theta TreatedProv_p * Post_t * Muslim_n} + \delta_p + \rho_n + \gamma_t + \epsilon_{pnt} \end{aligned} \tag{5}$$

Where Y_{pnt} in equation (4) represents the hate crime rate (per 100,000 inhabitants) against Muslims of nationality n, in province p and year t. In this specification, we are using hate crimes exclusively against individuals from a country classified as Muslim. $TreatedProv_p$ takes the value of one for the affected provinces (Barcelona, Girona, and Tarragona) and zero otherwise. $Post_t$ is a dummy that takes the value of one after the attacks and zero before. The coefficient of interest is β_3. We include province δ_p, nationality of the victim γ_n, and time ρ_t fixed effects. Standard errors are clustered at the province level.

In equation (5), the outcome of interest, Y_{pnt}, measures hate crime rate (per 100,000 inhabitants). The coefficients of $TreatedProv_p$, and $Post_t$ are constructed in the same ways as in equation (4). $Muslim_n$ takes the value of one when the victim is of a Muslim nationality and zero for all other immigrant nationalities. In this specification, as in the rest of the paper, we do not consider native individuals. The coefficient from the triple interaction θ shows whether the hate crime rate has changed for Muslims in affected provinces after (relative to before) the attacks. In this equation, we include the same fixed effects and computation of the standard errors as in equation (4). The only difference is that we include more nationalities than in the previous specification, which only includes Muslim nationalities.

Results from the two exercises described above are shown in table 10. Column (A) shows that there is an increase in the (reported) hate crime rate (per 100,000 inhabitants) against Muslims in provinces affected by the attacks relative to non-affected. With respect to the pre-attacks mean, this effect corresponds to an increase of around 40%. Column (B) provides the results for the triple difference in differences estimator. Here, we also find a statistically significant increase in the hate crime rate for victims of Muslim nationalities in affected provinces after the attacks. Compared to the mean before attacks, this effect corresponds to a 28.07% increase in the hate crime rate. To add validity to these results, we have performed event study estimates which are shown in the appendix section, table A8

Table 10: Hate Crimes and nationality of the victim

	(A)	(B)
	Difference in differences	**Triple Difference in differences**
	Hate crime rate against Muslims (per 100,000 inhab.)	**Hate crime rate (per 100,000 inhab.)**
DD Treated Prov*Post	**0.0139*** **	0.0043***
	(0.0049)	(0.0009)
DDD Treated Prov*Muslim*Post	–	**0.0096** **
	–	**(0.0046)**
Treated Province	-0.0193***	-0.0131***
	(0.0018)	(0.0017)
Post attacks	0.0047	0.0014
	(0.0036)	(0.0010)
Muslim dummy	–	-0.0130***
	–	(0.0039)
Interaction Muslim*Post	–	0.0014
	–	(0.0020)
Interaction Muslim*Treated Prov	–	0.0299***
	–	(0.0058)
Mean dependent variable	0.0342	0.0342
% Effect	**40.64%**	**28.07%**
Province FE	x	x
Nationality of the victim FE	x	x
Time FE	x	x
Observations	4,784	19,136
Number of clusters	52	52

Notes: Panel (A) presents the estimates of equation (4) where the outcome variable is hate crime rate against Muslim. Panel (B) shows estimates of the Triple difference in difference equation (5) where the outcome is the hate crime rate against all immigrant nationalities. Robust standard errors in parentheses clustered at the province level. ***p<0.001, **p<0.05, *p<0.10, respectively.

7.3 Terrorist attacks and stress

In the previous subsections we presented evidence supporting an increase in Islamophobia. As we have stated before, this increased Islamophobia may be a source of stress affecting pregnant Muslim women. Due to data limitations, we are not able to identify any stress-related outcomes directly from the births record data. However, we can still use other sources of data to assess whether Muslim women living in affected cities are facing increased levels of stress relative to other women. For this, we use the Catalan Health Survey (ESCA), conducted by the Health Department in Catalonia, for the years (cross-sections) 2015, 2016, 2017 and 2018. The survey compiles information about health, lifestyle and use of health services of the population living in Catalonia [19]. It is region-representative and samples individuals at the "basic health area" (AGA) level [20]. Every AGA is composed by one or more municipalities.

ESCA provides several variables related to health issues. For our purpose, we use four questions related to stress. First, we utilize a binary measure of self assessed health, which takes the value of one when the respondent declares having bad or very bad health, and zero otherwise. In the survey individuals are also asked about mental wellness. We use a number of mental health questions

[19] Unfortunately, ESCA does not provide information on prenatal health care use.
[20] AGA is the territorial health government in which the Catalan health system is organized.

and construct three dummy variables corresponding to one when respondents declare they have felt relaxed, self-confident, and happy during the last two weeks; and zero otherwise.

We formally test whether Muslim women living in affected cities experienced increased levels of stress after the attacks using the same specification as in equation (1), where now the outcomes of interest are; self-assessed health and the three indicators of mental wellness. As in the baseline estimates, we compare Muslim vs non-Muslim immigrant mothers (excluding Spanish women). We also include month and year fixed effects, women's country of birth fixed effects and AGA fixed effects. Standard errors are clustered at the AGA level.

Table 11 shows that, for Muslim women living in affected cities and being exposed to the attacks is associated with a decrease in the probability of being happy by 49.84 percentage points. For the other outcomes, even if we do not find a statistically significant result, we get the expected signs. These results are consistent with stress affecting mental wellness, which is an important channel through which the fetus can be affected while in utero.

Table 11: Terrorist attacks and Stress

	(1)	(2)	(3)	(4)
	Bad Health	**Relaxed**	**Self-confident**	**Happiness**
DDD City*Muslim*Post	**0.0622**	**-0.2082**	**-0.3399**	**-0.4984***
	(0.2210)	(0.1510)	(0.3781)	(0.2647)
Interaction City*Post	-0.1095*	-0.0560	0.0680	-0.0685
	(0.0555)	(0.1108)	(0.0765)	(0.0899)
Interaction City*Muslim	-0.0218	-0.0431	0.0727	0.0287
	(0.0426)	(0.0743)	(0.0735)	(0.0971)
Interaction Muslim*Post	0.0879	-0.0133	-0.0426	-0.1127
	(0.1021)	(0.1011)	(0.0735)	(0.0859)
Month FE	x	x	x	x
Year FE	x	x	x	x
Municipality (AGA) FE	x	x	x	x
Mothers' country of birth FE	x	x	x	x
Observations	946	877	877	877

Notes: Sample includes years 2015 to 2018. Women of childbearing age (15-45 years old). Estimation using weights according to survey design. Standard errors clustered at the "Area de region sanitaria" in Catalonia level, 43 clusters. Source: Catalan Health Department, Catalan Health Interview Survey. ***p<0.001, **p<0.05, *p<0.10, respectively.

