Job Ladder Consequences of Employment Protection: Theory and Evidence from Peru*

Pedro Casavilca Silva†

February 26, 2024

Click here for the latest version

Abstract

This paper sheds light on the intricate relationship between employment protection and labor market dynamics. I examine the decisions made by firms and workers regarding the supply and demand of various types of jobs, including informal, temporary, and permanent positions, as well as the dynamics of worker transitions between these categories. I also study the consequences of employment protection, analyzing how severance pay for permanent contracts affects worker transitions. To explore these issues, I develop an equilibrium model with directed search, where firms and workers jointly determine the types of contracts available in the market. The model is estimated using the novel Peruvian Employer-Employee dataset. In equilibrium, workers climb a job ladder, where informal jobs constitute the initial step into the labor market, and temporary contracts serve as a stepping stone to permanent positions, which workers value the most. In the short run, reducing the severance pay from 6.0 to 1.2 monthly wages promotes total formal employment. Moreover, it generates a substitution of temporary jobs for permanent ones, improving the internal composition of formal labor. However, these gains decrease by more than 50% in the long run when firms pay higher wages to permanent employees to compensate them for the loss of job security. This difference between short and long-run effects highlights the importance of analyzing employment protection policies through the lens of an equilibrium model.

JEL Codes: J31, J41, J46, J64, O17
Keywords: Informality, Fixed-term contracts, Employment protection, Directed search

*I thank Costas Meghir, Orazio Attanasio, and Ilse Lindenlaub for their invaluable mentorship and advice. I thank Fabrizio Zilibotti, John Eric Humphries, Cormac O'Dea, Jaime Arellano-Bover, Kerstin Holzheu, Lucas Finamor, Bernardo Ribeiro, Mirco Dinelli, Hanxiao Cui, Maria Teresa Sarmiento, and participants at the Labor/Public Finance seminars at Yale University for valuable comments and suggestions. I thank the Yale Center for Research Computing, especially Michael Rothberg, for their valuable help in submitting computational runs on the Grace cluster. This project uses the Peruvian Employer-Employee dataset (*Planillas Electrónicas*), provided by the Ministry of Labor of Peru (MTPE). I thank MTPE for granting permission to use the de-identified dataset and Patricia Pérez, Katia Samanamud, Ana Gómez, and David Tenorio for their guidance in requesting the data. I take full responsibility for the findings presented in this paper, which do not imply any endorsement or involvement by MTPE.

†Yale University - Department of Economics. Email: pedromiguel.casavilcasilva@yale.edu.

1 Introduction

In many developing countries, informal employment is a widespread phenomenon. It accounts for over 30% of the labor force and favors the prevalence of small and low-productive firms, contributing to wage inequality and the lack of long-term growth[1]. In contrast to the traditional perspective, which depicts informal labor as a disadvantaged segment in a segmented labor market, it is a dynamic sector. It exhibits significant transitions to formal employment among homogeneous workers[2]. Recent literature has addressed this dynamic through search frictions, which generate profitable opportunities for firms to create informal vacancies (Meghir et al. (2015) and Bobba et al. (2021)). However, it has paid much less attention to the internal composition of formal employment, which gathers two types of formal contracts: fixed-term or temporary and open-ended or permanent. Although both formal contracts abide by labor regulations, providing amenities and unemployment insurance in the event of separation, only permanent jobs *de facto* provide employment protection through severance pay upon firing. This generates tension between workers and firms. While workers may value permanent contracts the most, firms may prefer to retain the flexibility to carry out labor adjustments, diverting workers to less valuable and more fragile temporary and informal jobs.

Although the relationship between informal employment and labor regulation has gathered the interest of a growing literature[3], the effects of employment protection in a labor market where informal jobs coexist with two types of formal contracts have received much less attention. Moreover, determining the impact of severance pay is challenging because it generates counteracting effects on firms' profitability of hiring a permanent worker. For instance, an increase in severance pay reduces firms' profitability. However, to offset this negative impact, firms may reduce the entry wages of their permanent employees (Bentolila et al. (2020)). Also, they may vary the mix of informal, temporary and permanent job offers, affecting the composition of jobs in the labor market.

This paper studies how firms and workers choose to supply and demand informal, temporary, and permanent jobs and how workers transition between them. Moreover, this paper determines the equilibrium consequences of employment protection on workers' transitions, affecting the share of formal employment and its internal composition. Using rich survey data from Peru, combined

[1] When including self-employment, the share of informal employment increases to 70% (Elgin et al. (2022) and Loayza et al. (2009) for the cases of Emerging markets and development economies, and of Latin American countries, respectively).

[2] Maloney (2004) and Magnac (1991) discuss the traditional perspective of segmented labor markets. Moreover, Maloney (1999) is among the first studies highlighting the dynamics between informal and formal employment.

[3] For example, Meghir et al. (2015), Ulyssea (2018) and Haanwinckel and Soares (2021) for the case of Brazil.

with its novel Employer-Employee dataset (*Planillas Electrónicas*, PE hereafter), I first document three facts for the sample of male dependent workers (employees) aged 18-64 in firms with five or more employees in the private sector. First, workers tend to gradually progress from unemployment to jobs with higher formal status, typically starting their careers on an informal job and then transitioning to a temporary job and ultimately a permanent position. Second, firms hire workers on different contracts. However, relative to less productive firms, more productive ones hire a larger share of their employees on permanent jobs. Third, a Constitutional Court's resolution that increased the firing costs in 2002 generated a negative causal effect on firms' posting of permanent jobs, resulting in a substitution of permanent for temporary workers within firms. I then develop an equilibrium model with directed search on and off the job. The purpose of this model is to account for this evidence and the long-run effects of severance pay, which includes wage adjustments made by firms. In the model, firms and workers choose the type of contract to supply and demand, respectively. Moreover, in equilibrium, in response to a reduction in severance pay, firms have to pay higher wages to permanent employees to compensate for the loss of job security. I estimate the model on Peruvian post-reform data and quantify the impact of a reduction in employment protection that reverts the legal reform in 2002.

Peru constitutes a prominent case to address the purposes of this paper. First, it exhibits a high share of informal jobs, reaching 49% of total employees in the private sector[4]. Second, it makes an intensive use of temporary contracts, reaching 74% of formal employees in the private sector or 38% of total employees in the private sector. Finally, in 2002, Peru imposed an extreme employment protection policy: it forbade firing at will and allowed dismissed workers to pursue reinstatement into the job. This implies a significant high level of employment protection on permanent jobs, comparable to that of well-studied cases such as France and Spain[5].

I build an equilibrium model with directed search to account for the three key facts described earlier and the long-run effects of severance pay. In the model, the labor market is organized in submarkets indexed by two dimensions: (i) the expected present discounted (PD) value of holding a job in the submarket and (ii) the type of contract that delivers the value, which can be informal, temporary or permanent. The three classes of jobs exhibit different labor regulations and features. Regarding the former, only temporary and permanent abide by labor regulations. Therefore, they impose corporate taxes and labor income on firms and workers, and provide unemployment insurance paid by the employer upon job destruction. In addition to this, only permanent jobs

[4]These percentages correspond to 2015 - 2019, prior to the adverse impacts of the COVID-19 pandemic (see Figure 1). Moreover, they consider the sample used in this paper: male employees aged 18-65 working in firms with five or more employees in non-agricultural, non-public administration, and non-defense industries. The most recent data available corresponds to 2022. In the sample, informal jobs reach 57% of total employees in the private sector.

[5]As shown in Pierre (2004).

offer employment protection in the form of firing costs[6]. Regarding the features of each contract, they differ in (i) the separation probability, (ii) the probability of engaging in job search, and (iii) the job-finding rate. In the estimated model, these features are decreasing in the formal status of the contract: formal permanent jobs have the lowest separation rate, probability of engaging in job search, and job-finding rate.

There is directed search off and on the job. Taking as given the vacancy-filling rate and the job-finding probability in each submarket, heterogeneous firms and homogeneous workers choose the type of contract to supply and demand, respectively[7].

Workers choose the submarket where to apply for a job by maximizing the expected return to search. In making this decision, they trade off a lower job-finding probability (JFP) against a higher surplus of getting a new job. Importantly, the PD value of their current employment position affects this trade-off, which implies that applicants optimally separate according to their current states. In equilibrium, workers with a given current value optimally target submarkets offering a higher value[8].

Firms decide which value to promise to the worker and the type of contract to deliver it by comparing the expected value of creating a vacancy in a given submarket with its unit vacancy cost. Submarkets are feasible to the firm when this comparison is favorable. Among feasible submarkets, firms face two trade-offs. First, for a given type of contract, as the promised value increases, they trade off higher vacancy-filling rates against lower expected profits of hiring. Second, for a given promised value, as the formal status of a job increases from informal to formal permanent, firms balance out higher labor regulation costs against lower wages and a higher retention probability of an employee. On the one hand, as the type of contract varies from informal to formal permanent, firms encounter more regulation costs and employment protection. On the other hand, firms benefit from paying lower wages and a higher retention probability, which allows the firm to make profits for longer. This higher retention is a result of the reduced estimated separation shock and the decreased worker's probability of engaging in job search.

In equilibrium, the types of jobs and wages emerge endogenously. On the one hand, firms are indifferent between posting informal, temporary, and permanent vacancies in feasible submarkets because creating them yields the same expected return. On the other hand, workers optimally separate according to their current states, with workers currently earning some value optimally

[6]In the literature, it is a standard practice to consider that temporary jobs are exempt from firing costs. It is usually assumed that temporary contracts are held until expiration or cannot be destroyed. I assume the former. See Cahuc et al. (2016) or Cahuc and Postel-Vinay (2002) for the two types of assumptions.

[7]I consider homogeneous workers motivated by the fact that 83% of the overall wage inequality is within-education-group variance. See Appendix D for details on the variance decomposition.

[8]This endogenous separation is a standard outcome in models with directed search. See Shi (2009).

targeting jobs in submarkets offering higher values.

I estimate the model on the Peruvian economy. Using the Method of Simulated Moments (MSM), I match the distribution of the unemployed and employees across types of jobs, (ii) the 12-month (annual) transitions from each employment state, (iii) the average wages for all employees, permanent, temporary and informal employees; and (iv) the average share of permanent workers among formal employees for firms grouped into four clusters.

My model can account for the three key features observed in the Peruvian data. It provides two main results on the selection of workers into different contracts and contract supply by firms.

First, in equilibrium, there exists a job ladder with transitions between informal, temporary, and permanent jobs. The unemployed workers optimally target informal jobs, which constitute a first step towards formal employment. Informal employees, in turn, move towards temporary contracts, which serve as a bridge to highly valued permanent jobs. This sorting arises because, for less valuable positions, finding an informal job is the most likely across contracts. This generates that, among unemployed workers, the return to search for informal jobs exceeds that for temporary and permanent jobs. However, as the promised value of a job increases, the JFP of informal positions decreases more rapidly compared to other types of jobs. This dynamic leads to the displacement of informal jobs by temporary positions, followed by a subsequent displacement of temporary jobs by permanent contracts, as these choices become more attractive to workers in generating the highest expected surplus. In this context, an unemployed worker enjoying a given low value targets an informal job offering a higher value. However, as the worker makes progress in his career, he seeks higher values progressively offered on temporary and, ultimately, permanent jobs. Crucially, as the promised value increases, wage offers for each contract type increase, albeit at a decreasing rate, as the formality condition rises. Therefore, wage offers for informal jobs increase by the largest amount, reducing the relative attractiveness of offering informal positions for firms. This generates the accelerated decline in the JFP for informal positions as workers advance in their careers[9].

Second, firms hire workers on the three types of jobs. Despite their labor regulation differences, firms become indifferent between them by balancing out the expected profits of hiring on each type of job against the different vacancy-filling rates. Moreover, more productive firms are more likely to hire more permanent workers. This arises because, compared to their less productive counterparts, highly productive firms operate in more valuable submarkets, which provide more formal contracts.

[9]The reason the informal wage offer increases more than the other contracts as the promised value increases is due to the result that the slope of the workers' value function increases with the formality condition of the job. Therefore, for a given increase in the promised value, the informal wage offer has to increase more than that of temporary and permanent jobs (Section 6.3).

My main quantitative exercise is to analyze the impact of a reduction in severance from 6.0 to 1.2 monthly wages, which reverts the firing regulation change of 2002. The reduction generates short and long-run effects. In the short term, excluding changes in relative wages and firm contract offers, reducing severance pay creates a steeper job ladder. This results in increased permanent consumption at the top, attributed to the availability of more valuable and readily accessible permanent jobs. These higher probabilities facilitate quicker transitions to permanent positions, leading to two outcomes: (i) a full substitution of temporary jobs for permanent ones, enhancing the composition of formal employment, and (ii) a 3.5 percentage point (pps) boost in total formal labor. However, these benefits diminish by over 50% in the long term, as firms are compelled to offer higher wages to permanent employees to compensate them for the reduced job security. In equilibrium, the job ladder exhibits slightly higher levels of permanent consumption and improved job-finding prospects primarily at the top. In this context, the substitution of temporary jobs for permanent ones becomes partial, resulting in a 3.3 pps rise in the proportion of permanent workers among formal employees. Moreover, total formal labor increases by 1.6 pps, while unemployment marginally increases by 0.1 pps[10].

Importantly, the reduced severance pay alters the equilibrium by affecting firms' profitability of hiring permanent workers. The impact takes place through two counteracting mechanisms. On the one hand, for a given wage, the lower severance pay directly increases the firms' value of hiring permanent workers. On the other hand, it reduces the workers' value of holding a permanent job. Therefore, the wage that needs to be offered in submarkets offering permanent contracts increases, reducing the firms' value. In the estimated model, the first mechanism dominates and generates two effects. First, a larger set of submarkets where firms find it profitable to post permanent vacancies. Second, a higher equilibrium market tightness in submarkets offering permanent jobs, boosting workers' probability of finding a permanent job. The combination of these effects fosters workers' return to search for permanent jobs and increases the value delivered on permanent contracts in equilibrium. One of the most interesting features of the model is that the higher value of search for permanent jobs propagates to the lower temporary and informal rungs by weakly increasing their value of search and, therefore, the value of holding these other types of jobs. Intuitively, given that permanent contracts are offered at the top of the ladder, the return to search for permanent jobs is part of the continuation value for temporary and informal workers. Since climbing the job ladder takes time, and there are separation shocks and job search probabilities at each rung, the

[10]This last negligible effect contrasts with the findings of the literature on job security and employment, which suggest null to small positive impact of lower employment protection. See, for example, Cahuc and Postel-Vinay (2002) or Daruich et al. (2022) for European countries; and Heckman and Pagés (2004), Kugler (1999) or Tejada (2017) for Latin America countries.

increase in the value of searching for permanent contracts less than proportionally increases the value of holding a job on a lower rung. In equilibrium, this reduces the offered wages in temporary and informal submarkets, fostering the firms' profitability in posting these jobs.

This paper contributes novel insights into the equilibrium effects of employment protection and informal employment. In the short run, reducing the severance pay yields positive impacts on formal employment and permanent hiring. However, the magnitude of these effects significantly diminishes in the long run as firms adjust relative wages and contract offerings in response to firing regulation policies. This difference between short and long-run effects highlights the crucial need to examine employment protection policies through the lens of an equilibrium model. Moreover, the equilibrium job ladder found in this study provides a new perspective on informality. Rather than being an isolated state to avoid unemployment, informal employment can be an integral part of workers' careers. From a policy perspective, this shifts attention away from policies tackling the existence of informality towards those aiming to accelerate workers' transition from fragile informal jobs to more valuable formal ones.

Related literature. This paper is related to three strands of literature. First, to the literature on the impact of labor protection on employment in dual economies where the labor market gathers two types of formal contracts: temporary and permanent. This part of the literature highlights that, in principle, the impact of labor protection on employment is ambiguous (Cahuc and Postel-Vinay (2002), Aguirregabiria and Alonso-Borrego (2014), Bentolila et al. (2020)). However, it offers two robust findings in contexts where employment protection on permanent contracts is relatively more stringent than that on temporary jobs, which hinders the latter's conversion rate. First, employment protection generates null to a small negative impact on employment. Second, temporary hiring significantly increases relative to permanent, exposing workers to lower-paid and more fragile jobs and widening the wage gap between workers (Daruich et al. (2022), Cahuc et al. (2016), Tejada (2017), Tito (2011), Lazear (1990), among others).

I depart from these papers in three dimensions. First, in my model, the composition of temporary and permanent jobs and their wages emerge endogenously as firms and workers solve different types of trade-offs. Second, relative to more recent studies considering the share of temporary employees as an equilibrium outcome (Tejada (2017), Cahuc et al. (2016), Aguirregabiria and Alonso-Borrego (2014) and Berton and Garibaldi (2012)), I enrich firms and workers' trade-offs by considering a rich set of labor regulations, allowing temporary and permanent contracts to have different benefits and costs to firms and workers. Third, I introduce on-the-job search and informal jobs to a dual labor market. This introduction allows me to explain the imperfect substitution between the three types of contracts observed in the data. In addition to this, to the best of my knowledge, this is the first study that examines the role of employment protection in a labor

market where informal jobs coexist with temporary and permanent contracts. Recognizing the three types of contracts is important since transitions from informal to formal employment occur mainly through temporary jobs, which can represent a significant share of formal employment in many developing countries.

Second, this paper relates to the literature on labor regulation in informal labor markets. Three lessons arise. First, informal jobs impose trade-offs between (i) *de facto* flexibility to cope with shocks in the presence of burdensome labor regulation and (ii) misallocation of resources, potentially generating productivity losses (Bobba et al. (2021), Dix-Carneiro et al. (2021), La Porta and Shleifer (2014)). Second, the literature highlights that informality is related to search frictions. These frictions favor the prevalence of low-productive firms, which are more intensive in informal hiring (Meghir et al. (2015)). Third, among different policies that tackle informality, reducing hiring and firing costs fosters formal employment and reduces unemployment. However, their impact on welfare is less robust (Bosch and Esteban-Pretel (2012), Albrecht et al. (2009)).

The distinctive feature of my model is that firms and workers engage in directed search. In particular, they select into the types of jobs. On the one hand, firms choose the type of contract to offer and workers select the job to apply for. This search process generates sorting into the three types of contracts consistent with the transitions seen in the data.

Finally, I build on the standard model of directed search models such as Balke and Lamadon (2022), Menzio and Shi (2010), Shi (2009) and Delacroix and Shi (2006) to account for the three types of jobs[11]. In the standard version, directed search models allow value and policy functions to be independent of the distribution of job seekers and offers across submarkets. This property, called Block Recursivity, simplifies the equilibrium (Shi (2009) and Menzio and Shi (2010))[12]. I develop on this version to account for different contracts and the gradual transition from unemployment to jobs with higher formal status suggested by the data. Moreover, I use directed search to tractably solve for an equilibrium with different jobs and a continuum of submarkets. This approach provides predictions supported in the data, including a negative correlation between job mobility and total tenure and a non-monotonic wage distribution[13].

Outline. The rest of the paper is organized as follows. Section 2 describes the institutional framework, data sources, and sample used in this paper. Section 3 presents four features of the Peruvian labor market that motivate and inform the model. Sections 4 and 5 describe the equilibrium model with directed search on and off the job and explain the estimation procedure.

[11] Another important reference is offered by Garibaldi et al. (2016).

[12] Under random search, this independence does not arise. Instead, there is a two-way dependence between individual value and policy functions with the distributions of job seekers and wage offers, which are endogenous infinite-dimensional objects.

[13] This is observed using both ENAHO and *Planillas Electrónicas*. See Appendix B.

Sections 6 and 7 solve the model, describe the equilibrium job ladder, and discuss how it varies with a reduction in firing costs. Finally, Section 8 concludes.

2 Institutional Framework and data

I study the Peruvian labor market and consider employees in the non-agricultural private sector. I focus on the private sector because it has been subject to a unified Labor Code since 1997, which dictates a well-defined set of rules, including amenities, unemployment insurance and job security provisions for all formal contracts[14]. Moreover, the private sector gathers a sizable share of total non-agricultural employees: 79% over the last ten years[15]. In 2022, non-agricultural employees in this sector accounted for 5.8 million, exceeding the pre COVID-19 pandemic levels for the first time since 2019[16].

The Peruvian labor market has three characteristics conducive to the coexistence of different types of full-time jobs in the private sector[17]. First, it is governed by a unified Labor Code, which allows for open-ended (permanent) and fixed-term (temporary) formal contracts. These jobs are subject to unemployment insurance and employment protection rules. Second, it abides by a resolution of the Constitutional Court in 2002, which, in principle, increased the firing costs of both contracts. Finally, it bears the prevalence of informal jobs, which are those not supported by any explicit contract (i.e., hiring made 'out of books'). In this context, employees can hold one of three possible types of jobs: (i) formal permanent, (ii) formal temporary, and (iii) informal, each of which imposes different trade-offs to firms and workers.

2.1 The Peruvian Labor Code: permanent and fixed-term contracts

The Peruvian Labor Code establishes that all full-time formal arrangements are permanent. However, it allows the issuance of temporary contracts under three specific circumstances. First, to cover accidental or occasional needs such as those arising from an employee's accident or parental leave. Second, in the event of uncertain transitory situations such as (i) seasonal demand, (ii)

[14] *Law of Labor Productivity and Competitiveness*. March, 1997.

[15] The remaining 21% corresponds to employees in the public sector.

[16] Considering private and public sectors, there were 7.2 million non-agricultural employees in 2022. They represent 53% of the total employed in non-agricultural sectors. The remaining 47% corresponds to (i) self-employed and employers (42%) and (ii) unpaid family workers (UFW, 5%).

[17] In this paper, I focus on full-time jobs, which require four or more hours per day of work. They are subject to the full set of amenities and employment protection provisions, established in the Peruvian Labor Code. On the contrary, part-time jobs require less than four hours per day or 20 per week. Although they get health insurance paid by the employer, they do not offer paid holidays or job security provisions.

the beginning of operations or the extension of current ones, and (iii) firm's reconversion. Third, when a worker is hired to provide *specific services* or to engage in *specific projects*. In Section 3.4, I exploit this last circumstance to control for cross-sectional variation when testing a potential change in firms' posting decisions due to the Constitutional Court's resolution of 2002.

Under the current Labor Code, permanent and temporary contracts share four positive features. First, they are subject to the legal minimum wage, which currently amounts to USD 279 monthly. Second, they have the same probation period of 3 months, after which job security clauses become active and the worker becomes protected against firing[18]. Third, they include amenities, some of which are paid by the employer. Except for micro firms, these include paid holidays, profits sharing, and contributions to the public health insurance system[19,20]. Finally, permanent and temporary contracts offer a severance fund (*Compensación por Tiempo de Servicios*, CTS), which constitutes an unemployment insurance paid by the employer. Each year, while the labor relationship lasts, CTS is fed with a total of 0.5 and 1 employee's monthly wage in small and medium, and large firms, respectively. In each case, the Labor Code allows employees to partially access the CTS once it has accumulated at least three and five monthly wages. Upon separation, the employee is entitled to what remains in the fund.

Despite these similarities, permanent and temporary contracts differ in three dimensions: (i) duration, (ii) purpose, and (iii) incidence of the severance pay. Regarding the first, while permanent jobs are open-ended contracts, temporary jobs have a predetermined fixed duration. Although they can be renewed to work in the same firm, the total duration cannot exceed five years[21]. Importantly, if it does or if, within the maximum total duration, an employee still works without a renewal, the job becomes permanent[22]. Regarding purpose, permanent contracts can be issued under any circumstances, while temporary contracts are limited to occasional or accidental situations, uncertain transitory periods, and for the provision of a *specific service* or engagement in a *specific project*. Finally, severance payment in cases of 'arbitrary' firing, defined as an individual termination without an objective proven cause (i.e., firing 'at will'), predominantly influences permanent contracts. In contrast, for temporary contracts, where the job has a fixed-term duration, employers can potentially avoid severance payments by holding the labor relationship until

[18] The probation period is extended to 6 months and 12 months, in case of high-skilled workers or executive officers, respectively.

