

Cahuc, Pierre; Carcillo, Stéphane; Minea, Andreea; Valfort, Marie-Anne

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When Correspondence Studies Fail to Detect Hiring Discrimination

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Pierre Cahuc
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Pierre Cahuc

Sciences Po, IZA and CEPR

Stéphane Carcillo

OECD, Sciences Po and IZA

Andreea Minea

OECD

Marie-Anne Valfort

Paris School of Economics, Paris 1 Pantheon Sorbonne University and IZA

SEPTEMBER 2019

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

When Correspondence Studies Fail to Detect Hiring Discrimination

Based on a correspondence study conducted in France, we show that fictitious low-skilled applicants in the private sector are half as likely to be called back by the employers when they are of North African rather than French origin. By contrast, the origin of the fictitious applicants does not impact their callback rate in the public sector. We run a survey revealing that recruiters display similarly strong negative discriminatory attitudes towards North Africans in both sectors. We set out a model explaining why differences in discrimination at the stage of invitation for interviews can arise when recruiters display identical discriminatory attitudes in both sectors. The estimation of this model shows that discrimination at the invitation stage is a poor predictor of discrimination at the hiring stage. This suggests that many correspondence studies may fail to detect hiring discrimination and its extent.

JEL Classification: J45, J70, J71

Keywords: discrimination, correspondence studies, public sector

Corresponding author:

Pierre Cahuc

Department of Economics

Sciences Po

28 rue des St Pères

75007 Paris

France

E-mail: pierre.cahuc@sciencespo.fr

1 Introduction

Prejudice and stereotypes are at the core of theories of taste-based (Becker, 1957) and statistical (Phelps, 1972; Arrow, 1973) discrimination. In this paper, we run a correspondence study and set out a situation in which similar discriminatory preferences and beliefs among recruiters belonging to two different sectors result in very different outcomes in terms of discrimination at the stage of invitation for interview: one sector discriminates against minority candidates, whereas the other displays similar callback rates across groups. We set out a model explaining why such a gap in discrimination between the two sectors can arise at the interview stage in the absence of differences in prejudice and stereotype. The estimation of this model shows that discrimination at the invitation stage is a poor predictor of discrimination at the hiring stage. This suggests that many correspondence studies may induce type II errors (i.e. the failure to reject the null hypothesis that there is no discrimination) and should be complemented by additional investigation methods.

To show this, we focus on the chances of a callback of low-educated¹ candidates of French vs. North African² origin, who apply to the private or the public sector. These populations have been selected because second-generation immigrants of North African origin face strong labor market discrimination (Cediey and Forony, 2007; Duguet et al., 2010; Algan et al. 2010). The choice of public and private sectors is motivated by potentially large differences in recruitment behavior. Contrary to private sector recruiters, public sector recruiters are generally weakly constrained by profitability requirements. Our correspondence study shows that individuals of North African origin are strongly discriminated against in the private sector, while they are treated equally in the public sector. The average callback rate of our applicants is low: for 100 sent applications, they receive an average of 4.5 callbacks in the public sector and of 3.3 callbacks in the private sector. Being of North African origin leads to a significant drop in the callback rate when individuals apply to private sector vacancies (by about 2 points) but no penalty is associated with ethnicity in the public sector and this finding is robust to the introduction of a variety of controls related to the type of position applied for, employers' size and

¹Applicants left high school without acquiring a degree.

²Candidates of French origin are defined as French citizens with French-sounding first and last names. Candidates of North African origin are defined as French citizens with North African sounding first and last names. In 2015, North Africans represented one third of second-generation immigrants in France (INSEE, 2017a) and faced an average unemployment rate as high as 32% over a ten year period following the end of their education (INSEE, 2017b). They are thus one of the most sizable ethnic minority groups in France and in comparison to second-generation immigrants of European origin, they have a poorer labor market performance. Henceforth “North African” refers to French citizens of North African background and “French” to French citizens with no recent immigration background.

economic activity. In particular, individuals of French and North African origin are equally treated in both central and local government vacancies, despite the fact that recruitment procedures may differ across these occupations.

To understand what drives this discrimination gap between the two sectors, we run a survey on a sample of public and private sector recruiters representative of those to which our fictitious applications were sent. Survey results indicate that both public and private sector employers express marked discriminatory preferences and beliefs against North African candidates, with only small non-statistically significant differences between the two sectors. Previous studies have shown that North Africans are as under-represented among public sector hires as they are among private sector ones, especially when it comes to low-educated youth (Fougère and Pouget, 2004, Berson, 2016). Additionally, we find that the wage of young unskilled North African males is lower than that of their French compatriots in the private *and* public sectors. These findings are at odds with the absence of differences in callback rates observed at the invitation stage in the public sector between French and North African candidates.

