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The Ramadan Effect in the Workplace*

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Abstract

We investigate the consequences of Ramadan on the incidence of work accidents. Using daily observations from 2003 to 2016, we exploit the solar rotation of Ramadan days (11 days backward each year) to assess the impact of Ramadan on accidents involving Muslim workers in Spain, estimating a decrease in injuries for these workers with no spillover effects on non Muslim workers (mainly South Americans and Romanians). We explain our results as mainly driven by adjustments at both the extensive and intensive margin in the labor market. We show that the effect is stronger where Ramadan is harsher (longer duration of the fasting day based on latitude), and in provinces where there is a higher concentration of naturalized Muslims. Based on our results, policies supporting religious diversity and reconciling religious practices with the working schedule might decrease health costs related to occupational injuries.

JEL Classification: I12, J28, J61, J81

Keywords: Workplace Accidents, Ramadan, Religious accommodations, Immigrant Workers

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1 Introduction

In western countries, Christmas is celebrated and it is not considered a working day, but this is not always the case for many religious festivities, equally important to minorities. As societies become more multicultural, there is increasing interest in the effects of not-nationally-acknowledged religious practices in the workplace, both through the design of workplace religious accommodations and through the expected behavioral changes by workers during their religious holidays. This interest is sometimes translated into concerns: workers professing other religions are depicted as potential threats to workplace safety and to the firm's overall productivity.

We focus on a "costly" religious practice (Iannaccone, 1992), the Islamic holy month of Ramadan. The practice of Ramadan is relevant for several reasons. It requires a strict form of fasting, since complying Muslims cannot drink or eat from dawn to dusk.[1] It lasts for about 30 days, while similar types of recurrent fasting, such as the Jewish Yom Kippur and Tisha B'Av, last for 25 hours. This means that it is easier to provide an assessment of its effects. Additionally, Ramadan is one of the most respected pillars of Islam. For instance, even though only 39% of American-born Muslims and 44% of foreign-born Muslims say they pray five times a day, around 80% of American Muslims observe Ramadan by fasting regardless of the place where they were born (USA or abroad), their gender or race. Similar results hold across Europe. Only 33.9% of German Muslims state that they pray every day (Federal Office for Migration and Refugees, 2009), but 70% of Sunnis fast during Ramadan. This means that observing Ramadan can be quite stressful for Muslims residing in non-Muslim countries, where daily and working life are not usually adjusted to the religious needs of a part of the population that is generally considered a minority. Because of this, Ramadan is often perceived as a potential threat to safety in the workplace.[2]

[1] During the Christian Lent, believers can still eat and drink, while they should abstain from meat consumption on Fridays. Buddism includes different forms and degrees of fasting not necessarily related to a specific date.

[2] See for instance, the statement of the immigration and integration Danish minister, Inger Støjberg, in May 2018: "I wonder if a religious order commanding observance to a 1,400-year-old pillar of Islam is compatible with the society and labour market that we have in Denmark in 2018."

Prolonged fasting may cause physical distress (Toda and Morimoto, 2004; Maideen *et al.*, 2017), which could have a different impact on the risk of being involved in a work accident across seasons and types of jobs (e.g., blue vs. white collars).[3] Other things being equal, occupational injuries might increase for two groups of workers during Ramadan: Muslim and non-Muslim workers. If the effect on Muslim workers is intuitive, non-Muslim workers might experience a higher probability of incurring in a work accident through a spillover effect or through a composition effect: a spillover effect if Muslim and non-Muslim workers share shifts and work duties, a composition effect if non-Muslim workers are reassigned to some of the Muslim workers' tasks. We argue that workplace religious accommodations for Ramadan can decrease the probability of Muslim workers incurring occupational injuries during Ramadan and its potential spillover effects.[4] Yet, the effect of Ramadan on occupation injuries are not only filtered by religious accommodations, but they also depend on behavioral adjustments triggered by compliance with the religious practice.

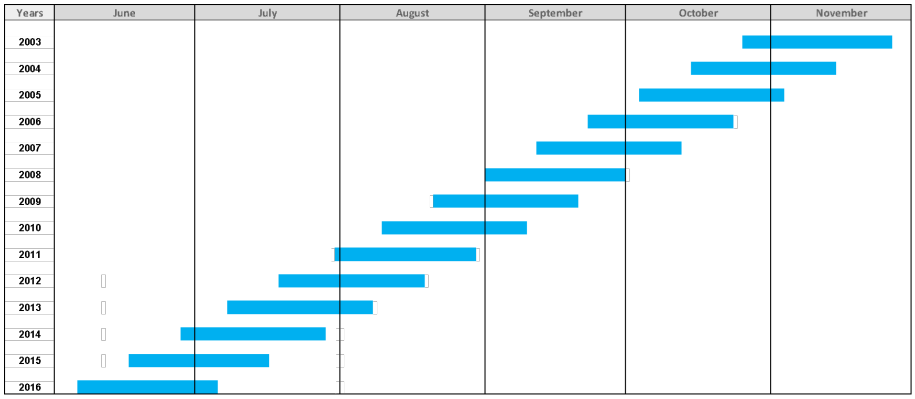
To prove our point, we rely on a unique administrative dataset from Spain. Spain is an ideal setting for our analysis. Its Muslim population has been growing in recent decades, and it is mainly involved in blue collar occupations, in which the physical burden of the job can be demanding. Spain is not a Muslim country, and thus findings based on Spanish evidence may provide insights for other non-Muslim countries with active Muslim communities. Our dataset contains day-year observations for each of the 52 Spanish provinces so that we can exploit of the rotation of Ramadan days to identify its effects similar to, among others, Almond and Mazumber (2011) and Campante and Yanagizawa-Drott (2015). Each year, Ramadan moves backward by 11 days: in 2003 (first year in our dataset) Ramadan started on October 26th and ended on November 26th, while in 2016 (the last year

[3]Additional effects, which are not the focus of our analysis, could be on the quality of the product for which the worker is in charge.

[4]There are many good practices adopted by employers, not necessarily through specific internal regulations. The CAVA restaurant chain has no official policy, but a local Montgomery County manager has frequently reshuffled schedules and working hours to help fasting employees. The GIANT grocery chain has no official policy, but local store managers have given fasting employees less strenuous tasks, asking them to help customers at the self-checkout line rather than do heavy lifting in the stockroom. Sweet Express is a trucking company based in Grand Rapids with about one-sixth of its employees being Muslim in 2013. Again, with no specific policy in place, the company attempts to find temporary stationary jobs for those observing Ramadan.

in our dataset) Ramadan started on June 6th and ended on July 5th. We provide a better idea of the rotation in Figure 1.

Figure 1: **Distribution of Ramadan Dates (2003-2016)**



Through a fixed effects model at the provincial level, we show that during Ramadan days the incidence of working accidents involving Muslim workers decreases by 0.9%-1.4%. At the same time, we do not detect any significant change in the incidence of accidents involving non-Muslim workers. Our results are robust to droppping the observations during national and provincial holidays and to restricting the sample to the period from June 6th (the first day of Ramadan in 2016) to November 27 (the last day of Ramadan in 2003). Our results are also supported by evidence from Health Barometer (*Barometro Sanitario*) a national survey on the utilization of health care services. Using this quarterly survey, we show that Muslims are less likely to access hospital emergency departments during the quarters including Ramadan, whereas there is no significant change in the incidence of non-emergency hospital services and no significant impact on non-Muslim respondents. This is consistent with the fact that emergency departments represent the preferred point of care in the case of working accidents.

We investigate possible composition effects as far as the severity of accidents is concerned. After defining accident severity according to outcomes (*e.g.*, death of the workers, and days of absence per accident), we do not detect any change in the severity of injuries during Ramadan days for both Muslim and non-Muslim workers. The time dynamics of the effect matches with a reasonable expectation that the decrease is not instantaneous. First, we run a discontinuity analysis,

using days from the start of Ramadan as our running variable, showing the lack of a sharp effect at the threshold (day 1 of Ramadan). We implement an event study pooling together Muslim and non-Muslim workers, and identify the second part of Ramadan (from day 15 to day 30) as the period recording the decrease in accidents.

Insight on the distribution of accidents through economic sectors (industry, agriculture, construction, commerce, and service) shows that the main decrease occurred in the agricultural sector, followed by the service sector, even though results for the latter are not robust. When it comes to the harshness of Ramadan, defined as the length of the fasting day, we follow Campante and Yanagizawa-Drott (2015): the administrative data cover a period of 14 years during which Ramadan falls through different seasons, and thus relying on the different provincial latitudes, we have variation on the average day duration of Ramadan in each year. We show that an increase by 20 minutes in an average duration of 13 hours of daylight (*i.e.*, the average duration of Ramadan in 2009) generates a further 0.06% decrease in working accidents. Finally, we show that the higher the incidence of naturalized Muslims (*i.e.*, the number of people born in a Muslim country with Spanish nationality), the lower the incidence of accidents during Ramadan. This result is coherent with the fact that, where the presence of the Muslim communities has a longer history, we would expect the local labor market to be more flexible to its religious needs.

