

Dignity by Decree? The Occupational Effects of Temporary Jobs Regulation in Italy*

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Abstract

We study the *Dignity Decree*, a first-in-its-kind 2018 reform that increased the strictness of temporary jobs regulation in Italy. First, we use a regression model to show that firms that were more exposed to the policy displayed a higher rate of substitution of temporary contracts for permanent ones – mainly arising through contract conversions for existing employment relationships – accompanied by lower labor turnover and a slightly lower employment growth. Then, we build a model of the labor market in which firms hire workers either with a temporary or with a permanent contract to exploit production opportunities with random duration. The model allows us to: (i) estimate the quantitative importance of specific regulatory prescriptions; (ii) obtain an estimate of the aggregate effect of the reform; (iii) think about counterfactual scenarios, like a different phase of the economic cycle.

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1 Introduction

Temporary employment contracts are controversial. Supporters claim that they provide sizable employment gains and that they can serve as a stepping stone for more stable working relationships; detractors maintain that they constitute a precarious form of employment with little security for the workers, who end up unduly absorbing part of the business risk of their firm.

Despite these controversies, temporary contracts have enjoyed a great diffusion during the last three decades. When during the 1980s and '90s unemployment rates started to pick up in many European countries, subsequently remaining high for prolonged periods, part of the blame was ascribed to the very low degree of flexibility prevailing in European labor markets at the time. As a reaction, policymakers in these countries started to reform their body of Employment Protection Legislation (EPL), with interventions aimed at revamping labor market dynamism and at leaving the so-called *Eurosclerosis* behind. Rather than embarking in the politically-costly endeavor of reforming the legislation covering permanent employment contracts, however, many governments opted for an alternative: adjusting the degree of labor market flexibility at the margin by facilitating the use of temporary employment contracts (Bentolila, Dolado, Jimeno, et al. 2020).

The rationale behind this move was simple: matching the marginal labor demand – for which the very rigid and protected permanent contracts would be too costly – with a new slice of supply, drawn directly out the ranks of the unemployed. To many policymakers this looked like a “free lunch” policy, which would increase total employment without the need to touch the rights of incumbent permanent workers. In countries such as Italy and Spain, the de-regulation of temporary contracts came to be considered a standard tool to boost employment up to the mid 2010s. Today, after three decades and many reforms abiding by this principle, the era of temporary work liberalizations might have finally come to an end.

In this paper, we study the occupational effects of the *Dignity Decree* (D.D. from now on), the first major labor market reform to invert the liberalizing trend begun in the 90s. The decree, signed into law in July 2018, severely tightened the set of rules governing the use temporary contracts in Italy through a combination of mandatory limitations, additional contributory costs and increased regulatory requirements. The policy pitch of this reform was clearly stated by its political promoters: “putting a stop to rampant precariousness” and marking a clear discontinuity with respect to previous reforms, which had operated according to “the myth of flexibility and the bugbear of rigidity”¹.

We start by documenting a clear break in temporary-contract employment growth in the summer of 2018 using aggregate data. This slowdown is mirrored by a contemporaneous rise in permanent-contract employment, so that the low but constant aggregate employment growth that had prevailed from 2014 to mid-2018 shows no sudden stop or reversal. The very noticeable temporal coincidence between this change in occupational trends and the introduction of the D.D. and the absence of large contemporaneous policy interventions in the Italian labor market motivate our investigation.

We then use a matched employer-employee dataset covering the universe of workers and firms in the region of Veneto (‘ 9% of total employment in Italy) to study in greater detail the changes in employment growth dynamics observed between the introduction of the reform in the summer of 2018 and the end of 2019. Taking firms as observational units, we rely on a regression model in which we compare firms that featured different levels of exposure to the policy under scrutiny. In our basic empirical specification, we divide firms into two groups (the “highly exposed” and the “little exposed”) and we compare their outcomes before and after the regulatory intervention. Our results suggest that higher exposure to

¹ Min. of Labor Luigi Di Maio, [speech](#) to the Chamber of Deputies, July 30 2018

the D.D. triggered lower gross hiring and lower net employment flows for temporary contracts and a parallel increase in employment flows for permanent contracts, driven principally by a surge in conversions from temporary to permanent contracts in the aftermath of the policy intervention. These two opposite and almost equivalent outcomes for different contract types generate a larger slowdown in total employment growth for the high-exposure group of firms, which does however not appear large enough to bring overall occupational growth into negative territory. Looking at the intensive margin, we document a concentration of temporary contracts duration close to one year, the threshold at which most provisions of the reform take effect. In line with other works in the literature, these results seem to suggest that the main effect of the D.D. was a substitution of temporary jobs for permanent ones, with no significant consequences on aggregate employment or labor churning.

Our last step is to investigate more in depth the mechanisms driving the observed aggregate trends through the lenses of a structural model of the labor market. We propose a modified version of the framework first introduced by Cahuc, Charlot, and Malherbet (2016), in which firms hire workers with different contracts to exploit production opportunities of random duration. Every match between a firm and a worker is associated with an idiosyncratic shock-arrival rate, measuring the risk that the job will become unproductive in any point in time. Every job that gets created needs to be formalized through a working contract, which can be permanent or temporary. In choosing the kind of contract to offer for each job, firms face a trade-off: by offering a permanent contract, they ensure themselves the chance to exploit each production opportunity until it lasts, but face the risk of bearing dead-weight labor costs if a shock arrives; by offering a temporary contract, instead, firms limit their exposure to productivity shocks but also limit their potential profits, given that the signing of each new contract is subject to a contracting cost. In

equilibrium, permanent contracts are used for jobs with low-shock arrival rates, while temporary contracts are used for more risky positions, and only a fraction of them is converted to permanent once the pre-established contract expiration date is reached.

We expand this original framework by adding the three main restrictions provided by the D.D. The introduction of a maximum duration to temporary employment relationships makes them less profitable ex-ante, causing a shift towards the use of permanent contracts for a fraction of temporary hires. On the other hand – if given a chance to – firms would always extend an expiring temporary contract with another temporary employment spell; limiting the number of possible extensions forces thus firms to choose between offering a permanent contract and losing the match. Finally, the introduction of a written justification requirement for the use of temporary contracts, represented as a increase in contract-cost for temporary workers, produces substitution from permanent to temporary contracts as well as some job displacement for the least productive temporary workers. If the provision is applied only to contracts above a certain duration, however, job displacement can potentially be avoided, with only the substitution effect remaining.

Once brought to the computer, the model will also allow us to draw conclusions on the aggregate occupational effects of the reform and link it to different firm characteristics such as size and productivity.

Finally, the calibrated model can be used to conduct two counterfactual exercises. First, we ask ourselves how the effects of the reform would be modified by a change in the stance of the business cycle. This change can be thought of as a change in the distribution of our idiosyncratic shock-arrival rate. Second, we speculate about the possibility that reforms of temporary contracts regulation with opposite directions (i.e. regulation vs. de-regulation) may not entail specular results, due to the fact that contract conversions can only work one way, from temporary to permanent.

This paper contributes to two main strands of literature. First, it adds to the restricted set of works studying the effects of partial employment protection reforms, that is, interventions on labor market flexibility enacted only through changes in the regulation of temporary contracts. The closest paper in this sense is Daruich, Di Addario, and Saggio (2020), which studies a reform going in the opposite direction with respect to the D.D., an episode of temporary contracts de-regulation occurred in Italy in 2001. As in our case, that intervention mainly produces substitution effects between temporary and permanent workers, with a drastic drop in conversion rates for young workers with a temporary contract, who turn out to be the greatest losers in welfare terms. Studying the same reform, Cappellari, Dell’Aringa, and Leonardi (2012) find that it also induced a substitution of temporary employees in favor of external staff and caused reductions in capital intensity, generating productivity losses. Cahuc, Charlot, Malherbet, et al. (2020) focus instead on the consequences of a tax on temporary jobs of short duration introduced in France in 2013. They show that this kind of intervention can backfire, potentially inducing a reduction in the mean duration of jobs and decreasing job creation, employment and welfare of unemployed workers. We contribute to this strand of literature in two ways. On the one hand, by disentangling the effects of the different policy levers that the D.D. relies on and by analyzing how their interaction comes to determine the aggregate occupational effects of the reform. On the other hand, by providing an empirical estimate of the cost of regulation, in particular as concerns the justification requirements that is imposed for the use of temporary contracts. Quantifying the effect of this prescription is a very relevant exercise, as it can inform policymakers about the effective burden caused by regulatory requirements that impose indirect costs to firms (e.g. the risk that the justification is challenged in a judicial litigation).