To reconcile these empirical findings we set out a model illustrating a situation in which the absence of invitation discrimination does not automatically result in the absence of hiring discrimination. In this model, recruiters interview workers to get information about their productivity. Interviews are costly. For each hiring, recruiters first choose the number of interviewed applicants and then hire the best one. Labor costs are lower in the public sector insofar as job creation is generally subsidized or determined by a budget allocated to a specific job, which is not paid by the recruiter and which cannot be used for any other purpose if the job is not created. In this framework, public sector employers value job creation more than private employers for whom the value of *marginal* jobs is driven downwards by competition. Accordingly, public employers are inclined to interview more applicants – notably more minority candidates – because the probability to fill jobs increases with the number of interviews. However, following the interviews, only the best applicant is hired. Insofar as interviews do not allow employers to extract all the necessary information on applicants' productivity, the final selection can be influenced by statistical discrimination. We show that a sector wherein expected profits from filled jobs are higher displays *smaller* differences in callback rates between applicants of different origins, but can also display *stronger* hiring discrimination among applicants invited for interviews. This case is precisely the one uncovered by our survey of recruiters, which indicates that employers of the public sector value job creation more than private sector employers. Therefore the absence of invitation

discrimination in the public sector, which likely flows from high valuation of job creation by recruiters in that sector, is compatible with significant hiring discrimination. To gauge the empirical relevance of this mechanism, we estimate the model relying on data from the French Labor Force Survey. We find that hiring discrimination against young North African high school dropouts, conditional on being invited for interview, is stronger in the public than in the private sector for relevant empirical parameter values. More generally, we show that depending on the labor market tightness and on the bargaining power of workers, discrimination at the hiring stage can be either stronger or weaker in the public sector than in the private sector. Overall, these results cast doubt on the ability of correspondence studies to detect hiring discrimination in any circumstance. They suggest that correspondence studies should be complemented with other investigation methods, including when these studies focus only on private sector firms, to the extent that empirical studies in the US and Europe typically find large total factor productivity differences across firms which translate into differences in expected profits from job creation.³

This paper brings contributions to four strands of the literature on discrimination against racial or ethnic minorities.

First, audit and correspondence studies seeking to capture discrimination based on racial or ethnic origin have already been conducted in a wide variety of developed and developing countries. They usually find marked differences in callback rates working against minority groups (see OECD, 2014, Bertrand and Duflo, 2016, Baert, 2018, Neumark, 2018). Strong evidence of discrimination at the stage of invitation for interviews is available in various regional areas (e.g. North America, Latin America, Europe and Oceania), but also for different levels of skills and education, as well as various industries. Heckman and Siegelman (1993), Heckman (1998) and Neumark (2012) have stressed that differences in the variance of unobserved productivity across groups can induce audit and correspondence studies to find spurious evidence of absence of discrimination or of discrimination in either direction.⁴ Our paper adds to these criticisms by showing that discrimination at the invitation stage is a poor predictor of discrimination at the hiring stage.

Second, we provide a theoretical model which highlights the relation between invitation discrimination and hiring discrimination. This relation is difficult to explore empirically insofar as audit studies,

³Bartelsman et al., 2013, Syverson, 2014.

⁴In our case, Heckman's critique would mean that differences in the variance of productivity across groups generate spurious evidence of discrimination at the invitation stage (i.e. differences in the average productivity across groups) in the private sector. This interpretation is however not consistent with the findings from our survey of recruiters and with our estimations of wage gaps between North Africans and ethnic French, which both provide evidence of discrimination against North Africans in the private and in the public sectors.

popular in the early 1990s (Cross et al., 1990, Turner, Fix and Struyk, 1991 and Bendick, Jackson and Reinoso, 1994), are subject to serious methodological criticisms (Heckman, 1998) and extremely expensive, which precludes researchers from generating large samples (Bertrand and Mullainathan, 2004). Jarosh and Pilossoph (2019) show that discrimination in callbacks of unemployed workers depending on their unemployment spell can have limited consequences for hiring decisions. Bartos et al. (2016) show how callback decisions are influenced by labor market features. We complement this approach by providing a two-stage hiring model in which a recruiter can interview several candidates before deciding whom to choose, a feature of the hiring process surprisingly neglected so far by the literature about discrimination. We show that this feature of the recruitment process implies that discriminatory behaviors at the invitation and at the hiring stages can be very different: the estimation of our model indicates that the absence of discrimination at the stage of invitation for interview is compatible with significant discrimination at the hiring stage. In particular, we find that recruiters discriminate less at the invitation stage when the value of job creation is higher because they invite more candidates for interview. We show that the relation between invitation discrimination and hiring discrimination depends on economic variables which influence not only the value of job creation but also the recruitment costs, like the labor market tightness, for instance, whose impact on invitation discrimination has been studied by Baert et al. (2015) and Carlsson et al. (2018).

Third, there is some evidence on the difference in ethnic discrimination between the public and the private sector. In the United-Kingdom (Wood et al., 2009) and Norway (Midtboen, 2012), correspondence studies have shown that discrimination is less frequent in the public than in the private sector. We complement this literature by showing that lower invitation discrimination in the public sector is compatible with stronger discrimination in that sector following the job interview. Additionally, we provide further empirical evidence that hiring discrimination likely prevails in both sectors, reinforcing Fougère and Pouget (2004) and Berson (2016) who find that workers with a migrant background are underrepresented in both the public sector and the private sector in France.

