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Reforming Dual Labor Markets: “Empirical” or “Contractual” Temporary Rates?*

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Abstract

This paper analyzes the impact of the 2021 labor reform in Spain on job creation, job destruction, and employment duration using new daily comprehensive administrative data. The reform’s primary objective was the mitigation of the temporary employment rate; however, despite the success in reducing the nominal temporary employment rate, the evidence suggests that employment stability in terms of duration has not significantly improved. The Spanish experience demonstrates that it is possible to design a labor reform that is highly effective in reducing the “contractual” temporary employment rate in a dual labor market, but with minimal impact on duration and short-term employment transitions, i.e. the “empirical” temporary employment rate.

JEL Classifications: E24; J08; J41.

Keywords: Employment flows; Fixed-term contracts; Calendar effects; Labor Reform.

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1 Introduction

In this paper, we analyze the impact of Spain’s 2021 labor reform, a country with the highest unemployment and temporary employment rates in the OECD. Employing a novel and extensive dataset which includes daily affiliation records from the Spanish Social Security, our goal is to elucidate the impact of the reform on improving job stability. Within months of its implementation, the temporary employment rate in Spain has decreased by nearly 50%, approaching the European average. However, the real impact and success of the reform are still up for debate. Evidence suggests that the impact of the reform on key aspects such as job creation, destruction, and duration have not been as remarkable. Our interpretation is that this policy reform has corrected the problem of “contractual” temporary employment, but the situation remains mostly unchanged for the permanent worker¹.

This reform has sparked a discussion about the segmentation of the Spanish labor market where the “contractual” and “empirical” aspects of temporary employment overlap. By framing temporary employment as just a “contractual” issue, the straightforward approach of the reform prohibiting temporary contracts appears to offer a clear solution to the problem. Despite the reform’s success in reducing “contractual” temporary employment, its impact on “empirical” temporary employment² – characterized by workers experiencing short employment periods and frequent shifts between jobs and unemployment – appears limited.

Even if “contractual” temporary employment does not exist, “empirical” temporary employment seems to affect all kinds of labor markets. Additionally, this “contractual” segmentation had the advantage of enabling us to pinpoint the most vulnerable workers in the workforce, precisely the workers who suffer from “empirical” temporary employment.

For the U.S. labor market, a labor market with one of the most flexible labor regulations

¹This labor market rigidity has been called “Eurosclerosis”. See [Giersch \(1985\)](#). An excellent summary of the *Eurosclerosis* process for the different European countries can be found in [Bentolila et al. \(2020\)](#).

²Luis Toharia, pioneer of modern labor economics in Spain, was the first to point out the difference between “contractual” temporary employment” and “empirical” temporary employment (see [Cebrián et al. \(2005\)](#)).

in the world, segmentation has long been documented as in [Doeringer and Piore \(1970\)](#)³. Since then, the overall description of job turnover and segmentation has remained mostly unchanged. Very recently, [Ahn et al. \(2023\)](#) find that 55% of workers experience practically no friction in employment: the primary tier. However, about 14% of workers have high turnover and high unemployment, absorbing most of the short-term labor market fluctuations at both seasonal and business cycle frequencies. These workers are 10 times more likely to be unemployed than their counterparts at the primary level. Finally, the remaining 30% include workers with little connection to the labor market, who experience unemployment when they enter the labor force from non-participation, but do not share the high rate of job destruction of workers in the second tier. Likewise, [Gregory et al. \(2021\)](#) identify three different types of workers in the U.S. labor market: α , β , and γ workers. Workers of the α type make up more than half of all workers and are the most likely to stay in the same job for more than 2 years. When these workers become unemployed they typically find a new job within one quarter. Workers of the γ type account for less than one-fifth of workers, have a low probability of staying in the same job for more than two years, and face a high probability of remaining unemployed for more than one year. Workers of the β type fall between the α and γ workers. Similar findings around the heterogeneity of the U.S. labor market can be found in [Hall and Kudlyak \(2019\)](#) and [Shibata \(2019\)](#).

Thus, based on the differences in the stable employment status of primary/ α workers there is a great similarity between European temporary workers and the secondary workers described by [Ahn et al. \(2023\)](#) or the γ workers of [Gregory et al. \(2021\)](#). Identification of worker types in the U.S. seems more complex than in the European case, where “contractual” segmentation points out the “empirical” segmentation. In Spain, due to the perceived “success” of the reform, the distinction of workers as “temporary” might vanish, even though they may continue to experience similar levels of job instability.

In most European countries the label “temporary” to a large extent comes from the

³These authors early identified for the U.S., one of the countries with the most flexible labor legislation, two types of workers: one with high turnover and constant entry and exit into unemployment, and the other with greater job stability.

use of temporary contracts. It is worthwhile to briefly examine the notion of a temporary worker within the context of European legislative frameworks. A temporary worker will not be hired by the company on a permanent basis (hence the label “temporary”), either because the contract termination date is known ex-ante, or because the contract links to the completion of a specific task with limited duration. It is further the case that firing costs are expected to be higher for workers under open-ended (permanent) contracts. Under these circumstances, temporary employment has been widespread in many European countries since the early 1980s. In fact, different countries introduced labor reforms to achieve greater labor market flexibility by promoting fixed-term contracts, trying to avoid the political cost for governments of reducing the firing costs of permanent workers⁴. Furthermore, the political will to tackle this issue with cost-cutting policies for permanent workers has been limited or non-existent, even when dual labor markets entail severe structural consequences for the economy.

Existing literature has identified the lack of productivity growth as a direct consequence of this segmentation by worker type (see [Bentolila and Saint-Paul \(1992\)](#), [Bassanini et al. \(2009\)](#), [Cabrales et al. \(2017\)](#), or [Cabrales and Hopenhayn \(1997\)](#)). The prevalence of short-term temporary contracts reduces the incentives for both workers and employers to invest in firm-specific human capital⁵. This paper fits into the literature by exploiting the relationship between “contractual” temporary employment given by labor market regulation, and “empirical” temporary employment defined by higher turnover, lower wages and higher probability of unemployment (see [Blanchard and Landier \(2002\)](#), [Cahuc and Postel-Vinay \(2002\)](#), [Bentolila et al. \(2012\)](#), [Sala et al. \(2012\)](#), and for Spain in particular [Dolado et al. \(2002\)](#) and [Garcia-Louzao et al. \(2023\)](#)). By exploiting the relationship between “contractual” and “empirical” temporary employment, we present a new insight: a reduction in

⁴[Dolado \(2017\)](#) contains the timetable of the reforms in several European countries and [Saint-Paul \(2000\)](#) on the political economy of the reforms. [Boeri \(2011\)](#) analyzes different reforms carried out in Europe in recent years.

⁵[Pijoan-Mas and Roldan-Blanco \(2022\)](#) use data from the Spanish labor market to analyze how the dual structure of the labor market hinders firm growth, due to the high turnover of temporary contracts, and reduces productivity.

“contractual” temporary employment may not effectively address the challenges associated with “empirical” temporary employment. To do so, we use the Spanish labor reform of 2021, the most successful reform ever in reducing the contractual temporary employment rate.

To assess the impact of the labor reform, and its effectiveness in reducing “empirical” temporary employment, we analyzed the daily flows of job creation and destruction, as well as the duration of the different types of contracts. [Conde-Ruiz et al. \(2019\)](#) have shown how large spikes in job creation and destruction coincide with the beginning/end of the week or month. Here, we analyze the same episodic patterns in job creation and job destruction but compare before and after the reform. Among the set of calendar effects identified, we only find a significant reduction in the “end of month” effect for job destruction. It is striking that the temporary employment rate has been reduced by half with no apparent change in job creation, destruction and duration of employment. This is only possible if the new contractual modalities exactly replicate the situation of pre-reform workers. In particular, this might be due to the use of the “Intermittent Open-ended” contract. This contract is a new, more flexible, open-ended contracting modality in terms of days worked. The reform has significantly expanded the variety of “Intermittent Open-ended” contract modalities across all types of activities, including intermittent, part-time, on-call, as well as contracting, subcontracting, and temporary employment agencies.

This research article makes several contributions to the existing literature. Firstly, it uses a novel database comprising administrative data that covers the universe of workers affiliated to the Social Security in Spain. This comprehensive database tracks the creation and destruction of jobs in recent years. Secondly, our study stands out as the first using extensive high-frequency data to examine the dynamics of job creation and destruction. By leveraging real-time data, it offers insights into the immediate labor market dynamics and sheds light on the nature of precarious work. In particular, fixed-term, short duration contracts without the inherent delays and limitations associated with conventional survey data. Thirdly, the findings presented herein provide empirical evidence that the prohibition

on fixed-term hiring in Spain lacks economic substance, and appears to have little effect on job creation and destruction, despite a significant reduction in the nominal temporary employment rate. Fourthly, this research bridges the recent body of literature on labor market segmentation in the United States with the extensive studies on dual labor markets in Europe. It demonstrates that the elimination of the “contractual” temporary segment does not eliminate “empirical” temporary employment, as comparable to the more precarious segment of the U.S. labor market. Finally, our paper is the first to make a complete assessment of the supposedly most successful labor reform fighting temporary employment in European dual labor markets.

The paper is organized as follows. Section 2 describes the labor reform. Section 3 describes the data and the main characteristics of daily employment flows and duration before and after the reform. In this section, we also compute the transition matrices for workers between the different types of contracts finding an increase in the probability of becoming permanent. Additionally, we analyze the survival rates in employment before and after the reform finding an increase in the mortality of permanent workers after the reform. In Section 4, we use a time series model in which we jointly regress the regular patterns in job creation and destruction, before and after the reform, without finding statistically large differences, except for a decrease in the effects associated with job destruction at the end of the month, which have been reduced. The last section concludes.

2 The 2021 Labor Reform in Spain

As a result of legislation imposing rigid employment protection for open-ended (permanent) contracts, dual labor markets appeared in Europe. In response, fixed-term (temporary) contracts with a greater flexibility and lower costs were introduced and have been extensively utilized to preserve the competitiveness of companies in an increasingly global economic environment. Temporary contracts were introduced in Spain with the 1984 labor reform⁶. Since then, temporary contracts have been used under additional circumstances, laying aside the requirement to prove the “temporary” nature of the activity they were intended for⁷.

Figure 1: Temporary Rate for Spain 1987 - 2023.



Source: Own elaboration based on data from the Labor Force Survey (EPA). The shaded areas correspond to recession periods. LR stands for “Labor Reform”.

Before 2021, six labor reforms (1994, 1997, 2001, 2006, 2010 and 2012⁸) were approved

⁶This reform was enacted in difficult times, with unemployment rate at 21% (above 40% for younger people) and the inflation rate at 11%. It was a desperate measure of a “transitory” nature, to alleviate the problems of the labor market in the prelude of joining the European Union in 1986.

⁷In 2019 (prior to the Covid-19 crisis and the labor reform), there were 19 million workers in the Spanish labor market, 27.43 million job creations and 26.52 million job terminations during this period. Temporary employment accounted for 25% of the stock of workers, 85% of the job creation flow and 83% of the job destruction flow. For more detailed information, refer to Appendix A.

⁸Conde-Ruiz et al. (2011) analyze the Spanish case and Boeri (2011) the case for a similar labor market, such as the Italian one.

in Spain to combat labor market duality. All of these reforms tried to restrict the use of temporary contracts by raising their termination compensation, limiting their duration or penalising the roll-over of contracts. In all of these cases, temporary employment remained more flexible than permanent employment and the duality of the labor market stayed mostly unchanged, often boosting the turnover of temporary workers. Figure 1 shows the sequence of reforms and their limited success. Only while entering economic recessions, where temporary employment is mostly destroyed, and the later reform of 2021, seem to have had an effect in reducing the temporary employment rate. The Labor Force Survey (EPA) indicates a unique situation after the recent labor reform of a decrease in the temporary employment rate from 25.0% to around 17%. Although significant drop, this is still above the European average of 12% in 2022 according to Eurostat.

The 2021 reform is the first that has proven to be very effective against fixed-term employment⁹. It was enacted on December 30, 2021 and came into full effect three months later, on March 30, 2022. The reform has the following key elements: First, project-based labour contracts have been banned. These were temporary contracts that lasted only until the associated project was completed¹⁰.

