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Teachers' sick leave and summer timing: an impact evaluation

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Research Article

Keywords: Sickness insurance, Workplace accidents, Absenteeism, Impact evaluation, Moral hazard, Opportunistic behaviour

Posted Date: June 19th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9866107/v1

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Additional Declarations: No competing interests reported.

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ABSTRACT

In the context of the growing share of public workers in the Spanish labour force, this paper analyses opportunistic behaviour in sick leave duration and return-to-work probabilities among teachers. We use administrative microdata (2011–2019), transformed into an original monthly spell-level panel. The analysis employs a tailored regression within a difference-in-differences framework exploiting the academic calendar and comparing professional sick leaves among pre-university teachers in public and private schools. Results show that the timing of sick leave endings systematically responds to the school calendar. Public-school teachers display longer sick leave durations and lower return-to-work probabilities than private-school teachers, consistent with ex post moral hazard under more generous employment protection and sick leave coverage. Around the summer break, these differences become more pronounced: public-school teachers extend their leaves further relative to private-school teachers. Simultaneously, the usual gap in return-to-work probabilities temporarily reverses, with public-school teachers becoming more likely to end their leave immediately after summer. These patterns are especially strong among mid-career workers, women, and cases involving more subjective or difficult-to-diagnose injuries.

KEYWORDS

Sickness insurance, Workplace accidents, Absenteeism, Impact evaluation, Moral hazard, Opportunistic behaviour

JEL CLASSIFICATION

K32, I18, J28, I13

Acknowledgements

Ángel L. Martín-Román acknowledges the financial support from the Government of Spain Ministry of Science and Innovation under project PID2024-155429NB-I00.

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Funding statement:
Ángel L. Martín-Román acknowledges the financial support from the Government of Spain Ministry of Science and Innovation under project PID2024-155429NB-I00.

Author Contribution declaration:

- **Conceptualization:** [AMR]
- **Methodology:** [IMA]
- **Data curation:** [PDC, IMA]
- **Formal analysis:** [IMA, AMR, PDC]
- **Writing – original draft:** [PDC]
- **Writing – review & editing:** [AMR]

All authors read and approved the final manuscript.

Data Availability declaration:
The data used comes from the Statistics on Workplace Accidents. This is a free, public source from the Spanish Ministry of Labour.
https://www.mites.gob.es/es/estadisticas/condiciones_trabajo_relac_laborales/EAT/welcome.htm

Ethics declaration:
Ethics declaration: not applicable

Competing Interest declaration
I declare that the authors have no competing interests as defined by Springer, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

1. Introduction

The report published by AMAT (**Error! Reference source not found.**)[1], which compiles data from Social Security and private insurance sources on sick leave due to common contingencies in Spain during 2024, records a historic high in both the number of initiated leaves—8.72 million—and related public expenditures—€15 billion, using 2015 as the baseline. A similar upward trend is observed in Social Security data (**Error! Reference source not found.**) concerning professional contingencies, with a cumulative increase of 52% in the total number of leaves between 2010 and 2023.

Although the workforce covered by the public system in Spain grew by approximately 25% during this period, the 121% increase in the number of leaves for common contingencies and the 181% rise in public expenditure appear disproportionate. This imbalance poses challenges about Spain's economic competitiveness, public health outcomes, and the long-term sustainability of the Social Security system. These concerns resonate at the European level as well. In 2019, workplace accidents and occupational diseases were estimated to cost 3.3% of the EU's GDP, amounting to roughly €460 billion (European Commission, **Error! Reference source not found.**).

Amid this backdrop, public debate has increasingly focused on the underlying factors contributing to these trends, including the expansion of social protection to specific worker categories. Public sector employees, who often enjoy permanent employment status in Spain, represent a key population within this debate and form the focus of our analysis. In particular, the education sector accounted for nearly 20% of Spain's 2.5 million public employees in 2023. The number of teachers—approximately 72% of whom work in the public sector—has risen significantly, from 550,000 in 2000 to over 800,000 in 2023, according to data from the Ministry of Education of Spain[2]. In contrast to a modest decline in the share of public workers across OECD and EU countries over the past 25 years, Spain has experienced growth in this area. The proportion of public sector employees in the Spanish workforce rose from around 13% in 2000 to over 15% in 2020, as reported by the OECD (**Error! Reference source not found.**).

We focus on sick leave spells resulting from workplace accidents. Within this context, the present study aims to investigate potential differences in the incidence and duration of professional sick leave among public and private school teachers. Existing literature generally indicates that public sector employees tend to have higher rates of sickness absence and longer leaves than their private sector counterparts, as documented by Frick and Malo (2008), Scoppa (**Error! Reference source not found.**), D'Amuri (**Error! Reference source not found.**) or Mastekaasa (2020).

We contribute to three strands of literature: absenteeism and moral hazard, differences between public and private sector workers, and the role of institutional timing in shaping labour supply decisions. One contributing factor, highlighted in these studies, is the more protective

[1] Asociación de Mutuas de Accidentes de Trabajo, translated into English for the purpose of this paper as Spanish Accident Insurance Association.

[2] Ministerio de Educación, Formación Profesional y Deportes, official Spanish designation.

institutional and administrative framework typically found in the public sector. This aspect will be further explored in the following section. Additionally, Fortin and Lanoie (**Error! Reference source not found.**) point out that information asymmetries between parties involved in employment relationships may lead to economic inefficiencies. In such cases, one party may adopt riskier or less disciplined behaviour, knowing that the consequences will largely be borne by the other party.

Against this background, we hypothesize that the seasonal structure of the academic calendar—particularly the extended summer break—acts as an incentive mechanism influencing both the likelihood and duration of sick leave. The institutional setting creates differential incentives to extend or terminate sick leaves depending on proximity to the summer break. We examine whether public school teachers take longer sick leaves and exhibit a lower probability of returning to work, all else being equal, when compared to their counterparts in private schools. To test these hypotheses, we use administrative microdata named "Estadísticas de Accidentes de Trabajo", abbreviated as "**Error! Reference source not found.**", obtained from the Ministry of Labour[3] (2025). This dataset covers all non-fatal workplace injuries involving both public and private school teachers in Spain from 2011 to 2019.

We propose an innovative transformation of the data, converting each individual sick leave record into a monthly spell-level panel, where the time dimension is represented by the number of months on leave. This transformation allows for a temporal analysis of sick leave occurrence and duration and facilitates the use of regression models that follow a difference-in-differences framework. The first dimension compares sick leave duration between public and private school teachers; the second captures variations in sick leave behaviour according to the month in which the leave concludes, particularly its proximity to the summer holiday.

Our identification exploits differences in incentives to return to work before the summer break, comparing public and private school teachers around the end of the academic year. The empirical strategy controls for a range of factors, including the intrinsic characteristics of the injury (e.g., severity), individual characteristics (such as age and gender), and workplace-related variables (e.g. region). The results revealed statistically significant differences between public and private school teachers regarding both the likelihood of returning to work and the duration of their leave. Specifically, the probability of returning to work is generally lower for public sector teachers, a pattern that is consistent with previous findings in the literature. However, in the months leading up to the summer break, this trend reverses, suggesting the presence of opportunistic behaviour linked to the academic calendar.

Moreover, our results highlighted that sick leave duration is typically longer for public sector employees, particularly around the summer holiday period. These patterns support the notion that the approach of the summer break may act as a motivating factor for teachers to strategically adjust their leave duration. Our findings contribute to the broader economic literature on absenteeism and moral hazard. They align with the reasoning in Martín-Román and Moral (**Error! Reference source not found.**), who show that calendar effects—such as

[3] Ministerio de Trabajo y Economía Social, official Spanish designation.

weekends or holidays—can influence the incidence and intensity of moral hazard behaviours.

We also found that the effects are more pronounced for injuries that are difficult to diagnose, such as sprains, strains, and lower back pain, consistent with the literature (Ruser, **Error! Reference source not found.**,**Error! Reference source not found.**,;Martín-Román, **Error! Reference source not found.**), in middle-aged workers and with relevant heterogeneity across Spanish regions. From a gender perspective, the findings are generally more significant among female teachers, suggesting a stronger behavioural response to the incentives structure, as noted by De Paola et al. (**Error! Reference source not found.**).

These results are especially relevant in the context of recent global crises, which have underscored the importance of designing robust, balanced sick leave policies. Such policies should be designed in a way that *simultaneously guarantee an individual's right to go on sick leave while incentivizing an early return to work without putting one's own and others' health at risk* (Marie & Vall, **Error! Reference source not found.**).

Our methodological approach aligns with the growing emphasis on quantitative evaluation of public policies, as encouraged by international organizations and increasingly adopted by national governments. It offers valuable evidence to inform the future design of social protection systems.

From a Spanish policy perspective, the findings and recommendations presented in this paper can contribute to enhancing the efficiency of public sector performance, with potential positive spillovers in areas such as educational outcomes, public health, and fiscal sustainability.

The following is a description of the structure of the paper. Section 2 presents a review of the relevant literature. Section 3 provides an overview of the institutional framework. Section 4 presents the data, the transformation and a descriptive analysis. Section 5 addresses the empirical model. Section 6 presents the results of the study. Section 7 tackles the policy implications linked to the results and Section 8 contains the conclusions of the paper.

2. Background

The existence of compensation schemes for workers who have suffered an accident are now commonplace in all developed economies. These frameworks typically transfer liability from workers to employers and the social security system, which compensates workers for lost income during periods of absence. However, information asymmetries—either in the design of these schemes or in worker behaviour—can generate unintended consequences, particularly by influencing the duration, frequency, or nature of sick leaves.

Workers weigh the benefits of returning to work against those of extending their leave, considering both personal and external factors (Steers & Rhodes, **Error! Reference source not found.**). These decisions carry important consequences for the health of the individual and their colleagues, particularly in cases of presenteeism, when employees continue working while still unwell (Cronin et al., **Error! Reference source not found.**; Pichler & Ziebarth, **Error!**

Reference source not found.). It is also negative for employers as inappropriate or prolonged absences may lead to unnecessary expenditures on replacements and reduced productivity, ultimately undermining the competitiveness of firms and economies (Ichino & Riphahn,2005; Maclean et al., 2025).

In this context, various forms of moral hazard emerge, as initially outlined in the seminal work by Fortin & Lanoie (**Error! Reference source not found.**). From an ex-ante perspective, moral hazard may arise through a reduced perception of risk owing to the protective nature of the scheme—a phenomenon often referred to as the Peltzman effect (Peltzman, **Error! Reference source not found.**). Ex post moral hazard, by contrast, occurs when workers manipulate the duration of their leave after an incident to their advantage. A further type, known as insurance substitution hazard, involves employees exploiting compensation schemes as a buffer against unrelated risks, such as unemployment or contract termination, especially when unemployment insurance is comparatively weak.

This paper focuses primarily on ex post moral hazard, where workers have limited incentives to reduce the duration or cost of their leave once it has begun. In this context, the worker possesses private information about their actual recovery progress, making it difficult for medical professionals to accurately assess whether the individual is fit to return to work. This information asymmetry creates opportunities for strategic behaviour, potentially leading to unnecessarily extended leave periods.

More specifically, the study examines what can be described as duration hazard, a situation in which workers deliberately adjust the length of their leave to serve their own interests. The findings of this paper expand the classical understanding of duration-based moral hazard, which typically focuses on extended absences, by showing how external institutional factors such as the academic calendar can also shape leave-taking behaviour. Previous studies, such as Martín-Román and Moral (2016), have shown that periods of institutional breaks (e.g., holidays or school vacations) can exacerbate moral hazard, particularly in so-called hard-to-diagnose injuries (Martín-Román and Moral, 2016; Card and McCall, 1996; or Campolieti, 2006) which are typically more difficult to verify by the doctors and where the degree of discretion by the workers regarding the severity of the condition is higher.