The second strand of literature on which this paper builds is the very broad set

of works on two-tier labor markets, which concentrates on the divide between temporary and permanent jobs and the effects of this divide for different groups of workers (Saint-Paul 1996; Blanchard and Landier 2002; Boeri and Garibaldi 2007), a detailed summary of which is provided in Bentolila, Dolado, Jimeno, et al. (2020). On the theoretical side, a key reference for our work is the aforementioned model by Cahuc, Charlot, and Malherbet (2016), which explains the effects of EPL under the assumption that temporary contracts are used as a substitute for permanent ones and that the choice between the two is driven by the precautionary behavior of firms in the face of possible productivity shocks; we adapt and use this model to study the effects of the D.D. A complementary theoretical view on the role of temporary contracts comes instead from Faccini (2014), who proposes a model in which temporary contracts are used as a screening device by firms: under this framework, the presence of temporary contracts allows to mitigate the disadvantages that a rigid EPL can cause. In our paper, we explore this possibility by estimating the extent of substitution between temporary contracts and other fixed-term contracts which were specifically created to allow for workers screening, such as the apprenticeship one.

The rest of this paper is structured as follows. Section 2 provides some institutional background on temporary contracts and on the D.D. Section 3 presents the data that we use. Section 4 reports the empirical facts that motivated our study. Section 5 presents a regression model at the firm level. Section 6 presents the model. Finally, Section 7 draws our preliminary conclusions and describes the next steps in our strategy.

2 Institutional Background

2.1 Temporary Contracts

In Italy, as in other European countries, the permanent contract is the most typical form of employment contract: in 2017, 85% of the entire dependent employment was permanent. The remaining 15% of job relationships is regulated by fixed-term employment contracts, a set of different arrangements that envisage a work relationship with pre-determined (usually short) duration. Despite the weight of fixed-term contracts is still limited when looking at employment stocks, their relevance has been growing steadily over the last three decades and today they account for more than half of total labor flows during periods of labor market stability.

Among fixed-term contracts, the most widespread form in Italy is the temporary employment contract (*contratto a tempo determinato*). This type of contract was first introduced to address specific instances in which labor demand would be temporary in nature: (i) extraordinary activities; (ii) substitution of other workers; (iii) significant and unforeseeable increases in activity. Due to its characteristic and the legislative changes that accumulated over time since its introduction, however, the temporary contract has progressively come to be considered as a “general-purpose fixed-term contract”, coming to produce between 65% and 70% of all fixed-term hires in the last decade². Temporary contracts can be initiated by the firm itself or through an agency. A temporary contract can be extended: an extension arises when, at or before the contract expiration date, the firm and the worker immediately decide to prolong the employment relationship without changing the terms of the contract. Workers can also be recalled by firms: a recall occurs whenever a worker is employed more than one time by the same firm using temporary con-

² Other fixed-term contracts: (i) apprenticeship, (ii) consultancy (so-called *parasubordinato*), (iii) intermittent worker, (iv) internship (so-called *tirocinio*) and (v) seasonal worker

tracts that are not consecutive (i.e. some time elapses between the end of the first and the beginning of the subsequent).

2.2 The Permanent-Temporary Choice

We can identify three main classes of reasons to have a temporary contract govern an employment relationship. The first relates to *precaution*: facing uncertainty in the demand for their products, firms may find it optimal to have a fraction of workers that can be dismissed by simply letting their contract expire rather than through individual or collective firings. In other words, firms may use temporary contracts as a put option on a share of their workforce, so as to grasp the benefits of a larger workforce during periods of growth while being shielded from the risk of holding underutilized and costly employees during contractions, be them aggregate or firm-specific.

The second class of explanations is instead grounded on a *screening* argument: in the presence of imperfect information about workers skills, about workers' capacity to learn or about the "goodness of fit" of a worker in their job, firms may prefer to first offer temporary contracts when starting new employment relationships, so as to be able to learn what they need about their new hires and eventually decide whether the worker is a good match or not. In most countries there usually exist ad-hoc forms of fixed-term contracts that are designed for this purpose.

The third class of reasons is instead linked to a truly *temporary nature* of a fraction of labor demand: in many circumstances, such as for example a prolonged absence of an incumbent permanent employee, firms might need to hire someone for a limited and ex-ante pretty well defined period of time, knowing in advance that this need will eventually cease. In our model in Section 6 we will focus on the precautionary-behavior explanation for using temporary jobs, accounting for the alternative explanations exploiting specific information in our micro-data.

2.3 The Dignity Decree

The so-called *Dignity Decree* (D.L. 2018, n.87) was the first major labor market reform to invert the trend of temporary contracts liberalization that characterized Italy and other major European countries starting from the 1990s (see Section A3 in the Appendix). The decree, introduced in July 2018, severely tightened the set of rules governing the use temporary contracts in Italy through a combination of mandatory limitations (“hard-bounds”), additional contributory costs and increased regulatory requirements. More specifically, following the introduction of the D.D.: (i) the maximum duration of a temporary employment relationship (incl. all extensions) is reduced from 36 to 24 months, (ii) fewer extensions are allowed (up to 4), (iii) a justification is required when the employment relationship is longer than 12 months (incl. extensions) and for all recalls and (iv) every recall triggers a 0.5% increase in the social security contributions by the employer. Other minor changes were included³.

A first glimpse of the relevance of this reform in strengthening temporary contracts regulation can be obtained by looking at the evolution in the OECD “Employment Protection Legislation Index” for both temporary (Figure A2a) and permanent (Figure A2b) positions: while the level of EPL did not vary much for permanent contracts over the last decade, changes in regulation concerning temporary contracts were more frequent and more relevant. In particular, shifting from 2018 to 2019 the level of regulation in Italy jumps to the highest level observed in the four major European economies since 2008.

³ The D.D. additionally establishes an increase in the statute of limitations to start a litigation regarding a temporary contract (from 120 to 180 days after its end) and in the compensation due for an unlawful dismissal of a permanent worker (from 4-24 to 6-36 monthly wages)

3 Data

3.1 Sources

We rely on three main sources of data in our analysis.

3.1.1 Osservatorio sul Precariato - INPS

In Section 4.1 we describe the behavior of aggregate occupational *flows* (hirings, terminations, conversions) in Italy before and after the reform. We make use of publicly available aggregate data from the INPS observatory [Osservatorio sul Precariato](#) – based on social security records.

3.1.2 Istat

In Sections 4.1 and 4.2 we provide information regarding the evolution of the stock of dependent employment in the Italian labor market. We use aggregate quarterly data derived from the [Labor Force Survey](#) conducted by Italian statistical institute (Istat).

3.1.3 Mercurio

In Section 5 we exploit [Mercurio](#), a rich matched employer-employee dataset covering the universe of dependent employment relationships for the region of Veneto. These records include all hiring, firing and contract-conversion⁴ events from the 1990s to 2020, with detailed information on all temporary contract extensions. These microdata are derived from mandatory private firms' notifications to the local public labour market agency (*Comunicazioni Obbligatorie*) and cover therefore all the (lawful) employment spells in the recent history of Veneto.

⁴ From fixed-term to permanent

Veneto is a large (‘ 5M inhabitants) region in north-east Italy. It has a high employment rate (75% in 2017) and low estimated incidence of the informal market (9% in 2017) relative to the rest of Italy, and it constitutes one of the most productive areas of the country with a very strong manufacturing base.