Second, in addition to the replacement contract (for maternity, paternity or sick leave), a single temporary contract has been left in place (the so-called “circumstances of production” contract, which has a maximum duration of six months and can be extended to one year if agreed in collective bargaining). This contract is used to face temporary peaks in production.

Third, there have been no changes in the traditional permanent contracts, i.e., the

⁹Throughout the 2008 financial crisis, Spain experienced a sharp decline in its rate of temporary employment, a trend that persisted for the following decade, during which the economy tried to revert to its pre-crisis GDP levels. The temporary employment rate initially dropped from 34.59% in the third quarter of 2006 to 21.94% by the first quarter of 2013. Although it rised slightly in the subsequent period of economic recovery, it eventually leveled off at approximately 26%. This structural decline in the temporary employment rate was explained by a structural change in Spain’s economic growth model. Prior to the financial crisis, the construction sector represented around 12% of the employment of the economy, employing approximately 2.5 million workers, driven by the real estate bubble. However, nowadays, this sector constitutes 6.5% of the employment, providing jobs for approximately 1.3 million workers (for more details, see [Bonhomme and Hospido \(2017\)](#)).

¹⁰These were typically the longest duration temporary contracts, used in the construction sector and in contracting and subcontracting, that is, when providing services to other (bigger) companies.

Spanish labor market continues to have a segment of workers that is highly protected against dismissal compared to other segments.

Fourth, the use of the “Intermittent Open-Ended” contract has been made more versatile, enabling its widespread use across a diverse range of situations. This contract is defined as a permanent contract, although this contract will be used for intermittent, seasonal work, temporary employment agencies or in contracting and subcontracting. That is to say, it can be used for days, weekends, months, quarters, years, or any specific period. Even though it is an open-ended contract, these contracts are very flexible and precarious¹¹.

Finally, a key fact of this reform is the lack of changes in the traditional structure of permanent contracts. The result of this is the Spanish labor market maintaining a segment of workers who enjoy significantly higher protection against dismissal than others. Thus, the reform achieves less temporary contracts and more permanent contracts, but many of them through the addition of the “Intermittent Open-Ended” type as an alternative to temporary flexibility. In this sense, the 2021 labor reform has been labelled as a success because the “contractual” temporary employment rate has fallen in this occasion very significantly for the very first time after more than 40 years of attempts. However, as we will see in Sections 3 and 4, despite a substantial decrease in temporary employment, precariousness and limited employment stability have hardly changed.

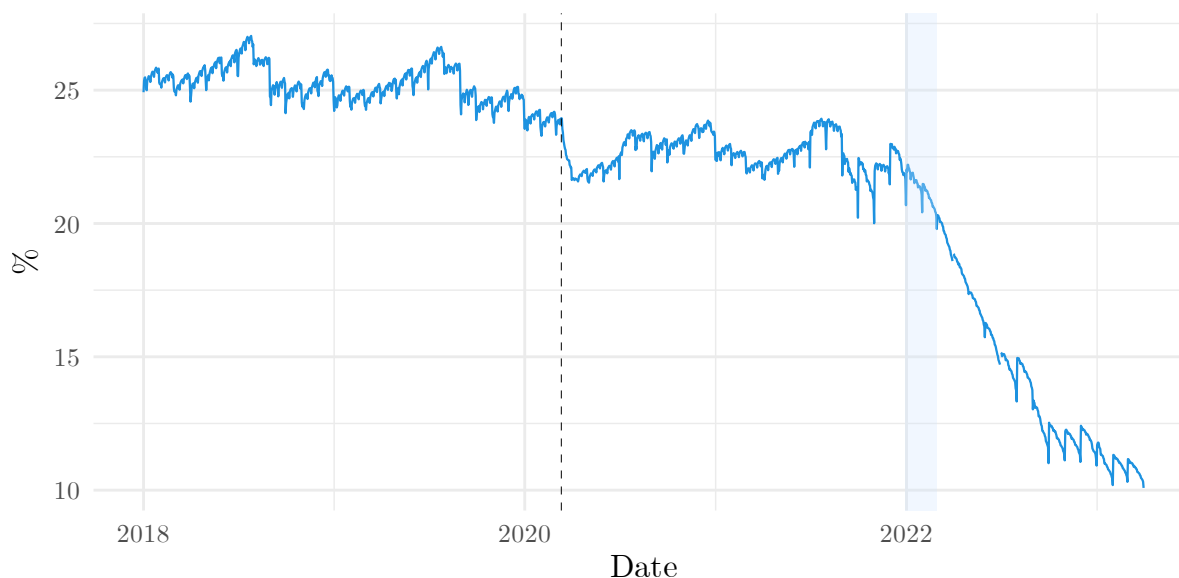
3 Employment Flows in Social Security Affiliation

This paper utilizes data from the Spanish Social Security affiliates registry, an administrative source that compiles daily records of each worker’s social security contribution episodes in the Spanish economy. This data set provides extensive details on both the hiring and termination of workers’ contracts. Furthermore, the Social Security records provide insights into the employee’s profile, including the type of labor contract they hold (Permanent,

¹¹The new Intermittent Open-Ended contract is sufficiently flexible that it could in the limit resemble the zero-hours contracts that are emerging in Europe. For an analysis of the effects of zero-hours contracts in the UK, see [Dolado et al. \(2021\)](#).

Temporary, Intermittent Open-Ended or Other), sectoral classification (four digit NACE Rev.2), gender, age, geographic location, regime (that allows us to identify self employed workers) and contribution account (that can be interpreted as the firm ID they are working for) during the reference month. Moreover, this database uniquely enables the tracking of job creation and destruction flows in the labor market with a significantly reduced time lag compared to other micro databases or surveys. It is important to highlight that, to the best of our knowledge, this dataset is being utilized for the first time in any publication.

Figure 2: Daily Temporary Rate for Spain.



Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started. The temporary employment rate is calculated by taking the percentage of social security affiliations under temporary contracts in relation to the total number of employment contracts.

Exploiting these Social Security records, we have constructed a daily aggregate series analyzing employment stocks and flows covering the period from January 1, 2017 to March 31, 2023. The formulation of these time series facilitates a granular and daily assessment of the effects of the reform. This methodology, which emphasizes the analysis of high-frequency data, is mainly influenced by the recent proliferation of ultra-short-term labor contracts in Spain, which the latest labor reform is attempting to mitigate¹². This approach contributes

¹²For instance, on an average day in 2022, over 19 million individuals were employed in the Spanish labor market. During that year, nearly 24 million jobs were generated while 21.5 million positions were

significantly to the understanding of the dynamics of the Spanish labor market and policy effects. As exemplified in Figure 2, it highlights the effectiveness of the 2021 labor reform in combating temporary employment, even during the transition period leading up to its full implementation.

3.1 Job Creation, Job Destruction and Employment Duration

In a similar way, Figures 3(a) and 3(b) represent job creation and destruction flows on a daily basis. The highest peaks correspond to the beginning/end of month job creation/destruction effects. The lowest peaks correspond to the beginning and end of week effects. It is difficult to appreciate shifts in the time series' flow pattern, beyond the significant drop in flows from the closure by Covid-19¹³. The thirty-day moving average illustrates the extent to which job creation and destruction in 2022 closely resembles that observed in 2021. This is despite the implementation of labor reform in one instance, and economic recovery from the pandemic in the other. However, the corresponding peaks at the end of the month seem to have been reduced since the reform was implemented, as we will show in Section 4.

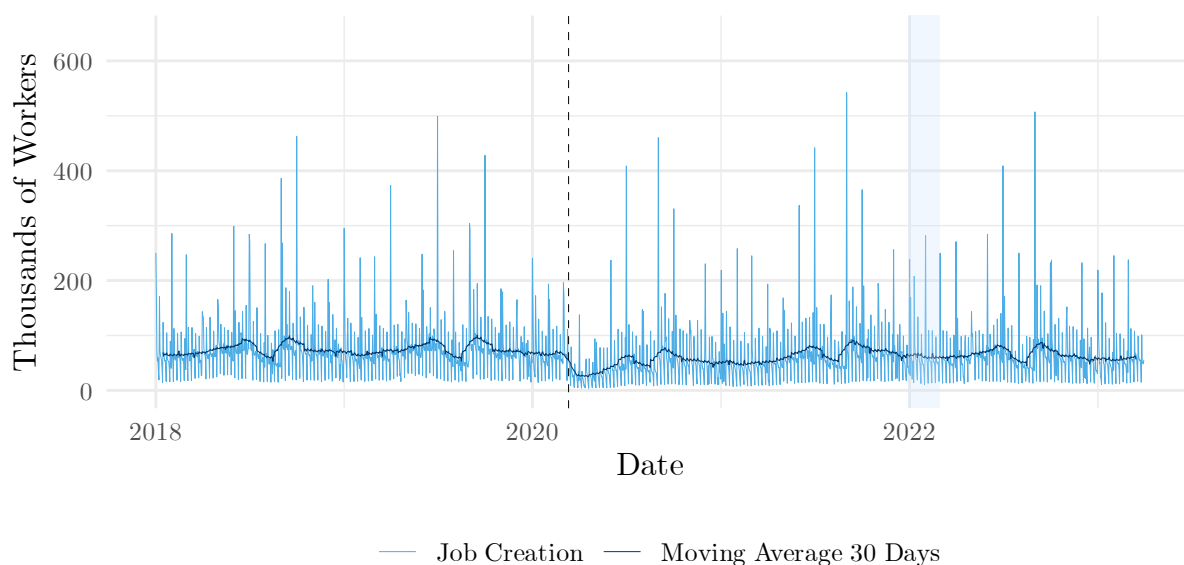
Consequently, a significant drop in the temporary employment rate with hardly any impact on daily job creation and destruction implies that employment duration and turnover may not have been affected. Figure 4 represents the average duration in employment for the new terminations¹⁴, and there does not seem to be major differences in the duration of contracts before and after the labor reform. However, in Figure 4 we see two significant changes in duration: i) the first one after the Covid-19 pandemic; and ii) another one in December 2022. The pandemic had sizeable effects in the labor market: more than one million temporary contracts were destroyed, some companies closed and also laid off their permanent workers (some of these workers decided to retire). All of this caused the duration

terminated. The main descriptive statistics of the Spanish labor market can be found in Appendix A.

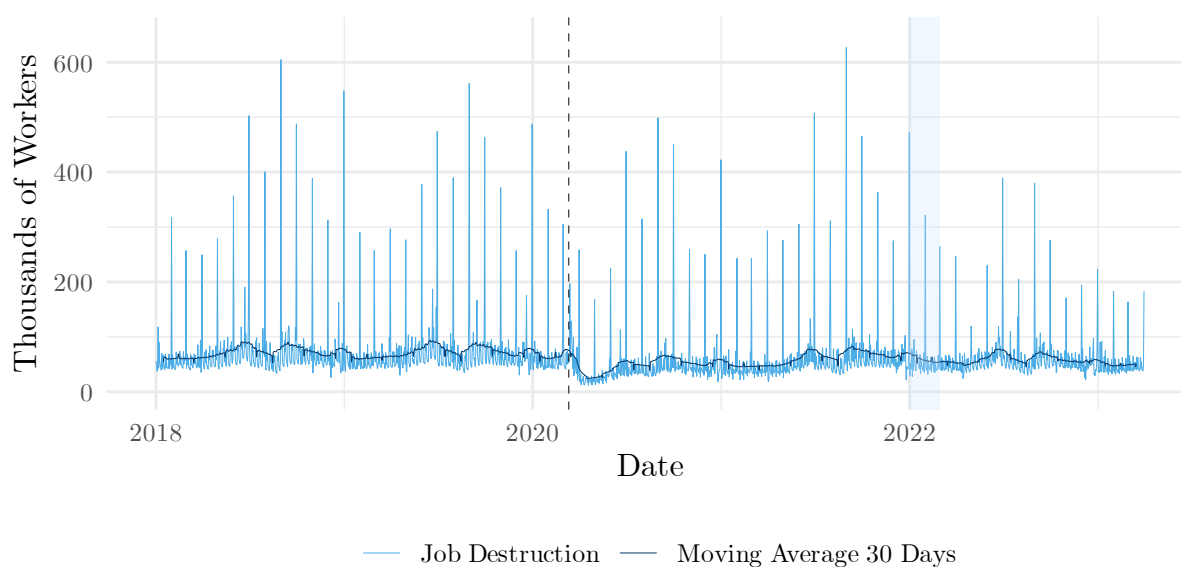
¹³During the Covid-19 furlough schemes had massively introduced (ERTEs, by their Spanish acronym) to support the employment and firms. For a detailed analysis of this ERTEs mechanisms see Dolado et al. (2023)

¹⁴Appendix B, Figure A.1(b) represents the duration in unemployment for the new worker hires (i.e. for each new hire how long they had been unemployed before a new contract).