[19] Micro firms are those with annual sales less than or equal to 150 Tax Units (USD 180.5 thousand, in 2019). In this case, the employer is only responsible for the contribution to the public health insurance system. It can reach 2% of the employee's monthly wage if the firm applies for the subsidized public health insurance.

[20] Regardless of the firm's size, the employee is responsible for the contribution to the pension system.

[21] The maximum total duration can be less than five years in some specific cases. For example, it is three years for the beginning or extension of operations, and two years in the case of firm's reconversion.

[22] *Law of Labor Productivity and Competitiveness.* March, 1997. Article 77.

its expiration. This distinctive incidence remains in place after 2002, when firing costs increased significantly (Section 2.2).

Table 1 summarizes the key features of these two types of formal contracts and those informal jobs described later in Section 2.3.

Table 1: **Main features of permanent, temporary and informal jobs**

	Formal contract		Informal job
	Permanent	**Temporary**	('out of books')
Minimum wage	✓	✓	×
Probation period	✓	✓	×
Amenities	✓	✓	×
Unemployment insurance[1]	✓	✓	×
Duration	Unspecified	Fixed	Unspecified
Purpose	All	Predetermined	All
Severance pay incidence	✓✓	✓	×

Note: (1) Corresponds to the CTS, a severance fund which constitutes an unemployment insurance paid by the employer.

2.2 Firing regulation change of 2002: the Constitutional Court's resolution

Before 2002, a formal job could be terminated by (i) retirement, (ii) resignation, (iii) mutual agreement, (iv) expiration of the service or project that justified a temporary contract, or (v) firing[23]. An *individual* firing could mainly be one of two types[24]. First, a 'fair' firing, which is based on an objective cause related to ability or behavior of the worker. In this case, the employer was required to specify the reason and provide proof in an advance notification, and be ready to show them to a judge upon trial. In case the firing was justified, the employer was not required to provide any severance pay. Therefore, the dismissed worker was only entitled to the CTS. Second, an *individual* firing could be 'arbitrary' or 'at will'. In this case, the employer had to provide a well-

[23] *Law of Labor Productivity and Competitiveness.* March, 1997. Article 16.

[24] *Individual* firing is different from *mass* firing. In this second case, contracts can be terminated due to objective causes such as economic reasons, firm bankruptcy, or unexpected property destruction. However, termination must affect at least 10% of the total employees and, upon recovery, the firm is required to prioritize the hiring of dismissed workers.

defined severance pay, according to the type of contract[25]. Accordingly, the dismissed employee received both the CTS and the predetermined severance pay[26].

In 2002, on a lawsuit presented by a group of former employees against one of the main private companies of the time, the Constitutional Court published a resolution declaring 'arbitrary' firing as *illegal*, introducing the possibility of reinstatement upon this type of firing[27]. This resolution declared that, upon trial, a worker fired 'at will' can request (i) reinstatement; (ii) severance pay, which is not explicitly defined as it was before 2002; or (iii) both, according to what he prefers. Given that this resolution increases the bargaining power of an employee upon firing, it constitutes an increase in the firing costs of formal contracts to employers. Under this new firing regulation, in order to dismiss a worker, employers are forced to go over a costly process to prove an objective cause or bargain the worker's resignation, which potentially generates a higher cost[28].

Although the increase in firing costs affects all formal contracts, given the fixed-term nature of those temporary, the resolution has a differential effect on permanent contracts. In Section 3.4, I document that it encouraged firms to substitute open-ended for fixed-term jobs.

2.3 Dual and informal labor market

In Peru, employees in the private sector can hold either formal or informal jobs. Following a legal definition of informality, I consider that an informal job is not supported by an explicit contract. This implies that it is not subject to any labor regulation such as unemployment insurance and job security provisions (Section 2.1). Moreover, I consider that the informal sector gathers firms that are not registered with the tax authority and, therefore, are not subject to tax regulation nor able to issue formal contracts. Upon these considerations, while employees holding a formal job can only be found in registered firms, informal salaried workers can be found in an unregistered firm or in a registered firm that hired a worker 'out of books'[29].

Table 2 shows key characteristics of permanent, temporary, informal and formal part-time jobs, which are those requiring less than 20 working hours per week. The table reveals three features. First, full-time workers exhibit different characteristics. Permanent employees earn

[25]The severance pay equals 1.5 monthly wages per year worked and per remaining month in the predetermined duration, in the case of permanent and temporary contracts, respectively. Both were subject to a cap of 12 wages.

[26]A possible third type is an invalid or null firing, which happens when the dismissal was rooted in syndicalism, gender, or race. This case triggers either reinstatement or severance pay to the employee.

[27]Constitutional Court's Sentence 1124-2002-AA/TC. July, 2002.

[28]After the Constitutional Court's resolution, the number of firings during 1998 - 2001 decreased by 70% in the period 2004-2007. Moreover, the average severance pay received by dismissed workers increased 36% in real terms during the same period. See Figure 9 in Appendix C.

[29]Although the model does not consider firms' registration decision, it is consistent with the concept of extensive and intensive margin of informality developed by Ulyssea (2018).

higher wages, are older, and have more years of education than temporary and informal workers. In contrast, the latter earn the lowest wages and are the least educated among employees. Moreover, permanent employees work in larger firms, especially compared to the informal workers. Second, the average distribution of these contracts between 2015 - 2019 is tilted towards informal and temporary jobs, making up 48.8% and 38.5% of employees in the private sector, respectively. Third, informal employees and formal part-time workers share key characteristics: on average, they earn almost the same wage, which are subject to the same dispersion. Also, these two types of workers have similar age. Moreover, the Labor Code excludes part-time workers from paid holidays, unemployment insurance, and employment protection upon firing. As I describe later, I leverage on these similarities to use part-time workers as proxy for informal ones regarding wages and separation shocks, whenever data on informal workers is not available.

Table 2: **Description of data 2015 - 2019**[1]
(employees in the non-agricultural private sector)

	Formal contract		**Informal**	**Formal**
	Permanent	**Temporary**	('out of books')	**Part-time**[2]
Monthly real wages (in logs)				
Mean	7.4	7.1	6.6	6.7
SD	0.6	0.5	0.7	0.7
Average age	40.5	33.6	33.4	34.2
Average years of education	13.4	12.9	10.5	-.-
Average size of firm	1198	837	66	383
Average number of workers				
in millions	0.6	1.9	2.4	0.1
as % of full-time employees[3]	11.7	38.5	48.8	-.-
Women participation	34.2	38.0	35.9	48.8

Source: ENAHO and PE, Peru. Notes: (1) Table considers employees in firms with 2 or more employees. (2) Formal part-time employees correspond to those working less than 20 hours in past week. Their information is obtained from PE. (3) The remaining 0.9% of full-time employees corresponds to those in probation period or holding other types of contracts such as internships.

2.4 Data

I mainly use three datasets. First, the Peruvian Employer-Employee dataset (PE), an administrative dataset collected monthly by the Peruvian Tax Authority. It contains information on all formal employees in tax withholding firms[30]. For example, employer's location and industry group,

[30]The Tax Authority requires firms with one or more workers paying labor income taxes to act as tax withholding agents. These firms are required to register their own and workers' information every month. There are only three

and employee's wage, type of contract, occupation, reason for separation, educational attainment, among others. PE allows tracking employees' employment histories, including their transitions between formal contracts, job durations, and industries across time. For this paper, PE is available from January 2015 to May 2020[31]. During 2015 - 2019, on average, it gathered 3.0 million employees each month.

Given its nature, PE does not contain information about informal employees. However, borrowing from the regulatory similarities, I use formal part-time workers as a proxy of those informal workers regarding wages and separation shocks[32]. This allows me to document firms' hiring across contracts, J2J transitions and to compute several moments for estimation (Section 3.3, Appendix F, and Section 5.1).

In addition to PE, I also use the National Household Survey (ENAHO and ENAHO Panel). ENAHO is an annual cross-sectional dataset representative at the national level with detailed information on households' members since 1997. It allows me to characterize the informal, temporary, and permanent employees in the private sector and compute their corresponding shares before and after the firing regulation change of 2002[33]. From 2007, ENAHO includes a rotating panel sample with a maximum length of five years (ENAHO panel). I exploit this longitudinal sample to characterize the workers' annual transitions from each employment state, which I then use in estimation (Section 5.2).

Finally, I use the Annual Economic Survey (EEA), a firm-level cross-sectional dataset repeated yearly since 2001. It is representative at regional and industry levels and contains detailed information about registered firms, such as annual sales, total number of temporary and permanent employees, payroll expenses, firms' age, among others, all corresponding to the year prior to the survey. I use EEA 2001 - 2007 to identify the causal effect of the firing regulation change of 2002 on the share of permanent workers within a firm (Section 3.3). During this period, there were 18,129 reporting firms on average each year.

Across these datasets, I focus on male employees aged 18-64 working in firms with five or more workers in the non-agricultural private sector[34]. I focus on men to avoid potential confounding

types of firms exempt from reporting: (i) those only hiring domestic workers, (ii) those only occasionally hiring civil construction workers; and (iii) those only hiring independent workers for whom the firm is not the tax withholding agent.

[31] This dataset is de-identified.

[32] Although a part-time worker gets health insurance paid by the employer, he shares some similarities with an informal worker: he does not enjoy some amenities such as paid holidays or employment protection provisions such as unemployment insurance and severance payment upon firing.

[33] For 1998 - 2001, I use a supplementary survey to ENAHO called the Specialized Employment Survey (SES), which gathered more detailed information on types of contracts for those years.

[34] I consider information only on main job or activity.

effects from life cycle decisions, which are not part of this study. Also, considering that permanent jobs are held by significantly older people (Table 2), I restrict attention to employees aged 18-64. This allows me to better study transitions between informal and formal employment and within types of formal jobs. Moreover, I consider firms with five or more workers to prevent a scale effect distorting the share of temporary and permanent workers in a firm. Finally, I exclude the agricultural sector because it is subject to specific labor regulations. Appendix A provides more sample selection and data construction details.

3 Motivating Evidence

This section describes four empirical facts that motivate the equilibrium model and estimation. First, employment in the private sector is primarily informal, and formal employment is mostly temporary. Second, workers tend to transition from informal jobs to temporary and, ultimately, permanent contracts. Third, firms hire workers on different contracts, and more productive firms are more likely to hire permanent employees. Fourth, the Constitutional Court's resolution of 2002 generated a negative causal effect on permanent hiring.

3.1 Employment is primarily informal and formal employment is mostly temporary

Figure 1 illustrates the distribution of permanent, temporary, and informal jobs from 1998 to 2019, prior to the adverse impacts of the COVID-19 pandemic[35]. Panel A shows that, after the firing regulation change of 2002, there was a sustained increase in the proportion of formal workers, which went from 39% in 1998 - 2001 to 51% in 2015 - 2019. However, Panel B reveals that this was caused by a significant rise in the share of temporary workers, which opposes to the decline in the proportion of permanent ones: the former increased from 19% in 1998 - 2001 to 38% in 2015 - 2019, almost three times the share of permanent employees (13%). As a result, the labor market is, for the most part, informal, and formal employment is primarily temporary.

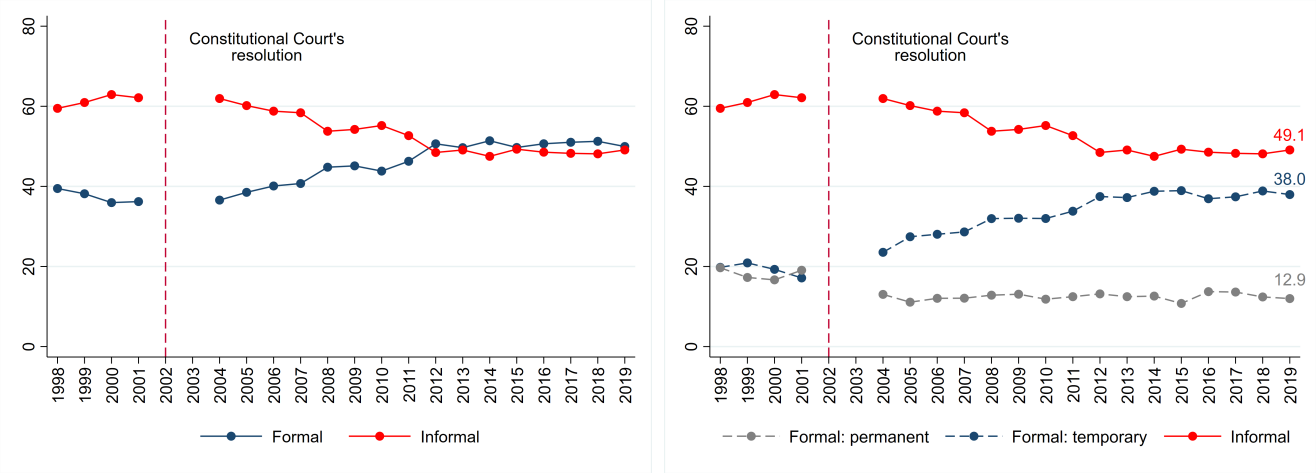
It is worth highlighting that, focusing on the stable period 2012 - 2019 after the firing regulation change, Figure 1 suggests that permanent, temporary, and informal jobs are imperfect substitutes. Despite the higher firing costs, which primarily affect permanent contracts, these jobs were still offered. Moreover, although the share of informal jobs decreased, it stabilized even above that of temporary jobs.

[35]The ENAHO-SES 2002 and 2003 do not allow to distinguish between types of formal contracts. Therefore, proportions for these years are not available.

Figure 1: **Employees in private sector 1998 - 2019**[1,2]

(as % of employees in private sector)

(A) By formality condition (B) By type of job[3]



Source: ENAHO-SES, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense industries. (2) ENAHO-SES 2002 and 2003 do not allow to distinguish the type of contract. (3) Employees in probation period or holding other types of formal contracts such as internships are not shown. During 1998 - 2019, they represent 1.0% on average.

3.2 Workers gradually progress from unemployment to jobs with higher formal status

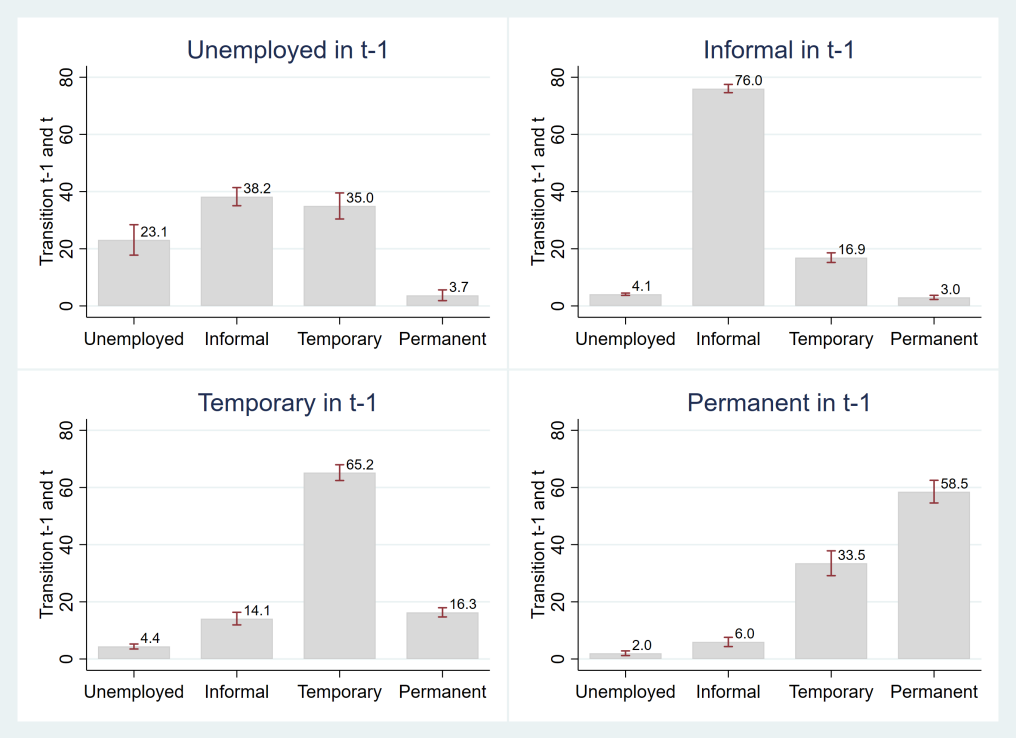
Considering the period 2015 - 2019, marked by a relatively modest economic growth rate of 3.2%, workers tend to gradually progress from unemployment to jobs with higher formal status. Figure 2 reveals two key observations. First, for individuals who were unemployed in a given year, the most common employment status one year later was informal employment (38.2%). Moreover, informal employees were most likely to remain in informal positions or transition to temporary roles (16.9%). Additionally, relative to the unemployed and informal employees, temporary workers had the highest probability of moving into permanent positions (16.3%). Second, each job type can be considered an absorbing state, as the likelihood of retaining the same employment status one year later exceeded 58.5%[36].

At this point, it is important to highlight that the conversion rate of a temporary contract to a permanent job is minimal. Using PE between 2015 - 2019, among temporary employees who moved to a new job in a given month, only 11.8% got a permanent contract and, among them, only 2.1% were upgraded within the same firm[37]. Based on this evidence, I consider that temporary

[36]See Appendix G.2 for the time series spanning 2007 - 2019.

[37]Following Güell and Petrongolo (2007) and Cahuc et al. (2016), the lack of conversion can be explained in

Figure 2: **Annual Transitions from Unemployment and Informal, Temporary and Permanent jobs**[1,2]



Source: ENAHO panel, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense industries. (2) Figure shows the average annual transitions and their 95% confidence intervals.

jobs are a flexible device for firms to produce while meeting labor regulation requirements. They do not play the role of a screening device towards a permanent contract.

3.3 Firms hire workers on different types of contracts

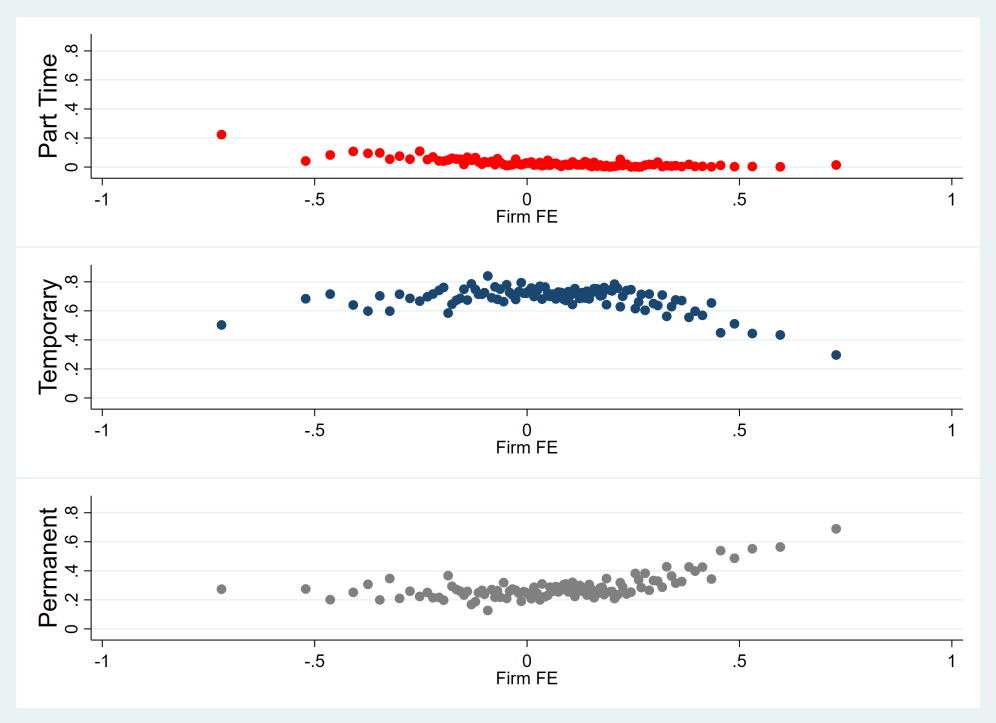
Figure 3 shows the distribution of part-time, temporary, and permanent employees in firms from 2015 to 2019, based on their productivity levels approximated by the firms' fixed-effects (FE) of an AKM two-way fixed effects regression[38]. This figure highlights two critical findings. First, for any given firm productivity level, firms hire workers on different types of contracts. On average, a firm hires 68% of its formal employees on temporary contracts, and the remaining 32% is allocated between permanent (29%) and part-time employees (3%). Second, more productive firms tend

contexts where workers' productivity is observed either from the beginning of the match or during the probation period. In the case of Peru, formal employees are subject to probation periods that range between 3 and 12 months, depending on the job to be performed.

[38]I performed this regression using the estimator described in Correia (2017).

to have a higher proportion of permanent workers, resulting in a lower share of temporary and part-time employees. For example, among the 25% least productive firms, 25% of their employees hold a permanent contract, 68% have a temporary contract, and 7% are on a part-time contract. In contrast, the top 25% of firms hire 38% of their employees in permanent positions, 60% on temporary jobs, and the remaining 2% under a part-time arrangement. Thus, while there is no perfect segmentation of contracts across firm types, there is significant sorting.

Figure 3: **Firms' share of formal employees by type of contract 2015 - 2019**[1,2]



Source: PE dataset, Peru. Annual shares from December 2015 - 2019. Notes: (1) Figure considers male employees aged 18-64 working in firms with 50 or more employees in non-agricultural, non-public administration and non-defense industries. (2) Firm Fixed Effects were estimated with AKM two-way fixed effects.

3.4 The firing regulation change of 2002 reduced permanent posting

As described in Section 2.1, in the presence of temporary contracts, firing costs affect mainly permanent jobs. Assuming homogeneous workers, increasing severance pay reduces the profitability of posting permanent relative to temporary contracts. Considering that they exhibit some level of substitution, this can induce firms to partially substitute permanent for temporary jobs.

I used firm-level data from EEA to test whether the share of permanent workers in a firm decreased as a result of the increased firing costs following the Constitutional Court's 2002 reso-

lution. I applied a difference-in-difference approach, controlling for temporary fluctuations in the legal corporate tax rate between 2001 and 2003, which might otherwise confound my estimates[39]. I consider firms in the construction sector as the control group. In this regard, although the resolution affects all formal (registered) firms, I exploit the fact that the Labor Code allows the issuance of temporary contracts when a worker is hired to provide *specific services* or to engage in *specific projects* (Section 2.1). Given that the construction sector provides well-defined services and projects, firms in this sector are less exposed to the resolution: they either use permanent contracts less intensively than firms in other sectors or they already are more flexible to substitute for temporary jobs, regardless of the firing regulation reform. This is supported by data from the EEA (Figure 13 in the Appendix G.1). Even before the increase in firing costs, firms in the construction sector had on average just 51% of their employees as permanent workers, 37 percentage points (pps) less than their counterparts in the commerce and services and manufacturing industries, which I consider as the exposed or treated group[40,41].