We list a series of theoretical adjustments in the labor market both at the extensive and the intensive margin, and, for a subset, we propose estimated proxies. Depending on the type of job (e.g. permanent or temporary, self-employed or employed), during Ramadan Muslim workers could simply decide not to work as, for instance, in the case of delaying the start of a new job. They could decide to work less (*e.g.*, part time) upon agreement with the employer if not self-employed. The total number of hours worked could not change, and yet there could be adjustments to work schedules, such as through changes in breaks so as to anticipate the end of the working day or through changes in shifts when possible. Finally, behavioral changes are likely as in the form of an increased level of attention dedicated to working tasks to compensate for the physical distress caused by fasting. Alternatively or in addition, a stricter adherence to other prescriptions of Islam, as

the ban on alcohol consumption, during Ramadan could decrease the probability of an accident.

We provide both qualitative and quantitative evidence of what occurs in the Spanish labor market. Qualitative evidence shows that there are collective labor agreements signed in several provinces that allow more flexibility in working hours and shifts during Ramadan, and that several major employers (*e.g.*, chains) allow the same flexibility in their firms. Quantitative evidence is based both on to adjustments in the labor market and on risky habits using three datasets: the quarterly Spanish Labor Force Survey, the daily Continuous Sample of Working Lives ("Muestra Continua de VidasLaborales", MCVL), and the Spanish household quarterly survey on Alcohol and Drugs consumption (EDADES). Through these data, we show that, conditional on working, when Ramadan affects a quarter of the Labor Survey, only Muslim workers work 1.1% fewer hours, they sign 6.4% fewer new employment contracts during Ramadan days, and they are 88% less likely to declare that they consumed alcohol if the 30 days before their interview overlapped with Ramadan. The decrease in alcohol consumption should not be considered the main driver of the estimated effect on occupational injuries for at least two reasons: the proportion of Muslims declaring alcohol consumption is quite small on average, and if the believers stop consuming alcohol on the first day of Ramadan, as they should, it is difficult to reconcile this behavioral change with the time dynamic we estimate (day 15-30). This leaves room for other behavioral adjustments coming from actual unobservable behaviors, as increasing the level of attention when executing a task or performing a task slower, to consume less energy and commit less errors.

It is not always easy to predict the costs of the adjustments. Even if some workplace religious accommodations seem to come at a very low cost, as in the case of moving meal breaks, we need to be aware that costs are a function of the type of production, among other things. In a production chain, the modification of meal breaks requires the rescheduling of every shift.[5] However, the religious

[5]In 2017, in Michigan, several Muslim employees sued Brose Jefferson auto supplier for religious discrimination after their employer (the fourth-largest family-owned automotive supplier according to their website) refused to allow adjustments to the meal break during Ramadan. In a case lasting from 2010 to 2015, JBS Swift vs. EEOC, meat-packing company JBS was accused of discriminating its employees on the basis of changes to their evening breaks during Ramadan

practice that we have analyzed is foreseeable, being based on the lunar calendar, and thus the cost of rearranging the shifts should be easy to minimize. This is true for many religious practices.

On the other hand, the costs of occupational injuries (or the benefit of avoiding them) are more unforeseeable. In addition to the medical expenses, compensation and legal or administrative expenses need to be considered. In a broader perspective, the time to investigate the event, the adoption of new safety measures or the increase in monitoring the existing ones, the lower productivity, and the potential lower employee morale are among those emphasized by both the American and the European Occupational Safety and Health Administration. Based on our preferred estimate, during Ramadan we observe a 1.4% fewer accidents involving Muslims, which, given a daily incidence of 1.08 accidents during non Ramadan days, translates to a decrease of 0.015 accidents per day (1.08*0.014). On 25 working days, we count -0.375 accidents per Ramadan per province (0.015*25), which considering the overall 50 provinces (and leaving the African provinces out of the picture), means -18.75 accidents each year at the national level (0.375*50). The challenge to provide a money benchmark for these injuries is due to the fact that we cannot associated an average type of disability or a proper evaluation of the emotional distress due to an occupational injury. However, a simulation on the average cost of a working accident in Spain during the period 2007-2011 provided a raw amount of 23,251 euros per accident (Rubio, 2012).[6] At the national level this would produce a saving of 435,956 euros (485,981 dollars as at December 2019) only in material damages.

Our contribution borrows from the literature on the direct effects of religious practices on economic performance, of which Campante and Yanagizawa-Drott (2015) is among the most representative works. They test the effect of religious

2008, with the Nebraska and Colorado Federal Courts disagreeing over whether shifting a break schedule would have placed an undue burden on the company. A 2010 EEOC case against Electrolux, a Swedish international company producing household appliances and appliances for professional use, collected complaints from employees who were initially denied a request to break their fast after sunset in accordance with the observation of Ramadan. The request clashed with a 2010 health and safety policy introduced by Electrolux that prohibited food in production areas of the plant.

[6]This number is obviously very different from available estimates in the US, since Spain has a public healthcare system and workers can rely on a welfare system.

practices on the economic growth of Muslim countries, measured as GDP. Exploiting differences in strictness of Ramadan triggered by different latitudes across Muslim countries, Campante and Yanagizawa-Drott (2015) show that longer daily exposure to Ramadan has a negative impact on GDP. However, when it comes to personal well-being, higher compliance with the religious practice is associated with higher levels of life satisfaction.

Since occupational injuries can have substantial consequences for workers' health, our work is also related to the health economics literature that exploits the exposure to Ramadan of pregnant women in determining the causal link between food deprivation during pregnancy and health at birth or later-life outcomes, as health conditions or cognitive performance (Almond and Mazumber, 2011; Van Ewijk, 2011; Oosterbeek and van der Klaauw, 2013; Almond, Mazumder and Van Ewijk, 2015; Majid, 2015; Jurges, 2015).

The remainder of this paper proceeds as follows. Section 2 provides information on Muslim communities in Spain. Section 3 details our dataset and provides basic trend statistics on working accidents. In Section 4, we account for the identification and present our main results, while checking for composition effects, sectoral effects, the time dynamic of the response, and the role of naturalized Muslims. Section 5 accounts for the qualitative and quantitative evidence on the labor market during Ramadan, while Section 6 concludes.

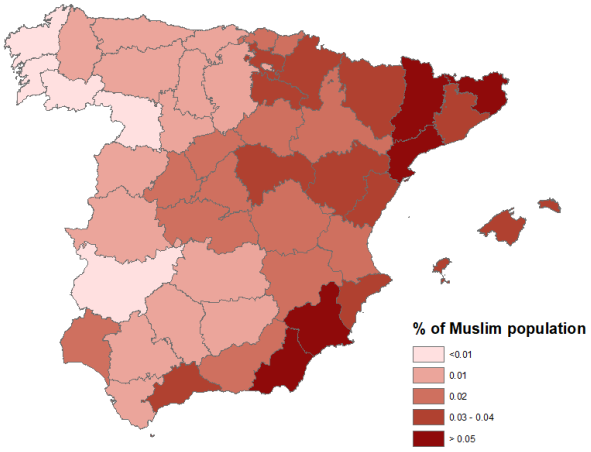
2 Muslims in Spain

In 2016, Muslims accounted for approximately 4% of the Spanish population and immigrants from Morocco were the most represented (67.6%) followed by Pakistani (7%) and Senegalese (5.6%) (UCIDE, 2017). As shown in Figure 2 (a), immigrant Muslims tend to concentrate more in the east of the country, although they are a significant part of the immigrant population across all provinces, as apparent from part (b). According to a recent study by the Ministries of Justice, Labour and Social Affair and the Interior (Metroscopia, 2011), the immigrant Muslim population is well integrated into Spanish society as 70% of respondents state that they feel at home in Spain. 53% define themselves as practicing Muslims and the average Muslim considers herself very religious. On a 10-point scale of religious

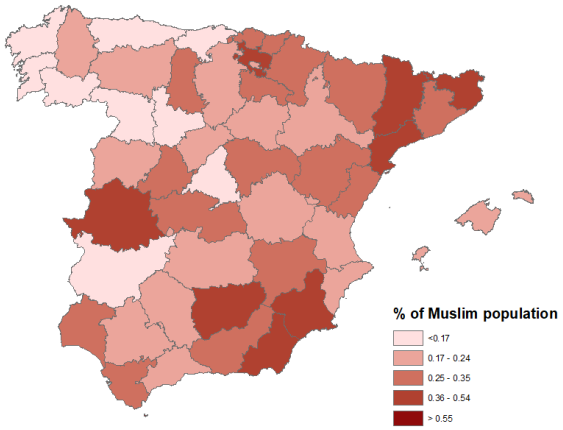
belief, Muslims score on average 7.8 against 4.6 of Christian Spaniards.

Figure 2: **Immigrant Muslims in Spain (2016, INE)**

(a) On total residents



(b) On immigrant residents

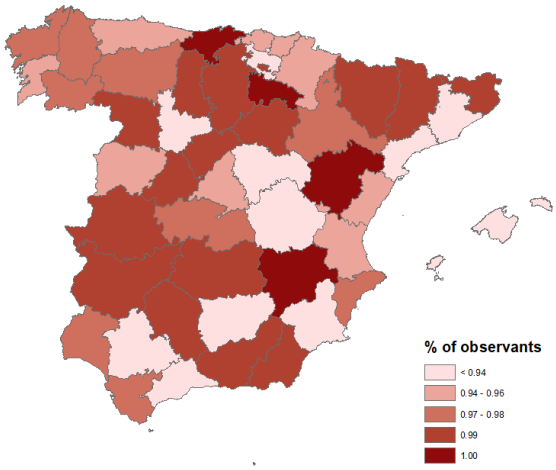


Notes: Based on data provided by the Spanish National Institute of Statistics (Instituto Nacional de Estadística - INE) for the year 2016. Based on the percentiles of the distribution of the measures of interest, figures (a) and (b) show the share of the Muslim population of the total population and of the immigrant population, respectively, at the provincial level.