Figure 3: Daily flows in job Creation and job Destruction



(a) job Creation

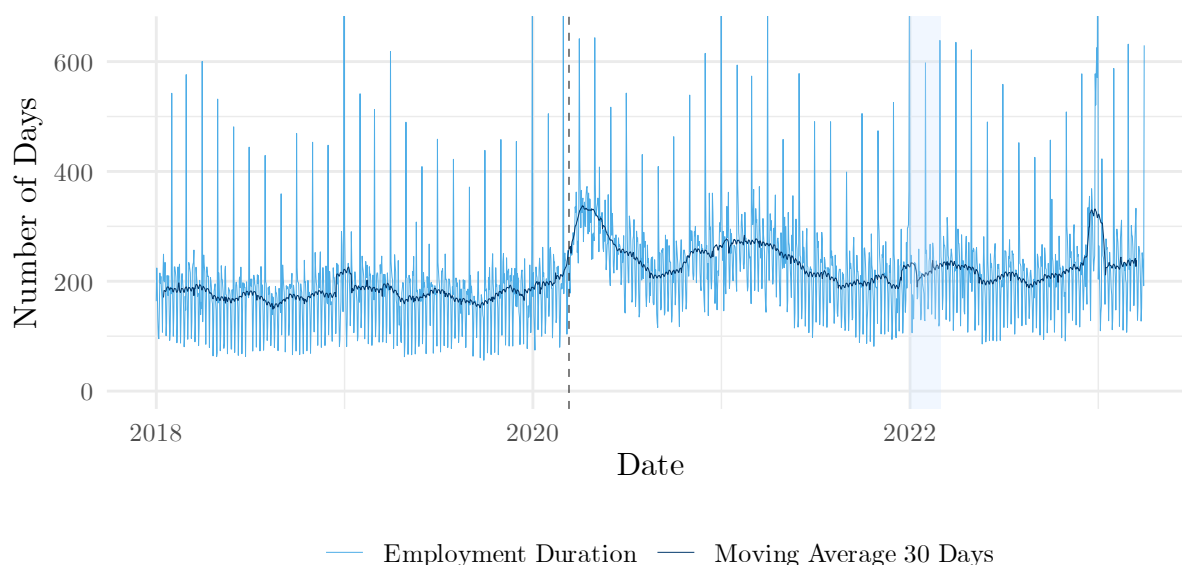


(b) job Destruction

Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

of the jobs destroyed to rise significantly before stabilizing at a higher level of duration than before the pandemic, which does not seem to have been affected by the labor reform. The increase in job duration observed in December 2022 has an entirely different explanation, linked to the substantial rise in the number of workers retiring during that month. Naturally,

Figure 4: Daily flows in Employment Duration.



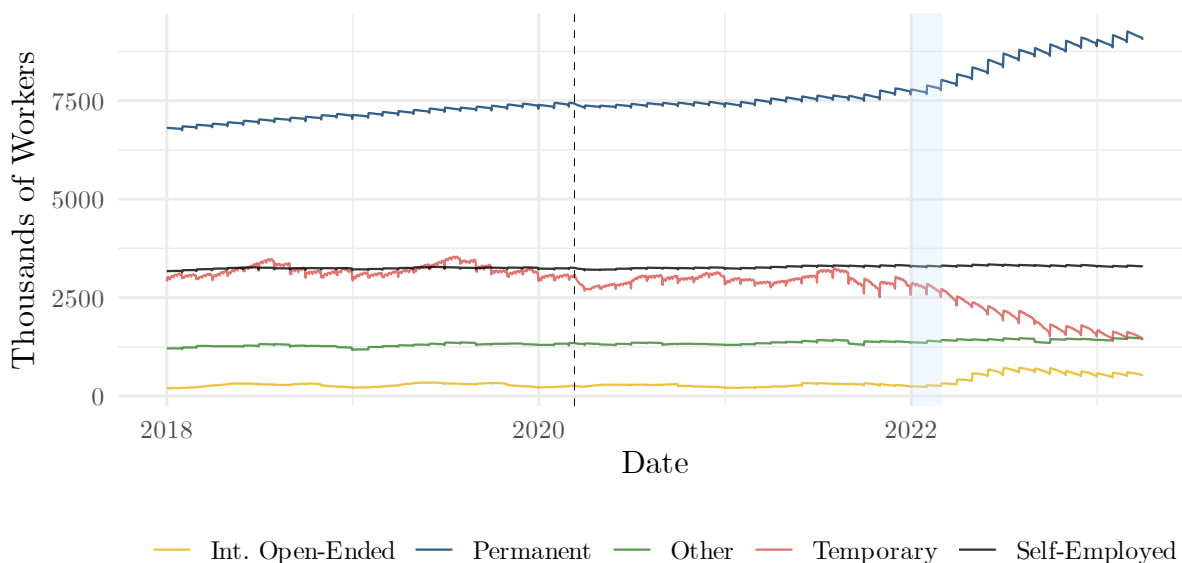
Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

the jobs ending due to retirement typically have a significantly longer duration. The reason behind the surge of workers opting for early retirement in the last week of December is attributed to the pension revaluation policy. As of January 1, 2023, all existing pensions were adjusted to reflect the average inflation rate of 2022, which was 8.5%. This adjustment surpassed the deductions applied for early retirement. Therefore, the incentive to retire earlier was clear. After that peak in December 2022, the average duration returned to previous levels.

3.2 Daily Flows by Type of Labour Contract

The sharp drop in the temporary employment rate seen in Figure 2 has been made possible by the large conversion of fixed-term contracts into open-ended contracts. Specifically, as we can see in Figure 5(a), the number of fixed-term contracts has fallen significantly and at the same time the number of regular open-ended contracts and Intermittent Open-Ended contracts has risen. Self-employed workers have remained practically unchanged after the reform.

Figure 5: Daily Social Security Affiliation per type of contract



(a) Full-Time



(b) Part-Time

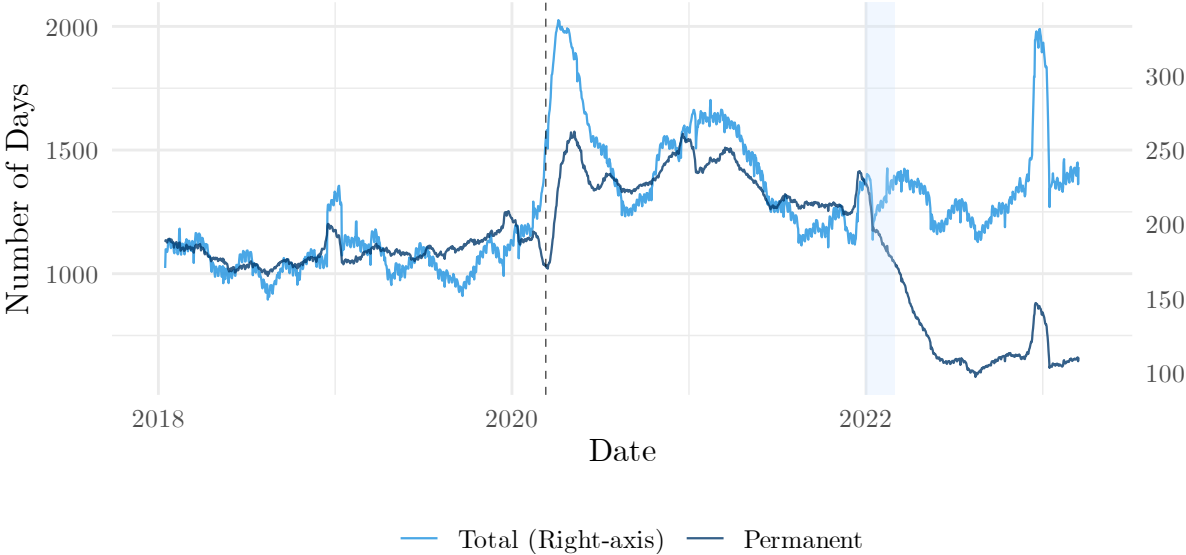
Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

It is worth highlighting, as can be seen in Figure 5(b), that the transition of employment between fixed-term and open-ended contracts has also taken place among part-time workers.

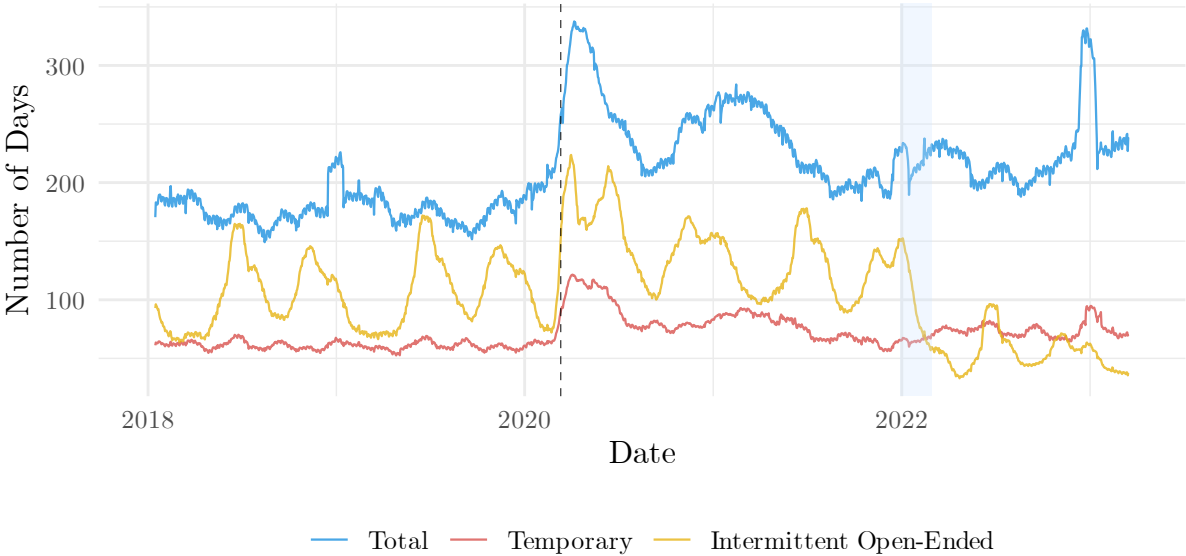
We have seen how the increase in open-ended contracts has not led to an improvement in employment stability, and this is only possible because the combination of open-ended

contracts (ordinary and Intermittent Open-Ended) replicates in a similar way the daily patterns of job creation and destruction of fixed-term contracts that have been banned with the labor reform.

Figure 6: Employment duration of the destroyed Jobs - Moving average 30 days.



(a) Permanent Workers



(b) Temporary and Intermittent Open-Ended Workers

Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

In Figure 6(a), we see that the average duration of traditional open-ended contracts has

notably decreased since the reform. This suggests a significant increase in the turnover of open-ended contracts, implying that companies are likely using them for shorter duration positions. It is crucial to emphasize that if termination takes place before the relationship between the worker and the company is consolidated over time, the cost of termination, both in days and in terms of legal uncertainty, is still low¹⁵.

In Figure 6(b) we analyze the average duration of temporary contracts and intermittent open-ended contracts destroyed each day. The new intermittent permanent contracts created after the reform are much more precarious than the previous ones, and their duration is now less than half of what it was before. Despite this, a positive aspect is that with this type of arrangement there are episodes of activity and inactivity under the same contract, which obliges the company and the worker to maintain a link that did not exist before. But, when assessing stability based on actual days worked, it is lower than before the reform. Intermittent Open-Ended contracts provide companies with the flexibility to align work schedules with current demand, enabling quick adjustments to business needs. However, this flexibility also means that workers assume all the risk of downtime.