Fourth, our survey on prejudice and stereotypes relates to the literature on social values in the workplace. Lyons et al (2006) investigate whether there are identifiable sectoral differences in prosocial attitudes, work values, and organizational commitment among a sample of highly skilled workers. They find only small differences between public, parapublic and private sectors. Similarly, Tonin et al. (2015) show that public sector workers are significantly more prosocial, but that the gap is almost fully explained by differences in the composition of the workforce across the two sectors, in terms of

workers' education and occupation. Based on revealed rather than self-declared preferences, Buurman et al. (2012) find no significant effect of belonging to the public sector on altruistic behaviors. To the best of our knowledge, our survey is the first to investigate potential differences in discriminatory preferences and beliefs across sectors.⁵ Consistent with previous research, we detect no significant differences between the public and the private sectors.

The paper is organized as follows. Section 2 presents the correspondence study which shows that North African applicants are strongly discriminated against in the private sector but not in the public sector. Based on data from a recruiters' survey, section 3 shows that recruiters in the private and public sectors exhibit similar strong negative attitudes toward North Africans. Section 4 presents a model of recruitment in the private and in the public sectors which shows that the initial absence of differences in callback rates between applicants of different origins is compatible with stronger hiring discrimination against applicants subsequently interviewed in the public sector.

2 Correspondence study

2.1 Experimental design

The experimental setup implements the best practices⁶ set by earlier correspondence studies with respect to (i) creating the fictitious applications, (ii) responding to job ads, and (iii) measuring recruiters' responses (e.g. Bertrand and Mullainathan (2004), Oreopoulos (2011), Kroft et al. (2013), Eriksson and Rooth (2014), Bartos et al. (2016), Deming et al. (2016) or Neumark, Burn and Button (2016), Lahey and Beasley (2018)).

The fictitious applications

Applications are built based on those of real applications, which were consulted online at the website of the public employment agency, *Pôle Emploi*, and which had similar qualification levels to those required for the type of positions to which our fictitious applications are sent. Applicants are identical in every respect save, their ethnicity, which is signaled by their first and last names. They are all French citizens, aged 20 years old. After graduating with a 2 years delay from middle

⁵Note that, from this perspective, we fill a gap in the recent research; see Neumark (2018, p 859) who states that: "But that should be taken as a challenge to come up with more compelling tests, perhaps by supplementing field experiments with survey or interview evidence on what employers know, what information they use, what assumptions they make, etc.".

⁶This experiment was approved by the board of the *Chaire Sécurisation des parcours professionnels* (<http://www.chaire-securisation.fr>), which funded this research, under the scrutiny of *Institut Louis Bachelier* (www.institutlouisbachelier.org).

school, they entered a vocational high school seeking to obtain a professional high school diploma (*baccalauréat professionnel*) either in the area of services for the management of places open to the public (*Services de proximité et vie locale, Spécialité: Gestion des espaces ouverts au public*) or of reception and customer relations (*Accueil-relation clients et usagers*). During high school, they had one summer job as a supermarket employee or a leaflet distributor; this work experience lasted 2 months. They left high school without acquiring a degree and at the time of their application, they already had one year and a half of unemployment. They all have basic English and computer skills, as well as a driving license. Résumés display equal amount of information on each youth’s interests and hobbies, chosen so as to remain very general and similar to those of real applicants. Leisure time activities include some volunteering experience, either for a sports association or for an association that organized activities for children.

The applications are spread out across the 96 department in mainland France. The postal addresses that appear on the CVs and letters of application differ from one département to another. The applicants reside in the downtown quarter of whatever city serves as the administrative capital (*préfecture*) of the département in which the job they are applying for was posted. These addresses were selected via Google Street View to ensure that (i) the street and the number exist; (ii) they coincide with a residential building (not with a vacant lot or an official building). Given that recruiters do not contact job applicants by mail anymore but rely, instead, on the phone and/or on emails, none of the postal addresses was associated with a real mailbox including the first name and last name of the fictitious candidates.

The relevant criteria of differentiation between the fictitious applicants for our purpose is their ethnic origin: French or North African. Individuals with French origin have French-sounding first and last names: *Alexandre Martin*, *Julien Martin* and *Thomas Martin*. North African individuals have North African sounding names: *Mehdi Benslimane*, *Mohammed Benslimane* and *Yassine Benslimane*. First names were chosen based on their frequency among real individuals born in 1995,⁷ which is the year of birth of our fictitious applicants.

Responses to job ads

Applications are made to receptionist, clerk, and cleaning person job offers between January 2 and

⁷Alexandre ranks second, Thomas third and Julien eighth among French first names; Medhi ranks first, Mohamed second and Yassine third among North African first names (Insee - Fichier des prénoms, Edition 2011). Martin is the most frequent French family name in France; Benslimane is a frequent name in Morocco which is clearly identified as a North African name thanks to the prefix “Ben” ; its frequency exceeds that of names such as Macron or Tirole (Insee - Fichier des noms, Edition 2018).

