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JOB COMPETITION IN CIVIL SERVANT PUBLIC EXAMINATIONS AND SICK LEAVE BEHAVIOR*

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ABSTRACT: In several countries the entry system to access public service positions is the traditional public examination procedure. In this setting, candidates have to take passing exams that require a huge load of material to study, and therefore time. Candidates who are working while preparing the public exam may find it difficult to devote enough time to both tasks. Thus, they might experience increased stress/anxiety related to high stakes civil service recruitment testing. In this paper, we investigate the impact of new openings of civil servant positions on sickness absences. Using a unique administrative dataset on the universe of sickness absences and civil servant positions offered in Spain from 2009 to 2015, we find a significant increase in health-related absences several months before the examination date. In particular, this effect is stronger for individuals working in the educational sector as well as for calls offering a large number of positions. This effect is mostly driven by stress related absences. Finally, using data on medical visits (GP and specialist) we find evidence consistent with a deterioration in public sector workers' health. Our results are important from a policy perspective as they highlight the existence of important negative consequences of the civil service recruitment process that have been previously overlooked.

JEL Codes: I13, J22, J45
Keywords: Public Examinations, Sick Leave; Negative Externalities, Absenteeism

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1 Introduction

In several countries the entry system to access permanent civil servant positions relies on the traditional process of formal public examinations,[1] which application is often justified as a mechanism to guarantee the objectivity and transparency of the process (Bagüés, 2005). Through public examinations doctors, teachers, judges and other positions are selected to provide public service. An example of countries in which public examinations is the main system are Portugal, Italy, Belgium, Greece, France, Spain and others in Latin America.

Civil servant positions are very attractive as they offer benefits that do not exist in the private sector (these benefits vary according to the legislation of the country). For instance, in Spain, the most relevant benefit is long term employment stability. This "secure job" condition may also be translated into economic stability for individuals. In addition, the public sector, in most of cases, offers better working conditions in terms of vacation days, labor conciliation policies and working hours. In this sense, the attractiveness of public service positions may encourage individuals to participate, situation that is not negligible. For example, in Spain in the year 2018, for a call of 4,725 positions there were more than 80,000 participants registered for taking the examination (Ministerio de Hacienda y Función Pública, 2018). In addition, according to the Spanish Labor Force Survey, EPA in Spanish, during the second trimester of year 2010 the number of Spanish people preparing for a public examination was around 72,438.

To access civil servant positions, individuals have to take an examination called "oposición" in Spanish, or public examination in English, which is not an easy task. According to Bagüés (2005) preparing a public examination usually requires a lot of time, which may be more critical for individuals who are working and preparing an exam at the same time. There might be several possibilities that originate from workers who are faced with time constraints and the need to study. For example, this could cause workers to: (i) reduce the allocation of time for sleeping which might reduce bodily function, (ii) reduce the allocation of time for leisure increasing stress or anxiety, (iii) increase stress/anxiety related to high stakes civil service recruitment testing, situations that might increase the rate of sickness episodes. Therefore, we can frame the impact of the Spanish civil service recruitment process assessing whether civil servant positions announcements increase sickness episodes.

This paper's aim, therefore, is to identify whether new openings of civil servant positions have an impact on sickness absences. We make use of rich administrative dataset on the universe of sickness absences and civil servant positions offered in Spain from 2009 to 2015, and exploit the variation coming from the different number of positions announced (and with examinations) across Spain and time.

Research on public examinations as a selection process has been somehow explored in the physiological and personnel management literature, where the topic is analyzed in the aim to establish "best practices". However in the economic literature, research is still very scarce. For instance, Sundell (2012) studies what is the best way to recruit civil servants, he finds that when the risk for patronage is low, private sector style-recruitment can be attempted to find the best candidates, but when the risk instead is high, public examinations are preferable to prevent patronage and nepotism. Bagues

[1] There are two main systems to entry public service: (i) private-sector style recruitment, and (ii) traditional civil service recruitment with formal public examinations. However, the former is usually applied for non-permanent contracts.

and Esteve-Volart (2006), using administrative data from all the major public examinations in Spain, analyze how overconfidence affects the gender gap in promotion. They found that most of candidates are women and that conditional on experience, men have higher probabilities of passing the exams, however men are affected with greater overconfidence which leads to greater dropout rates compared to women. In other work, the same authors explore the potential existence of a "state nobility" in top civil service in Spain, for this, they use information on public examinations in the main Corps of the Spanish Administration and find that candidates that have a relative in the Corps are more likely to apply for these positions compared to non-relatives, and also to perform better in the exams (Bagues and Esteve-Volart, 2008).

As a first insight of the results of this paper, we find that, overall, there is an increase in the absence rate (per 1,000 workers) in the public administration, education and health sectors several months before the public examinations. We find an increase by up to 5 spells per 1,000 workers per month per province. With respect to the intensive margin, we find that the average mean duration of the sickness spell may increase to up to 5 days in the more sensitive economic sector (the education sector, in our sample). In addition, we find mixed evidence on whether women(men) are more responsive than men(women) in terms on sick-related work absence. We also explore which type of medical conditions experience variation as a response to public examinations, and find that the effect is mostly driven by stress-related absences. Our results are robust to several checks, such as a placebo test, and changes in the treatment definition. We also provide some evidence which supports a negative relation between public examinations and public sector workers' health. We find an increase in the probability of general practitioner and specialist visits and in the number of specialist visits. We also find some significant differences between women and men in terms of self-assessed health.

This paper contributes to the existing literature on civil servants recruitment system in several ways. First, to the knowledge of the authors, this is the first attempt to investigate the causal relationship between public examinations and sickness absences. We also explore differences across economic sectors and demographic groups like gender. Second, we add evidence supporting that stress-related conditions seem to be the leading cause of the increase in sickness absences. Finally, we use two high-quality official administrative data set for our analysis. Sick leave data contains the universe of sickness spells occurred in Spain during the years 2009 to 2015. With respect to the public examination data, we built the dataset using official administrative records, and generated a novel data set containing the universe of public calls for years 2009 to 2015.

The results of this paper are of important policy implications as public examinations might be generating negative externalities in terms of work absences. In addition, sickness absence represents an important cost to the social security system in Spain and also to the society through productivity losses. For example, in 2015, public spending on incapacity represented around 2.4% of the GDP (OECD Data, 2015), being this number above the average of OECD countries (1.9%). In terms of absence from work due to illness, Spain registered an average of 11.3 days per year per worker (OECD Stat, 2015). Our results are also of external validity as several countries across the globe use public examinations as a civil servant selection system.

The rest of the paper proceeds as follows. Section 2 provides the institutional background on public examinations and sick leave system in Spain. Section 3 describes the data sets and shows some

descriptive statistics. Section 4 presents the empirical strategy. Section 5 presents the results. In Section 6, we explore the composition of sick leave spells regarding the most common illnesses used in medical certificates. Section 7 presents a set of robustness checks. In Section 8, we provide evidence on public sector workers' health. Finally, Section 9 concludes with a discussion of the results.

2 Institutional Background

2.1 Public Examinations in Spain

Public examinations is the selection method used to gain access to a variety of permanent positions in the civil service in several countries. Some examples are countries in Latin America, Asia and Europe such as Portugal, Italy, Belgium, Greece and Spain, etc.

In Spain, according to the Boletín Oficial del Estado (BOE) (2019), the process to enter civil service is made through three type of systems: (i) public examinations, which consist of one or more passing tests to assess applicant's knowledge in the relevant area, (ii) open competition based on merits and qualifications of applicants, and (iii) open competition-public examinations, which is a combination of the other two. The public examination is the ordinary entry system, however, sometimes, due to the nature of the functions to be performed, the competition-public examination may be used and, exceptionally, the open competition. Regarding public examinations, they must include general and specific topics related to the functions of the position to be filled, they can also include psycho-technical ≪tests≫ to improve the objectivity of the selection process.

The process begins with the authorization, by the competing authorities, of the "public job offer", after this, the institutions are allowed to publish the calls in the official journals of the public administration.[2] There is no minimum nor maximum in the number of positions announced, thus, an institution can offer 1, 1,000 or more places (Boletín Oficial del Estado (BOE), 1984). The calls must contain all the requirements and characteristics of the positions. For instance, the number of positions, access system, number of examinations required, grading system, etc. Once the call is published, candidates have 20 days to submit their applications, after this period, the competing authority issues a resolution that contains the list of admitted and non-admitted candidates based on the accomplishment of the requirements established in the call. Only admitted participants can take the examination(s) which are formally announced indicating the exact place, date and hour of celebration. Candidates who pass the exam continue to the last stage of the process that consist on the exhaustive revision of the documents provided in support of their qualifications.[3] Finally, candidates who passed the exam(s) and meet all the requirements are declared permanent civil servants and are assigned to their places of work.

Civil servant positions can be offered at all administrative levels: (i) The General State Administration that comprises all jobs whose scope of action is at the national level; (ii) Regional Level "Comunidades Autónomas", that includes most of the education and health economic sector positions; and (iii) the local administration institutions, usually municipalities and others that operate at

[2]The Official Journals refers to "Boletin Oficial del Estado" which is at the national level; and to all the locals and regional journals.

[3]This refers to academic, professional experience, courses, and any other requirement according to what was established in the official call.

the local level.

Looking more into the exams, they usually involve a huge load of material to study, which includes general and job-specific questions. Therefore, in order to pass a public examination, candidates must acquire very-specific knowledge, which may not be very useful for other positions in the labor market (Bagues and Esteve-Volart, 2006). To have an idea of the amount of material to study, for a call in year 2015 of 44 positions for administrative assistants in the region of Galicia, applicants had to learn 30 topics for the examination, which range from the the Spanish Constitution of 1978 to specific administrative procedures (Diario Oficial de Galicia, 2015).

Anecdotal evidence of candidates preparing public examinations indicates that 6 out of 10 combine work with exam study (Ecoaula.es, 2022). Likewise, participants begin their preparation several months before the official examination date. However, the study habits become more demanding as the exam date approaches. For example, on average, more than two-thirds dedicate between 5 and 7 days per week to study, and during the months previous to the exams the daily studying time can increase up to 10 hours (Opositatest, 2019). This behaviour is compatible with increased probability of reducing the allocation of time for sleeping or leisure, increased stress and anxiety which might increase sickness absence rates.

2.2 Sick Leave System in Spain

Spain has a social security system that has several benefits for workers. One of them is paid sick leave, which has the objective to compensate the income loss as consequence of temporary (common) illness, professional illness or accident. Common illness are considered all medical conditions that are independent of work activity, whereas professional illness refers to those acquired as a result of the work performed in the institution. Working accidents are any sudden events that occurs due to or during work, and that produce in the employee an organic injury, mental disturbance, a disability or death (Ministerio de Trabajo y Economía Social, 2023).

As explained by Marie and Vall Castelló (2020), to access sick leave benefits derived from a common illness, individuals have to be working, and contributing to social security for at least 180 days of the last 5 years before the beginning of the condition that generated the sick leave. Regarding the benefit amount, the system distinguishes between private and public employees. For private workers, when the origin is a common illness, individuals do not receive any compensation during the first 3 days of the absence, from the 4th to the 20th day they are entitled to the 60% of previous wage, and from the 21st day onwards to the the 75% (Ministerio de Trabajo y Economía Social, 2023). As seen, both public and private employees have the benefit of paid sick leave, though with different schemes, they are very similar in terms of coverage.

3 Data and Descriptive Analysis

3.1 Sick leave Data

We use administrative data provided by the social security administration of Spain for years 2009 to 2015 on the universe of sickness absence certified by a physician due to common illness. This data is at the individual (worker) level and contains information on month-year of birth, gender,

start and end date of the sickness, the specific disease causing the sickness leave according to the International Classification of Diseases tenth revision (ICD-10), the province of residence, and the economic activity of the firm where the individual works (according to the CNAE classification[4]). With this information, we are able to obtain the outcomes of interest: (i) the total number of spells, and (ii) the mean duration of sick leave spells. At this point, it is worth mentioning that working with the full cases of sick leave episodes has advantages over self-reported data. For example, one limitation of survey data is measurement error, that in this case, can lead to an under/over reporting of the number of lost work days. The data we have available does not suffer from this problem.

To give answer to our question, from the total number of sickness absences, we only keep sick leave episodes coming from workers registered under the "general contribution scheme" and exclude other categories, for instance, those who are self-employed.[5] We also focus on workers between 16 and 65 years old, which leaves us with a total of 25,586,406 sick leave spells. Due to the richness of the data, we are also able to distinguish between men and women as well as the economic sector to which employees belong. With the information available, we are able to unequivocally distinguish between three sectors: (i) public administration and defense, which includes exclusively public employees; (ii) education, that includes all the staff of pre-primary, primary schools, high schools, tertiary education and other education-related workers; and (iii) health, including all hospital activity, long term care workers and other health support employees.

To construct the first outcome of interest, the total number of sickness spells, we need to take into account that unemployment in the Spanish labor market is very seasonable, and that the number of individuals employed has changed considerably during the period of analysis. For this reason, we collapse (aggregate) the data at the province month-year level and divide it by the total number of "employed" workers in each economic activity during the second trimester of the corresponding year. In this sense, the unit of observation is at the province-month level. We derive the number of "employed" workers for each sample from the Spanish Labor Force Survey. For the second outcome, (mean) duration of sick leave spells, as it is conditional on the existence of a sickness episode, we do not need to divided it by the corresponding working population.