Similar to non-Muslim countries, in Spain the holy month of Ramadan is celebrated with fasting and is widely observed (Jiménez-Aybar and Barrios Baudor, 2006). This is clearly depicted in Figure 3 showing the percentage of observant Muslims at the provincial level by quantiles of the distribution. Even though the

vast majority of provinces report a share of observants above 94%, the overall average of 84% of Muslims fasts during the holy month (UCIDE, 2017). The observance rate registered in Spain is consistent with that observed in most countries with sizable Muslim populations. For example, according to a 2017 study by the Pew Research Center for Religion & Public Life, 98% fast during Ramadan in Morocco, 97% in Pakistan and Senegal, to mention only the main countries of the origin of Muslims residing in Spain (Pew Research Center, 2012).

Figure 3: **Ramadan Observance in Spain (2016)**



Notes: Based on data provided by the Union of the Islamic Communities of Spain (Unión de Comunidades Islámicas de Espana - UCIDE, 2017). The figure depicts the share of the observant Muslim population at the province level based on the quantiles of the distribution of the measures of interest.

Given its characteristics, the practice of Ramadan can affect the believer's physical and psychical performance: 25% Muslims in Spain claim that fasting undermines their work performance (Jiménez-Aybar and Barrios Baudor, 2006). Specifically, major distress is perceived at sunset when fasting ends, but the working day may not. Over time, there have been efforts to favor the integration of the Islamic communities and confession in Spain. A major step in this sense was the Cooperation Agreement between the State and the Islamic Commission of Spain (CIE) signed in April 1992. The Agreement recognizes the CIE as the representative body of the Muslim communities and regulates different aspects of the practice and organization of the Islamic confession in the country. In particu-

lar, with respect to labor conditions, it officially recognizes Islamic festivities and commemorations, as well as the possibility upon request of concluding the working day one hour before sunset during Ramadan. The merit of this agreement is to highlight the necessity of more flexibility to make the practice of Ramadan possible. Although the actual measures to be adopted need to be agreed between employers and employees, it is noteworthy that at least 37% of Muslim workers are aware of the Cooperation Agreement and its content (Jiménez-Aybar and Barrios Baudor, 2006).

3 Data on Work Accidents

Data were provided by the Spanish Ministry of Employment, Migration and Social Security and they include the universe of individuals that experienced a work accident in Spain from 2003 to 2016. The dataset includes information on the characteristics of the accident as well as some personal information on the employee.[7] The exact date of the accident is available, but the identity of the worker is not. As such, we cannot track accidents involving the same worker and we end up dealing with a repeated cross section. We do not have information on the religious affiliation of the workers. Therefore, we identify Muslim workers on the basis of the country of nationality, an item of information available through our data. On the basis of the nationality, we are able to form three groups of workers: Muslim workers, which include nationals from 48 predominantly Muslim countries (see Table A.1); non-Muslim workers, which include mainly immigrants from Latin American and Eastern Europe (prevalence of Romanians, see Farrè 2015); and Spanish workers. While the likelihood that there are Muslim believers among the non-Muslim nationalities is extremely low, the same it is not true for Spaniards. Among Spaniards, there are naturalized immigrants from Muslim countries as well as second/third generations. Because of this, we leave Spaniards out of the main analysis and provide some results on this sample in the Online Appendix.

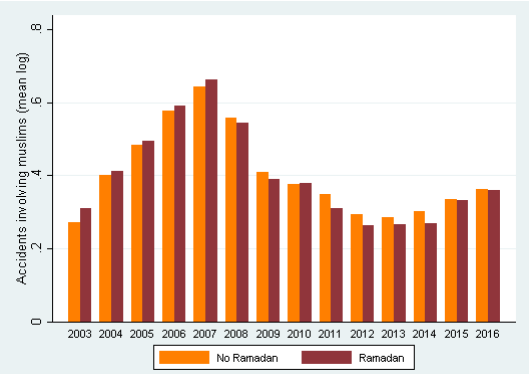
In Figure 4, we report the distribution of accidents involving Muslim workers on

[7] These administrative data only record accidents experienced by workers with an employment contract.

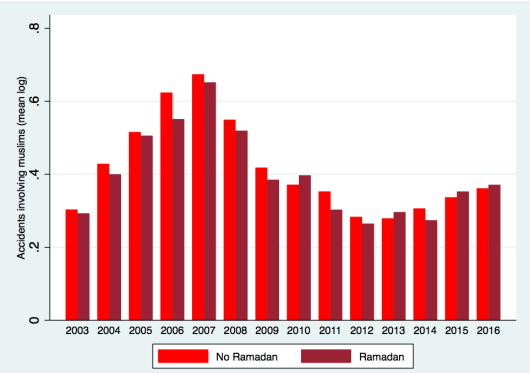
the entire sample and on the sample between June and November, distinguishing between accidents in and out of Ramadan.[8] A pure descriptive recollection points to a decrease in accidents during Ramadan days. Once we plot the trends of accidents involving Muslims and non-Muslims by intervals of 5 days from the beginning of Ramadan as in Figure 5, it also becomes apparent that there is a decrease in the number of accidents involving Muslims as Ramadan weeks pass.

Figure 4: **Distribution of Accidents Involving Muslims (Ramadan vs No Ramadan)**

(a) Entire sample



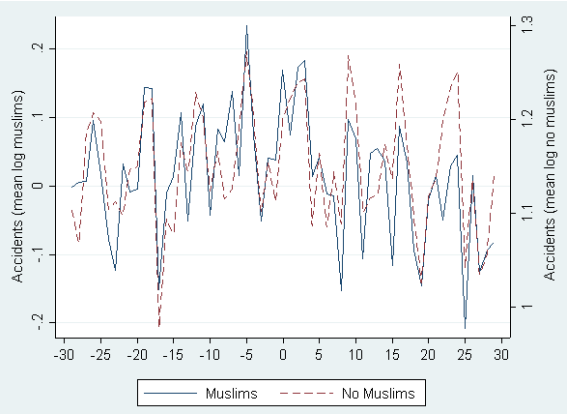
(b) June - November



Notes: The figures show the distribution of work accidents involving Muslims, distinguishing between those that occurred during Ramadan and those that did not. Figure (a) is based on all available observations between 2003 and 2016, while figure (b) uses only the sample from June 6th to November 26th.

[8]There is a clear decrease in the total number of occupational injured after 2007 due to the effect of the Great Recession, which was the cause of strong increases in unemployment in Spain; while the unemployment rate was 10.36% in the second quarter of 2008, it reached a peak level of 27% in the first quarter of 2013.

Figure 5: **Accidents Involving Muslim and Non-Muslim Workers**

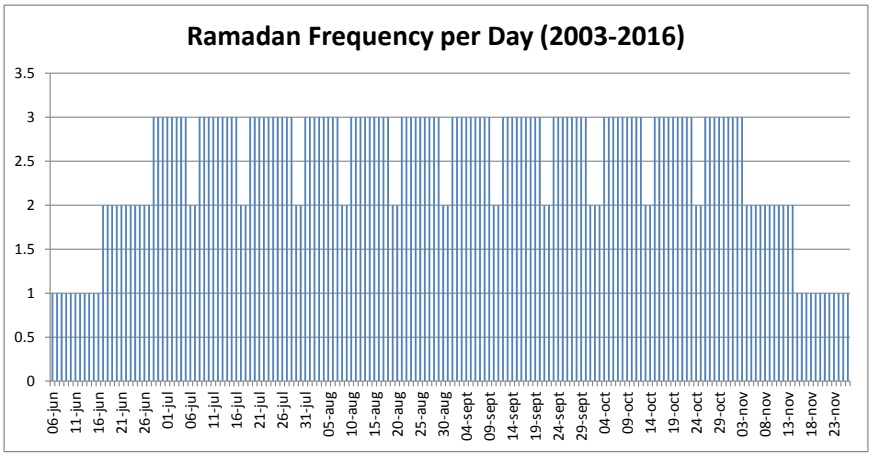


Notes: The figure plots the trends of work accidents by 5-day intervals since the beginning of Ramadan (day 0) for Muslim and non-Muslim workers.

4 Econometric Strategy and Results

Our identification relies on the rotation of Ramadan days across the years. From 2003 to 2016, we can count on about 420 treated days (30d*14y), representing 8% of the 5,110 total available days (365d*14y). These values need to be multiplied by the 52 provinces since our main outcome of interest is the logarithm of the daily number of work accidents at the provincial level. However, our Ramadan dates do not fully cover the entire year and there may be concerns about unobservable seasonal effects due to the use of only a part of the year, even after controlling for seasonality. Hence, we also focus on a narrower time window between the calendar day coinciding with the beginning of Ramadan in 2003 and the calendar day when Ramadan ended in 2016. This means we retain only the days between June 6th and November 26th for each year in our dataset for a total of 2,436 days (174d*14y), of which the 420 treated days represent 17%. Figure 6 shows the frequency with which each day in the Ramadan spell is treated.