July 29, 2016. These professions have been selected because they provided the largest flows of job offers for our low skilled candidates. The typical application included a résumé and a cover letter, and was accompanied by an email message (Appendix A.10 comprises examples of résumés, cover letters and email messages). Two types of layout were designed for the applicants, in order to ensure that the callback rate was not related to employers’ preferences in terms of layout. For each job offer, a French application and a North African one were sent on consecutive days. The first name of the applicant, the order in which the application would be sent (first or second day following the identification of the offer) and the layout type were selected randomly.⁸

Applications are sent to private market and public non-market job offers.⁹ Our analysis, which is focused exclusively on job offers from the private market (hereafter - *private*) and public non-market (hereafter - *public*) sectors, discards the job offers from the private non-market sector and from the public market sector. To the extent that private non-market and public market sectors combine features that make the financial situation and constraints of agents in these sectors more heterogeneous in comparison to their respective counterparts in the private market and the public non-market sectors, identifying and interpreting discrimination in these two former sectors would be less precise.

Given the low qualification level of the applicants, only cover letters were adapted to the type of occupations individuals applied for. Job offers were sent to all types of employment contracts, whether subsidized or non-subsidized, in the private and public sectors. In order to identify job offers, the website of the French public employment service, *Pôle Emploi*, was given priority, but job offers were also sought out on other websites such as *Indeed*, *Le Bon Coin* or *Météojob*. Applications were sent uniquely by email to the recruiter or to *Pôle Emploi* counselors when employers’ emails were not available. For the type of low-qualified positions sought by our applicants, *Pôle Emploi* counselors only check that the applicant meets the basic requirements of the job offer, such as experience or education level, before transmitting it to the employer who makes the decision to contact the applicant or not.

⁸We check that the type of applicant (North African or French) is not correlated with the layout types to avoid the potential issues of “template bias”, covered in Lahey and Beasley (2018).

⁹The OECD (2007) defines the private sector as comprising private corporations, households and non-profit institutions serving households. The public sector is defined as comprising the general government sector plus all public corporations including the central bank. In line with these definitions, in our paper, the private market sector includes all entities within the private sector that are driven by search-for-profit behavior (e.g. firms) while the private non-market sector includes entities driven by non-profit objectives (e.g. NGOs). The public non-market sector comprises all government-related entities whose activities are based on non-profit rationales (e.g. central and local administration). In contrast, the public market sector includes all public sector entities with profit-generating activities (e.g. state-owned enterprises).

To avoid detection, it was decided to contact recruiters only once (with one French and one North African application) even if the same employer posted several job offers in different administrative areas throughout the experiment period.

Recruiters do not rely on emails alone to contact job applicants. They can also call them on the phone. Therefore, as well as an email address, a cellphone number was created for each of the six first names used in the correspondence study. A message with an artificial voice requested callers to leave a message in the voicemail inbox.

The email and voicemail inboxes of all the applicants were checked daily. Out of respect for the recruiters who did issue an invitation to any applicant, and in order to limit the ethical concerns inherent to a correspondence study, an email message was sent to every employer who contacted an applicant either to request additional information or to invite him to an interview. This message, sent on the day after the recruiter contacted the applicant, thanked the recruiter for his consideration and informed him that the applicant had just accepted a different job offer.

Measure of recruiters responses and sample size

Callbacks may include explicit invitations for an interview as well as requests for further information. Many requests for additional information are close to being invitations for interview, such as when employers ask the applicant to call back over the phone, or inquire whether the applicant is really interested in the job offer since his home address appears to be relatively far from the location of the job within the department. Accordingly, our benchmark definition of callback includes explicit invitations for an interview as well as requests for information. Results based on a more restrictive definition of the callback, which includes only explicit invitations for an interview, are similar. They are presented in Appendix A.1.

In total, 3,188 applications were sent from January 2 to July 29, half of them from French youths and the other half from North Africans, to private market and public non-market job offers. We recorded callbacks to these applications until September 1, 2016. We stopped sending applications when we estimated that the probability of incorrect rejection of the null hypothesis of absence of discrimination in the private sector was clearly below 5% while the probability of incorrect rejection of the null hypothesis of absence of discrimination in the public sector was still above 80%, for samples of identical size in both sectors.¹⁰

¹⁰To compute the p-values with samples of identical size for the private and the public sector, we proceeded to bootstrap with sample size corresponding to the smallest sample, which is that of the public sector. The strategy consisting of checking the statistical significance of the results during the correspondence study is more appropriate than proceeding