For each employment spell reported in Mercurio, we can observe the contract type, the sector of activity and workers’ demographic characteristics: age, sex, education and occupation. Firms and workers identifiers are anonymized.

3.2 Sample Selection

One problem with a fraction of temporary job is that their fixed-term nature is completely dictated by the seasonality of the underlying economic activity. To account for this, following Sestito and Viviano (2018), we drop firms in the agricultural and tourism sectors and domestic and seasonal workers. We additionally limit our sample to workers with less than 55 years of age, to exclude those that are close to retirement age. We focus on the period between January 2017 and December 2019 to avoid the confounding effects of the two large waves of hiring subsidies that characterized 2015 and 2016 (see Section A3 in the Appendix) and of the shock induced by the Covid-19 pandemic starting from 2020. In the regression analysis (Section 5), we exclude new-entrant firms, that is, those firms that first appear in our dataset in 2017 or later.

4 Empirical Trends

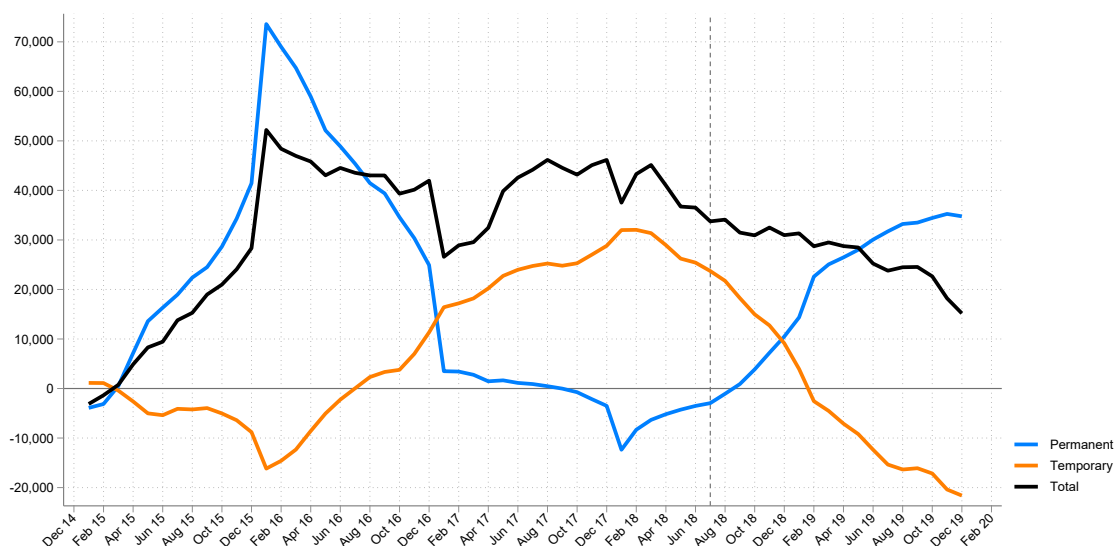
Since the end of 2013, Italy has experienced a prolonged period of steady employment growth, that continued – with basically no interruption – until the arrival of the Covid-19 pandemic in 2020 (Figure A1). Nevertheless, the source of this occupational expansion has been far from homogeneous over time: the relative

contribution of new permanent and temporary jobs to total employment growth has indeed varied a lot over time, with an alternation of periods of permanent employment expansion and periods when temporary contracts were the main drivers of change.

4.1 Flows and Stocks

In Figure 1 we look at monthly net labor flows by type of contracts between 2015 and 2019. We can clearly distinguish three phases. At the beginning of our time window, corresponding to years 2015 and 2016, we observe plenty of new entries into permanent positions and small negative flows for temporary positions. In 2017 the trend reverses, with a strong growth of temporary employment. In the mid of 2018, the months corresponding to the introduction of the D.D., we start to observe a second reversal, with permanent contracts driving once again overall employment growth.

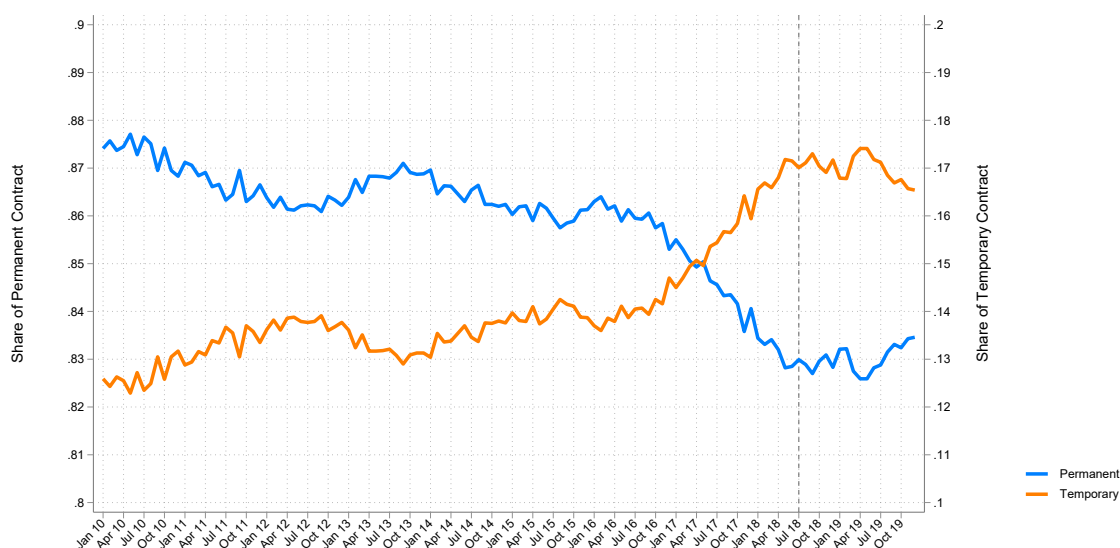
Figure 1: Net labor flows: 12-months backward-looking M.A



Note: Net occupational flows by type of contract (2015-2019). Net flows = hirings - terminations +/- conversions. Total flows also include other fixed-term contracts. Flows are reported as 12-months backward-looking moving averages to handle calendar effects. The vertical line indicates the month in which the D.D. is introduced. *Source:* INPS, see Section 3.1.1.

We complement the information on the flows with a look at employment stocks in Figure 2. The relative share of permanent and fixed-term⁵ contracts had remained quite stable between 2010 and 2017, with fixed-term contracts accounting for about 13% of total jobs. Coherently with the patterns described for labor flows, starting 2017 we observe a rise in the stock of fixed-term workers in total employment, a rise that gets interrupted abruptly in the middle of 2018.

Figure 2: Shares of total employment by contract type



Note: Shares of total employment by type of contract (2010-2019). The left axis refers to permanent positions, the right one to fixed-term positions. The vertical line indicates the month in which the D.D. is introduced. *Source:* ISTAT, see Section 3.1.2.

Figures 1 and 2 suggest that 2018 represents a year of change in the contract composition of employment growth in the Italian labor market. In the next subsection we investigate whether this change can be ascribed to simple reallocation mechanisms or whether it was the product of a large-scale substitution across contract types.