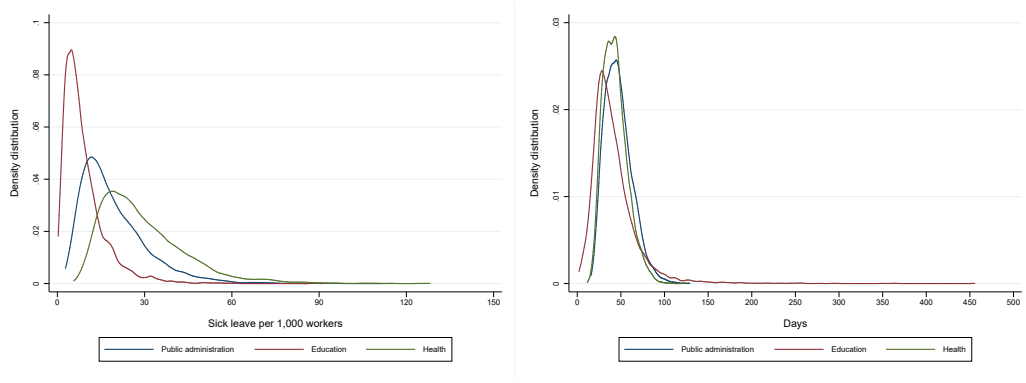
In Figure 1, we plot the kernel density estimates for (a) the total number of sickness spells per 1,000 workers, and (b) the mean duration of sickness absences for the three economic activity sectors. From here, we see that the maximum height for the public administration sector is around 20 sick leave spells per 1,000 workers, for the education group is around 15 per 1,000 workers and for the health sector around 25 episodes per 1,000 workers. With respect to the average mean duration, the education sector reports the longest episodes compared to the other sectors.

In Table 1, we show descriptive information regarding the total number of spells and the mean duration of sick leave episode per economic sector, comparing women and men. As we see in panel (a), overall, women report more sickness episodes than men across the economic sectors under analysis. Regarding mean duration of sickness absences, individuals working in the public administration sector report the largest number (39.55 and 39.19 days form women and men, respectively).

[4]CNAE is the standard economic activity classification used in Spain. We have this code at the 5 digit level.

[5]The other categories correspond to domestic workers and workers in the mining and agricultural sector.

Figure 1: Distribution of Sick Leave per Economic Sector



(a) # Sick leave per 1,000 workers (b) Mean duration of sick leave

Notes: Own elaboration using administrative Spanish Social Security data which includes the universe of sickness absence of employees under the "general contribution scheme" for years 2009-2015. It also includes data from the Spanish Labor Force Survey on the total number of workers per economic sector activity.

Table 1: Descriptive Statistics of Sick Leave Spells by Economic Activity and Gender.

Panel A. Number of spells			
Economic sector	**All**	**Female**	**Male**
Public Administration	2,324,525	1,357,086	967,439
Education	1,080,380	848,166	232,214
Health services	3,642,089	2,974,555	667,534
Other sectors	18,539,412	9,139,130	9,400,282
All sectors	**25,586,406**	14,318,937	11,267,469
Panel B. Mean duration (in days)			
Economic sector	**All**	**Female**	**Male**
Public Administration	39.40	39.55	39.19
Education	33.26	33.29	32.12
Health services	35.91	35.96	35.70
Other sectors	36.85	36.93	36.76
All sectors	36.79	36.76	36.83

Notes: Own elaboration with data from the Spanish social security administration on the universe of sickness absence due to common illness, years 2009 to 2015.

3.2 Public Examination Data

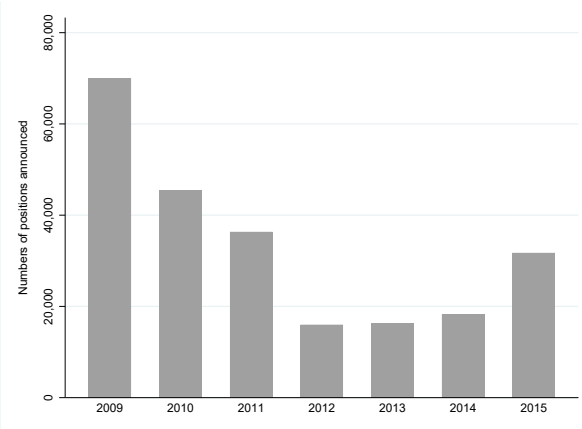
Regarding public examination data, we built this database using administrative records from the Ministry of Territorial Policy and Public Function in Spain, from 2009 until 2015. This database contains the full information on public employment calls of the General State Administration, the Autonomous Communities (from now on, regions), the European Union, International Organizations and Local Administration. The latter includes the corresponding calls of the provincial councils, provincial capitals, municipalities of more than 100,000 inhabitants and those who call at least 3 places, regardless of the number of inhabitants. The General State Administration includes positions offered by the ministries, the social security institution, armed forces, justice administration. The Autonomous Communities include positions in the education sector, health care institutions, justice administration and other administrative offices, and the Local level compiles all calls from the municipalities and other local administrations.

In this database, the unit of observation is the call for which we have information on the date of publication, whether the position is for the international, national, regional or local administration, the

type of contract of the position, the minimum educational degree required, the convening institution, the number of positions offered, the region-province of workplace and the date of the examination. With this information, and according to the institution that offers the places, we assign the CNAE code (economic activity sector) to every call in the dataset. Thus, we generate three categories: public administration and defense, education, and health.[6]

The universe of positions includes permanent and temporal positions, and also those offered at the European Union level, which gives a total of 263,714 positions. However, for the purpose of our analysis, we only keep those offered inside Spain and those whose access is under the "public examination" system. Specifically, we exclude temporal positions as they do not require a public exam to access the place,[7] which leaves us with 234,123 positions offered across the country. Figure 2 shows these positions, from here, we can see that 2009 was the year with the the most number of places called, then, we see a decrease in the number, and a new increase from year 2014 onwards.

Figure 2: Number of Positions Announced in Spain



Notes: Own elaboration using administrative data from the Ministry of Territorial Policy and Public Function in Spain, for years 2009-2015. It includes all positions that require a passing exam as entry condition in which the place of work is Spain. Excludes all temporal contracts.

To test whether public examinations influence sick leave behavior, we need the examination date. However, due to data restrictions, we do not have this information for all the calls. In particular, this information is mainly missing for the local positions. In Table 2, we provide details on the percentage of missing data according to the administrative level that offers the civil servant positions.

Table 2: Missing Examination Date

Adm. Level	# missing	# of positions offered	% missing
National	0	96,861	0.00
Regional	442	115,267	0.38
Local	13,193	21,995	59.98
Total	13,635	234,123	5.82

Elaboration: The Authors using data from the Ministry of Territorial Policy and Public Function in Spain, years 2009-2015.

We can see that for positions offered by the State Public Administration (National on the table), there is no missing information. For the regional ones, 442 positions have missing information on the

[6]The composition of the these three economic activities is the same as in the sick leave data.

[7]In any case, we have verified that all temporal positions excluded, indeed, did not have a passing exam as entry requirement

examination date, which corresponds to a 0.38% while, for local calls, there is a 59.98% of missing dates. Overall, the missing information is 5.82% of the sample. In spite of the percentage seen in the local positions, we have to keep in mind that the unit of observation in the database is the call, which can include from 1 to n positions. This is important because, as we will explain in the empirical strategy section, it is not the same a call with one position than one with, for instance, 500 (or more) positions. In this sense, from the 13,193 positions with missing examination date, a 49.10% corresponds to calls in which just one position was announced, and a 92.57% to up to 10 work places.

Finally, to have an idea of the cross-sectional variation in the number of positions at the regional level, in Figure A1 of the Appendix, we depict the number of positions offered per 1,000 workers for the year 2009, which registered the maximum number of new workplaces. This map includes the positions for which we have information on the examination date. We excluded the two autonomous cities, Ceuta and Melilla, just for graphing purposes. In addition, Table A1 of the Appendix shows the number of positions per year per region during the period of analysis.

4 Estimation Strategy and Identification

We are interested in the impact of public examinations on sick leave behavior. To do so, we focus on regional and local calls as in these ones we can identify the workplace at the province level.[8] Thus, we collapse and link sick leave with public examination data at the province, month and year of the examination level. We, therefore, get a balanced panel of provinces where the unit of observation is the province month-year, with one observation per province and month (for each year) counting the total number of spells, its mean duration, and number of positions announced. From here, we derive 3 samples: (i) the public administration sample, with data exclusively for individuals working in the public sector; (ii) the education sector, that contains all sick leave spells and civil servant positions of this sector, as previously defined; and (iii) the health sector. With this sample definition, we are left with 123,627 positions distributed across the 52 provinces of Spain to identify the effect of new call for positions on sick leave.

Formally, we exploit variation on the number of positions having an exam in province p, month m, year t. We measure this impact through two outcomes of interest: (i) the total number of sickness absences (per 1,000 workers), and (ii) the (average) length of the sickness episode conditional on taking it. As individuals who are currently working may be affected in terms of increased health-related work absence, we expect to see an increase in the total number of sickness absences before the examination date. At this point, as the reader might wonder, and due to data constraints, we do not really know whether people participating in public examinations and taking sick leave are actually the same. Therefore, our estimates are an intent-to-treat-effect.

We continue our analysis using an event study design that allows us to see how sick leave behaves before the examination date. We estimate the following baseline equation:

$$Y_{pmt} = \alpha + \sum_{j=-6}^{4} D_{pmt} + \delta_p + \gamma_m + \rho_t + \epsilon_{pmt} \quad (1)$$

[8] For the national calls it is not possible to know the geographical workplace.

where Y_{pmt} is the outcome of interest in province p, month m, year t. Our independent variables of interest are a set of dummies (0-1) that capture how the competition generated by public examinations influences sick leave behavior months before the examination date. We include seven pre-examination dummies, to compare how the two measures of sick leave vary, one month, two months, up to seven months before the examination date. We use seven months before the exam taking into account the average time between the calls and the examinations. We also include province fixed effects (δ_p) for time-invariant heterogeneity at the province level, month and year effects (γ_m, ρ_t) for common shocks across provinces, and cluster standard errors at the province level. Given that the outcomes are evaluated at the province level, and that provinces have different population sizes, all regressions are weighted by the number of employees per province. We perform separate regressions for each sub-sample, the public administration, education, and health economic sectors.

Literature on event study designs suggests to set the reference period (normalization) to one period prior to the treatment (Alsan and Wanamaker, 2018; Freyaldenhoven et al., 2019; Fuest et al., 2018; Schmidheiny and Siegloch, 2022). In our setting, the "treatment" is the competition (or need to study for the exams) generated by public examinations. In this context, it is not straightforward to establish a normalization period, thus, we decide to set this reference category at the pre-7 (7 months before the exams) month taking into account the average time between the publication of the call and the examination date. In addition, we follow the methodology proposed by Schmidheiny and Siegloch (2022) and estimate the event study with binned endpoints for multiple events of identical size.

The next step to build our identification strategy is to decide which calls we are going to use in our event(treatment) definition. Thus, for our baseline estimates, we focus on the largest calls, which are those that have a number of positions equal or greater than the 99 percentile of the "positions" distribution.[9] The decision to focus on a large number of positions is because sick leave behavior might not respond to a small number of workplaces announced, as preparation requires big efforts in terms of study, and, more importantly, the perceived probability of "wining the place" is higher when more positions are available. Therefore, participants might have more incentives to increase the demand of time to study, which in turns, might affect health resulting in an increase in absence rates. In this way, our event variable is a dummy taking the value of 1 when the number of positions (in province p, month m, and year t) in the call is greater or equal to the 99 percentile of the positions distribution.[10] Figure A2 of the Appendix shows the distribution of large events per 1,000 workers split by economic sector.

Finally, we assign the workplace location at the province level for every call. In the case of local calls, we have the information to which province the position belongs (in other words the workplace province), so they are directly assigned to each province in the panel. However, for the regional calls, we know the "autonomous community" to which the workplace can be allocated, therefore we assign the number of positions in every regional call to each province that comprises the "autonomous community",[11] since individuals have higher probabilities of participating in calls that are within their

[9] As a robustness check, in a following section, we conduct the baseline estimates using as treatment definition the calls with a number of positions equal or greater than the 95 percentile of the positions distribution.

[10] In the robustness check section, we present estimates where the event variable is constructed taking into account all the positions offered (not only the largest calls).

[11] For example, if there is a call of 100 positions in the health sector in the region of Catalonia, then we assign the 100 positions to the four province that comprise the region, that is Barcelona, Girone, Lleida and Tarragona.

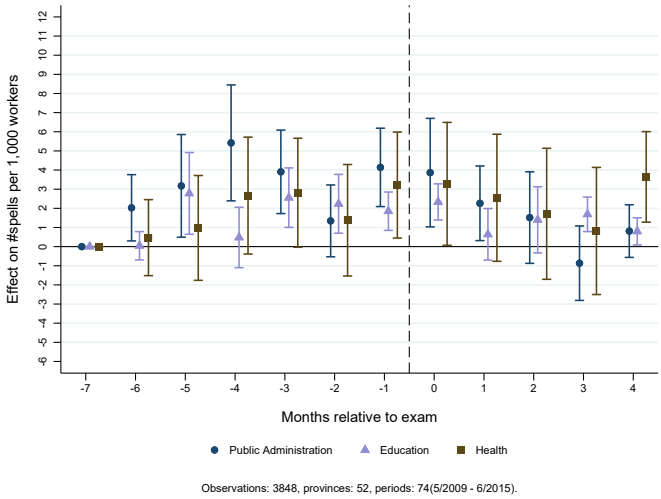
region of residence.