So far, we have argued that the adverse health at birth consequences that we find are driven by maternal exposure to stress. However, this stress could induce behavioral responses and physical conditions in Muslim mothers which, in turn, may adversely affect newborn's health (Persson & Rossin-Slater, 2018). For example, it is possible that Muslim women respond to increased stress by taking up smoking or by changing their dietary habits. Those elements have been proven to increase the risk of developing diseases such as diabetes and, these conditions, have been documented to be a risk for the fetus. Moreover, high levels of stress have been linked to increased probabilities of developing high blood pressure which, in turn, increases the chances of having complications during labor, pre-term newborns and low birth weight babies. We study whether the Catalonia attacks are associated with the presence of high risk factors (hypertension and diabetes) and with being a smoker. In table 12, we can see that the attacks are positively associated with being a smoker, and with the share of Muslim women (that live in the affected cities) having diabetes. For the hypertension indicator, even if we do

not find a statistically significant association, we get a positive sign in the coefficient of interest.

Table 12: Stress and behavioral responses

	(1)	(2)	(3)
	Smoking Status	**Hypertension**	**Diabetes**
DDD City*Muslim*Post	**0.2077***	**0.0183**	**0.2340****
	(0.1207)	(0.1258)	(0.1034)
Interaction City*Post	-0.1700***	0.0028	0.0022
	(0.0615)	(0.0517)	(0.0318)
Interaction City*Muslim	-0.0414	-0.1693*	-0.0194
	(0.0466)	(0.0932)	(0.0190)
Interaction Muslim*Post	-0.0213	0.2029**	-0.0072
	(0.0599)	(0.0819)	(0.0448)
Month FE	x	x	x
Year FE	x	x	x
Municipality (AGA) FE	x	x	x
Mothers' country of birth FE	x	x	x
Observations	877	946	946

Notes: Sample includes years 2015 to 2018. Women of childbearing age (15-45 years old). Estimation using weights according to survey design. Standard errors clustered at the "Area de region sanitaria" in Catalonia level, 43 clusters. ***p<0.001, **p<0.05, *p<0.10, respectively.
Source: Catalan Health Department, Catalan Health Interview Survey.
Smoking status equals 1 if daily smoker o occasional smoker.

According to our hypothesis, the attacks should mainly induce stress in Muslim women living in affected municipalities, and should not have a significant impact for other groups of women. To test this, we conduct a placebo analysis in which we change the treated group by women born in Latin American countries (and exclude Muslim women from our sample). We re-estimate equation (1) with the stress-related outcomes: Bad health, relaxed, self-confident and happiness. The results of this placebo estimates show that, for Latin American mothers, there is no significant association between the attacks and stress markers, except for the indicator of self-confidence but with the opposite sign. One might also be concerned about different trends between Muslim and non-Muslim women before the attacks that can be contaminating our stress results. To investigate this issue we estimate an event study version of equation (1) with the four stress markers as outcomes. We use three pre-attacks and one post-attacks periods, where the reference category is the period before the attacks (t=-1). Overall, we do not find evidence of pre-trends in any of the outcomes examined. We find a significant result for the "feeling relaxed" outcome but it is in the very last period. Results of the placebo test and the event study are shown in the appendix section in tables A9 and A10, respectively.

To conclude this section, we have found evidence of an increased rejection against the Muslim community in affected places after the 2017 attacks, relative to non-exposed places. This represents a plausible channel of increased exposure to stress. In particular, an increase in the general negative feeling towards immigrants has been found in affected, compared to non-affected areas. We also find evidence in support of an increase in local hate crimes in exposed municipalities after the attacks. Moreover, we found that hate crime rate increases for Muslim victims in the affected provinces after the attacks. Finally, we find that being a Muslim women living in the target cities is associated with higher probabilities of reporting emotional stress. Previous evidence suggests that this stress can

induce behavioral and physical responses, such as smoking and diabetes, that may potentially affect newborns' health at birth. However, we recognize that there might be other potential alternative channels through which stress may be affecting Muslim women: for example, they could choose not to go out in public, or refuse to seek medical attention [21]. Moreover, increased hate crimes could lead to a reduction in labor supply by mothers or their husbands, opening the possibility for an income channel. Unfortunately, we are unable, due to data restrictions, to rule out these additional channels. In any case, we argue, and we present robust evidence about it, that Islamophobia-related stress is one of the channels affecting health at birth.

8 Conclusions

Islamophobia is a phenomenon that has increased in the last decades since the 9/11 New York terrorist attacks perpetrated by jihadist groups. The usual target of this increased rejection are Muslim individuals, usually living in affected places. There are some papers that have found a link between Islamophobia and stress (Haque et al., 2019; Samari et al., 2018), which is particularly important for pregnant Muslim women as the evidence suggests that intra-uterine exposure to stress leads to detrimental health outcomes at birth.

In turn, health at birth has proved to have an impact in adulthood outcomes such as earnings, educational attainment and well-being (Currie & Vogl, 2013). There are many factors that can affect health at birth: one of them is exposure to stress during pregnancy, that may have negative effects in terms of birth weight, complications during delivery, etc.

Regarding human capital, there are specific groups of individuals, in which immigrants are included, that are particularly vulnerable as a result of existing barriers to join the labor market, earn a equitable wage, or attend school, among others. If we add detrimental health at birth in the next generations to these already existing disadvantages, the gap between them and the host population becomes extremely difficult to eliminate.

In this sense, assessing the extent to which exogenous sources of stress, such as those coming from terrorist attacks, affect health at birth of the immigrant Muslim community becomes very relevant. In particular, it is relevant to understand if they have been object of rejection, discrimination and hate speech (Union of Muslim Communities in Spain, 2018) after a terrorist attack perpetrated by a jihadist group, as these types of situations have been proven to negatively affect pregnant women through stress.

In this paper, we evaluate the effects of the Catalonia 2017 jihadist terrorist attacks on health at birth for newborns whose mothers are born in a Muslim country and reside in the affected cities. Using a triple difference in differences approach, we find that the attacks increase the share of newborns with low birth weight and increase the share of deliveries with complications for the population under study. We also present evidence regarding the timing of the attacks and the trimester of gestation. We find

[21] In this regards, as ESCA does not provide any information on prenatal care, we have used as indirect measures outcome variables such as (i) visits to the specialist, and (ii) visits to the gynecologist to see whether there are differences in health care use in our group of interest after the attacks. Estimates from this exercise do not show any significant result in terms of any change in health care use. Results of this exercise are available upon request.

that exposure to stress, coming from the attacks, during the first trimester of pregnancy is linked to worse health at birth outcomes for our group of interest. This conclusion is consistent with other research assessing terrorist attacks and health at birth. In addition, we also find detrimental effects on the second and third trimester of gestation.

We also show that a plausible mechanism through which the attacks affect the group of interest is maternal stress. This stress comes from increased rejection against the Muslim community -Islamophobia-, particularly after the attacks. We measure this increased rejection making use of survey data analyzing attitudes towards immigrants in Spain. We find that the 2017 attacks increase the rejection against Muslims in affected provinces, increase the negative feeling towards immigrants and also contribute to an increase in the proportion of hate speech against immigrant groups in the provinces where the attacks took place. In addition, we provide an indirect measure of Islamophobia; an increase in the number of local hate crimes in target cities (relative to non-attacked cities) after the attacks. We go one step further and show that hate crime rates against Muslim victims increase after the attacks in affected areas, relative to other groups of the immigrant population. Regarding maternal stress, we present evidence suggesting an increase in the share of (immigrant) Muslim women living in affected cities that experience stress after the attacks. Moreover, we find an association between the attacks and stress-induced conditions that may potentially affect health at birth, such as smoking and diabetes. However, we recognize that there might be other channels affecting health at birth that we are not able to check due to data constraints. Nonetheless, our results are in line with the medical and economic literature that shows a positive relation between stress and detrimental health at birth, as well as research linking Islamophobia and stress.