Considering that EEA provides information for the period 2000 - 2006, I estimated a pooled regression of the share of permanent workers controlling for (i) pre and post-2002 (Post2002), (ii) the condition of being a firm in the exposed group (exposed) and (iii) the interaction between these variables, among others. I added a variable to this baseline specification that captures whether a firm's real net sales per worker belonged to the bottom 25% of the distribution of its corresponding industry. This extension aims to identify a possible heterogeneous change in permanent workers' share for low-productive firms. The full specification is the following:

$$\begin{aligned}\text{Share of permanent}_{it} = \beta_0 &+ \beta_1(\text{Post2002}_t \times \text{exposed}_{it} \times \text{low productive}_{it}) \\ &+ \beta_2(\text{Post2002}_t \times \text{exposed}_{it}) + \beta_3(\text{Post2002}_t \times \text{low productive}_{it}) \\ &+ \beta_4(\text{exposed}_{it} \times \text{low productive}_{it}) \\ &+ \beta_5\text{Post2002}_t + \beta_6\text{exposed}_{it} + \beta_7\text{low productive}_{it} \\ &+ \sum_{j=8} \beta_j x_{j,it} + \epsilon_{it}\end{aligned}$$

where $x_{j,it}$ correspond to age of the firm, time trend, legal corporate tax, region dummies and minimum wage.

This equation is estimated with and without potential heterogeneity for low-productive firms.

[39] In 2001, the legal corporate tax rate was reduced from 30% to 20% for firms reinvesting profits. In 2002 and 2003, the tax rate was 27%. From 2004 - 2014, it returned to 30%.

[40] Commerce and Services sector does not include health, restaurants, and hotels.

[41] In 2019, before COVID-19, Commerce and Services, Manufacturing and Construction sectors gathered 45% of the total employed or 61% of employees in the private sector.

Results are shown in Table 3. It reveals that the firing regulation change had a negative causal effect on firms' share of permanent workers. In particular, it decreased by 4.5 pps. Moreover, the reform did not affect the least productive firms. Given that companies in the EEA only report employees under permanent and temporary contracts, the reduction generates an equivalent increase in the share of temporary employees within a firm. Moreover, considering that the Labor Code forbids the substitution of permanent for temporary contracts for a current employee[42], the reduction should correspond to an increase in posting new temporary contracts relative to permanent ones. Therefore, the Constitutional Court's resolution discouraged firms to post permanent jobs relative to temporary ones, generating a substitution towards temporary workers[43,44].

Table 3: **Impact of the Constitutional Court's resolution of 2002**

	Share of permanent workers	
	(1)	(2)
	Coef./SE	Coef./SE
Post2002 × exposed	-0.045**	-0.050**
	(0.019)	(0.022)
Post2002 × exposed × low productive	-.-	0.022
		(0.046)
Effect on low productive	-.-	-0.027
		(0.041)
Period	[2000-2006]	[2000-2006]
Exposed mean pre 2002	0.873	0.873
Control mean pre 2002	0.506	0.506
Firm's age FE	Yes	Yes
Corporate Tax, Year FE	Yes	Yes
Observations	22,528	22,528
R-squared	0.129	0.130

Source: EEA, Peru. Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

[42] *Law of Labor Productivity and Competitiveness.* March, 1997. Article 78.

[43] This substitution effect of more stringent labor protection implies some degree of substitution between these two types of contracts. This result is consistent with theoretical and empirical literature. See Cahuc et al. (2016) and Daruich et al. (2022).

[44] EEA does not contain information on informal employees, which can be a limitation. Therefore, I performed a complementary test from the workers' perspective using ENAHO. Considering all types of jobs, I tested if, after the regulation change, the probability of holding a temporary job increases relative to a permanent job. I found that it does, consistent with the results from firms' perspective using EEA.

4 The Model

I develop an equilibrium model with directed search off and on the job in which heterogeneous firms and homogeneous workers choose to supply and demand informal, temporary, or permanent jobs. Considering a rich set of labor regulations, I distinguish between informal and formal jobs and within formal ones. The model aims to explain (i) the workers' gradual progress from unemployment to jobs with higher formal status, (ii) firms' mix of employees on different contracts and how it changes according to firms' productivity, and (iii) the substitution of permanent for temporary employees caused by more expensive firing costs. Moreover, the model seeks to capture the equilibrium effects of severance pay, which includes changes in relative wages and contract offerings made by firms.

4.1 Environment

Agents and preferences. Time is discrete and continues forever. The economy is populated by a continuum of risk-neutral infinitely lived workers with a total measure L. Both unemployed and employed workers are homogeneous in skill and consume their income: the unemployment benefit b and the after-tax wages, respectively[45]. They maximize the expected lifetime income, discounted by factor $\beta \in (0,1)$.

The employer side of the market is composed of risk-neutral firms. Every period, they (i) create job vacancies, (ii) produce output, and (iii) pay wages. Regarding vacancy creation, ex-ante identical firms competitively enter the labor market by creating vacancies at a unit cost κ, expressed in utility units. Upon entry, firms learn their permanent productivity level $\rho \in \mathbb{P} = \{\rho_1, ..., \rho_{n_\rho}\}$ where $\underline{\rho} \equiv \rho_1 < ... < \rho_{n_\rho} \equiv \bar{\rho}$ by drawing it from an exogenous distribution of potential entrants $P(\rho) : \mathbb{P} \to \mathbb{R}^+$. Firms produce under a constant returns to scale (CRS) technology: the output of a match is given by ρ[46]. In this setting, firms post vacancies to maximize the expected lifetime profits, discounted by factor $\beta \in (0,1)$.

Types of jobs. In the economy, an employed worker can hold one of three possible types of jobs, which is denoted by $k \in \mathbb{K} = \{1,2,3\}$: informal ($k = 1$), formal temporary ($k = 2$), and formal permanent ($k = 3$). These contracts share two characteristics. First, they specify a wage that remains fixed while the labor relationship lasts[47]. Second, they can be destroyed

[45] Workers' homogeneity is motivated by the fact that, in the sample used in this paper, 83% of the overall wage inequality is within-education-group variance. See Appendix D for details on the variance decomposition.

[46] This CRS technology, combined with linear vacancy cost, allows me to understand a firm ρ as a single vacancy unit with productivity ρ or, equivalently, as the collection of matches with productivity ρ. I take this latter interpretation only when explaining the results on firms' mixing in Section 6.4.

[47] I consider fixed wage contracts because, in the PE dataset, the tenure profile of wages is relatively flat. See

due to (i) the arrival of an exogenous separation shock or (ii) endogenous quitting by workers. However, they exhibit important differences. Permanent jobs are open-ended contracts that comply with labor regulations. Therefore, they provide unemployment insurance to the worker, which, following the Peruvian Labor Code, is paid by the employer upon job destruction. Moreover, permanent jobs offer employment protection through severance pay: whenever a permanent worker gets exogenously separated, the employer pays him a proportion r of his wage. Finally, permanent jobs impose corporate taxes and labor income on firms and workers, respectively[48].

Temporary jobs are fixed-term contracts. They provide unemployment insurance and dictate corporate and labor income taxes. In principle, they last for a finite number of periods and are heterogeneous in duration. Since these features introduce non-stationary decision rules and an additional state variable in the recursive problem, I follow Wasmer (1999) and assume that temporary jobs are subject to exogenous expiration shocks. This assumption allows me to interpret the exogenous destruction of a temporary job as the contract's expiration, which does not generate severance pay. This constitutes the key difference between temporary and permanent jobs driven by labor regulation. Finally, in light of the minimal conversion rate of temporary contracts into permanent jobs observed in the PE dataset (Section 3.2), I consider that temporary jobs do not play a screening role to firms[49]. Instead, they constitute a flexible device to exploit production opportunities while meeting labor regulations and avoiding the firing cost[50].

Finally, informal jobs are open-ended and not subject to labor regulations. They neither provide unemployment insurance nor employment protection upon exogenous separation, and they do not impose labor income and corporate taxes on workers and firms hiring informal employees. Considering the low annual transitions to formal jobs, I assume informal jobs are not converted to temporary or permanent contracts. To firms, they constitute an available device to produce while avoiding labor regulations, including severance pay.

The existence of these three types of jobs, combined with separation shocks, implies that, in every period, a worker can hold one of four possible employment states denoted by $i = \{0, 1, 2, 3\}$:

Appendix E for more details.

[48] An additional implication of labor regulation is that formal permanent and temporary contracts are subject to the minimum wage, which I abstract from. A minimum wage would truncate the firms' profitability from below, potentially affecting workers' search strategy. However, it is possible to derive a condition that rules out this possibility. In the estimated model, this condition holds, implying that the minimum wage does not bind in both equilibrium and along the equilibrium path.

[49] This is consistent with both empirical and theoretical findings. See, for example, Basu et al. (2021) and Bentolila et al. (2020), respectively.

[50] It is worth mentioning that, despite neglecting a screening device role, the model can generate conversion of temporary to permanent employees within the same employer. However, this would arise from the endogenous quitting of a temporary employee, who may meet a permanent vacancy with the same productivity level as his previous employer.

unemployment ($i = 0$), employment on an informal job ($i = 1$), temporary job ($i = 2$) or permanent job ($i = 3$).

Labor Market and Directed Search. The labor market is organized in a set of submarkets indexed by $(v, k) \in \mathbb{V} \times \mathbb{K}$. The first dimension $v \in \mathbb{V} = [\underline{v}, \bar{v}]$ is the value promised to the worker in submarket (v, k). It corresponds to the expected present discounted (PD) value of holding a job in the submarket. The second dimension $k \in \mathbb{K}$ denotes the type of contract on which the value v is delivered.

Each submarket exhibits two endogenous objects. First, a fixed wage offered to the worker, which is represented by $h(v, k) : \mathbb{V} \times \mathbb{K} \to \mathbb{R}^+$. It corresponds to the wage that equalizes the worker's value function of holding a job type k to the value v. Second, a market tightness, which is represented by $\theta(v, k) : \mathbb{V} \times \mathbb{K} \to \mathbb{R}^+$, pinned down by free entry. In each submarket, $\theta(v, k)$ provides the ratio of vacancies created $A(v, k)$ to the number of job seekers $S(v, k)$ in the submarket. Crucially, workers and firms take $\theta(v, k)$ as given when making their optimal choices.

Market tightness $\theta(v, k)$ has two vital features. First, for a given type of contract k, it is a piecewise function that delivers a strictly positive market tightness for submarkets in which, conditional on meeting a worker, the firm's expected value of hiring on contract k is strictly higher than κ; and zero otherwise. Intuitively, let $\tilde{v}_k \in \mathbb{V}$ denote the promised value that equalizes the firm's expected value to κ. Considering that the firm's value is decreasing in the value promised to the worker, $\tilde{v}_k$ corresponds to the highest promised value that a firm can offer on contract k[51]. Therefore, $\theta(v, k)$ will be strictly positive in submarkets with promised values $v < \tilde{v}_k$; and will be zero otherwise. Second, $\theta(v, k)$ gives the market tightness for all submarkets (v, k), some of which are not visited by workers in equilibrium. Following Menzio and Shi (2010), for these inactive submarkets, $\theta(v, k)$ constitutes an out-of-equilibrium conjecture that helps determine the equilibrium.

For each type of contract k, there is a matching function $m_k(A(v, k), S(v, k))$, which maps vacancies and job seekers in a submarket into new matches on contract type k. These matching functions exhibit CRS and, therefore, the market tightness $\theta(v, k)$ determines the matching rates. In each submarket (v, k), a job seeker meets a vacancy with probability $p_k(\theta(v, k)) : \mathbb{R}^+ \to [0, 1]$; and a vacancy meets an applicant with probability $q_k(\theta(v, k)) : \mathbb{R}^+ \to [0, 1]$. On the one hand, $p_k(\theta(v, k))$ is assumed to be (i) twice-continuously differentiable and (ii) strictly increasing and strictly concave function, with $p(0) = 0$ and $p'(0) < \infty$. On the other hand, $q_k(\theta(v, k))$ is assumed to be twice-continuously differentiable and strictly decreasing and convex function such that (i)

[51] The firm's expected non-negative value of hiring is decreasing in v under the condition described in Appendix H.1.

$q_k(\theta(v,k)) \equiv \frac{p_k(\theta(v,k))}{\theta(v,k)}$; (ii) $q_k(0) = 1$; (iii) $q'(0) < 0$; and (iv) $p(q^{-1}(.))$ is a concave function[52].

Considering $\theta(v,k)$ and, therefore, the meeting rates $p_k(\theta(v,k))$ and $q_k(\theta(v,k))$, (i) job seekers choose the submarket (v,k) where to apply for a job; and (ii) firms choose where to post their vacancies. Within a submarket, the matching is random.

Timing of actions. Every period is divided into four stages: separation, search, matching, and production.

During the separation stage, workers in employment state $k = \{1,2,3\}$ get exogenously separated with probability λ_{k0}. Dismissed workers cannot engage in search, so they wait until the next period to do so.

During the search stage, both unemployed at the beginning of the period and employed workers who were not separated get the opportunity to apply for a job with probability λ_{e_i}, where $i = \{0,1,2,3\}$ accounts for the current employment state[53]. Conditional on being able to search, workers in state i engage in directed search. They choose the submarket (v,k) where to apply for a job by maximizing their expected return to search. In making this decision, they take as given $\theta(v,k)$ and consider the value they currently enjoy $V \in \mathbb{V}$ defined as:

$$V = \{\text{value of being unemployed}, \text{value of being employed in some submarket } (V,k)\}$$

On the other hand, given $\theta(v,k)$, identical firms enter the labor market by creating vacancies in submarkets (v,k). Since entry is competitive, in a given submarket, they create vacancies until the expected value of doing so equals the unit vacancy cost κ, which is assumed to be equal across different types of jobs. The vacancy creation process takes place in three steps. First, given $\theta(v,k)$, identical firms pay κ and create one vacancy that remains open for one period. Second, given the exogenous distribution of potential entrants $P(\rho)$, which is assumed to be the same across submarkets, they draw their productivity level $\rho \in \mathbb{P}$[54]. Finally, given ρ, firms realize their value of hiring in submarket (v,k). Those enjoying a positive value remain active to match while the others exit.

During the matching stage, job seekers and vacancies in (v,k) meet randomly. Job seekers meet a vacancy with probability $p_k(\theta(v,k))$; a vacancy type k meets a job seeker with probability $q_k(\theta(v,k))$. Upon meeting, the firm type ρ owning the vacancy makes an offer: a job type k paying a fixed wage $h(v,k)$ that delivers a value v to the worker. The worker accepts the offer, and a new

[52] Similar to Menzio and Shi (2010), in this paper, the assumption on $p(q^{-1}(.))$ allows to establish that, for a given k, the worker's search problem is strictly concave in v and, therefore, has a unique solution. It also allows to establish that this solution is increasing in the worker's value of holding the current job. See Proposition H.1

[53] Following Delacroix and Shi (2006), these probabilities capture the idea that applications are costly due to the cost of gathering information, for example.

[54] In particular, $P(\rho)$ is the distribution of firms that potentially remain for matching after learning their productivity ρ.

match with productivity ρ is formed.

Finally, during the production stage, an unemployed worker produces and consumes b units of output. Moreover, an employed worker in a match with productivity ρ in (v, k) produces ρ units of output and receives a wage $h(v, k)$, which is fully consumed.

In the following sections, I characterize individuals' decisions and describe the equilibrium of the model. In doing this, I focus on a stationary equilibrium where functions $\theta(v, k)$, $p_k(\theta(v, k))$ and $q_k(\theta(v, k))$, together with the distribution of workers across submarkets are time-invariant.

4.2 Workers' Problem

Workers maximize their discounted expected lifetime income. To this end, every period, conditional on being able to search, they choose to apply for a job in the submarket that maximizes their expected return to search.

Considering the three different types of contracts, the optimal submarket is determined in two steps. First, for every type of contract $k \in \mathbb{K}$, a worker determines the promised value v that maximizes the expected return of searching for a job k. I denote the optimal submarkets of this first step by $(v^*, k)\ \forall\ k \in \mathbb{K}$. Second, among the three optimal submarkets (v^*, k), the worker chooses the type of contract that generates the highest expected return to search. This decision defines the optimal submarket where the worker applies for a job in the following matching stage, which I denote by $(v^*, k^*) \in \mathbb{V} \times \mathbb{K}$.

Formally, consider the market tightness $\theta(v, k)$ and a job seeker enjoying V. In the first step, the job seeker solves:

$$\forall\ k \in \mathbb{K} \quad R^k(V) = \max_{v \in \mathbb{V}} \quad p_k(\theta(v, k))\,(v - V) \tag{1}$$

This search problem has three crucial features. First, for every k, among submarkets with a promised value $v < \tilde{v}_k$, where the market tightness is strictly positive, a worker trades off surplus or gains from getting a job in a new submarket against JFP, which is strictly decreasing and strictly concave in the promised value v[55]. Second, the worker's current value V affects this trade-off. In particular, the marginal rate of substitution between JFP and promised value is increasing in V, rendering a single-crossing condition. Therefore, holding constant the worker's expected return to search, a worker currently getting a higher V is willing to sacrifice more employment probability for a given surplus than another applicant with a lower V. This implies that, for every k, applicants optimally separate according to V, with workers currently earning V applying for submarkets offering a higher value $v \geq V$. This endogenous separation is a standard outcome in models with

[55] Online Appendix Balke and Lamadon (2022), Lemma W3. Also, Menzio and Shi (2010), Lemma 4.1, part (ii).

directed search (Shi (2009))[56]. Third, the value of search for a contract k, denoted by $R^k(V)$, is decreasing in V (Proposition H.1 in Appendix H.2). This property is important to generate an equilibrium with transitions across contracts.

In the fist step, the search strategy for a worker with current value V can be described as a search policy function $(v^*, k)(V) : \mathbb{V} \to \mathbb{V} \times \mathbb{K}$, defined as:

$$(v^*, k)(V) = \begin{cases} \Big(\arg\max_{v \in \mathbb{V}} p_k(\theta(v,k))\,(v - V)\,, k\Big), & V < \tilde{v}_k \\ \Big(V, k\Big), & \text{else} \end{cases} \tag{2}$$

For every k, when $V < \tilde{v}_k$, v^* is unique and belongs to the interval $(V, \tilde{v}_k)$, which implies that it is strictly increasing in V (Proposition H.1 in Appendix H.2). When $V \geq \tilde{v}_k$, the worker visits $(v^*, k)(V) = (V, k)$. In this case, since firms do not find it profitable to post vacancies type k promising values above $\tilde{v}_k$, the worker's search strategy is to remain in his current job, earning the value V.

Focusing on the case when $V < \tilde{v}_k$, the previous discussion reveals that workers optimally climb a ladder of values. Considering that the value of search for a job k is decreasing in V, if workers only apply to submarkets offering contract k, they will stop searching for a job k at $V = \tilde{v}_k$, from where they find it optimal to remain at their jobs. Notably, the existence of types of contracts other than k potentially increases the availability of jobs promising values beyond $\tilde{v}_k$, where the value of searching for a job type k becomes zero. This availability is one of the drivers generating an equilibrium ladder of values, with transitions across different types of jobs.

Having solved the first step of the worker's problem and presented its implications for a given type of contract $k \in \mathbb{K}$, I now turn to the worker's optimal choice across types of jobs. In the second step of the worker's problem, the applicant chooses the type of contract to look for by taking the submarket (v^*, k) that reports the maximum value of search across k, given his current value V:

$$R(V) = \max\left\{R^1(V), R^2(V), R^3(V)\right\} \tag{3}$$

The solution to the worker's problem provides three main objects. First, the worker's optimal submarket where to apply for a job, represented by the search policy function $(v^*, k^*)(V) : \mathbb{V} \to \mathbb{V} \times \mathbb{K}$. Second, the value of searching in $(v^*, k^*)(V)$, denoted by $R(V) : \mathbb{V} \to \mathbb{R}^+$. Third, the

[56]It is worth mentioning that, despite being homogeneous in skills, at every point in time, workers can hold different jobs and, therefore, earn dissimilar values V. This stems from the model's features: workers face separation shocks, search opportunities, and search frictions, which make them transition across jobs at different rates.

quitting probability $\bar{p}(V) \equiv p_{k^*}(\theta(v^*, k^*)(V))$, which corresponds to the probability that a worker currently enjoying V meets a vacancy in his optimal submarket.

Importantly, $\bar{p}(V)$ is decreasing in V[57]. Intuitively, since the value promised in the optimal submarket is strictly increasing in V and the market tightness is strictly decreasing in the promised value, the probability of finding a job in the optimal submarket is strictly decreasing in V for all $V < \tilde{v}_k$.

Having solved the worker's search problem, I now describe the optimal behavior of the unemployed, informal, temporary, and permanent workers at the end of each period.

Equation (4) corresponds to the Bellman equation of an unemployed. The value of being unemployed H_0 equals the flow income of unemployment b plus the discounted continuation value, which considers the probability that the unemployed searches (λ_{e_0}). In this case, he applies to his desired submarket, which can be either informal, temporary, or permanent, and offers an expected surplus $R(H_0)$. Meeting a vacancy results in employment; otherwise, he remains unemployed enjoying H_0.

Unemployed worker (state 0)

$$H_0 = b + \beta \left[H_0 + \lambda_{e_0} \max \left\{ 0, R(H_0) \right\} \right] \tag{4}$$

Equation (5) describes the value of holding an informal job that pays a fixed gross wage w_1. Since the worker holds an informal job, he does not pay any labor income tax and fully enjoys his gross wage. In the next period, he gets fired with probability λ_{10}, in which case he becomes unemployed and does not receive any firing provision such as unemployment insurance or severance pay. If he is not fired, he gets the opportunity to search for a new job with probability λ_{e_1}. In this case, he applies to his optimal submarket, which provides an expected surplus $R(H_1)$. Meeting a vacancy leads to a transition to a new job; otherwise, he returns to his informal position granting $H_1(w_1)$.

Informal worker (state 1)

$$H_1(w_1) = w_1 + \beta \left[\lambda_{10} H_0 + (1 - \lambda_{10}) \left[H_1(w_1) + \lambda_{e_1} \max\{0, R(H_1(w_1))\} \right] \right] \tag{5}$$

Equation (6) describes the value of holding a formal temporary job paying a fixed gross wage w_2. Given that the job is formal, he is subject to a labor income tax, captured by the rate τ_2. In the next period, his contract *expires* with probability λ_{20}, in which case he becomes unemployed.

[57] Online Appendix Balke and Lamadon (2022), Lemma W5. Also, Menzio and Shi (2010), Corollary 4.4.

In this case, he does not receive a severance pay but he is granted with an unemployment insurance paid by the employer, which corresponds to a proportion s_2 of his gross wage. If his contract does not expire, the temporary worker engages in search with probability λ_{e_2}. In this case, he applies to his optimal submarket where he gets an expected return $R(H_2(w_2))$. Meeting a vacancy leads to a transition to a new job; otherwise, he returns to his temporary position granting $H_2(w_2)$.

Formal temporary worker (state 2)

$$H_2(w_2) = (1-\tau_2)w_2 + \beta\left[\lambda_{20}(H_0 + s_2 w_2) + (1-\lambda_{20})\left[H_2(w_2) + \lambda_{e_2}\max\{0, R(H_2(w_2))\}\right]\right] \quad (6)$$

Finally, Equation (7) corresponds to the Bellman equation of a formal permanent worker currently earning a gross wage w_3. Like the formal temporary worker, he pays taxes on his labor income, captured by the rate τ_3. In the next period, he can get fired, in which case he becomes unemployed but receives two benefits from the employer: (i) unemployment insurance and (ii) severance pay. They amount to a proportion s_3 and r_3 of his gross wage, respectively. If he is not fired, he engages in search with probability λ_{e_3} and can get a positive return of $R(H_3(w_3))$. He moves to a new job if he meets a vacancy in his desired submarket. Otherwise, he remains in his current permanent occupation, enjoying $H_3(w_3)$.