2.2 Results

Table 1 reports the mean callback rates of our fictitious applicants. As explained above, callbacks include both explicit invitations to an interview as well as requests for further information. This average callback rate is notably low: our applicants need to send 100 résumés in order to receive around 4 positive replies. The limited qualifications of our applicants, who never finished high school and barely have any work experience, combined with unfavorable labor market conditions in France (in 2016, the youth unemployment rate was 24.3 %) are most likely responsible for this extremely low response rate. Nevertheless, French applicants obtain higher than average returns to their applications: the mean callback rate is 4.5 percent for individuals with French origin. When it comes to North Africans, their performances on the labor market appear to be worse, with a mean response rate of only 3.3 percent, meaning that the callback rate of French individuals is one third higher than that of North Africans. It is striking that this difference results entirely from the private sector insofar as there is no significant statistical difference between French and North African callbacks in the public sector (the difference between callback rates is equal to 0.001 with p-value= 0.90 for the null hypothesis of no difference) while the callback rate of French individuals is twice as high as that of North Africans in the private sector (the difference between callback rates is equal to 0.02 with p-value= 0.016 for the null hypothesis of no difference). Moreover, job applications to the public sector are associated with callback rates 63% higher than those of the private sector.

In order to examine more precisely the effect of belonging to the minority group on the probability of callback, the following linear probability model is estimated:

$$y_{ij} = \alpha + \beta \mathbf{1}(i) + \gamma_j x_j + \varepsilon_{ij}$$

where y_{ij} is an indicator variable equal to one if application i receives a callback from job j . $\mathbf{1}(i)$ is an indicator variable equal to one if the applicant is of North African origin. x_j is a vector of characteristics of job j , which can include the profession, the type of contract (open-ended or fixed-term), the size of the firm, *département* and month fixed effects. ε_{ij} is a residual term. Standard errors are clustered at the job level.

Results in Table 2 confirm the presence of discrimination in hiring of North African candidates. Columns (1) and (2) report that the callback rate of North Africans is 1.1 percentage point lower than that of French applicants, which is equal to 4.5 %. This difference is significant at the 1% level.

ex-ante insofar as most applications are called back in less than one week which implies that it is possible to almost instantly estimate callback rates with a good level of significance.

Table 1: Descriptive Statistics

<i>Callback Rate Descriptive Statistics</i>		
Dependent variable: Received a callback	Mean	Standard error
<i>Résumé attributes</i>		
All applicants	.039	.003
French	.045	.005
North African	.033	.004
French applying to private sector job	.040	.007
North African applying to private sector job	.020	.005
French applying to public sector job	.050	.008
North African applying to public sector job	.049	.005
<i>Job characteristics</i>		
Cleaning person position	.044	.005
Clerk position	.022	.005
Receptionist position	.050	.008
Job in the public sector	.049	.006
Job in the private sector	.030	.004
Subsidized job in the private sector	.014	.008
Non-subsidized job in the private sector	.032	.005
<i>Employer and Job Descriptive Statistics</i>		
Private	.536	
Public	.464	
Receptionist position	.237	
Clerk position	.291	
Cleaning person position	.472	
Subsidized contract	.277	
Non-subsidized contract	.723	
Open-ended contract	.309	
Fixed-term contract	.691	

Note: The first column of the upper part of the table reports the mean value of the primary dependent variable which is equal to one if the résumé received a callback from the employer. The second column reports the standard error of the mean of the variable. The bottom part of the table reports the share of market and non-market vacant jobs, the required occupation and the types of contract of vacant jobs.

Table 2: Discrimination of North African Candidates by Type of Public Jobs

	(1)	(2)	(3)	(4)	(5)	(6)
	All sectors	All sectors	Private	Public	Private	Public
North African candidate	-.011*** .005	-.011*** .005	-.020*** .006	-.002 .009	-.020*** .006	-.001 .009
Department fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Month fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Additional controls	<i>no</i>	<i>yes</i>	<i>no</i>	<i>no</i>	<i>yes</i>	<i>yes</i>
N	3,180	3,180	1,704	1,476	1,704	1,476
Adj-R ²	.043	.058	.098	.084	.109	.112

Note: The dependent variable is a dummy variable equal to one if the application gets a callback. Estimations in columns 2, 5 and 6 also include as controls: the size of the firm, the NACE code for the economic activity of the firm, the type of contract offered (fixed-term or open-ended) and the occupation applied for (cleaning person, clerk or receptionist). Proceeding to estimations with bootstrapped samples of identical size for the public and the private sector yields similar results. Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

Ethnicity thus has a statistically significant and sizeable effect on the employment prospects of young minority applicants in France. The other columns of Table 2 confirm that discrimination is observed in the private sector only. Having a North African sounding name decreases the callback rate by 2 percentage points in the private sector (column 3), while no significant difference appears between French and North African candidates when they apply to public sector job offers (column 4). Results are robust to the introduction of a variety of controls (columns 5 and 6), including the type of position applied for, the sector of economic activity as well as the size of the firm. When all controls are included, the significance level of the difference is equal to 0.1 % in the private sector while it is equal to 88% in the public sector. It is clear then that there is strong evidence of invitation discrimination in the private sector, while there is no apparent invitation discrimination in the public sector.