5 Results

5.1 Effects on the Number of Sick Leave Spells

We start the analysis of the impact of public examinations on sick leave behavior by plotting the event study specification of Equation (1) for the first outcome, the number of spells per 1,000 workers (per economic sector). Figure 3 shows the point estimates along with their 90 percent confidence intervals for each sample according to the economic sector. In the graph, each series represents a different regression.

Figure 3: Effect of Public Examinations on Sick Leave Spells: Results by Economic Sector



Notes: Figure plots event study estimates and 90 percent confidence intervals of different specifications of Equation (1). Treatment definition is according to the 99 percentile of the positions distribution. Dependent variable is the total number of spells per 1,000 workers for each economic sector. The reference period is pre-7 (seven months before the examination). Standard errors are clustered at the province level.

Looking at the estimates of the public administration sector, we find a positive and significant increase in the number of spells per 1,000 workers several months before the public examinations. In particular, we see an increase of around 4 sickness spells (per 1,000 workers) in the same month of the exams. Looking backwards, we also find detrimental effects from one to six months before the tests. At first sight, the magnitude of the impact seems to be larger for this sector than those of the other economic sectors. We also see a decrease in the size of the coefficient after the examination date. In all the pre-examination dates, all coefficients are of the expected signs.

Moving to the education sector, we also find a significant increase in the number of spells (per 1,000 workers) five, three, two, one months before, and in the month of the examination. The largest coefficient corresponds to three months before the exams, which is around 3 additional health-spells per 1,000 workers per month and province. In addition, after the public exams take place, the absence rate decreases. With respect to the health & social services sector, for the calls with the largest number of positions, we find a significant increase in the outcome of interest one, and the month of the public exams. In terms of magnitude, overall, we find the largest effects in the public administration and education sectors, which suggests that individuals in these sectors might be the most affected.

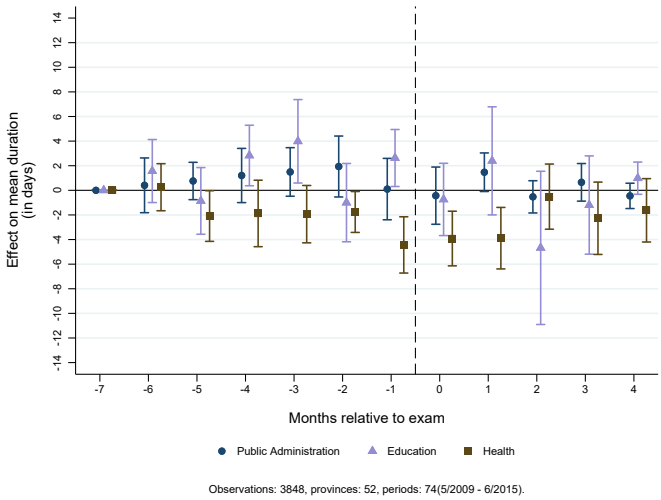
An interesting finding is that we still see some significant variation after the exams. This result is compatible with the "syndrome of the public examination participant" (sindrome del opositor in Spanish) which is related to lasting increased levels of anxiety and stress even after the exams. In table A3 of the Appendix, we report the estimated results of the coefficients plotted in Figure 3.

Our results point to an increase in the number of sick leave spells derived from the public examination system, which may be a (or one of the) negative consequence (externality) of the civil servant entry process. We find that in the public administration sector, sickness-related absences increase by up to 5 spells per 1,000 workers per month per province, in the education sector to up to 3 spells per (1,000) workers (per month per province), and in the health sector to a maximum of 3 spells per (1,000) workers (per month per province). With these results, one may also wonder whether stress/anxiety is playing a role behind the increase in sickness absences. We will discuss this possibility in the following sections of this document.

5.2 Effects on Length of Sick Leave Episodes

We continue exploring the impact of public examinations on sick leave behavior by analysing whether average mean duration of sickness episodes change before public exams. For this, we estimate Equation (1) where now the outcome of interest is the mean duration (in days) of sickness spells (per month, per province) conditional on having taken a sick leave. Figure 4 plots the average mean duration of sick leave spells for the three economic sectors. Likewise, in Table A4 of the Appendix, we show the estimated coefficients.

Figure 4: Effect of Public Examinations on Sick Leave Duration: Mean Length in Days



Notes: Figure plots event study estimates with 90 percent confidence intervals of Equation (1). Treatment definition is according to the 99 percentile of the positions distribution. Dependent variable is the mean duration of sickness spells per economic sector. The reference period is pre-7 (seven months before the examination). Standard errors are clustered at the province level.

Beginning with the public administration sector, we do not see any significant variation on the average mean duration of sickness spells before the examination date. Turning to the education sector, we find that average mean duration increases several months before the exams. For instance, one month before the exams the mean duration of the sickness spells increases by around 2 days per month per province, and three months before, this measure increases by 3.9 days. The results for the

education sector point to an overall increase in the average number of days that individuals take under sick leave, thought slightly significant. The strongest coefficient corresponds to three months before the exams which is compatible with the announcement of the process (call for positions).

An interesting result is seen in the health & social services sector. Here, we find a statistically significant decrease in the mean duration of sickness spells. A possible explanation for these findings might be that the type of sickness absences occurring in this sector may be mainly coming from diseases that, on average, have a shorter mean duration such as digestive, respiratory or stress-related conditions in comparison with other conditions such as neoplasms or injuries that usually demand more days off. This issue will be further explored in upcoming sections.

Overall, we find evidence supporting that the civil servant recruitment process may be generating negative unintended effects in terms of sickness absences. We find that this effect is stronger for individuals working in the education sector. Sickness absences in the workplace might be linked to work time lost as well as to productivity losses. For example, Herrmann and Rockoff (2012), on a research focused on teachers in New York City, found that worker absences have large negative impacts in terms of productivity, mainly coming from employing a temporary substitute as well as from replacing a regular worker.

5.3 Gender Differences in Sick Leave

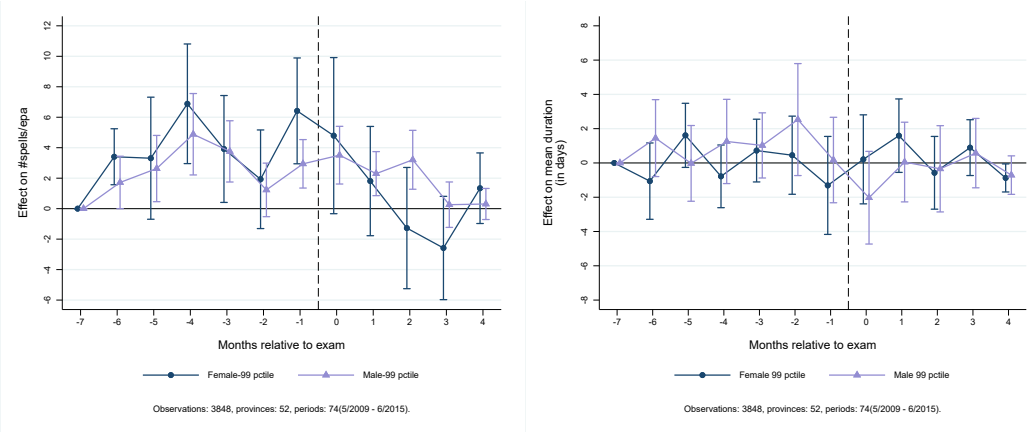
From the main results, one may also wonder whether there are differences in sick leave behaviour in terms of gender. To answer this question, within each economic sector, we split the sample between female and male, and re-estimate Equation (1) for the two samples: women and men workers using sick leave. Thus, the outcomes of interest are (i) the number of sickness absences per 1,000 female(male) workers in each economic sector,[12] and (ii) the mean duration of these sickness spells. We apply the same econometric strategy and define the treatment according to the 99 percentile of the positions distribution. We start with Figure 5 in which we plot the results for the public administration women/men employees.

We find similar results for both men and women (for the two outcomes) in terms of direction and statistical significance, which is compatible with the idea that, in the public administration sector, both groups seem to react in a similar way to public examinations. For instance, female workers in provinces in which there is a large number of public positions show, on average, a higher number of sick-related absences of up to (around) 6 episodes (per 1,000 workers and month) in months preceding the public exams in comparison with women located in other provinces. In terms of the average mean duration, the results are consistent with baseline estimates in which we do not find much significant variation in the months preceding public exams. Interestingly, after the examination date, we find some statistically significant variation for male workers, which might be compatible with the "sindrome del opositor" that we discussed in the previous section.

We next move to the education sector, and in Figure 6 plot the estimated results in separate regressions for women and men. For female workers, in panel (a), we see that in provinces with a large number of positions under examination women take, on average, a higher number of sick related

[12]This implies that for this outcome we divide the numerator over the number of female(male) workers per economic sector.

Figure 5: Effect of Public Examinations on Sick Leave in the Public Administration Sector: Women vs Men

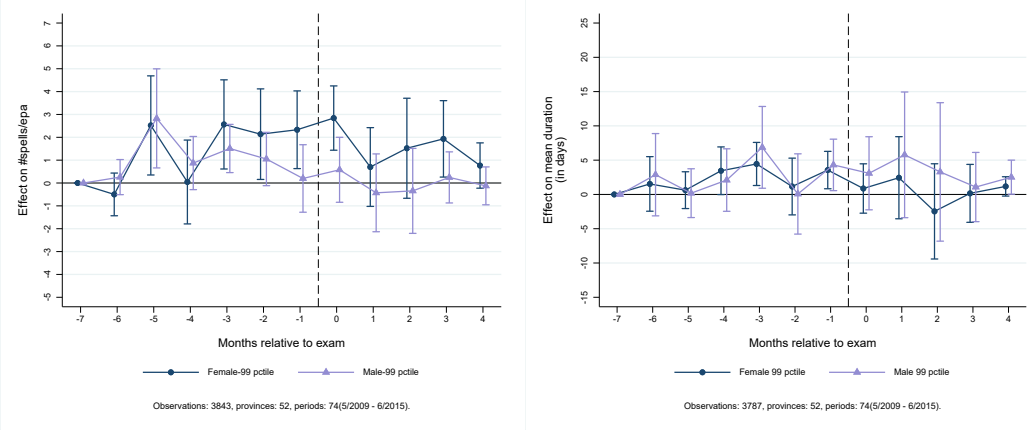


(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study estimates and 90 percent confidence intervals of Equation (1) in two separate regressions for male and female. Dependent variables are (panel a) the total number of spells per 1,000 female(male) workers, and (panel b) mean duration of sickness absences for male/female in the public administration sector. The reference period is pre-7. Standard errors are clustered at the province level.

absences in all the 6 months before the exams (except for the pre-4 month) relative to other provinces. In particular, we find the largest coefficient (around 4 spells per 1,000 female workers per province per month) three months before the examinations, which is compatible with the announcement of the call in this sector. For the male group, we also find an increase in health related absences though of smaller magnitude and significance. Overall, it seems that in the education sector, female workers would be more affected.

Figure 6: Effect of Public Examinations on Sick Leave in the Education Sector: Women vs Men



(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

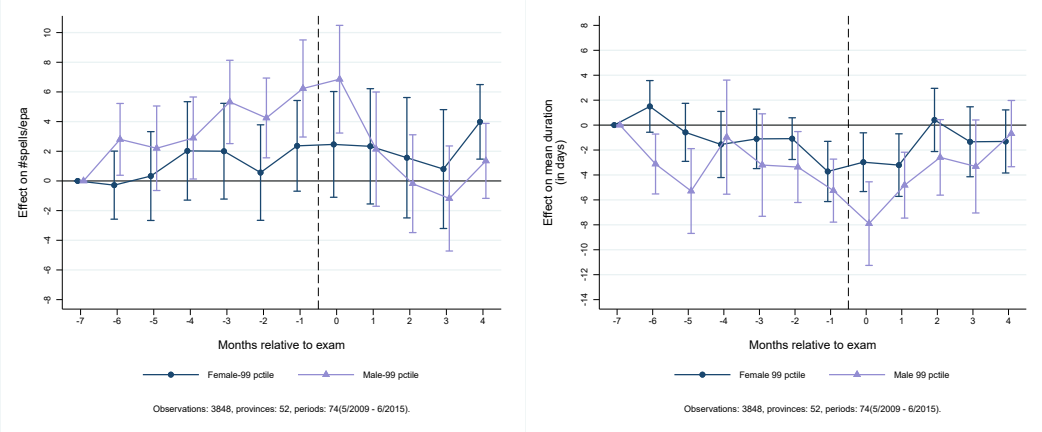
Notes: Figure plots event study estimates and 90 percent confidence intervals of Equation (1) in two separate regressions for male and female. Dependent variables are (panel a) the total number of spells per 1,000 female(male) workers, and (panel b) mean duration of sickness absences for male/female in the education sector. The reference period is pre-7. Standard errors are clustered at the province level.

Moving to the intensive margin, overall, it does not seem to be any change in the average mean duration of sickness spells, though we find some significant increase one month before the exams for women and men. In terms of magnitude, direction and statistical significance results are very similar for women and men.

With regards to how women and men's sick leave behavior responds to public examinations in the health & social services sector, in Figure 7, we show the estimated coefficients along with their 90 percent confidence intervals. For female workers, we do not find any significant variation in the number of sickness spells (panel a). For male workers the picture is different. For instance, we find an increase in the number of sickness episodes several months before the exams and the largest coefficient corresponds to that of the same month of the exam. After the examination date the coefficient drops and turns insignificant.

