The Wage of Temporary Agency Workers*

Antonin Bergeaud Pierre Cahuc Clément Malgouyres
Sara Signorelli Thomas Zuber

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Abstract

Using French administrative data, we estimate the distribution of the wage gap between in-house fixed-term workers and temporary agency workers employed in the same establishment and occupation. The average wage gap is approximately 2.6% in favor of in-house workers, but varies across labor markets and is negative in more than 25% of establishments-occupations. We analyze this heterogeneity by developing and estimating a search and matching model, which shows that while a large part of the wage gap is inefficient, eliminating it would not improve efficiency on all local labor markets, as it also stems from factors that contribute to the optimal allocation of jobs.

Key words: Wage gap, Temporary Work Agency, labor market frictions.
JEL Codes: J24, J31, J64, J65.

*Addresses: Bergeaud: HEC Paris, CEP-LSE and CEPR; Cahuc: SciencesPo Paris, IZA and CEPR; Malgouyres: CREST and IPP; Signorelli: CREST, Ecole polytechnique and IZA; Zuber: Banque de France. We thank Isaiah Andrews, Stéphane Bonhomme, Philippe Choné, Simon Jäger, Moritz Kuhn, Pat Kline, Thomas Le Barbanchon, Fabien Postel-Vinay, Roland Rathelot, as well as seminar participants at IAB firm and worker quality conference, IZA-Crest 2023, AFSE 2023, Mannheim, Leicester SaM workshop, 25th Anniversary IZA Conference in Labor Economics. We thank the CASD for secured data access (ANR-10-EQPX-17).

1 Introduction

In France, over 80% of job entries occur under contracts lasting less than a month, predominantly held by low-skilled workers. Notably, a significant portion of these short-term contracts—approximately half—are filled through temporary work agencies (TWAs),[1] whose core business revolves around such arrangements. More than 90% of their hires involve contracts of less than a month. This trend reflects an increasing reliance on TWAs in OECD countries, where firms are increasingly delegating the recruitment and employment of short-term workers to these specialized agencies.[2]

This type of outsourcing is often criticized for exacerbating wage inequalities. TWA workers are perceived to earn on average less than their fixed-term counterparts directly employed by user firms (e.g. The Economist, 2016), a claim best empirically supported by Drenik et al. (2020). Against this background, our study provides a more nuanced perspective. Leveraging novel microeconomic data with precise information on the jobs of TWA workers and in-house fixed-term workers, we show that while, on average, in-house fixed-term workers earn 2.6% more than TWA workers within the same firm and occupation, this wage gap varies substantially. In over a quarter of cases, TWA workers earn more than their in-house fixed-term counterparts.

To better understand the source of this heterogeneity and its implications, we develop a search and matching model in which firms may opt to use TWAs to fill their fixed-term positions for two primary reasons: to speed up the hiring process and to reduce human resources (HR) management costs. The model yields a simple expression for the wage gap, which can be decomposed into two components. The first arises from differences in HR management costs between user firms and TWAs, contributing to a more efficient allocation of labor. The second component stems from the externalization of vacancy costs by user firms, an effect we characterize as the "inefficient" portion of the wage gap. Our findings show that while TWAs may reduce labor market efficiency by shifting vacancy costs onto workers, they also improve efficiency by facilitating better labor allocation. These insights carry important implications for policy discussions on the regulation of TWAs and their broader role in the labor market.

We show that, in theory, the inefficient portion can be eliminated by merging TWAs

[1]Temporary work agencies are referred to by various terms in the literature, including "temporary help agencies," "staffing firms," and "staffing agencies." For the sake of clarity, we use the term "temporary work agencies", i.e. TWAs, consistently throughout this article.

[2]OECD (2021).

with user firms, thereby canceling out the inefficiency caused by the externalization of manpower. More practically, it is also possible to implement taxes on TWA job vacancies to finance wage subsidies for TWA workers. Such a policy can lead to an optimal allocation of workers, aligning welfare —as measured by production net of vacancy and capital costs— levels with those of the constrained optimal equilibrium. However, in practice, implementing such subsidies and taxes may be challenging due to the heterogeneity of local labor markets and their reliance on imperfectly observed parameters. Accordingly, we explore the consequences of another policy aimed at eliminating the wage gap entirely, rather than just its inefficient component. We show that such a policy would have heterogeneous effects on welfare across local labor markets in France, which can be positive or negative. This ambiguous effect arises from the fact that the wage gap is the result of objective factors that contribute to an efficient allocation of jobs. Quantitatively, we estimate that a policy eliminating the wage gap would have a highly heterogeneous impact across different local labor markets, with effects that could be either positive or negative. On aggregate, the overall effect is slightly positive, estimated at 0.11%. Similarly, the impact on employment varies by market, potentially increasing or decreasing employment depending on local conditions, but with an overall negative aggregate effect of 1.8%.

This result underlines the subtle effect of TWAs on the efficiency of the labor market: even if they can create significant wage differentials across observationally similar workers working on similar jobs in the same establishment, their higher relative efficiency in matching workers to vacancies has an overall positive impact on welfare. Consequently, we find that banning all TWAs from labor markets will lead to an overall reduction of welfare by 1.4% and of employment by 6.4%.[3]

The paper proceeds in three main steps. First, we provide new empirical insights into the wages of fixed-term in-house and TWA workers across different firms and labor markets, leveraging a richer dataset than previous studies. Unlike prior contributions, which primarily focus on average wage differences, our data allow us to explore the

[3]Our model only focuses on short-term contract workers and does not take into account the dynamic impact of TWAs on facilitating the transition of these workers into permanent positions. Table A.3.1 in Appendix shows that the transition rate from TWA contracts to permanent contracts amounts to 3% and that the transition rate from in-house temporary contracts to permanent contrats equals 4%. This is consistent with recent evidence from Spanish data (Carrasco et al., 2024) which suggests that the effects of TWAs on improving the insertion into more stable and permanent employment are limited. Specifically, while TWAs can provide immediate employment opportunities, there is little evidence that they foster long-term job stability, indicating that temporary agency work does not significantly enhance the likelihood of obtaining permanent positions.

heterogeneity of the wage gap in greater detail. In particular, we benefit from precise information on workers' occupations, enabling a more granular analysis of wage differences between in-house and TWA workers within the same firm and occupation.

We begin by following the approach of Drenik et al. (2020), which extends the framework of Abowd et al. (1999) by interacting firm fixed effects with workers' contract types, distinguishing between in-house and TWA arrangements. However, moving beyond the average wage gap, we highlight substantial heterogeneity across firms and markets, even after controlling for a comprehensive set of observable and unobservable characteristics of workers and jobs. Our findings reveal that while, on average, in-house workers earn 2.6% more than similar TWA workers, this wage gap is far from uniform. In fact, the standard deviation of the wage gap is five to six times larger than its mean, and in more than one-fourth of cases, the gap reverses, with TWA workers earning more than their in-house counterparts.[4] Finally, we show that the level of the wage gap is highly correlated to market, user firm, and TWA characteristics such as job turnover, capital per worker and ability of TWAs to fill vacancies, indicating that the variation captured in our empirical analysis reflects fundamental labor market forces rather than mere statistical noise. These correlations play a key role in shaping our model's definition.

Second, to better understand the source of this heterogeneity and its link with the functioning of the labor market, we develop and quantify a directed search and matching model[5] in which firms may opt to use TWAs to speed up the hiring process and to reduce HR management costs. In this framework, the relationship between TWAs and user firms creates a pecuniary externality that is not internalized by user firms. TWAs operate similarly to platforms like Amazon, where clients order services, and the price—including the delivery service—is determined at the time of the order. The price that clients are willing to pay decreases as delivery times increase and their

[4]Directive 2008/104/EC of the European Parliament and of the Council of 19 November 2008 on temporary agency work states that the principle of equal treatment of temporary and in-house workers applies to basic working and employment conditions, including the duration of working time, overtime, breaks, rest periods, night work, holidays, public holidays, and pay. However, empirical studies recurrently find a wage penalty for TWA workers, suggesting that this regulation is only indicative and not truly enforced.

[5]The decision to use a directed search model, rather than a random search model, is grounded in both theoretical and empirical considerations. From a theoretical standpoint, markets with directed search operate under a constrained efficient decentralized equilibrium (Moen, 1997; Wright et al., 2021). This approach enables us to clearly identify potential inefficiencies linked to the activity of TWAs. From an empirical perspective, job seekers can easily search for vacancies posted by TWAs or other firms, especially since the internet has become a critical job search channel (Kircher, 2022).

waiting costs rise. As a result, the waiting costs associated with the time it takes to deliver TWA workers are embedded in the price paid to TWAs and, ultimately, in the wages offered to TWA workers.

The data analysis shows that the measure of waiting costs derived from the model is positively correlated with the wage gap and negatively correlated with the wages of temporary workers. We find that the waiting costs incurred by user firms to employ TWA workers reduce their wages by approximately 7.7%. However, this effect is partially offset by the lower human resource management costs of temporary work agencies, which increase temporary workers' wages by about 5%. As a result, the final wage gap amounts to 2.7%.

Since the pecuniary externality associated with the hiring of TWA workers is not internalized by user firms, the decentralized equilibrium does not achieve the socially efficient allocation. In this context, we show that a merger between the user firm and the TWA eliminates the inefficiency because the full cost of maintaining vacant positions is then internalized in hiring decisions.[6]

Third, to empirically assess the inefficiency associated with TWA markdowns across local labor markets, we use our data to quantify the model by considering cells of commuting zones (Zones d'Emploi, or CZs) and occupations, combining various administrative datasets. We use information on the wage gap between in-house and TWA workers on short-term contracts, their job-finding and job-filling rates, and the average job duration. Using these values, we solve the model recursively and estimate market-specific parameters, allowing us to decompose the sources of the wage gap, evaluate the portion attributable to the inefficient use of TWA workers across 649 local labor markets, and simulate the effects of public policies on employment and welfare. Across these markets, the TWA markdown share in TWA workers' wages ranges from approximately 1% to 16%, with an average of 6.4%.

Related literature: This paper is mainly related to three strands of the literature. A growing strand of research analyzes the consequences of TWAs. Autor et al. (2003) and Estefan et al. (2024) investigate the impact of labor regulation changes on the expansion of TWAs and their effects on the labor market in the US and Mexico, respec-

[6] In search and matching models, when firms hire directly, the cost of maintaining vacancies does not directly influence employees' wages because employment contracts begin only after a match is realized (Pissarides, 2000). In directed search models, workers' ability to direct their search ensures that the equilibrium allocation is efficient (Acemoglu and Shimer, 1999).

tively. Atencio-De-Leon et al. (2024) show that TWAs play an increasingly prominent role in the United States, significantly contributing to firms' employment adjustments. Closer to our research, Drenik et al. (2020) use data from Argentina to demonstrate that TWA workers receive lower wages than in-house workers, even when working for the same user firms. Building on their work, we extend these findings using newly available data from France, which allows to compare workers not only within the same user firm but also within the same occupation—a dimension that Drenik et al. (2020) cannot account for.[7] Our analysis confirms their main results regarding the average wage gap and provides additional insights by documenting the significant dispersion in the wage gap between in-house and TWA workers across firms and markets. Furthermore, we describe the characteristics to which these wage gaps are correlated. Finally, we contribute by developing a simple model of TWAs in a frictional labor market, which explains the emergence of differential wage policies between TWA and in-house workers.[8]. This model allows us to understand and evaluate both the causes and welfare implications of these discrepancies.

From this perspective, our contribution complements a second strand of studies that focus on cases where contracting firms provide goods and services not produced by in-house workers, such as food, security, cleaning, or administrative services (Goldschmidt and Schmieder, 2017; Bilal and Lhuillier, 2021; Bergeaud et al., 2024). This is distinct from the type of activity we analyze. In our context, the contract specifies the hours of work provided by the TWA worker, typically for a short period, whereas in other cases, it specifies the output, often on a long-term basis (e.g., cleaning, security, or logistics services). Bilal and Lhuillier (2021) develop a search and matching model of outsourcing. In their framework, wage-posting user firms face upward-sloping labor supply curves, so in-house wages rise with firm size and productivity. Meanwhile, the market for outsourced workers is competitive, making outsourcing more attractive to larger, more productive firms. Crucially, wage differences between in-house and outsourced workers arise from differences in productivity between these two types of workers. We depart from their approach by building on a directed search framework, where firms use TWAs to accelerate hiring and reduce HR costs. Accounting for both

[7] Neugart and Storrie (2006), Autor and Houseman (2010), Beneito et al. (2024) and Carrasco et al. (2024) examine the role of TWAs as stepping stones toward more stable employment in user firms, which is very marginal in our context where the duration of TWAs jobs is very small.

[8] Spitze (2022) provides a search and matching model with TWAs that has different features from ours, where outsourced and in-house workers are employed in separate firms, as firms either exclusively use in-house workers or outsourced workers.

hiring and HR costs allows us to highlight mechanisms absent from the framework of Bilal and Lhuillier (2021), which can lead to either a positive or negative wage gap among identical workers in equally productive jobs.

The third strand of the literature is related to the role of intermediaries in markets with frictions. The seminal paper of Rubinstein and Wolinsky (1987) shows that the impact of intermediaries on the distribution of gains from trade and on market efficiency depends on the characteristics of the market. In line with this seminal paper, there is a significant body of literature that analyzes the role of intermediaries in markets with frictions, with applications for financial markets and product markets—see e.g. Biglaiser and Li (2018); Gautier et al. (2023); Masters (2007); Watanabe (2020); Weill (2020). This literature confirms the results of Rubinstein and Wolinsky (1987): the impact of intermediaries on the distribution of trade gains and on efficiency depends on the context of each market. In many cases, intermediaries deteriorate efficiency. Yavaş (1994) analyzes a labor market where an intermediary is a platform that matches the employers and the employees and does not trade on its own account. He finds that this type of intermediary can have a negative impact on efficiency. Our contribution is to study the properties of a model that specifically represents the role of TWAs in a labor market with frictions. We show that, starting from an efficient directed-search labor market benchmark (Moen, 1997; Acemoglu and Shimer, 1999), the introduction of a competitive commercial market for the services of TWA workers creates an externality that may reduce welfare, despite the potentially superior search and contract management technologies of TWAs.