From a gendered perspective, the literature has consistently shown that female workers tend to exhibit higher incidence rates and longer durations of sick leave compared to male workers (Markussen et al. **Error! Reference source not found.**; Fontaneda et al. **Error! Reference source not found.**; Mastekaasa & Melsom, 2014). These differences are partially attributable to biological factors (Martín-Román et al.2026,**Error! Reference source not found.**; Wolf et al., **Error! Reference source not found.**; Case & Paxson,**Error! Reference source not found.**), which may prolong recovery or increase susceptibility to certain illnesses (Coutu et al. **Error! Reference source not found.**)). Additionally, societal role expectations (Farré et al. **Error! Reference source not found.**; Côté & Coutu, **Error! Reference source not found.**) and personality (Friedl et al.,**Error! Reference source not found.**) further explain the divergence between men and women in sick leave patterns.

Among the individual characteristics considered in the analysis, age is a key determinant of sickness absence behaviour. The literature generally finds that older workers tend to take fewer but longer certified sick leaves, whereas younger workers exhibit more frequent but shorter spells, patterns that are often associated with stronger scope for moral hazard among younger employees (Thomson et al., 2000; Donders et al., 2012). In addition, older workers typically face longer unemployment durations in the event of job loss, which may lead them to behave more cautiously and reduce the likelihood of engaging in behaviours that could jeopardise employment (Dionne and Dostie, 2007). The effect of age is also closely intertwined with gender, as biological differences tend to attenuate over the life cycle and are compounded by persistent differences in social roles and household responsibilities (Donders et al., 2012).

In the specific case of public-sector employees, certain job characteristics may contribute to higher rates of absenteeism. Tasks in the public sector are often described as stable, rigid, and repetitive (Bellante & Link, **Error! Reference source not found.**; Boyne et al., **Error! Reference source not found.**; Liu & Tang, **Error! Reference source not found.**), which may decrease motivation. Furthermore, public-sector compensation structures typically lack competitive or performance-based incentives (Stiglitz, **Error! Reference source not found.**), and the limited availability of resources and promotional opportunities can lead to job dissatisfaction (Baldwin, 1990; Jensen et al., **Error! Reference source not found.**).

Also, public sector jobs are typically characterized by higher job security, which may reduce the perceived cost of absenteeism. D'Amuri (**Error! Reference source not found.**), for instance, argues that weaker monitoring and the presence of more generous sick leave benefits in the public sector increase workers' rents, thus reducing the marginal cost of being absent and creating moral hazard opportunities. Also, Heponiemi et al. (2010), highlighted that presenteeism is less likely in public employees whose job security is objectively and subjectively higher. Similarly, using data from 14 EU countries, Frick and Malo (2008) emphasise the important role of coverage rates and employment protection, generally higher in the public sector, in explaining cross-country differences in absence behaviour. Similarly, using German data, Prümer and Schnabel (2019) report a higher incidence of sick leave in the public sector, with estimates ranging from 5.6 to 9.3 percentage points depending on the specification.

Another factor regards unionization, as public employees are more likely to be unionized, and unions often negotiate more favourable sick leave provisions and stronger protections against dismissal. Uppal and LaRochelle-Côté (2013) finds that half of the raw difference in average sick days between public and private workers (4.1. days). can be explained by union coverage alone. Moreover, strong union representation in the public sector can reduce pressure to perform, potentially contributing to lower productivity (Ichino and Riphahn, **Error! Reference source not found.**).

Other studies emphasize the role of monitoring intensity and managerial discretion. Public institutions often operate under more bureaucratic, politized or standardized procedures that limit supervisory flexibility, making it harder to verify and respond to absenteeism. (Buchanan, **Error! Reference source not found.**, **Error! Reference source not**

found.; Harel & Tzafrir, **Error! Reference source not found.**; Desmarais & Abord de Chatillon, **Error! Reference source not found.**). Collectively, these factors hinder the development of competitive and ethical workplace norms (Perry & Porter, **Error! Reference source not found.**; Kangas, **Error! Reference source not found.**; Sardžoska & Tang, **Error! Reference source not found.**). Worker selection into the public sector may also play a role. As Hansen (**Error! Reference source not found.**) and Mastekaasa (**Error! Reference source not found.**) have noted, individuals with lower competitiveness or commitment may self-select into public employment due to the job security afforded by permanent status.

In the Spanish context, literatures comparing sickness absence patterns between public and private sector workers is scarce. Using administrative microdata, Marie and Vall (**Error! Reference source not found.**) exploited a large reduction to paid sick-leave benefits that primarily affected public-sector employees and showed a pronounced decline in the incidence of sick-leave spells but a simultaneous increase in average spell duration, with important adverse health and safety externalities (higher relapse and accident rates), implying partial offsetting of aggregate gains. This paper highlights two mechanisms that are centrally relevant for our research: first, the existence of incentive effects of benefit generosity on the decision to start a leave spell, and second, the occurrence of selection and health-recovery dynamics that determine how long absences last once initiated.

Also, Armijos and Vall, (**Error! Reference source not found.**5), examined how the presence of the public examination during the academic may induce public workers, with a special focus on teachers, to fall sick because of the extra effort in its preparation. In addition, Blázquez Cuesta (2012), provided descriptive evidence using Spanish administrative data. The study finds that public sector employees tend to be more prone to be on sick leave than comparable private sector workers. These differences remain even after controlling for observable characteristics, suggesting the influence of institutional factors such as job protection, monitoring intensity, or benefit design.

From a regional perspective, Corrales et al. (2008), highlighted considerable differences in the duration of sick leaves resulting from workplace accidents across the different Spanish Autonomous Communities. While part of these differences was explained by objective factors, there remains an unexplained component that could be associated with the presence of moral hazard. Likewise, Alba-Jurado et al. (2020) found relevant regional heterogeneity in the duration of the sick leaves absences depending on its classification as common or professional, among other factors.

Taken together, the interaction of generous protective schemes, limited oversight, weak incentive structures, and individual selection effects may foster conditions conducive to absenteeism in the public sector (De Paola et al. **Error! Reference source not found.**; D'amuri (**Error! Reference source not found.**); Scoppa (**Error! Reference source not found.**).

3. Institutional framework

3.1. Sick Leave Insurance

Under Spanish labour regulations, a worker is considered to be under temporary incapacity when they are unable to work due to illness or injury. These cases are classified either as occupational contingencies, which include workplace accidents or occupational diseases, or common contingencies, which cover non-work-related accidents or illnesses. Common contingencies are financed jointly by employers and employees and primarily cover situations related to illnesses or injuries not caused by work. In contrast, occupational contingencies, which represent the focus of this paper, provide coverage for work-related injuries and diseases and are fully financed by the employer.

The compensation system differs depending on whether the worker is employed in the public or private sector. For private-sector workers, no minimum contribution period is required, and compensation equals at least 75% of the calculation base, beginning the day after work cessation and continuing for up to 365 days. By contrast, public-sector employees receive compensation amounting to 100% of the calculation base, also from the day after work cessation. This discrepancy in financial compensation creates distinct monetary incentives depending on the sector in which the employee works. These differences are central to the analysis presented in this paper, particularly in understanding variations in leave duration and potential moral hazard.

3.2. Educational Employment Structure

The Spanish Constitution of 1978 established a decentralised education system in which responsibilities are divided among different levels of government. The General State Administration is responsible for setting national education policy and regulating the system's core components. The Regional Administrations are responsible for implementing those regulations and managing the education system within their territories.

Educational institutions are classified by ownership into three categories. Public schools are state-owned and publicly funded. Private schools are privately owned and funded. Subsidised private schools are privately owned but receive public funding through formal agreements. Education is divided by student age and level into three main stages. Pre-primary education serves children from zero to six years of age. Primary education covers children from six to twelve years of age. Secondary education is compulsory until age sixteen and optional thereafter, preparing students for university or vocational pathways.

From the employment perspective, teachers in public schools are considered public employees and access their positions through competitive civil service examinations. Teachers in private and subsidised schools are classified as private-sector employees and are recruited through institution-level selection processes. The working conditions of public-sector teachers are regulated by public employment legislation. Those of private teachers are governed by the Statute of Workers' Rights, sector-specific collective agreements, and individual employment contracts.

The academic calendar for teachers includes breaks during Christmas and Easter as well as a fixed two-month summer holiday in July and August. This differs from most occupations in Spain, where annual leave, approximately twenty-two working days, is distributed flexibly throughout the year in agreement with the employer.

3.3. Calendar Incentives

Several institutional features, summarized in **Table 1** suggest that the administrative frameworks governing public and private teaching staff may influence the incidence of opportunistic behaviours in the context of temporary incapacity due to occupational contingencies.

[Table 1]

From a financial standpoint, public-sector teachers receive full wage compensation equal to 100% of the calculation base for occupational contingencies starting from the first day of absence. Private-sector teachers are entitled to a minimum of 75% compensation. This difference creates a distinct incentive structure that may influence decisions about when to return to work.

Career-related incentives also vary across sectors. Public-sector teachers typically face limited opportunities for promotion or sanction which may reduce the urgency to return to work after recovery. Private-sector teachers operate in a more competitive environment where continued employment depends on performance and managerial oversight is stronger. As a result, private teachers may have greater motivation to return promptly even after short-term illnesses

Teachers are expected to end their sick leave before undertaking any travel outside their home municipality unless their condition is explicitly deemed compatible with travel. Workers on leave during scheduled holiday periods are subject to routine medical checks and inspections. These may complicate planning during the summer holidays. While these requirements apply equally to public and private teachers, their interaction with other sector-specific incentives may lead to different behavioural responses.

These institutional differences, combined with the fixed timing of the academic calendar, create variation in incentives to remain on or return from sick leave throughout the school year. The empirical strategy exploits this variation to identify differential behavioural responses between public- and private-sector teachers.

4. Data

4.1. Dataset

This study draws on restricted-access administrative microdata from the Estadística de Accidentes de Trabajo (**Error! Reference source not found.**), or Spanish Statistics on Accidents at Work, covering the period from 2011 to 2019. The anonymised spell-level dataset includes all work-related accidents or illnesses that led to sick leave under the occupational contingency insurance scheme. Only incidents that resulted in an absence from work of at least one full day (excluding the day of the event) are recorded. The EAT dataset is compiled using standardized employer reports which documents the start and end dates of the leave, the cause and consequences of the accident, individual characteristics (such as age and

gender), and occupational characteristics (such as length of employment, occupation, and compensation). It also contains information on the employer, including industry, sector (public or private), geographic location (at the province level), and firm size[4].

4.2. Descriptive Patterns

Between 2011 and 2019, the EAT dataset registered approximately 5.19 million non-fatal, work-related sick leave spells. Of these, 13% were attributed to public sector employees, 85% to private sector employees, and the remaining 2% to self-employed workers. Male workers accounted for approximately two-thirds of the recorded leaves. The average age of affected workers was 41 years, with negligible differences across gender. In terms of compensation, the average daily benefit across all spells was €40.90. A gender breakdown reveals an average of €43.06 for men and €36.54 for women, suggesting a significant gender pay differential in compensation following work-related incidents. Regarding the nature of injuries, approximately 50% of the cases were classified under diagnoses that are considered difficult to objectively assess or medically verify (hard-to-diagnose). In this paper, this category injuries, which will be often abbreviated as "HTD", comprises injuries causing concussions, distension, sprains, strains and mental injuries.

From an occupational and sectoral perspective, **Table 2** presents the ten most frequent categories based on the NACE Rev.2 (economic activity) and ISCO-08 (occupation) classifications, respectively. The public administration sector—the scope of this study—ranks first among NACE categories, accounting for 5.94% of total sick leave spells. The remainder of the top categories in both classifications are concentrated in traditionally high-risk, blue-collar occupations, such as construction, manufacturing, and transportation, which are typically associated with a higher incidence of workplace accidents.