Panel (b) shows the variation for the average mean duration of sickness spells. As in the baseline results, we observe a reduction in the average mean duration. This behaviour is similar for female and male workers thought the coefficients are larger for men. Overall, in this economic sector, we find evidence supporting that male workers might be more affected in terms of sickness absences.

Figure 7: Effect of Public Examinations on Sick Leave in the Health Sector: Women vs Men



(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study estimates and 90 percent confidence intervals of Equation (1) in two separate regressions for male and female. Dependent variables are (panel a) the total number of spells per 1,000 female(male) workers, and (panel b) mean duration of sickness absences for male/female in the education sector. The reference period is pre-7. Standard errors are clustered at the province level.

From the gender heterogeneity analysis, in general, we get mixed evidence on whether women (men) are more responsive than men(women) in terms of sick-related work absences. We find results supporting a gender-related heterogeneity across economic sectors and within sectors. For instance, in the public administration sector both groups are affected. In the education sector, we see a clearer and persistent increase in sickness absences for women months before the public examination. However, when we look at the variation in the average number of days there is not significant relationship. In the health sector, male workers seem to be more affected in terms of an increase in sickness spells in face to public examinations. Literature on how external factors affect sick leave behavior is very scarce and therefore limited evidence is available for gender heterogeneity. However, Eriksen et al. (2016), in a research where they assess workplace bullying and sickness absence, find that women have higher, persistent increases in long-term sickness absence and worse long-term health, pointing to different coping strategies between men and women. Finally, in the Appendix, in Tables A5, and A6 we present the estimates obtained in this section.

6 Type of Diseases in Sick Leave Episodes

In this section, we explore the composition of sick leave spells with respect to the most common illnesses used in medical certificates. As mentioned in previous sections, the data contains sick leave episodes certified by a physician, including detailed classification of the type of disease according to the ICD-10 official classification, therefore, we are able to exploit this information to explore which type of diseases are mostly used to get the medical certificates. For this, we classify all diseases into twenty main categories based on the macro groups of the ICD-10 classification. In Table A2 of the Appendix, we show descriptive statistics per illness category.

To begin with the analysis, in Figure A3 of the Appendix, we provide a set of plots of the distribution of average mean duration of sickness spells for selected illness categories and economic sectors. In addition in Table A2, we show the average mean duration of the different diseases across the three economic sectors. In here, we show that conditions such as neoplasms, mental and blood disorders have the highest average mean duration (up to 102 days for neoplasms), and illnesses related to infectious and respiratory conditions report the lowest number of (mean) days (around 10 days).

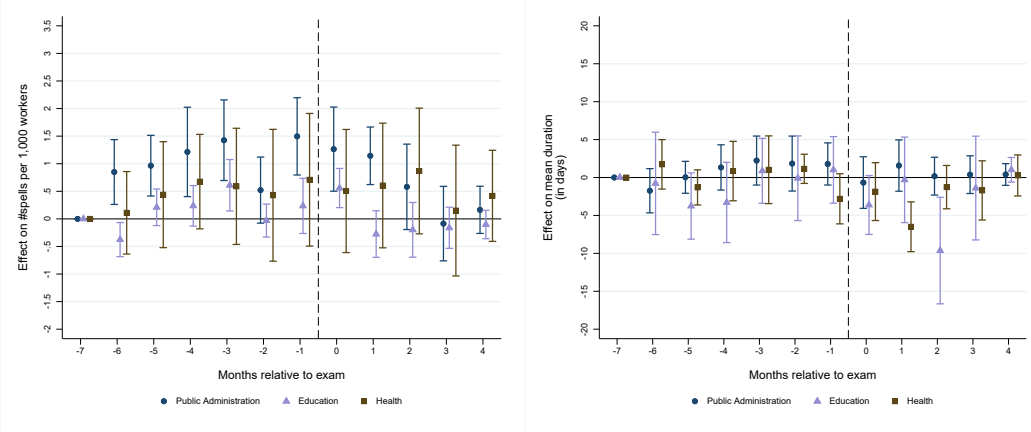
In this exercise we expect to find a significant increase in the absence rate coming from diseases that are mostly related with stress and anxiety. Recall from the Introduction, that workers who are faced with time constraints and the need to study might reduce the allocation of time for sleeping, reduce the allocation of time for leisure, and increase stress related to civil service recruitment testing, which may increase the rate of illness. Under the same idea, we should not find any significant difference in sickness absences coming from diseases that are unrelated to stress or anxiety such as neoplasms (both benign and malignant tumors). We will analyse this later in the robustness check section.

To formally assess whether stress-related health conditions change, we estimate Equation (1) using sickness spells coming from mental disorders (example: anxiety, depression, panic attacks), osteoarticular (back pain, joint pain) and digestive conditions (non-infectious gastrointestinal problems). We include the same fixed effects, treatment definition, and standard errors as in our baseline equation. Figure 8 shows the results for this exercise plotting the estimated coefficients along with their 90 percent confidence intervals for the two outcomes of interest. Each series represents a separate regression for each of the three economic sectors. In the Appendix, in Table A7, we report the estimated coefficients and their standard errors.

Panel (a) shows a significant increase in the absence rate for workers of the public administration sector. This suggests that stress-related conditions increase before public examinations. The largest effect is seen one month prior to the exams, and is around 1.5 additional sickness absences per (1,000) workers per province and month. Moving to the education sector, most of the coefficients are of the expected sign though not statistically significant. However, we find that the largest (and significant) coefficients are three months and the month of the exam (as in the overall results for this sector). In this sector we also observe, that after the recruitment tests, the coefficient of interest decreases relative to the reference period (7 months before the exams). Finally, for the health & social services sector, at first sight, we do not find any significant variation in terms of the number of sickness spells for this type of medical conditions.

Panel (b) depicts the results for the mean duration outcome. Here, overall, we do not find differences in provinces with large calls relative to other provinces, which suggests that the average length

Figure 8: Effect of Public Examinations on Sick Leave by Illness Category: "Stress-related Conditions"

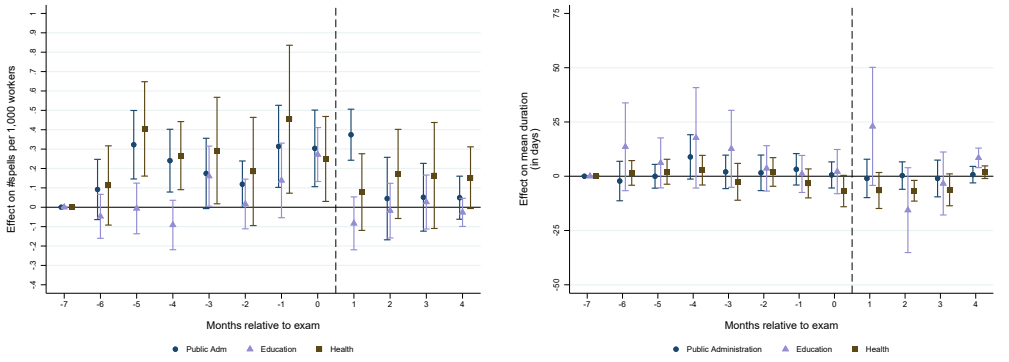


(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study estimates with 90 % confidence intervals of separate regressions for each economic sector. Dependent variables are (panel a) the total number of spells per 1,000 workers, and (panel b) mean duration of sickness absences. Reference period is pre-7. Standard errors are clustered at the province level.

of sickness episodes does not change in this group of medical conditions. We present a detailed table with descriptive statistics per economic sector in Table A2 of the Appendix.

Figure 9: Effect of Public Examinations on Sick Leave by Illness Category: "Mental Health Conditions"



(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study estimates with 90 % confidence intervals of separate regressions for each economic sector, for the sickness absences due to mental health conditions. Dependent variables are (panel a) the total number of spells per 1,000 workers, and (panel b) mean duration of sickness absences. Reference period is pre-7. Standard errors are clustered at the province level.

Next, we focus on sickness episodes coming exclusively from mental health conditions that mainly comprise anxiety and depression. For this, we re-do the above analysis using mental health diseases as outcome. Figure 9 depicts the estimated coefficients along with their 90 percent confidence intervals for the outcomes under analysis.

Overall from Figure 9, we find an increase in the number of sickness episodes in each of the three economic sectors. If we examine employees of the health sector, we find a sharp increase months before the public examinations. With respect to the education sector, we also find variation pointing to an increase in this type of health-related absences. In the public administration sector, we also see signif-

icant variation several months prior to the exams as well as in the month of the examinations. Moving to the average mean duration of these sickness spells, we do not find any significant variation. Results from this exercise, make us wonder whether applicants who combine work and exam preparation are experiencing negative unexpected consequences of the recruitment process in terms of increased levels of stress. We will come back to this point later on this paper.

7 Robustness Checks

In this section, we include some robustness checks to add validity to our findings. First, we add support to the hypothesis that we established in the empirical strategy section, in which we argue that sick leave behavior might not respond to small number of workplaces announced. Second, we change the treatment definition and consider calls in which the number of positions is greater or equal to the 95 percentile of the positions distribution. Third, as a placebo test, we show that diseases that are less (un)related to (short-term) stress/anxiety do not seem to be affected when there is a public examination approaching.

7.1 Continuous Event Variable

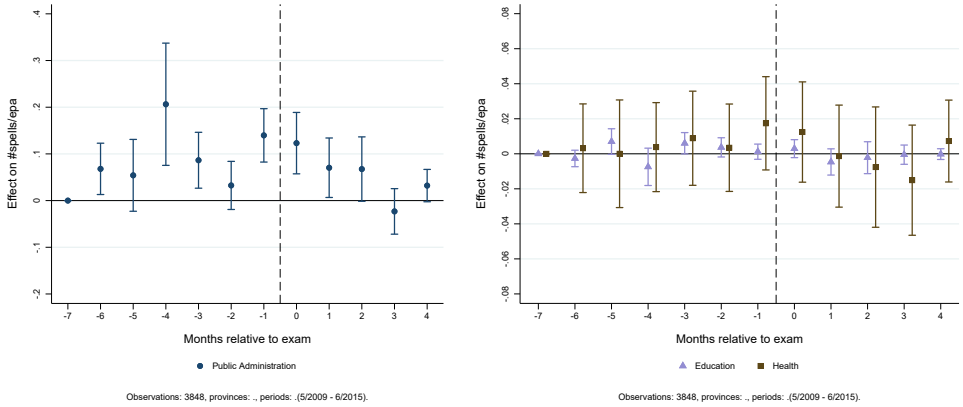
In our baseline results, we dichotomize the event variable based on whether the number of positions under examination is greater or equal to the 99 percentile of the positions distribution, under the assumption that sick leave behavior might not respond to a small number of workplaces announced as preparation requires big efforts in terms of study, and, more importantly, the perceived probability of "wining the place" is higher when more positions are available. To support this statement, in this subsection, we exploit all the available variation and estimate a generalized event study design as suggested by Schmidheiny and Siegloch (2022), where the event is constructed as a continuous variable measuring the number of positions per 1,000 workers for each economic sector. For the rest of the estimated equation, we use the same specification as in Equation (1).[13]

Figure 10 shows the results for this exercise. Panel (a) depicts the estimates for the public administration sector. In here, we see that we still find some significant effects in terms of increased number of sick leave episodes before the examination date. With respect to the education and health sectors, in panel (b), we see that we do not find any significant increase in sickness absence for the health sector. For the education sector, we only find a small increase in the outcome of interest three months before the examination date.

The results of this subsection show that even when we consider calls with a small number of positions, we still find some significant differences in the absence rate. However, we believe that by using only the largest calls (with a huge number of positions under competition), we are capturing in a more appropriate way the effects of public examination on sick leave behavior for the reasons already exposed.

[13] We present the estimated results in Table A8 of the Appendix.

Figure 10: Effect of Public Examinations on Sick Leave Spells: Continuous Event Definition



(a) Public administration sector (b) Education and Health sectors

Notes: Figure plots estimated coefficients of a generalized event study design where the event variable is continuous, along with their 90 percent confidence intervals. Panel (a) shows results for the public administration sector. Panel (b) presents results for the education and health sectors, separately. Dependent variable is the total number of spells per 1,000 workers in each economic sector. The reference period is pre-7 (seven months before the examination). Standard errors are clustered at the province level.

7.2 Changing the Treatment Definition

In this robustness check we change the treatment definition used in the baseline analysis. Now, we consider that an event takes place when the number of positions under examination is greater or equal to the 95 percentile (instead of 99) of the positions distribution. Formally, we re-estimate Equation (1) for the two outcomes: (i) the number of spells per 1,000 workers, and (ii) the average mean duration.