The rest of the paper is organized as follows. Section 2 describes the data used in the main analysis and provides an overview of the institutional framework governing temporary work in France. Section 3 analyzes the magnitude of the wage gap empirically, and shows how it correlates with firm and market characteristics. Section 4 presents our theory and Section 5 our quantitative analysis. Section 6 concludes.

2 Institutions and Data

2.1 TWA workers and fixed-term contracts in France

Temp (TWA) workers are formally employed by a temporary work agency but they work for another company (the *user* firm). In France, the vast majority of TWAs hires correspond to fixed-term contracts.[9] Workers can also be directly employed in-house under fixed-term contracts known as CDD (*"Contrat à Durée Déterminée"*). The regulations governing fixed-term contracts are identical, whether they pertain to TWA workers or in-house employees under a CDD. The only difference between CDD and TWA contracts is that, for the CDD, the employer is the company where the employee works, whereas for the TWA contract, the employer is the TWA itself. However, the labor law states that TWA workers act under the authority of the employer of the user company and that the TWA workers' salary must in theory adhere to the same compensation rules as those applicable to the employees of the user company (notably in terms of sectoral minimum wages). Fixed-term contracts (in house or not) can only be stipulated under well-defined circumstances : i) to address a temporary surge in activity, ii) to replace an employee on leave, and iii) for roles inherently temporary in nature. Table A.2.1 in the Appendix reports that for TWA or in-house fixed-term contracts, the main motives invoked is the temporary surge in activity. Finally, note that both types of fixed-term contracts cannot be renewed more than twice, with a maximal combined time of 18 months.

France's labor market is relatively polarized: 87% of employees work under protected open-ended contracts (*"Contrat à Durée Indéterminée"*, or CDI), while the remaining 13% are employed under fixed-term contracts, predominantly by young and low-skilled workers. Although the overall proportion of fixed-term employment appears modest, it constitutes a much larger share within the low-skill segment and accounts for a significant portion of job vacancies and employment transitions, making it a key factor in analyzing employment dynamics. While the overall share of fixed-term contracts remained relatively stable between 2011 and 2019, their composition shifted markedly, as shown in Appendix Figure A.1.1: TWA contracts increased from 40% to 55% of all fixed-term employment.[10]

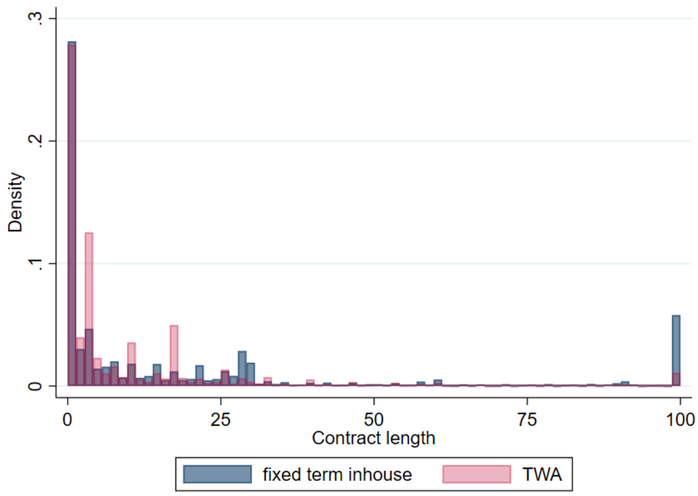
CDD and TWA contracts have similar average durations. Figure I presents the distribution of the length of all fixed-term contracts signed in 2019 in the private sector, distinguishing between these two types. This distribution is derived from the FORCE

[9] Since 2018, a law allows TWAs to hire workers on open-ended contracts known as *"CDI intérimaire"*. However, this possibility remains rarely utilized (only 0.3% of the TWA job offers in 2019 are open-ended) and are primarily designed for high-skill profiles.

[10] According to the 2021 OECD Employment Outlook (OECD, 2021), this phenomenon is not specific to France; TWA employment is becoming increasingly prevalent in most OECD countries. In 2019, France had the 5^{th} largest share of temporary agency employment within its labor force, ranking behind Spain, the Netherlands, Slovenia, and Slovakia. The rapid growth of staffing has also been documented in the USA (Katz and Krueger, 2019; Atencio-De-Leon et al., 2024).

database, which uniquely reports *all* distinct contracts signed between workers and employers, including those lasting only a single day and those repeatedly rolled over. The median (mean) length of CDD contracts is 3 days (14 days), compared to 4 days (10 days) for TWA contracts. About 25% of CDDs and 23% of TWA contracts last only one day. Since the FORCE database lacks sufficient information on contract characteristics, our primary working dataset is drawn from the administrative payroll dataset (*DADS*, see Section 2.2). In this dataset, repeated short contracts within the same firm are aggregated, artificially inflating the average duration. We discuss this issue further in Appendix A.1, where Figure A.1.4 reports the corresponding distribution. Nonetheless, across both data sources, the distribution of contract length is remarkably similar for TWA and CDD workers.

FIGURE I. Distribution of contract length



Notes: The graph is constructed using the *FORCE* dataset, which records all the single contracts signed in a given year. It shows the distribution of the length of all fixed-term contracts signed in 2019, and disentangles between in-house (CDD) and TWA contracts. The data is top coded at 100 days to ease readability.

To give a sense of the distribution of TWA contracts we first lists the occupations that employ the highest share of TWA workers among fixed-term contracts in Table I. The list includes positions in the health sector (e.g., caregivers, nurses, and midwives) as well as unskilled blue-collar jobs in construction, industry, and maintenance, all sectors that traditionally rely heavily on fixed-term contracts. Most of these are low-paying occupations but Figure A.1.2 shows that TWA employment still accounts for a significant portion of the occupational labor force up to the 8^{th} percentile of the wage distribution. Table I also reports the unconditional relative wage gap between TWA workers and in-house fixed-term workers, which already reveals some degree of heterogeneity. Likewise, both the share of TWA employment and the wage gap with fixed-term in-house employment vary considerably across commuting zones (see

Appendix Figure A.1.3).

TABLE I. Occupation with the highest shares of temporary agency workers

Occup. code	Occup. name	Share of TWA	Relative wage gap
V0Z	Caregivers	0.89	-0.08
J0Z	Unskilled BC workers in maintenance	0.85	0.002
E0Z	Unskilled BC workers in process industries	0.87	-0.04
C1Z	Skilled BC workers in electrical and electronic industries	0.92	0.06
V1Z	Nurses, midwives	0.92	-0.02
V4Z	Social workers	0.89	0.02
A2Z	Agricultural technicians and managers	0.91	0.10
B0Z	Unskilled BC workers in construction	0.66	-0.06
D0Z	Unskilled BC workers in metal industries	0.86	-0.10
B5Z	Machine operators in construction	0.88	-0.01

Notes: Shares are calculated by taking the ratio of the total hours worked by TWA ("interim") workers over total hours by all fixed-term workers. The relative wage gap is computed as the average in-house fixed-term wage minus the average TWA wage, divided by the average in-house wage. It can be thus interpreted as a % difference in favor of in-house fixed-term workers. Only private sector. Period: average over 2017-2019. Source: DADS.

This first rapid analysis of the prevalence of TWA workers among short-term contracts and the distribution of the wage difference between CDD and TWA across occupations and commuting zones gives a sense of the heterogeneity that exists across labor markets, which motivates our analysis. Appendix A.1 presents additional results and discussions on these descriptive facts.

2.2 Data

We rely on the administrative payroll database (the *DADS*) to recover the wage gap between in-house and TWA workers. In particular, we apply the extension of the Abowd et al. (1999) (AKM) model put forward by Drenik et al. (2020), controlling for differences in user firm characteristics, individual characteristics, and other observable components such as occupations and commuting zones. To apply this methodology, we exploit two important features of the French administrative data. First, we use the fact that, since 2017, the data reports both the employer and the user firm identifiers for all TWA workers which allow to compare them with in-house CDD workers employed by the same firm. This enables to net-out from the wage gap all differences explained by the composition of firms hiring TWA workers, which are typically the largest and most productive ones.

Second, we need to follow workers over time and to observe multiple individuals switching across contracts, occupations and firms in order to identify wage premia net of a rich set of fixed effects. The administrative records published by the French statistics office (INSEE) provide consistent individual identifiers for only $1/12^{th}$ of the total workforce, which results in a connected set that is too sparse to identify our parameters of interest. We therefore apply the procedure described by Babet et al. (2022) to recover the exhaustive worker panel from the *DADS* data over the years 2017 to 2019.

We finally exclude the public sector from our analysis due to its distinct wage-setting mechanisms. Additional details on data construction can be found in Appendix A.2. The final dataset obtained through this procedure includes more than 1 million workers who, over a three-year period, have held both TWA contracts and in-house fixed-term contracts. Notably, the vast majority of these workers also switch between firms and occupations when changing contract type, introducing substantial variation for our analysis (see Appendix A.2 for additional summary statistics). One important caveat of this dataset is that if a TWA worker is sent to multiple user firms within the same year but remains employed by the same TWA establishment, only the user firm where the worker spent the most days will be recorded, with all other contracts aggregated under that one. This may introduce some noise in the measurement of hourly wages. However, we do not expect this limitation to systematically bias our results, particularly if the user firms served by a given TWA and worker are broadly comparable.

3 An empirical exploration of the wages of CDD and TWA workers

3.1 Average wage gap

This section extends the analysis of Drenik et al. (2020) to examine the wage gap between comparable CDD and TWA workers and investigates the sources of this gap.[11] We begin by estimating the following AKM model on fixed-term contracts for both types of workers:

[11] Drenik et al. (2020) compare workers under the two contract types within the same user firm, we can go further and compare workers within the same user firm and four digits occupation.

$$\log(w)_{ioet} = \beta_1 Inhouse_{ioet} + \beta_2 X_{ioet} + \gamma_t + \gamma_i + \gamma_e + \gamma_o + \epsilon_{ioet}, \quad (1)$$

where $\log(w)_{ioet}$ measures the logarithm of the hourly wage paid to worker i in occupation o, establishment e and time t, $Inhouse_{ioet}$ is a dummy identifying that the worker is under an in-house CDD contract, and X_{ioet} controls for individual and contract-level characteristics such as age and age squared, gender, and the count of number of days worked on the job in the year. We further include increasingly demanding levels of fixed effects, including year (γ_t), worker (γ_i), user establishment (γ_e) and occupation (γ_o) fixed effects. Because establishments are tight to a given location, γ_e also accounts for a commuting zone fixed effect. An important element for identification is that movements across contracts are not correlated with unobserved time-varying individual characteristics. If workers systematically switch from TWA contracts to in-house contracts when they experience an unobserved productivity shock, this would create some endogeneity in the estimation of β_1. To get a sense of whether transitions from TWA to fixed-term in-house contracts constitute typical career ladders, Appendix Table A.3.1 reports the frequency of movements across contract types. What we observe is that, within fixed-term contracts, workers switch as frequently from in-house to TWA than the other way around. This observation alleviates the concern of endogenous transitions. Finally, one might wonder whether the type of individuals or the type of establishments that engage in in-house CDD contracts are very different from those engaging in TWA contracts. If this were the case, it would undermine the scope for comparability of the two work arrangements. To alleviate this concern, we estimate a standard AKM model with individual and establishment fixed effects, as well as the same time-varying controls included in equation (1), and we plot the distribution of the fixed effects for different types of contracts. Appendix Figure A.3.1 shows the results. We see that the distribution of establishment fixed effects is highly comparable across CDD and TWA contracts, with only a slight over-representation of TWA contracts towards more productive firms. When it comes to individual fixed effects, we see that the distribution among CDD and TWA workers is almost exactly the same.

Table II reports the estimation for β_1 when we only control for time fixed effects (Column 1), when we add all individual and contract level controls in X_{ioet} (Column 2), when we add worker fixed effects (Column 3), user establishment fixed effects (Column 4), and occupation fixed effects (Column 5). Interestingly, the raw comparison reveals that on average in-house fixed-term contracts pay about 0.7% less than TWA contracts, but controlling for individual fixed effects brings the difference close to zero. However, this small coefficient masks another difference: the fact that large and more productive firms are more likely to use TWA contracts. Once we control for both individual and user establishment FE, we obtain a wage gap of 2.7%, which marginally shrinks to 2.6% once we also control for occupation fixed effects. These estimates are obtained using over 11 million observations that span roughly 7 million individuals and 1.5 million user establishments in the French private sector over the years 2017 to 2019. They confirm the finding of Drenik et al. (2020): on average, TWA workers are paid less than comparable in-house fixed-term workers employed in the same firms and occupations.

TABLE II. Average wage gap between fixed-term contracts of in-house and TWA workers

	(1) log(w)	(2) log(w)	(3) log(w)	(4) log(w)	(5) log(w)
In-house CDD	-0.00727***	-0.00825***	-0.000371**	0.0275***	0.0258***
	(0.000117)	(0.000117)	(0.000170)	(0.000252)	(0.000257)
Controls		✓	✓	✓	✓
Indiv. FE			✓	✓	✓
User estab. FE				✓	✓
Occup. FE.					✓
N	14,608,013	14,608,013	11,322,585	11,064,381	11,064,381
R2	0.003	0.051	0.623	0.698	0.699

Notes: OLS estimation of coefficient β_1 from equation (1) adding progressively fixed effects γ_x. Column 1 controls for a dummy for year fixed effects only. Column 2 adds controls for gender, age and average hours worked per day, Column 3 adds individual fixed effects. Column 4 adds user establishment fixed effects. Column 5 adds occupation fixed effects. The unit of observation is a contract from 2017 to 2019. Standard errors clustered at the individual level in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2 Wage gap heterogeneity

Our focus is on the heterogeneity of this wage gap and, in order to analyze it, we extend the AKM model presented in the previous sub-section to recover establishment and market-specific wage gaps controlling for possible confounding factors. We compute wage gaps at three different levels of aggregation : i) establishment level, ii) establishment $\times$ occupation level, iii) commuting zone $\times$ occupation level (our definition of a labor market), as follows:

$$\log(w)_{ioect} = \beta_2 X_{ioet} + \gamma_{ec} + \gamma_t + \gamma_i + \epsilon_{ioect} \tag{2}$$

$$\log(w)_{ioect} = \beta_2 X_{ioet} + \gamma_{eoc} + \gamma_t + \gamma_i + \epsilon_{ioect} \tag{3}$$

$$\log(w)_{iozct} = \beta_2 X_{iozt} + \gamma_{zoc} + \gamma_t + \gamma_i + \epsilon_{iozct} \tag{4}$$

The subscript $c \in H, T$ indicates whether worker i is employed with a TWA contract T or an in-house fixed-term contract H. γ_{ec} are contract-specific establishment effects, γ_{eoc} are contract-specific establishment-occupation effects, and γ_{zoc} are contract-specific commuting zone-occupation effects. In each case we restrict the sample to the relevant largest connected set. We then recover the full distribution of cell-specific wage gaps by subtracting the TWA-specific fixed effects from the CDD specific fixed effects : $\gamma_{xH} - \gamma_{xT}$ for $x \in \{e, eo, zo\}$. In practice, the wage gaps obtained here are equivalent to extending equation (1) by interacting the TWA contract dummy with the entire battery of establishment, establishment-occupation or commuting zone-occupation fixed effects.