Our estimates are robust to a set of potential threats allowing us to draw causal conclusions regarding the effects of the 2017 attacks on health at birth. However, there are some limitations in our study, coming mostly from restrictions in data availability. First, there is limited information regarding the socio-economic status of the household or the specific mother, so that we cannot assess the potential existence of heterogeneous effects. Second, we do not have a direct measure of mother's health status, which can obviously play a role in newborns' health. In spite of these drawbacks we believe our results are robust based on our identification strategy.

Finally, our results are of high policy relevance to encourage future actions towards a more inclusive society, fighting against discrimination towards a group of individuals that not only has a great presence in Spain, 4% of the total population, but also across other European countries as well as in The United States of America.

References

Almond, D., Chay, K. Y., & Lee, D. S. (2005). The costs of low birth weight. *The Quarterly Journal of Economics*, *120*(3), 1031–1083.

Almond, D., & Currie, J. (2011). Killing me softly: The fetal origins hypothesis. *Journal of economic perspectives*, *25*(3), 153–72.

Álvarez-Aranda, R., Chirkova, S., & Romero, J. G. (2020). Growing in the womb: The effect of seismic activity on fetal growth. *Economics & Human Biology*, *36*, 100815.

Amer, M. M., & Bagasra, A. (2013). Psychological research with muslim americans in the age of islamophobia: Trends, challenges, and recommendations. *American Psychologist*, *68*(3), 134.

Bader, B., & Berg, N. (2013). An empirical investigation of terrorism-induced stress on expatriate attitudes and performance. *Journal of International Management*, *19*(2), 163-175.

Becker, G., & Rubinstein, Y. (2011). Fear and the response to terrorism: an economic analysis. *University of Chicago Mimeo*, *93*.

Berkowitz, G. S., Wolff, M. S., Janevic, T. M., Holzman, I. R., Yehuda, R., & Landrigan, P. J. (2003). The world trade center disaster and intrauterine growth restriction. *Jama*, *290*(5), 595–596.

Beydoun, H., & Saftlas, A. F. (2008). Physical and mental health outcomes of prenatal maternal stress in human and animal studies: a review of recent evidence. *Paediatric and perinatal epidemiology*, *22*(5), 438–466.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2007). From the cradle to the labor market? the effect of birth weight on adult outcomes. *The Quarterly Journal of Economics*, *122*(1), 409–439.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2016). Does grief transfer across generations? bereavements during pregnancy and child outcomes. *American Economic Journal: Applied Economics*, *8*(1), 193–223.

Bloomberg, S., Hess, G., & Orphanides, A. (2004). The macroeconomic consequences of terrorism. *Journal of Monetary Economics*, *51*(5), 1007-1032.

Brown, R. (2012). *The intergenerational impact of terror: Does the 9/11 tragedy reverberate into the outcomes of the next generation?* (Tech. Rep.). Duke University, mimeo.

Camacho, A. (2008). Stress and birth weight: evidence from terrorist attacks. *American Economic Review*, *98*(2), 511–15.

Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics*, *90*(3), 414–427.

Catalano, R., Bruckner, T., Marks, A. R., & Eskenazi, B. (2006). Exogenous shocks to the human sex ratio: the case of september 11, 2001 in new york city. *Human reproduction*, *21*(12), 3127-3131.

Currie, J., & Vogl, T. (2013). Early-life health and adult circumstance in developing countries. *Annu. Rev. Econ.*, *5*(1), 1–36.

De Weerth, C., & Buitelaar, J. K. (2005). Physiological stress reactivity in human pregnancy—a review. *Neuroscience & Biobehavioral Reviews*, *29*(2), 295–312.

DiMaggio, C., & Galea, S. (2006). The behavioral consequences of terrorism: a meta-analysis. *Academic Emergency Medicine*, *13*(5), 559-566.

Elver, H. (2012). Racializing islamn before and after 9/11: From melting pot to islamophobia. *Transnat'l L. & Contemp. Probs.*, *21*, 119.

Eskenazi, B., Marks, A. R., Catalano, R., Bruckner, T., & Toniolo, P. G. (2007). Low birthweight in new york city and upstate new york following the events of september 11th. *Human Reproduction*, *22*(11), 3013–3020.

European Union Agency for Fundamental Rights. (2018). *Second survey of the european union on minorities and discrimination: Muslims* (Tech. Rep.). Luxemburg: European Union Agency for Fundamental Rights.

Galea, S., Resnick, H., Ahern, J., Gold, J., Bucuvalas, M., Kilpatrick, D., ... Vlahov, D. (2002). Posttraumatic stress disorder in manhattan, new york city, after the september 11th terrorist attacks. *Journal of Urban Health*, *79*(3), 340–353.

Galea, S., Vlahov, D., Resnick, H., Ahern, J., Susser, E., Gold, J., ... Kilpatrick, D. (2003). Trends of probable post-traumatic stress disorder in new york city after the september 11 terrorist attacks. *American Journal of Epidemiology*, *158*(6), 514–524.

Gidron, Y. (2002). Posttraumatic stress disorder after terrorist attacks: a review. *The Journal of nervous and mental disease*, *190*(2), 118–121.

Gould, E. D., & Klor, E. F. (2016). The long-run effect of 9/11: Terrorism, backlash, and the assimilation of muslim immigrants in the west. *The Economic Journal*, *126*(597), 2064–2114.

Haque, A., Tubbs, C. Y., Kahumoku-Fessler, E. P., & Brown, M. D. (2019). Microaggressions and islamophobia: Experiences of muslims across the united states and clinical implications. *Journal of marital and family therapy*, *45*(1), 76–91.

Hobfoll, S., Canetti-Nisim, D., & Johnson, R. (2006). Exposure to terrorism, stress-related mental health symptoms, and defensive coping among jews and arabs in israel. *Journal of Consulting and Clinical Psychology*, *74*(2), 207-218.

Ivandic, R., Kirchmaier, T., Machin, S., et al. (2019). *Jihadi attacks, media and local hate crime* (Tech. Rep.). Centre for Economic Performance, LSE.

Jaeger, D. A., & Paserman, M. D. (2008). The cycle of violence? an empirical analysis of fatalities in the palestinian-israeli conflict. *American Economic Review*, *98*(4), 1591–1604.

Johnston, D. W., & Lordan, G. (2012). Discrimination makes me sick! an examination of the discrimination–health relationship. *Journal of Health Economics*, *31*(1), 99–111.

Kaplan, J. (2006). Islamophobia in america?: September 11 and islamophobic hate crime. *Terrorism and Political Violence*, *18*(1), 1–33.

Khashan, A. S., McNamee, R., Abel, K. M., Pedersen, M. G., Webb, R. T., Kenny, L. C., ... Baker, P. N. (2008). Reduced infant birthweight consequent upon maternal exposure to severe life events. *Psychosomatic medicine*, *70*(6), 688–694.