With this exercise, we expect to still find some statistically significant variation in sick leave behavior. Figure 11 shows that this is the case. For instance, for the absence rate (panel a), we get the expected signs in most of the coefficients and some significant variation (increase) in the previous and in the very month of the examinations. In addition, for the three economic sectors the estimated coefficients are smaller in magnitude compare to those of previous periods. Moving to the average mean duration of sickness spells, the education sector shows a significant variation, which can reach up to 5 more days on the length of average sickness absences per province per month. All the estimates from this subsection are shown in Table A9 of the Appendix.[14]

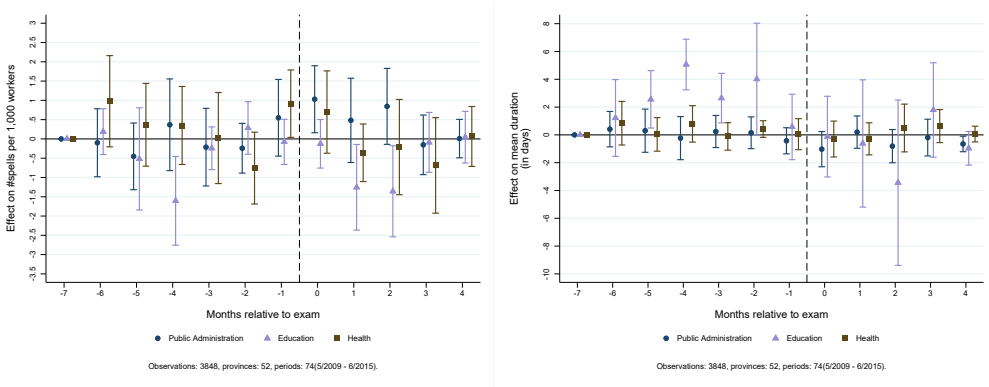
7.3 Placebo Illness Test

In this section, we perform a placebo test focusing on sickness spells with a diagnosis of "neoplasms". The intuition behind is that we should no expect to find any significant variation in terms of sickness absences, as it is very unlikely that participants both working and preparing an examination develop a tumor as consequence of the tough recruitment process.

With this reasoning, we implement the same regression as in Equation (1) using as sub-sample all sickness episodes with a diagnostic of "neoplasms". In Figure 12, we plot how neoplasms-related sickness spells change months before (and in the same month of) public examinations. We perform separate regressions for the three economic sectors under study (public administration, education and

[14]The rest of the results using the treatment definition of this subsection (gender and type of diseases analysis) are consistent and available upon request.

Figure 11: Robustness Checks - Different Treatment Definition

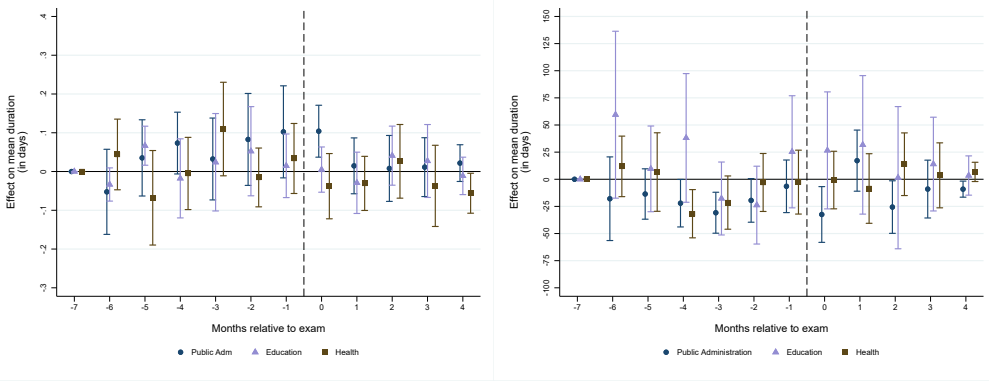


(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study designs along with 90 percent confidence intervals for sickness absences where the treatment definition is based on calls with a number of position greater or equal to the 95 percentile of the positions distribution. Dependent variables are (i) the total number of spells per 1,000 workers in each economic sector (separate regressions), and (ii) mean duration of sickness absence. The reference period is 7 months before the examinations. Standard errors are clustered at the province level.

health & social services) using the baseline treatment definition.

Figure 12: Effect of Public Examinations on Sick Leave Behaviour: Neoplasms



(a) Outcome: #Spells per 1,000 workers (b) Outcome: Mean duration

Notes: Figure plots event study designs along with 90 percent confidence intervals for sickness absences coming from neoplasms. Dependent variables are (i) the total number of spells per 1,000 workers (neoplasms-related) in each economic sector (separate regressions), and (ii) mean duration of these sickness absences. The reference period is 7 months before the examinations. Standard errors are clustered at the province level.

Regarding the extensive margin, in panel (a) of Figure 12, we do not find any statistically significant variation in the absence rate per 1,000 workers months before the exams in none of the three economic sectors. Likewise, in panel (b), we show the results for the average mean duration of these sickness spells. Once again, in general, we do not find any significant variation in this disease. We only find some significant changes, though of the contrary sign, in the public administration sector. Altogether, the results of this section add validity to our findings, which supports a significant increase in health-related absences several months before the examination date. The results seem to be mostly driven by stress related absences, which might be experienced by applicants who combine work and exam preparation. However, an additional possible explanation for our results might be that individuals may be using sickness absence as an strategic tool to gain more days to study exaggerating illnesses to increase sick leave. In this sense, employees could be more prone "to use" diseases that are more

difficult to be objectively diagnosed, which is clearly not the case for the neoplasms. This also goes in line with some literature that finds that some type of medical conditions are more sensitive to incentives (for instance, changes in the payment scheme, insurance claims, job stability, etc) that may affect sick leave behavior (Godard et al., 2022; Bratberg and Monstad, 2015). Finally, we present all estimates from Figure 12 in Table A10 of the Appendix.

8 Workers' health

Our main hypothesis is that the traditional recruitment system to access civil servant positions might be generating negative externalities in terms of increased health-related work absences. In this section, we provide some evidence that supports that large calls might be related to an increase in the use of health care services among public sector employees, which, in turn, might be compatible with deteriorating health. Formally, we test whether there is an association between large calls and some health (care) outcomes among public sector employees. We explore the existence of changes in self-assessed health and in health care use: general practitioner, emergency and specialist visits.

8.1 Public Administration Workers

We start comparing health-related outcomes of public sector employees with individuals working in other economic sectors. For this, we use data from the survey "Barómetro Sanitario" conducted by the *Centro de Investigaciones Sociológicas* of Spain for the years 2009 to 2015. This is a nationally representative survey that samples individuals aged 18 and older living in Spain. It provides information on health care use, waiting times, quality of services, self-assessed health and several socioeconomic characteristics at the individual level. It has several rounds per year.

We assess a set of outcomes such as general practitioner, specialists and emergency visits, in-hospital stay, self-assess health, and the number of general practitioner and specialist visits. For this, we use the corresponding questions from the survey asking whether individuals have used these services in the last twelve months. Using the responses to these questions, we construct the outcomes of interest, which are dummy variables taking the value of one for a positive response and zero otherwise. For the number of visits, these variables are conditional on having used the referred health services. As we did in the baseline estimates, we restrict the sample to individuals between 18 and 65 years old. The survey has important information that allows us to distinguish between public sector employees and other workers, which fits with our analysis.

To formally explore our hypothesis, we use a linear regression of the form:

$$Y_{ipt} = \alpha + \beta_1 Public_i + \beta_2 Exam_{pt} + \beta_3 Public_i * Exam_{pt} + \tau X_{ipt} + \gamma_p + \delta_t + \epsilon_{ipt} \quad (2)$$

where Y_{ipt} represents the health care use and health outcomes for individual i in province p and time t. $Public_i$ is a variable that takes the value of one for individuals working in the public sector and zero otherwise. $Exam_{pt}$ is a public examination indicator and takes the value of one for large calls (greater or equal to the 99 percentile of the positions distribution) in province p and time t. The

coefficient of interest is β_3, the interaction term between public sector employees and the public exam indicator. We include a set of control variables τX_{ipt} at the individual level: sex, age group categories and a socioeconomic status category which is designed and provided by the survey. We also include province fixed effects γ_p to account for any time invariant shock across provinces and time δ_t fixed effects. Standard errors are clustered at the province level (52 clusters). We use probability weights to take into consideration the survey design.

Table 3 shows the estimates of Equation (2). We find a significant increase in the probability of having used the general practitioner and specialist for public sector workers living in a province with a large number of public examinations. We also find some variation in the number of specialist visits (significant at the 10% level). For the other outcomes, even we do not find a significant variation, the estimated coefficients are of the expected signs.

Table 3: Health Care Use Results for Public Sector Workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GP Visits	**Emergency**	**Specialist**	**Hospital**	**SAH**	**# GP visits**	**# Specialist**
Public	-0.0038	-0.0064	0.0530***	-0.0091*	0.0393***	-0.1003	0.1087
	(0.0123)	(0.0103)	(0.0074)	(0.0050)	(0.0107)	(0.0835)	(0.1038)
Exam	-0.0321	0.0480*	0.0152	0.0000	-0.0063	0.5294	-0.0935
	(0.0249)	(0.0257)	(0.0257)	(0.0128)	(0.0263)	(0.5391)	(0.2367)
Public*Exam	**0.1816*** **	**0.0570**	**0.2201** **	**0.0312**	**-0.0977**	**0.8323**	**1.8187***
	(0.0504)	(0.0811)	(0.1028)	(0.0433)	(0.1062)	(0.7259)	(0.9901)
Female dummy	0.1176***	0.0568***	0.1243***	0.0277***	-0.0438***	0.7864***	0.3357***
	(0.0094)	(0.0057)	(0.0057)	(0.0028)	(0.0084)	(0.0780)	(0.0944)
Age categories	x	x	x	x	x	x	x
SES categories	x	x	x	x	x	x	x
Province FE	x	x	x	x	x	x	x
Time FE	x	x	x	x	x	x	x
Observations	34,684	34,699	34,684	34,692	29,664	23,454	14,599

Notes: OLS estimates of Equation (2). Outcomes "GP visits", "Emergency", "Specialists", "Hospital" are dummy variables assessing health care use at different levels of care. Outcome "SAH" is a dummy variable measuring self-assessed health (Good/Bad) for which there is no data for year 2009. "# GP visits" and "# Specialist visits" are the number of visits to the general practitioner and specialist, respectively. Standard errors are clustered at the province level (52 clusters). P-weights used in estimation to account for the survey design. ***p<0.01, **p<0.05, *p<0.10.

A possible interpretation for the increase in general practitioner visits, might be that individuals need to visit the physician to get the certificate to justify the sick leave, which can be interpreted as an immediate consequence of the public examinations. Regarding the probability of having visited the specialist, it also increases as well as the number of visits to this level of health care, which means that individuals already visiting the specialists, now increase the number of visits. This is compatible with deteriorating health for public sector employees compared with private sector workers in the presence of a large number of public examinations.

One concern about the previous results is that we should not find that health of permanent public sector workers is affected by opening of new positions. In fact, a permanent worker should not be affected, but a temporary one may fear for the current position, or getting uncertain about the future. To rule out that this is not the case, we now restrict the sample to individuals working exclusively to the public sector and estimate a model similar to Equation (2) where, instead of having a public indicator independent variable, we have a dummy taking the value of one for temporal workers and

zero for permanent employees. In this exercise, we expect to find negative health-related outcomes for individuals under temporal contracts in face of opening positions. We perform the analysis for the same outcomes and use the same specification as in Equation (2). Table 4 shows the results of this exercise.

Table 4: Health Care Use Results for Public Sector Workers: Temporal vs Permanent Contracts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GP Visits	**Emergency**	**Specialist**	**Hospital**	**SAH**	**# GP visits**	**# Specialist**
Temporal	0.0389*	-0.0072	-0.0280	0.0080	0.0269	-0.1054	-0.1527
	(0.0219)	(0.0257)	(0.0209)	(0.0153)	(0.0211)	(0.2508)	(0.3118)
Exam	0.0595	0.0342	0.2109	-0.0186	-0.0620	0.8003	0.7302
	(0.0876)	(0.0920)	(0.1285)	(0.0518)	(0.0709)	(0.9630)	(1.0954)
Temporal*Exam	**0.0844**	**0.5851*** **	**0.1449**	**0.1806**	**-0.7638*** **	**0.3429**	**0.4736**
	(0.1030)	(0.1863)	(0.2239)	(0.1912)	(0.0735)	(1.3002)	(1.3397)
Female dummy	x	x	x	x	x	x	x
Age categories	x	x	x	x	x	x	x
SES categories	x	x	x	x	x	x	x
Province FE	x	x	x	x	x	x	x
Time FE	x	x	x	x	x	x	x
Observations	3,229	3,235	3,234	3,234	2,766	2,203	1,619

Notes: OLS estimates of a sample of public sector employees. Outcomes "GP visits", "Emergency", "Specialists", "Hospital" are dummy variables assessing health care use at different levels of care. Outcome "SAH" is a dummy variable measuring self-assessed health (Good/Bad) for which there is no data for year 2009. "# GP visits" and "# Specialist visits" are the number of visits to the general practitioner and specialist, respectively. Standard errors are clustered at the province level (52 clusters). P-weights used in estimation to account for survey design. ***p<0.01, **p<0.05, *p<0.10.

Overall, we find the expected signs for all outcomes. In addition, we get a significant increase in the probability of visiting the emergency room for temporal public sector workers relative to permanent workers. Likewise, we find that temporal workers in provinces with a large number of public examination report worst (self-assessed) health compared to their counterparts.

8.2 Gender Differences in Public Administration Workers' Health

In this section, we analyse public administration workers' health separately for women and men. For this, we use the same survey data from the "*Centro de Investigaciones Sociológicas of Spain*" and perform a regression of the form of Equation (2) for two different sub-samples: men and women.

Table 5 shows the results. Panel (A) suggests that the increase in the probability of using the specialist services might be coming from female public sector employees. We also see, that female workers of the public administration sector experience an increase of around 4 additional visits to the specialist per quarter per province in face of public examinations. An interesting result for women is the negative significant result in the probability of reporting bad health compared to their female counterparts working in the private sector when there are public examinations. In addition, we also observe some variation (though at the 10% significance level) for both general practitioner visits and the number of visits.

In panel (B), we present the results for the male sample. We find that this group might be driving our results of increased visits to the general practitioner. For instance, we find an increase in the probability of using this service by 21.04 percentage points for male working in the public administration sector relative to private workers when there is a large number of public examinations.