Table III summarizes the wage gap distribution obtained with each one of the three models presented above. Figure II shows the histogram of the distributions. While the average wage gap within establishments and establishments-occupations is consistent with the magnitude shown in Table II, around 2.7% in favor of in-house workers, we confirm the presence of substantial heterogeneity, with more than 25% of the cells presenting higher wages for TWA workers than for in-house fixed-term workers regardless of the level of analysis chosen. Interestingly, 75% of the standard deviation in wage gaps is already observed across markets, as defined by the commuting zone and the occupation. The variation across establishments in the same market captures wider wage gaps in favor of in-house workers, as shown by the 75th percentile, but makes little difference in explaining the gaps in favor of TWA workers, as shown by the 25th percentile.

TABLE III. Summary statistic on firms' and markets' wage gaps

	mean	p25	p50	p75	sd	N
Wage gaps by estab	0.029	-0.056	0.019	0.103	0.151	85512
Wage gaps by estab - occup	0.027	-0.063	0.018	0.107	0.161	54886
Wage gaps by CZ - occup	0.005	-0.051	0.000	0.054	0.124	15793
Wage gaps by 20 estab. classes	0.012	-0.004	0.008	0.029	0.029	20

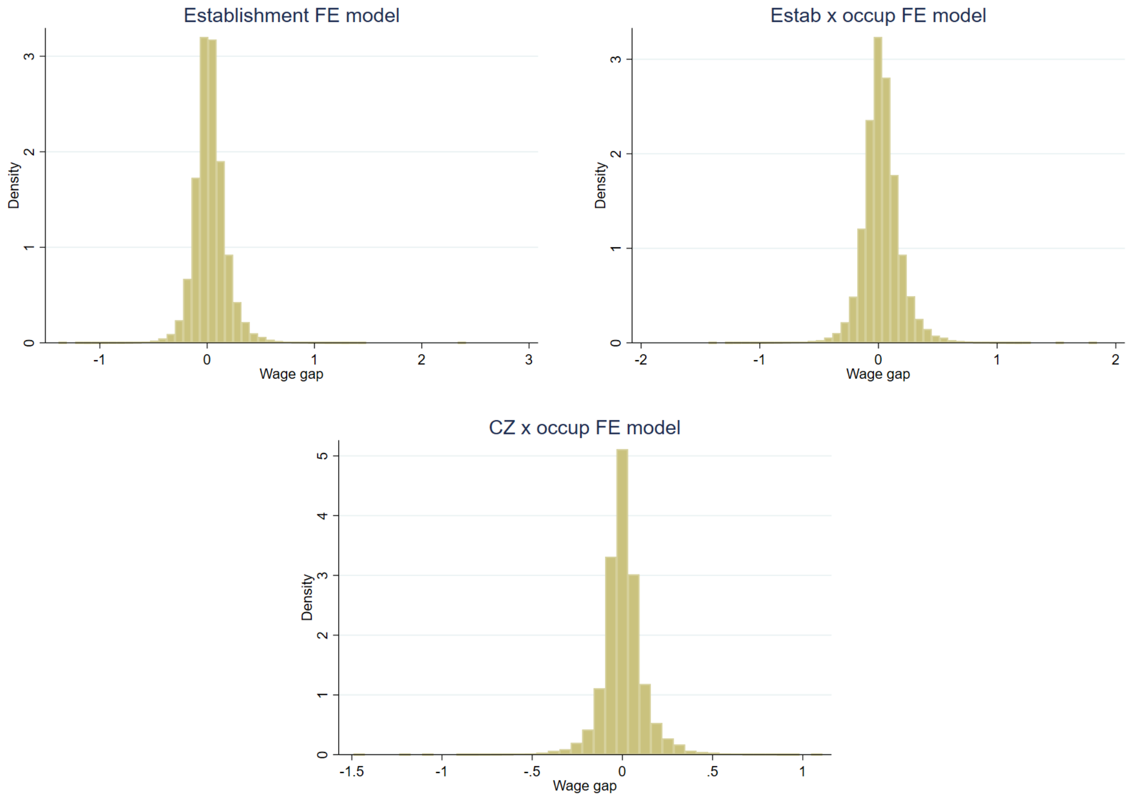
Note: This table reports the summary statistics of the cell-specific wage gaps obtained by subtracting the TWA-specific premium within a given establishment, establishment-occupation, and CZ-occupation from the in-house specific premium of the same entity, as reported in equations (2), (3) and (4). The last line shows the distribution of wage gaps computed within 20 firm classes in the spirit of Bonhomme et al. (2019).

Finally, we conduct a robustness test to show that cells with negative wage gaps are not driven by measurement error and small sample bias. We classify firms into 20 clusters defined by their average level of wages among in-house workers, in the spirit of Bonhomme et al. (2019). We then adopt the same methodology described above, but where instead of introducing establishment $\times$ contract fixed effects, we introduce establishment cluster $\times$ contract fixed effects (40 in total, 20 for each contract type). The obtained distribution is summarized in Table III. While the fact that the distribution becomes much narrower is to be expected given the significant reduction in the number of observations, it is interesting to notice that roughly 25% of the sample maintains a wage gap in favor of TWA workers. Appendix A.3 and the next sub-section provide additional tests that our negative wage gaps are not driven by measurement error but are correlated with meaningful firm and market characteristics.

3.3 Factors correlated with the wage gap heterogeneity

Common explanations for the average wage gap favoring in-house workers include differential rent-sharing between in-house and temporary workers within firms, as well as companies' fairness concerns toward their in-house employees (see discussion in Drenik et al., 2020). However, these interpretations are unable to explain wage gaps in favor of TWA workers. In models considering domestic outsourcing, the explanations of the wage gaps mainly refer to differences in productivity between outsourced and in-house jobs or workers (see Goldschmidt and Schmieder, 2017; Bilal and Lhuillier, 2021; Spitze, 2022). However, these interpretations are unable to explain the existence of a wage gap for similar in-house and TWA workers performing similar tasks in the same establishment.

FIGURE II. Distribution of wage gaps



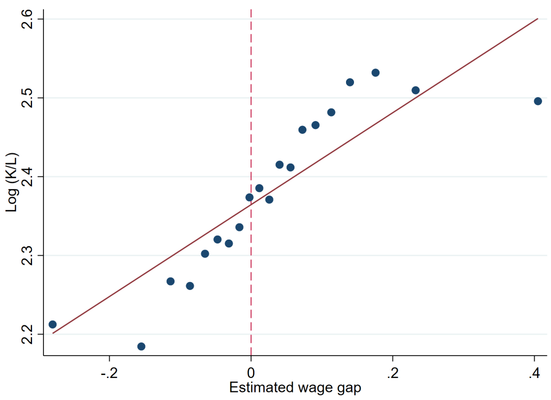
Notes: Distribution of the wage gaps between in-house and TWA workers recovered using equations (2), (3) and (4).

Our explanation suggests that the wage gap depends on user firms' characteristics, the efficiency of TWAs, and labor market conditions that influence how difficult it is to fill positions. TWA wages depend on the fee that user firms pay for TWA workers. When user firms face high waiting costs to employ TWA workers, such as the burden of vacant positions and long delays in filling them, they reduce this fee to offset some of those costs. Because TWA wages are directly linked to the fee, higher waiting costs ultimately depress wages, further widening the gap with in-house pay.

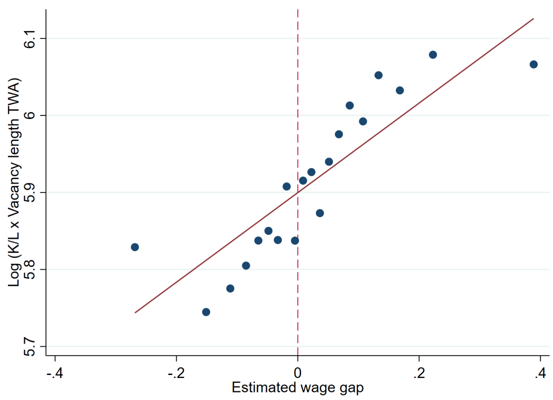
Figure III provides empirical support for this explanation by showing that the wage gap is correlated with natural proxies for user firms' waiting costs to employ TWA workers. These components include, first and foremost, the capital cost per worker, which firms continue to bear when positions remain vacant. This capital cost is positively correlated with the wage gap (Figure IIIa). The impact of capital costs on waiting costs is even greater when the time required to fill vacancies is longer. Indeed, the product of capital cost per worker and the average vacancy duration for TWA workers in user firms is also positively correlated with the wage gap (Figure IIIb). Moreover, the price paid to TWAs for their services depends not only on waiting costs but also on the expected profitability of hiring a TWA worker. This expected profit is lower when the duration of temporary employment is shorter. Consistent with this, the model formally shows that all the factors influencing the price paid to TWAs due to waiting costs combine to determine a specific component of the wage gap, expressed as $k(r+q)/f_a$, where k represents the capital-labor ratio, r is the interest rate, q is the job destruction rate, and f_a is the job filling rate for TWA positions. This aggregate, which is empirically positively correlated with the wage gap (Figure IIIc), drives down both the price paid to TWAs and the wages of TWA workers. It represents the inefficient portion of the wage gap. The remaining component of the wage gap corresponds to differences in human resource management costs between TWAs and user firms.

FIGURE III. Correlation between wage gaps and waiting costs

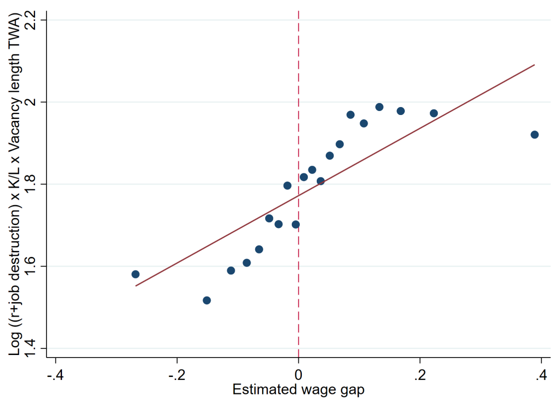
(a) Wage gaps and K/L of user firms



(b) Wage gaps and K/L x TWAs' vacancy length



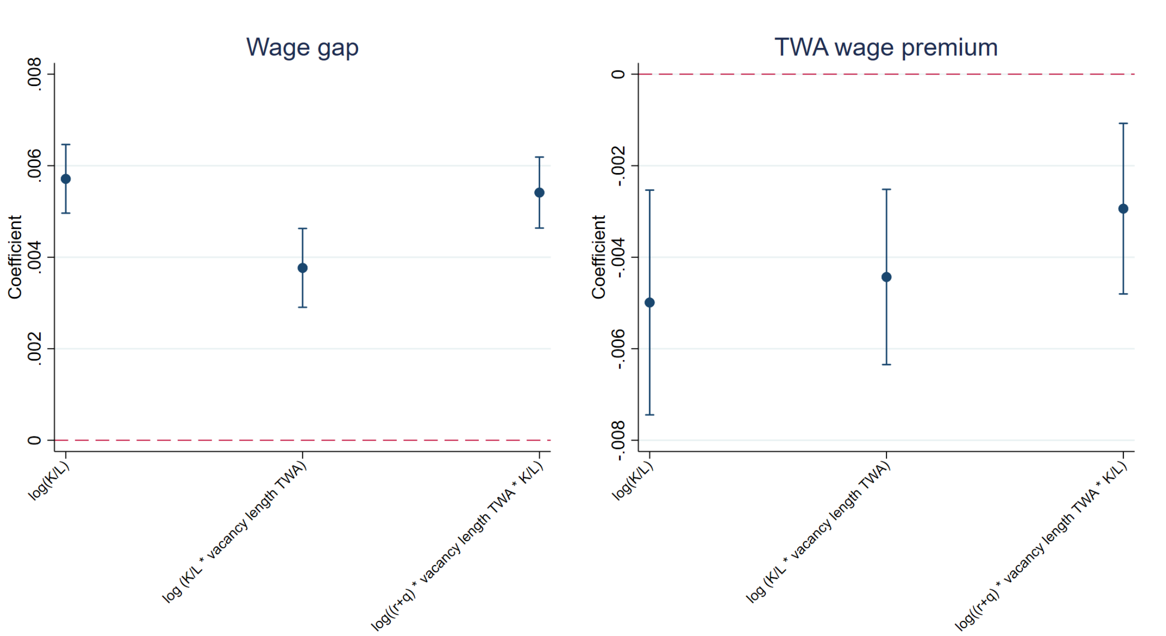
(c) Wage gaps and K/L x TWAs'vacancy length x job destruction



Note: This figure shows how the wage gap between in-house and TWA workers obtained from AKM regressions at the user establishment level correlates with the waiting costs: the capital that needs to be mobilized for each worker, the average waiting time to hire a TWA worker, and the frequency of hiring needs expressed by the job destruction rate.