Figure 6: **Frequency of Treated Days (2003-2016)**



To estimate the impact of Ramadan on work accidents involving Muslims and non-Muslims, we use the model defined by Equation 1. *Ramadan* is equal to 1 when a day d in year t is a Ramadan day and 0 otherwise. In a basic specification, we control for a set of fixed effects at different levels: DoW day of the week to address structural differences between accidents occurring on different days of the week, $Year$ to capture exogenous shocks affecting all provinces, WoY week of the year to control for seasonality, *Province* to control for time invariant characteristics at the provincial level that could affect the attitude towards immigrants as being more respectful of their religious beliefs. Errors are clustered at the provincial level to control for serial correlations. In a second specification, we also control for the number of employed Muslims per province quarter-year, since accidents are a function of the number of employed workers. Finally, in a third specification, we drop the observations from Ceuta and Melilla, two Spanish provinces located in northern Africa and with a prevalent Muslim population. This is done to check if our main results are uniquely driven by the adjustments in the labor market that are likely to happen in those provinces.

$$Log(Accidents)_{dtp} = \delta Ramadan_{dt} + \pi DoW_{dt} + \rho Year_t + \gamma WoY_w + \rho Province_p + \epsilon_p \quad (1)$$

We estimate Equation 1 on three samples for both Muslim and non-Muslim

workers. The first sample includes all observations. In a second sample, we drop both national and provincial holidays since work schedules on those days could be out of the ordinary. In a final third sample, we make a further drop so as to have only the days between June 6th and November 26th of each year. Table 1 shows the results for each specification and sample. We find two important results: during Ramadan days Muslim workers face fewer accidents in a range between 0.9 and 1.4%, while there is never a significant effect on accidents involving non-Muslim workers.[9]

Our evidence of an average decrease in the number of accidents is corroborated by the quarterly survey on access to care. The Health Barometer (*Barometro Sanitario*) is a national survey that collects information on opinions, attitudes, utilization, and perceptions of health services among a representative cross-section of the Spanish population, aged 18 and above. This survey has the advantage that it is run three times a year so that, regardless of the limitation of not having daily information, we can better capture the timing of Ramadan. We explore the impact of Ramadan on 4 main outcomes: good self-assessed health (which is a dummy with value 1 if the self-rated health is very good, good and regular, and zero for bad and very bad health), visit to general practitioners (which is a dummy with value 1 if the individual has visited the general practitioner in the last 30 days and zero otherwise), visit to the hospital emergency department (which is a dummy with value 1 if the individual has visited the emergency department in the last 30 days and zero otherwise), and visit to a hospital (which is a dummy with value 1 if the individual has used any of the non-emergency services of a hospital in the last 30 days and zero otherwise). The data on these outcomes are available only for the 2010-2016 period and, consistent with the main analysis, we restrict the analysis to non-Spaniards (as defined by their country of origin). We estimate a fixed effects model at the yearly, provincial, and quarter level whose results are reported in Table 2. Although we cannot rely on a large sample, results show a significant decrease in the accesses to emergency departments for Muslims during the quarters affected by Ramadan. We do not find any significant impact on either visiting a general practitioner or using a hospital non-emergency service.

[9]Results on the sample of Spaniards in Table A.2 show a decrease in accidents in a magnitude between 1.5 and 2.1%.

This is consistent with the idea of a general decrease in accidents. The most common and easiest way to obtain care following a work accident is to visit a hospital emergency department. In fact, an individual must first obtain a doctor's referral to access non-emergency hospital services, while to arrange a physician's office visit she would have to first contact her insurance company or that of the employer to be directed to a doctor. The result on self-reported health is not statistically significant, and thus we cannot in fact comment on the self-perception during Ramadan. There are no significant effects in the sample of non-Muslim workers.

Table 1: **Effects of Ramadan on Muslim Work Accidents (Log)**

	Muslims			**Non-Muslims**		
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: ALL						
Ramadan	-0.010**	-0.011**	-0.011**	-0.007	-0.008	-0.008
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)
Observations	265,912	256,787	246,563	265,912	264,722	255,688
Mean	0.403	0.414	0.426	0.822	0.826	0.855
PANEL B: NO HOLIDAYS						
Ramadan	-0.009**	-0.009**	-0.009*	-0.004	-0.005	-0.005
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Observations	254,647	245,885	236,149	254,647	253,522	244,911
Mean	0.413	0.424	0.436	0.840	0.843	0.872
PANEL C: NO HOLIDAYS & JUNE-NOVEMBER						
Ramadan	-0.013***	-0.013***	-0.014**	-0.008	-0.009	-0.009
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Observations	90,020	87,112	83,710	90,020	89,516	86,618
Mean	0.416	0.427	0.439	0.865	0.870	0.899
Prov FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
DoW FE	✓	✓	✓	✓	✓	✓
WoY FE	✓	✓	✓	✓	✓	✓
Employed Muslims		✓	✓			
Employed Non-Muslims					✓	✓
Ceuta&Melilla	✓	✓		✓	✓	

Notes: *DoW*= Day of the week; *WoY*= Week of the Year; *Employed Muslims*= Muslims employed per quarter-year at the provincial level. Columns (3) and (6) coincide with the sample without Ceuta and Melilla, the north African provinces. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: **Health Barometer for Muslims during Ramadan**

	Self assessed health	General practitioner	Emergencies	Hospital non-emergency services
Muslims				
Ramadan	-0.056	-0.141	-0.217***	0.003
	(0.047)	(0.112)	(0.065)	(0.057)
Observations	514	511	516	516
Non-Muslims				
Ramadan	0.021	-0.020	-0.021	-0.029
	(0.015)	(0.067)	(0.0589)	(0.036)
Observations	1,418	1,415	1,418	1,417
Year FE	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓
Province FE	✓	✓	✓	✓

Notes:. *** p<0.01, ** p<0.05, * p<0.1.

4.1 Composition of Accidents

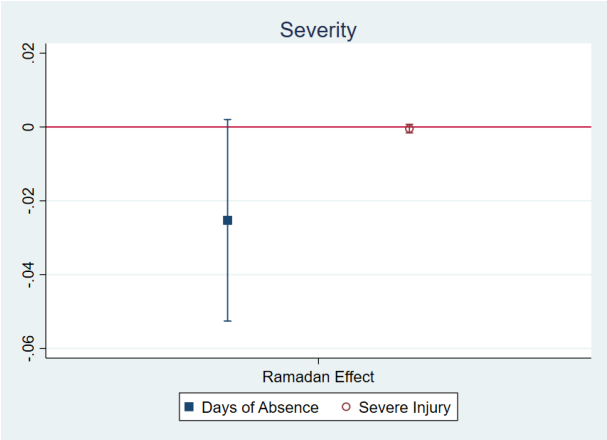
Along with the average decreases the incidence of work accidents, there may be a change in their composition: more severe accidents may displace less severe ones. Hence, we run a check on the severity of accidents measured in two ways: the number of days of absence per accident and the severity of the related injuries. The number of days of absence per accident represents both an outcome and a potential driver: days of absence are prescribed by physicians according to the severity of the injury, but they could also be affected by the strategic behavior of workers who might attempt to obtain extra days during Ramadan. In fact, a worker could pretend to be in worse condition that she is to obtain more days of absence, and if so this could explain a decrease in the incidence of accidents. As a second measure, we also check the impact of Ramadan on severe accidents, such as those involving a life threatening injury or the worker's death at the workplace. In Figure 7, we plot the coefficients of Equation 1 on the sample without national and provincial holidays and using the log of days of absence and the log of severe accidents as outcomes.[10] There is no change in the severity of accidents for both

[10]The results for the dataset with all the available days are shown in Figure A.1.

Muslims (Part a) and non-Muslims (Part b) according to both measures (Part a).

Figure 7: **Severity of Accidents**

(a) Muslims



(b) Non-Muslims

Notes: The plotted coefficients are obtained estimating Equation 1 using as outcomes severe accidents in logs involving Muslims and non-Muslims, as well as the logs of the number of days of absence for these two groups separately. Coefficients plotted at 95 percent confidence interval. Here, we use the dataset without the national and provincial holidays. The results for the dataset with all the days are available in Figure A.1.