Table 5: Health Care Use Results: Women vs Men

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	GP Visits	**Emergency**	**Specialist**	**Hospital**	**SAH**	**# GP visits**	**# Specialist**
A. Female sample							
Public	0.0056	-0.0120	0.0395***	-0.0035	0.0334**	0.0858	0.2257
	(0.0153)	(0.0156)	(0.0129)	(0.0096)	(0.0144)	(0.1709)	(0.1633)
Exam	-0.0301	0.0886*	-0.0270	-0.0020	-0.0031	0.1737	0.0366
	(0.0367)	(0.0457)	(0.0342)	(0.0234)	(0.0306)	(0.3543)	(0.3136)
Public*Exam	**0.1508***	**0.0701**	**0.3254****	**0.0846**	**-0.4006****	**1.7692***	**4.6044*****
	(0.0802)	(0.2286)	(0.1374)	(0.1509)	(0.1902)	(0.9118)	(1.5475)
Observations	15,980	15,990	15,986	15,992	13,655	11,835	7,895
B. Male sample							
Public	-0.0131	-0.0042	0.0615***	-0.0127	0.0462***	-0.2875	-0.0255
	(0.0155)	(0.0114)	(0.0139)	(0.0095)	(0.0136)	(0.1931)	(0.1667)
Exam	-0.0338	0.0152	0.0516	0.0045	-0.0128	0.7317	-0.2745
	(0.0393)	(0.0393)	(0.0451)	(0.0173)	(0.0394)	(1.0505)	(0.2875)
Public*Exam	**0.2104*****	**0.0703**	**0.1738**	**0.0144**	**0.0913**	**0.4855**	**0.5762**
	(0.0700)	(0.1308)	(0.1176)	(0.0556)	(0.0874)	(1.0774)	(0.9404)
Observations	18,704	18,709	18,698	18,700	16,009	11,619	6,704
Control variables							
Age categories	x	x	x	x	x	x	x
SES categories	x	x	x	x	x	x	x
Fixed effects							
Province FE	x	x	x	x	x	x	x
Time FE	x	x	x	x	x	x	x

Notes: OLS estimates of Equation (2). Panel A corresponds to the female sample and Panel B to the male sample. Outcomes "GP visits", "Emergency", "Specialists", "Hospital" are dummy variables assessing health care use at different levels of care. Outcome "SAH" is a dummy variable measuring self-assessed health (Good/Bad) for which there is no data for year 2009. "# GP visits" and "# Specialist visits" are the number of visits to the general practitioner and specialist, respectively. Standard errors are clustered at the province level (52 clusters). P-weights used in estimation to account for survey design. Control variables and fixed effects are applied to both the female and male samples. ***p<0.01, **p<0.05, *p<0.10.

Overall, we find evidence that supports some differences between the female and male samples. We show that women might be experiencing conditions leading them to make more use of the specialist care. Finally, we provide evidence supporting that there might be a deterioration of workers' health in face of public examinations which could be due to concerns about working stability or a general physical/mental overload due to the recruitment system.

9 Conclusions

Public examinations is the most common recruitment system to select civil servants in several countries. For instance, in Europe it is used in France, The UK, Spain, among others. Likewise, it is also used in some countries of Asia and South America. In spite of its wide use, there is scarce research conducted with respect to any potential unexpected negative consequences of the recruitment process. On this point, Bagüés (2005) in a document assessing the determinants of public exams success, highlights as a drawback the great impact on society in terms of income search costs due to the great effort needed to pass the exams. And additional example is a working document conducted by the World Bank done for south-pacific Asian countries, in which they found that the traditional public examination system induces corruption to get the positions. In this sense, assessing whether the system generates negative externalities in terms of health-related work absence results relevant for governments to decide future

improvements in the selection mechanism.

In this document, we contribute to the literature on civil servants recruitment process assessing the impact of new openings of civil servant positions on sickness absences. For this, we use a unique administrative data from Spain on the universe of sickness absences due to common illness certified by a physician, and on the universe of public examinations, both for years 2009 to 2015. Empirically, we estimate an intention-to-treat effect exploiting the variation coming from the different number of positions under examination across time and provinces. We find a significant increase in health-related absences several months before the examination date. This effect is stronger for individuals working in the educational sector as well as for calls offering a large number of positions.

Next, we explore whether there are differences between women and men within each economic sector. We find that, overall, women seem to be taking more sick leave (in terms of number of episodes) several months before the exams. This is particularly visible in the education sector, which could be explained by the fact that the education sector is women-predominant in Spain. For the health sector the impact is mostly seen on men employees. In addition, we analyze which type of diseases are driving the results, and find that the effect is mostly coming from stress-related absences.

Our results provide evidence supporting the idea that the public examination process may be generating negative externalities in terms of increased sickness absences. We go a step further and find that stress-related conditions may explain these changes.

In addition, we explore health and health care use outcomes of public sector employees. We find evidence that supports a short term (self-assessed) health deterioration in temporal public sector workers compared to permanent civil servants in face of public exams. Moreover, we find that public sector workers have higher probabilities of visiting the general practitioner as well as the specialist in face of public exams, which is consistent with a deterioration in public sector workers' health. With this, we support the idea that the increase in sickness absence in the months previous to the examinations could be actually a true negative health effect due to an increase in stress among applicants who combine work and exam preparation. However, we have to recognize that there is still room for our results to be coming from a strategic behavior from participants.

Our results are important from a policy perspective as they highlight the existence of important negative consequences of the civil service recruitment process, which should be taken into account in future designs of improvement of the process. In this document we find evidence supporting that participants might be facing increased levels of stress and anxiety.

Compliance with ethical standards

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Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Data availability statements: Raw data cannot be shared due to confdentiality.

Code availability: The code is available upon well-reasoned request.

A Appendix

Table A1: Total Number of Positions Announced by Region

Region	2009	2010	2011	2012	2013	2014	2015
Andalusia	6,873	4,137	4,335	8	592	446	3,088
Aragon	2,838	590	1,074	129	546	700	1,128
Cantabria	745	352	14	53	90	12	87
Castille-La Mancha	5,547	627	0	0	210	0	330
Castille and Leon	1,679	1,179	901	0	176	0	895
Catalonia	5,197	8,511	1,849	90	0	88	370
Ceuta & Melilla	72	18	0	5	1	10	0
Community of Madrid	5,556	1,564	497	3,765	445	387	1,545
Navarre	1,066	1,069	308	172	9	0	13
Valencian Community	4,011	1,297	1,976	0	303	3	0
Extremadura	910	973	1,752	52	676	0	182
Galicia	3,691	998	439	58	481	325	802
Balearic Islands	2,966	1,069	245	0	18	0	97
Canary Islands	805	1,430	850	421	395	2,761	208
La Rioja	325	209	48	0	80	0	50
Basque Country	821	1,010	3,673	828	0	0	1,032
Principality of Asturias	796	136	197	448	24	52	188
Region of Murcia	1,931	581	0	0	214	0	0
Total	45,799	25,750	18,158	6,029	4,260	4,784	10,015

Elaboration: The Authors. Source: Administrative data from the Ministry of Territorial Policy and Public Function in Spain, for years 2009-2015. Includes all positions offered at the regional level that require a passing exam as entry condition, for which we have the information on the exam date.

Table A2: Sick Leave by Disease Category and Economic Sector: Descriptive Statistics

	Public Administration			Education sector			Health sector		
Main disease category	**# of Spells**	**% Spells**	**Mean duration**	**# of Spells**	**% Spells**	**Mean duration**	**# of Spells**	**% Spells**	**Mean duration**
Osteo-articular system	467,512	20.11	52.13	181,225	16.77	45.09	661,068	18.15	53.14
Respiratory system	403,019	17.34	11.20	226,503	20.97	9.48	607,888	16.69	10.33
Infectious diseases	193,386	8.32	8.64	101,612	9.41	7.70	363,008	9.97	7.34
Injuries	188,603	8.11	50.01	72,899	6.75	45.67	238,497	6.55	50.15
Digestive system	143,358	6.17	27.48	59,068	5.47	22.84	240,595	6.61	20.57
Mental disorders	163,447	7.03	81.35	71,848	6.65	72.13	251,004	6.89	74.98
Senses and nervous system	106,542	4.58	37.81	45,447	4.21	30.98	194,106	5.33	32.09
Genitourinary system	59,277	2.55	35.86	29,555	2.74	32.50	105,734	2.90	34.12
Pregnancy complications	55,073	2.37	54.32	44,366	4.11	49.02	103,446	2.84	55.70
Circulatory system	49,054	2.11	72.00	19,483	1.80	58.06	72,934	2.00	58.64
Neoplasms	42,698	1.84	103.26	21,452	1.99	104.42	64,988	1.78	101.61
Supplementary factors(code V)	40,822	1.76	46.27	21,817	2.02	45.17	63,117	1.73	45.57
Skin diseases	28,883	1.24	30.82	10,229	0.95	25.88	41,194	1.13	29.64
Procedures (code P)	29,995	1.29	53.99	10,879	1.01	45.69	47,030	1.29	50.77
Endocrine diseases	16,105	0.69	49.02	6,317	0.58	48.45	25,347	0.70	50.12
External causes of injuries (code E)	8,621	0.37	47.98	3,513	0.33	40.40	12,619	0.35	42.10
Blood diseases	4,343	0.19	71.17	2,162	0.20	61.21	7,538	0.21	64.50
Congenital anomalies	3,548	0.15	63.81	1,611	0.15	55.86	6,068	0.17	60.40
Perinatal period diseases	1,770	0.08	67.16	984	0.09	55.01	2,542	0.07	67.13
Diseases not well defined	214,199	9.21	29.97	106,764	9.88	25.03	372,023	10.21	24.79
No diagnosis	23,128	0.99	73.46	8,153	0.75	55.42	32,957	0.90	59.36
Missing data	81,142	3.49	35.99	34,493	3.19	42.29	128,386	3.53	31,23

Elaboration: The Authors. Source: Administrative data from the Spanish Social Security Institution for years 2009-2015, and from the Ministry of Health, Consumption and Wellbeing (Ministerio de Sanidad, Consumo y Bienestar Social) on disease classification, available at . Notes: Mean duration is measured in days.

Table A3: Effect of Public Examinations on Sick Leave Behavior: (#) of Sick Leave Spells by Economic Sector

Economic sector	**Public Adm.**	**Education**	**Health**
	# Spells (1,000 workers)	# Spells (1,000 workers)	# Spells (1,000 workers)
Exam date_Pre,t-6	2.0287*	0.0454	0.4688
	(1.0524)	(0.4489)	(1.2071)
Exam date_Pre,t-5	3.1744*	2.7804**	0.9755
	(1.6306)	(1.2974)	(1.6643)
Exam date_Pre,t-4	5.4190***	0.4782	2.6664
	(1.8409)	(0.9596)	(1.8557)
Exam date_Pre,t-3	3.9072***	2.5574***	2.8145
	(1.3255)	(0.9442)	(1.7307)
Exam date_Pre,t-2	1.3447	2.2377**	1.3780
	(1.1408)	(0.9336)	(1.7709)
Exam date_Pre,t-1	4.1394***	1.8507***	3.2167*
	(1.2443)	(0.6095)	(1.6828)
Exam date	3.8657**	2.3344***	3.2785*
	(1.7227)	(0.5740)	(1.9524)
Exam date_Post,t+1	2.2636*	0.6406	2.5531
	(1.1850)	(0.8189)	(2.0188)
Exam date_Post,t+2	1.5171	1.4000	1.7150
	(1.4535)	(1.0509)	(2.0807)
Exam date_Post,t+3	-0.8662	1.6883***	0.8173
	(1.1822)	(0.5486)	(2.0192)
Exam date_Post,t+4	0.8125	0.7968*	3.6432**
	(0.8352)	(0.4306)	(1.4377)
Month FE	x	x	x
Year FE	x	x	x
Province FE	x	x	x
No. of observations	3,848	3,848	3,848
No. of provinces	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province level. ***p<0.01, **p<0.05, *p<0.10.

Table A4: Effect of Public Examinations on Sick Leave Behavior: Mean Duration of Sickness Spells by Economic Sector

Economic sector	**Public Adm.**	**Education**	**Health**
	Mean duration (in days)	Mean duration (in days)	Mean duration (in days)
Exam date_Pre,t-6	0.4067	1.5677	0.2526
	(1.3521)	(1.5571)	(1.1629)
Exam date_Pre,t-5	0.7594	-0.8606	-2.0898
	(0.9226)	(1.6465)	(1.2508)
Exam date_Pre,t-4	1.2051	2.8310*	-1.8786
	(1.3386)	(1.4947)	(1.6423)
Exam date_Pre,t-3	1.4943	3.9841*	-1.9372
	(1.1995)	(2.0615)	(1.4168)
Exam date_Pre,t-2	1.9366	-1.0002	-1.7583*
	(1.5047)	(1.9343)	(1.0107)
Exam date_Pre,t-1	0.1013	2.6275*	-4.4368***
	(1.5170)	(1.4088)	(1.3893)
Exam date	-0.4335	-0.7396	-3.9169***
	(1.4136)	(1.7859)	(1.3502)
Exam date_Post,t+1	1.4708	2.3953	-3.8881**
	(0.9530)	(2.6702)	(1.5195)
Exam date_Post,t+2	-0.5289	-4.6777	-0.5120
	(0.7960)	(3.7854)	(1.6092)
Exam date_Post,t+3	0.6502	-1.1965	-2.2705
	(0.9288)	(2.4280)	(1.7872)
Exam date_Post,t+4	-0.4514	0.9860	-1.6247
	(0.6255)	(0.7963)	(1.5658)
Month FE	x	x	x
Year FE	x	x	x
Province FE	x	x	x
No. of observations	3,848	3,848	3,848
No. of provinces	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province level. ***p<0.01, **p<0.05, *p<0.10.