Krueger, A. (2007). *What makes a terrorist.* Princenton University Press.

Lauderdale, D. S. (2006). Birth outcomes for arabic-named women in california before and after september 11. *Demography*, *43*(1), 185–201.

Lenain, P., Bonturi, M., & Koen, V. (2002). *The economic consequences of terrorism.*

Maas, A., & Lu, L. (2021). Elections have consequences: Partisan politics may be literally killing us. *Applied health economics and health policy*, *19*(1), 45–56.

Mansour, H., & Rees, D. I. (2012). Armed conflict and birth weight: Evidence from the al-aqsa intifada. *Journal of development Economics*, *99*(1), 190–199.

Persson, P., & Rossin-Slater, M. (2018). Family ruptures, stress, and the mental health of the next generation. *American economic review*, *108*(4-5), 1214–52.

Quintana-Domeque, C., & Ródenas-Serrano, P. (2017). The hidden costs of terrorism: The effects on health at birth. *Journal of health economics*, *56*, 47–60.

Reinares, F., & García-Calvo, C. (2017). Actividad yihadista en españa, 2013-2017: De la operación cesto en ceuta a los atentados en cataluña. *Real Instituto Elcano*.

Reinares, F., & García-Calvo, C. (2018). Un análisis de los atentados terroristas en barcelona y cambrils. *Análisis del Real Instituto Elcano*, *12*, 1.

Rondó, P. H., Ferreira, R. F., Nogueira, F., Ribeiro, M. C., Lobert, H., & Artes, R. (2003). Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *European journal of clinical nutrition*, *57*(2), 266.

Samari, G. (2016). Islamophobia and public health in the united states. *American journal of public health*, *106*(11), 1920–1925.

Samari, G., Alcalá, H. E., & Sharif, M. Z. (2018). Islamophobia, health, and public health: a systematic literature review. *American journal of public health*, *108*(6), e1–e9.

Samnaliev, M. (2014). The impact of discrimination, victimization and social standing on health-related quality of life. *Value in Health*, *17*(7), A331.

Sanders, N. J., & Stoecker, C. (2015). Where have all the young men gone? using sex ratios to measure fetal death rates. *Journal of health economics*, *41*, 30–45.

Schuster, M. A., Stein, B. D., Jaycox, L. H., Collins, R. L., Marshall, G. N., Elliott, M. N., ... Berry, S. H. (2001). A national survey of stress reactions after the september 11, 2001, terrorist attacks. *New England Journal of Medicine*, *345*(20), 1507–1512.

Sheridan, L. P. (2006). Islamophobia pre–and post–september 11th, 2001. *Journal of interpersonal violence*, *21*(3), 317–336.

Sheridan, L. P., & Gillett, R. (2005). Major world events and discrimination. *Asian Journal of Social Psychology*, *8*(2), 191–197.

Smits, L., Krabbendam, L., De Bie, R., Essed, G., & Van Os, J. (2006). Lower birth weight of dutch neonates who were in utero at the time of the 9/11 attacks. *Journal of Psychosomatic Research*, *61*(5), 715–717.

Swahn, M. H., Mahendra, R. R., Paulozzi, L. J., Winston, R., Shelley, G. A., Taliano, J., ... Saul, J. (2003). Violent attacks on middle easterners in the united states during the month following the september 11, 2001 terrorist attacks. *Injury Prevention*, *9*(2), 187–189.

Tartaglia, S., Rollero, C., & Bergagna, E. (2019). The two sides of islamophobia and the perception of threat from islamic terrorists. *Journal of Community Psychology*, 1-15.

Torche, F. (2011). The effect of maternal stress on birth outcomes: exploiting a natural experiment. *Demography*, *48*(4), 1473–1491.

Union of Muslim Communities in Spain. (2018, January). *Institución para la observación y seguimiento de la situación del ciudadano musulmán y la islamofobia en españa* (Tech. Rep.). Union of Muslim Communities in Spain. Retrieved from `http://ucide.org/`

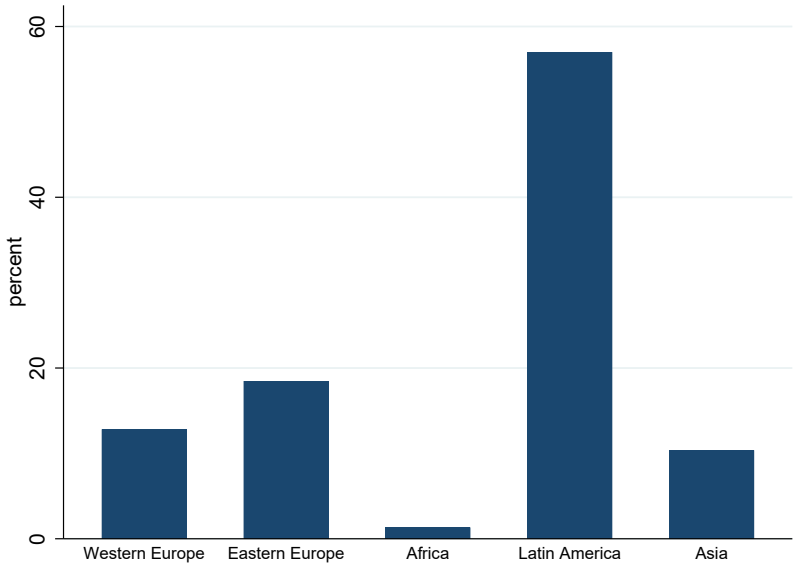
Williams, D. R., Neighbors, H. W., & Jackson, J. S. (2003). Racial/ethnic discrimination and health: Findings from community studies. *American journal of public health*, *93*(2), 200–208.

Wooldridge, J. M. (2006). Cluster-sample methods in applied econometrics: an extended analysis. *Michigan State University mimeo*.

Yamamoto, T. (2016, Spring). *Difference in difference methods. introduction to causal inference.* Keio University.

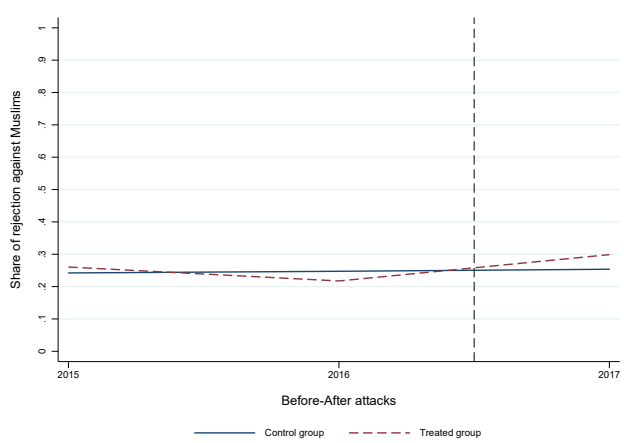
A Appendix

Figure A1: Non-Muslim immigrants distribution across countries

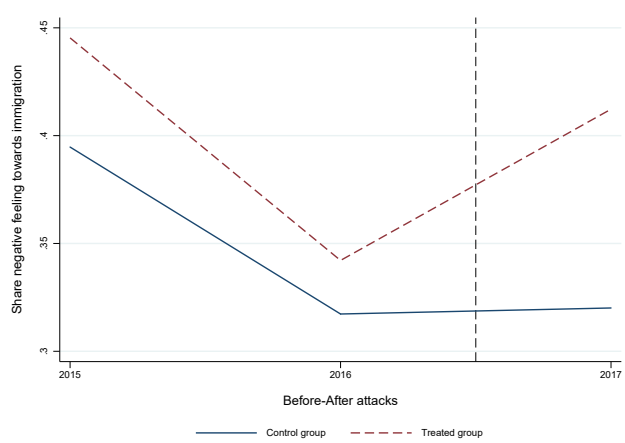


Notes: Own elaboration using the National registry of live births in Spain provided by the INE, years 2015 - 2018. Every bar represents the percent that represents each region within the control group.