[Table 2]

As the objective of this article is to analyse the behaviour of teachers in relation to work-related absences, the study concentrates on salaried workers employed at the pre-primary, primary, and secondary levels. Teachers were identified using the National Occupation Classification (CNO) codes 223 to 225 and further filtered by the National Activity Classification (CNAE) codes 851 to 853, which correspond to educational institutions. Self-employed individuals and those employing others were excluded to ensure a consistent sample of salaried workers. This filtering process yielded a final sample of approximately 23,142 sick leave spells.

[Table 3]

Table 3 presents the main descriptive statistics for this subsample. The data indicate a predominance of teachers working in the private sector, a higher proportion of female workers, and a significant share of cases categorized as hard-to-diagnose injuries. Interestingly, male teachers in the sample tend to take longer sick leaves on average than female teachers. This

[4] Readers interested in more details can consult the following web address: https://www.mites.gob.es/es/estadisticas/condiciones_trabajo_relac_laborales/EAT/welcome.htm

pattern diverges from findings commonly reported in existing literature and may be explained by two complementary hypotheses. One possibility is that women exhibit greater aversion to social risk, as suggested by Croson and Gneezy (**Error! Reference source not found.**). Another plausible explanation is that men are overrepresented in injury-prone teaching roles, such as physical education, where their participation in Spain ranges from 65 percent to 80 percent according to recent studies (Teresa et al., **Error! Reference source not found.**; Serra et al., **Error! Reference source not found.**).In addition, heterogenous durations are observed when the data are disaggregated by sector, sex, and injury severity. Regarding the latter, the variable HTD groups the injuries that are traditionally defined as hard-to-diagnose and comprises injuries causing concussions, distension, sprains, strains and mental injuries.

This section examines not only descriptive statistics but also the timing of sick leave spells, as absences may be linked to specific periods of the year. **Figure 1** and show the monthly distribution of teachers' sick leave, alongside two reference groups: the full population of recorded sick leaves and a comparable subset of 84,281 workers in occupations similar to teaching. This subset is defined using ESAW's "Working Process" classification, which groups occupations by tasks and workplace exposure relevant to accident risk. Teachers are part of this ESAW category, making the group directly comparable; however, they are excluded from the subset to avoid duplication[5].

[Figure 1]

Figure 1 illustrates the monthly distribution of sick leave commencements (upper panel) and terminations (lower panel). The series corresponding to teachers' sick leaves display pronounced seasonal patterns that contrast sharply with the relatively uniform distributions observed for the overall workforce and for comparable occupations.

Focusing first on leave commencements (upper panel), the number of teachers' sick leaves reaches its lowest levels in July and August, coinciding with the summer break, when teaching activity is largely suspended. Smaller but similar declines are also evident during the Christmas and Easter holidays. In contrast, leave commencements rise in the months immediately preceding the summer and Christmas breaks, indicating a clear temporal clustering aligned with the academic calendar.

Disaggregating teachers by sector reveals systematic differences over the academic year. Public-school teachers consistently exhibit a higher share of leave commencements than private-school teachers, despite facing similar working environments and occupational risk factors. This gap peaks in May, the month immediately preceding the summer break, and narrows sharply in June. Put differently, public teachers are more likely to initiate sick leave in late spring, whereas this difference largely disappears as the school year comes to an end. This pattern, and its differences with private teachers, may reflect underlying behavioural or institutional mechanisms.

The lower panel of **Figure 1**, which reports the distribution of leave terminations,

[5] The European Statistics on Accidents at Work (ESAW) provides a standardized classification of occupations and workplace tasks, allowing meaningful comparisons of sick leave patterns related to workplace accidents.

complements the evidence from the upper panel. Leave endings among teachers accumulate sharply immediately before major school holidays, particularly in June. The difference between public and private teachers is again most pronounced in this month, while it is minimal in May. Importantly, these seasonal patterns are absent among comparable occupations, suggesting that teachers' leave behaviour responds to incentives or constraints that are closely linked to the academic calendar rather than to general labour-market conditions.

[Figure 2]

Figure 2 complements the previous analysis by examining the average duration of teachers' sick leave spells, distinguishing between leaves grouped by the month of termination (top panels) and by the month of initiation (bottom panels). The left-hand panels report outcomes for teachers, while the right-hand panels display the corresponding patterns for the overall workforce.

In the absence of behavioural or institutional responses, average sick leave duration would not be expected to vary systematically with the calendar month in which a leave begins or ends. Moreover, conditional on occupation, no substantial differences should arise solely from the public or private nature of employment. Consistent with this benchmark, the right-hand panels—corresponding to all sick leaves in the dataset—exhibit relatively stable monthly patterns. By contrast, the left-hand panels reveal pronounced seasonal variation in teachers' sick leave duration.

Across both the initiation- and termination-based measures, public-school teachers—represented by the red lines—consistently experience longer sick leaves than private-school teachers, represented by the blue lines. This difference is also present, although substantially attenuated, in the overall distribution shown in the right-hand panels, and is in line with patterns documented in the existing literature. The particularly high average durations observed for teachers in July and August are driven by a very small number of cases and typically reflect severe health conditions associated with prolonged absences, medical inspections, or relapses.

When leave duration is analysed by the month of initiation (bottom-left panel), both public- and private-school teachers display a sharp reduction in average duration for leaves starting immediately before major holiday periods, most notably the summer break. By contrast, when duration is grouped by the month of termination (top-left panel), average leave duration increases markedly for leaved concluded right before and during holiday months. Importantly, these seasonal dynamics are not observed for the overall workforce.

Taken together with the evidence from **Figure 1**, the results in suggest that teachers adjust not only the timing but also the length of their sick leaves in ways that closely track the academic calendar. These adjustments are more pronounced among public-school teachers, consistent with differences in institutional arrangements, benefit generosity, and monitoring intensity between public and private sectors. The descriptive patterns documented here motivate the empirical analysis that follows and contribute to the broader literature on absence behaviour and moral hazard in public insurance settings.

4.3. Monthly Spell Structure

Each record in the EAT anonymized microdata corresponds to a single sick leave episode. To align the dataset with the structure required for the empirical analysis, the data were transformed such that each leave was expanded into multiple monthly observations. The number of rows generated for each leave corresponds to the number of calendar months during which the leave was active, taking advantage of the fixed timing of the academic summer break across years. Sick leaves whose duration expand in more than one year were excluded to increase the precision of the analysis.

Table 4 provides a schematic of the original EAT data format while **Table 5** details the transformation process using two examples. In the first example, a leave spanning from January to April results in four rows. In the second example, a leave spanning from April to June generates three rows.

[Table 4]

Each observation within the transformed dataset (**Table 5**) contains several variables that are essential for the econometric analysis. The variable "public" takes the value of one if the leave is associated with a public-school teacher and zero if it corresponds to a private school teacher. The variable "back" indicates the final month of the leave, taking the value of one in the month when the leave ended and zero in all other months. The variable "Mmonth" identifies the months in which the teacher was on leave and takes the value of one for each of these months. Finally, the variable "Di_month" is defined as the interaction between "public" and "Mmonth," and captures the specific monthly exposure of public-school teachers to sick leave. For the part of the analysis focused on leave duration, only completed sick leave spells are retained. Consequently, all observations in which the variable "back" equals zero are excluded, as they do not provide information on the termination of the leave. Using the examples of **Table 5**, rows number four (leave with ID 1) and seven (leave with ID 2) would be retained.

[Table 5]

In light of the aforementioned context, where it seems that the prolonged two-month summer break for teachers could influence the probability of sick leaves and their duration, the empirical analysis focuses on all teachers' completed sick leaves lasting at least one day that began between January 1 and August 31 for the years 2011 to 2019, comprising 13,900 unique leaves.

5. Empirical Setting

5.1. Hypotheses

Under a scenario in which teachers' behaviour is invariant to institutional arrangements or calendar-related incentives, the probability of returning to work—and, correspondingly, the duration of sick leave—should not vary systematically over the course of the year, nor differ

between public and private school teachers. However, when information is asymmetric and incentives between employees and employers are imperfectly aligned, individuals may exploit institutional features for personal gain.

The identification assumption is that, conditional on observed characteristics and common month effects, differences in leave termination patterns between public- and private-sector teachers outside the summer-related period capture baseline institutional differences, while deviations around the end of the academic year reflect differential behavioural responses to calendar-related incentives.

The present study investigates whether differences in institutional arrangements between public and private school teachers detailed in **Table 1** increase the risk of moral hazard. To this end, the analysis exploits the academic calendar as a source of exogenous temporal variation, focusing on the impact of the clearly defined summer break in July and August. This calendar structure may influence sick leave behaviour in a manner analogous to the approach adopted by Martín-Román and Moral (2016), who used calendar regularities as natural experiments to identify behavioural responses.

Existing evidence underscores the importance of institutional design in shaping sick leave behaviour. Studies by Henrekson and Persson (2004), Johansson and Palme (1996), and Marie and Vall (2023), among others, show that higher compensation levels and greater job security are associated with a higher incidence of sick leave and longer leave durations.

Against this background, the following hypotheses are proposed:

Hypothesis 1. *Ceteris paribus, the probability of concluding a sick leave period is lower for public school teachers than for private school teachers and the magnitude of the difference varies over the academic calendar, with stronger effects in the months preceding the summer break, when opportunities for opportunistic behaviour are greatest.*

Hypothesis 2. *Ceteris paribus, the duration of sick leave is significantly longer for public school teachers than for private school teachers and the magnitude of the difference varies over the academic calendar, with stronger effects in the months preceding the summer break, when opportunities for opportunistic behaviour are greatest.*

To examine potential heterogeneity in moral hazard behaviour, the analysis is further stratified by the severity of the injury, gender, age and region. Regarding severity, a variable labelled HTD[6] is constructed to identify injuries that are inherently difficult to diagnose and monitor following the approach of Ruser (1998) and Martín-Román and Moral (2016). As previously noted, this variable equal one when the sick leave is associated with conditions such as sprains, strains, distensions, concussions, or mental health disorders, and zero otherwise. These conditions are comparatively more subjective and less verifiable, granting workers greater discretion regarding the timing and duration of their leave. As a result, they provide a particularly suitable context in which to detect potential opportunistic behaviour.

5.2. Econometric Specification

[6] Hard-to-diagnose injury.

To test the proposed hypotheses, a difference-in-differences approach is implemented using the transformed monthly spell-level panel described in **Table 5**, forming a database of 27,000 observations from 13,900 unique leaves. The main estimation uses a logistic regression model to assess, using the binary variable ($Y_{i,m}$), the probability that a teacher "i" who is on sick leave at the beginning of a given month "m" returns to work within that same month. The model is specified as follows:

$$(1)\ (\Pr(Y_{i,m} = 1) = \alpha + \gamma_t + \lambda_m + \pi D_i + \sum_{e=-k}^{-1} \delta_e^{bef} D_{i,e} + \sum_{e=0}^{L} \beta_e D_{i,e} + \theta X_{i,m} + V_{i,m}$$

The dependent variable $Y_{i,m}$ takes the value of one if teacher i concludes the leave in month m, conditional on being on leave at the start of that month, and zero otherwise.

The term $\gamma_t$denotes year fixed effects, which capture time-specific shocks common to all individuals over the period 2011–2019. The set of month fixed effects λ_m controls for baseline seasonal patterns in sick-leave termination probabilities across the academic year and is assumed to apply equally to public and private school teachers.