To demonstrate that these correlations survive the inclusion of additional controls, the left panel of Figure IV plots the coefficients obtained from a regression of the wage gap on the different components of the waiting costs controlling for user firm productivity, measured as value added per worker. The corresponding regression table is reported in Appendix Table A.3.3, which further shows that the correlation on the main aggregate survives controlling also for user firm size and commuting zone fixed effects. Finally, to show that these variables actually have an impact on the wages of temporary agency workers, as opposed to only affecting in-house workers, we run a regression using the same regressors of interest on the TWA rent, which is estimated from an AKM wage regression on TWA workers only, controlling for user firm and individual fixed effects. All the variables that increase the wage gap have indeed a negative impact on the wages of temporary agency workers. The main coefficients of interest are reported in the right panel of Figure IV, while the complete regression table in reported as Appendix Table A.3.4.

FIGURE IV. COEFFICIENTS ON THE DETERMINANTS OF WAGE GAP AND TWA WAGE PREMIUM



Note: The left panel of this figure shows the coefficients obtained from regressions at the user establishment level on the wage gap between in-house and TWA workers. Each dot corresponds to a separate regression using the different aggregations of the waiting cost measure already presented in Figure III, but additionally controlling for user firm productivity. The full regression model is reported in Appendix Table A.3.3. The right panel shows the correlation between the same regressors and the TWA wage premium obtained from an AKM on TWA wages. The regression further controls for the average client productivity and client wage premium. The full regression model is reported in Appendix Table A.3.4.

Finally, we can calculate that the average wage gap level within user firms amounts to

2.6 euros per day in favor of in-house workers, corresponding to 2.7% of TWA daily wages. This gap can be decomposed into two components: an inefficient component, driven by aggregate weighting costs, and an efficient component, reflecting differences in HR management costs (unobserved). The inefficient component accounts for 7.4 euros per day (7.7% of TWA wages), while the efficient component offsets this by -4.8 euros per day (-5% of TWA wages), leading to the observed net wage gap. This decomposition suggests that, in an efficient setting, TWA workers should earn more on average. Consequently, a policy mandating equal pay between in-house and TWA workers may not necessarily improve overall welfare.[12]

Motivated by this empirical evidence, in the next section we put forward the model rationalizing why identical in-house workers and TWA workers can be paid differently within the same firm and occupation, and why the pay gap can vary considerably across firms and markets, to the point of reversing sign in some instances.

4 Theoretical model

We begin by introducing the general structure of the model, summarized in Figure V, before detailing the behaviors of workers, firms and TWAs. We then present the labor market equilibrium and compare it to a socially efficient allocation chosen by a planner who maximizes production net of capital and job vacancies costs.

4.1 Framework

The framework is a directed job search model in continuous time, where $\mathcal{N}$ risk-neutral workers, each with an infinite lifespan, participate. The economy features a numéraire good produced from capital and labor. A representative firm, representing a set of firms with a given number, can create jobs, employ in-house workers, and procure labor services of TWA workers through TWAs. The decisions of the representative firm can reflect the decisions of heterogeneous firms, whose vacancy posting costs differ.[13]

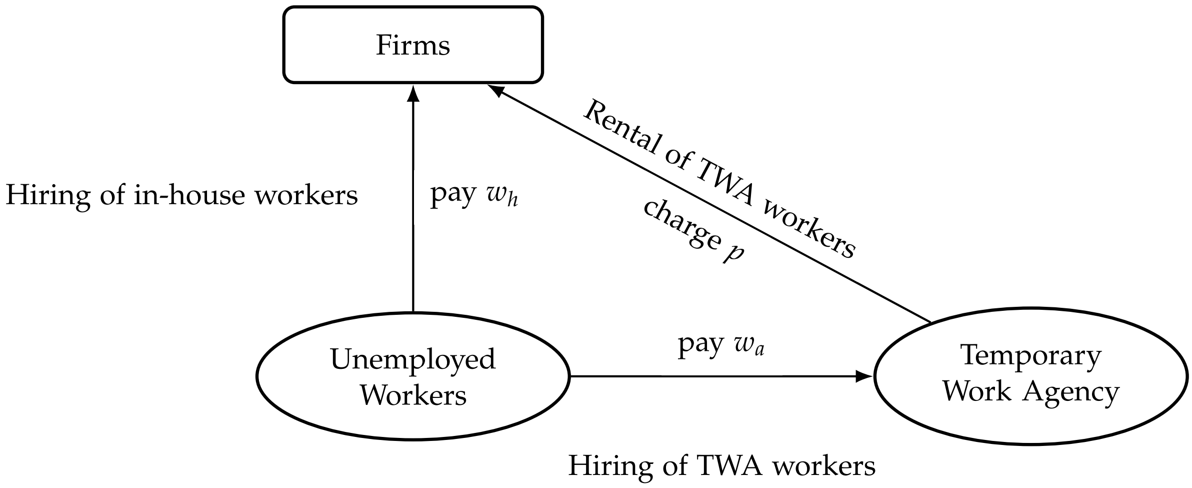
[12] We estimate the effect of this counterfactual scenario in Section 5. These calculations follow equation 14, where each component is expressed in daily values. The daily interest rate r is set to 0.01337%, and the elasticity of the matching function η is 0.5. We maintain these values in the quantitative analysis presented in Section 5.

[13] For example, in the form $c_i + \gamma \mathcal{V}_i^{\nu}$, where i denotes the firm index, $\mathcal{V}_i$ its number of job vacancies and $c_i > 0$, $\gamma > 0$, and $\nu > 1$ are scalars.

An exogenous number of identical TWAs, normalized to one, offer the services of TWA workers to firms in a perfectly competitive market. Within this job market, firms and TWAs seek workers by advertising job vacancies. Workers are free to apply for positions with either firms or TWAs. This assumption, that TWA workers and in-house employees perform the same jobs and tasks, is intended to capture the specific characteristics of TWAs. This contrasts with other forms of outsourcing analyzed in the models of Bilal and Lhuillier (2021) and Spitze (2022), where external workers typically perform specialized roles, such as cleaning, catering, or security, which are not performed by in-house workers.

Firms utilize a constant return to scale technology to produce $y > 0$ units of the final good per unit of time for each filled job. Filled jobs are subject to destruction at an exogenous Poisson rate q. These job losses stem from productivity shocks that can impact not only the firm, due to fluctuations in demand or supplier availability, but also individual workers, as a result of personal events that require them to be absent or leave their positions.

FIGURE V. STRUCTURE OF THE MODEL



Job creation incurs an investment of $k \geq 0$ units of the numéraire good implying a flow cost of capital equal to rk, where r stands for the interest rate. The capital k is required regardless of whether the job remains vacant or becomes filled. To recruit an in-house worker to fill a vacancy, a firm posts a vacancy with an associated marginal cost $C'(\mathcal{V}_h)$, where $\mathcal{V}_h$ denotes the number of vacancies for in-house positions, and $C(\mathcal{V}_h)$ represents the cost function. This function is characterized by the conditions: $C(0) = 0$, $C' > 0$, $C'' > 0$, and $\lim_{\mathcal{V}\to 0} C'(\mathcal{V}) = 0$.[14]

[14]The convexity hypothesis of the job vacancy cost function is empirically relevant to explain the hiring

Firms have the option to rent the services of workers employed by TWAs. The market for renting these services is perfectly competitive. The cost for a firm to post its vacancy through a TWA is effectively zero,[15] and the firm incurs a cost of p payable to the TWA only when a TWA worker fills the job. To prevent user firms from seeking in-house workers for vacancies initially posted at the TWAs, contracts may specify that user firms owe compensation to the TWAs for any cancellation of their demand. This compensation which is not paid under equilibrium conditions does not influence the equilibrium price paid to the TWAs.

The increasing marginal cost of posting vacancies for firms seeking to recruit internal workers on their own can stem from the fact that they must mobilize internal human resources that are not necessarily specialized in this type of activity. The specialization of TWAs allows them to increase their activity without being confronted with these difficulties. Therefore, we assume that the TWAs post vacant jobs at a constant marginal cost κ.

Wages for each vacancy, which are set by employers, are fixed and non-negotiable, creating distinct submarkets for each wage level and type of job. Unemployed workers are free to search across all submarkets for job opportunities. The matching process within each submarket is governed by a matching function exhibiting constant returns to scale. This function dictates that vacancies posted by firms for in-house employment are filled at an endogenous Poisson rate $m(\theta) > 0$, where $m'(\theta) < 0$ and $m''(\theta) < 0$, and $\theta \geq 0$ represents labor market tightness — the ratio of job vacancies to unemployed workers within a submarket. Unemployed workers find jobs at rate $\theta m(\theta)$.

Vacancies posted by TWAs are filled at an endogenous rate of $\alpha m(\theta) > 0$.[16]

Here, $\alpha > 0$ acts as a scalar adjusting for the differential in search efficiency between firms and TWAs. Notably, α may be less than one, reflecting situations where TWAs are less efficient than firms. Additionally, a divergence in human resource manage-

behavior of firms. See, among others Coşar et al. (2016); Gavazza et al. (2018); Manning (2006); Merz and Yashiv (2007).

[15]This assumption is made for the sake of simplicity. Assuming the presence of a positive fixed cost does not alter our key findings.

[16]In this framework, the labor tightness of TWAs' market, denoted by θ_a, is equal to $\theta_a = \alpha\mathcal{V}_a/\mathcal{U}_a$ where $\mathcal{V}_a$ and $\mathcal{U}_a$ stand for the number of TWAs' job vacancies and $\mathcal{U}_a$ the number of job seekers looking for TWA jobs. The matching function M yields $M(\alpha\mathcal{V}_a, \mathcal{U}_a)$ matches per unit of times. Therefore the job filling rate of TWAs' job vacancies is equal to $M(\alpha\mathcal{V}_a, \mathcal{U}_a)/\mathcal{V}_a$. The homogeneity of degree one of the matching function implies that it can be written $\alpha m(\theta_a)$. The same reasoning implies that it equals $m(\theta_h)$ for in-house job vacancies, where $\theta_h = \mathcal{V}_h/\mathcal{U}_h$.

ment costs exists between the two entities: TWAs bear a fixed cost per filled job denoted by $c_a \geq 0$, whereas firms managing in-house workers incur a cost of $c_h \geq 0$.

Now, we will define the objectives and behaviors of workers, firms and TWAs in a frictional labor market with in-house and TWA workers.

4.2 Value functions and offered wages

4.2.1 Workers

Let W_u denote the expected value from unemployment at the start of the period. In different labor submarkets, there are varying potential values of wage w and market tightness θ. Workers find jobs at rate $\theta m(\theta)$ in a submarket with tightness θ, and those who do not find a job receive unemployment income b. The arbitrage condition is given by:

$$rW_u = b + \theta m(\theta) \left(W(w) - W_u \right), \quad \forall (w, \theta) \tag{5}$$

where $W(w)$, the expected value for employed workers at wage w, satisfies:

$$rW(w) = w + q \left(W_u - W(w) \right) \tag{6}$$

This condition outlines a negative relationship between wage and labor market tightness across submarkets, as higher wages attract more unemployed workers to those submarkets.

4.2.2 Firms

Each firm can produce with $\mathcal{L}_h \geq 0$ in-house workers and $\mathcal{L}_a \geq 0$ TWA workers. The number of workers employed by each firm is

$$\mathcal{L} = \mathcal{L}_h + \mathcal{L}_a$$

Firms choose the number of in-house and TWA job vacancies, denoted by $\mathcal{V}_h$ and $\mathcal{V}_a$, respectively. More precisely, $\mathcal{V}_a$ represents the demand for vacant positions by user firms to be filled by TWAs. User firms anticipate that these vacancies will typically be filled more quickly by TWAs compared to their own hiring process. This demand is matched with the supply of vacancies provided by TWAs, as defined below, within a competitive market. The equilibrium of this market determines the price p that user firms pay to TWAs for utilizing the services of their workers.

Firms also choose the wage associated with their in-house job offers. Let us denote by $\mathrm{d}t \to 0$ a small interval of time and by $x^{+} - x$ the variation of variable x over the time interval $\mathrm{d}t$. The value function of a firm satisfies:

$$(1 + r\,\mathrm{d}t)\,\Pi\left(\mathcal{L}_h, \mathcal{L}_a\right) = \max_{(\mathcal{V}_h \geq 0, \mathcal{V}_a \geq 0, w)} \Big\{ y\mathcal{L} - \left(w_h + c_h\right)\mathcal{L}_h - C(\mathcal{V}_h) \\ - rk\left(\mathcal{L} + \mathcal{V}_h + \mathcal{V}_a\right) - p\mathcal{L}_a \Big\}\,\mathrm{d}t + \Pi\left(\mathcal{L}_h^{+}, \mathcal{L}_a^{+}\right)$$

subject to the arbitrage condition (5) and the law of motion of in-house and TWA jobs:

$$\begin{aligned} \mathcal{L}_h^{+} &= \left(1 - q\mathrm{d}t\right)\mathcal{L}_h + \mathcal{V}_h m(\theta_h)\mathrm{d}t \\ \mathcal{L}_a^{+} &= \left(1 - q\mathrm{d}t\right)\mathcal{L}_a + \alpha\mathcal{V}_a m(\theta_a)\mathrm{d}t \end{aligned}$$

For clarity, we describe here the equilibrium in which firms post in-house and temporary job vacancies. Firms may use the services of both temp and in-house workers because the marginal cost of posting vacancies for in-house workers is increasing, while the marginal cost of employing TWA workers, equal to the price paid to TWAs, is considered by the firm as a variable independent from its activity. The other equilibria and detailed derivations are described in Appendix B.

For an interior solution, the first order conditions of the firms' maximization problem imply that they offer the wage:

$$w_h = \eta\left(y - rk - c_h - rW_u\right) + rW_u \tag{7}$$

where $\eta = -\theta m'(\theta)/m(\theta)$ is the elasticity of the job filling rate with respect to the labor market tightness.