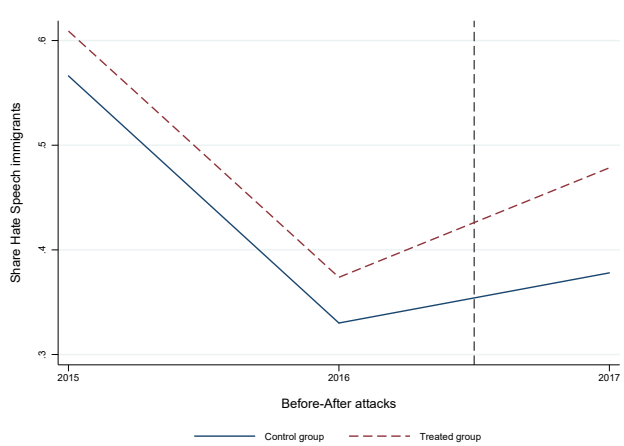
Figure A2: Raw trends for Measures of Islamophobia



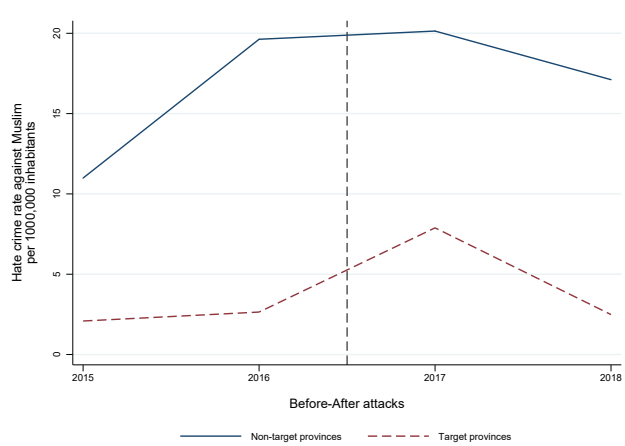
(a) Rejection against Muslims



(b) Negative feeling immigration



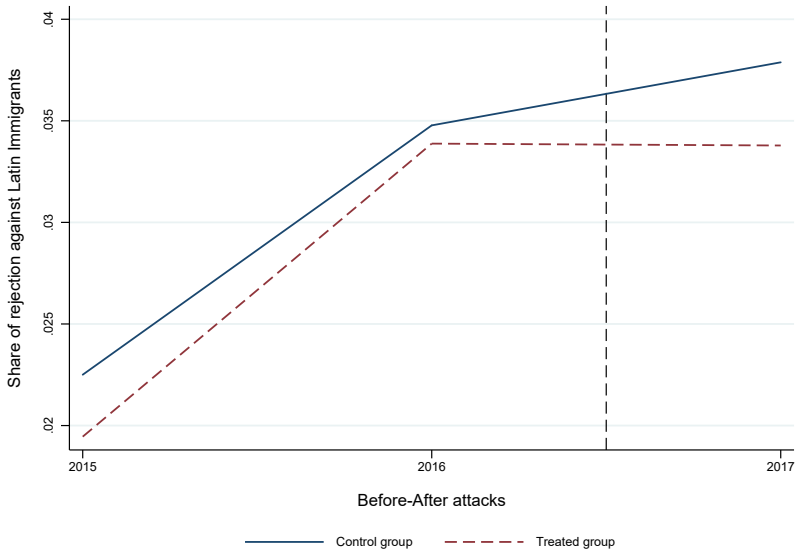
(c) Hate speech



(d) Hate crime rate against Muslims

Notes: Figure shows the raw trends of the Islamophobia-related outcomes. Panel (a) depicts trends for the rejection against Muslim, panel (b) for the negative feeling towards immigrants, panel (c) for hate speech against immigrants, and panel (d) for hate crime rate against Muslims, in all cases comparing affected vs. non-affected provinces.
Source: Authors' calculations based on data from the "Centro de Investigaciones Sociológicas" of Spain and "Ministerio del Interior", for years 2015-2018.

Figure A3: Raw trends Rejection against Latin American



Notes: Figure shows the raw trends of the rejection against Latin American comparing affected vs. non-affected provinces.
Source: Authors' calculations based on data from the "Centro de Investigaciones Sociológicas" of Spain, for years 2015-2017.

Table A1: Muslim immigrants distribution across countries

Country of birth	**Freq.**	**Percent**	**Cum.**	**% of population that is Muslim**
Algeria	483	1.68	1.68	98.00
Gambia	964	3.36	5.04	95.30
Guinea	260	0.91	5.95	84.20
Guinea-Bissau	41	0.14	6.09	42.80
Mali	427	1.49	7.58	92.40
Morocco	21,338	74.40	81.98	99.90
Mauritian	61	0.21	82.19	99.20
Nigeria	544	1.90	84.09	47.90
Senegal	1,180	4.11	88.20	95.90
Bangladesh	596	2.08	90.28	90.40
Pakistan	2,703	9.42	99.70	96.40
Syria	85	0.30	100.00	92.80
Total	28,682	100.00		

Elaboration: The Authors.
Source: National Registry of live births in Spain (INE, 2018).
For the share of Muslim population in each country we refer to the World Population Review (2010) `https://worldpopulationreview.com/countries/muslim-majority-countries/`, and `file:///C:/Users/Grace/Downloads/FutureGlobalMuslimPopulation-WebPDF-Feb10.pdf`.

Table A2: Emigration and net immigration of Muslim women

Panel A: Emigration (from SPAIN)
With destination to countries with a majority of Muslim population
Per semester, years 2015 to 2018.
Women between 15 and 49 years old – All nationalities

	2015-I	**2015-II**	**2016-I**	**2016-II**	**2017-I**	**2017-II**	**2018-I**	**2018-II**
# Migratory movements	1,855	2,091	2,087	2,236	2,765	2,663	2,094	1,899

Panel B: Emigration (from SPAIN) to foreign countries
Per semester, years 2015 to 2018.
Women between 15 and 49 years old – born in Muslim countries

	2015-I	**2015-II**	**2016-I**	**2016-II**	**2017-I**	**2017-II**	**2018-I**	**2018-II**
# Migratory movements	3,832	4,315	4,061	4,210	4,256	4,239	3,918	3,446

Panel C: Net immigration (abroad)
Per semester, years 2015 to 2018.
Women between 15 and 49 years old – born in Muslim countries

	2015-I	**2015-II**	**2016-I**	**2016-II**	**2017-I**	**2017-II**	**2018-I**	**2018-II**
# Migratory movements	1,775	1,814	2,580	3,163	3,419	5,057	6,094	10,573

Elaboration: The Authors.
Source: Emigration and immigration flows taken from the National Institution of Statistics of Spain (INE).
The unit of observation is the number of migratory movements.