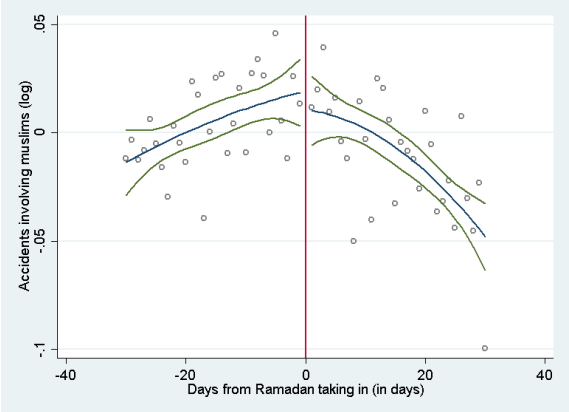
4.2 Time Dynamics

The response to Ramadan might not be immediate. In fact, a Muslim worker could attempt to adjust to Ramadan as the days pass and it becomes more demanding to deal with the consequences of fasting. To test this hypothesis, we

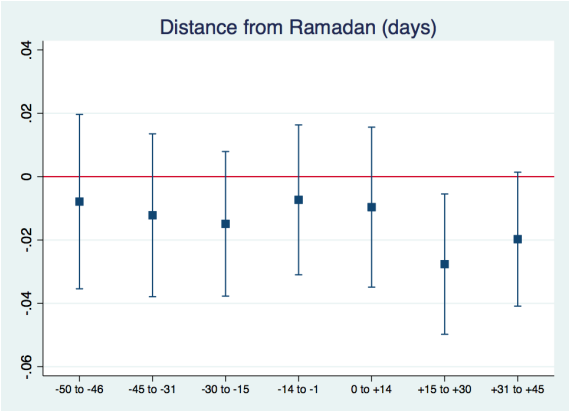
first run a regression discontinuity (RD) on accidents involving Muslim workers. Subsequently, we also provide an event study of Ramadan using the non-Muslim workers as control group. We plot the square polynomial in the distance from Ramadan in Part (a) of Figure 8, showing that there is no significant jump at the threshold. When we move to the event study, we consider 15-day intervals (first vs. second part of Ramadan) to reduce the noise generated by shorter intervals. We plot the estimated coefficients in Part (b) of Figure 8 using as the reference interval the +46/+50 days from the start of Ramadan (day 0). Consistent with our hypothesis, a significant decrease appears to occur in the second part of the holy month.

Figure 8: **RD analysis of Ramadan on Muslim Workers' Accidents**

(a) RD



(b) Event Study



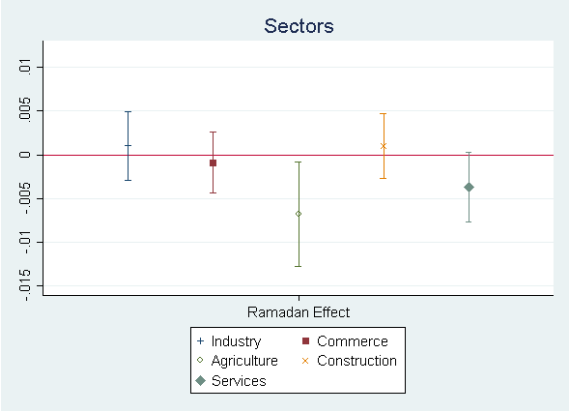
Notes: In Part (a) the dots are mean values per day. Part (b) plots the coefficient of the event study in a window of +/- 50 days from the first day of Ramadan with a 95 confidence interval. The reference period is +46/-50.

4.3 Sectoral Effects

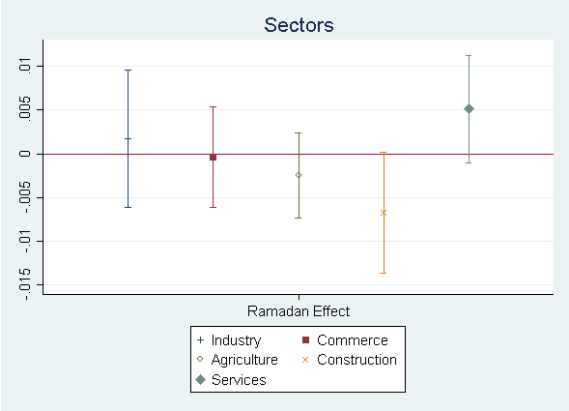
In Spain, the Muslim population is and has been mainly employed in blue collar jobs (see Figure A.2). Traditionally, the main sectors of employment for Muslims are services and construction, but, after the 2008 great recession, many workers flew from construction to agriculture and commerce. Still, some blue collar jobs may be heavier than others and it is reasonable to believe that Ramadan may affect heterogeneously the incidence of working accidents through different sectors. Following the national classification of economic activities (in Spanish, the so-called CNAE), we focus on five sectors: industry (overall), commerce, agriculture, construction, and services. Subsequently, in Figure 9, we plot the coefficients of Ramadan days on accidents involving Muslims in each sector. As apparent from Part (a), the main decrease is driven by accidents occurring in agriculture. There is also a decrease in accidents for the service sector, but it is not robust at the 95% confidence interval. We estimate the same outcomes also for non-Muslims and we plot the related coefficients in Part (b) of Figure 9. It is apparent that accidents in agriculture are not redistributed from Muslim to non-Muslim.

Figure 9: **Ramadan Effects across Economic Sectors (No Holidays)**

(a) Muslims



(b) Non-Muslims



Notes: The plotted coefficients are obtained estimating Equation 1 using as outcomes accidents involving Muslims and non-Muslims, respectively, per different sectors. Coefficients plotted at 95 percent confidence interval. Here, we use the dataset without the national and provincial holidays. The results for the dataset with all the available days are depicted in Figure A.3

4.4 Ramadan Duration

Apart from the employment sector, another factor that can trigger a heterogeneous response to Ramadan is the length of the fasting day. The longer, and thus the "harsher" the fasting is, the more difficult it becomes to cope with it for Muslims.

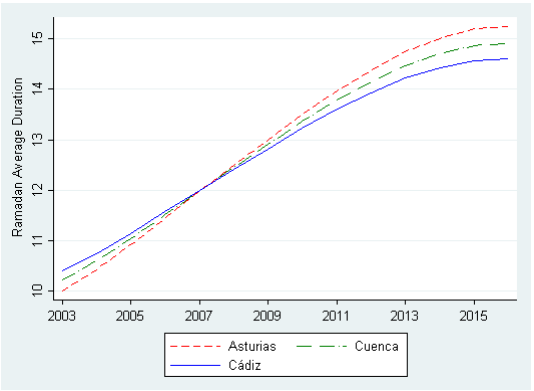
As pointed out by Campante and Yanagizawa-Drott (2015), through seasons, latitude determines the length of the fasting day. During summers, the nearest one is to the equator, the shorter is the Ramadan duration, while the reverse is true in

winter. This means that the provincial latitude triggers variations in the duration of Ramadan during the same season. To provide an idea of how these changes are relevant in our dataset, we focus on three provinces: Asturias located in the north, Cuenca in the center, and Cadiz in the south, as shown in Figure 10, Part (a). We use the latitude and longitude of the centroid of each province to calculate the average duration of the day using the command solar-calculator in STATA, and we plot the trend in the average duration of Ramadan during our observational period as shown in Figure 10, Part (b). Asturias, which recorded the lower duration of Ramadan in 2003 when Ramadan occurred in November, is the province with the longer duration of Ramadan in 2016, when the holy month covered June. When we repeat this exercise for all Spanish provinces during our observational spell, we obtain the data plot in Figure 11. In 2003, the difference between the southern provinces (lower latitude) and the northern provinces (higher latitude) was about 55 minutes, while in 2016 is was more than one hour.

Figure 10: **Ramadan Duration: Example**

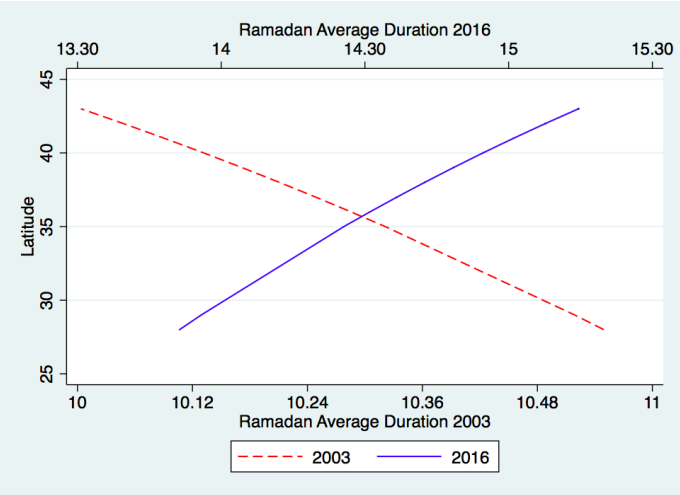
(a) Province Location

(b) Average Duration



Notes: Figure (a) shows the location of three representative provinces. Asturias is the darker area in the northern part, Cuenca is the gray area in the center, and Cadiz is the light gray area in the southern part of Spain. Figure (b) plots the trend of the average duration of Ramadan for each of these three provinces during 2003-2016.

Figure 11: **Ramadan Average Duration (2003-2016)**



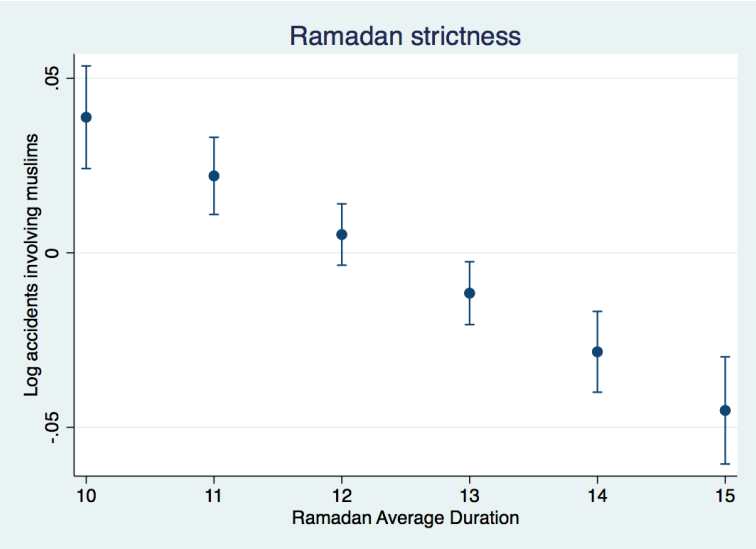
Notes: The figure shows the average duration of Ramadan between 2003-2016. To calculate the average duration, we have used the duration in hours of the first and of the last day of Ramadan for each province in each year and then computed the average per province/year.