⁵ Data on labor stocks do not separate different kinds of fixed-term jobs (see Section 3.1.2)

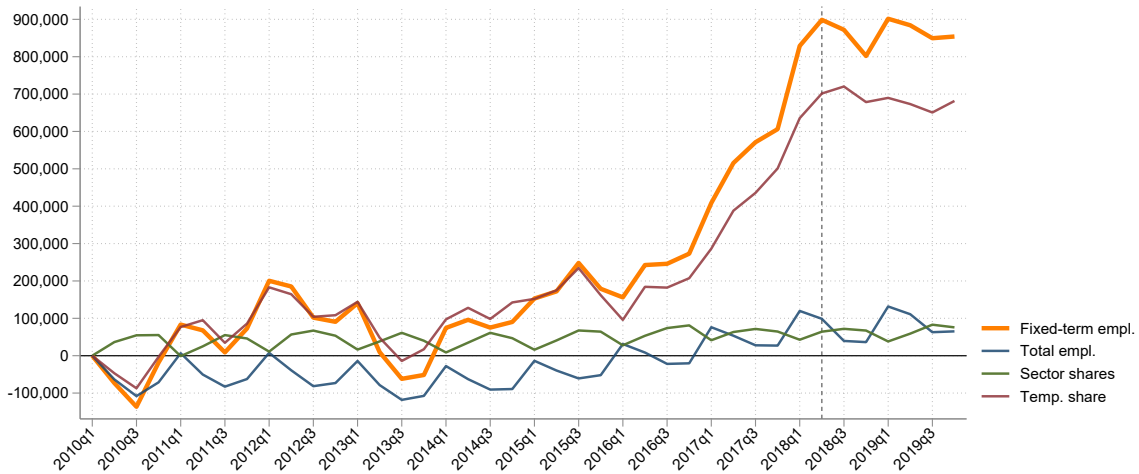
4.2 Growth, Reallocation or Substitution?

We continue our empirical investigation by decomposing the variability of temporary employment over time. We do so by writing the total stock of fixed-term⁶ jobs in Italy at any given point in time (T_t) as the sum of the sum of the stocks utilized by k different sectors in the economy. We then write each element of this sum as the product of three factors: total employment in the economy, the weight of each sector (in percentage terms w.r.t. total employment E_t) and the share of fixed-term jobs in each sector.

$$T_t = \sum_k \mathring{a}_{k,t} T_{k,t} = \sum_k \mathring{a}_{k,t} \underbrace{\frac{E_{k,t}}{E_t}}_{\text{Sector share}} \underbrace{\frac{T_{k,t}}{E_{k,t}}}_{\text{Temp. share}} \quad (1)$$

We then report in Figure 3 the absolute variation in total fixed-term employment over time with respect to January 2010 (orange line), along with the fraction of variability that is explained by changes in each of the three factors in equation (1).

Figure 3: Fixed-term employment (differences from 2010)



Note: Absolute variation in the deseasonalized stock of fixed-term jobs, differences from 2010. Blue, green and red lines represent the contribution from the three factors from equation (1). *Source:* ISTAT, see Section 3.1.2.

⁶ Data on labor stocks do not separate different kinds of fixed-term jobs (see Section 3.1.2)

The main driver of the growth in fixed-term employment over the decade 2010-2020 was the increasing share of this kind of contracts in the total employment of different sectors (red line). On the contrary, the contribution to temporary occupational growth coming from labor reallocation across sectors – i.e. from the fact that employment grew more in sectors that had more fixed-term jobs in 2010 – or from the overall employment growth in the country (green and blue lines) is more limited. This simple decomposition identifies therefore substitution across contract types as the main driving force behind the surge and subsequent halt of temporary employment growth in Italy. Moreover, Figure 3 complements Figures 1 and 2 in identifying mid-2018 as the key moment for a change in this substitution pattern across contracts in the different sectors of the economy.

4.3 Duration and Extensions

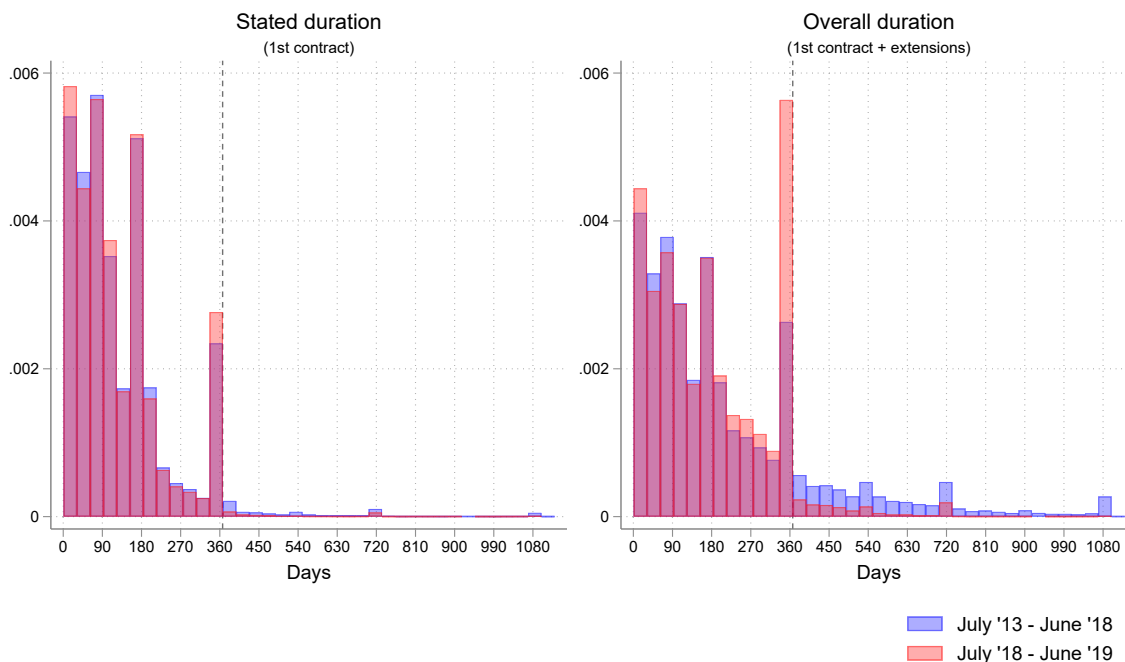
We provide here some empirical evidence on the intensive margin of temporary contracts utilization. We focus on the duration and number of extensions and compare temporary contracts signed before and after the reform.

Figure 4 displays the distribution of temporary contracts with respect to their duration, limiting the sample to those contracts that regulate the first employment relationship between a worker and a firm (i.e. excluding recalls). The left panel refers to stated duration – the duration that is written on the contract when it is first signed, while the second panel refers to the overall duration of the employment relationships, thereby also including extensions.

Looking at the overall duration (r.h.s.), a clear difference emerges from a before-after comparison of the distributions: after the D.D. we observe a marked increase in the concentration of duration just below the 1-year threshold, with a fall in the share of very long temporary employment spells and also a reduction in the fraction of contracts lasting less than six months overall. These changes can be

reconciled with the design of the reform, which entails significant increases in costs for temporary employment spells that go over one year of duration and discourages the repeated use of short-term extensions.

Figure 4: Histogram of duration for 1st temporary contracts



Note: Duration histogram of temporary employment contracts before and after the introduction of the D.D. Left panel: stated duration. Right panel: overall duration. *Source:* Mercurio, see Section 3.1.3.

One important disclaimer applies to this comparison, though. In the first months of 2020 nearly all temporary contracts in the Italian economy were left expire by firms due to the effect of the 2020 pandemic on labor demand: this implies that some of the temporary employment relationships that would have been extended in the absence of the pandemic were instead dissolved upon contract expiration, suffering therefore a shortening in their overall duration. Given the fact that most temporary contracts are initially signed with a duration of few months, this shortening effect due to lack of extensions is bound to be more relevant the closer a temporary contract is signed with respect to the first quarter of 2020.

While these concerns may prevent us from taking the differences between dis-

tributions observed in the graph as estimates of the absolute effect of the reform, two elements seem to support the meaningfulness of this before-after comparison. First, although smaller, the same distributional effects that we can observe for overall duration (r.h.s. panel) can be observed for stated duration (l.h.s. panel), which does not suffer from the pandemic-induced bias ⁷. Second, the change in the distribution occurs as a squeeze towards the 1-year threshold and not just as an overall reduction in duration; in other words, the spike observed just below the threshold dwarfs the increases observed for the nearby bins, something that we would not expect if the change was driven only by the pandemic-related censoring.

Shifting to the number of extensions, a coherent story emerges: after the reform the fraction of temporary contracts that eventually get extended is reduced, and this holds across all stated-duration groups (Figure 5).

Figure 5: Share of extended temporary contracts

Note: Share of extended temporary contracts before and after the introduction of the D.D., grouped by classes of stated duration. Source Mercurio, see Section 3.1.3.