2.3 Robustness checks

In the public sector, the lack of any discriminatory behavior at the invitation for interview stage may result from the specificities of the recruitment process, which gives less flexibility to the central administration in hiring decisions than to the local one. Hence, results could be driven by the behavior of central government employers while local ones would be more likely to discriminate since hiring rules are less strict for them. In a similar vein, the lack of any discrimination in the public sector could stem from the political orientation of employers in this sector, whose political views or party allegiances may induce them to discriminate less. In what follows, we test these two hypotheses and

provide evidence that the absence of discrimination in the public sector is neither the result of more stringent hiring rules in the central government nor of the political views of recruiters.

2.3.1 Recruitment process in the public sector

Our correspondence study finds that North Africans are discriminated against in the private sector and not in the public one. The lack of any discrimination against minority candidates in the public sector may also originate in the specificities of the recruitment process in this sector. Budgetary rules in France leave more flexibility in hiring decisions to local administrations in comparison to central ones; hence, local administrations are likely to have more freedom with respect to the choice of their candidates and thus, be more likely to discriminate than the central government. We therefore examine whether in local administrations discrimination against North Africans becomes statistically significant.¹¹ Table 3 reports the main results of this analysis, taking a more extensive and a more restricted definition of local administrations. Irrespective of the definition used, no discriminatory behavior can be observed when focusing only on local administrations.¹² On the contrary, discrimination at the invitation stage is still present in the private sector when the estimation is run on a bootstrapped sample of similar size to that of local administration employers.¹³ The lack of discrimination in the public sector, observed in our correspondence study, does not seem to be dependent upon the degree of recruitment control in the public sector.

2.3.2 Political orientation of public employers

An additional concern related to our finding of no discrimination in the public sector is the extent to which recruitment decisions are driven by politically-oriented behaviors. If recruiters in the public sector belong to parties or ideologies that preach openness to foreigners or immigrants, then coherently with the political discourse of their organization they may be more “generous” with respect to the hiring of non-ethnically French individuals. To check for this alternative rationale that may be driving our findings, we examine whether discriminatory behaviors in the public sector vary based on the vote share in local elections of the French far-right party *Front National* (FN). We use data

¹¹Our sample comprises only 56 observations for central government employers. Hence, no estimation is run on this sample.

¹²Results for the extensive definition are robust to the removal of local public entities where recruiters may be under greater scrutiny (schools, universities and hospitals).

¹³The table reports only the estimation run on a private sector sample similar in size to the one based on the restrictive definition of the local administration. The estimation run on a larger sample, similar to that of the extensive definition, delivers similar results.

Table 3: Discrimination of North African Candidates by Sector

	(1)	(2)	(3)	(4)	(5)
	Local	Local	Local	Local	Private
	administration	administration	administration	administration	sector
	(extensive)	(extensive)	(restrictive)	(restrictive)	(bootstrap)
North African candidate	-.011	-.011	-.011	-.011	-.020***
	.009	.009	.014	.014	.008
Department fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Month fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Additional controls	<i>no</i>	<i>yes</i>	<i>no</i>	<i>yes</i>	<i>yes</i>
Constant (ref: French)	.021	-.092**	.005	-.013	.027
	.014	.046	.029	.066	.100
N	1,278	1,278	508	508	508
Adj-R ²	.105	.131	.178	.228	.109

Note: The dependent variable is a dummy variable equal to one if the application gets a callback. The extensive definition of the local administration includes all public non-market entities that are not considered to be part of the central government, where the central government includes all ministries and devolved State services. The restrictive definition of the local administration is based on the official nomenclature of juridical categories and includes only territorial authorities: municipalities, departments, overseas collectivities and regions. Estimation in column 5 is based on a bootstrap with 5000 replications and a sample size of 508, similar to that of the restrictive definition of the local administration. All columns include department and month fixed effects. Estimations in columns 2, 4 and 5 also include as controls: the size of the firm, the NACE code for the economic activity of the firm, the type of contract offered (fixed-term or open-ended) and the occupation applied for (cleaning person, clerk or receptionist). Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

Table 4: Political orientation and discrimination in the public sector

	(1)	(2)	(3)	(4)	(5)	(6)
	All public sector	Q1	Q2	Q3	Q4	Q5
North African candidate	-.001	-.010 .031	-.001 .030	.005 .022	.000 .026	-.006 .016
Controls	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Constant (ref: French)	.091**	.019 .115	.037 .144	-.105 .133	.331* .173	.108 .076
Far-right (FN) vote share						
Mean	23.70	10.54	18.38	23.29	28.69	37.68
Min	0.00	0.00	16.35	20.51	25.72	32.05
Max	61.4	16.34	20.49	25.62	31.99	61.4
N	1,476	228	246	282	308	310
Adj-R ²	.112	.418	.419	.370	.325	.243

Note: The dependent variable is a dummy variable equal to 1 if the application gets a callback. QX stands for the number of the quintile of the share of votes received by the FN in the commune where the job offer was posted at the departmental elections in 2015. Mean, Min and Max denote the mean, the minimum and the maximum value of the quintile of the FN vote share at the commune level respectively. The total number of observations is slightly lower compared with the previous tables because the commune was not identified for some job offers. The regressions include department and month fixed effects. Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

from the departmental elections of 2015, since these are the most recent local elections prior to our correspondence study and thus enable us to investigate whether in communes where the FN had received smaller vote shares in the elections, we also observed less discrimination against North African candidates.