To assess the differences in the response to Ramadan in the incidence of accidents involving Muslims, we define *Duration* for each province p and year t and we estimate the model in Equation 2. Since the duration of Ramadan cannot be equal to zero by definition, in this new specification we are interested in the joint significance of $\delta+\lambda$ at different values of *Duration*. In particular, we focus on the average duration from 10 to 15 daily hours to be consistent with the shifts taking place in our sample from 2003 to 2016. In Figure 12, we plot the joint estimates of δ and λ. The longer the average duration, the higher is the negative impact of Ramadan on accidents involving Muslims. Essentially, in 2009 the average fasting day lasted 13 hours. According to our estimates, an increase by 20 minutes decreases the incidence of working accidents for Muslims by an extra 0.06%. However, the plotted coefficients also point out the fact that a shorter duration of Ramadan increases the number of accidents involving Muslims. This effect occurs when Ramadan coincides with the fall and can be consistent with the idea of a general tendency to underestimate the distress of fasting out of the summer season. It is reasonable to expect that the more favorable weather conditions and the shorter duration of the fasting day can induce both employers and

Muslim workers to understate the possible negative consequences of Ramadan.

$$Y_{dtp} = \delta Ramadan_{dt} + \lambda Ramadan_{dt} * Duration_t + \omega Duration_t + \pi DoWk_{dt} + \rho Year_t + \gamma WoY_w + \rho Province_p + \epsilon_p$$

Figure 12: **Ramadan Duration Effect on Accident Involving Muslims**



Notes: The plotted coefficients refer to Equation 2. Coefficients plotted at 95 percent confidence interval.

4.5 Composition of the Muslim Community

The composition of the Muslim community itself may also matter in affecting the response to Ramadan. For example, larger communities might entail higher awareness about workers' rights during Ramadan or make Ramadan a more sensitive topic favoring discussion and cooperation with employers. To capture this, we use a proxy for the incidence of naturalized Muslims at the provincial level, which measures the number of people born in a Muslim country who later acquired Spanish nationality.[11] This proxy fully represents the case of someone who is born, for

[11]Spanish nationality is not acquired on soil but by blood. This means that in our measure of Muslim workers by nationality there could also be people born in Spain but not naturalized by

instance, in Morocco, moved to Spain and obtained Spanish nationality. However, our measure is a lower bound of the true presence of naturalized Muslims, since it does not capture the case of someone born by two naturalized parents.[12] Our expectation that the share of naturalized Muslims captures the importance of the Muslim community per se is confirmed by the high and positive correlation of our measure with both the number of Muslim associations (religious and non-religious) (0.21) and the presence of Muslims not naturalized (0.56), since immigrants tend to locate where there are already established communities.[13]

We construct the variable $More$ which is equal to 1 when, in a province, the incidence of naturalized Muslims is higher than the median of the distribution of the variable across all provinces p in year t to estimate the model in Equation 4:

$$Log(Accidents)_{dtp} = \delta Ramadan_{dt} + \lambda Ramadan_{dt} * More_{pt} + \omega More_{pt} + \quad (3)$$

$$\pi DoW_{dt} + \rho Year_t + \gamma WoY_w + \rho Province_p + \epsilon_p \quad (4)$$

Table 3 reports the estimated coefficients on the entire sample and only on working days, which is our preferred specification, for accidents involving both Muslim and non-Muslim workers. It seems that the main effect is driven by provinces with more naturalized Muslims, while there are no effects on the sample on non-Muslim workers.[14]

parents. This is a quite remote case since for non-European immigrants, the Spanish nationality means access to free mobility in the European market. Hence, if they decide to stay, they tend to become naturalized.

[12]This information is not available even through Census data, and the National Institute of Statistics only provides provincial information on the residents per nationality and country of origin.

[13]The data on the distribution of the Muslim associations (religious and not religious) across provinces is time invariant and was obtained through the register of the associations managed by the Spanish Ministry of Justice.

[14]We also compute the ethnic concentration or, in other words, a Herfindal-Hirschman index on the country of origin composition of the provincial-year Muslim community. The idea is that a community originating mainly from the same country could be more cohesive and, thus have more bargaining power with local employers. However, since settling patterns are not random and the predominant ethnic group comes from Morocco, ethnic concentration turns out to be mechanically correlated to naturalized Muslims. The results of the heterogeneity are consistent with those we observe for naturalized Muslims and are reported in Table A.3.

Table 3: **Effects of Ramadan across Communities - Naturalized Muslims**

	Muslims		**Non Muslims**	
	All dates	No holidays	All dates	No holidays
Less Naturalized	0.007	0.012*	-0.014	-0.008
	(0.006)	(0.006)	(0.010)	(0.010)
More Naturalized	-0.028***	-0.029***	-0.004	-0.003
	(0.010)	(0.010)	(0.011)	(0.011)
Difference	-0.035**	-0.041***	0.010	0.005
	(0.015)	(0.015)	(0.019)	(0.018)
Observations	256,787	245,885	256,787	245,885
Year FE	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Employed Muslims	✓	✓		
Employed Non-Muslims			✓	✓

Notes: DoW= Day of the week; WoY= Week of the Year; *Employed Muslims*= Muslims employed per quarter-year at the provincial level. *** p<0.01, ** p<0.05, * p<0.1.

5 Adjustments at the Extensive and Intensive Margin

Our average findings could be the results of different types of adjustments within the labor market. There could be an extensive margin adjustment: Muslim workers could decide to work fewer hours, work part-time, or not work at all by exploiting their vacation time or by deferring new jobs during Ramadan. At the same time, there could also be adjustments at the intensive margin: having more breaks within the same work schedule, changing shifts whenever possible (moving to the night shift), or simply taking more time to perform the same task so as to exert extra care. Finally, a lower probability to incur accidents could also be explained by

a higher observance of the Islamic prescriptions other than fasting, such as the abstinence from alcohol. We would expect that the latter channel plays a minor role, since the percentage of alcohol consumers among Muslims is quite small.

Addressing extensive and intensive margin adjustments due to Ramadan has several empirical challenges. While we have daily observations on work accidents for each province, it is difficult to find the same level information about adjustments in the labor market or working habits. By the same token, public information on how firms allocate their workers to daily shifts is not available and the level of attention exerted on individual tasks often remains part of the unobservables. Hence, we provide insights through both qualitative and quantitative evidence.

Qualitative evidence supports a narrative of adjustments in the workplace, which is especially important for blue collar workers. For instance, according to the collective labor agreement of the agricultural sector (i.e, "*Sector de Trabajo en el Campo*") in the Alméria province, Muslim workers may opt for a continuous work day during Ramadan, as well as request a reduction in the number of working hours by postponing by one hour the beginning and/or anticipating by one hour the end of their work day.[15] Similar provisions are also included in the collective labor agreement of the construction sector in Melilla and in that of the iron and steel sector in Ceuta (Sierra Rodríguez, 2012). Sectoral associations are also active in promoting good practices during Ramadan. An example is the Association of the Agricultural Employers of Lleida that provides its workers with guidelines on practical measures to cope with the possible negative consequences of fasting and to avoid working accidents. Finally, there are several cases of larger employers (i.e., chains) applying specific measures to ensure more flexibility for their Muslim workers during Ramadan. The NH hotel chain, the third most important group in the European hospitality business (392 hotels and over 22,000 employees worldwide), officially recognizes the Islamic festivities (EUMC, 2007); the vegetable producer Agrar System (almost 300 employees in Spain) plans shorter work days during Ramadan; and the Majestic hotel group (266 employees in Spain) allows flexible schedules for their Muslim cleaning workers (Sierra Rodríguez, 2012).

Our quantitative evidence is based on three datasets: two related to the labor

[15]See Article 23 of collective labor agreement n. 04000795011990 in the Alméria Province Official Bulletin n. 77, 24/04/2013

market, the Spanish Labor Force Survey (EPA) and the Continuous Sample of Working Lives (MCVL), and one related to individual risky behaviors, the Spain Household Survey on Alcohol and Drugs (EDADES).

5.1 Worked Hours

The Spanish Labor Force Survey (EPA), run by the Spanish National Institute of Statistics, is a rotating quarterly survey with a sample size of about 64,000 households per quarter, including approximately 150,000 adult individuals. EPA provides several types of information on the work habits of the respondents while also always making available their nationality. This allows us to identify a respondent as a Muslim worker based on her country of nationality following the classification in Table A.1 of the Online Appendix. Since data are at the quarter level, we extend the observational period using the years from 1992 to 2016 and we consider as treated each quarter that included the month of Ramadan in each year. If a quarter only partially included the Ramadan month, we exclude it from the sample. Therefore, we only consider quarters that either fully included or fully excluded Ramadan. We estimate a model with year, quarter, and province fixed effects on two outcomes: the probability of being employed and the logarithm of the number of hours worked conditional on being employed.