Finally, the duration of fixed-term contracts has hardly changed. One plausible explanation is that the disappearance of long-term fixed-term contracts (prohibited by the reform) and very short-term fixed-term contracts (penalized by the reform and replaced by Intermittent Open-Ended contracts that are much more attractive to companies) has caused the average duration, due to the composition effect, to have hardly been affected¹⁶.

3.3 Transitions and Survival Rates

To understand the significant shift occurred between types of labour contracts (Permanent, Temporary and Intermittent Open-ended) after the labor reform, Tables 1 to 3 represent

¹⁵As previously mentioned, the increase in the graph's duration for workers with open-ended contracts terminated in December 2022 can be attributed to a surge in retirements driven by the perverse incentives resulting from the substantial pension revaluation due to the significant inflation spike in 2022.

¹⁶In Appendix B we have represented the changes in durations according to age range. Figure A.2 illustrates that in the age groups with the highest levels of precariousness, i.e., those corresponding to the youngest groups, the reform does not seem to have any impact.

the transition matrices between the different types of contracts. In Table 1, we select permanent workers in March of each year and observe the type of contract they have in March of the following year. In Tables 2 and 3 we do the same exercise for temporary and permanent workers, respectively. The main results are as follows. First (see Table 1), for permanent contracts there are hardly any changes with the reform and 90.0% of workers with permanent contracts remain with a permanent contract one year later. Second (see Table 2), the percentage of workers with a temporary contract who after one year have a permanent contract increases: before the reform they were around 18% and after the reform they are 33.16%¹⁷. Furthermore, the percentage of workers who after one year go from a Temporary contract to an Intermittent Open-ended contract increases from 1.5% to 9.16%. Finally (see Table 3), the percentage of Intermittent Open-ended workers who after one year move to a Permanent contract increases from 3.17% to 17.14%, although it is true that before the reform, in December 2021, there were only 534 thousand workers with an Intermittent Open-ended contract (2.5% of the total).

Year	Permanent	Int. Open-Ended	Other	Temporary	Out
2017	89.42	0.09	1.02	3.96	5.52
2018	89.06	0.10	1.04	4.20	5.60
2019	88.77	0.12	1.09	3.96	6.06
2020	89.91	0.10	0.87	3.21	5.91
2021	90.12	0.16	0.93	3.18	5.61
2022	90.15	0.66	1.08	1.76	6.35

Table 1: Permanent worker

To complement this analysis we will compute the survival rates of contracts before and after the reform for the period 2017-2023. The left column of Figure 7 shows the survival rates for the stock of workers and the right column represents the survival rates for the new contracts created from March of each year. The main result is that the survival probability worsens significantly after the reform for permanent contracts (both in the stock and in new contracts). It is interesting to remark that the year where the survival of permanent

¹⁷This percentage is 31.84% if we consider only ordinary permanent contracts. That is to say, without considering permanent contracts in the construction industry which, as we have indicated above, have a different legal regime for dismissal.

Year	Permanent	Int. Open-Ended	Other	Temporary	Out
2017	16.22	1.41	3.18	61.43	17.76
2018	18.26	1.58	2.93	59.31	17.92
2019	17.25	1.48	3.33	57.68	20.26
2020	14.73	1.22	2.87	58.92	22.26
2021	22.85	3.28	4.13	52.70	17.05
2022	33.16	9.16	3.68	36.03	17.98

Table 2: Temporary worker

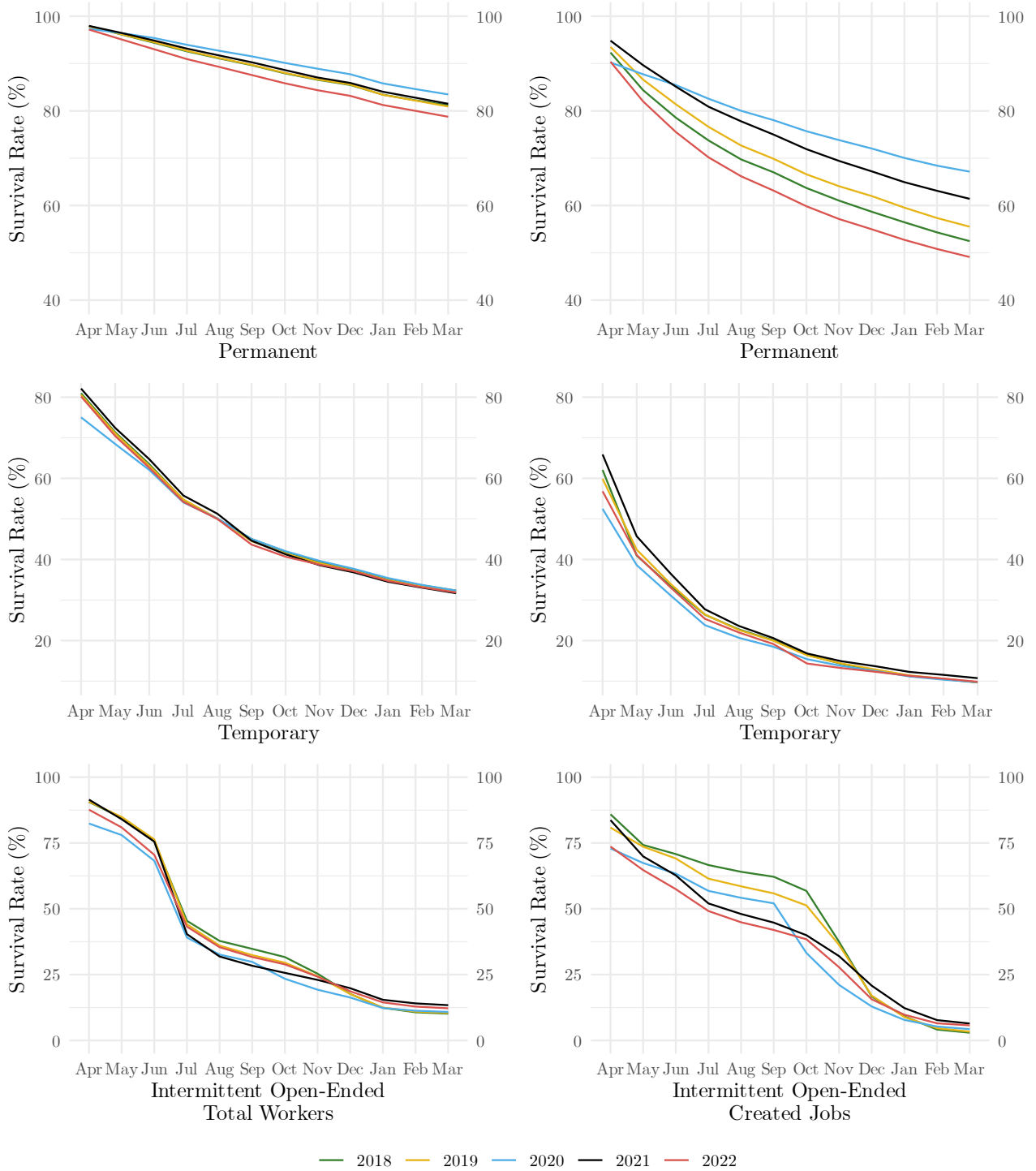
Year	Permanent	Int. Open-Ended	Other	Temporary	Out
2017	4.37	77.90	1.64	7.06	9.02
2018	4.54	73.74	1.67	7.68	12.37
2019	4.36	73.96	2.07	7.60	12.01
2020	3.17	68.10	1.92	7.44	19.36
2021	6.13	75.94	2.38	6.09	9.46
2022	17.14	64.10	2.62	3.45	12.68

Table 3: Intermittent Open-Ended worker

contracts was the highest corresponds to 2020, where all of these contracts were protected with ERTE (furlough schemes introduced during Covid-19). For temporary and Intermittent Open-ended contracts there is hardly any change in the survival rate after the reform.

In summary, on the one hand, the probabilities of transition between contracts tell us that the security of workers has improved, since the percentage of temporary workers (and to a lesser extent Intermittent Open-ended workers) who one year later have an open-ended contract has increased. However, survival rates after the reform have fallen for permanent contracts. Therefore, a standard analysis can not determine what is the final impact of the reform on the stability of workers.

Figure 7: Survival Rates per type of contract.



Notes: This panel shows the survival rate of workers from March of each year in the following 12 months. On the left side the total number of workers in the economy, on the right side the rates corresponding to new workers hired in the month of March of each year.

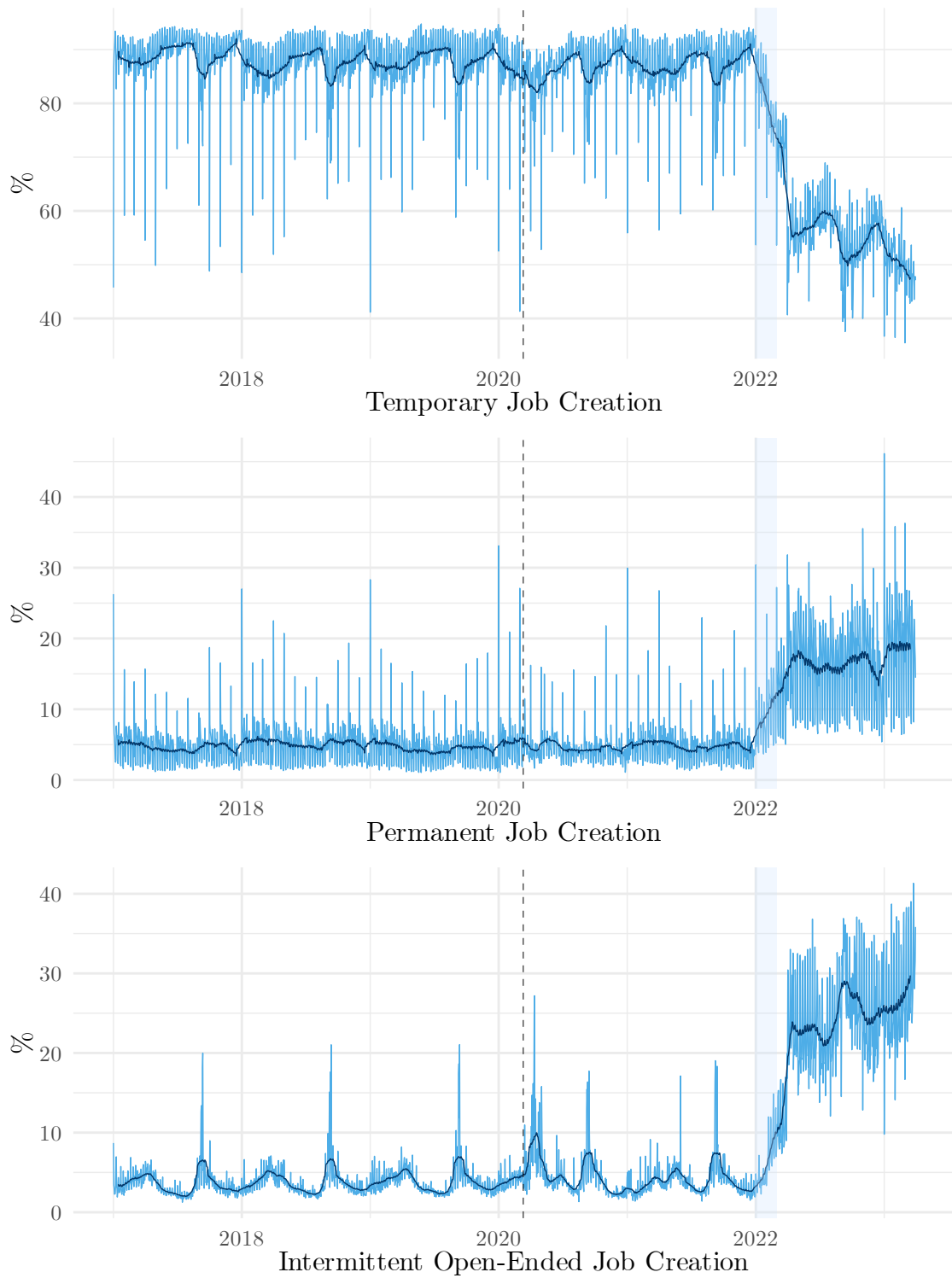
4 Calendar effects in daily Job Creation and Job Destruction

In this environment of job creation and job destruction flows, it is important to consider the lack of consistency inherent in the episodic nature of hiring. In Figures 3(a) and 3(b) we observe that large peaks are systematically repeated on the first day of the month for job creation and on the last day of the month for job destruction. We also observe smaller peaks on Mondays for creation and Fridays for destruction. These peaks can be associated with the following calendar effects: i) Monday and Friday effect, jobs are created on Monday to be destroyed on Friday, ii) weekend effect, jobs are created on Saturday to be destroyed on Sunday, and iii) beginning and end of month effect, jobs are created on the first day of the month to be destroyed at the end of the month.