Table 4 displays the main results of this analysis.¹⁴ No significant discriminatory behavior is present in the public sector in areas where the FN obtained higher voting shares, thus confirming the lack of a relationship between the prevailing political ideology and the discriminatory attitudes exhibited by recruiters in our correspondence study. Whether we look at communes where the FN obtained less than 11% of vote shares or at communes where more than 38% of votes went to the far-right, North African candidates do not appear to be penalized by recruiters in the public sector. Thus the political orientation of employers in the public sector does not seem to play a role in explaining the results of our correspondence study.

¹⁴When no FN list was present in the elections in a given department, we consider this as a nul vote for the FN. Our results are robust to a definition where we consider the absence of a FN list as missing instead of a nul.

3 Prejudice and stereotypes among recruiters in the private and public sectors

Our correspondence study finds that there is a strong discrimination against North African applicants at the stage of invitation for interview in the private sector but no discrimination in the public sector. To analyze the cause of this difference, we run a survey¹⁵ about the prejudice and stereotypes potentially held by recruiters in both sectors. The survey is conducted among 1,054 recruiters from the private and the public sectors. As in the previous section we restrict the sample to recruiters from the private market and public non-market sectors.¹⁶

The survey investigates whether recruiters from the private and public sectors have different attitudes towards North Africans relative to French applicants which may be at the origin of the discrimination gap observed in our correspondence study between the private and the public sectors. Survey items are designed to detect the two discrimination types or rationales put forward by the economics literature, namely taste-based discrimination – that flows from prejudice (Becker, 1957) – and statistical discrimination – that flows from stereotypes (Phelps, 1972; Arrow, 1973). These items are similar to those found in other national or cross-country values surveys.¹⁷ Items that are in line with taste-based discrimination assess whether the respondent would mind if a North African were appointed as his/her boss or married a close relative and if the respondent believes that the presence in France of North Africans makes the country a worse place to live. Items that are in line with statistical discrimination focus on whether the respondent believes a new hire will be more easily accepted by colleagues or clients if he/she is French rather than North African, whether at similar diploma and experience levels a North African works as hard or as efficiently as a French person (beliefs about the first moment of productivity), and finally whether the respondent believes that there is more uncertainty about a North African’s ability to work hard or efficiently than about that of a French person (beliefs about the second moment of productivity).

Since the survey concerned possibly sensitive issues about discriminatory attitudes, we paid par-

¹⁵Detailed information about the survey is provided in Appendix A.2. This survey was conducted in collaboration with the polling organization *Viavoice* (www.institut-viavoice.com) after the approval of the board of the *Chaire Sécurisation des parcours professionnels* (<http://www.chaire-securisation.fr>), which funded this research, under the scrutiny of *Institut Louis Bachelier*, (www.institutlouisbachelier.org).

¹⁶Henceforth, we use information about 804 employers because our analysis excludes the market public sector and the non-market private sector. See footnote 9.

¹⁷Some of these surveys are: the European Working Conditions Survey, the World Values Survey, the European Social Survey, etc.

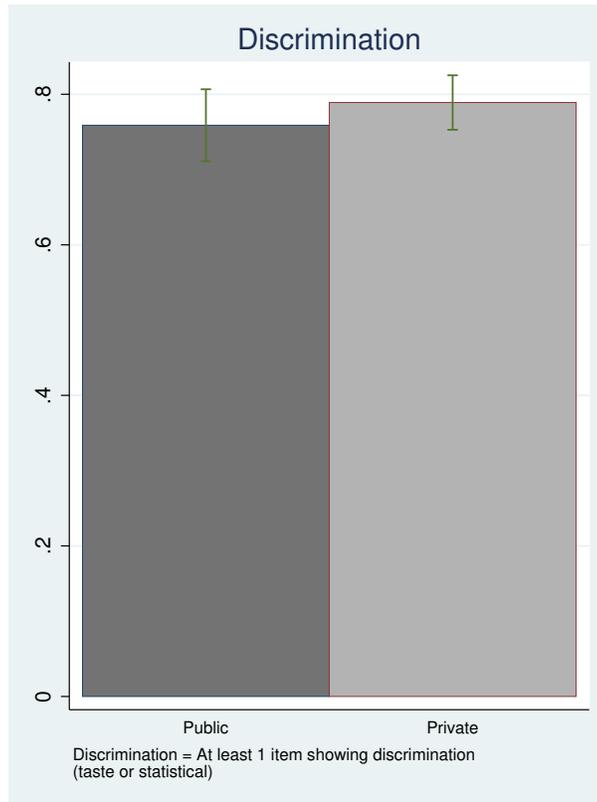


Figure 1: Discriminatory beliefs of recruiters in the private and public sectors

Note: this figure reports the average value of an index of discriminatory beliefs by sector. The index is an indicator variable equal to one if the respondent displays discriminatory beliefs for at least one item among all the items measuring taste-based or statistical discrimination listed in Appendix A.2. For each item, it is considered that an individual displays discriminatory beliefs if she does not strongly disagree with discriminatory statements or does not strongly agree with non-discriminatory statements.