At the optimum, firms equalize the marginal cost of job creation to its marginal return. To create a job, firms invest and then pay the flow cost of capital equal to rk, whether the job is vacant or filled. The vacancy cost is equal to $C'(\mathcal{V}_h)$ if they look for an in-house worker. The expected marginal return of a vacant job is equal to the job filling rate $m(\theta_h)$ times the discounted difference between marginal productivity, y, and the cost of labor and capital $w_h + c_h + rk$. Therefore, the equalization of the marginal cost of job creation for in-house workers to their marginal return yields, using the definition (7) of the optimal wage:

$$C'(\mathcal{V}_h) + rk = (1-\eta)m(\theta_h)\frac{y - rk - rW_u - c_h}{r+q} \tag{8}$$

When a firm seeks a TWA worker, the marginal cost of a vacant job is represented by the flow cost of capital, rk. The marginal return is determined by the job filling rate $\alpha m(\theta_a)$ multiplied by the discounted difference between the marginal productivity y, and the sum of the flow cost of capital rk and the price p paid to the TWA if the job is successfully filled. The equilibrium condition, equating the marginal cost to the marginal return of TWA job vacancies, dictates the demand of firms for TWA workers as follows:

$$p = y - \frac{rk(r+q)}{\alpha m(\theta_a)} \tag{9}$$

This equation shows that the price paid to TWAs is equal to the productivity of the job minus the waiting cost, which depends on the cost of capital, the job destruction rate, and the time required for the TWAs to fill the position.

4.2.3 TWAs

The TWAs post job vacancies at a unit cost of κ and offer a wage w_a to recruit workers for user firms, which pay a price p if a TWA worker is recruited. The probability of filling job vacancies is $\alpha m(\theta_a)$, and the TWAs incur a human resource management cost c_a per TWA worker. Therefore, the value of vacancies posted by the TWAs is given by:

$$rV_a = \max_{w_a} -\kappa + \alpha m(\theta_a)\left(\frac{p - w_a - c_a}{r+q} - V_a\right) \quad \text{subject to (5)} \tag{10}$$

The wage offered to TWA workers is determined by:

$$w_a = \eta\left(p - c_a - rW_u\right) + rW_u \tag{11}$$

The market for TWA workers operates under a free entry condition, implying that TWAs will continue to create vacancies until the value of their vacant jobs is zero ($V_a = 0$). This condition, combined with the wage expression w_a, defines the equation for the supply of vacancies for TWA workers:

$$\frac{\kappa}{\alpha m(\theta_a)} = (1-\eta)\left(\frac{p - c_a - rW_u}{r+q}\right) \tag{12}$$

4.3 Labor market equilibrium

In equilibrium, the demand for and supply of TWA workers are equal and workers seeking employment receive the same expected utility across all submarkets.

The equilibrium between the demand for TWA workers by user firms and their supply by TWAs allows for the substitution of the price p paid by firms for the services of TWA workers – defined by the demand equation (9) – into the wage equation (11). Consequently, the wage offered to TWA workers is determined as follows:

$$w_a = \eta\left(y - rk - c_a - rW_u - rk\frac{r+q}{\alpha m(\theta_a)}\right) + rW_u \tag{13}$$

This equation demonstrates that the wages of TWA workers depend not only on the characteristics of client firms but also on those of TWAs, as evidenced by the empirical analysis. Specifically, the wages of TWA workers decrease with the waiting costs of user firms — i.e. the term $rk(r+q)/\alpha m(\theta_a)$—, as shown in Figure IV.

Proposition 1. *The wage differential between in-house and TWA workers is influenced by rk, the maintenance cost of vacant jobs, $\alpha m(\theta_a)$, the job filling rate of the TWAs, and $c_a - c_h$, the disparity in human resources management costs between TWAs for TWA workers and firms for in-house workers.*

Proof. From equations (7) and (13) the wage gap between in-house and TWA workers is equal to:

$$w_h - w_a = \eta\left(rk\frac{r+q}{\alpha m(\theta_a)} + c_a - c_h\right) \tag{14}$$

□

Now, we can define the conditions which recursively determine the equilibrium values of: i) the tightness on the submarket for TWA jobs from the equality between the supply and demand for TWA jobs; ii) the equilibrium value of the tightness for the submarket for in-house jobs from the arbitrage condition of unemployment workers; iii) the number of vacancies for in-house jobs from the equality of the supply and demand for those vacancies (see Appendix B for details):

$$
\begin{cases}
\underbrace{\kappa + rk}_{\text{Cost of TWA job vacancies}} = \underbrace{\alpha m(\theta_a)\,(1-\eta)\,\dfrac{y - rk - c_a - b}{r + q + \eta\theta_a m(\theta_a)} + \eta\dfrac{r + q + \theta_a m(\theta_a)}{r + q + \eta\theta_a m(\theta_a)} rk}_{\text{Expected profits of TWA job vacancies}} \\[2ex]
\underbrace{\dfrac{\eta\theta_h m(\theta_h)\,(y - rk - c_h - b)}{r + q + \eta\theta_h m(\theta_h)}}_{\text{Expected gains of seeking in-house jobs}} = \underbrace{\dfrac{\eta\theta_a m(\theta_a)}{r + q + \eta\theta_a m(\theta_a)}\left(y - rk - c_a - b - \dfrac{r+q}{\alpha m(\theta_a)} rk\right)}_{\text{Expected gains of seeking TWA jobs}} \\[2ex]
\underbrace{C'(\mathcal{V}_h) + rk}_{\text{Cost of in-house job vacancies}} = \underbrace{\dfrac{m(\theta_h)\,(1-\eta)}{r + q + \eta\theta_h m(\theta_h)}\,(y - rk - c_h - b)}_{\text{Expected profits of in-house job vacancies}}
\end{cases}
\tag{15}
$$

The top equation, derived from equations (9) and (12), specifies the labor market tightness θ_a for TWA workers compatible with the demand and supply of TWA job vacancies. The left-hand side represents the combined costs to firms and TWAs for maintaining a vacancy for TWA workers. The right-hand side corresponds to the joint expected profits for TWAs and firms, calculated as the vacancy filling rate multiplied by the share $(1-\eta)$ of the job surplus accruing to TWAs and firms, multiplied by the value of the joint surplus. Additionally, the last term of the right-hand side shows that the cost of maintaining vacant TWA jobs for user firms enhances the joint expected profits from TWA job vacancies at the expense of the remuneration of TWA workers. This effect arises because this cost reduces the price p paid by user firms to TWAs, as outlined in equation (9), which subsequently impacts the wage of temporary workers, as detailed in equation (13). The top equation defines a unique value for θ_a, assuming it exists.

The relationship between labor market tightness in submarkets for in-house and TWA workers, displayed in the middle equation, is determined through the arbitrage condition (5), in conjunction with wage determinations in equations (7) and (13). The expected gains from seeking in-house jobs (on the left-hand side of the equation) or TWA jobs (on the right-hand side) are equal. This equation yields a unique value for θ_h, given a specific θ_a.

Lastly, the number of vacancies for in-house workers, $\mathcal{V}_h$, is defined through equation (8).

Once the equilibrium values of labor market tightness, θ_a and θ_h, and the number of vacancies for in-house workers, $\mathcal{V}_h$, are established, we can derive the number of vacancies for temporary workers ($\mathcal{V}_a$), the number of in-house workers ($\mathcal{L}_h$), the number of temporary workers ($\mathcal{L}_a$), and the number of unemployed workers seeking in-house ($\mathcal{U}_h$) and TWA jobs ($\mathcal{U}_a$). These are determined by the labor market tightness definitions, the flow equilibrium conditions:

$$\begin{aligned}
\mathcal{U}_h\theta_h &= \mathcal{V}_h \\
\mathcal{U}_a\theta_a &= \alpha\mathcal{V}_a \\
q\mathcal{L}_h &= \theta_h m(\theta_h)\mathcal{U}_h \\
q\mathcal{L}_a &= \alpha\theta_a m(\theta_a)\mathcal{U}_a
\end{aligned}$$

and the resource constraint:

$$\mathcal{N} = \mathcal{U}_a + \mathcal{U}_h + \mathcal{L}_h + \mathcal{L}_a.$$

4.4 Efficiency

4.4.1 Constrained efficient allocation

The constrained efficient allocation can be obtained as the result of the choice of a planner who selects the number of vacancies for temp and in-house jobs, as well as the number of job seekers for each, aiming to maximize the discounted value of the output minus the costs of capital and vacant jobs. This optimization process yields the following system of equations, which determine the market tightness values for temp and in-house jobs, and the number of in-house job (see Appendix B.3):

$$\begin{cases}
\underbrace{\kappa + rk}_{\text{Cost of TWA job vacancies}} = \underbrace{\alpha m(\theta_a^*)\,(1-\eta)\,\frac{y - rk - c_a - b}{r + q + \eta\theta_a^* m(\theta_a^*)}}_{\text{Expected gains of TWA job vacancies}} \\[2ex]
\underbrace{\frac{\theta_h^* m(\theta_h^*)\,(y - rk - c_h - b)}{r + q + \eta\theta_h^* m(\theta_h^*)}}_{\text{Expected gains of seeking in-house jobs}} = \underbrace{\frac{\theta_a^* m(\theta_a^*)\,(y - rk - c_a - b)}{r + q + \eta\theta_a^* m(\theta_a^*)}}_{\text{Expected gains of seeking TWA jobs}} \\[2ex]
\underbrace{C'(\mathcal{V}_h^*) + rk}_{\text{Cost of in-house job vacancies}} = \underbrace{\frac{m(\theta_h^*)\,(1-\eta)}{r + q + \eta\theta_h^* m(\theta_h^*)}\,(y - rk - c_h - b)}_{\text{Expected gains of in-house job vacancies}}
\end{cases} \tag{16}$$

The top equation of each of the two systems, (15) and (16), represents the equality between the marginal cost of TWA job vacancies, on the left-hand side, and the marginal expected gain, on the right-hand side. For the social planner, the marginal cost includes the cost of maintenance of job vacancies, rk, plus the cost of vacancies for the TWAs, equal to κ. This cost is equivalent to the joint costs for user firms and TWAs in the decentralized equilibrium. However, the expected gains of TWA job vacancies differ from the perspective of the social planner because the wage of TWA workers is reduced by the maintenance cost of vacancies accruing to user firms in the decentralized equilibrium. This mechanism, which enhances the incentives of user firms to rely on TWA jobs in the decentralized equilibrium, is socially inefficient, as evidenced by the comparison of the top equations of systems (15) and (16).

The middle equation of the system (16) signifies the equality between the marginal returns of seeking temp and in-house jobs. A comparison with the decentralized equilibrium reveals that the return from seeking TWA jobs is too low, relative to its socially efficient level, because the wage of TWA workers is diminished by the maintenance cost of TWA job vacancies for user firms.

The bottom equation, determining the optimal number of in-house job vacancies, retains the same expression in both the constrained efficient solution and in the decentralized equilibrium.

4.4.2 Comparison of the decentralized equilibrium with the constrained efficient allocation

The comparison of the systems of equations (15) and (16), shows that, when $k = 0$, the constrained efficient and the decentralized equilibrium values of $(\theta_h, \theta_a, \mathcal{V}_h)$ are determined by the same conditions, which implies that the decentralized equilibrium is constrained efficient. The sole source of inefficiency arises from the distortion due to the maintenance cost of TWA job vacancies for user firms, which diminishes the wage of TWA workers relative to that of in-house workers.

Proposition 2. *The decentralized equilibrium is constrained efficient if and only if the waiting cost for vacant TWA jobs of user firms, $rk(r+q)/\alpha m(\theta_a)$, is equal to zero.*

The inefficiency of the decentralized equilibrium can be explained as follows: firms hire TWA workers, whose wage is negatively impacted by the maintenance cost of temp vacant jobs for user firms, because they bear a fraction η of the job maintenance cost – see the right-hand side of the top equations of systems (15) and (16) – with the TWAs. This scenario arises because the waiting costs diminish the demand for TWA workers, which in turn lowers the price paid to the TWAs for using the services of TWA workers – see equation (9) – and consequently, the wages of TWA workers – see equation (13). The expression of the wage gap $w_h - w_a$ – see equation (14) – implies the following result.

Proposition 3. *The wage gap between in-house and TWA workers stems from the inefficiency induced by the maintenance cost of TWA job vacancies for user firms and from the difference in the cost of human resources management between the TWAs for TWA workers and firms for in-house workers, which does not induce inefficiency of the decentralized equilibrium.*

The inefficiency of the decentralized equilibrium has also consequences on the number of jobs which can be summarized as follows

Proposition 4. *For all parameter set values, the number and the share of in-house jobs in the decentralized equilibrium are either equal to or higher than those in the constrained efficient solution.*

Proof. See appendix B.4 □

The insufficient share of TWA jobs and the excess of in-house jobs in the decentralized equilibrium are the consequence of the low wages of TWA workers. On the one hand, the low wages of TWA jobs induce firms to rely too much on TWA jobs. On the other hand, these wages prompt TWA workers to direct their search toward in-house jobs, complicating the recruitment of TWA workers. This second effect always dominates when both temp and in-house jobs are available, to the extent that it is easy to redirect search efforts between temp and in-house jobs, a feature well accounted for by the directed search model. It is worth noting that the scarcity of TWA jobs in decentralized equilibrium implies that there are parameter set values where firms employ only in-house workers, even though it would be more efficient to use both temp and in-house workers.

Proposition 4 reveals that the number and share of in-house jobs remain always too high in decentralized equilibrium compared with the constrained efficient allocation across all parameter set. However, a comparison between the constrained efficient solution and the decentralized equilibrium shows differences in the number of TWA jobs and the total number of jobs, which depend on specific parameter values. Specifically, the decentralized equilibrium either has too many or too few TWA jobs when it includes both job types. Consequently, when the decentralized equilibrium includes both temp and in-house jobs, the total number of jobs can be either excessively high or insufficiently low. In contrast, scenarios where the decentralized equilibrium includes only TWA jobs consistently show an oversupply of these positions. This excess occurs because workers lack alternative in-house job options, forcing them to accept TWA jobs at very low wages – see B.4. Our quantification of the parameters in Section 5.2 can be used to assess the empirical relevance of these findings.

4.4.3 Implementation of the constrained efficient allocation

The inefficient wage gap between in-house and TWA workers induces firms to post too many TWA job vacancies and job seekers to search too little for TWA jobs. Therefore, it is possible to implement the constrained efficient allocation with wage subsidies for TWA workers and taxes on the vacancies posted by the TWAs. Let σ_a denotes the wage subsidy, such that TWA workers get the income $w_a + \sigma_a$ when the TWAs pay the wage w_a, and τ_a the tax on each vacancy posted by the TWAs.