⁷ Stated duration is the duration decided at the moment of signing the contract, so any job started before 2020 could not have been affected by the pandemic

The most substantial decrease, however, is observed for contracts between six months and one year of duration, those that have the highest likelihood of crossing the one-year threshold when opting for an extension. Taking into account that the same right-censoring problem outlined for duration applies here, and that it should affect more contracts of longer duration, the fact that the observed decrease is larger for contracts just below the threshold than for contracts just above it is coherent with a strategic reduction in the number of extensions aimed at avoiding the additional costs implied by going over one year of duration. The changes summarized here only concern contracts governing the first relationship between a worker and a firm. Turning to workers recalls, instead, we find no significant changes over time.

To sum up, our descriptive evidence suggests that the summer of 2018 constituted a moment of profound change in the hiring behavior of Italian firms: on the one hand, a trend of rapid growth in temporary employment was abruptly interrupted, leaving room to more permanent-contract hires; on the other hand, temporary employment relationships were shortened, with fewer contracts going over one year of duration and fewer contract extensions being used.

5 Regression Model

Unlike other preceding reforms, the D.D. does not present characteristics that generate a clear quasi-experimental setting which could be exploited to identify its causal effects. Despite this disadvantage, setting up a regression model can still prove useful: on the one hand, it allows us to exploit the additional information that we get from the micro data and check whether part of the variability observed in the aggregate is due to some factor that can be controlled for; on the other hand, it helps us investigate the potential heterogeneity of the post-reform occupational

trends across different groups of firms.

We rely on a panel dataset constructed starting from Mercurio data (see Section 3) where the labor flows of each active firm i are observed with monthly frequency, so that we can count all hiring, layoff and contract-conversion events for each type of contract.

We then set up a regression model in which we compare the time-variation in occupational outcomes between firms that are differently exposed to the reform. The most basic specification takes the following form

$$Y_{i,t} = a_i + t_t + b_t I(p_i > \tilde{p}) + \epsilon_{i,t} \quad (2)$$

where $Y_{i,t}$ is a firm-level occupational outcome at time $t = \text{fy,mg}$. The terms a_i and t_t denote firm and month fixed effects respectively. The key element of heterogeneity across firms is p_i , which represents the exposure of each firm to the reform. We measure this exposure by relying on long-run differences in the demand for temporary workers at the firm level

$$p_i = \frac{T_{i,\text{Pre-2017}}}{E_{i,\text{Pre-2017}}} \quad (3)$$

That is, firm i 's exposure is provided by the ratio between its average monthly stock of temporary employees before 2017 ($T_{i,\text{Pre-2017}}$) and its average total employment ($E_{i,\text{Pre-2017}}$). In our preferred specification, we use $p_i = \frac{T_{i,2012-2016}}{E_{i,2012-2016}}$. Figure A3 shows the resulting distribution of p_i ⁸.

Specifying the model as in (2) we perform the simplest possible exercise: we compare the average employment outcomes of two groups of firms, the “high-exposure” and the “low-exposure”, which we define based on indicator function $I(p_i > \tilde{p})$ that takes value one if p_i is greater than the median value \tilde{p} (7%).

⁸ To check the robustness of this measure, we also calculate this ratio using labor flows (gross hiring) instead of the stocks and we consider different time windows. These changes do not affect the final results of our regression models.

Figure 6 reports the b_t parameters from this regression with the respective confidence intervals using net permanent-contract labor flows as an outcome. The vertical line indicates July 2018, the month when the D.D. was introduced. A

Figure 6: Difference in net permanent-contract flows

Note: Difference in net permanent-contract labor flows between high- and low-exposed firms. Source Mercurio, see Section 3.1.3.

statistically significant difference in the occupational outcomes of the two groups appears after July 2018, despite swings driven by calendar effects⁹: firms that are more exposed to the reform display greater (more positive) permanent-contract employment flows, with the average firm in the high-exposed group increasing its hiring by 0.1 workers-per-month more than the low-exposed counterpart. Importantly, this outcome is strongly driven by the gap in temporary-to-permanent contract conversions observable in Figure 7.

To interpret these results correctly, it is important to stress that what we observe is somewhat mechanical: the fact that units with a higher demand for temporary employees experience more conversions in the months following the D.D. is driven

⁹ The peak observed in January in Figures 6 and 7 is attributable to the custom of taking the start of calendar years as reference points for the signing of new contracts.

Figure 7: Difference in temporary-to-permanent conversions

Note: Difference in temporary-to-permanent contract conversions between high- and low-exposed firms. Source Mercurio, see Section 3.1.3.

at least in part by the fact that only a firm that has some temporary workers can convert them to permanent. This is very likely the case if temporary jobs usage is a time-persistent choice of firms. However, that the difference between the two groups is of the expected sign and that it starts to be observed in correspondence of the introduction of the reform suggests that the latter might indeed have had a role in shaping the labor flow of the Italian labor market starting 2018. In other words, despite this simple regression framework might not deliver a clear-cut setting for causal identification, arguably the two most important necessary conditions for claiming that the reform had an effect on labor market outcomes (time-consistency and monotonicity with respect to exposure) are satisfied.

We next try to go beyond the simple bisection of the sample of firms used in equation (2) and look instead at what happened at different points along the distribution of p . We modify equation (2) by collapsing its time dummies into a unique dummy variable Z taking value 1 for all the post-reform periods and interact the

latter with one dummy for every decile of the distribution of p_i :

$$Y_{i,t} = a_i + Z_t + \sum_{d=2}^{10} \alpha_d I(p_i \text{ 2 decile } d) Z_t + \epsilon_{i,t} \quad (4)$$

We then plot in Figure 8 the resulting decile-specific coefficients α_d , along with their respective confidence intervals. These coefficients can be interpreted as the gap between the pre-post reform difference in net hiring in each decile and the pre-post difference observed in the group of firms with $p_i = 0$. The three different curves represent the behavior of permanent and temporary contracts and of total employment.

Figure 8: Heterogeneity in the effect of p on net hirings

Note: Post-reform change in net employment flows across the distribution of p by type of contract. The estimates and the relative confidence intervals are recovered from an augmented version of equation (2). Source Mercurio, see Section 3.1.3.

As expected, net hiring for temporary positions increase as we shift up the distribution of p , with high-exposure deciles featuring the greater (relative) loss of temporary jobs after the reform. On the contrary, the curve representing permanent contracts is concave across deciles, with net hiring growing up to the sixth decile and then going back close to 0 among firms with the highest levels of exposure.

As a result, a negative relationship between policy exposure and total net hiring emerges, creating some job displacement among high-productivity firms. This suggests that low-exposure firms manage to react more promptly to the reform by substituting between contract types easily, while this does not apply for very high-productivity firms.

6 Model

In this section we use a structural model of the labor market to complement the evidence provided by our regression results. Our objective is threefold. First, we aim to provide a prediction regarding the contribution of the different policy levers exploited by the D.D. – the “hard bounds” and the increase in costs – to the overall effect of the reform. Second, we wish to calibrate the model and recover the aggregate occupational effect of the D.D.; once the model is calibrated, we will also statistically estimate the effect of the most peculiar provision of this reform, the justification requirement. Third, we will exploit the model to engage in two counterfactual exercises that will allow us to answer two questions relating to the external validity of our results: (i) How would the effect of the reform change during a different phase of the business cycle? (ii) Would a reform going in the opposite direction (i.e. a liberalization) trigger specular results?

As anticipated in Section 2, we concentrate our modeling effort on describing the precautionary motivation for the use of temporary contracts. We take this choice on two grounds: on the one hand, the reform acts on the relative cost of permanent and temporary contracts, so it is natural to choose a framework that gives the centre of the stage to the tradeoff between the two; on the other hand, the use of temporary contracts as a precaution device gets more relevant in contexts – such as the Italian one – where the level of employment protection for permanent employees is high, because it acts as a form of insurance against an oversized workforce.