Table A3: Robustness Check - Measure of Distance to Treated Cities

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**(C-Section)**
DDD Dist*Muslim*Post	**-73.6575***	**0.0521*****	**0.0041**	**-0.0401**	**0.0588***	**-0.0558**
	(40.0898)	(0.0188)	(0.0130)	(0.0371)	(0.0341)	(0.0424)
Interaction Distance*Post	-20.4512	0.0013	0.0194*	0.0053	0.0029	0.0342
	(30.7420)	(0.0156)	(0.0110)	(0.0201)	(0.0262)	(0.0259)
Interaction Distance*Muslim	13.9920	-0.0040	0.0031	0.0548***	-0.0184	0.0015
	(35.3630)	(0.0148)	(0.0097)	(0.0176)	(0.0261)	(0.0245)
Interaction Muslim*Post	37.8409	-0.0350**	0.0053	0.0351	-0.0340	0.0291
	(32.8891)	(0.0163)	(0.0114)	(0.0288)	(0.0266)	(0.0354)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	65,519	65,519	75,070	75,070	75,070	75,070

Notes: OLS estimates. Outcomes for the live births from mothers whose region of residence is Catalonia. Standard errors are clustered at the mother's municipality of residence level, 121 clusters. The variable "Distance" is modelled as a negative exponential form of the minimum distance to Barcelona, Cambrils or Ripoll.
***p<0.001, **p<0.05, *p<0.10, respectively.

Table A4: Robustness Check - Excluding Barcelona City

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**C-Section**
DDD City*Muslim*Post	**-139.5538*****	**0.0163**	**0.0283**	**0.0312**	**-0.0859***	**0.0605*****
	(11.9017)	(0.0301)	(0.0254)	(0.0469)	(0.0449)	(0.0182)
Interaction City*Post	-6.4718	0.0196	0.0221	-0.0413***	0.0765**	-0.0253
	(12.2431)	(0.0172)	(0.0162)	(0.0103)	(0.0342)	(0.0376)
Interaction City*Muslim	233.7940***	-0.0414***	-0.0423***	-0.0064	-0.0132	-0.0025
	(31.3878)	(0.0034)	(0.0073)	(0.0118)	(0.0196)	(0.0088)
Interaction Muslim*Post	-15.9175	0.0018	0.0079*	0.0013	0.0060	-0.0156*
	(10.5626)	(0.0055)	(0.0042)	(0.0069)	(0.0103)	(0.0090)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	47,621	47,621	54,582	54,582	54,582	54,582

Notes: OLS estimates of equation (1). Outcomes for the live births from mothers whose region of residence is Catalonia excluding those living in Barcelona City (21,565 observations). Standard errors are clustered at the mother's municipality of residence level, 120 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively

Table A5: Robustness Check - Excluding Ripoll City

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**C-Section**
DDD City*Muslim*Post	**-10.2867**	**0.0149*** **	**0.0046**	**0.0134***	**0.0213***	**0.0115**
	(12.0062)	(0.0057)	(0.0042)	(0.0074)	(0.0123)	(0.0091)
Interaction City*Post	-2.8852	-0.0034	0.0087**	-0.0018	-0.0111	0.0152**
	(6.6855)	(0.0047)	(0.0034)	(0.0057)	(0.0067)	(0.0060)
Interaction City*Muslim	3.1384	0.0011	-0.0004	0.0074	-0.0136**	-0.0071
	(13.8459)	(0.0039)	(0.0033)	(0.0046)	(0.0056)	(0.0062)
Interaction Muslim*Post	-15.8402	0.0018	0.0077*	0.0012	0.0052	-0.0154*
	(10.6046)	(0.0056)	(0.0042)	(0.0069)	(0.0103)	(0.0090)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	65,447	65,447	74,982	74,982	74,982	74,982

Notes: OLS estimates of equation (1). Outcomes for the live births from mothers whose region of residence is Catalonia excluding those living in the municipality of Ripoll (90 observations). Standard errors are clustered at the mother's municipality of residence level, 120 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively

Table A6: Robustness Check - Excluding Cambrils City

	(1)	(2)	(3)	(4)	(5)	(6)
	Birth Weight	**LBW**	**Prematurity**	**Complications**	**Female**	**C-Section**
DDD City*Muslim*Post	**-9.2203**	**0.0163*** **	**0.0053**	**0.0166** **	**0.0280*** **	**0.0118**
	(11.4679)	(0.0059)	(0.0045)	(0.0071)	(0.0104)	(0.0091)
Interaction City*Post	-2.8910	-0.0041	0.0081**	-0.0015	-0.0116*	0.0164***
	(6.6735)	(0.0047)	(0.0034)	(0.0057)	(0.0066)	(0.0058)
Interaction City*Muslim	-4.3075	0.0023	0.0002	0.0077	-0.0150**	-0.0079
	(8.1318)	(0.0034)	(0.0031)	(0.0047)	(0.0058)	(0.0062)
Interaction Muslim*Post	-15.8887	0.0019	0.0077*	0.0012	0.0052	-0.0155*
	(10.6016)	(0.0056)	(0.0042)	(0.0069)	(0.0103)	(0.0090)
Municipality of residence FE	x	x	x	x	x	x
Month, year of conception FE	x	x	x	x	x	x
Mother's country origin FE	x	x	x	x	x	x
Observations	65,180	65,180	74,710	74,710	74,710	74,710

Notes: OLS estimates of equation (1). Outcomes for the live births from mothers whose region of residence is Catalonia excluding those living in the municipality of Cambrils (372 observations). Standard errors are clustered at the mother's municipality of residence level, 120 clusters.
***p<0.001, **p<0.05, *p<0.10, respectively

Table A7: Hate Crimes - Event Study

	(1)
	(ln) Hate Crimes
City*Pre,t-3	-0.4670***
	(0.0491)
City*Pre,t-2	-0.0607
	(0.0617)
City*Event	0.0577
	(0.1109)
Municipality FE	x
Month FE	x
Year FE	x
Observations	7,308

Notes: Sample includes years 2015 to 2017. Time dummies are constructed on an annual base. The omitted category is one period before the attacks.
Standard errors clustered at the municipality level, 203 clusters.
Source: Catalan Health Department, Catalan Health Interview Survey.
***p<0.001, **p<0.05, respectively.

Table A8: Hate Crimes and nationality of the victim - Event Study

	(A)	**(B)**
	Difference in Differences	**Triple Difference in Differences**
Outcome	**Hate crime rate against Muslim (per 100.000 hab)**	**Hate crime rate (per 100.000 hab)**
Pre,t-2	-0.0004	0.0020
	(0.0063)	(0.0060)
Event	0.0755***	0.0613***
	(0.0177)	(0.0180)
Post,t+1	-0.0001	-0.0004
	(0.0046)	(0.0049)
Province FE	x	x
Nationality of the victim FE	x	x
Time FE	x	x
Observations	4,784	19,136

Notes: Sample includes years 2015 to 2018. Column (A) show event study version of equation (4), and column (B) those of equation (5). The omitted category is one period before the attacks. Standard errors clustered at the province level, 52 clusters.
***p<0.001, **p<0.05, respectively.