Although it could be discussed that part of an episodic nature corresponds to seasonal frictions, it is important to highlight that this episodic nature is also the direct result of institutional effects on the labor market. As previously shown in [Conde-Ruiz et al. \(2019\)](#), these peaks that we call calendar effects are the ones defining the creation and destruction flows in the Spanish labor market. These effects also represent a direct relationship with fixed-term contracting. Fixed-term employment has larger job creation and job destruction effects than permanent employment. Higher patterns of job creation and destruction should be understood as less job stability. The workers who suffer most from these effects are those who move in and out of employment on a regular basis.

The empirical strategy followed in this paper is whether the 2021 reform, which has reduced the fixed-term rate by half, has had a statistically significant impact on these calendar effects on job creation and destruction. As Figure 8 shows (and similarly for job destruction, Figure A.3 in Appendix C), and as we will show more formally in Section 4.1, these episodic frictions reflected in the calendar effects, seem to have been directly transferred to the new fixed-term contract types. These modalities have absorbed the volatility of job creation and job destruction that was previously concentrated only in fixed-term employment.

Figure 8: Share of job Creation per type of contract



Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

4.1 The time-series model for daily data

In this section, we introduce our time series model designed to examine if calendar effects remain consistent or have experienced substantial changes as a result of the labor reform. Our analysis requires daily frequency data to accurately assess the extent of these peaks (the “calendar effects”), both pre- and post-reform. Utilizing data at any other frequency would limit our understanding of potential changes in the patterns of job creation and destruction.

In order to deal with coexistence of multiple seasonal components (weekly, monthly and even yearly) together with the complex structure of the calendar, we use trigonometric seasonal components to adjust the seasonality. Note that the monthly and annual components have fractional periodicities (not all months and years have the same number of days) although weeks always have 7 days. These fractional periodicities require the use of a more parsimonious approach, a trigonometric representation of seasonal components based on Fourier series (see [Harvey \(1990\)](#) and [West and Harrison \(2006\)](#)). This technique accommodates seasonal patterns of varying frequencies (including non-integer ones like monthly) which enables the correction of weekly, monthly, and annual patterns in high-frequency data. Consequently, in a similar way to [Livera et al. \(2011\)](#), we can now specify a deterministic, harmonic seasonal, and autoregressive time-series model for all the flow variables of interest, that is¹⁸:

$$\log(\text{flow}_t) = \sum_{j=1}^C \beta_j \xi_t x_{j,t} + \sum_{j=C+1}^{2C} \beta_j (1 - \xi_t) x_{j,t} + \beta_{C19} x_t^{C19} + \beta_E x_t^E + m_t + \varepsilon_t, \quad (1)$$

where the (log) “flow” variable can be either job creation (JC) or job destruction (JD), and the first block of regressors, $x_{j,t}$, is a set of dummy variables that cover all relevant calendar effects, C (Monday and Friday effects, Weekend Effect, and Beginning and End of Month effects), at day t .

In order to account for the labor reform we use ξ_t as a dummy variable that takes

¹⁸Other examples of the use of this strategy to adjust high-frequency data in economics include [Auerbach and Gorodnichenko \(2016\)](#), [Choi et al. \(2022\)](#), or [Cuevas et al. \(2021\)](#)

value one on all dates before January 1st, 2022. Therefore, for each calendar effect, C , we estimate parameters β_j , for $j = 1, \dots, C$, before the labor reform, and parameters β_j , for $j = C + 1, \dots, 2C$, afterwards. There are further specific dummies for Covid-19, x_t^{C19} , and for the Easter period each and every year, x_t^E .

To complete the model, we specify the harmonic part, m_t , which can be written:

$$\sum_{i=1}^3 \sum_{k=1}^J \left[\gamma_j \sin \left(\frac{2 k \pi t}{m_i} \right) + \phi_j \cos \left(\frac{2 k \pi t}{m_i} \right) \right],$$

where estimated periods for the seasonal components are $m_1 = 7$; $m_2 = 30.44$; and $m_3 = 365.25$; as corresponds to a week, a month and a year. J is the estimated number of harmonics of each seasonal component.

Finally, ε_t accounts for the autoregressive part according to

$$\varepsilon_t = \frac{\theta(L)}{\varphi(L)} a_t, \quad a_t \sim N(0, \sigma_a^2),$$

with polynomials θ and φ in the lag operator, L , and a white noise process, a_t .

4.2 Calendar effects and the labour reform

This section outlines the estimated impacts of calendar effects prior to and following the reform. We identify up to five significant calendar effects, namely: Monday and Friday effects, Weekend Effect, and Beginning and End of Month effects. Also, we identify two significant seasonal effects, which are associated, first, to the Easter period: each and every year Thursday to Sunday; and secondly, and more significantly, to the Covid-19 episode.¹⁹

Table 4 reports the estimation of the model. Clearly, and despite the huge reallocation from fixed-term to open-ended contracts seen in data after the reform, calendar effects in job Creation (JC) have not significantly changed, except for a slight change in the beginning of month effect, which makes it more episodic. To interpret the coefficient, before the reform,

¹⁹The treatment of outliers during Covid-19 deserves further consideration, as discussed, for instance, in [Conde-Ruiz et al. \(2020\)](#)

Table 4: The time series model for job creation and destruction before and after the labor reform

Effect	Job Creation		Job Destruction	
	Before	After	Before	After
Monday	1.1088*** (0.0468)	1.0973*** (0.0587)	-0.1509*** (0.0412)	-0.1546*** (0.0603)
Friday	-0.2139*** (0.0531)	-0.2236*** (0.0737)	0.6137*** (0.0429)	0.5941*** (0.0577)
Weekend	-0.5042*** (0.0359)	-0.5261*** (0.05783)	0.1057*** (0.0259)	0.09** (0.0429)
Beg of Mth	1.4525*** (0.024)	1.5676*** (0.0378)	-0.1122*** (0.0236)	-0.0139 (0.0686)
End of Mth	-0.1659*** (0.0342)	-0.2169*** (0.0714)	1.8526*** (0.02)	1.5484*** (0.0355)
Easter	-0.4188*** (0.036)		-0.2596*** (0.0653)	
Covid-19	-0.3287*** (0.0815)		-0.2204*** (0.0653)	

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

a typical day at the beginning of the month had on average about 145% more creations than a normal day. After the reform, it became about 157%, resulting in a 12% increase in job creation at the beginning of the month. Likewise, calendar effects in job destruction (JD) remain mostly unchanged, except for a reduction in the end of month effect after the reform, going from 185% to 155% of jobs destroyed on average compared to a regular day of the month.

Our results show that, in aggregate terms of job creation and destruction, the labor reform has had no impact on Monday, Friday or weekend effects, while there has been an increase in the beginning-of-month effect on hiring. Consequently, we might anticipate a rise in job losses at month's end to balance this increase. However, a substantial decline in job destruction in the end-of-the-month effect is observed. This may be due to the use of a new hiring modality that is more flexible and open in terms of days worked, making it easier for

companies to adapt the flow of job destruction to their needs, which is a positive result of this labor reform. For illustration, before the reform, companies used temporary contracts of one month and therefore had to destroy the contract on the last day of the month to make a new contract on the first day of the following month. Now, with Intermittent Open-ended contracts they can adapt to the demand to end the contract. However, this decrease in the end-of-the-month job destruction effect could also indicate that we are in a phase of net job creation that may be influencing these changes.

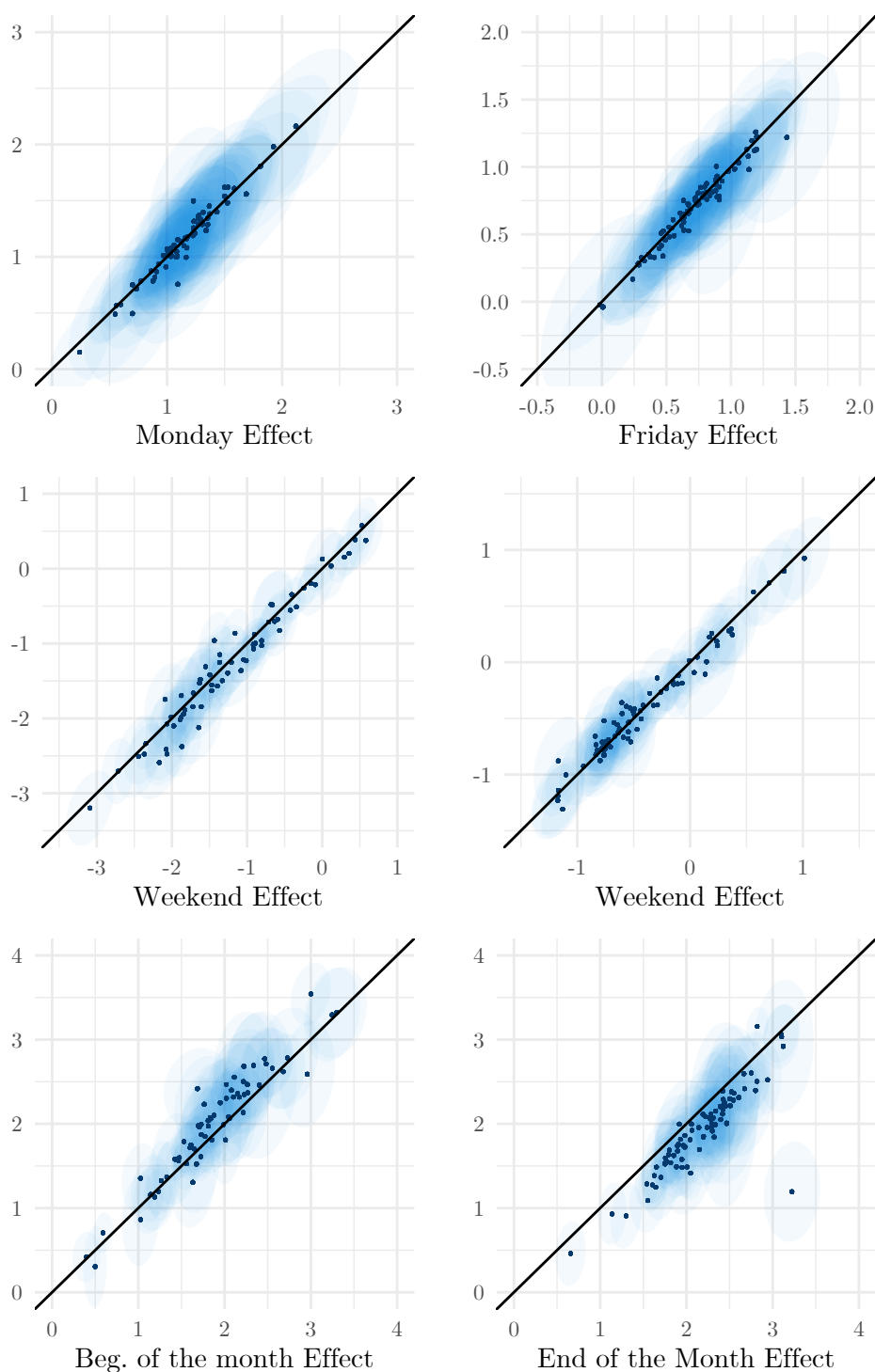
To complement these results, we estimate calendar effects by type of labour contract for both creation (JC) and destruction (JD). The results can be found in Tables A.2 and A.3 in Appendix E. The most significant changes for JD are two (see Table A.3). End-of-month effects on destruction for all types of contracts decreased, consistent with the aggregate economy. For the case of creation (JC) by type of contract, the most significant effect occurs at the beginning of the month, which falls for permanent contracts and Intermittent Open-ended contracts, but increases for temporary contracts. The calendar effect corresponding to weekends has been reduced for temporary contracts, but this effect has increased for Intermittent Open-ended contracts. This is logical, since by restricting and making the use of very short-term temporary contracts more expensive, firms increased their use of Open-ended contracts.