The coefficient π measures the average difference in the probability of returning to work between public and private school teachers across all months. It is associated with the binary indicator D_i, which equals one if the teacher works in the public sector and zero otherwise, and captures the first difference in the difference-in-differences framework.

To identify how this difference varies over the academic calendar, a second difference is introduced through a set of temporal interaction terms. These variables index the distance in months e between the observation month and a reference month, chosen to be March ($m = 3$). March is selected because it is not adjacent to major holiday periods and represents a neutral point in the academic year.

Formally, for each teacher and month, the indicator $D_{i,e}$ equals one if the observation month is e months away from March and zero otherwise. For example, if the observation month is May, then $e = 2$. The support of e ranges from −2 (January) to 5 (August), with $k = 2$ and $L = 5$ defining the maximum distances before and after the reference month.

The coefficient β_e captures, for the months between April and August, the incremental effect in the probability of ending a leave in the month corresponding to distance "e" with respect to in the reference month of March. The coefficient δ_e^{bef} has a similar interpretation to β_e, for the months before March. Both coefficients are constructed by interacting public-sector status with month-of-leave indicators constructed in the transformed dataset in **Table 5**.

Together, the sets of coefficients (β_e and δ_e^{bef}) allow us to assess whether differences between public and private teachers are concentrated in the months preceding the summer break or whether they persist throughout the academic year. This structure enables a direct test of whether behavioural responses intensify during periods in which incentives for opportunistic behaviour are strongest.

The vector Xi,m includes observable controls such as age, gender, school level, type of injury, years of experience, and region. The error term Vi,m captures unobserved factors affecting the monthly probability of returning to work.

Evidence in support of **Hypothesis 1** would correspond to a statistically significant

estimate of π, indicating a lower probability of leave termination among public school teachers. Statistically significant estimates of β_e, particularly in May or June, would support the second part of **Hypothesis 1** by indicating calendar-specific behavioural responses consistent with moral hazard.

To test **Hypothesis 2** with respect to sick-leave duration, the analysis is restricted to observations corresponding to the month in which the leave ends (i.e. $back = 1$), yielding 13,900 observations. An ordinary least squares (OLS) model is estimated using the following specification:

$$(2)\ \log(D_{i,m}) = \alpha \quad + \gamma_t + \lambda_m + \pi D_i + \sum_{e=-k}^{-1} \delta_e^{bef} D_{i,e} + \sum_{e=0}^{L} \beta_e D_{i,e} + \theta X_{i,m} + V_{i,m}$$

where $\log(D_{i,m})$ denotes the natural logarithm of the total number of days on sick leave for teacher i.

Unlike the logistic model, this specification focuses on the cumulative outcome of interest. A statistically significant π would indicate longer average sick-leave durations among public teachers (**Hypothesis 2**), while significant estimates of β_e, particularly in May and June, would confirm the second part of **Hypothesis 2**, suggesting that public teachers adjust the duration of their leave in response to the academic calendar.

6. Results

This section presents the evaluation of the previously formulated hypotheses, analysing the possible presence of moral hazard and whether the aforementioned behaviours systematically respond to the incentives associated with the school calendar. We present the empirical results derived from the econometric strategy described above. First, we show the estimated difference between public- and private-sector teachers in the probability of ending a sick leave due to temporary disability, as well as its variation throughout the academic calendar. We then examine differences in leave duration, with particular attention to seasonal effects.

The empirical strategy provides consistent support for the main hypotheses. First, the average public–private differential in the probability of returning to work is statistically significant and economically meaningful. Public-sector teachers are approximately 7 percentage points less likely to exit a sickness spell than their private-sector counterparts, consistent with the range of estimates (5.6 to 9.3 percentage points, depending on the specification) documented in studies with a similar focus, such as Prümer and Schnabel (2019). Second, the calendar-based hypothesis is confirmed: the sectoral gap varies systematically over the academic year and reverses in the months immediately preceding the summer break. As shown in **Figure 3**, the aggregate negative differential (indicated with a horizontal dashed line) turns positive in June, when public teachers become about 8 percentage points more likely to end their leave than private teachers.

[Figure 3]

Consistent with the hazard-based evidence, public-sector teachers have sick leaves that are about 20% longer on average than those of private teachers, exceeding the estimates

reported in other papers such as Uppal and LaRochelle-Côté (2013) (4.1 days); or Frick and Malo (2008) (1.4 days). Importantly, this duration gap expands as the summer break approaches, falling to roughly half of the aggregate difference by June. Taken together, the results point to systematic behavioural responses aligned with the academic calendar. The remainder of this section, using the results contained in **Table 6** and **Table 7**, progressively explores the heterogeneity of the effects by gender, diagnosis type, age, and region, with the aim of identifying the underlying mechanisms that explain the observed divergences

[Table 6]

[Table 7]

6.1. Probability of Ending a Leave

Table 6 reports the estimation of the main parameters of equation (1), which allow us to test the previously stated hypotheses. Together with the aggregate estimation, the table also presents the differential impact by gender and by diagnosis difficulty.

The aggregate results confirm a significant differential in exit probabilities. The coefficient π associated with the public-sector indicator shows that, ceteris paribus, public-school teachers are about 7 percentage points less likely to end a leave. The analysis of the monthly interactions, captured by parameters β_e in equation (1), reveals clear sensitivity to the academic calendar in the months close to summer. While in May the negative differential persists—indicating a lower likelihood of ending the leave—in June we observe a statistically significant reversal, reflecting an increase in the probability of returning to work in the month preceding the holiday period.

To further explore this pattern, **Figure 3** shows an extended analysis of parameters δ_e, and β_e from (1) over the first half of the year, using the "regular" month of March as a reference. While the results before May are not significant, the negative sign of the parameter for May reflects a significant lower probability of returning to work among public-sector teachers relative to those in the private sector. This effect is offset by the June estimate, where public-sector teachers display a significant differential exit probability that is 8 percentage points higher than that of private-sector teachers.

6.2. Leave Duration

The duration analysis complements the evidence obtained in the hazard model. **Table 7** reports the estimation of the key parameters of equation (2) that allows us to test **Hypothesis 2**, focusing on parameters π and β_e. Alongside the aggregate estimation, the table also presents the differentiated impact by gender and diagnosis difficulty.

The results show that sick leaves among public-sector teachers are approximately 20% longer than those in the private sector. This difference is statistically significant and relatively homogeneous by gender, although it reaches its largest magnitude for hard-to-diagnose injuries, where the gap approaches 25%. Moreover, as summer approaches, the gap between public- and private-sector teachers changes substantially, with those ending their leave in June exhibiting a 50% increase relative to the annual average differential.

As in the case of the probability of ending sick leave shown in **Figure 3**, the differences in the log duration of sick leave between public and private teachers display a seasonal pattern (**Figure 4**). In May and June the estimated differences remain positive, and the confidence intervals are wider and, in some cases, include zero, indicating weaker statistical precision. Overall, the pattern suggests that the gap in sick-leave duration between public and private teachers tends to increase as the summer break approaches.

[Figure 4]

The results obtained above—both for the probability of ending the leave and for its duration—show that the differences between public- and private-sector teachers are not only statistically robust but also economically meaningful. On average, public-sector teachers are about 7 percentage points less likely to end a sickness spell and experience leaves that are roughly 20 percent longer than those of their private-sector counterparts. The interaction between institutional protection, diagnostic discretion, and the academic calendar creates an environment in which incentives may translate into strategic behaviours that either prolong or shorten the leave. These findings expand the absenteeism literature by showing that the effects of moral hazard are not unidirectional but may reverse depending on the temporal and institutional context.

The previous results provide consistent evidence in support of the main hypotheses. First, the average differential between the public and private sectors is statistically significant for both outcomes analyzed. Public-sector teachers exhibit a lower probability of ending a leave and significantly longer absence durations, patterns that are consistent with the literature on public–private differences in absence behaviour and with an ex post moral hazard framework arising from stronger employment protection and more generous coverage.

Second, the part of the hypotheses based on the academic calendar is clearly confirmed. The sectoral differential is not constant over the academic year but varies systematically as the summer break approaches. In the case of exit probabilities, the aggregate negative differential reverses in June, when public-sector teachers become approximately 8 percentage points more likely than private-sector teachers to end their leave. Regarding duration, the gap relative to the private sector widens toward the end of the academic year. Taken together, these dynamics suggest that the same institutional framework that encourages longer absences during the school year is exacerbated as the holiday period approaches.

6.3. Heterogeneity

6.3.1. Heterogeneity in Exit Probabilities

Regarding the probability of ending the leave, **Table 6** reports disaggregated results. Concerning parameter π of equation (1), associated with the regressor D_i, which captures the differential between public- and private-sector teachers, the aggregate effect is primarily driven by women, who constitute the majority of the teaching workforce. For men, the coefficients are smaller and less statistically representative.

When disaggregating by diagnosis type, the largest differential appears in hard-to-diagnose (HTD) conditions, where the gap reaches approximately 10 percentage points. This result reinforces the interpretation based on diagnostic discretion and informational asymmetries. In conditions whose medical verification is more complex, institutional incentives

appear to have greater potential to influence the effective duration of the leave.

The estimation of monthly interactions reveals a clear calendar effect among women and HTD cases, suggesting that the proximity of the summer holiday period acts as a disciplining mechanism or as a strategic incentive to synchronize the end of the leave with the beginning of vacation time.

Other characteristics that allow for a deeper evaluation of the preceding hypotheses are age and region. **Figure 5** presents the estimation of parameter π from equation (1), along with 95% confidence intervals, as a function of the worker's age at the start of the leave. **Figure 5** shows meaningful heterogeneity over the life cycle. Public–private significant differences are more pronounced in the early and middle stages of the professional career, between ages 30 and 50, with lower exit probabilities among public-sector teachers.

[Figure 5]

With regard to seasonal effects, the next **Figure 6** shows the estimated β_e parameters for May (left panel) and June (right panel), capturing the differential probability of ending the leave between public- and private-sector teachers relative to the "regular" month of March. **Figure 6** shows significant seasonal heterogeneity. Public-sector teachers until 30 display negative significant differentials in exit probabilities in May (relative to private-sector teachers), indicating a higher likelihood of remaining on leave compared to the reference month of March. By contrast, the June estimates show that public-sector teachers aged 30 to 60, the majority of the sample, exhibit a higher significant propensity to return from leave compared to their private-sector counterparts. This June reversal may be linked to dynamics of job stabilization and consolidation in public employment.

[Figure 6]

Regarding regional analysis, **Figure 7** displays the estimation of parameters π and β_e for the months of May and June. The regional analysis confirms, through π, the existence of significant territorial heterogeneity. The parameters for Madrid and Andalusia are negative, indicating that public-sector teachers in these regions show, as in the aggregate result, lower probabilities of ending a leave throughout the year when compared with private-sector teachers. Moreover, the estimates for β_e reveal a significant reversal of this effect in June for public-sector teachers in Andalusia and the Basque Country, reflecting an increased likelihood of ending the leave in the month preceding the summer holidays. These differences suggest that the intensity of moral hazard may also depend on regional administrative practices and institutional frameworks.

[Figure 7]

6.3.2. Heterogeneity in Duration

The results in **Table 7** show that the longer duration of leaves in the public sector is stable across genders, although it again reaches its greatest magnitude for hard-to-diagnose injuries, where the gap approaches 25%. Moreover, as summer approaches, the duration gap between public- and private-sector teachers widens substantially: for those ending their leave in June, duration increases by roughly 50% relative to the average annual differential. This pattern is consistent with the dynamic evidence found in exit probabilities and suggests strategic timing

of leave duration with the school calendar.

Figure 8 presents the estimation of parameter π from equation (2), together with 95% confidence intervals, as a function of the worker's age at the beginning of the leave. Significant longer duration of sick leaves for public teachers is particularly relevant in early stages of the professional career, especially among teachers under 40, and also in later stages, above age 60.