Table A9: Terrorist attacks and Stress - Placebo

	(1)	(2)	(3)	(4)
	Bad Health	**Relaxed**	**Self-confident**	**Happiness**
DDD City*Latin*Post	**-0.1849**	**-0.0589**	**0.2478****	**0.2274**
	(0.1144)	(0.2886)	(0.0980)	(0.1536)
Interaction City*Post	0.0096	-0.0197	-0.1028	-0.2470**
	(0.0986)	(0.2411)	(0.0972)	(0.1053)
Interaction City*Latin	0.1679	-0.1288	-0.1031	-0.1676
	(0.1013)	(0.1425)	(0.0965)	(0.1022)
Interaction Latin*Post	0.1564*	-0.1336	-0.1966***	-0.2182***
	(0.0833)	(0.1202)	(0.0550)	(0.0621)
Month FE	x	x	x	x
Year FE	x	x	x	x
Municipality (AGA) FE	x	x	x	x
Mothers' country of birth FE	x	x	x	x
Observations	686	665	665	665

Notes: Sample includes years 2015 to 2018. Women of childbearing age (15-45 years old). The treatment group is made up with mothers born in Latin American countries. Controls are mothers born in other foreign countries.
Estimation using weights according to survey design. Standard errors clustered at the "Area de region sanitaria" in Catalonia level, 43 clusters.
Source: Catalan Health Department, Catalan Health Interview Survey. ***p<0.001, **p<0.05, *p<0.10, respectively.

Table A10: Terrorist attacks and Stress - Event Study

	(1)	(2)	(3)	(4)
	Bad Health	**Relaxed**	**Self-confident**	**Happiness**
City*Muslim*Pre,t-3	0.0021	-0.6894***	-0.0693	-0.1380
	(0.1188)	(0.1972)	(0.1338)	(0.1415)
City*Muslim*Pre,t-2	-0.1812	-0.5532	-0.4411	-0.6622
	(0.1437)	(0.4626)	(0.3486)	(0.3437)
City*Muslim*Event	0.1798	-0.7475**	-0.6456	-1.0134***
	(0.3099)	(0.3691)	(0.4845)	(0.2310)
City*Muslim*Post,t+1	-0.2099	-0.0851	0.0713	0.2017
	(0.1565)	(0.2554)	(0.1760)	(0.2062)
Month FE	x	x	x	x
Year FE	x	x	x	x
Municipality (AGA) FE	x	x	x	x
Mothers' country of birth FE	x	x	x	x
Observations	946	877	877	877

Notes: Sample includes years 2015 to 2018. Immigrant women of childbearing age (15-45 years old). The omitted category is one period before the attacks.
Estimation using weights according to survey design. Standard errors clustered at the "Area de region sanitaria" in Catalonia level, 43 clusters.
Source: Catalan Health Department, Catalan Health Interview Survey. ***p<0.001, **p<0.05, *p<0.10, respectively.

2017

2017/1, González Pampillón, N.; Jofre-Monseny, J.; Viladecans-Marsal, E.: "Can urban renewal policies reverse neighborhood ethnic dynamics?"
2017/2, Gómez San Román, T.: "Integration of DERs on power systems: challenges and opportunities"
2017/3, Bianchini, S.; Pellegrino, G.: "Innovation persistence and employment dynamics"
2017/4, Curto-Grau, M.; Solé-Ollé, A.; Sorribas-Navarro, P.: "Does electoral competition curb party favoritism?"
2017/5, Solé-Ollé, A.; Viladecans-Marsal, E.: "Housing booms and busts and local fiscal policy"
2017/6, Esteller, A.; Piolatto, A.; Rablen, M.D.: "Taxing high-income earners: Tax avoidance and mobility"
2017/7, Combes, P.P.; Duranton, G.; Gobillon, L.: "The production function for housing: Evidence from France"
2017/8, Nepal, R.; Cram, L.; Jamasb, T.; Sen, A.: "Small systems, big targets: power sector reforms and renewable energy development in small electricity systems"
2017/9, Carozzi, F.; Repetto, L.: "Distributive politics inside the city? The political economy of Spain's plan E"
2017/10, Neisser, C.: "The elasticity of taxable income: A meta-regression analysis"
2017/11, Baker, E.; Bosetti, V.; Salo, A.: "Finding common ground when experts disagree: robust portfolio decision analysis"
2017/12, Murillo, I.P; Raymond, J.L; Calero, J.: "Efficiency in the transformation of schooling into competences: A cross-country analysis using PIAAC data"
2017/13, **Ferrer-Esteban, G.; Mediavilla, M.:** "The more educated, the more engaged? An analysis of social capital and education"
2017/14, Sanchis-Guarner, R.: "Decomposing the impact of immigration on house prices"
2017/15, Schwab, T.; Todtenhaupt, M.: "Spillover from the haven: Cross-border externalities of patent box regimes within multinational firms"
2017/16, Chacón, M.; Jensen, J.: "The institutional determinants of Southern secession"
2017/17, Gancia, G.; Ponzetto, G.A.M.; Ventura, J.: "Globalization and political structure"
2017/18, González-Val, R.: "City size distribution and space"
2017/19, García-Quevedo, J.; Mas-Verdú, F.; Pellegrino, G.: "What firms don't know can hurt them: Overcoming a lack of information on technology"
2017/20, Costa-Campi, M.T.; García-Quevedo, J.: "Why do manufacturing industries invest in energy R&D?"
2017/21, Costa-Campi, M.T.; García-Quevedo, J.; Trujillo-Baute, E.: "Electricity regulation and economic growth"

2018

2018/1, Boadway, R.; Pestieau, P.: "The tenuous case for an annual wealth tax"
2018/2, Garcia-López, M.À.: "All roads lead to Rome ... and to sprawl? Evidence from European cities"
2018/3, Daniele, G.; Galletta, S.; Geys, B.: "Abandon ship? Party brands and politicians' responses to a political scandal"
2018/4, Cavalcanti, F.; Daniele, G.; Galletta, S.: "Popularity shocks and political selection"
2018/5, Naval, J.; Silva, J. I.; Vázquez-Grenno, J.: "Employment effects of on-the-job human capital acquisition"
2018/6, Agrawal, D. R.; Foremny, D.: "Relocation of the rich: migration in response to top tax rate changes from spanish reforms"
2018/7, García-Quevedo, J.; Kesidou, E.; Martínez-Ros, E.: "Inter-industry differences in organisational eco-innovation: a panel data study"
2018/8, Aastveit, K. A.; Anundsen, A. K.: "Asymmetric effects of monetary policy in regional housing markets"
2018/9, Curci, F.; Masera, F.: "Flight from urban blight: lead poisoning, crime and suburbanization"
2018/10, Grossi, L.; Nan, F.: "The influence of renewables on electricity price forecasting: a robust approach"
2018/11, Fleckinger, P.; Glachant, M.; Tamokoué Kamga, P.-H.: "Energy performance certificates and investments in building energy efficiency: a theoretical analysis"
2018/12, van den Bergh, J. C.J.M.; Angelsen, A.; Baranzini, A.; Botzen, W.J. W.; Carattini, S.; Drews, S.; Dunlop, T.; Galbraith, E.; Gsottbauer, E.; Howarth, R. B.; Padilla, E.; Roca, J.; Schmidt, R.: "Parallel tracks towards a global treaty on carbon pricing"
2018/13, Ayllón, S.; Nollenberger, N.: "The unequal opportunity for skills acquisition during the Great Recession in Europe"
2018/14, Firmino, J.: "Class composition effects and school welfare: evidence from Portugal using panel data"
2018/15, Durán-Cabré, J. M.; Esteller-Moré, A.; Mas-Montserrat, M.; Salvadori, L.: "La brecha fiscal: estudio y aplicación a los impuestos sobre la riqueza"
2018/16, Montolio, D.; Tur-Prats, A.: "Long-lasting social capital and its impact on economic development: the legacy of the commons"