4.3 Sectoral Decomposition of the Calendar effects

A key question is whether these consistent calendar effects have been uniformly spread across sectors both before and after the reform. In order to better understand the effects of this reform in aggregate terms, Figure 9 shows the fixed-term employment rates for the different sectors between 2022Q1 and 2023Q1.

In accordance with the previous findings, temporary employment rates across all sectors of the Spanish economy have decreased. Despite significant differences across sectors, the variation in the reduction of temporary employment appears to be associated with the initial levels specific to each sector. Sectors with strong affiliations to the Public Sector, such as

Figure 10: Calendar Effects before and after the Labor reform.



Notes: The left column corresponds to job Creation, the right column to job Destruction. The vertical axis corresponds to post-reform values and the horizontal axis to pre-reform values. The solid line indicates the 45^o line. Blue ellipses are 95% confident intervals around estimated CEs pairs before and after the labor reform

degree line. In all of the cases, a confidence interval for the pair of estimates is computed as the ellipse with radius given by the 95% confidence region for the estimate before and after the reform²⁰.

The top left figure shows the impact of the Monday effect on job creation, while the top right shows the Friday effect on job destruction. In both cases, all sectors are around a 45-degree diagonal line, indicating that the reform has had little or no impact on these effects. Regarding the weekend effect on both job creation and job destruction, the distribution pattern appears similar. However, there is a greater variability among the different sectors when compared to the Monday and Friday effects.

Finally, the most significant changes pre- and post-reform occur in the beginning and end-of-month effects, as shown in the bottom figures of Figure 10. While there is a marginal increase in the beginning-of-month effect on job creation in many sectors, the main variation after the labor reform is observed in the decrease of the end-of-month effect on job destruction. As illustrated in bottom right figure, the majority of sectors show a moderate reduction in job terminations the last day of the month²¹. The observed decline in the end-of-month effect could be attributed to a shift from traditional one-month fixed-term contracts, which are typically established at the start of the month and conclude at its end, to the utilization of "Intermittent Open-Ended" contracts. These flexible contracts accommodate real-time business needs, moving away from the previously rigid monthly scheduling structure.

²⁰See Appendix D for comprehensive details on the calculation of confidence regions and associated p-values. Additionally, Appendix F presents the test of parameter equality for each effect, comparing periods before and after the labor reform.

²¹The graph shows a clear outlier in the end-of-the-month destruction, corresponding to the postal and courier activities sector, where the end-of-month effect has dropped significantly from 322% more job destruction in a last day of month compared to the average to 114%. The explanation is a little more specific. In addition to the end-of-month effect, this is the sector in which the "rider" (i.e. couriers of the new delivery platforms, mainly in the cities) participate. Despite the various reforms to convert these workers into salaried workers, the fact is that after the labor reform and given the restriction of fixed-term contracts, most of them have become self-employed. Self-employed workers have hardly any calendar effects on their creation and destruction as we saw in Conde-Ruiz et al. (2019).

5 Conclusions

The 2021 labor reform has proven to be the most successful policy fighting the dual nature of Spain’s labor market, even drawing attention from other European nations facing analogous dual labor market challenges²².

Using a novel database covering all daily Social Security records, we conduct the first evaluation of the labor reform implemented in Spain in 2021. The primary finding of this study indicates that while the reform has proven very effective at reducing the “contractual” temporary employment rate, it has not proven successful in mitigating labor instability or reducing “empirical” temporary employment.

In our opinion, if the goal is to reduce not only “contractual” temporary employment but also “empirical” temporary employment, it is necessary to accompany the prohibition of fixed-term contracts with an increase in the flexibility of all open-ended contracts (including ordinary open-ended contracts)²³. Ending “empirical” temporary employment, defined by high turnover, lower wages, and a high probability of unemployment, requires a more ambitious reform to end the dual labor model. Making permanent contracts more attractive to companies will help to change the production model towards less seasonal or temporary activities with greater value added. Nevertheless, ending “contractual” temporary employment is a good first step towards ending “empirical” temporary employment.

The strategy followed by the Spanish reform was to drastically restrict the use of fixed-term contracts without any variation in the flexibility of regular open-ended contracts. However, in order to avoid a decrease in flexibility, the reform has encouraged the use of other new variations of permanent contracts that offer less stability, like the “Intermittent Open-Ended” contract. These new contract types, despite being labeled as open-ended, do

²²See for example the article in the Financial Times of 4th April 2023 [“How Spain has taken on the problem of precarious work”](#).

²³In other words, moving towards a framework of “flexicurity” where the job is no longer protected (once the worker obtains an open-ended contract) to one where the worker is protected, with active and passive labor policies, if unfortunately the worker is dismissed because the job is no longer economically viable. See [Boeri et al. \(2012\)](#) for an analysis of the political economy behind the “Flexicurity” model.

not offer the same level of job security as traditional open-ended contracts. This situation has led to a substantial shift between contract types, resulting in a notable decrease in the rate of fixed-term contracts without much improvement in job duration or stability for workers.

In this regard, the conversion of fixed-term workers into permanent workers has increased (into both the traditional permanent contract and the Intermittent Open-ended). Considering that permanent workers' contracts offer greater legal stability and entail higher termination costs compared to temporary contracts, there should theoretically be an increase in worker stability. However, the situation proves to be more complex than it initially appears. On the one hand, we have seen a large increase in the mortality rate of ordinary permanent contracts after the reform, many of which were destroyed during the trial period²⁴ where there is no termination cost. On the other hand, the Intermittent Open-ended contract is an open-ended contract that has a termination cost that is higher (apart from having greater legal protection) than a fixed-term contract. Nonetheless, due to the very short and intermittent nature of these contracts, a significant portion will likely end in voluntary termination without incurring termination costs.

There are several lessons to be drawn from the Spanish labor reform. Firstly, the new labor framework allows a different composition of contracts to create an exact replication of the previous situation in terms of labor stability for workers. Hence, in aggregate terms, the labor market does not exhibit the anticipated changes in job duration as a result of the decline in temporary employment. However, we do observe how the new contractual types are adapting to seasonal or intermittent activities, achieving the same outcomes as before the reform.

Secondly, we have seen how the temporary employment rate, which was the main indicator for measuring labor precariousness in countries with a dual labor market, is no longer a good indicator as it has lost the ability to observe this segment of workers. Certainly,

²⁴The length of the trial period is decided by collective bargaining, and can be as long as more than 1 year.

we must look for other ways of measuring precariousness that go beyond the label of the contract, such as the duration of the contracts.

Finally, it is important to emphasize that even if this article analyzes the aggregate daily job creation and destruction in the Spanish labor market before and after the 2021 labor reform, for a fairer and more complete evaluation of the reform, it is necessary to study two aspects: i) wait a few years after its approval to see how the trends highlighted in this article will be consolidated and ii) a more detailed description of the characteristics and the employment history of the workers.

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Appendix

A Aggregate Employment Data

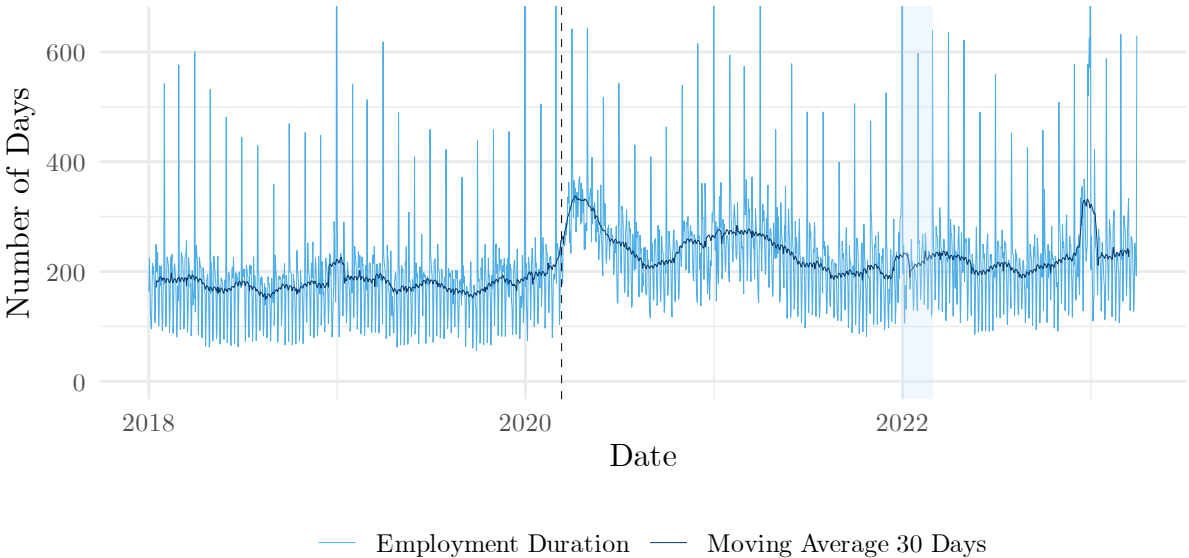
Social Security Registers. Daily flows are constructed from the starting date and the termination date of all employment spells in the universe of Social Security registers, 2017-2023. The data includes both employed workers and self-employed. It is for this reason that we refer to these employment data flows as *creation* and *destruction*. We use the number of daily new registrations (number of de-registrations) to Social Security. We interpret the number of new registrations as job creation and the number of de-registration as job destruction. It is important to stress that the registers dates occur each and every weekday.

Table A.1: Yearly Employment Statistics

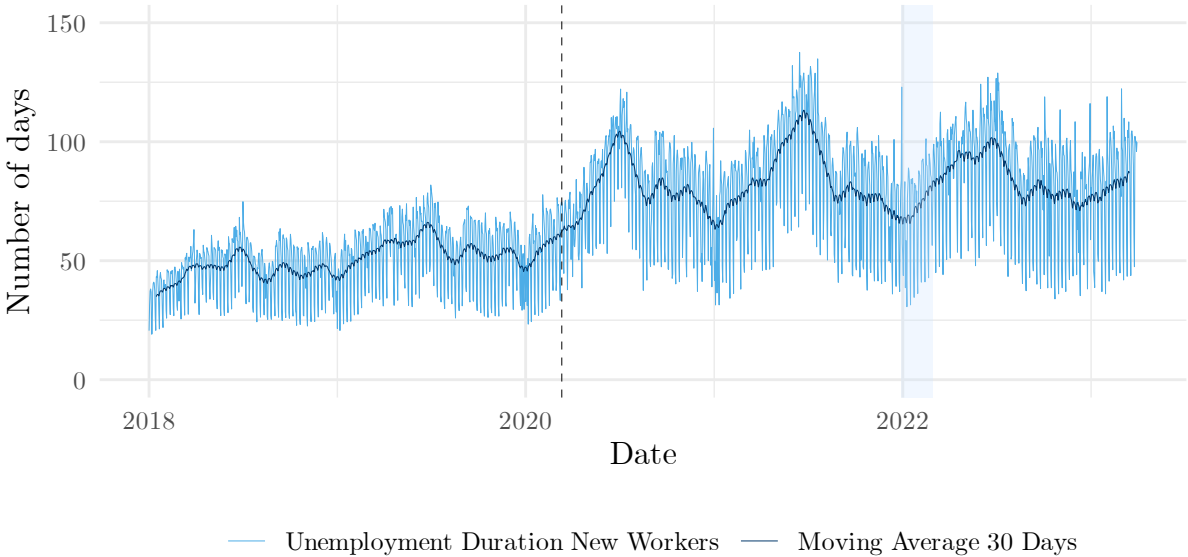
Year	Average Affiliation	% Temp.	Jobs Created	% Temp	Jobs Destroyed	% Temp.
2017	18,048.69	25.71%	26,188.91	85.23%	25,197.09	83.00%
2018	18,580.44	25.57%	27,140.80	84.38%	26,237.07	82.17%
2019	19,045.44	25.11%	27,428.25	84.85%	26,522.39	82.72%
2020	18,643.30	23.00%	19,498.35	83.18%	19,423.01	79.62%
2021	18,871.72	22.54%	23,488.79	83.75%	22,290.47	81.06%
2022	19,342.76	15.78%	23,919.87	58.11%	21,610.26	61.78%