[Figure 8]

Regarding seasonal effects, the next figure presents the estimated β_e parameters for May (left) and June (right) from equation (2), capturing the differential in the log duration of sick leave between public- and private-sector teachers in those months, using the "regular" month of March as a reference.

Figure 9 shows substantial seasonal heterogeneity with significant results concentrated among teachers aged 40 to 50. For this age group, public-sector teachers who end their leave in May or June experience larger increases in leave duration compared with private-sector teachers returning in the same months, indicating a statistically significant increase in leave length as summer approaches. No significant effects are observed for the remaining age groups.

[Figure 9]

Regarding the regional analysis, **Figure 10** reports the estimated π and β_e parameters for the months of May and June. The regional analysis confirms the existence of substantial territorial heterogeneity. Madrid (Asturias) exhibits a positive (negative) significative aggregate differential in leave duration between public- and private-sector teachers throughout the year, while the increase in duration among public-sector teachers ending their leave in June is concentrated in regions such as Asturias and Madrid. These differences also reinforce the findings related to exit probability about the importance of regional administrative practices and institutional frameworks on the possibility and intensity of moral hazard behaviours.

[Figure 10]

7. Implications and Policy Recommendations

The findings of this paper suggest that sickness absence behaviour among teachers is shaped not only by institutional differences between public and private employment, but also by the temporal incentives generated by the academic calendar. While public-school teachers exhibit lower return-to-work probabilities and longer sick-leave durations on average, these differences vary systematically throughout the school year and partially reverse immediately before the summer break.

This pattern is consistent with a dynamic interpretation of moral hazard. Rather than generating a constant tendency toward longer absences, institutional incentives appear to affect the timing of leave decisions. The evidence suggests a form of intertemporal substitution: during most of the academic year, public-school teachers remain on leave for longer periods, whereas immediately before the summer holiday they become more likely to end their leave relative to private-school teachers. These results highlight how calendar structures may interact

with employment protection and monitoring systems to shape absence behaviour (Bravo and Vall Castelló, 2024).

The heterogeneity analysis further supports this interpretation. The estimated effects are particularly strong among hard-to-diagnose conditions, where informational asymmetries are more severe and worker discretion is greater (Martín-Román and Moral, 2017). Likewise, the results are more pronounced among women and mid-career workers, suggesting that family constraints, career incentives, and employment stability may amplify behavioural responses to institutional incentives.

The results also reveal substantial regional heterogeneity, indicating that administrative practices and monitoring intensity may play an important role in determining sickness absence behaviour (Corrales et al., 2008). This finding cautions against treating public-sector absenteeism as institutionally homogeneous within countries and suggests that implementation differences may substantially affect behavioural outcomes.

Given the economic relevance of education in Spain, we translated our log-based results into working days. To avoid the bias of exponential transformations (Abrevaya, 2002; Cameron & Trivedi, 2009), we relied on the relative position of coefficients within the log distribution and converted them to the level scale. The estimates indicate an average excess of 8 days per sick leave, rising to 9 days for hard-to-diagnose cases. Applied to the nearly 6,000 public teacher sick leaves in our dataset, this implies a surplus of about 54,000 working days. These sector-specific estimates exceed those reported for the broader public sector by Uppal and LaRochelle-Côté (2013) (4.1 days) and Frick and Malo (2008) (1.4 days).

In monetary terms, and using an average subsidy of €64 per day (**Table 3**), the opportunistic behaviours identified generated an estimated cost of €3.456 million. This is a conservative figure, as it covers only professional contingencies, which represent a minority of cases and are subject to stricter monitoring. It also reflects only the public–private differential, excluding teachers' overall excess absenteeism and replacement costs.

The effects of these behaviours go beyond direct financial costs. Absenteeism generates substantial fiscal burdens (Martín-Román and Moral, 2017), may harm student outcomes (Winkler, 1980), and can increase coworkers' workload and absence risk. The study also identifies presenteeism, particularly among teachers returning before summer holidays. Although beneficial in the short term, working while ill may spread contagious diseases and reduce institutional performance (Barmby and Larguem, 2009; Adda, 2016; Pichler and Ziebarth, 2017).

From a policy perspective, administrative data can support targeted interventions. Monitoring leave durations at critical points may discourage strategic behaviour, consistent with Biscardo et al. (2019) and Eskildsen et al. (2021). Similarly, AIReF (2026) highlights that better real-time data sharing and coordination between social security and healthcare institutions would reduce information gaps, speed return-to-work decisions, and limit moral hazard in sickness absence.

Additional measures such as random medical checks, implemented in Italy (De Paola et al., 2014), may discourage opportunistic behaviour. Likewise, self-declaratory short-term sick leave, as used in Portugal, could improve efficiency by reducing administrative burdens and focusing resources on higher-risk cases. Positive and negative incentives may also deter

strategic absenteeism. Eskildsen et al. (2021) show that individualized policies linking absence behaviour to promotion and dismissal decisions can reduce unjustified absences. Furthermore, harmonizing benefit coverage across sectors and employment types could reduce behavioural distortions, improving both system efficiency and educational outcomes.

8. Conclusions

The findings of this paper provide empirical evidence of moral hazard behaviours within the Spanish education sector. These behaviours appear to be influenced by differences in administrative structures and incentive systems that govern public and private school teachers. Consistent with patterns widely observed in the economic literature, public school teachers in Spain are less likely to terminate a period of sick leave and tend to have longer leave durations than their private-sector counterparts. This disparity can be attributed to stronger job protection and more generous financial compensation for public employees, coupled with fewer career-related penalties for extended absences. As noted by Scoppa (2010), job characteristics and contractual arrangements significantly shape worker behaviour. More secure and less supervised positions, such as those in the public sector or in large firms, are associated with higher levels of absenteeism.

A central contribution of this study is the identification of the academic calendar as a key determinant of leave behaviour and its timing. The presence of a fixed two-month summer break appears to modify the conventional moral hazard mechanism. Specifically, in the months preceding this period, the estimated effect reverses sign: public school teachers exhibit a higher likelihood than comparable private-sector workers of returning to work before the onset of the holiday. Likewise, the results also showed that sick leave duration is subject to additional upward adjustment as the summer holidays approach.

This behaviour can be interpreted as an alternative manifestation of moral hazard, complementing the standard focus on leave prolongation. The effect is particularly pronounced for hard-to-diagnose injuries, where informational asymmetries are more severe and allow greater scope for discretionary behaviour. More broadly, the results highlight how institutional features and calendar-induced incentives interact with timing decisions to shape absenteeism.

In addition, the evidence indicates that these responses vary systematically over the life cycle. Age and career stages associated with greater employment uncertainty or higher family burdens—particularly among women—are linked to stronger behavioural adjustments. The analysis also reveals substantial territorial heterogeneity, pointing to the importance of regional administrative framework.

From a fiscal standpoint, the findings of this study suggest that moral hazard behaviours impose a direct cost on Spain's Social Security system. The estimated cost for the year analysed is approximately 3.84 million euros and 60,000 working days. These figures do not include indirect costs such as salaries paid to substitute teachers or the effects of additional absences resulting from an unmanageable workload due to staff shortages.

In conclusion, addressing the persistent challenges associated with sickness absence requires that public policy be grounded in empirical evidence and supported by robust quantitative research within reinforced coordinated public administrations and other stakeholders. The careful design and effective enforcement of incentive mechanisms, together with the harmonization of benefit structures across sectors and employment types, can minimize behavioural distortions and prevent disproportionate advantages among worker groups. Taken together, these evidence-based strategies can enhance system efficiency, strengthen worker well-being, and foster improved outcomes in vital public services such as education.

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TABLES

Table 1. Summary of the incentives and the related effects

Incentives	Public	Private
Financial	100% of salary	75% of salary
Career-related	Extremely unlikely to be dismissed nor penalized in case of recurrent leaves	Although education has a protective framework in Spain, it is possible to terminate the contract if the employer considers it appropriate
Enjoyment of holidays	The sick leave conditions the enjoyment of holidays if the leave is incompatible with the activities during the holidays	

Effect of the incentives	Public	Private
Effect of the incentives in probability of getting back to work	Less prone to come back	More prone to come back
Effect of the incentives in duration	More prone to extend duration	Less prone to extend duration

Source: Own elaboration

Table 2. Most common leaves from economic activity (NACE Rev.2.) and occupation classifications (ISCO-O8)

NACE code	NACE Description	%
841	Public administration and defence; compulsory social security	5.94
412	Construction of buildings	4.23
812	General cleaning activities of building interiors	3.89
861	Hospital activities	3.73
471	Retail trade in non-specialized stores with food, beverages or tobacco predominating	3.47
561	Restaurants and mobile food service activities	3.2
432	Electrical, plumbing and other construction installation activities	3.17
494	Road freight transport and moving services	2.56
563	Beverage serving activities	2.48
463	Wholesale of food, beverages and tobacco	2.13

INE Occupation Code	ISCO-08 minor group description equivalence	%
921	Cleaners and Helpers	6.08
970	Manufacturing Laborers	5.31
522	Shop Salespersons and Retail Clerks (Retail Trade Workers)	4.66
951	Agricultural, Forestry and Fishery Laborers	3.57
512	Waiters	3.47
843	Heavy Truck and Lorry Drivers (Drivers and Mobile-plant Operators)	3.34
740	Machinery Mechanics and Repairers (Craft and Related Trades)	2.87
712	Building Finishers and Related Trades Workers	2.84
731	Sheet and Structural Metal Workers; Moulders, Welders and Related Workers	2.82
981	Labourers in Transport, Storage and Related Services	2.76

Source: Own ellaboration using EAT

Note: NACE stands for "Nomenclature statistique des activités économiques dans la Communauté européenne", in English: Statistical Classification of Economic Activities in the European Community and has complete equivalence with the Spanish CNAE-2009 taxonomy. ISCO-08 stands for the International Standard Classification of Occupations, 2008 version, which is a system developed by the International Labour Organization (ILO) to classify and organize jobs and occupations in a consistent way worldwide Spanish INE Occupation Code (CNO) is mapped with ISCO-08 taxonomies, and we include the correspondent description equivalence in the table to ease understanding.