As shown in Table 4, there is no significant change in the probability of being employed, whereas there is a significant reduction in the number of hours worked by Muslims during quarters including Ramadan. More specifically, we estimate a 1.1% drop in the number of hours worked during Ramadan quarters by employed Muslims.

Table 4: **Worked Hours & Employment Status in the Ramadan Quarter**

	Worked Hours (log)	Employed
Muslim Workers		
Ramadan	-0.011**	0.000
	(0.004)	(0.004)
Observations	32,509	85,686
Non-Muslim Workers		
Ramadan	-0.003	0.006
	(0.004)	(0.003)
Observations	31,667	62,375
Year FE	✓	✓
Quarter FE	✓	✓
Province FE	✓	✓

Notes: The differences in the individual observations is because $WorkedHours$ is measured conditional on being employed. *** p<0.01, ** p<0.05, * p<0.1.

5.2 Number of Contracts Signed

The Continuous Sample of Working Lives ("*Muestra Continua de VidasLaborales*", MCVL) allows us to construct a dataset with daily observations. The MCVL is based on administrative records provided by the Spanish Social Security Administration and is composed by several waves. Each wave contains a random sample of 4% of all the individuals who had contributed to the social security system (either by working or being on an unemployment scheme) or had received a contributory benefit (e.g., permanent disability and old-age) during at least one day in the year the sample is selected (Garcia Perez et al. 2019). Hence, the sample does not include those individuals with no contact to social security in such a year. For each worker in each wave (we have the 2010, 2011, 2013, and 2014 waves), we can reconstruct the full employment history since their first employment contract in the Spanish labour market. We exploit this to compute the number of contracts

signed in each day from 2003 to 2014 to verify if the number of contracts signed by Muslim workers (535,105 individuals across the waves) decreases during Ramadan. This is a reasonable expectation given the dual nature of the Spanish labour market in which a strong protection of permanent jobs coexists with a massive use of temporary employment contracts following a 1984 labor reform meant to fight the large surge in unemployment that followed the end of the Franco dictatorship. In particular, the reform liberalized the use of highly flexible temporary contracts for all regular activities without affecting the employment protection of permanent jobs and Spain became the OECD country with the highest share of fixed-term contracts (Dolado et al., 2002). Hence, if there is an extensive margin adjustment to Ramadan, this is very likely to be captured in a change in the number of temporary contracts signed per day.

The sample is representative at the provincial level, but since we are focusing only on workers without Spanish nationality, we keep the analysis at the national level.[16]

We estimate a fixed effects model, controlling for the year, the day of the week, and week of the year fixed effects. We again use 3 samples, one with all observations, one dropping national holidays, and the last restricting the sample only to the period from June 28th (first day of Ramadan in 2014) to November 27th (last day of Ramadan in 2003). Our estimates, reported in Table 5, indicate a significant decrease in the number of signed employment contracts by 6.4% in our preferred specification which does not include holidays. Conversely, there is no similar effect on the number of contracts signed by non-Muslims.

[16]We also generate a dataset at the provincial level. Results are identical at those at the national level, but the magnitude is lower, with a decrease in signed contracts by 3.7%.

Table 5: **Number of Employment Contracts Signed per Day (Log)**

	All	No Holidays	No Holidays& June-November
Muslim Workers			
Ramadan	-0.067**	-0.063***	-0.064***
	(0.023)	(0.022)	(0.023)
Observations	4,383	4,206	1,788
Non Muslim Workers			
Ramadan	0.007	0.004	0.012
	(0.058)	(0.059)	(0.0588)
Observations	4,232	4,062	1,731
Day of Week FE	✓	✓	✓
Week of the Year FE	✓	✓	✓
Year FE	✓	✓	✓

Notes: Observations are at the daily level per each year between 2003 and 2014 for the entire Spain. *** p<0.01, ** p<0.05, * p<0.1.

5.3 Alcohol Consumption

While behavioral adjustments in the workplace remain unobservable, we focus on changes in risky behaviors that can be connected to the observance of Ramadan and can affect the probability of work accidents. We use the Spain Household Survey on Alcohol and Drugs consumption, a cross sectional survey that collects demographic data on all individuals in the sample, as well as information on their consumption of both legal and illegal drugs.

We focus on information on alcohol and tobacco consumption.[17] The former is important because it is directly linked to the likelihood of accidents, while we look at the latter as a proxy for the individual general attitude to healthier/better behaviors which is not necessarily related to the probability of experiencing an

[17]We focus on alcohol and tobacco consumption because this is measured over the last 30 days. Differently, other risky behaviors of respondents were measured over the 12 months preceding the interview.

occupational injury. The waves are run at the yearly level and, given the dates of collection, we consider as treated by Ramadan the 2005 and 2007 waves, while we use the 2009 wave as control. We find that when the 30 days previous to the interview partially overlap with Ramadan, the probability to consume alcohol decreases by 88% at the mean of the variable, which is half of the incidence of alcohol consumption among non-Muslims. Muslims are also less likely to smoke (-29%), which indicates a general increased attention to their behaviors. No similar effects are detected in the sample of non-Muslim respondents.

Table 6: **Results from Behaviors in the Last 30 Days**

	Muslims	Non-Muslims
Have you had an alcoholic drink?		
Ramadan	-0.313***	0.116
	(0.0363)	(0.129)
Observations	1,475	4,883
Mean	0.357	0.624
Have you smoked?		
Ramadan	-0.170***	0.032
	(0.0407)	(0.032)
Observations	1,478	4,891
Mean	0.368	0.381
Year FE	✓	✓
Province FE	✓	✓

Notes:. *** p<0.01, ** p<0.05, * p<0.1.

6 Conclusion

A 2015 newspaper article published by The English Guardian called for a proper account of the economic and health costs of Ramadan in non-Muslim countries. Conservative politicians are not always in favor of respecting religious diversity (e.g. Danish Minister Stojberg in 2018), and they have used the potential be-

havioral changes of workers during Ramadan as a threat to the safety of other workers.

Using unique administrative data for Spain, we investigate the consequences of Ramadan on the incidence of work accidents. Taking advantage of daily observations from 2003 to 2016, as well as of the solar rotation of Ramadan days (11 days backward each year), we estimate an average decrease in injuries in a range between 0.9% and 1.4%. There is no similar effect on accidents involving non-Muslim workers (mainly South Americans and Romanians). In addition, we find that the effect on Muslim workers is stronger where Ramadan is harsher (longer duration of the fasting day based on latitude) and when the presence of naturalized Muslims is higher. We explain these results as mainly driven by a decrease in hours worked, as recorded through the Labour Force Surveys, and a lower probability to start a new job during Ramadan days. These findings show that workplace religious accommodations can decrease the risk of occurring occupational injuries triggered by the physical distress of fasting. We also show that religious accommodations in the case of Spain tend to occur in the second part of Ramadan (day +15/+30) where the main effect is detected, and thus they should not impose a dramatic change in the working arrangements for a significant period. Finally, our results cannot be explained entirely by religious accommodations, but are partly due to their combination with a probable rise in carefulness by Muslim workers during Ramadan.

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Appendix A: Additional Figures and Tables

Table A.1: **Muslim Countries**

(1)	(2)	(3)
Afghanistan	Guinea Bissau	Nigeria
Albania	Indonesia	Oman
Saudi Arabia	Iran	Pakistan
Algeria	Iraq	Palestine
Azerbaijan	Jordan	Qatar
Bahrain	Kazakhstan	West Sahara
Bangladesh	Kyrgyzstan	Senegal
Bosnia-Herzegovina	Kuwait	Sierra Leon
Brunei	Lebanon	Syria
Burkina Faso	Libya	Somalia
Chad	Malaysia	Tajikistan
Comoros	Maldives (Islands)	Tunisia
Egypt	Mali	Turkmenistan
United Arab Emirates	Morocco	Turkey
Gambia	Mauritania	Uzbekistan
Guinea	Niger	Yemen

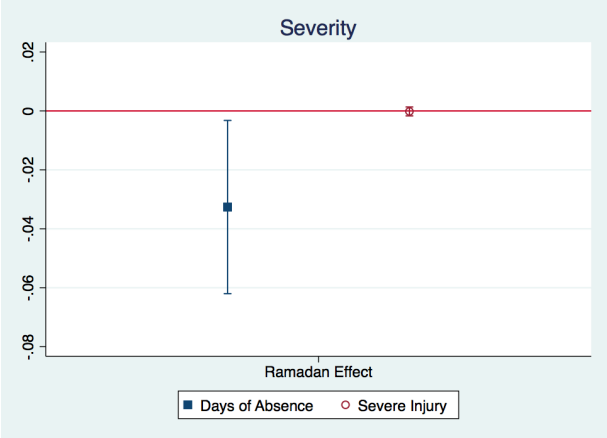
Table A.2: **Effects of Ramadan on Spaniards Work Accidents (Log)**