Formal permanent worker (state 3)

$$H_3(w_3) = (1-\tau_3)w_3 + \beta\left[\lambda_{30}(H_0 + s_3 w_3 + r_3 w_3) + (1-\lambda_{30})\left[H_3(w_3) + \lambda_{e_3}\max\{0, R(H_3(w_3))\}\right]\right] \quad (7)$$

Given the Bellman equations, I now define the fixed wage determination rule in every submarket (v,k). In a given (v,k), the wage offer $h(v,k) : \mathbb{V} \times \mathbb{K} \to \mathbb{R}$ corresponds to wage that equalizes the value of holding a contract k to the value v promised in the submarket where the firm and applicant meet. Therefore, it solves $H_k(h(v,k)) = v \;\forall\; (v,k)$ and $k \in \mathbb{K}$. Importantly, for every k, since the value of holding a job increases in the gross wage w_k, submarkets offering higher values pay higher wages. This implies that $h(v,k)$ is increasing in the promised value v.

4.3 Firms' vacancy creation

Firms can post three types of vacancies: informal, temporary, and permanent. They decide which contract to post and which value to promise by comparing the expected value of creating a vacancy in a given submarket to κ. The former corresponds to the product between the vacancy-filling rate and the expected non-negative net PD value of hiring a worker on a given contract to a firm

with productivity ρ, which is unknown before entry[58]. Let $K_k(w_k, \rho)$ denote the value of hiring a worker on contract k paying a wage w_k to a firm with productivity ρ. The value of hiring on informal, temporary, and permanent contracts are the following:

Value of hiring an informal employee

$$K_1(w_1, \rho) = \rho - w_1 + \beta\Big[(1-\lambda_{10})\Big((1-\lambda_{e_1}\bar{p}(H_1(w_1)))K_1(w_1,\rho)\Big)\Big] \tag{8}$$

An informal match is not subject to corporate taxes, generating a flow of profits equal to its total output minus the fixed wage paid w_1. In the next period, the match only generates profits if the worker remains on the job. This happens if the worker is not exogenously separated, does not get the opportunity to engage in on the job search, or does not find a job in his desired submarket. In this sense, the retention probability of an informal employee currently enjoying a value $H_1(w_1)$ corresponds to $(1-\lambda_{10})(1-\lambda_{e_1}\bar{p}(H_1(w_1)))$.

Value of hiring a temporary employee

$$K_2(w_2, \rho) = (1-T)(\rho - w_2) + \beta\Big[\lambda_{20}(0 - s_2 w_2) + (1-\lambda_{20})\Big(\lambda_{e_2}\bar{p}(H_2(w_2))(0 - s_2 w_2) + (1-\lambda_{e_2}\bar{p}(H_2(w_2)))K_2(w_2,\rho)\Big)\Big] \tag{9}$$

When hiring a temporary worker, a firm pays a corporate tax T over the flow of profits it generates. In the next period, if the temporary contract *expires* or if the worker quits to start his new optimal job, the match is destroyed, and the firm pays unemployment insurance to the worker $s_2 w_2$. The match keeps generating profits only if the worker remains in the job, which happens if the contract does not end and the worker does not find a job in another submarket. In this sense, the retention probability of a temporary employee currently enjoying lifetime utility $H_2(w_2)$ is $(1-\lambda_{20})(1-\lambda_{e_2}\bar{p}(H_2(w_2)))$.

Value of hiring a permanent employee

$$K_3(w_3, \rho) = (1-T)(\rho - w_3) + \beta\Big[\lambda_{30}(0 - s_3 w_3 - r_3 w_3) + (1-\lambda_{30})\Big(\lambda_{e_3}\bar{p}(H_3(w_3))(0 - s_3 w_3) + (1-\lambda_{e_3}\bar{p}(H_3(w_3)))K_3(w_3,\rho)\Big)\Big] \tag{10}$$

[58] As it will be explained in Section 4.4, the expectation is taken on non-negative values to take firms' exit into account. In this model, firms facing a negative value after entry certainly exit.

Finally, the case of hiring a permanent worker is similar to that of hiring a temporary worker. The main difference is that, upon separation, the firm bears the additional cost of a severance pay $r_3 w_3$. The retention probability of a permanent employee currently enjoying a value $H_3(w_3)$ is $(1-\lambda_{30})(1-\lambda_{e_3}\bar{p}(H_3(w_3)))$.

Using the wage offer $h(v,k)$ in each submarket (v,k), I derived the value of hiring a worker in submarket (v,k) to a firm with productivity ρ. It corresponds to $J_k(v,k,\rho) = K_k(h(v,k),\rho)\ \forall\ k \in \mathbb{K}$ and $\forall\ \rho \in \mathbb{P}$. For each k, this function is represented by Equation (11), where $\{T_k, s_k, r_k\}$ are zero for $k=1$ and positive parameters for $k=\{2,3\}$.

Value of hiring a worker in submarket (v,k) to a firm with productivity ρ

$$J_k(v,k,\rho) = \underbrace{\left[\frac{1}{1-\beta(1-\lambda_{k0})(1-\lambda_{e_k}\bar{p}(V=v))}\right]}_{\text{'Discounting component'}} \times \underbrace{\Big[(1-T_k)\rho - h(v,k)\Big((1-T_k)+\beta\lambda_{k0}(s_k+r_k) + \beta(1-\lambda_{k0})\lambda_{e_k}\bar{p}(V=v)s_k\Big)\Big]}_{\text{'Flow profit component'}} \quad (11)$$

Equation (11) reveals three crucial features. First, for a given productivity ρ, the firm's value of hiring in submarket (v,k) is affected by the promised value v through (i) the wage offer $h(v,k)$, which is increasing in v; and (ii) the quitting probability $\bar{p}(V=v)$, which decreases in v[59].

Second, for a given productivity ρ, the firm's value of hiring in submarket (v,k) is the product of a flow profit component and a discounting component. For a given type of contract k, as the value promised to the worker increases, these two factors have opposing effects on the firm's value.

On the one hand, the flow profit component is decreasing in v. The reason is that higher promised values are delivered by higher wage offers $h(v,k)$, which reduces the firm's value. The reduction in this component is partially attenuated by the reduction in the quitting probability $\bar{p}(V=v)$, which reduces the firm's chance of bearing the cost of unemployment insurance. The attenuation effect is partial because it is affected by the joint product of four less than one factors. Moreover, it only affects the firm's value of hiring on temporary and permanent contracts since only formal jobs are subject to unemployment insurance.

On the other hand, the discounting component is increasing in v but bounded from above. This component is increasing in v because when a firm hires a worker in a submarket that promises a higher value, his quitting probability becomes lower. This increases the worker's retention

[59] $\bar{p}(V)$ is decreasing in V (Menzio and Shi (2010) Corollary 4.4). Notice that when a worker is hired in a submarket that promises v, he becomes employed with the current value $V=v$. Therefore, a worker hired in a higher-valued submarket has a lower quitting probability.

probability, allowing the firm to make profits for longer. Given that $\bar{p}(V = v)$ is bounded from below by zero, the retention probability is bounded from above by $1 - \lambda_{k0}$.

Importantly, the magnitudes of these two components are influenced by the characteristics of each contract. In the estimated model, this interaction results in heterogeneity in $J_k(v, k, \rho)$ across job types, rooted in different levels and rates at which they change with v. As discussed in Section 6.3, this variation triggers differences in $\tilde{v}_k$, which represents the maximum promised value that a firm can afford on contract k.

In Appendix H.1, I establish the necessary condition for firm ρ's value of hiring on contract k to decrease with v. Throughout the paper, I assume this condition holds for all k.

Finally, Equation (11) also shows that, for every k, $J_k(v, k, \rho)$ is monotonically increasing in ρ. Considering that it is decreasing in v, this implies that, before entry, the expected non-negative profits of hiring in submarket (v, k), which corresponds to $\mathbb{E}_\rho[\max\{J_k(v, k, \rho), 0\}]$, is decreasing in v. I use this expectation and its property in Section 4.4 to determine $\tilde{v}_k$.

4.4 Stationary Equilibrium

For every k, the return to creating a vacancy in a given submarket (v, k) equals to the expected benefit of posting the vacancy minus the fixed cost of creating it κ:

$$q_k(\theta(v, k))\mathbb{E}_\rho\left[\max\{J_k(v, k, \rho), 0\}\right] - \kappa$$

The expected benefit corresponds to the product between the vacancy-filling rate and the expected non-negative profits of hiring in submarket (v, k), represented by $\mathbb{E}_\rho[\max\{J_k(v, k, \rho), 0\}]$. I use this expectation to determine $\tilde{v}_k$. It is the promised value on contract k that satisfies the break-even condition $\mathbb{E}_\rho\left[\max J_k(\tilde{v}_k, k, \rho), 0\right] = \kappa$. As explained in Section 6.3, the variation in $\tilde{v}_k$ across different contracts and their relative order are crucial factors in characterizing the equilibrium.

In this setting, firms create vacancies in a given submarket (v, k) while the return to doing so is positive. In making this decision, firms face two classes of trade-offs. First, for a given k, as v increases, firms trade off higher vacancy-filling rates against lower expected profits of hiring.

Second, for a given v, as the formal status of a job increases from informal to formal permanent, firms balance out higher labor regulation costs against lower wages and a higher retention probability of an employee. Except for the labor regulation costs, assumed by the definition of each contract, the other components arise after estimation. On the one hand, as the type of contract varies from informal to formal permanent, firms encounter more regulation costs and employment protection. On the other hand, firms benefit from paying lower wages and a higher retention prob-

ability, which allows the firm to make profits for longer. For a fixed v, these embedded trade-offs generate different firm's value of hiring across contracts.

In equilibrium, for all feasible submarkets (v, k), the probability of filling a vacancy $q_k(v, k)$ adjusts to make firms indifferent to posting vacancies in each submarket. This indifference explains why firms follow a mixed strategy, hiring workers on informal, temporary, and permanent contracts in equilibrium.

Free entry. There is free entry in every submarket (v, k). If the return to creating a vacancy in a submarket (v, k) is positive, more firms will enter and post vacancies to make positive profits. However, this process generates congestion, reducing the vacancy-filling rate and the benefit of posting. Thus, firms will create vacancies until the return to doing so becomes non-positive. Therefore, the free entry condition are defined as the following:

$$\forall\ (v, k) \in \mathbb{V} \times \mathbb{K} \quad q_k(\theta(v, k))\mathbb{E}_\rho\left[\max\{J_k(v, k, \rho), 0\}\right] \leq \kappa \tag{12}$$

I use this condition to pin down the equilibrium market tightness function $\theta(v, k)$, which combined with the corresponding matching function $m_k(v, k)$, governs the likelihood to match in each submarket. These probabilities make firms indifferent to posting vacancies in submarkets (v, k) because creating them yields the same expected return. Building on Menzio and Shi (2010), $\theta(v, k) : \mathbb{V} \times \mathbb{K} \to \mathbb{R}^+$ is defined as:

$$\theta(v, k) = \begin{cases} q_k^{-1}\left(\frac{\kappa}{\mathbb{E}_\rho[\max\{J_k(v,k,\rho),0\}]}\right), & v < \tilde{v}_k \\ 0, & \text{else} \end{cases} \tag{13}$$

Intuitively, for a given type of contract k, for all (v, k) such that $q_k(\theta(v, k))\mathbb{E}_\rho\left[\max\{J_k(v, k, \rho), 0\}\right] \geq \kappa$, the equilibrium $\theta(v, k)$ is strictly positive for all $v < \tilde{v}_k$ and equal to zero when $v = \tilde{v}_k$. On the other hand, for all (v, k) such that $q_k(\theta(v, k))\mathbb{E}_\rho\left[\max\{J_k(v, k, \rho), 0\}\right] < \kappa$, the equilibrium $\theta(v, k)$ is zero.

For every type of contract k, $\theta(v, k)$ is continuous and strictly decreasing in the promised value $v < \tilde{v}_k$[60]. Intuitively, since the expected profits of hiring in a submarket is decreasing in the promised value v, to guarantee equilibrium, the vacancy-filling rate should be increasing, which implies that $\theta(v, k)$ is decreasing in v.

The market tightness is a key equilibrium object in the model. In addition to determine the matching probabilities in each submarket, it allows to recover the mass of vacancies posted, given a positive number of job seekers in a submarket.

Market Clearing. Let $g : \mathbb{P} \times \mathbb{V} \times \mathbb{K} \to \mathbb{R}$ denote the stationary probability density function

[60] Menzio and Shi (2010), Lemma 4.1, part (i).

of employees in a firm with productivity $\rho \in \mathbb{P}$, currently earning value $V \in \mathbb{V}$ on contract type $k \in \mathbb{K}$. Therefore, market clearing condition requires the following:

$$\sum_{\rho} \sum_{k} \int_{V} g(\rho, V, k) dV = L - s_0 \tag{14}$$

where L is the total mass of the labor force in the economy and s_0 is the total mass of the unemployed workers.

The equilibrium allocation comprises five objects. For each type of contract, the probability density function of employees in a firm with productivity ρ, currently earning lifetime utility V. In addition to these three functions, the equilibrium includes the mass of unemployed workers s_0 and the mass of vacancies in each visited submarket (v, k).

Consider a contract type $k \in \mathbb{K}$. In equilibrium, the total density of employees in firms with productivity $\rho = \rho_j \in \mathbb{P}$ currently earning a lifetime utility V on contract type k satisfies:

$$\begin{aligned} g(\rho_j, V, k) = A(V, k) \times q_k(\theta(V, k)) \times Pr[\rho = \rho_j | J(V, k, \rho_j) > 0] \\ + (1 - \lambda_{k0})(1 - \lambda_{e_k} \bar{p}(V)) \times g(\rho_j, V, k) \quad \forall k \in \mathbb{K} \end{aligned} \tag{15}$$

Moreover, in equilibrium, the total mass of unemployed workers s_0 satisfies:

$$\begin{aligned} s_0 = s_0 \times (1 - \lambda_{e_0} \bar{p}(H_0)) + \lambda_{10} \sum_{\rho} \int_{V} g(\rho, V, 1) dV \\ + \lambda_{20} \sum_{\rho} \int_{V} g(\rho, V, 2) dV \\ + \lambda_{30} \sum_{\rho} \int_{V} g(\rho, V, 3) dV \end{aligned} \tag{16}$$

Finally, let $A(\hat{v}, \hat{k})$ be the mass of vacancies in a submarket $(\hat{v}, \hat{k})$. It satisfies:

$$A(\hat{v}, \hat{k}) = \theta(\hat{v}, \hat{k}) \times \left[s_0 \times \mathbb{1}_{\{(v^*, k^*)(H_0) = (\hat{v}, \hat{k})\}} + \sum_{i=1}^{3} \sum_{\rho} \int_{V} \mathbb{1}_{\{(v^*, k^*)(V) = (\hat{v}, \hat{k})\}} \times g(\rho, V, i) dV \right] \tag{17}$$

Based on these equilibrium conditions, I now define equilibrium.

Definition 4.1 (Equilibrium)**.** Equilibrium consists of market tightness function $\theta(v, k)$, matching probabilities $p_k(\theta(v, k))$ and $q_k(\theta(v, k))$, search value function $R(V)$, value of being unemployed H_0, search policy function $(v^*, k^*)(V)$, quitting probability function $\bar{p}(V)$, wage offer function $h(v, k)$,

firm value function $J_k(v,k,\rho)$, a mass of unemployed workers s_0, and the mass of vacancies $A(v,k)$ across submarkets (v,k) $\forall$ $v, V \in \mathbb{V}$, $k \in \mathbb{K}$ and $\rho \in \mathbb{P}$ such that:

1. $\theta(v,k)$ satisfies Equation (12) for all $(v,k) \in \mathbb{V} \times \mathbb{K}$.
2. $R(V)$ satisfies Equation (3) for all $V \in \mathbb{V}$, and $(v^*,k^*)(V)$ and $\bar{p}(V)$ are associated policy functions.
3. H_0 satisfies Equation (4).
4. $J_k(v,k,\rho)$ satisfies Equation (11) for all $(v,k) \in \mathbb{V} \times \mathbb{K}$ and $\rho \in \mathbb{P}$.
5. $g(\rho,V,k)$ for all $\rho \in \mathbb{P}$ is generated by s_0 and $A(v,k)$ as in Equation (15).
6. s_0 and $A(v,k)$ clear the market according to Equations (16) and (17).

I focus on the stationary equilibrium where the mass of the unemployed s_0 and the distribution of workers across submarkets $\sum_\rho g(\rho,V,k)$ are time-invariant. Based on Menzio and Shi (2010), Equilibrium is Block Recursive: it has the property that the equilibrium objects do not depend on the distribution of workers across employment states $(s_0, \sum_\rho g(\rho,V,k))$ $\forall$ $\rho \in \mathbb{P}$ and $(V,k) \in \mathbb{V} \times \mathbb{K}$.

5 Specification and Estimation

The parameters of the model can be grouped in three categories. First, parameters related to workers' preferences: the discount factor β; and the flow value of unemployment b. Second, parameters associated to the search technology: the probabilities to engage in search λ_{e_i} $\forall$ $i = \{0,1,2,3\}$; and the curvature of the matching function $m_k(S(v,k),A(v,k))$ $\forall$ $k \in \mathbb{K}$, which governs the matching probabilities. Third, parameters related to the production technology: the separation probabilities λ_{k0}; the number of different types of firms n_ρ; firms' productivity levels $\rho \in \mathbb{P}$; the distribution of potential entrants $P(\rho)$; and the unit vacancy cost κ, which is constant across the different types of jobs.

Among these parameters, those associated to the matching functions are essential because they govern the probabilities at which workers and firms meet and fill vacancies, respectively. Following Menzio and Shi (2010), I consider:

$$m_k(S(v,k),A(v,k)) = \frac{S(v,k)A(v,k)}{[S(v,k)^{\varphi_k} + A(v,k)^{\varphi_k}]^{\frac{1}{\varphi_k}}} \quad \forall \quad k \in \mathbb{K}$$

This specification has two main implications. First, for a given positive market tightness $\theta(v,k) \equiv \frac{A(v,k)}{S(v,k)}$, the probabilities to meet and fill a vacancy are increasing in φ_k. Second, the matching elasticity, which corresponds to $\frac{1}{1+\theta(v,k)^{\varphi_k}}$, is decreasing in $\theta(v,k)$. Moreover, for sufficiently large $\theta(v,k)$, the elasticity decreases at a faster rate as φ_k increases. In this context, for a worker, given a market tightness, the contract with the highest φ_k is the easiest to find. However, as the promised value increases towards $\tilde{v}_k$ and, hence, the market tightness declines, the JFP of this type of contract decreases at a faster rate than the other types.

To pin down the parameters of the model, I estimated some parameters outside the model and estimated the remaining ones using the method of simulated moments (MSM).

5.1 Estimation - first step

Timing. In this model, one period corresponds to a month. Therefore, I fix the discount factor β equal to 0.9952, consistent with an annual interest rate of 6%. This rate corresponds to the average annual yield of long-term Peruvian sovereign bonds in local currency between 2005 - 2019.

Probability of engaging in search. I set the probability of searching for a job for the unemployed to be equal to 35.15% each month, consistent with a total duration of unemployment of 9.7 weeks in 2019. For this, I considered the average total duration of unemployment in Metropolitan Lima, estimated in Belapatiño et al. (2014) for 2002 - 2013. I then estimated its value in 2019 by considering the average annualized growth rate. For the informal, temporary, and permanent employees, I used the ENAHO 2016 - 2020 to compute the average proportion of employees reporting to have looked for a better main job in the previous week. I focused on those individuals in my sample with 11 or fewer years of education to consider a homogeneous group. With this information, the monthly probability of searching for a job for the informal, temporary and permanent employees is 20.1%, 15.2% and 9.0%, respectively.

Separation shock. I define separation as individual or mass firing, expiration of the contract, or resignation with financial incentives, which I consider an undesired termination. I used PE 2015 - 2020 to estimate the firing and expiration probabilities for a part-time, temporary, and permanent worker, controlling for age, educational attainment, year, and workers' fixed effects. I focused on those individuals in my sample who were observed for at least 12 months out of 65 in PE. I get that, on average, a permanent employee faces a 0.8% probability of being separated each month. Conditioning on observed and unobserved characteristics, for a temporary and part-time worker, this probability increases to 2.6% and 4.6%, respectively (Table 15 in Appendix G.5). Using the estimated separation rate for part-time employees, I estimated a 5.6% conditional probability of informal employees experiencing separation. To derive this, I compared the implied annual

separation probability of part-time workers to their average annual transition to unemployment from 2007 to 2019. Assuming this relationship extends to informal employees and considering the observed annual transitions from informal jobs to unemployment, I determined a monthly conditional separation rate of 5.6% for informal employees.

Number of types of firms and exogenous distribution of potential entrants. In Section 3.3, I estimated an AKM two-way fixed effect wage equation, where I normalized the firms and workers' FE to be in $[0, 1]$. I then performed k-mean clustering based on the firms and workers' FE, firm size, and share of permanent employees within firms. I chose to partition firms in four clusters ($n_\rho = 4$), which delivered the exogenous distribution of potential entrants $P(\rho) = \{0.653, 0.221, 0.092, 0.034\}\ \forall\ \rho \in \mathbb{P}$. This distribution means that, in a given submarket, the probability that a firm draws the lowest productivity ρ_1 is 65.3%, while that of drawing the highest productivity ρ_4 is 3.4%. Notably, this distribution is tilted to less productive firms, which will generate that, in a given submarket, the mass of vacancies available for matching mostly correspond to less productive firms. This distribution is one of the drivers of the different mix of workers across firms.

Policy parameters. I set these parameters to the values applicable to Peru during 2015 - 2019. I fixed the payroll tax rates to both temporary and permanent employees (τ_2 and τ_3) to 5.6%, which corresponds to the effective tax rate on labor income in 2017[61]. The shares of monthly wages paid as unemployment insurance to temporary and permanent employees (s_2 and s_3) are fixed at 6.25%, corresponding to an average of 0.75 wages per year worked as established by the Labor Code. Similarly, I consider the baseline severance pay to permanent employees upon firing to be six times the wage. It corresponds to the maximum approximated severance reported in ENAHO after the reform. It also represents 50% of the maximum severance established by the Labor Code. Finally, firms' corporate tax rate is 15.0% of their revenues (T_2 and T_3). This rate is the average effective tax rate paid between 2007 - 2019[62].

5.2 Estimation - second step

I estimate the remaining parameters using MSM. I match four sets of moments implied by the model to those observed in the data: (i) the distribution of the unemployed and employees across

[61] In Peru, in addition to an unaffected income bracket, there are five brackets with marginal tax rates that go from 8% to 30%. According to an official Report of 2019, 72% of formal workers in 2017 declared labor earnings within the unaffected bracket, and only 0.8% had earnings subject to the highest marginal tax rate. This explains the effective tax rate being small. *Análisis de Ingresos Tributarios 2019.* Ministry of Economy and Finance of Peru, August 2020.