2018/17, Garcia-López, M. À.; Moreno-Monroy, A. I.: "Income segregation in monocentric and polycentric cities: does urban form really matter?"
2018/18, Di Cosmo, V.; Trujillo-Baute, E.: "From forward to spot prices: producers, retailers and loss averse consumers in electricity markets"
2018/19, Brachowicz Quintanilla, N.; Vall Castelló, J.: "Is changing the minimum legal drinking age an effective policy tool?"
2018/20, Nerea Gómez-Fernández, Mauro Mediavilla: "Do information and communication technologies (ICT) improve educational outcomes? Evidence for Spain in PISA 2015"
2018/21, Montolio, D.; Taberner, P. A.: "Gender differences under test pressure and their impact on academic performance: a quasi-experimental design"
2018/22, Rice, C.; Vall Castelló, J.: "Hit where it hurts – healthcare access and intimate partner violence"
2018/23, Ramos, R.; Sanromá, E.; Simón, H.: "Wage differentials by bargaining regime in Spain (2002-2014). An analysis using matched employer-employee data"

2019

2019/1, Mediavilla, M.; Mancebón, M. J.; Gómez-Sancho, J. M.; Pires Jiménez, L.: "Bilingual education and school choice: a case study of public secondary schools in the Spanish region of Madrid"
2019/2, Brutti, Z.; Montolio, D.: "Preventing criminal minds: early education access and adult offending behavior"
2019/3, Montalvo, J. G.; Piolatto, A.; Raya, J.: "Transaction-tax evasion in the housing market"
2019/4, Durán-Cabré, J.M.; Esteller-Moré, A.; Mas-Montserrat, M.: "Behavioural responses to the re)introduction of wealth taxes. Evidence from Spain"
2019/5, Garcia-López, M.A.; Jofre-Monseny, J.; Martínez Mazza, R.; Segú, M.: "Do short-term rental platforms affect housing markets? Evidence from Airbnb in Barcelona"
2019/6, Domínguez, M.; Montolio, D.: "Bolstering community ties as a means of reducing crime"
2019/7, García-Quevedo, J.; Massa-Camps, X.: "Why firms invest (or not) in energy efficiency? A review of the econometric evidence"
2019/8, Gómez-Fernández, N.; Mediavilla, M.: "What are the factors that influence the use of ICT in the classroom by teachers? Evidence from a census survey in Madrid"
2019/9, Arribas-Bel, D.; Garcia-López, M.A.; Viladecans-Marsal, E.: "The long-run redistributive power of the net wealth tax"
2019/10, Arribas-Bel, D.; Garcia-López, M.A.; Viladecans-Marsal, E.: "Building(s and) cities: delineating urban areas with a machine learning algorithm"
2019/11, Bordignon, M.; Gamalerio, M.; Slerca, E.; Turati, G.: "Stop invasion! The electoral tipping point in anti-immigrant voting"

2020

2020/01, Daniele, G.; Piolatto, A.; Sas, W.: "Does the winner take it all? Redistributive policies and political extremism"
2020/02, Sanz, C.; Solé-Ollé, A.; Sorribas-Navarro, P.: "Betrayed by the elites: how corruption amplifies the political effects of recessions"
2020/03, Farré, L.; Jofre-Monseny; J., Torrecillas, J.: "Commuting time and the gender gap in labor market participation"
2020/04, Romarri, A.: "Does the internet change attitudes towards immigrants? Evidence from Spain"
2020/05, Magontier, P.: "Does media coverage affect governments'preparation for natural disasters?"
2020/06, McDougal, T.L.; Montolio, D.; Brauer, J.: "Modeling the U.S. firearms market: the effects of civilian stocks, crime, legislation, and armed conflict"
2020/07, Veneri, P.; Comandon, A.; Garcia-López, M.A.; Daams, M.N.: "What do divided cities have in common? An international comparison of income segregation"
2020/08, Piolatto, A.: "'Information doesn't want to be free': informational shocks with anonymous online platforms"
2020/09, Marie, O.; Vall Castello, J.: "If sick-leave becomes more costly, will I go back to work? Could it be too soon?"
2020/10, Montolio, D.; Oliveira, C.: "Law incentives for juvenile recruiting by drug trafficking gangs: empirical evidence from Rio de Janeiro"
2020/11, Garcia-López, M.A.; Pasidis, I.; Viladecans-Marsal, E.: "Congestion in highways when tolls and railroads matter: evidence from European cities"
2020/12, Ferraresi, M.; Mazzanti, M.; Mazzarano, M.; Rizzo, L.; Secomandi, R.: "Political cycles and yardstick competition in the recycling of waste. evidence from Italian provinces"

2020/13, Beigelman, M.; Vall Castelló, J.: "COVID-19 and help-seeking behavior for intimate partner violence victims"
2020/14, Martínez-Mazza, R.: "Mom, Dad: I'm staying" initial labor market conditions, housing markets, and welfare"
2020/15, Agrawal, D.; Foremny, D.; Martínez-Toledano, C.: "*Paraísos fiscales*, wealth taxation, and mobility"
2020/16, Garcia-Pérez, J.I.; Serrano-Alarcón, M.; Vall Castelló, J.: "Long-term unemployment subsidies and middle-age disadvantaged workers' health"

2021

2021/01, Rusteholz, G.; Mediavilla, M.; Pires, L.: "Impact of bullying on academic performance. A case study for the community of Madrid"
2021/02, Amuedo-Dorantes, C.; Rivera-Garrido, N.; Vall Castelló, J.: "Reforming the provision of cross-border medical care evidence from Spain"
2021/03, Domínguez, M.: "Sweeping up gangs: The effects of tough-on-crime policies from a network approach"
2021/04, Arenas, A.; Calsamiglia, C.; Loviglio, A.: "What is at stake without high-stakes exams? Students' evaluation and admission to college at the time of COVID-19"

Institut d'Economia de Barcelona

Universitat de Barcelona

ieb@ub.edu
www.ieb.edu

Public Policies

IEB Working Paper