B Daily flows in Employment and Unemployment Duration

Figure A.1: Daily flows in Employment and Unemployment Duration



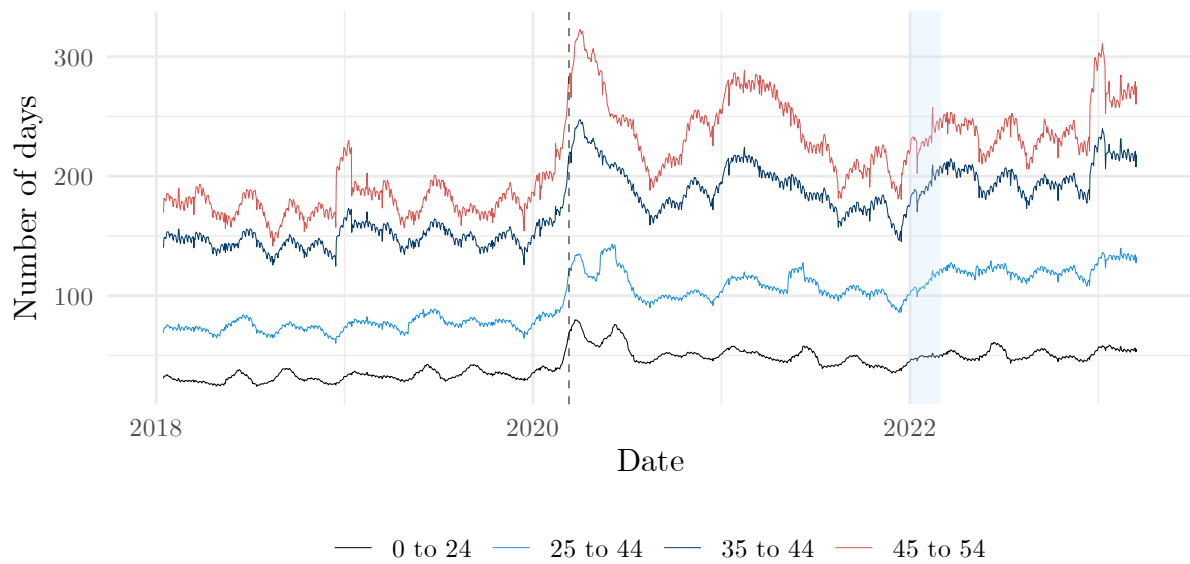
(a) Employment Duration of the Destroyed Jobs



(b) Unemployment Duration of the Created Jobs.

Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

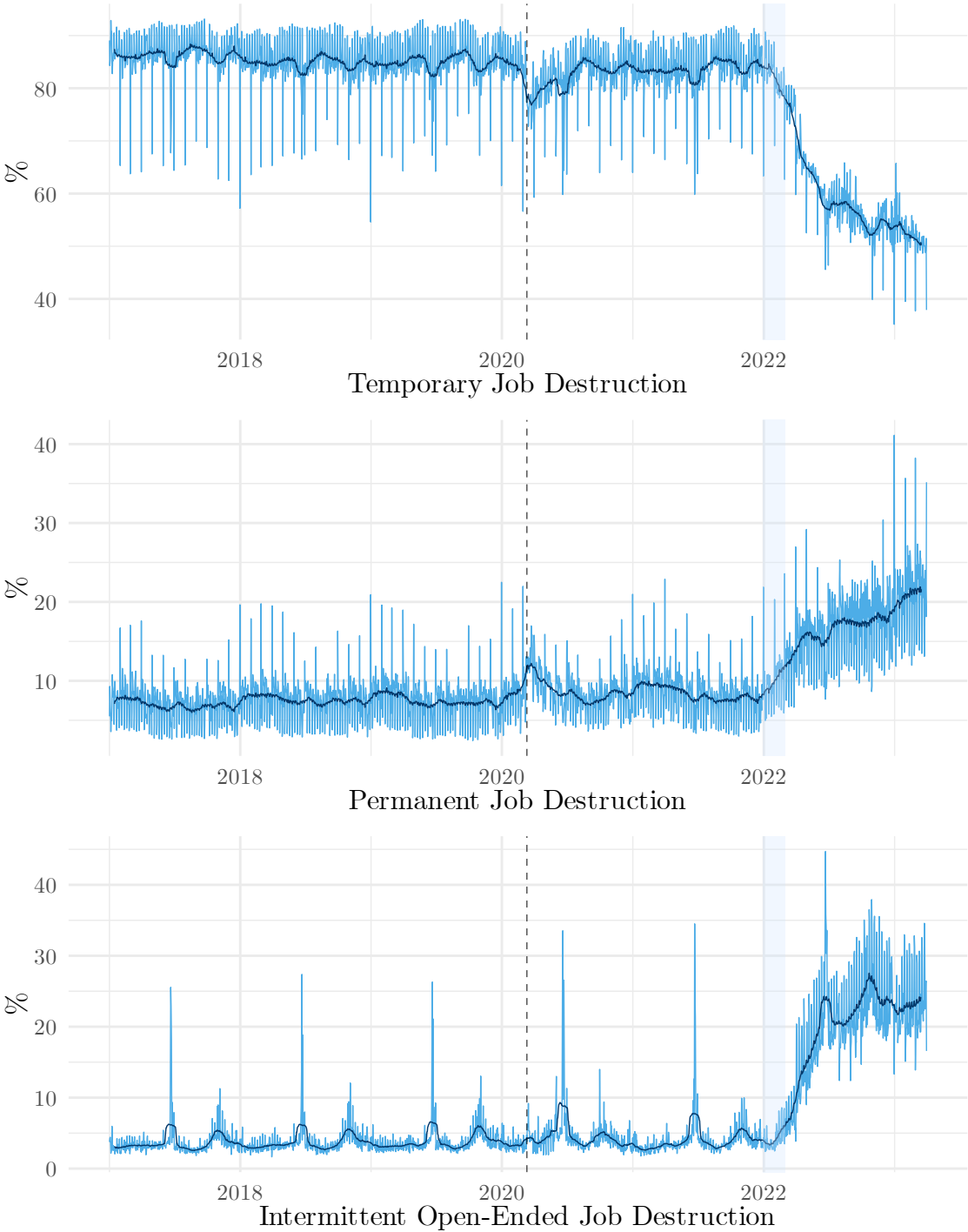
Figure A.2: Employment duration by Age Group.



Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

C Share of Job Destruction per type of Contract

Figure A.3: Share of job destruction per type of contract



Notes: Shaded area represents the transitory period of the law. Dashed line indicates the Covid-19 lockdown started.

D Comprehensive Calendar Effects

Figure 10 report all estimated calendar effects as pairs before and after the reform for the aggregate economy. Confidence regions for the pair of estimates before and after the reform, as depicted in the figures, are computed as follows. First, consider equation (1) in Section 4.1. For each and every calendar effect, we obtain maximum likelihood OLS estimates $\hat{\beta} = \{\hat{\beta}_i, \hat{\beta}_j\}$ for i, j before and after the labor reform, together with $\hat{\sigma}_u^2$ variance of the error term in eq. (1) and parameter variance-covariance matrix $\widehat{Var}(\hat{\beta})$. Let R be an orthonormal basis in \mathbb{R}^k . Then, a confidence region for selected parameters $\{\beta_i, \beta_j\}$ is:

$$\left\{ (\beta_i, \beta_j) \in \mathbb{R}^2 : \left[R(\beta - \hat{\beta}) \right] \left[R(X'X)^{-1}R \right]^{-1} \left[R(\beta - \hat{\beta}) \right] \leq \hat{\sigma}_u^2 k K_\alpha \right\}$$

where $K_\alpha = F_{k, T-k}(\alpha)$, for $k = 2$ and Snedecor's F . Define $S = (X'X)^{-1}$ and $\hat{\Sigma} = \hat{\sigma}_u^2 S$. Then, the frontier of the confidence region for parameters $\{\hat{\beta}_i, \hat{\beta}_j\}$ is given by the ellipse:

$$a_{11} \tilde{\beta}_i^2 + a_{22} \tilde{\beta}_j^2 + 2 a_{12} \tilde{\beta}_i \tilde{\beta}_j = 2 K_\alpha$$

with $\tilde{\beta} = \beta - \hat{\beta}$, and matrix A :

$$A \equiv \begin{bmatrix} \hat{\sigma}_i^2 & \hat{\sigma}_{ij} \\ \hat{\sigma}_{ij} & \hat{\sigma}_j^2 \end{bmatrix}^{-1} = \begin{bmatrix} a_{11} & a_{12} \\ a_{12} & a_{22} \end{bmatrix}.$$

Consider symmetric $A = M \Lambda M$, with Λ diagonal. Then $\tilde{\beta}' A \tilde{\beta} = 2 K_\alpha$ can be written:

$$(\tilde{x}, \tilde{y}) \Lambda \begin{pmatrix} \tilde{x} \\ \tilde{y} \end{pmatrix} = 2 K_\alpha \quad \text{with} \quad \begin{cases} \tilde{x} = \sqrt{\frac{2K_\alpha}{\lambda_1}} \cos(t) \\ \tilde{y} = \sqrt{\frac{2K_\alpha}{\lambda_2}} \sin(t) \end{cases}, \quad t \in [0, 2\pi], \quad \text{and} \quad \Lambda = \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix},$$

and consequently,

$$\left\{ \begin{array}{l} \beta_i = \hat{\beta}_i + u_1 \tilde{x} + v_1 \tilde{y} \\ \beta_j = \hat{\beta}_j + u_2 \tilde{x} + v_2 \tilde{y} \end{array} \right. , \text{ with } M = \begin{bmatrix} u_1 & v_1 \\ u_2 & v_2 \end{bmatrix} \text{ in } A = M \Lambda M, \text{ with } M^{-1} = M,$$

define the confidence region for values $t \in [0, 2\pi]$.

E Contractual Calendar Effects for Job Creation and Destruction

Table A.2: The time series model for job creation before and after the labor reform

Effect	Permanent		Temporary		Intermittent		Open-Ended		Total	
	Before	After	Before	After	Before	After	Before	After	Before	After
Monday	1.267*** (0.0678)	1.235*** (0.0837)	1.124*** (0.044)	1.088*** (0.0563)	1.113*** (0.0801)	0.982*** (0.1108)	1.109*** (0.0468)	1.097* (0.0587)		
Friday	-0.367*** (0.0769)	-0.337*** (0.1049)	-0.236*** (0.0491)	-0.244*** (0.0664)	-0.074 (0.0923)	-0.037 (0.138)	-0.214*** (0.0531)	-0.224*** (0.0736)		
Weekend	-1.347*** (0.0481)	-1.342*** (0.0773)	-0.441*** (0.0339)	-0.433*** (0.0562)	-0.42*** (0.0596)	-0.228** (0.1128)	-0.504*** (0.0359)	-0.526*** (0.0578)		
Beg of Mth	2.826*** (0.0304)	2.24*** (0.0517)	1.123*** (0.0232)	1.313*** (0.0376)	1.474*** (0.0361)	1.088*** (0.0844)	1.453*** (0.024)	1.568*** (0.0378)		
End of Mth	-0.29*** (0.041)	-0.301*** (0.0857)	-0.147*** (0.0338)	-0.186** (0.0802)	-0.268*** (0.0512)	-0.177 (0.1159)	-0.166*** (0.0342)	-0.217*** (0.0714)		
Easter	-0.607*** (0.0537)	-0.429*** (0.0337)	-0.362*** (0.0648)	-0.419*** (0.036)						
Covid-19	-0.202* (0.1059)	-0.337*** (0.0653)	-0.295*** (0.0963)	-0.329*** (0.0815)						

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: The time series model for destruction before and after the labor reform