	(1)	(2)	(3)
PANEL A: ALL			
Ramadan	-0.021***	-0.021***	-0.021***
	(0.003)	(0.003)	(0.003)
Observations	265,912	265,912	255,688
Mean			
PANEL B: NO HOLIDAYS			
Ramadan	-0.015***	-0.015***	-0.015***
	(0.003)	(0.003)	(0.003)
Observations	254,647	254,647	244,911
Mean			
PANEL C: NO HOLIDAYS & JUNE-NOVEMBER			
Ramadan	-0.015***	-0.015***	-0.015***
	(0.003)	(0.003)	(0.003)
Observations	166,520	166,520	160,180
Mean			
Prov FE	✓	✓	✓
Year FE	✓	✓	✓
DoW FE	✓	✓	✓
WoY FE	✓	✓	✓
Employed Spaniards		✓	✓
Ceuta&Melilla	✓	✓	

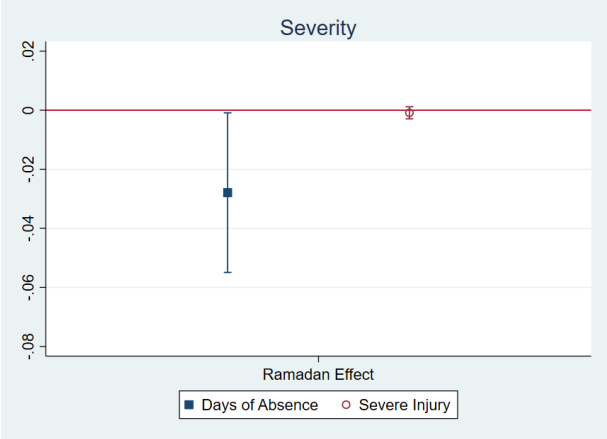
Notes: *DoW*= Day of the week; *WoY*= Week of the Year; *Employed Spaniards*= Spaniards employed per quarter-year at the provincial level. The third column of each sample is the sample without Ceuta and Melilla. *** p<0.01, ** p<0.05, * p<0.1.

Figure A.1: **Severity of Accidents (all dates)**

(a) Muslims



(b) Non-Muslims



Notes: The plotted coefficients are obtained estimating Equation 1 using as outcomes severe accidents involving Muslims and non-Muslims, respectively, as well as the number of days of absence for these two groups separately. Coefficients plotted at the 95 percent confidence interval. Here we use the dataset without the national and provincial holidays. The results are for the dataset with all the dates.

Figure A.2: **Distribution of Muslim and non-Muslim Workers per Sector**

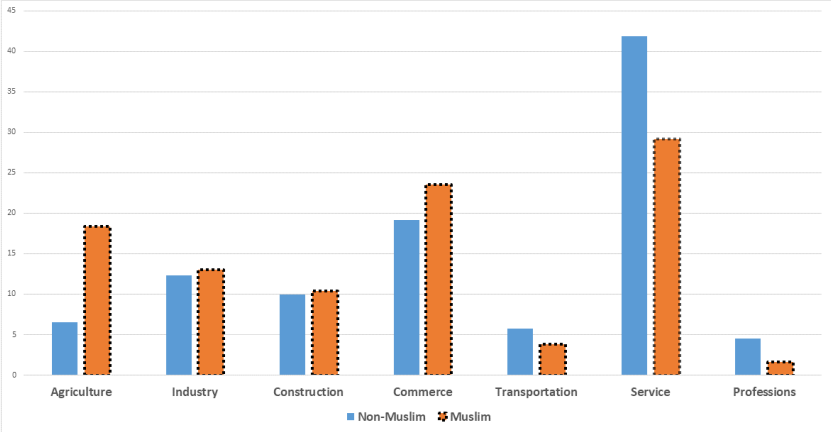
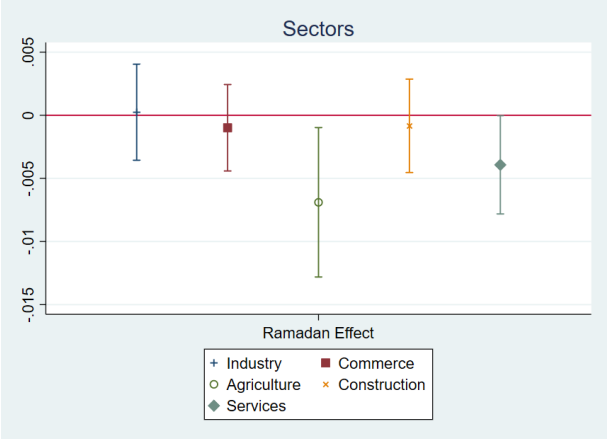
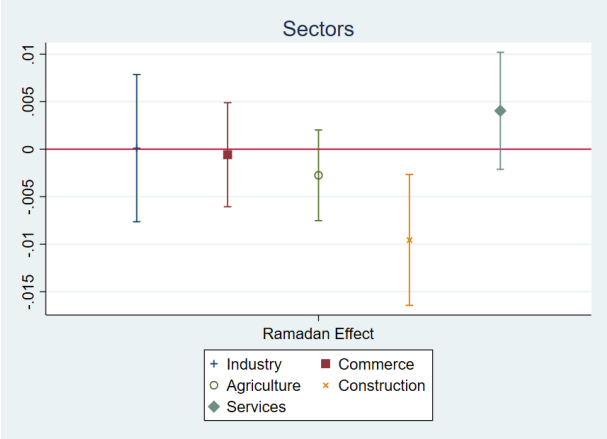


Figure A.3: **Ramadan Effects across Economic Sectors (all dates)**

(a) Muslims



(b) Non-Muslims



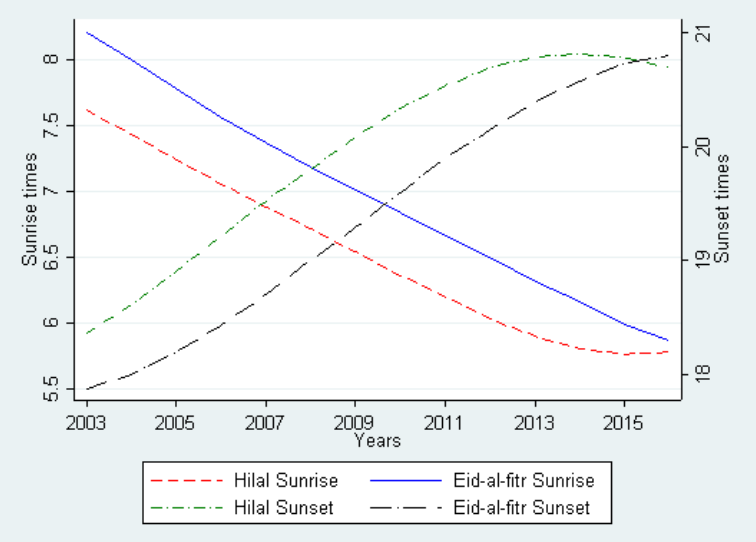
Notes: The plotted coefficients are obtained estimating Equation 1 using as outcomes accidents involving Muslims and non-Muslims, respectively, per different sectors. Coefficients plotted at the 95 percent confidence interval. Here we use the dataset without the national and provincial holidays. The results are for the dataset with all the dates.

Table A.3: **Effects of Ramadan across Communities - Ethnic Concentration**

	Muslims		Non Muslims	
	All dates	No holidays	All dates	No holidays
Less Concentrated	0.008	0.013**	-0.014	-0.009
	(0.006)	(0.006)	(0.010)	(0.009)
More Concentrated	-0.028***	-0.029***	-0.004	-0.002
	(0.009)	(0.010)	(0.011)	(0.011)
Difference	-0.036**	-0.042***	0.011	0.006
	(0.014)	(0.014)	(0.018)	(0.018)
Observations	256,787	245,885	256,787	245,885
Year FE	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓
Province FE	✓	✓	✓	✓
Employed Muslims	✓	✓	✓	✓

Notes: DoW= Day of the week; WoY= Week of the Year; *Employed Muslims*= Muslims employed per quarter-year at the provincial level. *** p<0.01, ** p<0.05, * p<0.1.

Figure A.4: **Sunrise and Sunsets of the First and Last Day of Ramadan (2003-2016)**



Abstrakt

Zkoumáme dopady Ramadánu na četnost pracovních nehod s použitím denních dat od roku 2003 do roku 2016. Využíváme posunu počátku Ramadánu (11 dní zpět každý rok) k posouzení vlivu Ramadánu na nehody zahrnující muslimské pracovníky ve Španělsku. Odhadujeme snížení počtu zranění muslimských pracovníků bez spillover efektu na nemuslimské pracovníky (převážně Jihoameričani a Rumuni). Naše výsledky jsou primárně dány přizpůsobením délky pracovní doby a zaměstnaností muslimských pracovníků. Ukazujeme, že efekt je silnější tam, kde je Ramadán tvrdší (delší období půstu dáno zeměpisnou šířkou), a v oblastech, kde je vyšší koncentrace naturalizovaných muslimů. Na základě našich výsledků lze tvrdit, že politika podporující náboženskou diverzitu a snažící se sladit náboženské zvyklosti s pracovním rozvrhem může snížit náklady na zdravotní péči spojenou s pracovními úrazy.

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