Table 3. Overview of main statistics of teachers' leaves

Variable	General	Public	Private	Male	Female	HTD	No HTD
Public School (%)	35.08%	–	–	–	–	–	–
Private School (%)	64.92%	–	–	–	–	–	–
Male (%)	18.13%	17.08%	18.69%	–	–	17.70%	18.66%
Female (%)	81.87%	82.98%	81.31%	–	–	82.23%	81.34%
HTD (%)	59.98%	61.75%	59.02%	58.88%	60.24%	–	–
Seniority (months)	102.81	66.79	122.29	109.70	101.29	94.46	115.34
Daily compensation (€)	55.51 €	64.64 €	50.58 €	59.83 €	54.56 €	54.78 €	56.61 €
Preprimary level (%)	27.18%	17.99%	38.66%			32.15%	30.3%
Primary level (%)	23.23%	45.59%	34.78%			39.39%	39.97%
Secondary level (%)	49.59%	33.42%	26.56%			28.46%	29.73%
Age (mean in years)	41.98	42.45	41.74	42.21	41.94	41.09	43.33
Nº employees (mean)	1388.72	3584.128	202			1446.178	1302.79
Duration (mean in days)	36.41	43.14	32.78	39.24	35.78	30.99	44.53
Duration (median in days)	18	25	16	21	18	17	21
Duration (std deviation/days)	48.69	53.20	45.66	51.03	48.13	41.54	56.81
Duration Skewness	3.16	3.02	3.22	3.05	3.17	3.74	2.56
Observations	23,142	8,119	15,023	4,195	18,947	13,881	9,261

Source: Own ellaboration using EAT

Table 4. Example of the EAT leave structure

Date beginning	Date ending	Public	Age	Province Code	Diagnostic Code	Nº Workers
11/01/2011	14/04/2011	1	54	24	104	43
23/04/2012	15/06/2012	0	34	36	85	67

Own elaboration based on EAT

Table 5. Transformation of EAT for the empirical research

ID	Month_beg	Month_back	year	Public	Back	Mjanuary	Mfebruary	Mmarch	Mapril	Mmay	Mjune	Mjuly	Maugust	Di_ene	Di_feb	Di_March	Di_apr	Di_may	Di_jun	Di_jul	Di_ago
1	1	4	2011	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	1	4	2011	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1	1	4	2011	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
1	1	4	2011	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
2	4	6	2012	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2	4	6	2012	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	4	6	2012	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Own elaboration based on EAT

Table 6. **Average difference (marginal effects) between public and private teachers in the probability of ending a leave (equation 1)**

Variable	All	Men	Women	HTD	No HTD	HTD Men	HTD Women
Di	-0.07***	-0.06	-0.07***	-0.10***	-0.04	-0.04	-0.11***
	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)
	[-4.99]	[-1.66]	[-4.74]	[-5.13]	[-1.81]	[-0.85]	[-5.31]
Di_may	-0.04	-0.00	-0.05*	-0.03	-0.06	-0.03	-0.03
	(0.02)	(0.05)	(0.02)	(0.03)	(0.03)	(0.06)	(0.03)
	[-2.12]*	[-0.03]	[-2.34]	[-1.20]	[-1.88]	[-0.44]	[-1.09]
Di_jun	0.08***	0.11*	0.08***	0.11***	0.05	0.11	0.10***
	(0.02)	(0.05)	(0.02)	(0.03)	(0.03)	(0.06)	(0.03)
	[4.09]	[2.40]	[3.34]	[3.99]	[1.47]	[1.78]	[3.52]

Source: Own ellaboration using EAT.

Note: "*", "**", "***" indicate when results are statistically significant at the 10%, 5%, and 1% level, respectively. Standard deviations are reported in parentheses, and t-statistics are reported in square brackets. HTD refers to the leaves causing hard-to-diagnose injuries as defined in **Error! Reference source not found.**and NOHTD comprises the rest of causes of the leave not included under HTD

Table 7. **Average difference in the log of the duration between public and private teachers (equation 2)**

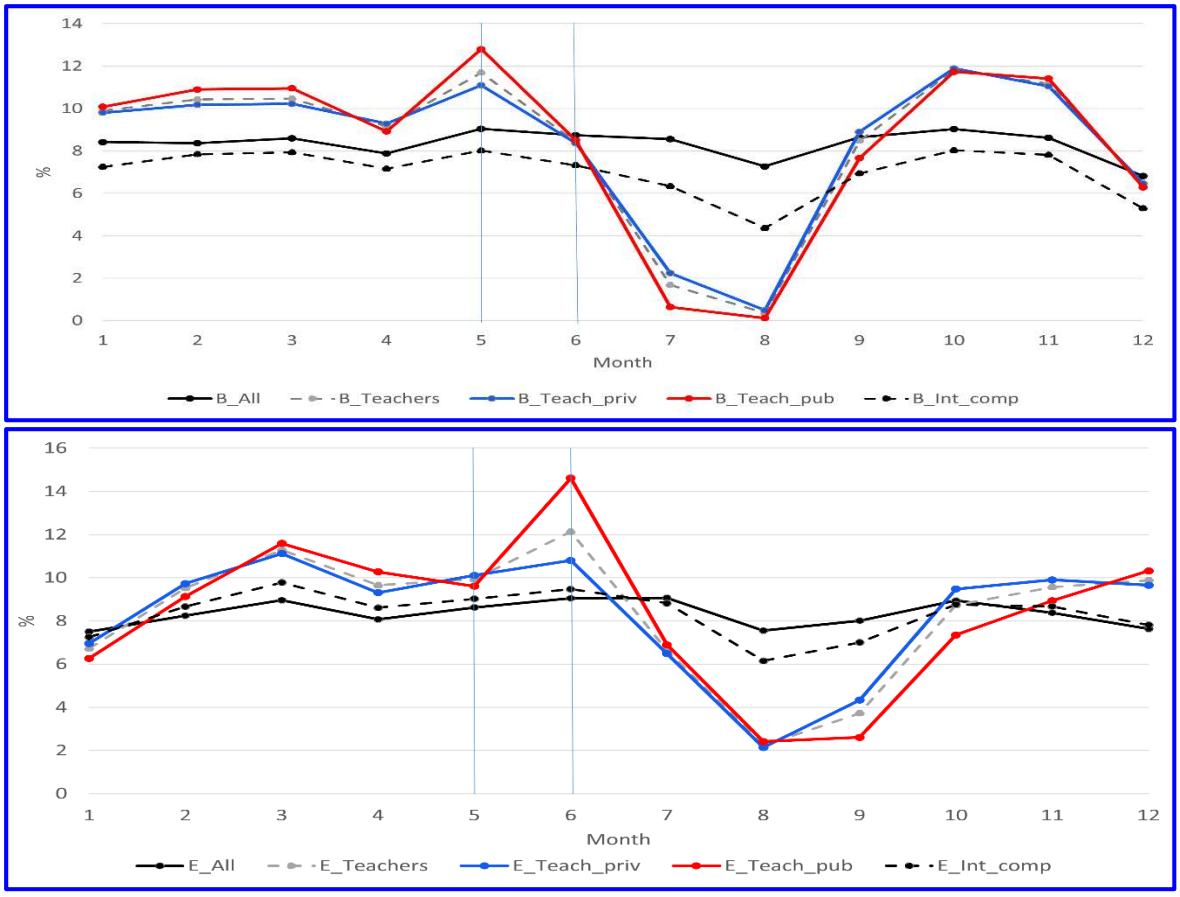
Variable	All	Men	Women	HTD	No HTD	HTD Men	HTD Women
Di	0.20***	0.19*	0.20***	0.25***	0.11	0.25*	0.25***
	(0.04)	(0.09)	(0.04)	(0.04)	(0.06)	(0.11)	(0.05)
	[5.45]	[2.12]	[4.96]	[5.64]	[1.76]	[2.31]	[5.19]
Di_may	0.09	0.03	0.11	0.09	0.12	-0.05	0.11
	(0.05)	(0.13)	(0.06)	(0.06)	(0.09)	(0.15)	(0.07)
	[1.73]	[0.20]	[1.87]	[1.33]	[1.31]	[-0.32]	[1.58]
Di_jun	0.10*	0.06	0.11*	0.09	0.15	-0.07	0.13
	(0.05)	(0.12)	(0.06)	(0.06)	(0.09)	(0.14)	(0.07)
	[2.04]	[0.47]	[2.08]	[1.56]	[1.72]	[-0.47]	[1.91]

Source: Own ellaboration using EAT.

Note: "*", "**", "***" indicate when results are statistically significant at the 10%, 5%, and 1% level, respectively. Standard deviations are reported in parentheses, and t-statistics are reported in square brackets..HTD refers to the leaves causing hard-to-diagnose injuries as defined in **Error! Reference source not found.**and NOHTD comprised the rest of causes of the leave not inluded under HTD.

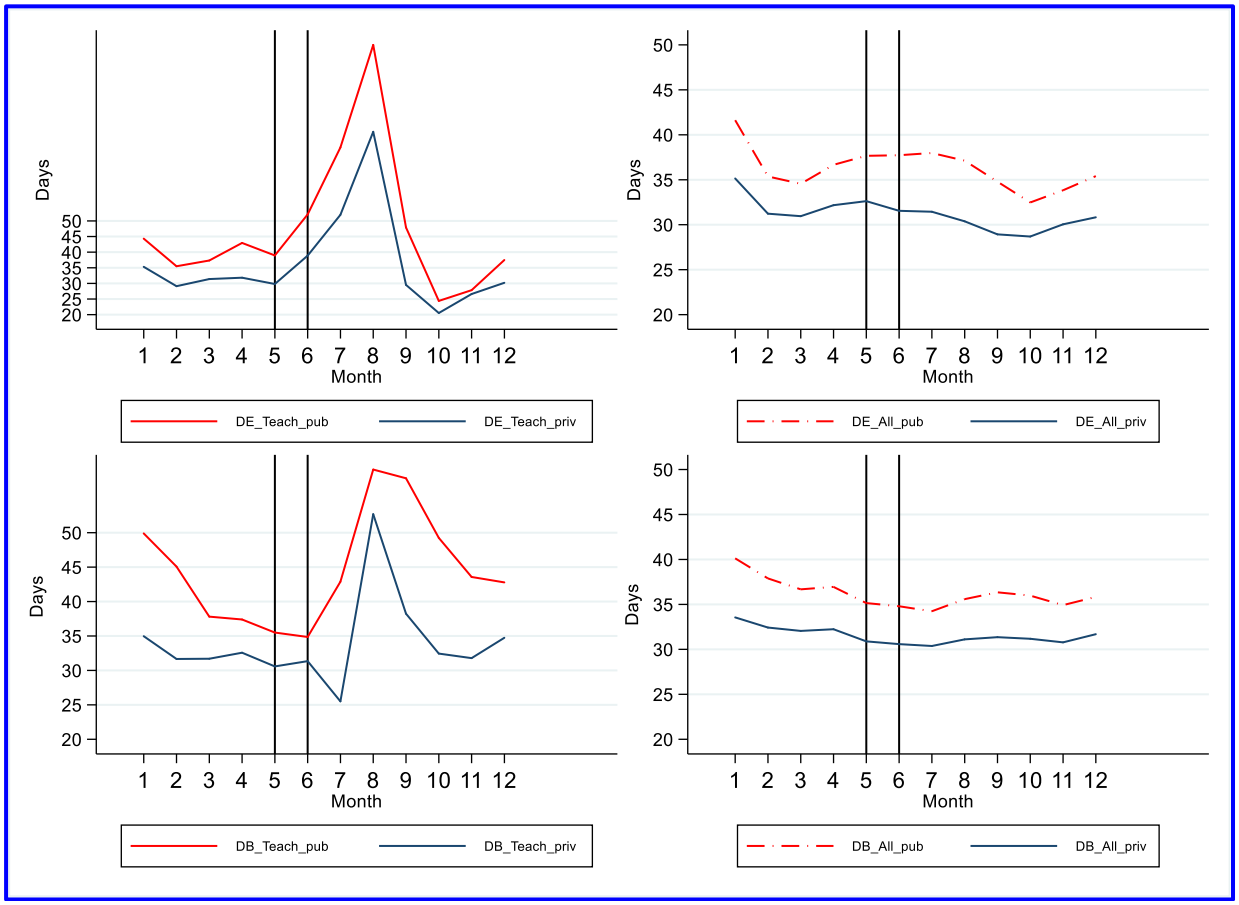
FIGURES

Figure 1. Monthly Distribution of Leave Commencements (Upper Panel) and Terminations (Lower Panel)



Source: own elaboration using EAT.
Notes: Series prefixed with B refer to the month in which the sick leave begins, while series prefixed with E refer to the month in which the sick leave ends. B_All denotes the monthly share of all sick leaves in the dataset; B_Teachers corresponds to all teachers; B_Teach_priv and B_Teach_pub refer to private- and public-school teachers, respectively; and B_Int_comp denotes comparable occupations defined using ESAW's "Working Process" classification. Vertical reference lines indicate May and June, which constitute the main months of analytical interest in the paper.