Table A5: Effect of Public Examinations on Sick Leave Behavior: Gender Analysis by Economic Sector

Economic sector	**Public Adm.**		**Education**		**Health**	
Outcome:	# Spells	# Spells	# Spells	# Spells	# Spells	# Spells
(per 1,000 workers)	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
Exam date_Pre,t-6	3.4073***	1.7183	-0.4987	0.2581	-0.2832	2.8027*
	(1.1169)	(1.0474)	(0.5680)	(0.4671)	(1.3947)	(1.4710)
Exam date_Pre,t-5	3.3106	2.6320*	2.5201*	2.8280**	0.3292	2.2032
	(2.4353)	(1.3220)	(1.3184)	(1.3180)	(1.8201)	(1.7317)
Exam date_Pre,t-4	6.8828***	4.8835***	0.0448	0.8729	2.0245	2.8945*
	(2.3868)	(1.6244)	(1.1153)	(0.7073)	(2.0167)	(1.6804)
Exam date_Pre,t-3	3.9167*	3.7588***	2.5639**	1.5100**	2.0045	5.3249***
	(2.1326)	(1.2219)	(1.1859)	(0.6415)	(1.9619)	(1.7074)
Exam date_Pre,t-2	1.9296	1.2310	2.1375*	1.0502	0.5642	4.2467**
	(1.9676)	(1.0686)	(1.2047)	(0.7093)	(1.9570)	(1.6348)
Exam date_Pre,t-1	6.4178***	2.9424***	2.3306**	0.1989	2.3655	6.2317***
	(2.1112)	(0.9669)	(1.0336)	(0.8977)	(1.8584)	(1.9891)
Exam date	4.7923	3.5103***	2.8419***	0.5785	2.4627	6.8574***
	(3.1147)	(1.1509)	(0.8554)	(0.8640)	(2.1666)	(2.2063)
Exam date_Post,t+1	1.8102	2.2984**	0.6994	-0.4292	2.3338	2.1441
	(2.1800)	(0.8786)	(1.0475)	(1.0352)	(2.3619)	(2.3408)
Exam date_Post,t+2	-1.2748	3.2072***	1.5209	-0.3443	1.5651	-0.1852
	(2.4186)	(1.1754)	(1.3304)	(1.1305)	(2.4666)	(2.0043)
Exam date_Post,t+3	-2.5819	0.2602	1.9314*	0.2451	0.8006	-1.1825
	(2.0610)	(0.9063)	(1.0164)	(0.6795)	(2.4355)	(2.1529)
Exam date_Post,t+4	1.3415	0.3061	0.7645	-0.1247	3.9827**	1.3522
	(1.4085)	(0.6201)	(0.6025)	(0.5040)	(1.5276)	(1.5360)
Month FE	x	x	x	x	x	x
Year FE	x	x	x	x	x	x
Province FE	x	x	x	x	x	x
No. of observations	3,848	3,848	3,843	3,843	3,848	3,848
No. of provinces	52	52	52	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. Outcome variable is the total number of spells per 1,000 female/male workers per economic sector. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province level. ***p<0.01, **p<0.05, *p<0.10.

Table A6: Effect of Public Examinations on Sick Leave Behavior: Gender Analysis by Economic Sector

Economic sector	**Public Adm.**		**Education**		**Health**	
Outcome:	Mean duration (in days)		Mean duration (in days)		Mean duration (in days)	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
Exam date_Pre,t-6	-1.0611	1.4487	1.5330	2.8765	1.4992	-3.1200**
	(1.3538)	(1.3640)	(2.4197)	(3.6487)	(1.2596)	(1.4606)
Exam date_Pre,t-5	1.6103	-0.0251	0.6239	0.1843	-0.5815	-5.2874**
	(1.1367)	(1.3429)	(1.6316)	(2.1633)	(1.4151)	(2.0676)
Exam date_Pre,t-4	-0.7815	1.2535	3.4533	2.0996	-1.5543	-0.9662
	(1.1118)	(1.4944)	(2.1148)	(2.7710)	(1.6125)	(2.7823)
Exam date_Pre,t-3	0.7221	1.0227	4.4456**	6.8673*	-1.1055	-3.2053
	(1.1126)	(1.1557)	(1.9107)	(3.6249)	(1.4493)	(2.4988)
Exam date_Pre,t-2	0.4514	2.5301	1.1555	0.0700	-1.0860	-3.3646*
	(1.3856)	(1.9855)	(2.5161)	(3.5589)	(1.0167)	(1.7296)
Exam date_Pre,t-1	-1.3106	0.1708	3.5561**	4.3074*	-3.7196**	-5.2556***
	(1.7375)	(1.5160)	(1.6580)	(2.2826)	(1.4681)	(1.5366)
Exam date	0.2098	-2.0279	0.8681	3.0856	-2.9745**	-7.9023***
	(1.5788)	(1.6433)	(2.1880)	(3.2406)	(1.4322)	(2.0385)
Exam date_Post,t+1	1.5911	0.0521	2.4379	5.7737	-3.2091**	-4.8185***
	(1.3030)	(1.4128)	(3.6399)	(5.5728)	(1.5261)	(1.6064)
Exam date_Post,t+2	-0.5748	-0.3415	-2.4705	3.2835	0.4144	-2.5898
	(1.2901)	(1.5297)	(4.2220)	(6.1390)	(1.5416)	(1.8417)
Exam date_Post,t+3	0.8938	0.5735	0.1575	1.0795	-1.3378	-3.3190
	(0.9899)	(1.2302)	(2.5678)	(3.0697)	(1.7057)	(2.2681)
Exam date_Post,t+4	-0.8741*	-0.7090	1.1710	2.5176	-1.3116	-0.6815
	(0.4976)	(0.6826)	(0.8572)	(1.5100)	(1.5381)	(1.6152)
Month FE	x	x	x	x	x	x
Year FE	x	x	x	x	x	x
Province FE	x	x	x	x	x	x
No. of observations	3,848	3,848	3,841	3,787	3,848	3,848
No. of provinces	52	52	52	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. Outcome variable is the mean duration of spells for female/male workers per economic sector. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province level. ***p<0.01, **p<0.05, *p<0.10.

Table A7: Effect of Public Examinations on Sick Leave Behavior - Stress-related Conditions

Economic sector	**Public Adm.**		**Education**		**Health**	
Outcome	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)
Exam date_Pre,t-6	0.8493**	-1.7419	-0.3759*	-0.7738	0.1103	1.7366
	(0.3571)	(1.7715)	(0.1880)	(4.1028)	(0.4546)	(1.9836)
Exam date_Pre,t-5	0.9644***	0.0256	0.2104	-3.7560	0.4391	-1.3040
	(0.3344)	(1.2800)	(0.2017)	(2.6584)	(0.5842)	(1.4094)
Exam date_Pre,t-4	1.2140**	1.3295	0.2365	-3.2849	0.6757	0.8490
	(0.4925)	(1.8132)	(0.2235)	(3.2181)	(0.5208)	(2.3812)
Exam date_Pre,t-3	1.4258***	2.2362	0.6100**	0.8803	0.5898	1.0208
	(0.4443)	(1.9637)	(0.2833)	(2.6066)	(0.6401)	(2.7145)
Exam date_Pre,t-2	0.5218	1.8387	-0.0306	-0.0932	0.4283	1.1455
	(0.3643)	(2.2041)	(0.1819)	(3.3946)	(0.7266)	(1.1708)
Exam date_Pre,t-1	1.4962***	1.7881	0.2357	1.0086	0.7091	-2.8074
	(0.4259)	(1.6895)	(0.3043)	(2.6664)	(0.7309)	(2.0085)
Exam date	1.2646***	-0.6685	0.5591**	-3.6197	0.5051	-1.8576
	(0.4637)	(2.0661)	(0.2161)	(2.3597)	(0.6784)	(2.3182)
Exam date_Post,t+1	1.1439***	1.5759	-0.2750	-0.3086	0.6054	-6.4947***
	(0.3170)	(2.0573)	(0.2570)	(3.4270)	(0.6871)	(1.9939)
Exam date_Post,t+2	0.5808	0.1770	-0.1986	-9.6292**	0.8683	-1.2677
	(0.4708)	(1.5154)	(0.3018)	(4.2715)	(0.6928)	(1.7359)
Exam date_Post,t+3	-0.0856	0.3771	-0.1620	-1.3900	0.1508	-1.7020
	(0.4104)	(1.5104)	(0.2266)	(4.1591)	(0.7208)	(2.3728)
Exam date_Post,t+4	0.1640	0.3974	-0.1019	1.0177	0.4179	0.2703
	(0.2600)	(0.8681)	(0.1569)	(0.9839)	(0.5021)	(1.6437)
Month FE	x	x	x	x	x	x
Year FE	x	x	x	x	x	x
Province FE	x	x	x	x	x	
No. of observations	3,848	3,848	3,848	3,822	3,848	3,848
No. of provinces	52	52	52	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Outcome variables are (i) the total number of sickness spells per 1,000 workers per economic sector, and (ii) the mean duration of sickness spells per economic sector, both due to osteoarticular, digestive and mental conditions. Event study designed with binned endpoints. Reference category is pre-7. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province level. ***p<0.01, **p<0.05, *p<0.10.

Table A8: Robustness Check: Continuous Treatment Definition

Economic sector	**Public Adm.**	**Education**	**Health**
	# Spells (1,000 workers)	# Spells (1,000 workers)	# Spells (1,000 workers)
Exam date_Pre,t-6	0.0679**	-0.0027	0.0032
	(0.0334)	(0.0029)	(0.0154)
Exam date_Pre,t-5	0.0541	0.0070	0.0000
	(0.0468)	(0.0044)	(0.0187)
Exam date_Pre,t-4	0.2063**	-0.0074	0.0038
	(0.0796)	(0.0065)	(0.0154)
Exam date_Pre,t-3	0.0864**	0.0060	0.0089
	(0.0364)	(0.0037)	(0.0163)
Exam date_Pre,t-2	0.0325	0.0037	0.0035
	(0.0313)	(0.0033)	(0.0152)
Exam date_Pre,t-1	0.1397***	0.0012	0.0174
	(0.0348)	(0.0026)	(0.0162)
Exam date	0.1230***	0.0029	0.0124
	(0.0400)	(0.0031)	(0.0174)
Exam date_Post,t+1	0.0704*	-0.0047	-0.0013
	(0.0387)	(0.0046)	(0.0177)
Exam date_Post,t+2	0.0675	-0.0022	-0.0076
	(0.0419)	(0.0055)	(0.0209)
Exam date_Post,t+3	-0.0232	-0.0005	-0.0151
	(0.0296)	(0.0033)	(0.0191)
Exam date_Post,t+4	0.0321	-0.0002	0.0073
	(0.0211)	(0.0019)	(0.0142)
Month FE	x	x	x
Year FE	x	x	x
Province FE	x	x	x
No. of observations	3,848	3,848	3,848
No. of provinces	52	52	52

Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. 74 time periods included in the estimation sample (05/2009-06/2015). All regressions are weighted with the number of employees at the province at level. ***p<0.01, **p<0.05, *p<0.10, respectively.

Table A9: Robustness Check: Different Treatment Definition

Economic sector	**Public Adm.**		**Education**		**Health**	
Outcome	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)
Exam date_Pre,t-6	-0.0996	0.4114	0.1889	1.2162	0.9774	0.8396
	(0.4499)	(0.6497)	(0.3030)	(1.4076)	(0.6035)	(0.8002)
Exam date_Pre,t-5	-0.4521	0.3018	-0.5180	2.5590**	0.3669	0.0374
	(0.4411)	(0.7929)	(0.6766)	(1.0534)	(0.5477)	(0.6168)
Exam date_Pre,t-4	0.3671	-0.2338	-1.6057***	5.0638***	0.3484	0.7915
	(0.6067)	(0.7913)	(0.5873)	(0.9285)	(0.5160)	(0.6692)
Exam date_Pre,t-3	-0.2135	0.2418	-0.2418	2.6447***	0.0229	-0.1118
	(0.5138)	(0.5884)	(0.2825)	(0.9083)	(0.6026)	(0.5044)
Exam date_Pre,t-2	-0.2411	0.1516	0.2846	4.0145*	-0.7565	0.4200
	(0.3294)	(0.5832)	(0.3472)	(2.0496)	(0.4753)	(0.3048)
Exam date_Pre,t-1	0.5483	-0.4252	-0.0773	0.5714	0.9142**	0.0502
	(0.5069)	(0.4792)	(0.2989)	(1.2023)	(0.4462)	(0.5696)
Exam date	1.0294**	-1.0264	-0.1265	-0.1255	0.6969	-0.2990
	(0.4433)	(0.6467)	(0.3213)	(1.4809)	(0.5448)	(0.6581)
Exam date_Post,t+1	0.4815	0.2005	-1.2541**	-0.6168	-0.3594	-0.2840
	(0.5573)	(0.5933)	(0.5668)	(2.3354)	(0.3808)	(0.5882)
Exam date_Post,t+2	0.8440*	-0.8096	-1.3576**	-3.4424	-0.2113	0.4951
	(0.5026)	(0.6095)	(0.6027)	(3.0343)	(0.6301)	(0.8766)
Exam date_Post,t+3	-0.1533	-0.1930	-0.0898	1.7918	-0.6869	0.6327
	(0.3943)	(0.6742)	(0.3965)	(1.7328)	(0.6318)	(0.6067)
Exam date_Post,t+4	0.0083	-0.6534**	0.0457	-0.9631	0.0638	0.0593
	(0.2541)	(0.2849)	(0.3415)	(0.6167)	(0.3960)	(0.2874)
Month FE	x	x	x	x	x	x
Year FE	x	x	x	x	x	x
Province FE	x	x	x	x	x	x
No. of observations	3,848	3,848	3,848	3,848	3,848	3,848
No. of provinces	52	52	52	52	52	52

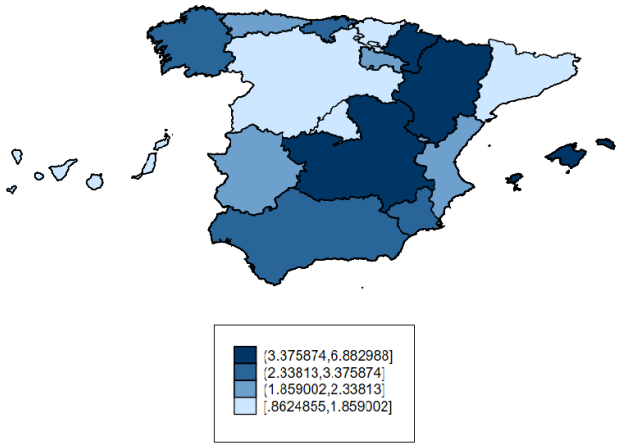
Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. Outcome variables are (i) the total number of sickness spells per 1,000 workers per economic sector, and (ii) the mean duration of sickness spells per economic sector. Treatment definition: calls with a number of positions greater or equal to the 95 percentile of the positions distribution. 74 time periods included in the estimation sample (05/2009-06/2015). ***p<0.01, **p<0.05, *p<0.10.