[62] *Informe sobre Incumplimiento Global en el Impuesto a la Renta de la Tercera Categoría del Régimen General y del Régimen MYPE Tributario durante 2021.* Peruvian Tax Authority, June 2022.

types of jobs; (ii) the 12-month (annual) transitions $ii' \ \forall \ i \in \{0, 1, 2, 3\}$; (iii) the average wage for all employees, as well as for permanent, temporary and informal employees, approximated by that of part-time workers; and (iv) the average share of permanent employees among formal workers for firms grouped into the four clusters considered. Denoting the vector of parameters to be estimated as Φ with dimension $P \times 1$, the estimation procedure determines $\hat{\Phi}$ as the argmin of the following criteria function:

$$M(\Phi)'\Sigma M(\Phi)$$

where $M(\Phi)$ is the $M \times 1$ vector of moments computed with Φ; and Σ corresponds to the weighting matrix $M \times M$, which I consider a diagonal matrix with the inverse of the variance of each moment calculated from the data[63].

While it is not feasible to provide a formal identification proof, here I provide a heuristic identification argument for the model's key parameters. On the one hand, firms' productivity parameters $\rho \in \mathbb{P}$ are determined by the average share of permanent employees in each of the four clusters considered. Let a firm type ρ be the collection of matches with productivity ρ. In the model, ρ affects $J_k(v, k, \rho)$, determining the set of feasible submarkets offering contract k where a firm type ρ can operate. Considering submarkets offered on permanent contracts, ρ will affect the number of permanent workers that the firm hires and, therefore, its share. On the other hand, the parameters governing the curvature of the matching functions ($\varphi_k \ \forall \ k \in \mathbb{K}$) are pinned down from the annual transitions and average wages. Intuitively, φ_k influences $p_k(\theta(v, k))$, thus affecting the expected return to search for contract k. This weakly impacts the value of search and, hence, the value of holding a job, ultimately affecting the wage offered in a submarket. Therefore, the annual transitions and the average wages are significantly influenced by φ_k.

6 Estimation Results

As I already discussed, I focus on male employees aged 18-64 working in firms with five or more employees in the private sector.

6.1 Model Fit

Table 4 shows the moments from my sample and simulations.

[63] I computed the variance of each moment by estimating their standard errors using bootstrap with 1000 replications.

Table 4: **Model Fit**

	Actual	Model		Actual	Model
Distribution of unemployed and employees[1]			Annual transitions		
Unemployed	0.07	0.10	From unemployment to		
Informal	0.46	0.40	Unemployment	0.23	0.11
Temporary	0.36	0.36	Informal	0.38	0.60
Permanent	0.11	0.14	Temporary	0.35	0.28
			Permanent	0.04	0.00
Monthly wages[2]			From informal to		
Informal	0.39	0.39	Unemployment	0.04	0.16
Temporary	0.42	0.42	Informal	0.76	0.62
Permanent	0.42	0.40	Temporary	0.17	0.21
Total	0.40	0.40	Permanent	0.03	0.00
			From temporary to		
Share of permanent employees[3]			Unemployment	0.04	0.06
Firm type 1	0.26	0.00	Informal	0.14	0.13
Firm type 2	0.27	0.26	Temporary	0.65	0.78
Firm type 3	0.29	0.30	Permanent	0.16	0.03
Firm type 4	0.30	0.31	From permanent to		
			Unemployment	0.02	0.02
			Informal	0.06	0.09
			Temporary	0.33	0.10
			Permanent	0.59	0.79

Notes: (1) As percentage of the total labor force. (2) Residual monthly wages, controlling for worker's FE, educational level, age, contract and year FE. I normalize to the maximum residualized value in the sample. (3) As percentage of formal employees.

6.2 Estimated parameters

Table 5 shows the estimates of the model's parameters. Regarding workers' preferences, the flow value of leisure is 0.024. Regarding search technology, the parameters governing the curvature of the matching functions imply that, given the market tightness, informal vacancies are the easiest to find for workers and to fill for firms. Moreover, temporary jobs exhibit a higher JFP among formal contracts, which is also found in Tejada (2017). The ordering in the ease of matching across the three types of jobs can arise from higher hiring costs on formal employment, rooted in the labor regulation and stringent firing policy for permanent jobs. Finally, Table 5 exhibits the productivity level of the four types of firms and the fixed vacancy cost (0.024).

Table 5: **Estimated Parameters**

Notation	Value	Description
Workers' preferences		
b	0.024	Flow value of unemployment
Search technology		
φ_1	0.992	Matching curvature: informal
φ_2	0.328	Matching curvature: temporary
φ_3	0.213	Matching curvature: permanent
Production technology		
ρ_1	0.404	Productivity Firm type 1
ρ_2	0.431	Productivity Firm type 2
ρ_3	0.435	Productivity Firm type 3
ρ_4	0.491	Productivity Firm type 4
κ	0.024	Vacancy cost

6.3 Equilibrium Job ladder

The equilibrium of the estimated model corresponds to a job ladder of values, which are progressively delivered by informal, temporary, and ultimately permanent contracts. This equilibrium arises due to the interaction of three factors. First, for a given type of contract k, workers apply for more valuable jobs based on the value of their current occupation V. Second, as the promised value v increases, it is profitable for firms to post vacancies on more formal contracts only. Third, while the probability of finding an informal job is the highest for less valuable jobs, it declines more rapidly compared to the other contracts as v increases, paving the path for temporary jobs, which exhibit the second highest JFP and can offer higher values.

Regarding the first factor, for a given k, when $V < \tilde{v}_k$, workers' search strategy $(v^*, k)(V)$ dictates that they separate according to V and optimally apply for jobs in submarkets offering higher values. This strategy implies that workers climb a ladder of values within contract k[64].

Regarding the second factor, the estimation of the model offers that $\tilde{v}_1 < \tilde{v}_2 < \tilde{v}_3$, which implies that, as v increases, submarkets are open on more formal contracts only. Crucially, this estimation outcome divides the set of promised values into four regions: a zone of the least valuable jobs where firms can offer values on the three types of jobs ($v \in [\underline{v}, \tilde{v}_1]$), a second where firms can offer higher values on temporary and permanent jobs only ($v \in (\tilde{v}_1, \tilde{v}_2]$), a third where firms can promise even higher values on permanent contracts only ($v \in (\tilde{v}_2, \tilde{v}_3]$), and a fourth where firms cannot promise

[64]This ladder exhibits diminishing gains and a finite number of rungs. See Appendix H.2 for details on these equilibrium properties.

values on any contract because none is profitable ($v \in (\tilde{v}_3, \bar{v}]$)[65].

The ordering of $\tilde{v}_k$ arises because the expected profits of hiring increase with formal status. Three drivers mainly explain this result. First, the retention probability is the highest for permanent employees, followed by temporary and, ultimately, informal workers. This order is due to the lowest destruction probability (λ_{30}) and probability of engaging in search (λ_{e_3}) faced by permanent employees. Second, for every v generating a positive surplus for the unemployed, the offered wage decreases with the formality of the job. This happens because, conditional on holding a job, the value of a permanent contract is greater than that of a temporary one, which in turn is higher than that of an informal arrangement. Therefore, for a given promised value, the wage delivering the value on a permanent job is the lowest, and that on an informal one is the highest. Third, as v increases, the offered wage on permanent contracts increases by the smallest amount and that on informal jobs increases by the most significant amount, reducing the relative attractiveness of offering informal jobs for firms[66].

Finally, the equilibrium job ladder with gradual transitions varying from informal to permanent jobs is also driven by the heterogeneous matching functions. The estimation of the model offers that $\varphi_1 > \varphi_2 > \varphi_3$ (Table 5). Considering the market tightness in each submarket (v, k), these different matching functions have two implications. On the one hand, in submarkets with sufficiently low promised values, the JFP of informal jobs is the highest among contracts, followed by that of temporary jobs and, ultimately, by that of permanent ones. On the other hand, as the promised value of a submarket approaches $\tilde{v}_k$, the JFP of job type k decreases more rapidly than other contracts[67]. This dynamic encourages transitions to other contracts.

Considering the three factors mentioned, an unemployed worker initially enjoying a value of H_0 finds it optimal to enter the labor market through an informal job, which exhibits the highest JFP and offers the greatest return to search. Once employed, the worker keeps climbing the ladder of values. However, as his current V approaches $\tilde{v}_1$, the JFP of an informal job decreases significantly, reducing its return to search. In this context, temporary jobs displace informal ones as those generating the largest return, prompting the informal worker to transition to a temporary position. Eventually, as the value of holding a temporary job approaches $\tilde{v}_2$, the value of searching for a permanent job exceeds that of searching for a temporary one. At this point, the worker

[65] See Figure 18 in Appendix H.3 for a visualization of these four regions.

[66] The reason the informal wage offer increases more than the other contracts as the promised value v increases is due to the result that the slope of the workers' value function increases with the formality condition. Therefore, for a given increase in the promised value, the informal wage offer has to increase more than that of temporary and permanent jobs. Notably, the slope of workers' value function increases with formality because of the unemployment insurance and employment protection offered by formal contracts, defined as proportions of the wages.

[67] This result is driven by the heterogeneity in φ_k and the property that $p(\theta(v, k))$ is decreasing and concave in v.

optimally applies for a permanent job. This process establishes a job ladder of values, where informal jobs constitute the first step into employment, and temporary jobs act as a stepping stone towards permanent ones.

The equilibrium job ladder is shown in Table 6. It exhibits three important features.

First, workers optimally apply for jobs based on the value of their current state. The unemployed gradually progress to informal, temporary, and ultimately permanent jobs, which offer the highest values. The equilibrium ladder captures the coexistence of three job types seen in the data. Also, it reveals that informal employment is an integral part of workers' careers, and that temporary contracts serve as stepping stones towards permanent positions.

Second, the job-finding probabilities decrease with the rungs of the job ladder. For example, an unemployed who enjoys a value of 86.3 finds it optimal to look for an informal job promising a value of 87.4, where the probability of matching is 83.9%. However, once the worker gets the job, he applies for a temporary contract offering a value of 88.2, where the JFP declines to 12.0%. Similarly, as a temporary employee, he applies for a permanent contract offering a value of 89.5, where the probability of matching is just 2.5%. This negative relationship between the JFP and rungs leads to J2J transitions that are decreasing in the rung of the ladder, which is aligned with the empirical evidence (Appendix F.1). This implies that, as workers build their careers, getting more valuable and formal jobs takes longer.

Table 6: **Equilibrium submarkets**

	Submarket		JFP	Employees		
	Value	Contract	%	N	%	Wage
0	86.3	0	-.-	98	-.-	0.024
1	87.4	1	83.9	402	44.6	0.394
2	88.2	2	12.0	363	40.2	0.419
3	89.5	3	2.5	125	13.9	0.401
4	90.4	3	0.6	12	1.3	0.414

Finally, the equilibrium job ladder in Table 6 generates a labor market with two other characteristics. First, labor is primarily informal, and formal employment is mostly temporary, consistent with the fact described in Section 3.1. In particular, among employees, 44.6% hold an informal job, whereas 40.2% and 15.2% hold temporary and permanent jobs, respectively. Second, there is a wage cut for transitions from temporary to permanent jobs. This is consistent with the fact that, among those temporary employees who get a permanent job, 48.6% face a reduction in their wages, after controlling for educational level and age fixed effects[68]. In the model, this arises

[68]See Appendix G.6

because, relative to temporary contracts, permanent jobs offer employment protection upon job destruction. In this context, a permanent job offers a higher value for every wage than a temporary one. Therefore, when a temporary worker and a permanent vacancy meet, the offered wage will be lower than the current wage[69].

6.4 Firms' hiring policy

In this section, let a firm type ρ be the collection of matches with productivity ρ. One of the most interesting implications of the model is that firms hire workers on different contracts and this mixture varies across firms' productivity.

Figure 4 shows firms' hiring policy in equilibrium. There are three features to highlight. First, among the four types of firms considered, the three most productive are active in equilibrium. The least productive does not participate because it does not find it profitable to hire in any of the submarkets that workers visit.

Second, every active firm hires workers on informal, temporary, and permanent contracts. This mix emerges due to the trade-offs embedded within each contract and the different vacancy-filling rates. These factors make active firms indifferent to posting the three types of contracts. In the estimated model, before entry, firms are indifferent between creating vacancies in the submarkets displayed in Table 6. However, once they create vacancies and learn their productivity parameter, only the three most productive firms experience a positive value of hiring in those submarkets. With positive vacancy-filling rates, these firms hire workers across various submarkets, offering different contracts. This process leads to a mix of workers within each firm.

Third, Figure 4 shows that more productive firms hire a larger share of their employees on permanent jobs. This outcome arises for two reasons.

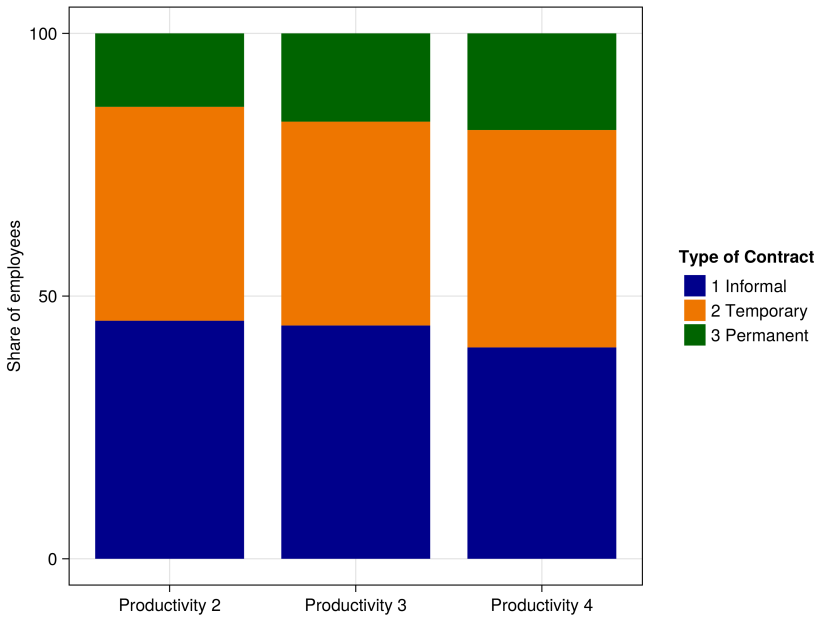
On the one hand, only highly productive firms can afford to hire in submarkets promising the highest values, which are offered on more formal contracts[70]. This implies that, relative to less productive counterparts, more productive firms participate in more valuable submarkets offering permanent contracts, leading to more permanent employees. In line with this, in the equilibrium of the estimated model, only firm types ρ_3 and ρ_4 can afford to hire in the most valuable submarket, which offers permanent jobs (Table 6).

On the other hand, more productive firms hire fewer workers on less valuable submarkets, which

[69] This feature where wage cuts are caused by the different intrinsic values of different types of contracts is also present in Meghir et al. (2015). An alternative approach generating wage cuts is sequential auctions (Postel-Vinay and Robin (2002)).

[70] This stems from the property that firm's value of hiring on contract k is increasing in ρ (Equation (11)) and the ordering of $\tilde{v}_k$ (Section 6.3).

Figure 4: **Type of worker by type of firm**[1]
(as % of employees in the firm)



Note: (1) A firm type ρ corresponds to the collection of matches with productivity $\rho = \{0.404, 0.431, 0.435, 0.491\}$.

offer less formal arrangements. These firms find it profitable to operate in those submarkets. However, even though matching in each submarket is random, the probability to fill vacancies is determined by the distribution of potential entrants, conditional on remaining for matching ($P(\rho|J_k(v,k,\rho) > 0)$, which is tilted towards less productive firms[71].

The previous two results are consistent with the evidence described in Section 3.3. Moreover, they generate wage dispersion within and between firms. On the one hand, submarkets visited in equilibrium promise different values, each of which is delivered on a different wage. Therefore, there is wage dispersion within firms hiring on different types of contracts. On the other hand, since firms hire a different number of workers on each type of contract and only firms ρ_3 and ρ_4 hire permanent workers in the most valuable submarket, there is wage dispersion across firms.

7 Policy Analysis: Reducing the Firing Cost

In this section, I examine the model's implication of a reduction in the severance pay from 6.0 to 1.2 wages, which is the approximated average severance received before the Constitutional Court

[71] As explained in Section 5.1, $P(\rho) = \{0.653, 0.221, 0.092, 0.034\}\ \forall\ \rho \in \mathbb{P}$.

resolution in 2002[72].

In the model, a reduction in the severance pay alters the equilibrium by affecting firms' profitability of hiring permanent workers. The impact takes place through two counteracting mechanisms, which hold for all ρ. First, for a given wage, a decrease in employment protection directly increases the firms' value of hiring permanent workers. In particular, for every promised value to the worker, $J_3(v, 3, \rho)$ shifts upwards (Equation (11)). Second, it reduces the workers' value of holding a permanent job for every wage (Equation (7)). Therefore, by the wage determination rule, the offered wage $h(v, 3)$ increases in all submarkets offering permanent contracts. This wage adjustment mechanism pushes $J_3(v, 3, \rho)$ downwards.

In the estimated model, the first mechanism dominates. Since this holds for all ρ, a reduction in severance generates a net increase in the expected value of hiring permanent employees to firms, before entry. This generates two effects. First, by the break-even condition, it causes an increase in the highest value a firm can offer on a permanent contract ($\tilde{v}_3$), which constitutes an enlargement of the set of feasible values offered on permanent contracts. Second, by the free entry condition, it increases the equilibrium market tightness in submarkets offering permanent jobs, boosting the probability of finding a permanent position. The combination of these two effects generates that, in equilibrium, applicants with a given current value V face a higher return to search for permanent jobs and target more valuable permanent submarkets $(v^*, 3)(V)$.

One of the most interesting features of the model is that the higher value of search for permanent jobs at the top of the ladder, propagates to the lower temporary and informal rungs. Intuitively, since permanent contracts are offered at the upper end, and the return to search for permanent jobs is part of the continuation value of temporary and informal workers, the increase in the value of search for permanent contracts increases the value of holding these other jobs. Consider a temporary employee currently enjoying a value $V_2 < \tilde{v}_3$. The increase in the return to search for permanent jobs ($R^3(V_2)$) weakly increases his value of search ($R(V_2)$). Considering that reaching the top of the ladder takes time and it is subject to different shocks, the increase in $R(V_2)$ translates into a less than proportional increase in the value of holding a temporary job. Crucially, in the presence of the wage adjustment mechanism, this weaker increase causes a reduction in the offered wages in temporary submarkets, fostering the firms' expected value of recruiting temporary employees ($\mathbb{E}_\rho[\max\{J_2(v, 2, \rho), 0\}]$). Similar to the permanent case, this (i) enlarges the corresponding set of feasible values and, in equilibrium, (ii) generates a higher market tightness in submarkets offering temporary jobs. These two effects generate a higher value of search for temporary vacancies and more valuable targeted temporary submarkets $(v^*, 2)(V_2)$.

[72]Considering ENAHO 1998 - 2001, it corresponds to the average reported severance received in the last 12 months, as percentage of the wage earned.

This same logic applies to an informal employee with $V_1 < \tilde{v}_2$. The higher return to search for permanent and temporary jobs ultimately leads to a less than proportional increase in the value of holding an informal job. Through the wage mechanism, this reduces the offered wages in informal submarkets, fostering the firms' profitability of hiring informal employees. This generates a higher value of searching for informal vacancies and a more valuable targeted informal submarket $(v^*, 1)(V_1)$. Finally, the unemployed workers benefit from the higher returns to search for all types of jobs, which weakly increases the value of unemployment.

In this sense, a reduction in severance pay, which directly affects permanent contracts offered at the top of the job ladder, generates a steeper ladder of values and a propagation to lower rungs.

I performed a counterfactual analysis in which I reduce the severance pay from 6.0 to 1.2 wages, reverting the legal reform in 2002. I determined the impact of this reform on the job ladder and the labor market composition for two alternative scenarios: (i) short term, when I abstract from wage adjustments made by firms; and (ii) long term, when firms adjust wages in response to changes in the workers' value of holding a job, given the severance pay policy.

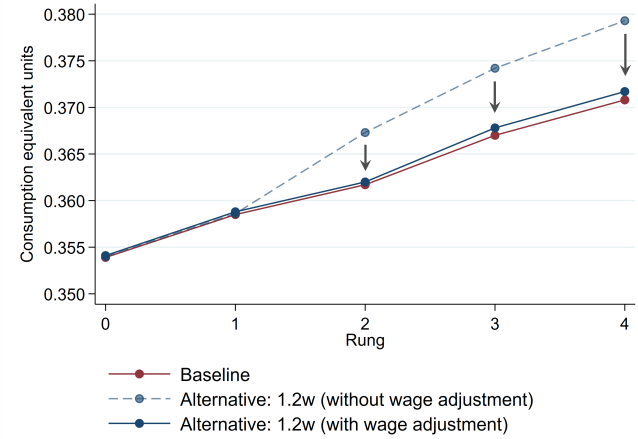
Regarding the job ladder, the reduced severance generates a steeper job ladder. Panel A in Figure 5 shows the promised value of holding a job in each rung expressed in permanent consumption units for the baseline and the alternative scenarios.

In the short term, permanent consumption increases to a significant larger extent at the top three rungs, which are now offered on permanent contracts (Table 16 in Appendix G.7). In particular, the reform generates an average increase in permanent consumption of 1.9% among permanent employees, relative to baseline (Panel B in Figure 5). This arises from the increased availability of more valuable and readily accessible permanent jobs. Importantly, the gains in lower rungs are negligible. This arises because, without wage adjustments, the higher returns to search for permanent jobs after the policy do not change the firms' incentives to post temporary and informal jobs and, therefore, do not modify the workers' optimal submarkets at lower rungs.

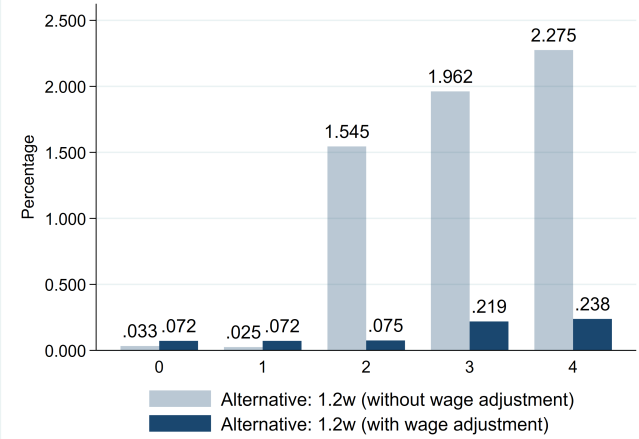
In the long term, the steeper job ladder partially flattens, driven by the firms' imperative to offer higher wages to permanent employees to compensate them for the reduced job security. Consequently, the equilibrium job ladder exhibits slightly higher levels of permanent consumption and improved job-finding prospects, particularly at the higher rungs. This aligns with the model's propagation effect, where each tier of the equilibrium ladder, including unemployment, yields slightly higher levels of permanent consumption compared to the baseline (Panel B). The increase in percentage is more pronounced at the top rungs that offer permanent contracts, as the decrease in severance pay directly amplifies the value for both firms and workers in offering and seeking permanent positions.