6.1 Benchmark

In order to study the choice between temporary and permanent contracts, we start from the model proposed by Cahuc, Charlot, and Malherbet (2016). We briefly summarize here the fundamental characteristic of this benchmark framework, while we refer to the original paper for definitions, proofs and detailed explanations.

The model represents a continuous-time economy with a continuum of risk-neutral workers and firms. Firms use labor as their only production input to exploit the production opportunities that they encounter, which all generate the same output y per unit of time. Each production opportunity is associated to a measure of its riskiness, a Poisson shock arrival rate λ ($G(\lambda)$) which defines the probability that the opportunity will cease to exist at any given moment in time¹⁰. If, after observing their shock-arrival rate, the parties decide to start a new job, this needs to be formalized through an employment contract, which can be permanent or temporary.

Permanent contracts do not have an expiration date, establish a wage $w(\lambda)$ that cannot be renegotiated without mutual agreement and entail a red-tape hiring cost F . Temporary contracts, on the contrary, are characterized by a pre-established duration D (determined when the contract is signed) and a wage $w(\lambda, D)$, and they cannot be destroyed before their expiration date. If a temporary contract ends before any shock hits it, the firm and the worker can decide to preserve the match and convert it into a permanent contract or to interrupt the employment relationship.

In choosing the kind of contract to use in order to formalize the employment relationship, firms and workers trade off the costs and benefits of the permanent and

¹⁰ Each firm uses exactly one worker in this baseline specification, so that λ can be considered as associated to a firm or to a match

temporary options. This tradeoff between the two types of contracts is summarized mathematically by the comparison of functions

$$S_P(\lambda) = J_P(\lambda) + W_P(\lambda) - U \quad (5)$$

$$S_T(\lambda, D) = J_T(\lambda, D) + W_T(\lambda, D) - U \quad (6)$$

that represent, respectively, the surplus that signing a permanent or a temporary contract generates with respect to the alternative of leaving the match with no job creation. Each of these functions is the sum of surpluses generated on the firm side, $J(\cdot)$, and on the worker side, $W(\cdot) - U$. Both functions are decreasing in the shock arrival rate λ . The duration stated in each temporary contract is defined as $D = \arg \max_d S_T(\lambda, d)$, that is, contract duration is chosen optimally given the shock arrival rate (see Section A4). The total surplus generated by the contract is split in fixed proportions between the firm and the worker according to a bargaining parameter $b \in (0, 1)$.

What generates the tradeoff? On the firm side, the value of $J(\cdot)$ (stated explicitly on the first line of equations 9 and 10 in the Appendix) is affected by the contract choice as follows: by offering a permanent contract, firms ensure themselves the chance to exploit each production opportunity until it lasts, but face the risk of bearing dead-weight labor costs (or the firing cost) if a shock arrives; by offering a temporary contract, instead, firms limit their exposure to productivity shocks but also limit their potential profits, given that the signing of each new contract is subject to a contracting cost c ¹¹. On the worker side, the value of $W(\cdot) - U$ is determined by comparing the worker's discounted labor earnings (limited in time in the case of a temporary contract) with the outside option of obtaining a fixed unemployment benefit.

¹¹ If the firm were to substitute a permanent contract with a sequence of temporary ones, it would incur a cost for each of them, while if it interrupted the working relationship after the first it would forgo some profits

The instantaneous decision that firms and workers face on whether to start an employment relationship or not is therefore driven by the relative size of the two surpluses, which is in turn determined by the value of the model's parameters. The most interesting equilibrium arises when both surpluses are positive for some interval on the support of λ and the two functions cross each other at some point in that interval. This situation is represented in Figure 9.

Figure 9: Surplus as a function of the shock arrival parameter λ

In this case, permanent contracts are used for jobs with low-shock arrival rates ($\lambda < \lambda_S$), while temporary contracts are used for more risky positions ($\lambda > \lambda_S$). Not all temporary jobs face the same destiny upon expiration, though: for the fraction of temporary jobs featuring a relatively low shock arrival rate ($\lambda_S < \lambda < \lambda_P$), the fact that $S_P(\lambda) > 0$ implies that it will be beneficial to continue the employment relationship by converting the temporary job to a permanent position when the contract expires (conditional on no shock having hit the match). On the contrary, for temporary jobs with $\lambda_P < \lambda < \lambda_T$ the expiration of the temporary

contract will imply the breaking of the match.

This formalization for the choice between permanent and temporary contracts represents the instantaneous decision that agents need to make every time they form a match and it constitutes the backbone of the model. To complement it and represent a labor market equilibrium, the model builds on a standard search and matching structure, summarized in the system of equations (7):

$$\begin{aligned} \mathbb{W} & V(I) = \frac{1}{1+r} [q_q(1-b)S(I) + (1-q_q)V(I)] \\ \mathbb{W} & k = \max_{Z} \{V(I), 0\} - G(I) \end{aligned} \quad (7)$$

The first equation is a Bellman equation representing the value of a vacancy, depending on surplus, the shock arrival rate and labor market tightness q_q . The second equation is a free entry condition by which firms post new vacancies up to the point when their discounted value matches a fixed job-opening cost k .

6.2 Adaptation

We are expanding this original framework by working on two sides: adding the main regulatory restrictions provided by the D.D. and reproducing a setting with firms of different sizes.

6.2.1 The Reform

We start by adding to the model the regulatory changes provided by the reform, taking Cahuc, Charlot, and Malherbet (2012) as a reference for the two “hard bounds” and providing instead a novel scheme for the increase in regulatory costs.

The first change is the introduction¹² of a maximum duration to temporary employment relationships, represented in Figure 10. A cap on duration restricts one

¹² In actual facts, the D.D. significantly reduced the preexisting 3- years maximum duration of a temporary employment relationship to 2 years. See Section 2

Figure 10: Effect of a cap to maximum contract duration

of the margins of adjustment of firms with respect to their shock arrival rate. Given the decreasing relationship between shock arrival rate λ and the optimal contract duration $D(\lambda)$ (see Section A4), a cap on duration prevents firms with a very low shock arrival rate to offer temporary contracts of very long duration. In the Figure, this corresponds to all the jobs with $\lambda < \lambda_{D_{max}}$ for which the duration will be fixed at D_{max} . This change makes a temporary contract less profitable (ex-ante) for this set of jobs, so that for a fraction of them (highlighted in blue) the temporary contract ceases to be the best option in favor of the permanent one.

Second, we consider the introduction of a limitation to the number of possible temporary contract extensions¹³. Given that the benchmark model does not allow for extensions, we study this restriction by comparing the “regulated” (i.e. zero-extensions) benchmark with a setting where one – and only one – extension (T_2) is allowed for each new temporary contract (T_1). This is represented in Figure

¹³ Extension= continuation of a temporary employment relationship by means of a new temporary contract once the first has expired

11. The surplus generated by the first temporary contract is reported in a darker shade of orange when it does not coincide with the surplus of the second (i.e. the extension). Passing from the setting where one extension is allowed to the zero-

Figure 11: Effect of allowing for one contract extension

extensions situation, no job experiences a change in the type of contract used: what changes is the overall duration of temporary employment relationships. When extending is an option, firms offer an extension to all temporary contracts that expire without being hit by a shock. Therefore, limiting the number of possible extensions forces firms with expiring temporary jobs to choose between offering a permanent contract and losing the match, with the choice being taken on the basis of the threshold represented by I_P .

Finally, in Figure A2 we represent an increase in the cost of temporary contracts, modeled as an asymmetry between the contract-costs c of temporary and permanent jobs so that $c_T = c_P + g$.

Figure 12: Effect of an increase in the regulatory requirements for temporary jobs

(a) All temporary jobs affected

(b) Only temporary jobs of long duration affected

Panel 12a shows the effect of imposing such a rise in costs to all temporary

contracts: an increase in the share of permanent jobs (blue area) is accompanied by some job displacement (pink area), as the temporary jobs that are more exposed to shocks become unprofitable. The extent of this displacement will be determined both by the width of the segment and by the distribution of λ . Panel 12b represents instead the case of additional costs imposed only on temporary contracts above a certain duration, as it was the case for the D.D. for which the threshold was set at 1 year. In this case, the displacement effect can disappear, leaving instead the same shift from temporary to permanent jobs in place.