Table A10: Robustness Check: Placebo Illness Test Neoplasms

Economic sector	**Public Adm.**		**Education**		**Health**	
Outcome	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)	# Spells per 1,000 workers	Mean Duration (in days)
Exam date_Pre,t-6	-0.0524	-17.9211	-0.0335	59.4926	0.0440	11.8702
	(0.0560)	(19.6625)	(0.0219)	(39.2362)	(0.0465)	(14.2297)
Exam date_Pre,t-5	0.0351	-13.5663	0.0666**	9.6000	-0.0678	6.6629
	(0.0502)	(11.8447)	(0.0257)	(20.1463)	(0.0622)	(18.4556)
Exam date_Pre,t-4	0.0734*	-22.0389*	-0.0177	38.0890	-0.0050	-31.7400***
	(0.0406)	(11.1691)	(0.0520)	(30.2432)	(0.0475)	(11.3359)
Exam date_Pre,t-3	0.0323	-30.8182***	0.0239	-17.7145	0.1096*	-21.4700*
	(0.0539)	(9.6261)	(0.0641)	(17.1382)	(0.0616)	(12.5174)
Exam date_Pre,t-2	0.0828	-19.4661*	0.0524	-23.8100	-0.0153	-2.9492
	(0.0605)	(10.2555)	(0.0587)	(18.2923)	(0.0387)	(13.6247)
Exam date_Pre,t-1	0.1024*	-6.4822	0.0148	25.3171	0.0336	-2.6112
	(0.0606)	(12.3618)	(0.0419)	(26.3470)	(0.0461)	(15.0153)
Exam date	0.1040***	-32.4471**	0.0050	26.6083	-0.0378	-0.7234
	(0.0342)	(13.0990)	(0.0298)	(27.4989)	(0.0429))	(13.5321)
Exam date_Post,t+1	0.0147	17.1688	-0.0291	31.7017	-0.0306	-8.5103
	(0.0368)	(14.3663)	(0.0403)	(32.5526)	(0.0356)	(16.3551)
Exam date_Post,t+2	0.0080	-25.6101**	0.0409	1.4578	0.0263	13.8614
	(0.0434)	(12.3508)	(0.0389)	(33.4211)	(0.0485)	(14.7243)
Exam date_Post,t+3	0.0113	-9.0246	0.0272	13.9977	-0.0370	3.6217
	(0.0387)	(13.5907)	(0.0480)	(22.0369)	(0.0534)	(15.2729)
Exam date_Post,t+4	0.0217	-9.0967**	-0.0113	3.4547	-0.0560**	6.7949
	(0.0242)	(3.7749)	(0.0246)	(9.2332)	(0.0263)	(4.5286)
Month FE	x	x	x	x	x	x
Year FE	x	x	x	x	x	x
Province FE	x	x	x	x	x	x
No. of observations	3,848	3,636	3,848	2,872	3,848	3,722
No. of provinces	52	52	52	52	52	52

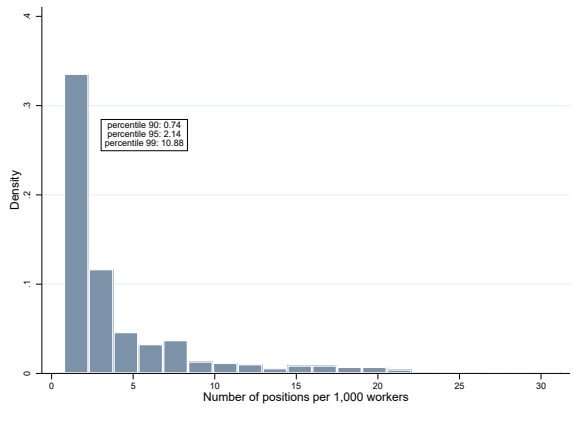
Notes: Robust standard errors in parentheses clustered at the province level. Event study designed with binned endpoints. Reference category is pre-7. Outcome variables are (i) the total number of sickness spells per 1,000 workers per economic sector related to neoplasms, and (ii) the mean duration of these sickness spells. 74 time periods included in the estimation sample 74 (05/2009-06/2015). ***p<0.01, **p<0.05, *p<0.10.

Figure A1: Cross-sectional Variation in the Number of Positions per 1,000 Workers at the Regional Level in year 2009.

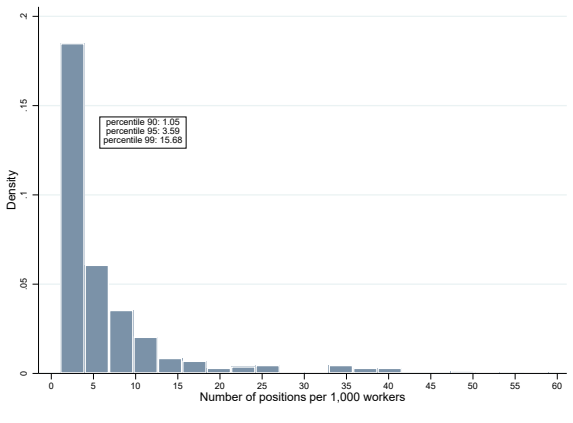


Notes: Own elaboration using administrative data from the Ministry of Territorial Policy and Public Function in Spain, for the year 2009. It also includes data from the Spanish Labor Force survey on the total number of workers for year 2009. It includes all positions that require a passing exam as entry condition in which the place of work is Spain. Excludes all temporal contracts.

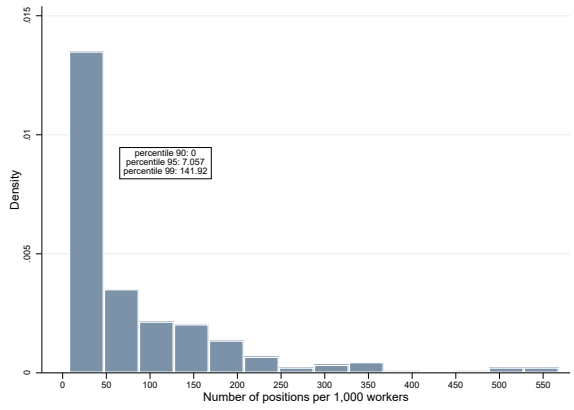
Figure A2: Distribution of Large Events per Economic Sector



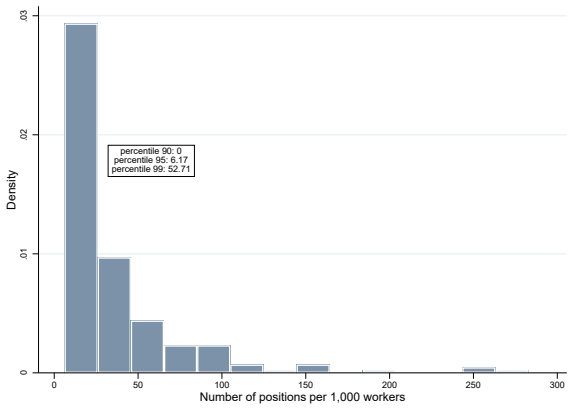
(a) All sectors per 1,000 workers



(b) Public administration per 1,000 workers



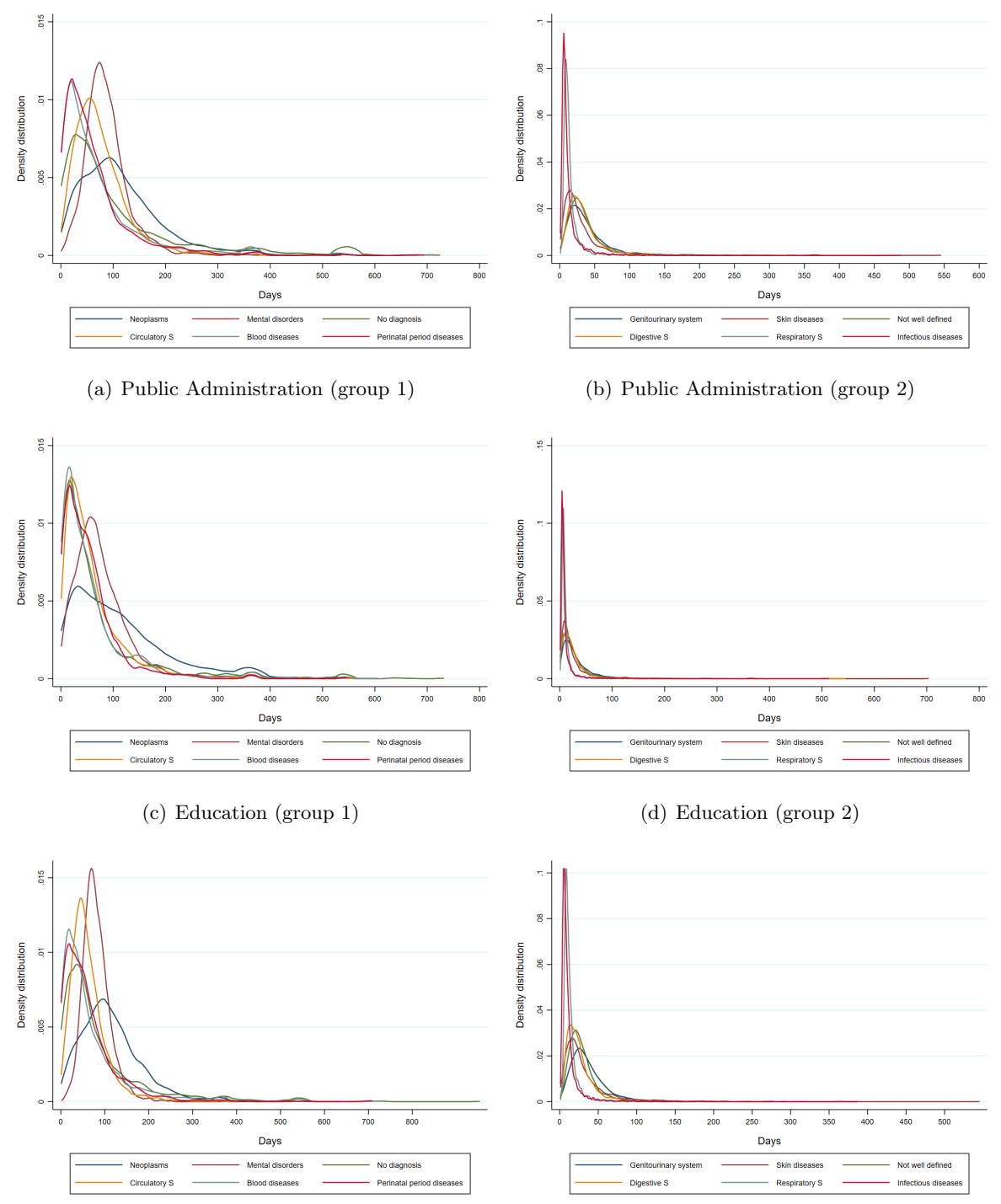
(c) Education per 1,000 workers



(d) Health per 1,000 workers

Notes: Figure shows the distribution of large events, which are defined as calls with a number of positions equal or greater than the 95 or 99 percentile of the positions distribution in each economic sector. Authors' calculations based on data from the Ministry of Territorial Policy and Public Function in Spain and the Spanish Labor Force Survey, for years 2009-2015.

Figure A3: Distribution of Average Mean Duration of Sickness Absences per Illness Category



(a) Public Administration (group 1)

(b) Public Administration (group 2)

(c) Education (group 1)

(d) Education (group 2)

(e) Health (group 1)

(f) Health (group 2)

Notes: Figure shows the distribution of average mean duration of sickness absences per illness category within every economic sector. Authors' calculations based on data from the Social Security Institution.

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