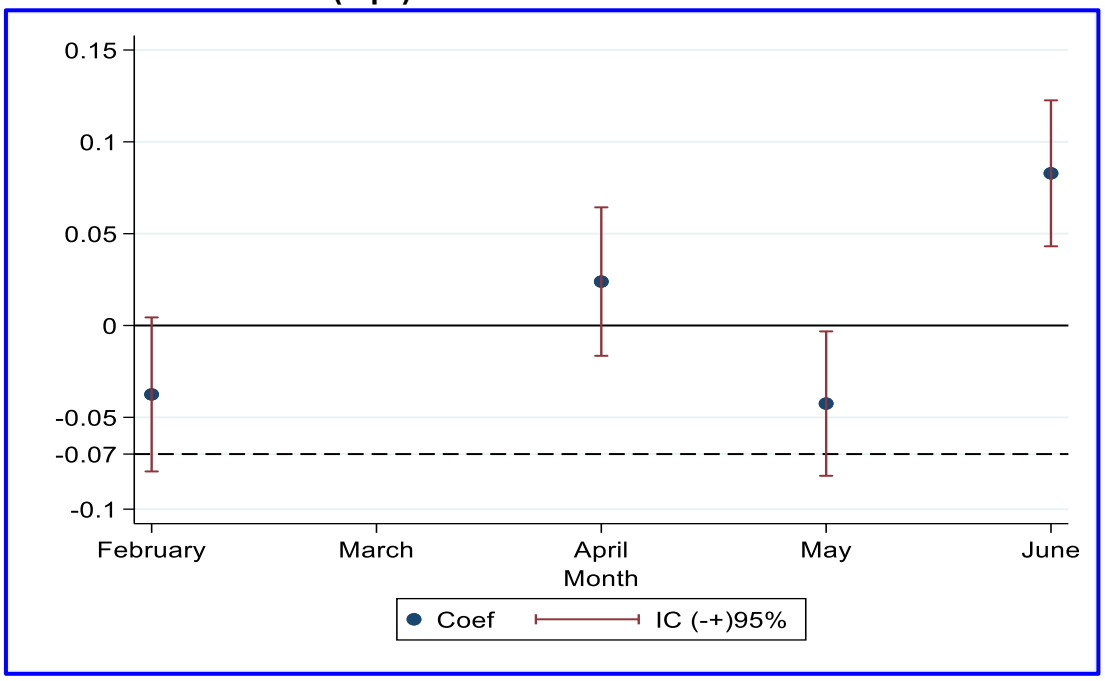
Figure 2. **Average Duration of Teacher Leave and Overall Leave Distribution by month of initiation or termination**



Source: own elaboration using EAT

Notes: Series prefixed with DE report the average duration of sick leave spells grouped by the month in which the leave ends (top panels), while series prefixed with DB report average duration grouped by the month in which the leave begins (bottom panels). The left-hand panels refer to teachers, with Teach_pub denoting public-school teachers (red lines) and Teach_priv private-school teachers (blue lines). The right-hand panels report the corresponding distributions for all sick leaves in the dataset (All). Vertical reference lines indicate May and June, which constitute the main months of analytical interest in the paper.

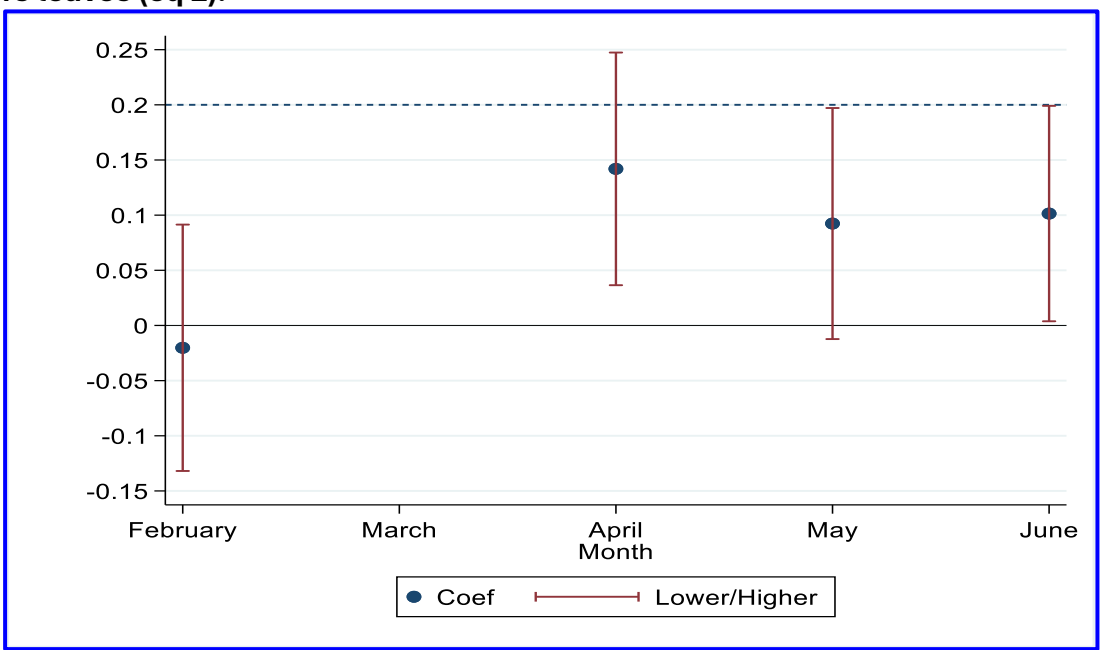
Figure 3. Difference in the return-to-work probability between public and private teachers. All teachers leaves. (eq 1)



Source: Own ellaboration using EAT

Note: The horizontal dashed line corresponds to the average overall difference in the probability of getting back to work and has been added to complement the dynamic results in Figure 3.

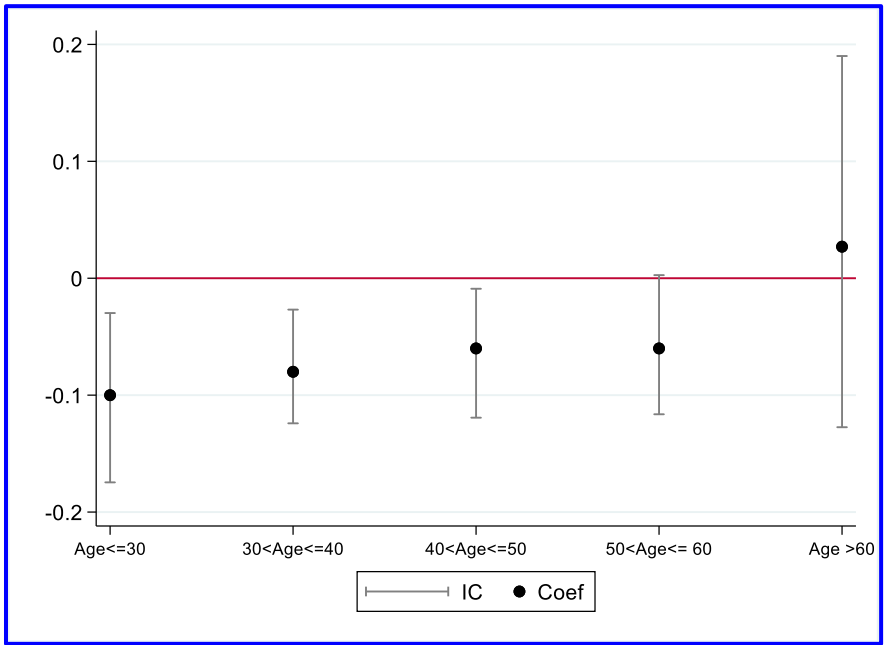
Figure 4. Difference in the log of the duration between public and private teachers. All teachers leaves (eq 2).



Source: Own ellaboration using EAT

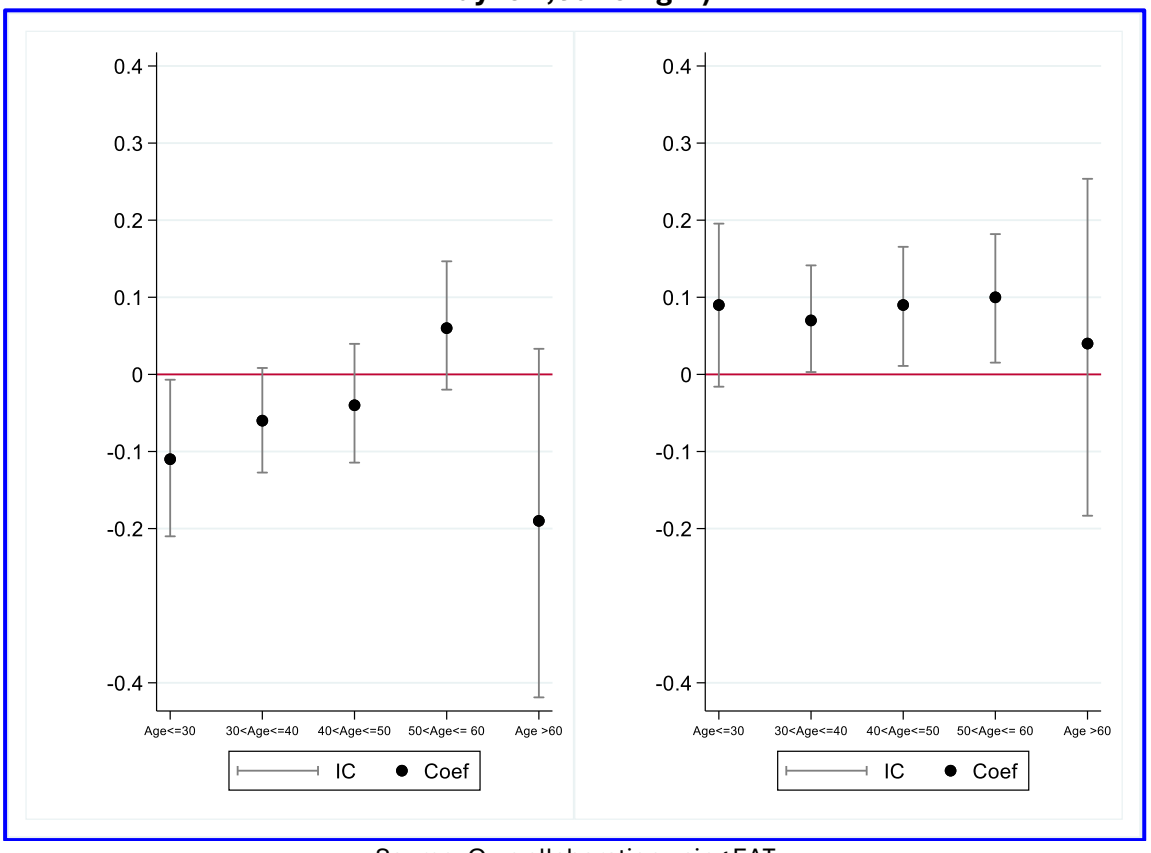
Note: The horizontal dashed line corresponds to the average overall difference in the log of the duration between public and private teachers and has been added to complement the dynamic results in Figure 4.