To sum up, these three kinds of changes will affect the relative position of the surplus functions of temporary and permanent contracts, thereby changing the value functions in System 7.

6.2.2 Firms

In the benchmark version of the model each firm offers exactly one job. This has two important implications: first, the model behaves as if all shocks were idiosyncratic across workers, with no role for firm-level disturbances; second, the model is unable to speak of differences in the hiring behavior of different firms and their link with basic firms characteristics such as size and productivity. In this section, we aim to address these limitations by acting on the assumptions regarding the distribution of shock arrival rates, the job-posting process and the determination of the surplus of each match.

Firstly, we assume that the value of the shock arrival rate is determined by two components: λ and w (e.g. a convex combination $\lambda = a\lambda + (1-a)w$, with $a \in (0, 1)$). λ is drawn at the firm level¹⁴ from the distribution $F(\cdot)$; w is mean-independent w.r.t. λ and it is drawn at the worker level from the distribution $W(\cdot)$. We assume that firms can post as many vacancies as they wish per period, subject

¹⁴ In the benchmark firm and job were indistinguishable

to a job opening cost function that is convex with respect to firm size. Once the firm observes its draw (f) it decides how many vacancies to open and when it gets to know the draw of the worker (w) it chooses whether to offer a job and which contract to use.

The fraction of firms that end up actually opening vacancies will depend on a system like 7, with the main difference that the surplus will now depend on the expectation of workers' shocks. We are currently working out the conditions that guarantee the existence and computability of this expectation.

7 Conclusion

Temporary contracts have exhibited a great expansion during the last three decades in many European countries as a result of the progressive de-regulation of their use opted for by policy-makers. In this paper, we study the occupational effects of the Dignity Decree, the first major labor market reform to invert this liberalizing trend by severely tightening the rules governing the use temporary contracts in Italy.

7.1 What We Know So Far

We first document a clear break in temporary employment growth right after the reform using aggregate data. We rule out some potential non-institutional explanations (e.g. sectoral reallocation) by showing the major role of the substitution across contract types in driving the overall temporary employment dynamics. We also document a concentration of temporary contracts duration close to one year, the threshold at which most provisions of the reform take effect.

We then use a regional matched employer-employee dataset to study the effect of the D.D. on occupational flows. Regression results support of the hypothesis that the D.D. has caused a substitution pattern between temporary and permanent

contracts like the one observed in the aggregate data. We additionally document an extensive use of conversions from temporary to permanent in shaping this pattern. Firms more exposed to the policy experience a stronger slowdown in employment growth after the reform, with lower (albeit positive / null) net labor flows, and lower turnover.

These results seem to suggest that the main effect of the Decree was a substitution of temporary jobs for permanent ones, with no significant consequences on aggregate employment or labor churning.

On the modeling side, the changes to the original framework allow us to provide predictions regarding the effects of the different provisions introduced by the reform. The introduction of a maximum duration to temporary employment relationships causes a shift towards the use of permanent contracts for a fraction of temporary hires. Limiting the number of possible extensions does not change the density of permanent and temporary jobs, but limits the average total duration of temporary employment relationships. Finally, an increase in regulatory costs – which in the case of the D.D. took the form of the introduction of a written justification requirement for temporary employment relationships above 1 year of duration – induces substitution from permanent to temporary contracts as well as job displacement for the least productive temporary workers.

7.2 Next Steps

7.2.1 Coverage and Information Detail

We requested access to employer-employee national records. This would provide improvements on the statistical power of our analyses and strengthen the external validity our conclusions. Furthermore, access to national records would greatly enrich the set of information we have on workers and firms. On one hand, this

would enable us to explore the effects of the reform on different types of workers. On the other hand, it would give us better tools to improve the classification of firms into groups based on pre-reform characteristics. We intend ρ in equation (2) to proxy for differential exposure to D.D. So far we have measured ρ with the ratio between the average monthly stock of temporary employees in any firms before 2017 and the average stock of employees. Ideally, instead, we would let the data tell us what groups of firms are there to be compared by performing a classification exercise based on common observable characteristics (size, location, sector, output, wage premium, ...) in the machine-learning spirit – e.g. k-means (Steinley 2006).

7.2.2 Wages

Information on wages would allow us to check whether the reform affected also this margin, thereby exhaustively describing the labor market adjustments in the post-reform equilibrium. We would examine whether the increase in conversions has been associated to an earning premium, or whether this dimension has been traded-off for more security in the market. To answer this question, we would frame a regression model of this type:

$$DW_{T|P,i,k} = g\bar{W}_{T,i} + X_{i,k}f + b_k + I_m + \epsilon_{i,k} \quad (8)$$

where $W_{T|P,i,k}$ is the log daily wage premium associated to the conversion for individual i in period k ; $\bar{W}_{T,i}$ is the average of log daily wages for individual i when temporary; $X_{i,k}$ is a vector of observable characteristics (age, experience, tenure,...) just before the conversion; I_m is a calendar-month fixed effect. Equation (8) would be estimated on the sample of individuals who at some point in any period k experience a within-employer transition from a temporary to a permanent contract. Coefficients f and b_k hence identify the evolution of the earning premium associated to conversions for similar incumbent temporary workers. We are primarily interested

in investigating the presence of a discontinuity in this quantity in July 2018 and in understanding and modeling the theoretical channels behind it.

7.2.3 Model

There are a number of steps yet to be taken before we are able to use the model to learn something about the reform.

First, we need to try check whether the hard-bounds limitations can interact with the increase in regulatory costs in some unexpected way, determining unexpected equilibrium results. This is being done by working on a surplus function $S(I)$ that will reflect all the proscriptions and limitations entailed by the reform.

Second, we will bring our model to the computer: our objective is to estimate the relevance of the justification requirement in increasing the regulatory costs that firms face, so as to be able to identify which aspects of the reform matter most in shaping the new labor market equilibrium. Moreover, this would allow us to perform counterfactuals and answer the two questions that we posed in introducing our model section (see Section 6).

Finally, we will need to find a way to accommodate the proposed worker-level component of the shocks arrival rates so that, before firms learn about it, they can still form expectations regarding the surplus that a new job will generate and evaluate whether and how much opening a new vacancy will be profitable. In practice, this amounts to choosing a suitable distribution function for the shock w and to finding a functional form linking it to I that will allow the existence of the expectation of the non-linear surplus function $S(I)$.

Given the current state of advancement, we can not delve into the two questions posed at the beginning of Section 6 yet. Nevertheless, we summarize how we plan to provide an answer to them when the model will be calibrated in Section A4.

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Appendix

A1 Figures

Figure A1: Employment rate in the working-age population (Italy, 2010-2019)

Note: Employment rate for people aged 15-64 in Italy (2010-2019). Source [FRED](#)

Figure A2: Strictness of EPL in Europe

(a) Restrictions on temporary contracts

(b) Protection for permanent contracts

Note: Strictness of the Employment Protection Legislation regarding permanent and temporary jobs for France, Germany, Italy and Spain. The indicator is a synthetic measure of the level of protection against dismissals for permanent contracts and of the level of regulation for the use of temporary contracts. Source [OECD](#)

Figure A3: Distribution of stock-based p_i at the firm level

Note: Distribution of stock-based p_i at the firm level (2012-2016). Left panel: full distribution. Right panel: distribution without $p_i=0$ and $p_i=1$. Source Mercurio, see Section 3.1.3.

Figure A4: Reforms and interventions in the Italian labor market

Note: Timeline of reforms and interventions in the Italian labor market (2015-2019). Structural reforms are reported on top of the timeline, while hiring subsidies at the bottom. For subsidies, filled bars indicate periods in which it is possible to gain entitlement to the subsidy, and pattern-filled bars indicates the benefit duration.