Proposition 5. *The constrained efficient allocation is implemented with wage subsidies*

$$\sigma_a = \frac{r+q}{\alpha m(\theta_a^*)} rk$$

for TWA workers financed by a tax $\tau_a = rk$ on the vacancies posted by TWAs.

Proof. See appendix B.6 □

When the constrained efficient allocation is implemented, the labor income gap between in-house and TWA workers is equal to

$$w_h - (w_a + \sigma_a) = \eta(c_a - c_h)$$

Thus, we can claim:

Proposition 6. *When the constrained efficient allocation is implemented with subsidies and taxes in the decentralized equilibrium, the wage gap between in-house workers and external workers only depends on the gap between the costs of human resources management of TWAs for TWA workers and firms for in-house workers.*

5 Quantitative analysis

In this section, we use our rich micro dataset to provide some quantitative insight from our model. We start by decomposing the wage gap between an efficient and an inefficient components and we then derive the market-specific parameters of the decentralized equilibrium. We then use these parameters to evaluate the welfare gap between the constrained efficient allocation and the decentralized equilibrium and quantify the impact of TWAs activity on economic activity and employment.

5.1 Wage gap

Figure A.1.5 reports the distribution of the average daily wage by markets, respectively for TWA and in-house workers. In the model, the wage gap can be defined both in the decentralized equilibrium and after the implementation of the social optimum (efficient wage gap) as presented in equation (17):

$$\underbrace{w_h - w_a}_{\text{Wage gap in decentralized equilibrium}} = \underbrace{\eta(c_a - c_h)}_{\text{Efficient wage gap}} + \underbrace{\eta(r+q)\frac{rk}{\alpha m(\theta_a)}}_{\text{Inefficiency}}. \tag{17}$$

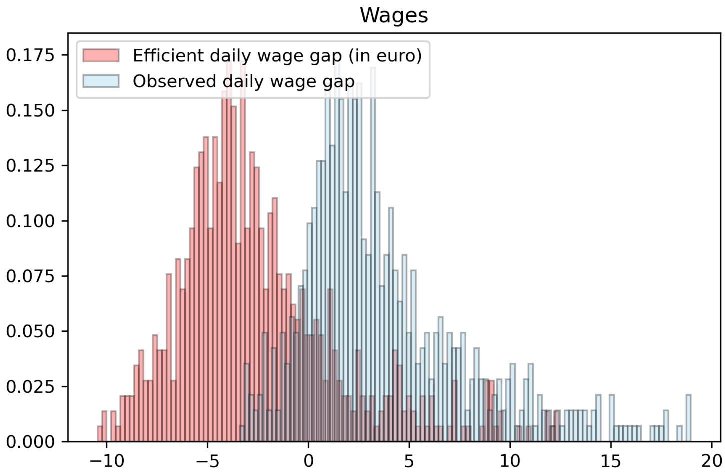
Before moving to an estimation of the individual parameters market by market, we can simply use direct observations on the separation rate q, the job filling rate of TWA workers $\alpha m(\theta_a)$ and the stock of capital k and set the values of η and r to evaluate the size of the inefficiency (see next Section for details on the data). Figure VI reports the distribution of both the theoretical wage gap $w_h - w_a$ and the efficient wage gap defined as the difference between the decentralized wage gap and the inefficiency presented in equation (17).

The distribution of efficient wage gaps is translated to the left compared to the distribution of the theoretical wage gaps and the magnitude of the inefficiency is around 10 euros per day for the average market. Figure VII shows that the share of TWA markdown in the wages of TWA workers varies from about 1% to 16% across labor markets, with an average equal to 6.4%.

5.2 Solving for the decentralized equilibrium

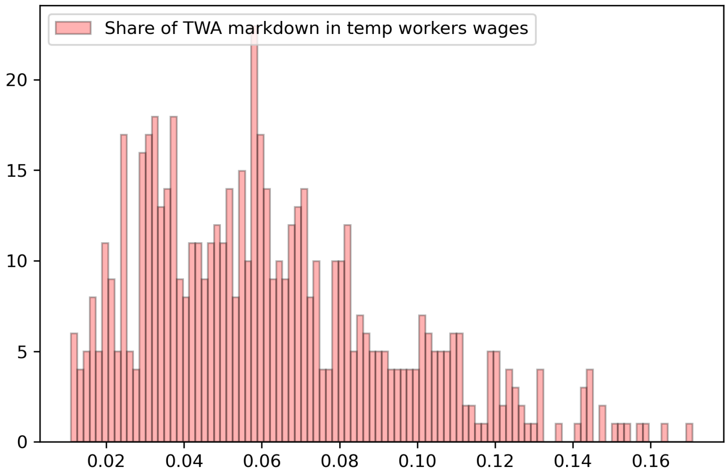
We now use our data to solve the model market by market. As explained in Section 2, we define a labor market as a combination of a commuting zone (306 different "zones d'emploi") and a worker skill category. We use the 4^{th} character of the FAP ("FAmilles Professionnelles") classification which split workers into 5 categories once we exclude the executives and most skilled occupations. In what follows, labor markets are in-

FIGURE VI. Efficient and actual wage gaps



Notes: Wage gaps are taken as the difference between the average wage of in-house temporary workers and TWA workers for each market and are given in euros per day. Decentralized wage gap corresponds to the "theoretical wage gap" presented in equation (17). Number of observations: 649 labor markets.

FIGURE VII. Share of TWA markdown in TWA workers wages



Notes: The share of TWA markdown in TWA workers wages if equal to the inefficient term in the right-hand side of equation (17) divided by the wage of TWA workers. Number of observations: 649 labor markets.

dexed by i. We restrict our attention to labor markets where we observe at least one worker in both segments (in-house and TWA).

Data In addition to the administrative payroll data and firms' balance sheet data that we presented in Sections 2 and 3, we use data from the French public employment agency ("*Pole Emploi*") and from the fichier ForCE ("*Formation, Chomage, Emploi*") for the year 2019. These datasets allow us to measure the corresponding job filling rates $\chi_{h,i}$ and $\chi_{a,i}$ and total unemployment $\mathcal{U}_i$.

Cleaning and variable construction We use historic public employment services records available in the ForCE dataset to construct the employment and unemployment histories for the universe of French job seekers. Within each job seeker's unemployment history we concatenate spells whose ending and starting date are separated by less than 30 days. After a basic cleaning step where we ensure that all observations have non-missing information on crucial variables (most notably, age, gender, location and search occupation), we drop all job seekers who declare not to be immediately available for a job in the public employment services' files. All retained job seekers are thus either looking for a full-time permanent position, a permanent part-time position or a regular fixed term duration/temporary work agency job. To construct a measure of local unemployment and job finding rates, we first measure the monthly stock of job seekers observed within each labor market. We average this monthly measure of the stock of registered job seekers over 2019. In a second step we use related exhaustive contract level DSN data ("Déclarations Sociales Nominatives") from the same ForCE datatset to construct the average monthly flow of new contracts in these same commuting zone × occupation cells. While doing so we restrict to in-house fixed-term contracts (CDD) and TWA type contracts (Interim). Combining the average monthly stocks of registered job seekers and the average monthly flows of new contracts pertaining to the same underlying population of job seekers we are able to construct monthly local labor market level job finding rates by contract type from the flow equilibrium between entries and exits for each contracts type. We add to this information exhaustive information on vacancies posted by firms on public employment services' website. Each vacancy contains information on the location, user firm identifier, contract type, posting firm identifier in the case of temporary work arrangement, occupation, as well as the creation and destruction rate. We use vacancy duration at the occupation, commuting zone and contract type level to construct measures of local job filling rates. Finally we use exhaustive data on employment (DADS

Postes) to measure average monthly employment by labor market as well as the share of TWA jobs.

Common parameters. We set two parameters which are common across labor markets. First the elasticity η of the matching function is set to 0.5 which is a standard value used in the literature (Petrongolo and Pissarides, 2001). Second, the real interest rate r is set to 0.01337% to match a daily value corresponding to a yearly interest rate of 5%.

Market specific inputs In addition to the finding rates for both type of workers and the total number of unemployed workers ($\chi_{h,i}$, $\chi_{a,i}$ and u_i) we use market specific values for $c_{hi}, y_i, k_i, q_i, \mathcal{L}_{h,i}$ and $\mathcal{L}_{a,i}$. Details are given in Table IV.

TABLE IV. Market specific inputs

Variable	Description	Source	Average
c_h	HR wagebill per worker (in euro per day)	DADS	14.1
y	Value added of a worker (in euro per day)	FARE and DADS	355
k	Stock of capital per worker (in euro)	DARE and DADS	$22/r$
$\mathcal{L}_h$	Total employment (full time equivalent) of in house workers	DADS	284
$\mathcal{L}_a$	Total employment (full time equivalent) of in TWA workers	DADS	199
q	Inverse of the average duration of a contract in days	DADS	0.0197 (51 days)

y and k cannot be directly measured at the labor market level. We estimate their values at the firm level, respectively, by considering the total value added and the stock of net capital, both divided by the total working time in hours. We then assign these values to each worker in the firm and average for all workers in a given labor market, and convert them into euros per day. q is estimated by taking the inverse of the average contract duration in days, and $\mathcal{L}_h$ and $\mathcal{L}_a$ are measured in full-time equivalent workers.

c_h measures the management cost of an in-house contract, which we proxy by the total wage bill of HR by firm divided by the number of hours worked by in-house workers. We then use the same strategy as the one used for y and k to allocate this value by labor market.

We finally set b, the unemployment benefit to be equal to half of the value of $y - rk$ in the corresponding market. Assuming a labor share of about 0.7, this implies an unemployment benefit equal to roughly 70% of the wage.

Estimation of other parameters We make two functional form assumptions. First, we assume a matching function that can be written for each market i as

$$m(\theta_i) = m_{0i}\theta_i^{-\eta}$$

where m_{0i} is a parameter that can vary by market. Second, we assume that the vacancy cost function for in house workers can be written as:

$$C(\mathcal{V}_i) = \nu_{0i}\mathcal{V}_i^{\nu},$$

and we thus have $C(\mathcal{V}_i)' = \nu_{0i}\nu\mathcal{V}_i^{\nu-1}$. Similarly to the matching function, we assume that the exponent parameter ν is similar across markets while the scale parameter ν_0 is market specific.

Objective function From our data, we observe:

$$\Theta_i = (y_i, k_i, b_i, \mathcal{L}_{h,i}, \mathcal{L}_{a,i}, q_{h,i}, q_{a,i}, \chi_{h,i}, \chi_{a,i}, \mathcal{U}_i, c_{h,i})$$

We also have imperfect measures of the job finding rates from looking at the average duration in unemployment by market respectively for individuals seeking a job as in-house workers or through a TWA. We denote these rates as $\varphi_{h,i}$, $\varphi_{a,i}$ and we allow them to be measured with some error so that the observed value are denoted $\tilde{\varphi}_{h,i}$ and $\tilde{\varphi}_{a,i}$. This is because we do not observe in which segment an unemployed worker is really searching for a job. Finally, we measure the average wage gap (dw_i) from a regression at the individual level where the dependent variable is the wage in level and where we include an interaction between a dummy for working in-house and a labor market fixed effect, similarly to the approach presented in equation (4).

We also set parameters r and η and we want to estimate a vector of market specific parameters:

$$\Gamma_i = (\mathcal{V}_{h,i}, \mathcal{V}_{a,i}, \mathcal{U}_{h,i}, \mathcal{U}_{a,i}, m_{0i}, \kappa_i, c_{a,i}, \alpha_i, \theta_{h,i}, \theta_{a,i}, p_i)$$

as well as ν_{0i} and ν.

Our strategy is detailed in Appendix C. The general idea is to solve for the equations defining the decentralized equilibrium while minimizing the distance between the measured wage gap dw_i and the model induced wage gap as defined in equation (14) as well as $\tilde{\varphi}_{h,i}$, $\tilde{\varphi}_{a,i}$.

Results Our model can be solved exactly for 649 markets which represent 639,710 individuals.[17] The average values of each component of Γ is given in Table V. The values of ν and ν_0 are respectively 1.21 and 26.6. The average value of α is 1.52 which means that TWA are more than 50% more efficient in finding workers, this value is lower than 1 for 13% of the markets.

TABLE V. Results in decentralized equilibrium

	$\mathcal{V}_{h,i}$	$\mathcal{V}_{a,i}$	$\mathcal{U}_{h,i}$	$\mathcal{U}_{a,i}$	m_{0i}	κ_i	$c_{a,i}$	α_i	$\theta_{h,i}$	$\theta_{a,i}$	p_i
Mean	229	138	297	206	0.021	95.1	9.43	1.52	0.752	0.954	321
p25	28	5	42	9	0.018	44.9	2.95	1.14	0.584	0.655	230
p50	94	25	123	42	0.021	68.8	6.45	1.38	0.723	0.835	305
p75	242	118	300	197	0.023	112.8	12.9	1.70	0.884	1.095	373

Notes: Average value and first, second and third quartiles of the component of Γ. Averages are unweighted across all 649 markets. $\mathcal{V}_{h,i}$, $\mathcal{V}_{a,i}$, $\mathcal{U}_{h,i}$ and $\mathcal{U}_{a,i}$ are given in number of individuals, κ_i, $c_{a,i}$ and p_i are in euros (per day for $c_{a,i}$ and p_i).

The number of vacancies is large (the size of the average market is 3000 workers), this is consistent with a low duration of contracts for these workers as discussed previously. Consequently, the number of unemployed workers in both the in-house and TWA segment is relatively high. This does not necessarily translate into a large unemployment rate because the time spent in unemployment is usually low. Finally, the average price of a TWA worker for the firm p is on average 1.2 times the value of w_a.