Figure 5. **Difference in the return-to-work probability by age group (All teacher leaves).**



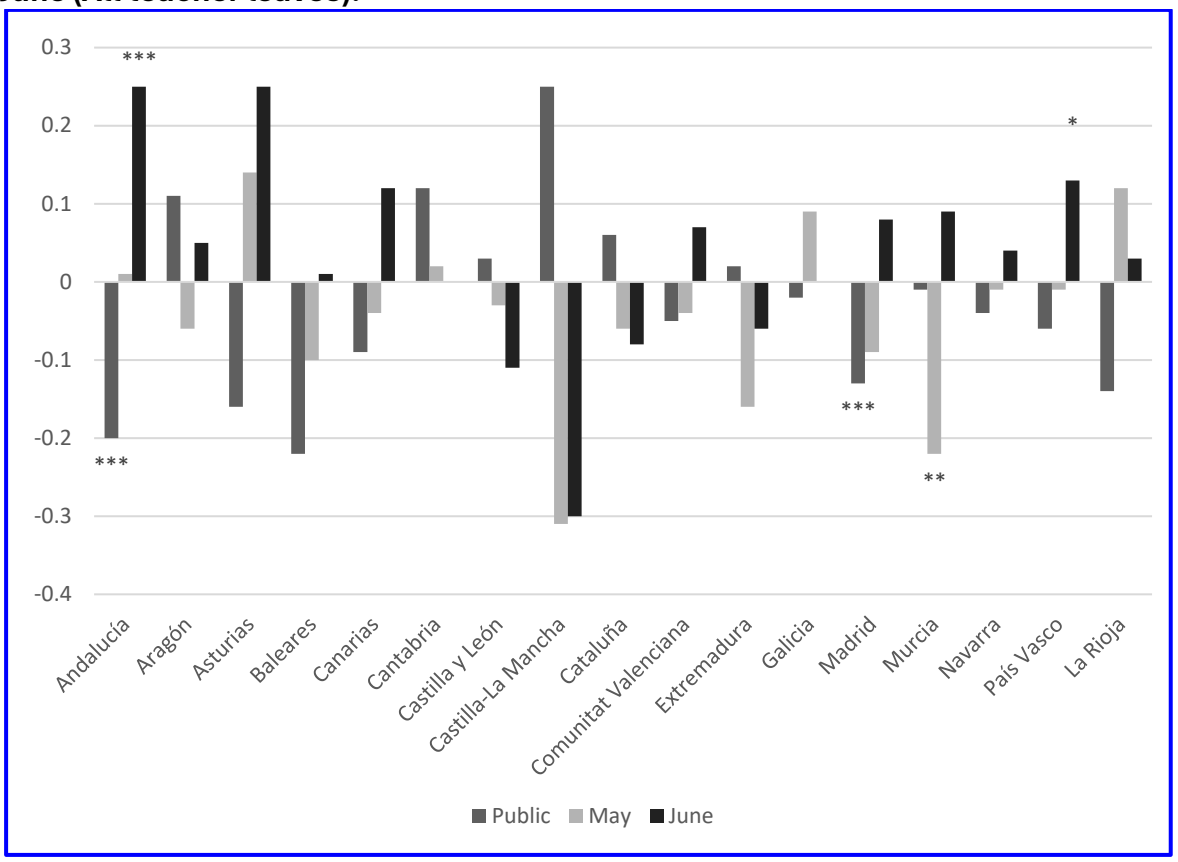
Source: Own ellaboration using EAT

Figure 6. **Difference in the return-to-work probability by age group. (All teacher leaves; May left, June right).**



Source: Own ellaboration using EAT

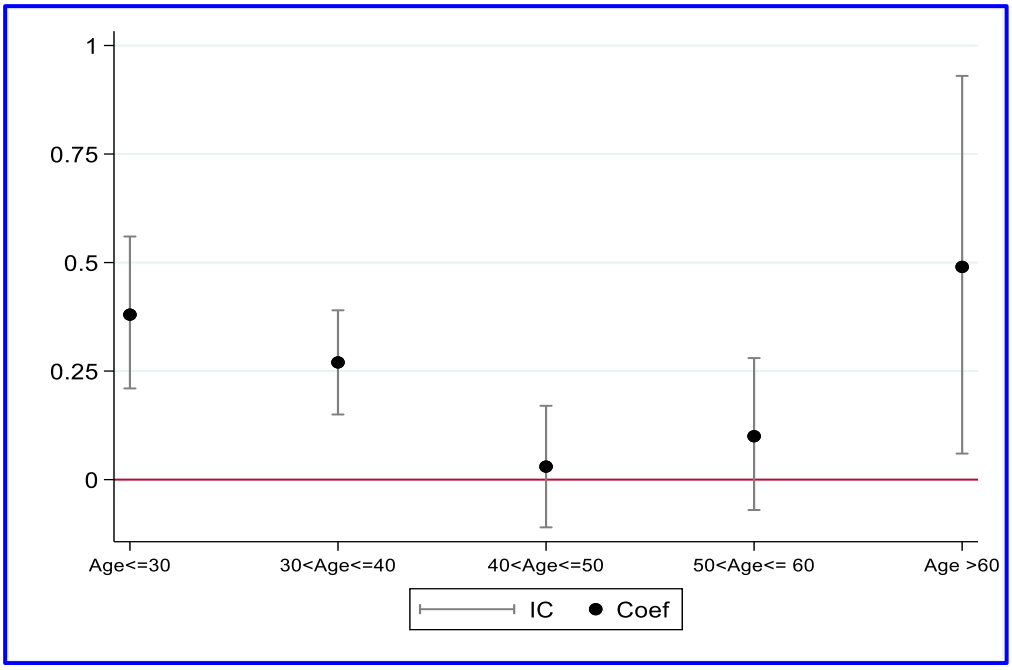
Figure 7. Difference in the return-to-work probability associated with the months of May and June (All teacher leaves).



Source: Own elaboration.

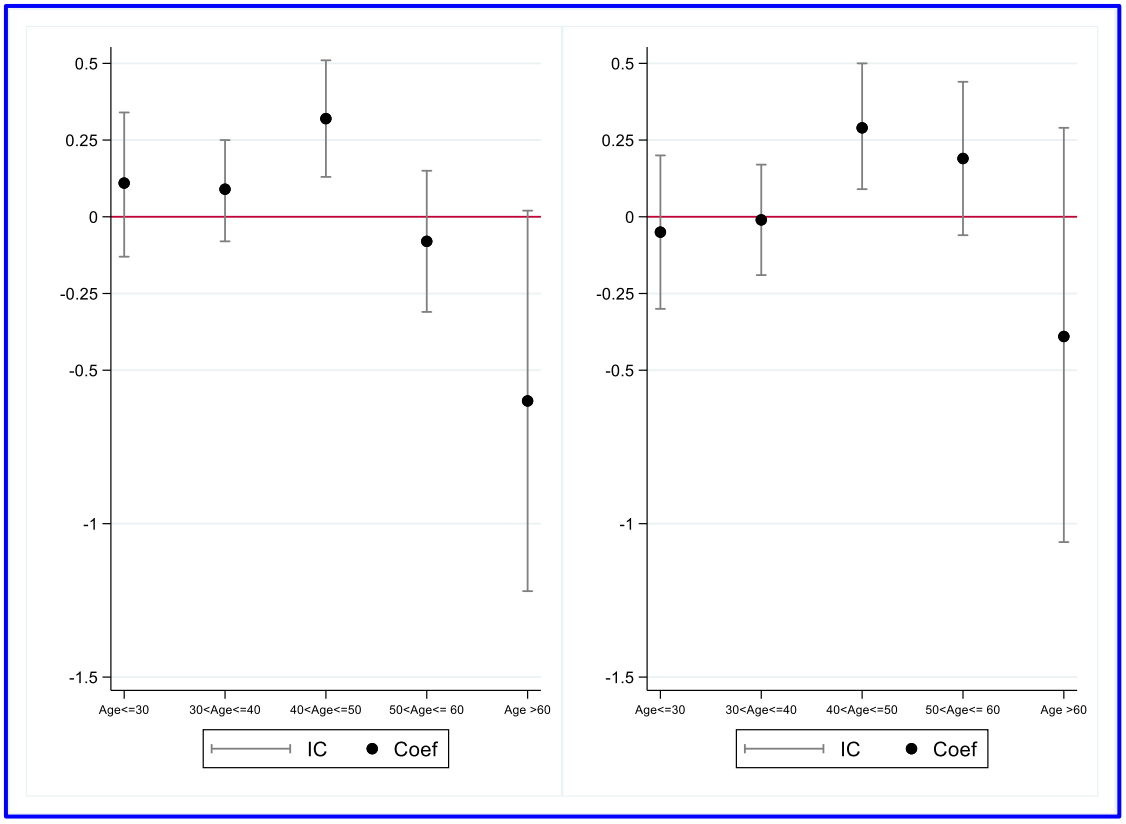
Note: "*", "**", "***" indicate when results are statistically significant at the 10%, 5%, and 1% level, respectively.

Figure 8. **Difference in the log of the duration by age group. All teachers leaves. (eq. 2)**



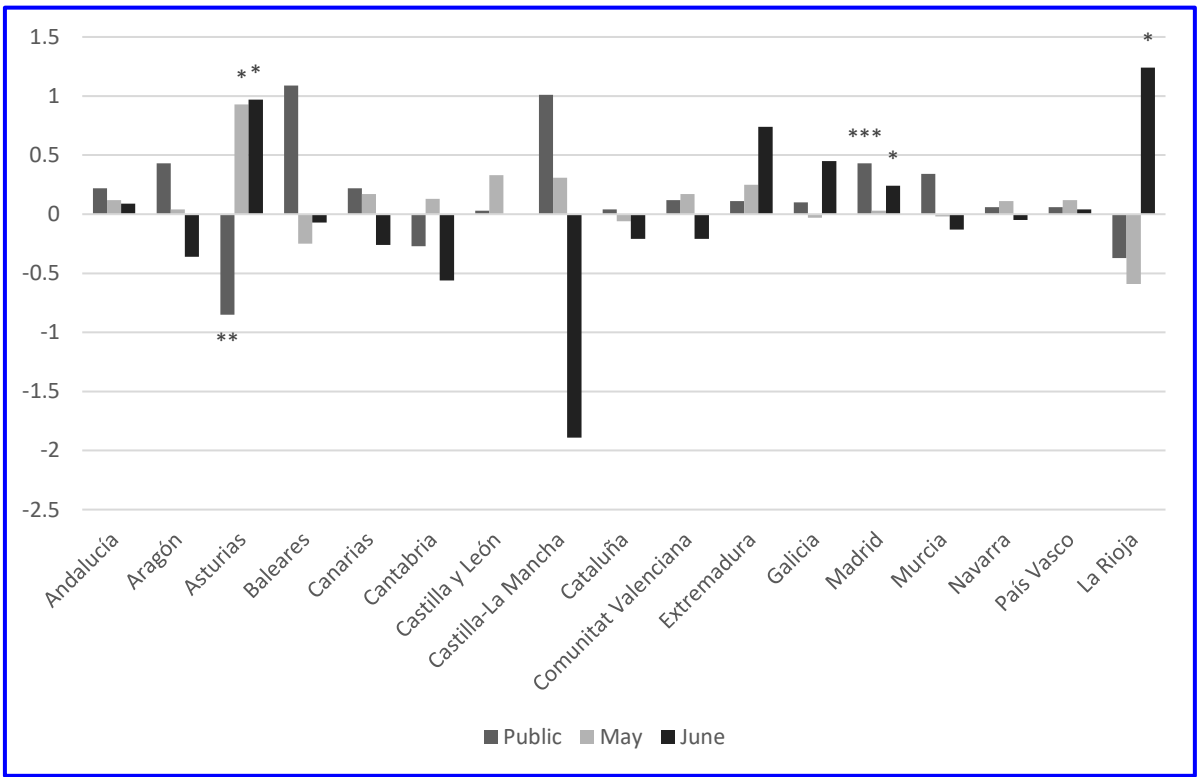
Source: Own elaboration using EAT

Figure 9. **Difference in the log of the duration by age group. (All teacher leaves; May left, June right).**



Source: Own elaboration using EAT

Figure 10. **Difference in the log of the duration associated with the months of May and June (all teacher leaves).**



Source: Own elaboration.
Note: "*", "**", "***" when statistically significant at the 10%, 5%, and 1% level.