A2 Tables

A3 Background

The progressive diffusion of temporary contracts in Italy dates back to the 1990s, when a number of reforms started a process of temporary contracts liberalization that continued throughout the 2000s. As underlined in Daruich, Di Addario, and Saggio (2020), most of these legislative measures were partial, meaning that, while the regulation of temporary contracts was largely relaxed, the employment protection measures associated with permanent positions remained unchanged. Over the years 2010s, on the contrary, three major reforms significantly intervened on the Italian labor market by acting on the legislation concerning both types of contract.

In 2012, the Fornero Reform¹⁵ attempted to reduce the regulatory gap between permanent and temporary contracts by acting on both sides: on one hand, it reduced the uncertainty about firing costs associated to permanent positions¹⁶; on the other hand, it made more costly the renewal of temporary contracts¹⁷.

In 2015, the Jobs Act brought even further the reduction of protection for permanent positions¹⁸ but at the same time strongly liberalized the use of temporary contracts¹⁹.

The third of these reforms was the Dignity Decree, the object of interest of our

¹⁵ Law 28 June 2012, n. 92 (Not to be confused with the Fornero Law (pension system reform from the same minister))

¹⁶ Fornero Reform eliminated the automatic reinstatement of a worker in the job in some cases of unlawful dismissal (the judge can opt for a monetary compensation)

¹⁷ Fornero Reform introduced the requirement of an explicit justification for the recourse to temporary employment (except for the first contract) and increased the social contribution for renewals by 1.4%

¹⁸ Jobs Act introduced the graded-security contract, which limits the reinstatement to discriminatory dismissals and sets a predetermined level for the compensation for unfair dismissals, proportional to job tenure. In September 2018, the Constitutional Court Sentence 194/2018 stroke down this pillar of Jobs Act by determining that a judge can once again step in to decide the amount of the severance

¹⁹ Poletti Decree eased the process of entry and renewals associated to temporary positions alongside and removed the requirement of a justification for any temporary employment relationships up to 36 months and/or to 5 extensions

study (see Section 2.3).

Despite the period between the introduction of the Jobs Act in 2015 and the signing of the D.D. in 2018 was a relatively calm one on the side of changes in labor market legislation, the various governments in charge during those years still took an interventionist stance with respect to employment: four waves of subsidies flooded the Italian labor market with the aim to incentivize firms to hire workers with a permanent contract²⁰. To better visualize the whole institutional picture, in Figure A4 we report the timeline of the reforms and interventions undertaken in the Italian labor market starting from 2015.

While the first two waves of subsidies – those of 2015 and 2016 – were very large and directed to the entire labor force, the subsequent two waves – starting in 2017 – were much more restricted in size and targeted to specific groups of workers: those working in a firm located in regions of Southern Italy and those under 35 years of age.

²⁰ Subsidy programs:

- (i) Untargeted 3 Year: total exemption - with 36 months duration - from employer's social security contributions, with a 8060 cap each year
- (ii) Untargeted 2 Year: 40% exemption - with 24 months duration - from employer's social security contributions, with a 3250 cap each year
- (iii) Targeted - Firms in the South: total exemption - with 12 months duration - from social security contributions, with a 8060 cap each year
- (iv) Targeted - Firms hiring Under-35 workers: 50% exemption - with 36 months duration - from the payment of social security contributions, with a 3'000 cap

A4 Model

The surplus functions for permanent and temporary contracts are modelled as

$$\begin{aligned}
 S_P(l) &= J_P(l) + W_P(l) - U \\
 &= \int_0^{\infty} \int_0^t [y - w(l)] e^{-rt} dt - F e^{-rt} - \int_0^{\infty} l e^{-lt} dt - c \\
 &+ \int_0^{\infty} [w(l)] e^{-rt} dt + U e^{-rt} - \int_0^{\infty} l e^{-lt} dt - U
 \end{aligned} \tag{9}$$

and

$$\begin{aligned}
 S_T(l, D) &= J_T(l, D) + W_T(l, D) - U \\
 &= \int_0^D [y e^{-lt} - w(l, D)] e^{-rt} dt + \max\{fJ_P(l), 0\} g e^{-(r+l)D} - c \\
 &+ \int_0^D [w(l, D) - rU] e^{-rt} dt + \max\{fW_P(l), U\} g e^{-(r+l)D} + U(1 - e^{-(r+l)D})
 \end{aligned} \tag{10}$$

where y represents production (equal for all firms); $w(\cdot)$ represents workers wage function; F represents a *red-tape* firing cost (i.e. no severance); U represents the value of unemployment; t represents the random date at which a job becomes unproductive; c represents general contract-costs.

The optimal duration of temporary jobs Δ maximizes $S_T(l, d)$. The F.O.C. of the maximization problem is

$$y e^{-lD} - rU - (r+l) e^{-lD} \max\{fS_P(l), 0\} g = 0 \tag{11}$$

which, rearranging terms, provides a decreasing functional relationship between optima duration D and the shock arrival rate l

$$\begin{aligned}
 D(l) &= \begin{cases} \infty & \text{if } l < l_P \\ \geq \frac{1}{l} \ln \frac{rU + lF + (r+l)c}{rU} & \text{if } l = l_P \\ > \frac{1}{l} \ln \frac{y}{rU} & \text{if } l > l_P. \end{cases}
 \end{aligned} \tag{12}$$

When the possibility to extend the contract one time is added, we need to specify a surplus function for each of the two consecutive temporary employment spells.

At the end of the first spell the worker and the firm will have the chance to choose whether to break the match or to continue the employment relationship; in the latter case they will need to choose between extending the contract for another temporary spell or converting it into a permanent contract:

$$S_{T_1}(l, D_1) = \int_0^{D_1} [ye^{-lt} - rU]e^{-rt} dt + \max\{S_P(l), S_{T_2}(l, D_2), 0\}e^{-(r+l)D_1} - c \quad (13)$$

At the end of the second spell the choice will instead be the same as in the case with no extensions:

$$S_{T_2}(l, D_2) = \int_0^{D_2} [ye^{-lt} - rU]e^{-rt} dt + \max\{S_P(l), 0\}e^{-(r+l)D_2} - c \quad (14)$$

The optimal duration values D_1 and D_2 are calculated in the same way as what was done in equation 11, providing similar decreasing relationships between duration and shock arrival rates.

What follows in the next two subsections is a brief explanation of how we plan to use this model to answer the two questions outlined in Section 6.

A4.1 Business Cycles

A change in the stance of the business cycle can be introduced in this framework by a change in the distribution $G(\cdot)$ from which the shock arrival rate l is drawn. We can think of this taking Figure 9 as a point of departure and imagining how large the impact of each of the changes represented in Figures 10, 11 and 12a would be for different underlying distributions. On the aggregate, these effects would be proportional to the share of workers that occupy each of the intervals described in Figure 9. An increase in the average shock arrival rate, for instance, would shift away workers from the leftmost part of the graph and push them towards the right side. Under this setting, the higher the share of workers with a high shock arrival

rate, the higher the job displacement effect that an intervention like the increase in contract-cost for temporary contracts (Figure 12a) would create. We plan to investigate this relationship further by making explicit our assumptions about the distribution $G(\cdot)$ from which the shock arrival rate λ is drawn for each match.

A4.2 Opposite Reform, Specular Effects?

The second counterfactual exercise that we aim at conducting with the model is to think about the differences that could arise between the effects of two opposite reforms: a liberalization and a strengthening of the regulation concerning temporary contracts.

Our prior is that the effect would not be necessarily specular due to the central role of conversions in determining the relative weight of temporary to permanent jobs. Given that conversions can only work one way (from temporary to permanent) and that consequently their number can only be positive, if a temporary contracts liberalization were to push conversions to zero, the only further way for firms to substitute between contracts would be to wait for a fraction of permanent workers to exit the market (most likely, retire) and then hire new workers through temporary contracts. This however, would take considerable time.

The same would likely not happen in the opposite case of a strengthening of temporary jobs regulation: in this case, conversions could increase up until all temporary jobs get transformed into permanent ones, with the change taking no delay.