5.3 Comparison of constrained efficient and decentralized allocations

We now use the calibrated values of κ, c_a, m_0, ν, ν_0, and α, as well as the observed values for y, q, k, c, and b from the previous section, to calculate the optimal values of the number of vacancies $\mathcal{V}_h$ and $\mathcal{V}_a$, the labor market tightnesses θ_h and θ_a, the share of TWA worker γ, and employment $\mathcal{L}$ for each market as defined by equations (16). One important difference with the decentralized equilibrium is that we need to consider two equilibrium types since we have shown that it is possible that the constrained efficient allocation has TWA workers only when the decentralized equilibrium has both

[17] For the remaining markets, we could not solve for the decentralized equilibrium given the empirical values of y, k, c_h and the wage gap. In particular, these sets of values correspond to a negative expected gains of seeking in-house jobs in equation (15). As we want to measure exactly the gap between the constrained efficient equilibrium and the data, we restrict our analysis to the 649 markets for which we could solve perfectly the model.

in-house and TWA workers—as detailed in Appendix B.4.4. The process is further elaborated in Appendix C.2. We start by showing the difference in aggregate welfare between the constrained efficient and decentralized allocations across markets before highlighting the differences in the number of job seekers, vacancies, and jobs in temp and in-house job markets. Subsequently, we analyze the effects of several policies: taxes and subsidies employed to enact the constrained efficient allocation, the elimination of the wage gap, and the prohibition of TWAs.

5.3.1 Welfare

According to Figure C.3.1, welfare – measured as total production minus the costs of vacancies and capital —- is typically about 0.1% higher in the constrained efficient allocation than in the decentralized equilibrium. Relatively, this welfare difference is smaller than the drop in temporary workers' wages due to TWA, equal to about 6%, which drives the inefficiency in the decentralized equilibrium. The reason is that job seekers can direct their search towards in-house jobs at no cost in the directed search model.

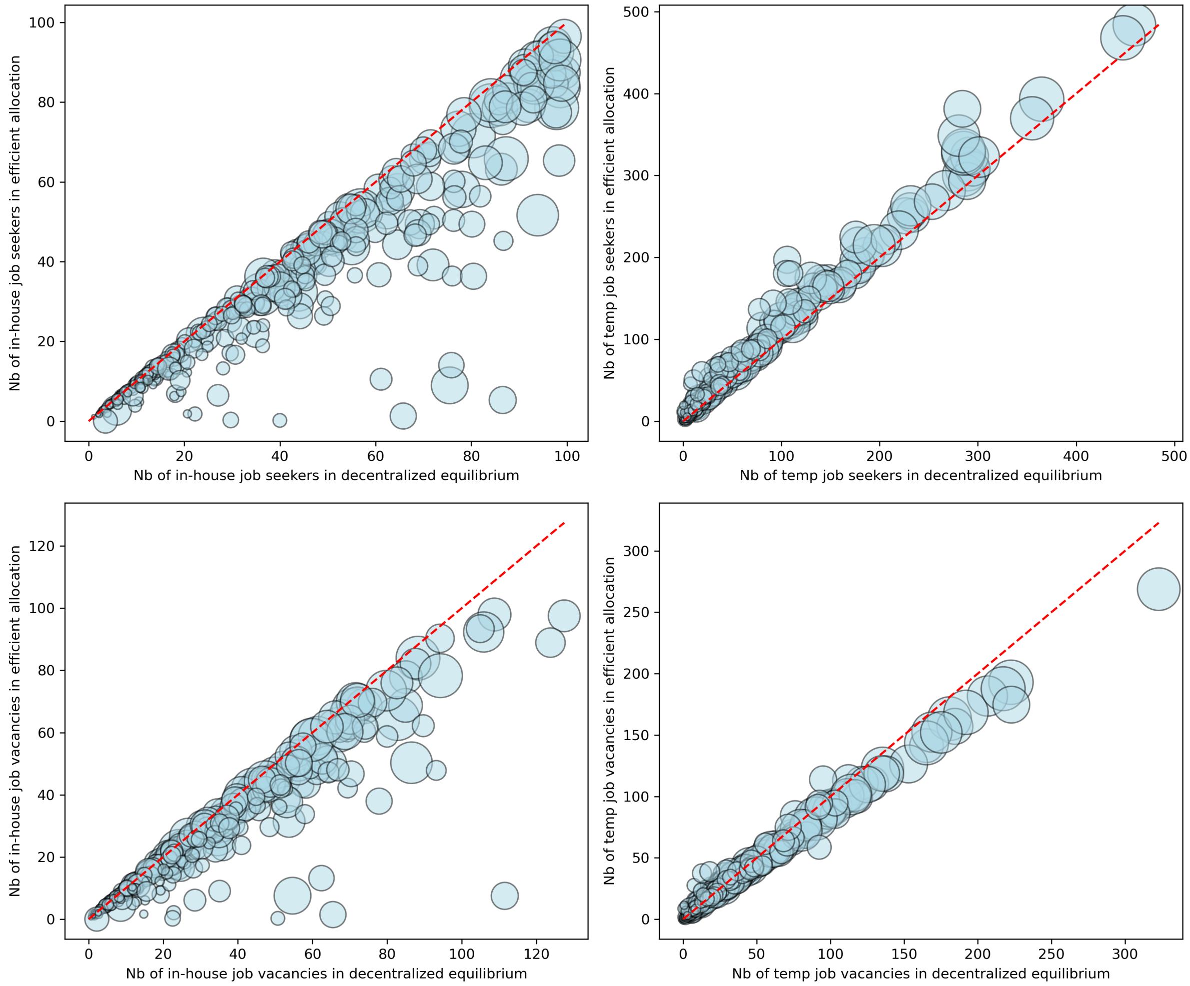
5.3.2 Job seekers and vacancies

In all markets, the constrained efficient allocation results in more unemployed workers seeking temporary jobs and fewer seeking in-house positions compared to the decentralized equilibrium – see top panels of Figure VIII. This disparity stems from the decentralized equilibrium's inefficiency, which arises due to fewer job seekers pursuing temporary positions because of lower wages offered by TWAs. Additionally, there are fewer in-house job vacancies under the constrained efficient allocation – see bottom left panel of Figure VIII. Although more job seekers opt for temporary positions in the constrained efficient allocation, the availability of these vacancies may be lower than in the decentralized equilibrium. This discrepancy is due to firms being incentivized to post too many TWA job vacancies in the decentralized equilibrium, influenced by the relatively low wages paid to TWA workers – see bottom right panel of Figure VIII.

5.3.3 Number of in-house and TWA jobs

The excess of job seekers looking for in-house jobs and of in-house job vacancies in the decentralized equilibrium induces too many in-house jobs – see Figure IX, top left

FIGURE VIII. Job seekers and vacant jobs in constrained efficient allocation and in decentralized equilibrium



Notes: Each dot represents a labor market. The size of the dot is proportional to the size of the market (total number of employed and unemployed workers). The red line corresponds to the 45 degree lines.

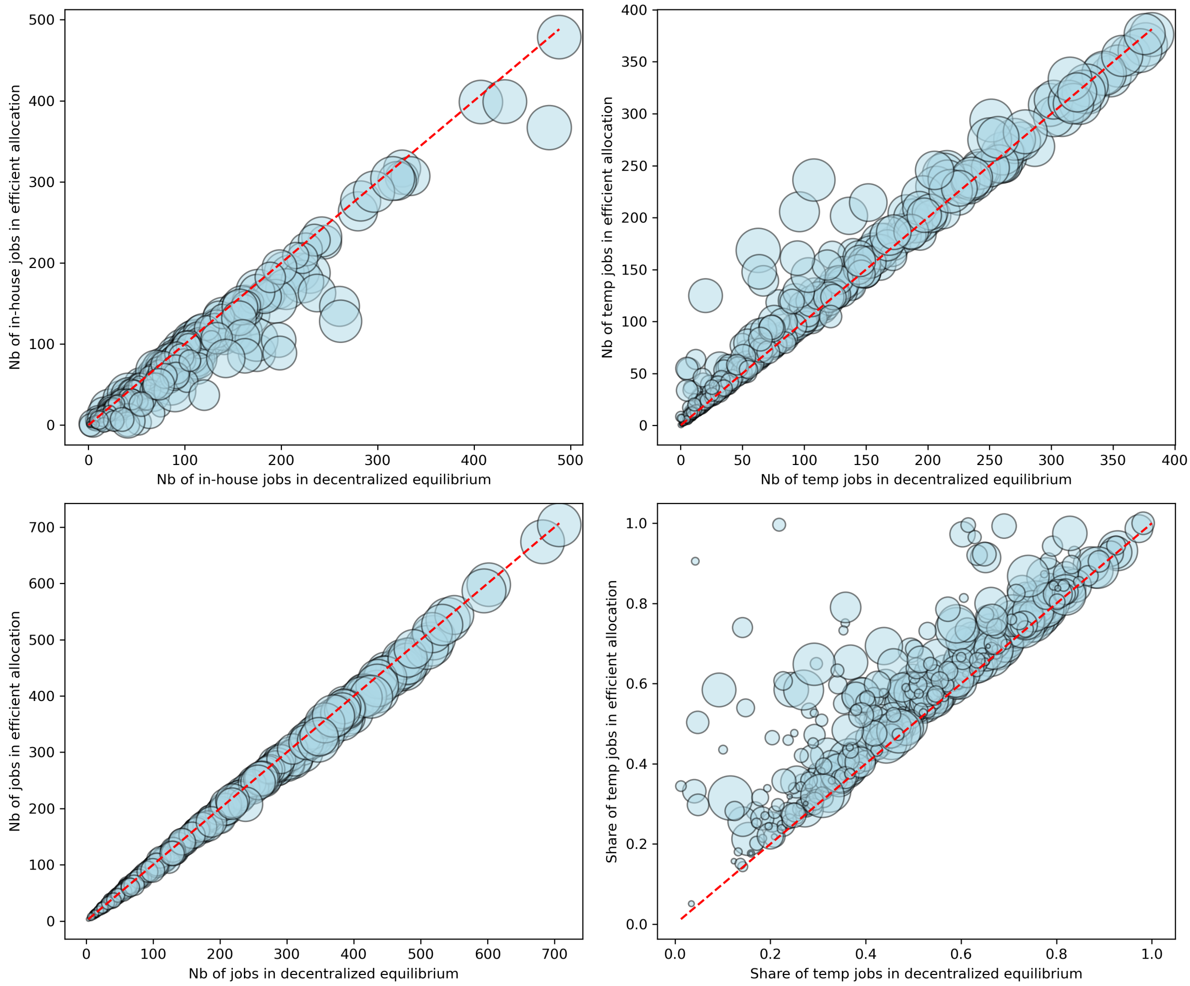
panel. The number of TWA jobs is lower in the decentralized equilibrium in about one fourth of the markets – top right panel – but the share of TWA jobs in the total number of jobs is always lower in the decentralized equilibrium – bottom right panel.

Since TWAs have lower human resource management costs and a more efficient matching technology than user firms, corresponding to a value of α greater than one in most markets – see Table V –, could suggest that the larger share of TWA jobs in the constrained efficient allocation would entail more jobs overall. However, as shown in the bottom left panel of Figure IX, this is not the case in 99% of the markets. The lower wage of TWA workers prompts firms to create too many TWA jobs relative to the number of job seekers, resulting in excessive labor market tightness for TWA jobs in the decentralized equilibrium. Additionally, an excess of job seekers for in-house positions leads to the over-creation of those jobs. Therefore, despite the larger share of TWA jobs in the constrained efficient allocation and the lower human resources management costs and more efficient matching technologies of TWAs, the inefficiency of the decentralized equilibrium does not necessarily result in a lower number of jobs than in the constrained efficient allocation. Actually, the total number of jobs if 4% lower in the constrained efficient allocation.

5.3.4 Wage subsidies and discounted expected incomes

The constrained efficient allocation involves implementing a wage subsidy for TWA workers, averaging about 4.6% of their wage. This subsidy ranges from approximately 0.2% to 15% across different labor markets —- see Figure C.3.2, top right panel. In the constrained efficient allocation, the improved allocation of job seekers and vacancies leads to an average increase of about 0.2% in the discounted expected income of unemployed workers, varying from 0.01% to 1.3% across markets —- top left panel. This very small effect results two opposing effects. On the one hand, there is a significant hike in the discounted expected income of TWA workers, which equals 14.7% on average and ranges from 1.9% to 49.9%. On the other hand, a slight decrease of 0.5% on average in the discounted expected income of in-house workers. These changes in discounted expected income are compensated by changes in the expected duration of unemployment of job seekers looking for TWA jobs, which increases when the subsidy is introduced, and that of those looking for in-house jobs, whose unemployment duration drops.

FIGURE IX. Unemployment and employment in constrained efficient allocation and in decentralized equilibrium



Notes: Each dot represents a labor market. The size of the dot is proportional to the size of the market (total number of employed and unemployed workers). The red line corresponds to the 45 degree lines.

5.4 Eliminating the wage gap

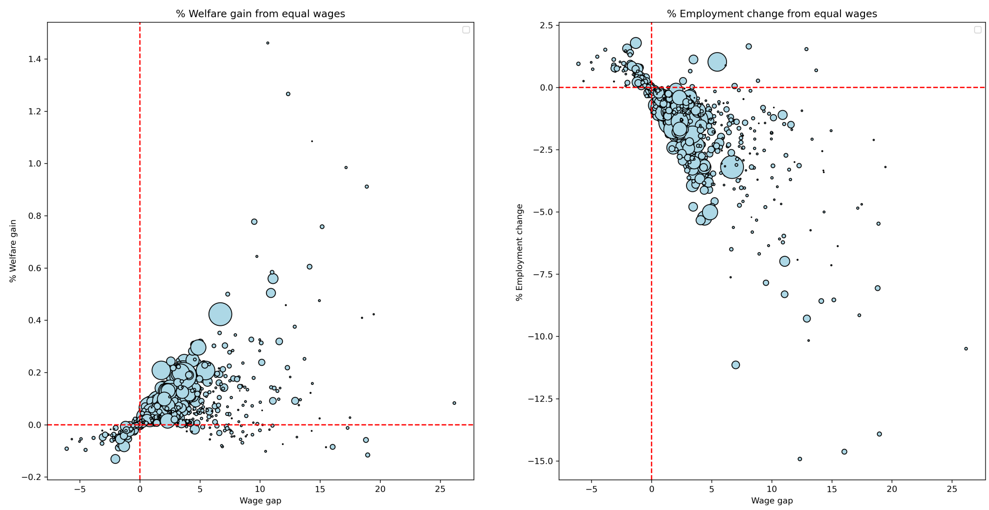
Since the decentralized equilibrium is inefficient and this inefficiency is linked to lower wages for TWA workers, closing the wage gap could enhance welfare. In this scenario, we assume that user firms set wages to attract workers, following the benchmark directed search and matching model, while TWAs passively adopt the same wage as the user firms they supply with workers — see Appendix B.7. The impact of eliminating the wage gap varies across local labor markets, where the wage gap itself plays a crucial role, as illustrated in Figure X.