Effect	Permanent		Temporary		Intermittent Open-Ended		Total	
	Before	After	Before	After	Before	After	Before	After
Monday	-0.191*** (0.0394)	-0.211*** (0.0547)	-0.028 (0.0293)	-0.091* (0.0508)	-0.279*** (0.0828)	-0.207* (0.1197)	-0.151*** (0.0412)	-0.155*** (0.0602)
Friday	0.625*** (0.0404)	0.703*** (0.0499)	0.544*** (0.0327)	0.489*** (0.0452)	0.631*** (0.0989)	0.549*** (0.1257)	0.614*** (0.0473)	0.594*** (0.0576)
Weekend	-0.515*** (0.0217)	-0.414*** (0.0354)	0.217*** (0.023)	0.121*** (0.043)	0.163*** (0.0544)	0.421*** (0.0914)	0.106*** (0.0259)	0.09** (0.0429)
Beg of Mth	0.06*** (0.0215)	0.144*** (0.0552)	-0.08*** (0.0238)	0.004 (0.0713)	-0.123*** (0.0421)	-0.054 (0.1105)	-0.112*** (0.0236)	-0.014 (0.0686)
End of Mth	2.722*** (0.0226)	2.143*** (0.0391)	1.652*** (0.019)	1.285*** (0.0342)	2.057*** (0.0379)	1.132*** (0.0756)	1.853*** (0.02)	1.484*** (0.0355)
Easter	-0.37*** (0.0362)	-0.219*** (0.0278)	-0.243*** (0.054)	-0.26*** (0.026)				
Covid-19	0.126** (0.0568)	-0.127 (0.0829)	-0.17 (0.1759)	-0.22*** (0.0653)				

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

F Sectorial Comprehensive Calendar Effects

For each effect j (j = Monday effect, Friday effect, first of the month effect, end of the month effect, weekend effect) we perform the test of equality of parameters for each effect before and after the labor reform. Suppose that $\hat{\beta}_b^j$ is the parameter estimated for the j effect before the labor reform, and $\hat{\beta}_a^j$ is the parameter estimated for the j effect after the labor reform.

The hypothesis testing is as follows:

$$H_0 : \beta_b^j = \beta_a^j$$

$$H_1 : \beta_b^j \neq \beta_a^j$$

The test statistic is defined as:

$$t = \frac{|\hat{\beta}_b^j - \hat{\beta}_a^j|}{\sqrt{\hat{V}(\hat{\beta}_b^j) + \hat{V}(\hat{\beta}_a^j) - 2\hat{\text{cov}}(\hat{\beta}_b^j, \hat{\beta}_a^j)}} \sim t_{d.o.f}$$

under H_0 , where \hat{V} corresponds to the estimated variance, and $\hat{\text{cov}}$ the estimated covariance. In Figures A.4 and A.5 for job creation, and Figures A.6 and A.7 for job destruction, we calculate the p-values of this test defined as $p\text{-value} = 2[1 - F(t)]$ where $F(t)$ is the distribution function of a Student's t evaluated on the computed test statistic.

In the table we shade with light gray the p -values between 10% and 5% (i.e., we reject the null hypothesis of equality of parameters at 10%); with gray the p -values between 5% and 1% (i.e., we reject the null hypothesis of equality of parameters at 5%); and, finally, we shade with dark gray the p -values below 1% (i.e., we reject the null hypothesis of equality of parameters at 1%).

Figure A.4: Test for equality of parameters for each effect before and after the labor reform
- Job creation I.

Sector	p-values				
	Beg. of the Month	End of the Month	Monday	Friday	Weekend
1	0.001	0.934	0.277	0.940	0.094
2	0.104	0.486	0.995	0.835	0.140
3	0.009	0.351	0.878	0.310	0.066
10	0.564	0.700	0.416	0.556	0.005
11	0.397	0.335	0.262	0.957	0.102
14	0.055	0.256	0.982	0.454	0.735
16	0.805	0.343	0.930	0.835	0.312
17	0.225	0.062	0.458	0.852	0.074
18	0.571	0.980	0.674	0.658	0.573
20	0.181	0.407	0.801	0.994	0.034
22	0.042	0.529	0.869	0.379	0.129
23	0.001	0.617	0.557	0.748	0.000
24	0.230	0.459	0.914	0.322	0.004
25	0.045	0.463	0.648	0.831	0.178
28	0.043	0.009	0.186	0.623	0.866
29	0.000	0.571	0.317	0.117	0.001
30	0.027	0.704	0.012	0.755	0.876
33	0.010	0.089	0.427	0.501	0.062
36	0.364	0.192	0.751	0.744	0.702
38	0.070	0.021	0.271	0.436	0.409
41	0.033	0.193	0.547	0.350	0.199
42	0.002	0.363	0.254	0.832	0.265
43	0.042	0.797	0.720	0.479	0.853
45	0.014	0.950	0.465	0.776	0.000
46	0.006	0.876	0.245	0.991	0.075
47	0.701	0.675	0.138	0.615	0.032
49	0.028	0.600	0.801	0.800	0.003
50	0.417	0.325	0.597	0.197	0.102
51	0.567	0.574	0.256	0.657	0.048
52	0.003	0.391	0.570	0.489	0.883
53	0.001	0.550	0.001	0.783	0.000
55	0.263	0.021	0.001	0.190	0.006
56	0.361	0.449	0.316	0.052	0.004
58	0.059	0.438	0.308	0.148	0.067
59	0.503	0.863	0.737	0.884	0.000
60	0.383	0.504	0.383	0.972	0.000
61	0.790	0.808	0.758	0.981	0.503
62	0.000	0.896	0.801	0.641	0.000

Notes: light gray the p-values between 10% and 5%; with gray the p-values between 5% and 1%; and, finally, we shade with dark gray the p-values below 1%.

Figure A.5: Test for equality of parameters for each effect before and after the labor reform
- Job creation II.

Sector	p-values				
	Beg. of the Month	End of the Month	Monday	Friday	Weekend
63	0.640	0.938	0.471	0.560	0.292
64	0.638	0.260	0.632	0.958	0.000
65	0.613	0.099	0.867	0.230	0.361
68	0.428	0.648	0.545	0.988	0.002
69	0.350	0.059	0.772	0.920	0.000
70	0.187	0.194	0.267	0.451	0.352
71	0.162	0.955	0.365	0.507	0.121
72	0.760	0.833	0.959	0.917	0.679
73	0.990	0.748	0.350	0.215	0.019
74	0.796	0.913	0.735	0.718	0.089
77	0.222	0.902	0.992	0.215	0.146
78	0.006	0.775	0.000	0.836	0.548
79	0.200	0.446	0.831	0.363	0.046
80	0.174	0.231	0.289	0.735	0.093
81	0.001	0.999	0.402	0.994	0.007
82	0.817	0.896	0.706	0.992	0.904
84	0.000	0.108	0.853	0.906	0.011
86	0.000	0.000	0.033	0.193	0.000
87	0.065	0.844	0.273	0.509	0.000
88	0.001	0.897	0.762	0.707	0.006
90	0.469	0.985	0.526	0.614	0.313
91	0.159	0.710	0.483	0.661	0.061
92	0.532	0.948	0.460	0.005	0.000
93	0.329	0.870	0.871	0.925	0.935
94	0.037	0.339	0.450	0.963	0.372
96	0.000	0.943	0.767	0.478	0.000
97	0.132	0.308	0.281	0.995	0.000

Notes: light gray the p-values between 10% and 5%; with gray the p-values between 5% and 1%; and, finally, we shade with dark gray the p-values below 1%.

Figure A.6: Test for equality of parameters for each effect before and after the labor reform - Job destruction I.

Sector	p-values				
	Beg. of the Month	End of the Month	Monday	Friday	Weekend
1	0.002	0.000	0.960	0.803	0.935
2	0.481	0.001	0.959	0.657	0.517
3	0.000	0.337	0.255	0.793	0.559
8	0.600	0.143	0.718	0.836	0.390
10	0.867	0.000	0.951	0.446	0.494
11	0.318	0.009	0.607	0.992	0.013
13	0.926	0.089	0.926	0.333	0.664
14	0.359	0.248	0.566	0.543	0.000
15	0.934	0.101	0.811	0.440	0.449
16	0.147	0.000	0.662	0.333	0.415
17	0.746	0.014	0.628	0.030	0.729
18	0.000	0.001	0.139	0.313	0.628
20	0.971	0.087	0.915	0.356	0.038
21	0.926	0.142	0.657	0.912	0.000
22	0.186	0.217	0.939	0.255	0.941
23	0.252	0.083	0.320	0.044	0.007
24	0.691	0.005	0.614	0.744	0.260
25	0.386	0.006	0.458	0.512	0.613
26	0.243	0.326	0.882	0.577	0.910
27	0.886	0.117	0.536	0.039	0.344
28	0.476	0.224	0.446	0.143	0.880
29	0.692	0.857	0.036	0.546	0.673
30	0.028	0.090	0.532	0.642	0.008
31	0.035	0.012	0.936	0.576	0.180
32	0.362	0.120	0.789	0.435	0.757
33	0.249	0.154	0.891	0.295	0.386
35	0.708	0.007	0.349	0.147	0.004
36	0.240	0.134	0.075	0.190	0.003
38	0.111	0.037	0.068	0.299	0.018
41	0.158	0.000	0.953	0.723	0.899
42	0.184	0.000	0.687	0.317	0.615
43	0.139	0.000	0.676	0.948	0.894
45	0.323	0.001	0.873	0.566	0.580
46	0.498	0.000	0.683	0.985	0.472
47	0.367	0.000	0.813	0.494	0.434
49	0.203	0.000	0.460	0.136	0.017
50	0.411	0.004	0.566	0.226	0.767
51	0.520	0.100	0.050	0.694	0.003

Notes: light gray the p-values between 10% and 5%; with gray the p-values between 5% and 1%; and, finally, we shade with dark gray the p-values below 1%.

Figure A.7: Test for equality of parameters for each effect before and after the labor reform
- Job destruction II.

Sector	p-values				
	Beg. of the Month	End of the Month	Monday	Friday	Weekend
52	0.015	0.000	0.749	0.002	0.000
53	0.002	0.000	0.265	0.123	0.598
55	0.790	0.000	0.749	0.851	0.928
56	0.886	0.000	0.895	0.167	0.172
58	0.218	0.324	0.936	0.794	0.002
59	0.152	0.025	0.913	0.992	0.138
60	0.384	0.000	0.629	0.056	0.001
61	0.845	0.014	0.632	0.756	0.033
62	0.008	0.000	0.408	0.751	0.000
63	0.256	0.001	0.566	0.571	0.347
64	0.584	0.025	0.495	0.168	0.225
65	0.614	0.045	0.942	0.210	0.206
66	0.090	0.000	0.902	0.127	0.789
68	0.567	0.000	0.958	0.586	0.000
69	0.143	0.000	0.440	0.986	0.053
70	0.903	0.004	0.465	0.921	0.284
71	0.030	0.032	0.724	0.124	0.985
72	0.770	0.228	0.985	0.815	0.496
73	0.631	0.000	0.644	0.595	0.497
74	0.219	0.000	0.924	0.619	0.072
75	0.241	0.008	0.689	0.775	0.005
77	0.353	0.001	0.892	0.478	0.554
78	0.009	0.099	0.231	0.134	0.007
79	0.702	0.000	0.091	0.372	0.214
80	0.744	0.000	0.973	0.854	0.009
81	0.521	0.002	0.842	0.076	0.109
82	0.451	0.000	0.346	0.335	0.364
84	0.097	0.000	0.499	0.068	0.898
85	0.047	0.000	0.936	0.868	0.899
86	0.001	0.000	0.997	0.407	0.004
87	0.874	0.000	0.973	0.284	0.001
88	0.341	0.007	0.708	0.146	0.054
91	0.144	0.063	0.377	0.813	0.339
92	0.188	0.003	0.002	0.736	0.631
93	0.711	0.000	0.678	0.402	0.884
94	0.358	0.099	0.761	0.072	0.645
95	0.547	0.000	0.734	0.992	0.168
96	0.879	0.000	0.924	0.246	0.000
97	0.681	0.001	0.279	0.239	0.044

Notes: light gray the p-values between 10% and 5%; with gray the p-values between 5% and 1%; and, finally, we shade with dark gray the p-values below 1%.