Figure 5: **Effects on the Job Ladder**

(A) Permanent per-period consumption units



(B) Percentage change with respect to baseline



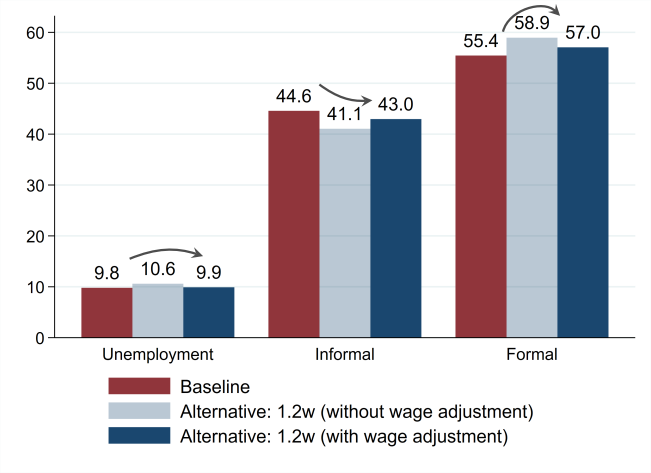
Regarding the labor market composition, in the short term, the reduction in the severance pay fosters formal employment by 3.5 pps, reaching 58.9% of employees (Figure 6). Moreover, the reform prompts a complete substitution of temporary jobs for permanent ones, significantly enhancing the composition of formal employment. This occurs because, in the short run, when abstracting from wage adjustments, the reduction in severance fully increases the firms' value of hiring on permanent contracts. This greatly increases the probability of finding permanent jobs, displacing temporary positions.

However, in the long term, these gains decrease by more than 50%. Formal employment increases by 1.6 pps compared to the baseline, reaching 57.0%. Furthermore, temporary labor decreases by 0.7 pps, while permanent employment rises by 2.3 pps (Panel B in Figure 6). This implies that, among formal employees, the share of permanent workers increases by 3.3 pps, improving the internal composition of formal employment. Finally, unemployment exhibits a minor increase of 0.1 pps. This effect contrasts with the null to small positive impact of lower employment protection found in part of the existing literature (Cahuc et al. (2016) and Tejada (2017)). However, these studies do not take into account informal employment.

Figure 6: **Effect on Unemployment and Job Distribution**

(as % of labor force and employees, respectively)

(A) Unemployment, Informal and Formal labor



(B) Formal labor

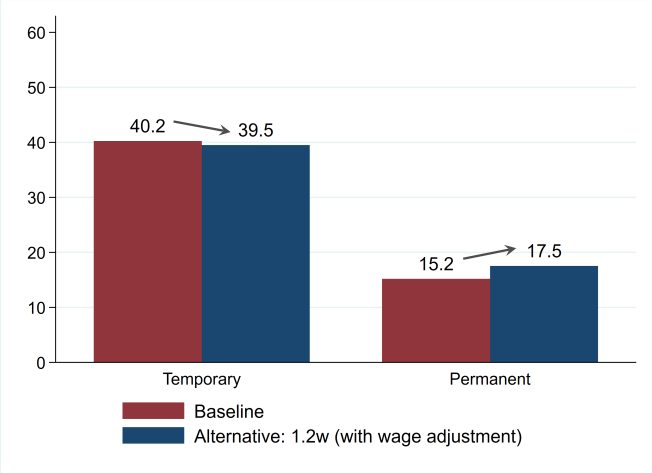


Table 7 presents the new equilibrium following a reduction in severance pay from 6.0 to 1.2 wages. In summary, three key observations emerge. First,in line with the model's predictions, the policy generates a job ladder characterized by slightly more valuable jobs and improved job-finding prospects, primarily at the top where formal positions are offered. Second, these more valuable and accessible jobs foster formal employment and permanent hiring, enhancing the internal composition of formal labor. Finally, the reform generates higher-paying permanent positions, widening the wage gap with informal employees.

Table 7: **Equilibrium submarkets: firing cost** $1.2w^1$

	Submarket		JFP	Employees		
	Value	Contract	%	N	%	Wage
0	86.4 (86.3)	0	-.-	99	-.-	0.024
1	87.5 (87.4)	1	83.8 (83.9)	387	43.0 (44.6)	0.394 (0.394)
2	88.3 (88.2)	2	12.2 (12.0)	356	39.5 (40.2)	0.419 (0.419)
3	89.7 (89.5)	3	2.6 (2.5)	142	15.8 (13.9)	0.414 (0.401)
4	90.7 (90.4)	3	1.0 (0.6)	16	1.8 (1.3)	0.425 (0.414)

Note: (1) Numbers in parentheses correspond to the baseline scenario.

8 Conclusions

In this paper I examine how firms and workers choose the types of contracts to supply and demand in an economy where informal jobs coexist with formal temporary and permanent contracts. Moreover, I determine the short and long-run effects of employment protection on workers' transitions, affecting the share of formal employment and its internal composition. To address these issues, I develop a novel equilibrium model with directed search, where firms and workers select into jobs, jointly determining the types of contracts available in the market. Leveraging the novel Peruvian Employer-Employee dataset, the estimated model yields two main findings.

First, in equilibrium, workers climb a job ladder, where informal jobs constitute the initial step into the labor market, and temporary contracts serve as a stepping stone to permanent positions, which workers value the most. This job ladder provides a new perspective of informality. Rather than being considered a refuge to avoid unemployment, informal employment emerges as an integral part of workers' careers. From a policy perspective, this shifts attention from policies aimed at tackling the prevalence of informality to those directed at accelerating workers' progression from fragile informal jobs to more valuable formal employment opportunities.

Second, a counterfactual analysis reveals that reducing the severance pay from 6.0 to 1.2 monthly wages, which reverts the Constitutional Court's resolution in 2002, is an effective but limited policy to promote consumption and enhance the labor market composition. Regarding the former, the policy generates a steeper job ladder, with slightly higher levels of permanent consumption associated to temporary and permanent jobs. Regarding the labor market composition, the reform fosters formal employment and permanent hiring in the short term, when firms have not yet altered the relative wages and contract offerings across different types of jobs. However, in the long term, these gains decrease by more than 50%. Relative to baseline, the share of formal employment increases by 1.6 percentage points, and the share of permanent workers among formal employees does by 3.3 percentage points, improving the internal composition of formal employment. Despite these gains, unemployment marginally increases by 0.1 percentage points. This difference between short and long-run effects highlights the importance of examining employment protection policies through the lens of an equilibrium model.

Further examination of the model presented in this paper indicates that fostering long-run formal employment can be achieved by integrating policies that reduce firing costs with initiatives designed to enhance firms' productivity. According to the proposed model, a higher prevalence of highly productive firms broadens the availability formal contracts, enhancing the job-finding probabilities associated with these positions. This accelerates workers' transition to more formal employment opportunities.

References

Victor Aguirregabiria and Cesar Alonso-Borrego. Labor contracts and flexibility: evidence from a labor market reform in spain. *Economic Inquiry*, 52(2):930–957, 2014.

James Albrecht, Lucas Navarro, and Susan Vroman. The effects of labour market policies in an economy with an informal sector. *The Economic Journal*, 119(539):1105–1129, 2009.

Neele Balke and Thibaut Lamadon. Productivity shocks, long-term contracts, and earnings dynamics. *American Economic Review*, 112(7):2139–77, 2022.

Arnab K Basu, Nancy H Chau, and Vidhya Soundararajan. Contract employment as a worker discipline device. *Journal of Development Economics*, 149:102601, 2021.

Vanessa Belapatiño, Nikita Céspedes, A Gutiérrez, et al. La duración del desempleo en lima metropolitana. *Revista Estudios Económicos*, 27(1):67–80, 2014.

Samuel Bentolila, Juan J Dolado, and Juan F Jimeno. Dual labor markets revisited. In *Oxford Research Encyclopedia of Economics and Finance*. 2020.

Fabio Berton and Pietro Garibaldi. Workers and firms sorting into temporary jobs. *The Economic Journal*, 122(562):F125–F154, 2012.

Matteo Bobba, Luca Flabbi, Santiago Levy, and Mauricio Tejada. Labor market search, informality, and on-the-job human capital accumulation. *Journal of Econometrics*, 223(2):433–453, 2021.

Mariano Bosch and Julen Esteban-Pretel. Job creation and job destruction in the presence of informal markets. *Journal of Development Economics*, 98(2):270–286, 2012.

Pierre Cahuc and Fabien Postel-Vinay. Temporary jobs, employment protection and labor market performance. *Labour economics*, 9(1):63–91, 2002.

Pierre Cahuc, Olivier Charlot, and Franck Malherbet. Explaining the spread of temporary jobs and its impact on labor turnover. *International Economic Review*, 57(2):533–572, 2016.

Sergio Correia. Linear models with high-dimensional fixed effects: An efficient and feasible estimator. *Unpublished manuscript, http://scorreia. com/research/hdfe. pdf (last accessed 25 October 2019)*, 4:2, 2017.

Diego Daruich, Sabrina Lucia Di Addario, and Raffaele Saggio. The effects of partial employment protection reforms: Evidence from italy. *Bank of Italy Temi di Discussione (Working Paper) No*, 1390, 2022.

Alain Delacroix and Shouyong Shi. Directed search on the job and the wage ladder. *International Economic Review*, 47(2):651–699, 2006.

Rafael Dix-Carneiro, Pinelopi K Goldberg, Costas Meghir, and Gabriel Ulyssea. Trade and informality in the presence of labor market frictions and regulations. Technical report, National Bureau of Economic Research, 2021.

Ceyhun Elgin, M Ayhan Kose, Franziska Ohnsorge, and Shu Yu. Understanding the informal economy: Concepts and trends. 2022.

Niklas Engbom and Christian Moser. Earnings inequality and the minimum wage: Evidence from brazil. *American Economic Review*, 112(12):3803–47, 2022.

Pietro Garibaldi, Espen R Moen, and Dag Einar Sommervoll. Competitive on-the-job search. *Review of Economic Dynamics*, 19:88–107, 2016.

Maia Güell and Barbara Petrongolo. How binding are legal limits? transitions from temporary to permanent work in spain. *Labour economics*, 14(2):153–183, 2007.

Daniel Haanwinckel and Rodrigo R Soares. Workforce composition, productivity, and labour regulations in a compensating differentials theory of informality. *The Review of Economic Studies*, 88(6):2970–3010, 2021.

James J Heckman and Carmen Pagés. Introduction to "law and employment: Lessons from latin american and the caribbean". In *Law and Employment: Lessons from Latin America and the Caribbean*, pages 1–108. University of Chicago Press, 2004.

Adriana D Kugler. The impact of firing costs on turnover and unemployment: Evidence from the colombian labour market reform. *International Tax and Public Finance*, 6(3):389–410, 1999.

Rafael La Porta and Andrei Shleifer. Informality and development. *Journal of Economic Perspectives*, 28(3):109–26, 2014.

Edward P Lazear. Job security provisions and employment. *The Quarterly Journal of Economics*, 105(3):699–726, 1990.

Norman Loayza, Luis Servén, and Naotaka Sugawara. *Informality in latin america and the caribbean*, volume 4888. World Bank Washington, DC, 2009.

Th Magnac. Segmented or competitive labor markets. *Econometrica: journal of the Econometric Society*, pages 165–187, 1991.

William F Maloney. Does informality imply segmentation in urban labor markets? evidence from sectoral transitions in mexico. *The World Bank Economic Review*, 13(2):275–302, 1999.

William F Maloney. Informality revisited. *World development*, 32(7):1159–1178, 2004.

Costas Meghir, Renata Narita, and Jean-Marc Robin. Wages and informality in developing countries. *American Economic Review*, 105(4):1509–46, 2015.

Guido Menzio and Shouyong Shi. Block recursive equilibria for stochastic models of search on the job. *Journal of Economic Theory*, 145(4):1453–1494, 2010.

Gaëlle Pierre. *Employment Regulations through the Eyes of Employers: Do they matter and how do firms respond to them?*, volume 1424. World Bank Publications, 2004.

Fabien Postel-Vinay and Jean-Marc Robin. Equilibrium wage dispersion with worker and employer heterogeneity. *Econometrica*, 70(6):2295–2350, 2002.

Shouyong Shi. Directed search for equilibrium wage–tenure contracts. *Econometrica*, 77(2):561–584, 2009.

Mauricio M Tejada. Dual labor markets and labor protection in an estimated search and matching model. *Labour Economics*, 46:26–46, 2017.

Boeri Tito. Institutional reforms and dualism in european labor markets. In *Handbook of labor economics*, volume 4, pages 1173–1236. Elsevier, 2011.

Gabriel Ulyssea. Firms, informality, and development: Theory and evidence from brazil. *American Economic Review*, 108(8):2015–47, 2018.

Etienne Wasmer. Competition for jobs in a growing economy and the emergence of dualism. *The Economic Journal*, 109(457):349–371, 1999.

Appendix

A Appendix - Data cleaning

A.1 Data sources and description

Table 8 describes the main datasets used in this paper.

Table 8: Data sources

Short name	Period	Full name	Description
PE	2015-2020	Planillas Electrónicas	Monthly administrative employer-employee dataset on formal employees in tax withholding firms.
ENAHO	1997-2022	Encuesta Nacional de Hogares	Annual survey. Contains data on households' members such as employment spell, wages, contracts.
SES	1997-2001	Encuesta Especializada de Niveles de Empleo	Annual survey, supplementary to ENAHO. For period 1997-2001, it contained more detailed data on households' members' type of contract.
ENAHO panel	2007-2022	Encuesta Nacional de Hogares - Panel	Rotating panel sample with a maximum of five years.
EEA	2001-2022	Encuesta Económica Annual	Annual survey. Contains data on a sample of firms such as sales, expenditures, number of employees.

In addition to these datasets, I use the effective labor income tax and corporate tax rates from the Ministry of Economy and Finance of Peru and the Peruvian Tax Authority, respectively. Similarly, I get the minimum wage time series from the Central Bank of Peru.

A.2 Data manipulation

A.2.1 *Planillas Electrónicas* and ENAHO - ENAHO Panel

In this paper, the main unit of analysis consists of the unemployed and employees, who are workers holding an implicit or explicit contract and receiving a monetary compensation for their work. It includes fixed and variable compensations such as wage and bonuses, respectively. Also, as described in the main text, I restrict attention to employees working in firms with five or more

employees in the non-agricultural private sector. This excludes Public Administration and Defense industries.

I consider monthly wages as those corresponding to the main activity. In PE, I consider it corresponds to the job that generates the highest wage in a given month. In the few cases in which there were two main jobs generating the same wage, I ranked the main jobs according to the type of contract. The ranking I consider is permanent, temporary and others. If there were two main jobs offering the same wage on the same contract, I just took the first job reported. In ENAHO, individuals report the frequency and compensation they receive in their main activity. I consider these variables to build the gross monthly compensation in main activity. I consider gross compensation and, since I focus on employees, I only consider income from dependent main jobs as opposed to income from self employment.

In PE, there were cases exhibiting large transitory changes in monthly compensations during J2J transitions and re-entry into formal jobs. This may be related to significant differences in the number of days worked in a month between the former and the new job. Since the dataset does not include this information, I substitute the wage of the first month after a transition or re-entry by that of the following month. Similarly, I replace the last wage before a transition or exit by that of the previous month. I also exclude monthly wages exhibiting monthly changes larger than 50% during a given job and larger than 90% in switching to another job. Finally, I also exclude from the sample those monthly wages below 50% of the minimum wage.

I compute the real monthly wages expressed in PEN Soles of Metropolitan Lima in 2010. For this, I use the Consumer Price Index and the Regional Poverty Line relative to that of Metropolitan Lima. With this measure of real wages, I exclude the 1% at the bottom and at the top of the distribution.

Regarding employees' type of contracts, in PE, I consider workers holding a part-time job as proxy of informal employees, which are only observed in ENAHO. I also take temporary employees as all workers holding a fixed term contract, regardless of the circumstance (accidental or occasional needs, uncertain transitory situations or the provision of specific services). This is consistent with the characterization of temporary workers from ENAHO, which includes workers under fixed-term contracts, provision of specific services and occasional work. Finally, I define permanent employees as those holding an open-ended contract. Using ENAHO, I define informal employees as those that do not hold an explicit contract but get a monetary compensation for their work. Also, I consider temporary employees as the sum of those holding a fixed term and those providing a specific service.

For information on annual transitions, I use the ENAHO Panel. Since in the model, unemployed people always remain in the labor force, I consider as unemployed those without any contract that

actively seek for a job. In this sense, to compute the annual transitions, I exclude those discouraged unemployed who exit the labor force and the unemployed who become self-employed or join the agricultural sectors.

For information on J2J transitions, I use the PE. I use individuals in my sample that, between 2015-2020, make up to five J2J transitions in that period. They represent 99.5% of the total individuals in the sample.

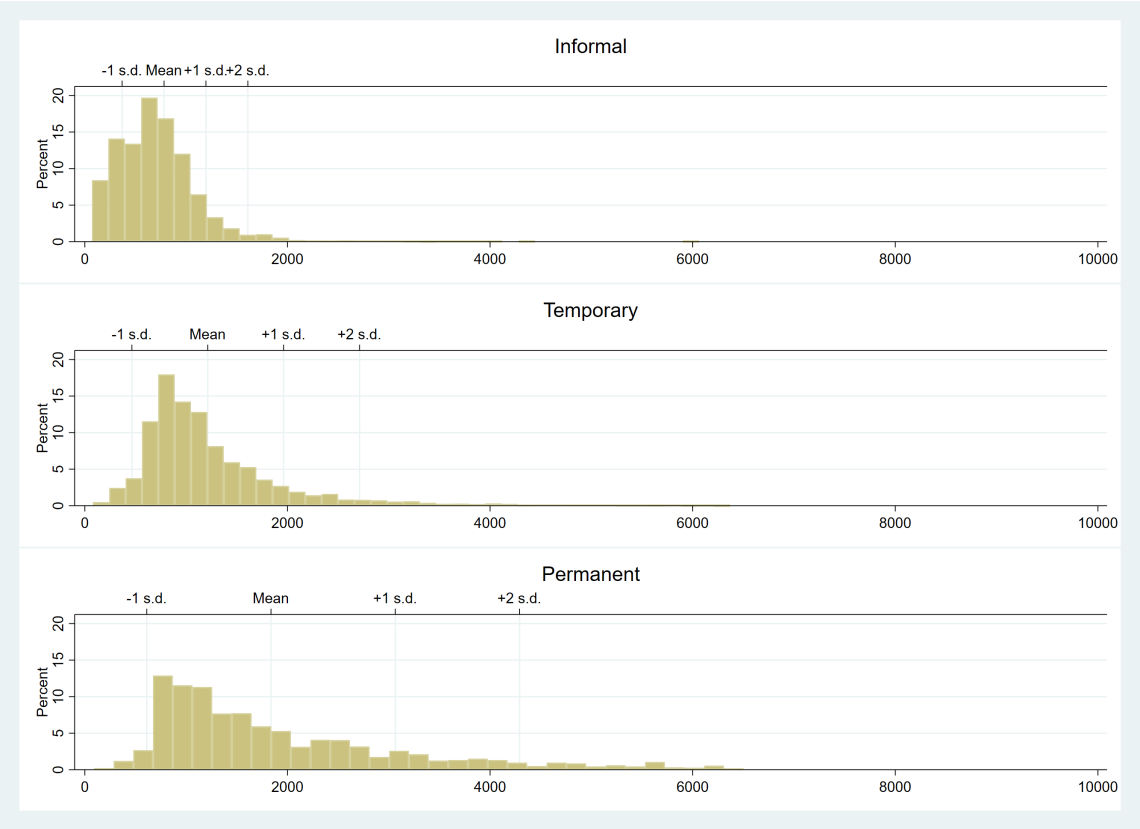
A.2.2 EEA

I restrict attention to firms in the private sector with five or more employees. Therefore, I excluded public enterprises and entrepreneurs. EEA contains information from a sample of firms, which can be micro, small medium and large.

Regarding employees and their types of contracts, the sample construction in the EEA follows as closely as possible those applied to *Planillas Electrónicas*, ENAHO and ENAHO Panel. In this sense, for each firm and its establishments, I consider total number of employees in a firm as the total number of workers holding a permanent contract, which includes managers; and workers holding a temporary contract, which includes occasional personnel. I exclude owners and unpaid family members. Therefore, in the sample, permanent and temporary workers sum up to the total number of a firm's employees.

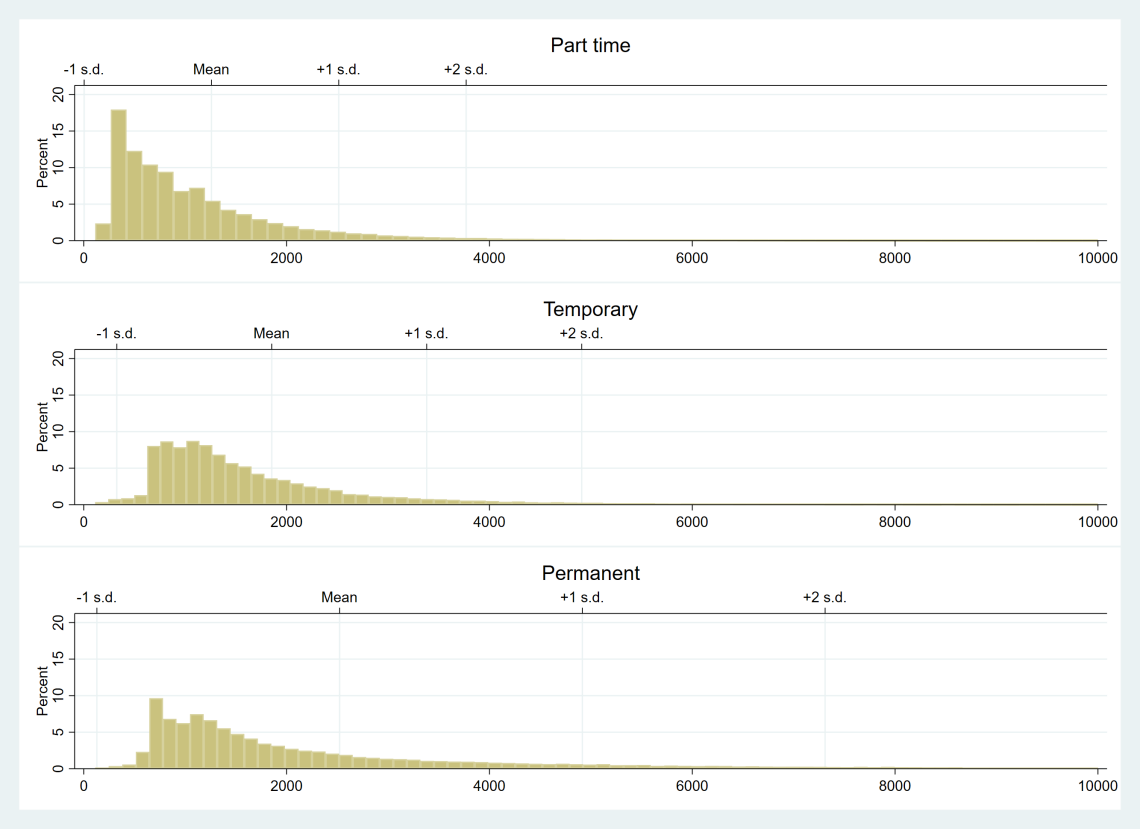
B Appendix - Distribution of monthly real wages 2015 - 2019

Figure 7: **ENAHO: Monthly Real Wages 2015 - 2019**



Source: ENAHO, Peru. Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense industries.

Figure 8: **PE: Monthly Real Wages 2015 - 2019**



Source: PE dataset, Peru. Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense industries.