When the wage gap is negative, the HR management costs of TWAs are necessarily much lower than those of user firms, since the inefficient component of the wage gap always contributes to a positive wage gap. In this case, eliminating the wage gap reduces the wages of TWA workers, prompting job seekers to look for in-house jobs – see Figure C.3.3. In response, the number of in-house vacancies and in-house jobs increases. These changes eliminate jobs with lower HR management costs, leading to a decline in welfare. Conversely, when the wage gap is positive, eliminating it raises the wages of TWA workers, encouraging job seekers to apply more for TWA jobs. In this scenario, the share of TWA jobs increases, which tends to enhance welfare, as this share is too small in the decentralized equilibrium compared to the socially efficient allocation. On aggregate, eliminating the wage gap results in a welfare gain of approximately 0.11% and an employment loss of 1.8%.

5.5 Welfare and employment gains from TWAs

So far, we have examined the consequences of introducing subsidies and taxes aimed at improving the functioning of the labor market in the presence of TWAs and of eliminating the wage gap. A related question concerns the implications of banning or limiting TWA jobs, as excessive use of TWA workers can diminish welfare in the decentralized equilibrium. To address this issue, we compare the decentralized equilibrium scenarios with and without TWAs to evaluate the effects of a complete ban of these intermediaries (Figure XI). Our analysis reveals that TWAs contribute to total welfare, increasing it by an average of 0.6%. Welfare gains vary from -0.1% to 2.4% across labor markets. The impact of TWAs on welfare is negative in three markets where TWAs incur significantly higher human resource management costs compared to user firms, yet possess highly efficient matching technology, facilitating temporary job creation despite the associated costs. TWAs raise the discounted expected income

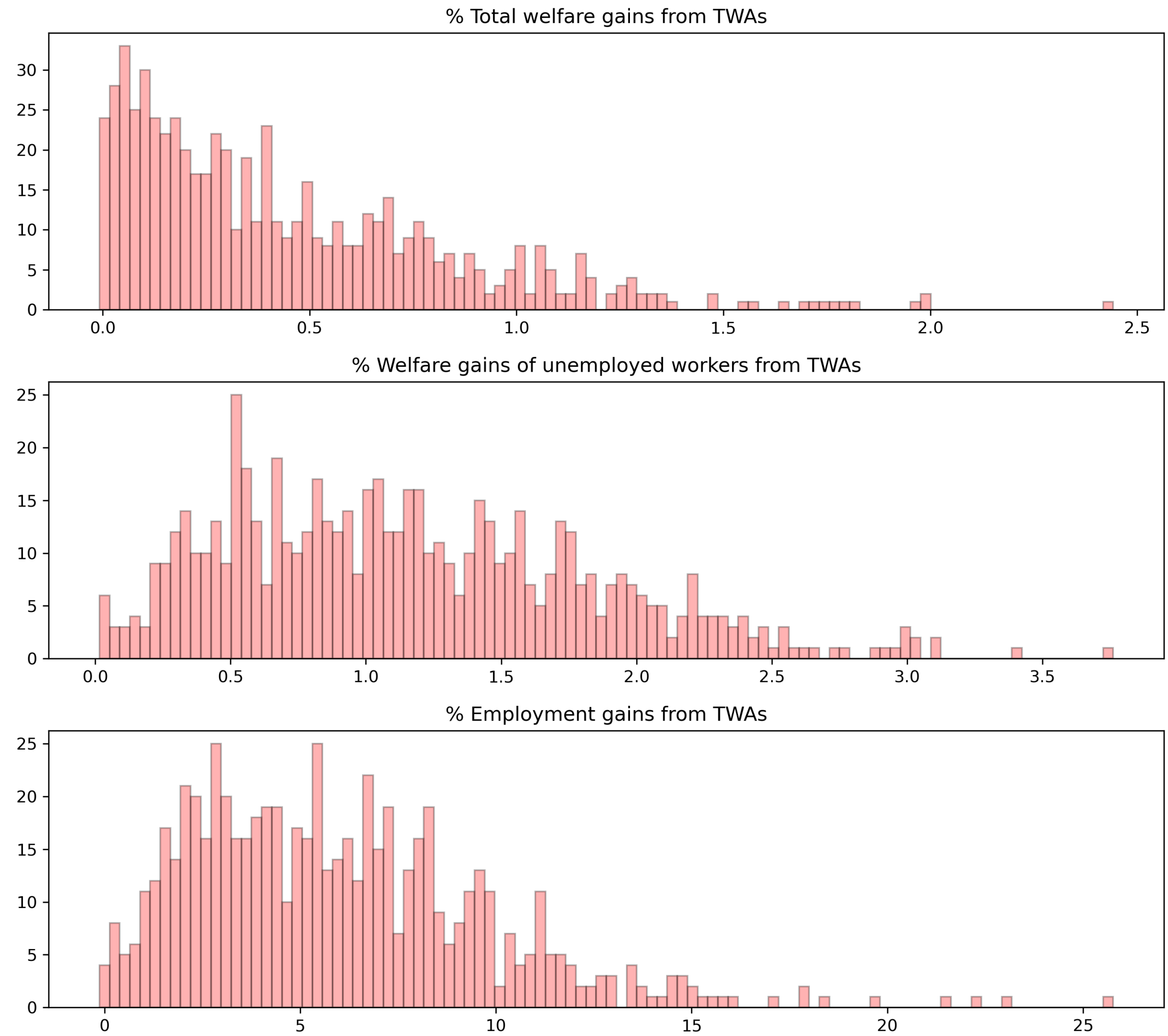
FIGURE X. Welfare and employment gains from eliminating the wage gap



Notes: The figure illustrates the relation, across labor markets, between the wage gap in favor of in-house workers (horizontal axis on both panels) and the welfare (left panel) and employment (right panel) gains associated with eliminating the wage gap. Each dot represents a labor market. The size of the dot is proportional to the size of the market (total number of employed and unemployed workers).

of unemployed workers across all markets, ranging from 0.02% to 3.8%, with an average increase of 1.4%. TWAs also boost employment by 6.4%, though this figure ranges from -0.12% to 25.8%. Notably, their impact on employment is negative in only one market, characterized by low matching efficiency and low human resource management costs for TWAs.

FIGURE XI. Welfare and employment gains from TWAs



Notes: The figure illustrates disparities the welfare gains equal to the discounted total production minus the discounted cost of vacant jobs (top panel), the discounted expected incomes of unemployed workers (middle panel) and employment gains (bottom panel) from the TWAs activity in the decentralized equilibrium across labor markets.

6 Conclusion

This article shows that the wage gap between in-house workers and TWA workers holding identical positions, averaging 2.6% in favor of in-house workers, is nevertheless negative in about a quarter of cases. The analysis of this wage gap shows that it comprises an efficient component, arising from differences in the management costs between TWA workers and in-house employees, and an inefficient component, which stems from the waiting costs incurred by user firms when employing TWA workers.. This cost, which reduces the price paid by user firms to TWAs for employing TWA workers, lowers the wages of TWA workers by an average of 6% according to our estimates. However, the assessment of the impact of this inefficiency on welfare suggests that it leads to a minor loss, typically around 0.1% across all local markets, due to the possibility for unemployed individuals to choose between temp and in-house job offers. Furthermore, despite this inefficiency, the activity of TWAs improves welfare by approximately 1.4% on average, with a positive impact in almost all local markets. Moreover, eliminating the wage gap has a slight negative impact on total welfare and a significant negative effect on employment, which drops by about 6%.

These results are situated within a framework where TWAs enable companies to recruit labor more quickly and to outsource the cost of human resource management. These are two essential components of the TWA activity. However, they overlook the fact that TWAs can improve the quality of matches between jobs and workers. Empirical assessment of this dimension of the TWA activity and its consequences requires the use of an analytical framework that integrates the heterogeneity of workers and jobs, which will need to be addressed in future work to refine our conclusions and assess their robustness.

References

Abowd, John M, Francis Kramarz, and David N Margolis, "High wage workers and high wage firms," *Econometrica*, 1999, *67* (2), 251–333.

Acemoglu, Daron and Robert Shimer, "Holdups and efficiency with search frictions," *International Economic Review*, 1999, *40* (4), 827–849.

Atencio-De-Leon, Andrea, Chen Yeh, and Claudia Macaluso, "Job Dynamics with Staffed Labor," *Richmond Fed mimeo*, 2024.

Autor, David H. and Susan N. Houseman, "Do Temporary-Help Jobs Improve Labor Market Outcomes for Low-Skilled Workers? Evidence from "Work First"," *American Economic Journal: Applied Economics*, July 2010, *2* (3), 96–128.

__, Frank Levy, and Richard J. Murnane, "The skill content of recent technological change: An empirical exploration," *Quarterly Journal of Economics*, 2003, *118* (4), 1279–1333.

Babet, Damien, Olivier Godechot, and Marco G Palladino, "In the Land of AKM: Explaining the Dynamics of Wage Inequality in France," 2022. Mimeo Sciences Po.

Beneito, Pilar, Maria Garcia-Vega, Oscar Vicente-Chirivella, and Guillaume Wilemme, "Robots and firms' labour search: The role of temporary work agencies," Technical Report 2024.

Bergeaud, Antonin, Clément Mazet-Sonilhac, Clément Malgouyres, and Sara Signorelli, "Technological change and domestic outsourcing," *Journal of Labor Economics*, 2024. Forthcoming.

Biglaiser, Gary and Fei Li, "Middlemen: the good, the bad, and the ugly," *The RAND Journal of Economics*, 2018, *49* (1), 3–22.

Bilal, Adrien and Hugo Lhuillier, "Outsourcing, Inequality and Aggregate Output," Working Paper 29348, National Bureau of Economic Research October 2021.

Bonhomme, Stéphane, Thibaut Lamadon, and Elena Manresa, "A distributional framework for matched employer employee data," *Econometrica*, 2019, *87* (3), 699–739.

Carrasco, Raquel, Ismael Gálvez-Iniesta, and Belén Jerez, "Do temporary help agencies help? Employment transitions for low-skilled workers," *Labour Economics*, 2024, p. 102586.

Coşar, A. Kerem, Nezih Guner, and James Tybout, "Firm Dynamics, Job Turnover, and Wage Distributions in an Open Economy," *American Economic Review*, March 2016, *106* (3), 625–63.

Drenik, Andres, Simon Jäger, Pascuel Plotkin, and Benjamin Schoefer, "Paying outsourced labor: Direct evidence from linked temp agency-worker-client data," *The Review of Economics and Statistics*, 2020, pp. 1–28.

Estefan, Alejandro, Roberto Gerhard, Joseph P. Kaboski, Illenin O. Kondo, and Wei Qian, "Outsourcing Policy and Worker Outcomes: Causal Evidence from a Mexican Ban," *Working Paper*, January 2024.

Gautier, Pieter, Bo Hu, and Makoto Watanabe, "Marketmaking Middlemen," *The RAND Journal of Economics*, 2023, *54* (1), 83–103.

Gavazza, Alessandro, Simon Mongey, and Giovanni L. Violante, "Aggregate Recruiting Intensity," *American Economic Review*, August 2018, *108* (8), 2088–2127.

Goldschmidt, Deborah and Johannes F Schmieder, "The rise of domestic outsourcing and the evolution of the German wage structure," *Quarterly Journal of Economics*, 2017, *132* (3), 1165–1217.

Katz, Lawrence F and Alan B Krueger, "The rise and nature of alternative work arrangements in the United States, 1995–2015," *ILR review*, 2019, *72* (2), 382–416.

Kircher, Philipp, "Job Search in the 21St Century," *Journal of the European Economic Association*, 10 2022, *20* (6), 2317–2352.

Kline, Patrick, Raffaele Saggio, and Mikkel Sølvsten, "Leave-out estimation of variance components," *Econometrica*, 2020, *88* (5), 1859–1898.

Manning, Alan, "A Generalised Model of Monopsony," *The Economic Journal*, 2006, *116* (508), 84–100.

Masters, Adrian, "Middlemen in Search Equilibrium," *International Economic Review*, 2007, *48* (1), 343–362.

Merz, Monika and Eran Yashiv, "Labor and the Market Value of the Firm," *American Economic Review*, September 2007, *97* (4), 1419–1431.

Moen, Espen R, "Competitive Search Equilibrium," *Journal of Political Economy*, 1997, *105* (2), 385–411.

Neugart, Michael and Donald Storrie, "The emergence of temporary work agencies," *Oxford Economic Papers*, 2006, *58* (1), 137–156.

OECD, *OECD Employment Outlook 2021* 2021.

Petrongolo, Barbara and Christopher A. Pissarides, "Looking into the Black Box: A Survey of the Matching Function," *Journal of Economic Literature*, June 2001, *39* (2), 390–431.

Pissarides, Christopher A., *Equilibrium Unemployment Theory*, 2nd ed., MIT Press, 2000.

Rubinstein, Ariel and Asher Wolinsky, "Middlemen," *The Quarterly Journal of Economics*, 1987, *102* (3), 581–594.

Spitze, Scott, "The Equilibrium Effects of Domestic Outsourcing," 2022. Presented at SEA 2020, NASMES 2021, and the Federal Reserve Bank of St. Louis.

The Economist, "America's Growing Temporary Workforce," *The Economist*, 2016.

Watanabe, Makoto, "Middlemen: A Directed Search Equilibrium Approach," *The B.E. Journal of Macroeconomics*, 2020, *20* (2), 20190258.

Weill, Pierre-Olivier, "The Search Theory of Over-the-Counter Markets," *Annual Review of Economics*, 2020, *12* (1), 747–773.

Wright, Randall, Philipp Kircher, Benoît Julien, and Veronica Guerrieri, "Directed Search and Competitive Search Equilibrium: A Guided Tour," *Journal of Economic Literature*, March 2021, *59* (1), 90–148.

Yavaş, Abdullah, "Middlemen in Bilateral Search Markets," *Journal of Labor Economics*, 1994, *12* (3), 406–429.