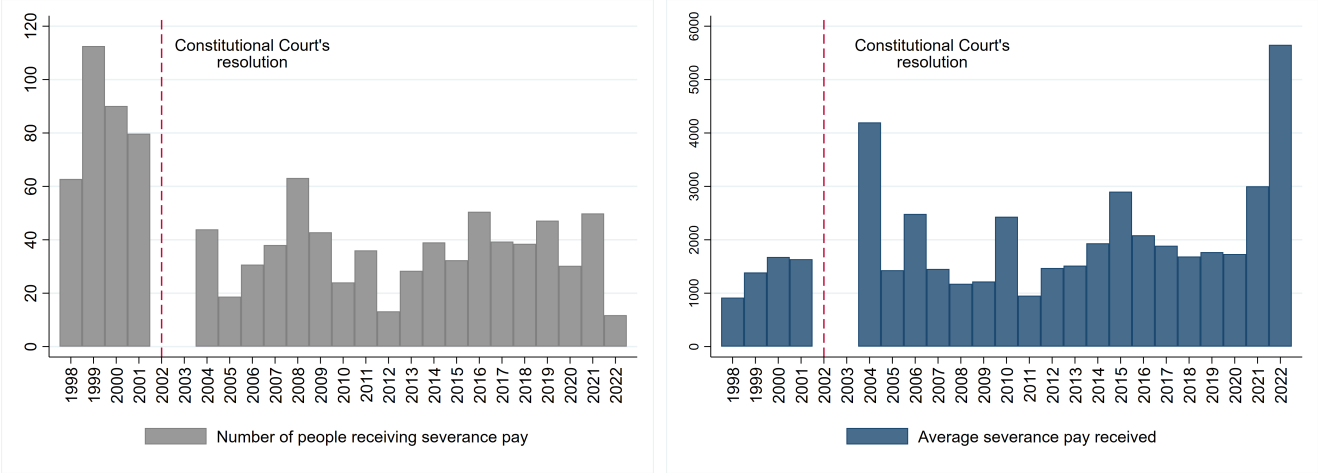
C Appendix - Dismissed workers and average severance pay 1998 - 2022

Considering the number of people who claim having received severance pay upon firing in the past 12 months as a proxy of dismissed formal employees, Figure 9 shows that, after the Constitutional Court's resolution, the number of firings during 1998 - 2001 decreased by 70% in the period 2004-2007. Moreover, the average severance pay received by dismissed workers increased 36% in real terms during 2004 - 2007.

Figure 9: **Dismissed workers and average severance pay received 1998 - 2022**[1]

(A) Dismissed Formal employees[2] (thousands)

(B) Severance received in the last 12 months (PEN S/ 2010)



Source: ENAHO-SES, Peru. Notes: (1) ENAHO-SES 2002 and 2003 does not allow to distinguish the type of contract. (2) Number of people who claim having received a severance pay upon firing in the last 12 months.

D Appendix - Decomposition of total variance of log wages 2015 - 2019

I perform a decomposition of total variance of wages, following Engbom and Moser (2022). Let y_{it} denote the log of real monthly wages of individual i in month t. Let $edu(i) = \{ed_1, ed_2, ..., ed_n\}$ denote the educational attainment group of individual i, which I assume constant for period 2015 - 2019. Then, the total variance of log wages can be decompose according to the following:

$$Var(y_{it}) = \underbrace{Var(\mathbb{E}[y_{it}|edu(i)])}_{\text{Between education-group variance}} + \underbrace{Var(y_{it} - \mathbb{E}_i[y_{it}|edu(i)])}_{\text{Within education-group variance}}$$

0.454	**0.077**	**0.377**
100%	*17%*	*83%*

The first term on the right hand side is the variance of the average log wage of the educational attainment group of individual i. It represents the between-educational-attainment-group variance of log wage. The second term is the variance of the worker-month level deviations from the education group log wage, which captures the within-education-group variance (Engbom and Moser (2022)).

I implement the previous decomposition using PE for period 2015 - 2019. I considered two samples. First, all employees with ages in the range 18-64 working in firms with five or more employees in the private sector. Second, among the previous sample, I considered only men. For these two samples, I exploited a very detailed educational group variable with seven categories, running from no education to complete graduate education. The results for the two samples are similar. I find that, out of a total variance of 47 and 45 log points for each sample, only 17% is explained by the between-education-group variance. The remaining 83% is explained within educational groups, which I take as motivating evidence to build a model that can explain wages and employment dynamics among homogenous workers.

E Appendix - Relatively flat tenure profile of wages

I use PE 2015 - 2020 to capture the tenure profile of wages. I estimated the following equation:

$$\text{Log(wage)}_{it} = \beta_1 \text{rung}_{it} + \beta_2 \text{rung}^2{}_{it} + \beta_3 \text{permanent}_{it} + \sum \delta_{ijt}^{tenure} + \sum_{k=4} \beta_k x_{k,it} + \epsilon_{it}$$

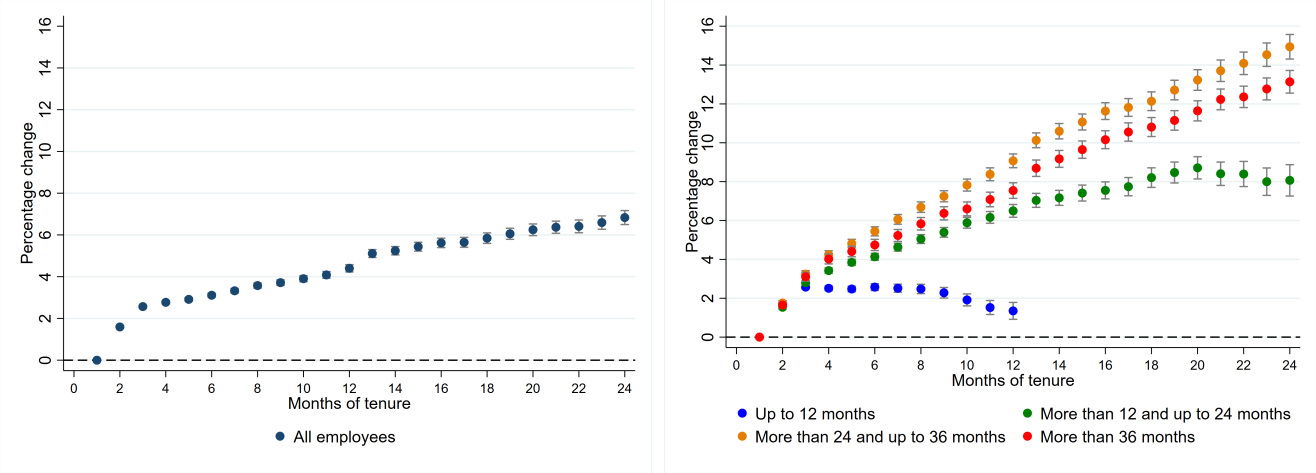
where δ_{ijt}^{tenure} are dummies for each month of tenure an individual i has in a firm j in a given period t; and $x_{k,it}$ corresponds to a control variable such as worker's FE, worker's age, occupation, firm's size, industry and year FE.

Figure 10 shows the point estimates for each month of tenure in a job and their 95% confidence interval. Panel A reveals a positive but relatively flat tenure profile of wages: after 24 months in a given job, workers are paid 6.8% more than at the beginning of the match.

Moreover, considering that 60% of individuals in the sample hold a job for 24 months or less and that only 20% hold one for more than 36, I decided to group individuals by their job duration. Panel B shows that the tenure profile is heterogeneous across groups of job duration. For example, among individuals keeping a job for 12 months or less (30% of the sample), wages increase on average 1.3% by the end of the month 12 relative to the beginning of the match. However, this percentage increases to 7.5% among those holding a job for more than 36 months (19.6% of the sample).

Figure 10: **Accumulated percentage change in wages over tenure**[1,2]
(relative to beginning of match)

(A) All employees (B) By job duration



Source: PE dataset, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense industries. (2) Figure includes 95% confidence interval of each point estimate.

F Appendix - Characteristics of job-to-job transitions

Considering PE 2015 - 2019, in a given month, 89% of formal employees in my sample remain in their current jobs, 6% are new entrants or re-entrants and 5% change or exit their jobs. Among this last group, 31.2% correspond to J2J transitions, which exhibit three interesting features[73]. First, they are decreasing in wages and in the rung of the job ladder an employee is currently observed. Second, transitions generate positive but diminishing wage gains (i.e., wage gains decrease as a worker climbs up the job ladder). Finally, transitions are associated to relatively limited wage mobility in the sense that, on average, they occur between adjacent deciles of wages.

Put together, the three properties of the J2J transitions in the data suggest that a given worker in a low paying job gradually climbs up the job ladder, experiencing positive but diminishing percentage wage gains as he transits to new jobs, where he remains for longer periods. I take this evidence as supportive of my directed search approach. When search is directed, workers gradually progress along the job ladder because their current state affects the trade-off they face when optimally choosing the market where to apply for a job. Applicants target more valuable

[73]The remaining 68.8% exit the formal sector. Among them, 49.0% are reported to exit because their contract expire or quit without any incentives; and 2.7% are reported to have been fired, have quit with incentives or other reasons. For the remaining 48.3%, the reason of termination is not reported.

jobs according to their current states. This generates that, for a given type of contract, the gains along the job ladder are positive but systematically decreasing in percentage terms.

F.1 Job-to-job transitions are decreasing in current wage and rung

I run a regression of J2J transition on log wages and dummies for rung, controlling for the type of contract the worker holds, worker's age, occupation, firm's size, industry and year FE.

$$\text{J2J}_{it} = \beta_1 log(w_{it}) + \sum \alpha_{it}^{rung} + \sum_{k=2} \beta_k x_{k,it} + \epsilon_{it}$$

The first column of Table 9 considers employees who made up to five J2J transitions between 2015 - 2020[74]. It shows two results. First, for employees holding a temporary and permanent contracts, a 10% higher wage is associated to 0.15 pps decrease in the probability to transit to a new job, respectively. Second, as employees change jobs, the chance to switch to a new job declines relative to that in the previous job. For example, relative to his first job, an employee in his second job has 0.12 pps less probability to move to another job. Similarly, relative to his previous job, an employee in his sixth job has 0.07 pps less chances to move. This implies that, as workers progress in their careers, it takes longer to move to new jobs.

These results are robust to different subsamples. Given that PE does not contain individuals' employment history previous to 2015, I divided the sample in groups according to the total number of J2J transitions observed between 2015 - 2020. Columns 2-5 in Table 9 show the estimates for individuals making 1-4 transitions during that period. Regarding the first result, I get that, among those either temporary or permanent employees making one transition, a 10% higher wage is related to a 0.07 pps decrease in the probability to transit to another job. Similarly, for those making four transitions, this probability declines by 0.28 pps. Regarding the second result, these two groups of workers remain for longer time in their jobs: as they transition to new jobs, the probability of engaging in a J2J transition declines.

Finally, these negative relationships between J2J transitions and wage and rungs also remain when I consider only those employees who held the same type of contract (either a temporary or a permanent) along all the J2J transitions (see Tables 10 and 11 in Appendix G.3).

[74] These individuals represent 99.5% of all employees in my sample.

Table 9: **Job-to-job transition**

	Job-to-job transition				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Log(wage)	-0.015***	-0.007***	-0.015***	-0.022***	-0.028***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Permanent	-0.002	-0.004	-0.002	0.005	0.009
	(0.003)	(0.003)	(0.005)	(0.010)	(0.020)
Log(wage) × Permanent	-0.001**	-0.000	-0.001	-0.002	-0.003
	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)
Rung=2	-0.115***	-0.147***	-0.055***	-0.050***	-0.049***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Rung=3	-0.185***		-0.217***	-0.109***	-0.102***
	(0.000)		(0.001)	(0.001)	(0.002)
Rung=4	-0.236***			-0.282***	-0.164***
	(0.001)			(0.001)	(0.003)
Rung=5	-0.279***				-0.350***
	(0.001)				(0.003)
Rung=6	-0.347***				
	(0.002)				
Constant	0.231***	0.170***	0.268***	0.349***	0.421***
	(0.003)	(0.003)	(0.005)	(0.010)	(0.018)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	9,458,218	8,838,157	2,653,241	772,679	268,289
R-squared	0.084	0.107	0.093	0.088	0.089
Adj. R-squared within	0.0425	0.0541	0.0583	0.0583	0.0592

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

F.2 Job-to-job transitions generate positive but diminishing wage gains

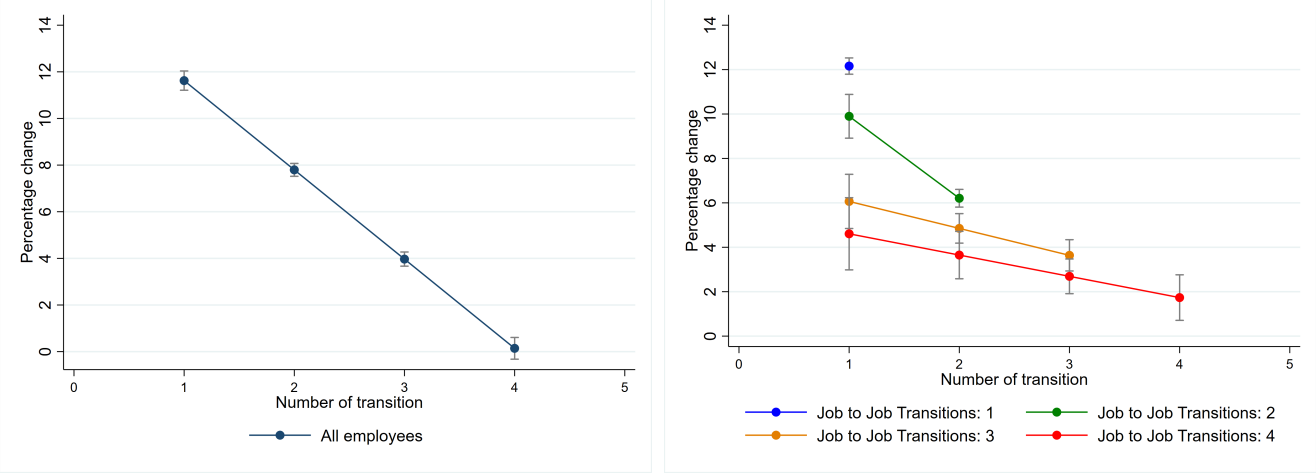
I run a regression of log wages on the rung an employee is observed between 2015 - 2020, controlling for the type of formal contract he holds, months of tenure in a given job and the same set of additional controls used before.

$$\text{Log(wage)}_{it} = \beta_1 \text{rung}_{it} + \beta_2 \text{rung}^2{}_{it} + \beta_3 \text{permanent}_{it} + \sum \delta_{ijt}^{tenure} + \sum_{k=4} \beta_k x_{k,it} + \epsilon_{it}$$

Figure 11 shows the estimated percentage change in wage in a given J2J transition[75]. Considering all employees who made up to five J2J transitions between 2015 - 2020 (Panel A), there are positive but diminishing wage gains as workers climb up the job ladder. While in the first transition, an employee gets an average wage increase of 11.6% relative to his previous job, the fourth transition generates an increase of just 0.1%.

Figure 11: **Percentage change in wages in a J2J transition**[1,2,3]
(relative to previous job)

(A) All employees (B) By number of J2J transitions



Source: PE dataset, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with [5,500] in non-agricultural, non-public administration and non-defense industries. (2) Employees are grouped by the number of Job-to-job transitions observed between 2015 - 2020. (3) Figure shows 95% confidence intervals.

This negative relationship also holds for groups of employees according to (i) the number of transitions they made and (ii) the type of contract they held along transitions. Regarding the first, Panel B shows that, for example, employees who made only two J2J transitions experienced an

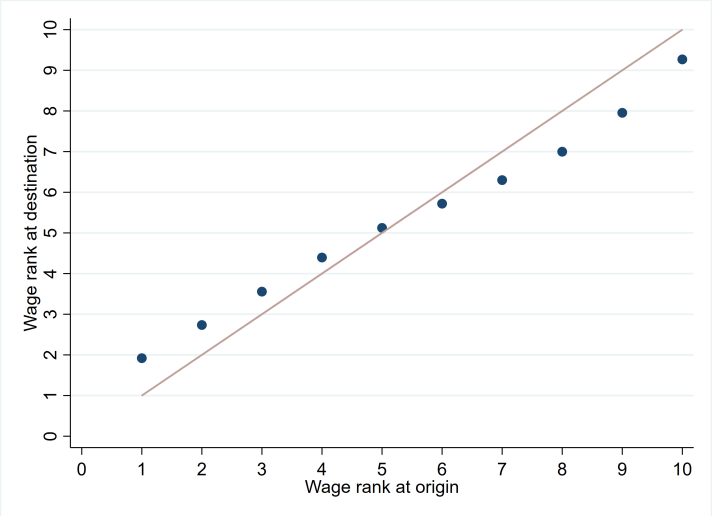
[75] Table 12 in Appendix G.4 show the estimated coefficients.

average wage increase of 9.9% in the first transition, whereas they got 6.2% on average in the the second[76]. Similarly, when gathering employees holding the same type of contract along transitions (either temporary or permanent), J2J transitions are also associated to diminishing wage gains (Tables 13 and 14 in Appendix G.4).

F.3 Job-to-job transitions are associated to limited wage mobility

I residualize wages on both unobserved and observed worker's characteristics such as educational attainment, age, type of contract and year FE. I then compute the residual wage ranks at origin and at destination for all individuals who move to a new job. Figure 12 shows that, on average, J2J transitions take place between adjacent deciles of wages. In particular, the wage at the new job takes the worker at most one decile up or down in the distribution of conditional wages.

Figure 12: **Wage ranks at origin and at destination 2015 - 2020**[1,2]



Source: PE dataset, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration and non-defense sectors. (2) Ranks correspond to deciles in the distribution of residual wages, controlling for worker's FE, educational level, age, contract and year FE.

[76]Interestingly, these wage gains are systematically smaller for individuals changing of jobs more frequently. In a context where temporary employees earn less than permanent workers and are forced to bear search frictions more frequently due to expiration, this evidence can suggest growing wage inequality across types of contracts

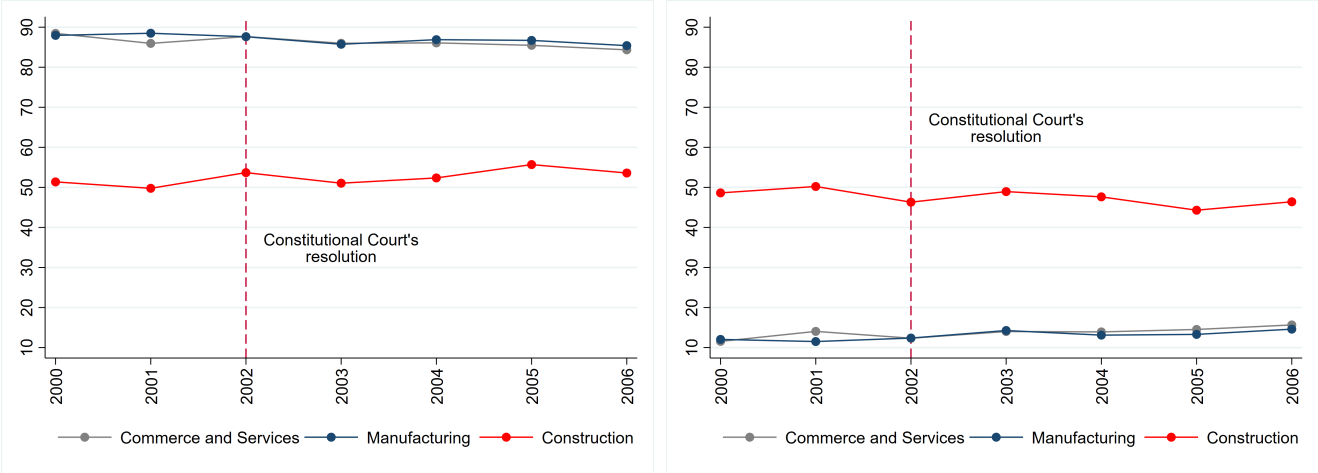
G Appendix - Figures and Tables

G.1 Firms' posting decision: Parallel Trends

Figure 13: **Average number of employees in a firm**[1]

(as share of total employees)

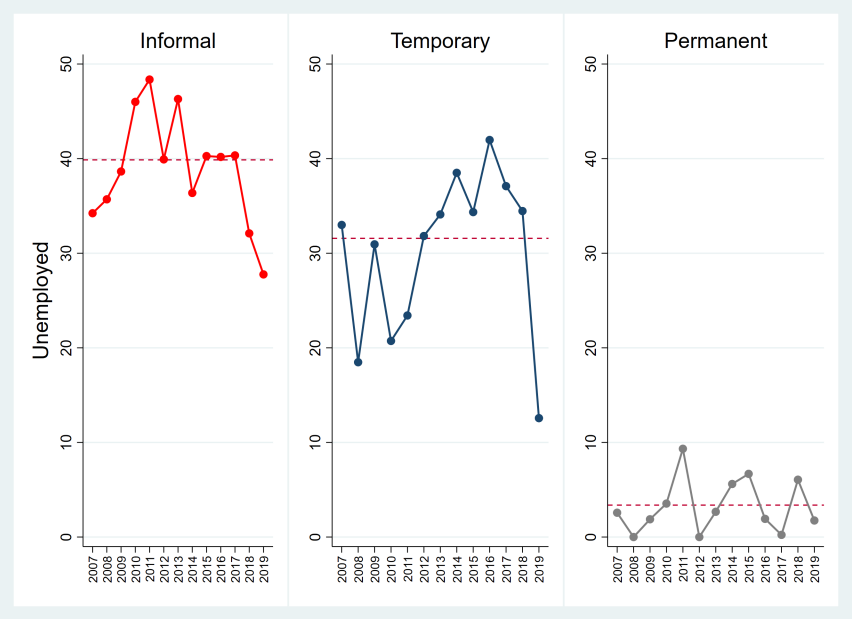
(A) Permanent contract (B) Temporary contract



Source: EEA, Peru. Note: (1) Figure considers firms with five or more employees.

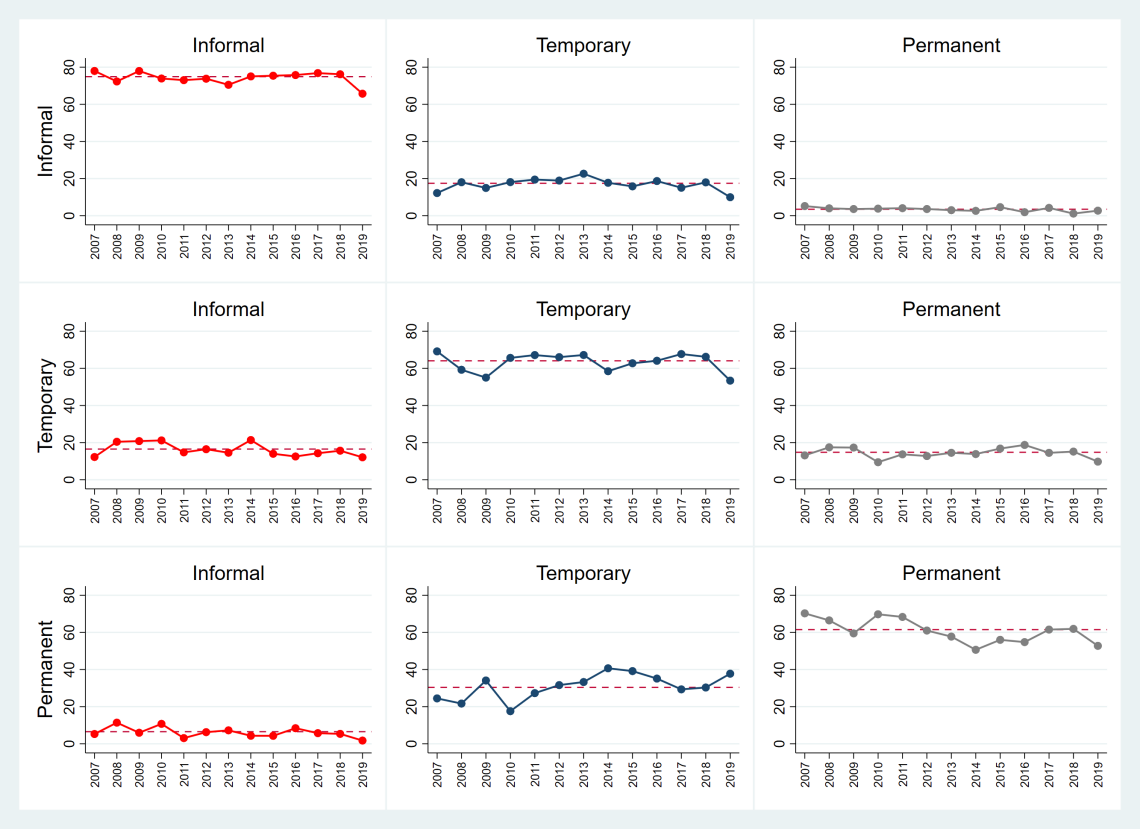
G.2 Annual transitions 2007 - 2019

Figure 14: **Annual Transitions from Unemployment to job type** $\{1, 2, 3\}$



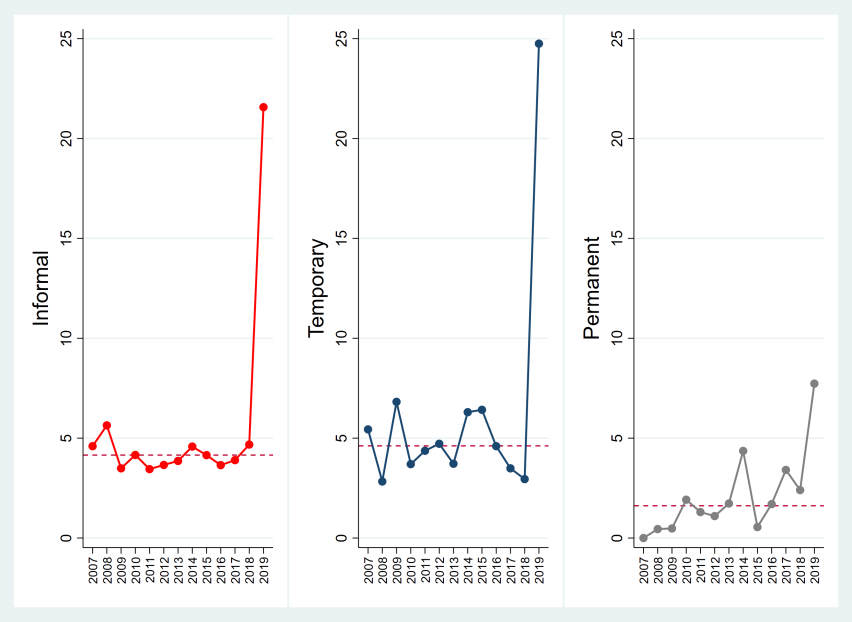
Source: ENAHO panel, Peru. Figure considers male employees aged 18-64. Dashed line corresponds to average 2007 - 2018.

Figure 15: **Annual Transitions from job type $\{1, 2, 3\}$ to $\{1, 2, 3\}$**



Source: ENAHO panel, Peru. Considers male employees aged 18-64. Dashed line corresponds to average 2007 - 2018.

Figure 16: **Annual Transitions from job type $\{1, 2, 3\}$ to unemployment**



Source: ENAHO panel, Peru. Figure considers male employees aged 18-64. Dashed line corresponds to average 2007 - 2018.

G.3 Job-to-job transitions are decreasing in wages and rungs

Table 10: **Temporary Employees: Job-to-job transition**

	Job-to-job transition				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Log(wage)	-0.014***	-0.006***	-0.014***	-0.020***	-0.026***
	(0.000)	(0.000)	(0.001)	(0.002)	(0.003)
Rung=2	-0.119***	-0.151***	-0.053***	-0.050***	-0.050***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Rung=3	-0.190***		-0.219***	-0.108***	-0.105***
	(0.001)		(0.001)	(0.002)	(0.003)
Rung=4	-0.242***			-0.286***	-0.164***
	(0.001)			(0.002)	(0.003)
Rung=5	-0.285***				-0.355***
	(0.002)				(0.004)
Rung=6	-0.355***				
	(0.002)				
Constant	0.223***	0.166***	0.261***	0.350***	0.404***
	(0.003)	(0.003)	(0.006)	(0.013)	(0.024)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	6,172,773	6,084,823	1,699,213	463,138	157,629
R-squared	0.085	0.108	0.095	0.091	0.091
Adj. R-squared within	0.0439	0.0558	0.0596	0.0594	0.0599

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

Table 11: **Permanent Employees: Job-to-job transition**

	Job-to-job transition				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Log(wage)	-0.009***	-0.007***	-0.009***	-0.024***	-0.017*
	(0.001)	(0.001)	(0.002)	(0.006)	(0.010)
Rung=2	-0.115***	-0.134***	-0.058***	-0.058***	-0.062***
	(0.001)	(0.001)	(0.002)	(0.006)	(0.013)
Rung=3	-0.188***		-0.213***	-0.102***	-0.102***
	(0.002)		(0.002)	(0.007)	(0.014)
Rung=4	-0.238***			-0.285***	-0.175***
	(0.004)			(0.008)	(0.018)
Rung=5	-0.276***				-0.377***
	(0.007)				(0.020)
Rung=6	-0.349***				
	(0.009)				
Constant	0.175***	0.151***	0.222***	0.352***	0.430***
	(0.008)	(0.008)	(0.020)	(0.058)	(0.099)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	903,806	923,816	144,381	27,170	9,203
R-squared	0.082	0.094	0.093	0.102	0.114
Adj. R-squared within	0.0409	0.0465	0.0520	0.0506	0.0527

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

G.4 Job-to-job transitions generate positive but diminishing wages gains

Table 12: **Log wages in a Job-to-job transition**

	Log(wage)				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Rung	0.154***	0.122***	0.136***	0.073***	0.056***
	(0.003)	(0.002)	(0.010)	(0.010)	(0.012)
$Rung^2$	-0.019***		-0.018***	-0.006***	-0.005***
	(0.001)		(0.002)	(0.002)	(0.002)
Constant	6.949***	6.913***	7.055***	7.104***	7.220***
	(0.016)	(0.018)	(0.025)	(0.047)	(0.057)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age, Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size, Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	3,677,816	3,499,439	1,060,666	312,516	112,898
R-squared	0.911	0.915	0.903	0.897	0.897

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

Table 13: **Temporary Employees: Log wages in a Job-to-job transition**

	Log(wage)				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Rung	0.149***	0.117***	0.114***	0.068***	0.042***
	(0.004)	(0.002)	(0.011)	(0.011)	(0.013)
$Rung^2$	-0.019***		-0.013***	-0.005**	-0.004*
	(0.001)		(0.003)	(0.002)	(0.002)
Constant	6.950***	6.939***	7.049***	7.185***	7.221***
	(0.019)	(0.020)	(0.029)	(0.046)	(0.047)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age, Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size, Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	2,421,629	2,412,109	680,813	191,373	67,035
R-squared	0.901	0.906	0.893	0.888	0.887

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

Table 14: **Permanent Employees: Log wages in a Job-to-job transition**

	Log(wage)				
	(1)	(2)	(3)	(4)	(5)
	All	1 Transition	2 Transitions	3 Transitions	4 Transitions
	Coef./SE	Coef./SE	Coef./SE	Coef./SE	Coef./SE
Rung	0.145***	0.097***	0.071*	0.108**	-0.022
	(0.013)	(0.006)	(0.041)	(0.050)	(0.054)
$Rung^2$	-0.022***		-0.009	-0.017*	0.006
	(0.003)		(0.010)	(0.010)	(0.009)
Constant	6.966***	6.886***	7.494***	7.323***	7.633***
	(0.050)	(0.055)	(0.159)	(0.104)	(0.117)
Worker FE	Yes	Yes	Yes	Yes	Yes
Age, Occupation FE	Yes	Yes	Yes	Yes	Yes
Firm's size, Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	353,825	368,362	63,539	11,232	3,415
R-squared	0.947	0.946	0.949	0.960	0.964

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1

G.5 Separation probability

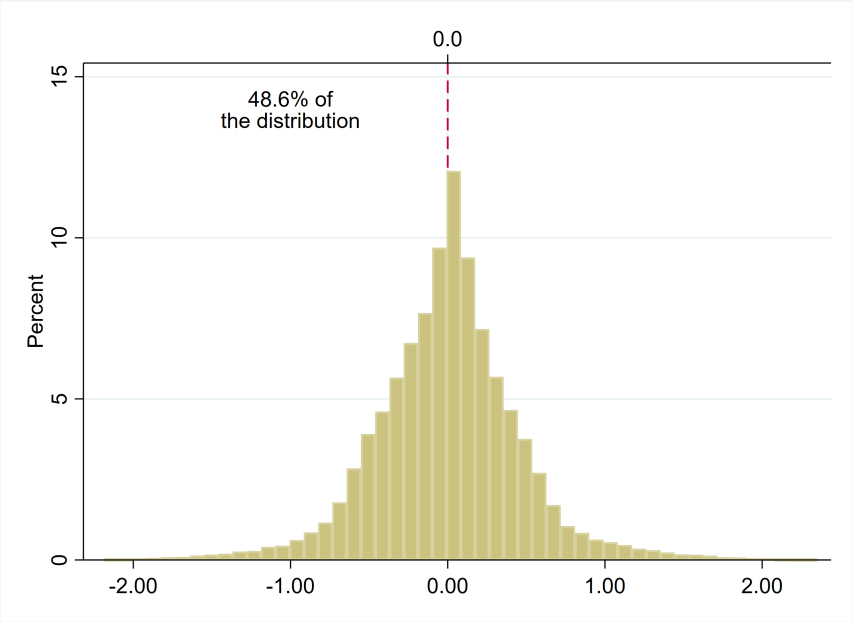
Table 15: **Separation probability**[1]

	Separation probability
	(1)
	Coef./SE
Part-time	0.0378***
	(0.000)
Temporary	0.017***
	(0.000)
Constant	-0.138***
	(0.001)
Separation probability:	
part-time	0.046***
	(0.000)
Temporary	0.026***
	(0.000)
Permanent	0.008
Worker FE	Yes
Age FE	Yes
Educational attainment FE	Yes
Year FE	Yes
Observations	88,609,921
Number of workers	2,355,913
R-squared	0.003
Adj. R-squared Within	0.003

Source: PE dataset, Peru. Notes: Standard errors in parentheses, clustered by worker. *** p<0.01, ** p<0.05, * p<0.1. (1) This considers male employees aged 18-64 working in firms with five or more employees in non-agricultural and non-defense industries. Also, I consider employees observed for at least 12 out of 65 months.

G.6 Wage cut when moving to permanent jobs

Figure 17: **Change in wages when moving from temporary to permanent jobs**[1,2]



Source: PE dataset, Peru. Notes: (1) Figure considers male employees aged 18-64 working in firms with five or more employees in non-agricultural, non-public administration or non-defense sectors. (2) Real wages in Lima Metropolitan prices in 2010. They are residualized, controlling for educational level and age fixed effects. Changes in log points.

G.7 Job ladder with severance $1.2w$ without wage adjustment

Table 16: **Equilibrium submarkets: firing cost $1.2w$ without wage adjustment**

	Submarket		JFP	Employees		
	Value	Contract	%	N	%	Wage
0	86.3	0		106		0.024
1	87.5	1	83.9	367	41.1	0.394
2	89.6	3	6.3	429	48.0	0.388
3	91.3	3	2.8	92	10.3	0.411
4	92.5	3	0.7	6	0.7	0.426

H Appendix - Supporting condition, proposition and proof

H.1 Necessary condition for $J_k(v,k,\rho)$ to decrease with v

For all $k \in \mathbb{K}$ and $\rho \in \mathbb{P}$, $J_k(v,k,\rho)$ is decreasing in v if the following condition holds:

$$\frac{\left|\frac{\partial h(v,k)}{\partial v}\right|}{\left|\frac{\partial \bar{p}(V=v)}{\partial v}\right|} > \frac{\beta(1-\lambda_{k0})\lambda_{e_k}(A + s_k h(v,k)B)}{((1-T_k)+\beta\lambda_{k0}(s_k+r_k)+\beta(1-\lambda_{k0})\lambda_{e_k}\bar{p}(V=v)s_k)B}$$

where:

$$A = (1-T_k)\rho - h(v,k)((1-T_k)+\beta\lambda_{k0}(s_k+r_k)+\beta(1-\lambda_{k0})\lambda_{e_k}\bar{p}(V=v)s_k)$$
$$B = 1-\beta(1-\lambda_{k0})(1-\lambda_{e_k}\bar{p}(V=v))$$

H.2 Equilibrium Properties of the Workers' Search Problem

In this section, I describe in detail the equilibrium properties of the workers' search problem for a given type of contract k.

Consider one type of contract $k \in \mathbb{K}$. The worker's search problem, characterized by Equation (1), satisfies three properties described in Proposition H.1.

Proposition H.1. Given the market tightness $\theta(v,k)$, current values $V, V_1, V_2 \in \mathbb{V}$ with $V_1 \leq V_2$, for every $k \in \mathbb{K}$:

1. The value of search for a contract k is decreasing in the worker's current value V.
$$-(V_2 - V_1) \leq R^k(V_2) - R^k(V_1) \leq 0$$

2. The search policy function $(v^*,k)(V)$ is unique, defined by Equation (2).

3. The search policy function is increasing in worker's current value V. Moreover, the surplus of getting a job in the optimal submarket is decreasing in V.
$$0 \leq (v^*,k)(V_2) - (v^*,k)(V_1) \leq V_2 - V_1$$

Proof. This proof closely follows Menzio and Shi (2010). Fix a type of contract k. To simplify notation, consider $(v^*,k)(V) \equiv (v^*(V),k)$. Let $f_k(v,k,V)$ denote the expected return to search for a worker currently earning V: $f_k(v,k,V) \equiv p_k(\theta(v,k))(v-V)$.

Part 1.

By definition:

$$R^k(V_1) = f_k(v^*(V_1), k, V_1)$$
$$R^k(V_2) = f_k(v^*(V_2), k, V_2)$$

Therefore:

$$\begin{aligned} R^k(V_2) - R^k(V_1) &\leq f_k(v^*(V_2), k, V_2) - f_k(v^*(V_2), k, V_1) \\ &\leq -p_k(\theta(v^*(V_2), k))(V_2 - V_1) \\ &\leq 0 \end{aligned}$$

Similarly:

$$\begin{aligned} R^k(V_2) - R^k(V_1) &\geq f_k(v^*(V_1), k, V_2) - f_k(v^*(V_1), k, V_1) \\ &\geq -p_k(\theta(v^*(V_1), k))(V_2 - V_1) \text{ . Given } p_k(\theta(v^*(V_1), k)) \leq 1, \text{ we get:} \\ &\geq -(V_2 - V_1) \end{aligned}$$

The previous two expressions imply $-(V_2 - V_1) \leq R^k(V_2) - R^k(V_1) \leq 0$.

Part 2.

The strategy is to show that $f_k(v, k, V)$ is strictly concave in $v \; \forall \; v \in (V, \tilde{v}_k)$. Let $x_1, x_2 \in \mathbb{V}$ be two promised values such that $V < x_1 < x_2 < \tilde{v}_k$. Let $x_\alpha \equiv \alpha x_1 + (1-\alpha)x_2 \; \forall \; \alpha \in (0,1)$.

$$\begin{aligned} f_k(x_\alpha, k, V) &\equiv p_k(\theta(x_\alpha, k))(x_\alpha - V) \\ &> (\alpha p_k(\theta(x_1, k)) + (1-\alpha)p_k(\theta(x_2, k)))(\alpha x_1 + (1-\alpha)x_2 - V) \\ &> \alpha f_k(x_1, k, V) + (1-\alpha)\alpha f_k(x_2, k, V) + \alpha(1-\alpha)(p_k(\theta(x_1, k)) - p_k(\theta(x_2, k)))(x_2 - x_1) \\ &> \alpha f_k(x_1, k, V) + (1-\alpha)\alpha f_k(x_2, k, V) \end{aligned}$$

where the second line arises because $p_k(\theta(v, k))$ is decreasing and concave in v, the third follows after some arrangements and the last is implied by $x_1 < x_2$.

The last line implies that, for all V, the expected return to search is strictly concave in v and, therefore, supports a unique solution v^*. This holds for all $k \in \mathbb{K}$.

Part 3.

Given $V_1, V_2 \in \mathbb{V}$ with $V_1 \leq V_2$, let $(v^*, k)(V_1)$ and $(v^*, k)(V_2)$ be the unique optimal promised values where workers earning V_1 and V_2 apply for a job.

For every promised value $v \in \mathbb{V}$, $\tilde{v}_k$ splits its domain in two segments: $v \leq \tilde{v}_k$ and $\tilde{v}_k < v$.

Therefore, given V_1, V_2 and $\tilde{v}_k$, three possible cases arise.

Case 1. Consider $\tilde{v}_k < V_1 \leq V_2$

In this case, the workers' search strategy (2) dictates that $(v^*, k)(V_1) = V_1$ and $(v^*, k)(V_2) = V_2$, which makes Part 3 of the proposition hold.

Case 2. Consider $V_1 \leq \tilde{v}_k \leq V_2$

Workers' search strategy (2) dictates that $(v^*, k)(V_1) \in (V_1, \tilde{v}_k)$ and $(v^*, k)(V_2) = V_2$. In this case, Part 3 of the proposition also holds.

Case 3. Consider $V_1 \leq V_2 \leq \tilde{v}_k$

In this case,

$$
\begin{aligned}
f_k(v^*(V_1), k, V_1) &\geq f_k(v^*(V_2), k, V_1) \\
f_k(v^*(V_2), k, V_2) &\geq f_k(v^*(V_1), k, V_2) \\
0 &\geq f_k(v^*(V_2), k, V_1) - f_k(v^*(V_1), k, V_1) + f_k(v^*(V_1), k, V_2) - f_k(v^*(V_2), k, V_2) \\
0 &\geq (p_k(\theta(v^*, k)(V_2)) - p_k(\theta(v^*, k)(V_1)))(V_2 - V_1)
\end{aligned}
$$

Given that $p_k(\theta(v, k))$ is decreasing and concave in v, the previous line implies that $(v^*, k)(V_1) \leq (v^*, k)(V_2)$ and, therefore, $0 \leq (v^*, k)(V_2) - (v^*, k)(V_1)$.

To complete the proof, I now need to determine the upper bound of $(v^*, k)(V_2) - (v^*, k)(V_1)$.

1. Let $(v^*, k)(V_1) = (v^*, k)(V_2)$. Since $(v^*, k)(V)$ is unique for a given V, this case would imply that $V_1 = V_2$. Therefore, Part 3 holds.

2. Let $(v^*, k)(V_1) < (v^*, k)(V_2)$. Define an arbitrary real number $\Delta \equiv \left(0, \frac{(v^*,k)(V_2)-(v^*,k)(V_1)}{2}\right)$.

   On the one hand, $f_k(v^*(V_1), k, V_1) \geq f_k(v^*(V_1) + \Delta, k, V_1)$. This implies:

$$
v^*(V_1) - V_1 \geq \frac{p_k(\theta(v^*(V_1) + \Delta, k)) \times \Delta}{p_k(\theta(v^*(V_1), k)) - p_k(\theta(v^*(V_1) + \Delta, k))} \tag{18}
$$

   On the other hand, $f_k(v^*(V_2), k, V_2) \geq f_k(v^*(V_2) - \Delta, k, V_2)$. This implies:

$$
v^*(V_2) - V_2 \geq \frac{p_k(\theta(v^*(V_2) - \Delta, k)) \times \Delta}{p_k(\theta(v^*(V_2) - \Delta, k)) - p_k(\theta(v^*(V_1), k))} \tag{19}
$$

By the definition of Δ and the concavity of $p_k(\theta(v,k))$, it follows that $p_k(\theta(v^*(V_1)+\Delta,k)) \geq p_k(\theta(v^*(V_2)-\Delta,k))$.

Given that we are in the case $(v^*,k)(V_1) < (v^*,k)(V_2)$, the concavity of $p_k(.)$ implies:

$$p_k(\theta(v^*(V_1),k)) - p_k(\theta(v^*(V_1)+\Delta,k)) \leq p_k(\theta(v^*(V_2)-\Delta,k)) - p_k(\theta(v^*(V_2),k))$$

Combining this condition with Equations (18) and (19), we conclude:

$$(v^*,k)(V_2) - (v^*,k)(V_1) \leq V_2 - V_1$$

This completes the proof that $0 \leq (v^*,k)(V_2) - (v^*,k)(V_1) \leq V_2 - V_1$

□

The features of the model combined with the search policy function and Proposition H.1 generate a job ladder of values with diminishing gains and a finite number of rungs.

First, on the one hand, the model considers that workers face separation shocks, job search opportunities and search frictions. Therefore, in every point in time and despite being homogeneous in skill, workers hold different employment states and jobs, enjoying dissimilar current values. In this context, property 2 in Proposition H.1, which establishes that applicants endogenously separate according to their current value V, implies that, in equilibrium, there are different submarkets being visited, each by job seekers currently enjoying some $V < \tilde{v}_k$.

Second, property 3 implies that, given their current $V < \tilde{v}_k$, applicants to jobs on contract type k gradually climb up a ladder of values with diminishing gains. This arises because, on the one hand, the optimal submarket $(v^*,k)(V)$ is increasing in V and, on the other hand, the actual surplus or gain in value of getting a job in the optimal submarket $(v^* - V)$ is decreasing in V.

Finally, following Delacroix and Shi (2006), the ladder has a finite number of rungs because of two reasons. First, given some current value $V < \tilde{v}_k$, the equilibrium path contains a finite number of rungs. Second, every current value $V < \tilde{v}_k$ can be reached in a finite number of steps from the value of being unemployed. Regarding the former, workers currently enjoying some V apply for jobs offering higher values (property 3). However, since firms bear a vacancy cost, there is a value above which firms do not post vacancies ($\tilde{v}_k$). Given that the promised value in a submarket is bounded from above, there is a finite number of steps in which workers currently enjoying V reach the top of the ladder. Regarding the second reason, the argument goes by contradiction. Consider a visited submarket $(\hat{v},k)$ that is reached from an initial rung different to that of the unemployed. Let $(\hat{v}_0,k)$ denote this initial rung. Given that the model considers separation shocks, on the job search opportunities and search frictions, there is a flow of individuals out of $(\hat{v}_0,k)$. However,

since it is not reached from any other rung, it does not receive any flow into. Therefore, $(\hat{v}_0, k)$ neither can be visited nor can support any subsequent visited submarket.

Putting these arguments together, for a given type of contract k, based on their current value $V < \tilde{v}_k$, workers gradually climb up a job ladder of values with diminishing gains and a finite number of rungs. This is consistent with the empirical evidence described in Appendix F. In the model, for a given type of contract, the value of holding a job is increasing in the wage. Therefore, a higher wage generates both a higher current value and, thus, a higher-valued optimal submarket where to apply for a job. Since submarkets offering higher values exhibit lower job-finding probabilities, the J2J transitions on a given type of contract are decreasing in wage, which is observed in the data (Appendix F.1). Moreover, for a given type of contract, the actual surplus or gain in value after getting a new job is positive but decreasing in the current value. This implies that workers experience positive but diminishing wage gains as they engage in J2J transitions, which is also documented from the data (Appendix F.2)

H.3 Feasible set of informal, temporary and permanent jobs

Figure 18: **Feasible set of informal, temporary and permanent jobs**