ticular attention to the survey design and to possible non-response bias (see Appendix A.2 for more detail). In particular, the respondents had the possibility to provide no answer to each question. The non-response rate of employers participating in the survey to questions about discriminatory beliefs was very low, below 3% and does not show statistically significant difference between the private and public sectors.¹⁸

Figure 1 reports the preferences for discrimination, whether taste-based or statistical, of surveyed attitudes in the private and the public sectors. Recruiters are considered to have discriminatory

¹⁸This small non-response rate together with the absence of any statistically significant difference between the private and the public sectors implies that our results are robust to imputation methods to correct for missing not at random (MNRA) data.

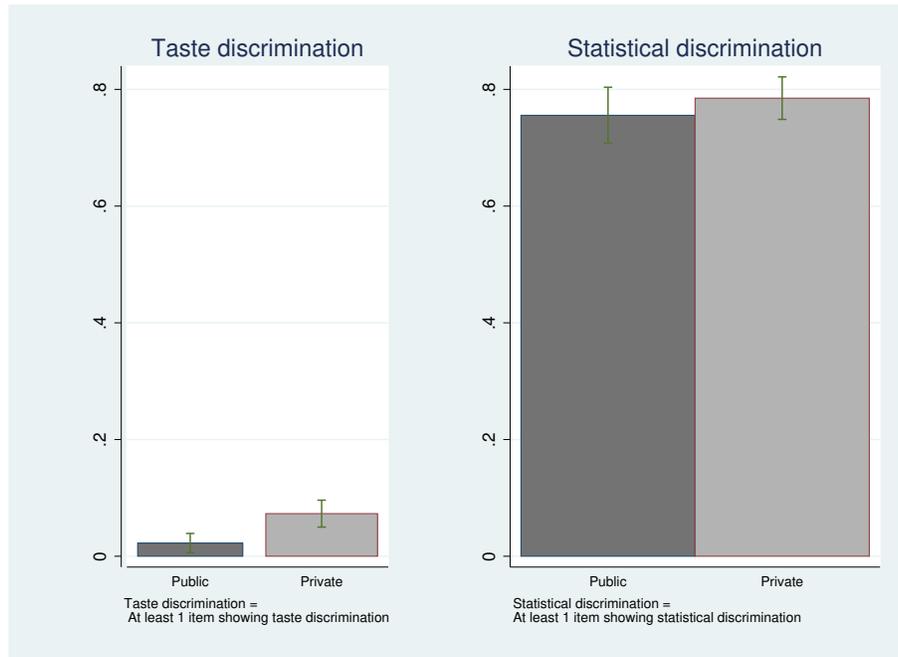


Figure 2: Taste-based and statistically-based discriminatory attitudes of recruiters in the private and public sectors

Note: this figure reports the average value of an index of taste-based (left panel) and statistical (right panel) discriminatory attitudes by sector. The index is an indicator variable equal to one if the respondent displays discriminatory attitudes for at least one item among all the items measuring either taste-based (left panel) or statistical (right panel) discriminatory attitudes listed in Appendix A.2. For each item, it is considered that an individual displays discriminatory beliefs if she does not strongly disagree with discriminatory statements or does not strongly agree with non-discriminatory statements.

attitudes when they display a bias against French citizens of North African background for at least one item probing discriminatory attitudes.¹⁹ It is striking that discriminatory beliefs are widespread in both sectors. More than 75% of recruiters express preferences for discrimination, and no statistically significant difference emerges between private and public employers in this respect. Next, Figure 2 examines recruiters' attitudes by discrimination type. Statistical discrimination appears to prevail among employers from both the private and public sectors, whereas only a very small minority of recruiters exhibit taste-based discrimination, which is slightly more prevalent among private sector employers.

Table 5 shows that differences in attitudes toward North Africans are very small and never statistically significant between the private and public sectors when one controls for the age, education

¹⁹Detailed information about the responses for each item are provided in Appendix A.2.

Table 5: Private sector recruiters, discrimination and productivity requirements

	(1)	(2)	(3)
	Discriminate by taste	Discriminate statistically	Discriminate (taste/statistical)
Recruiter from the private sector	.032	-.060	-.066
Controls	<i>yes</i>	<i>yes</i>	<i>yes</i>
Constant (ref: recruiter from the public sector)	.004 .108	.941*** .168	.934*** .161
N	804	804	804
Adj-R ²	.072	.067	.065

Note: In the first column, the dependent variable is a dummy equal to one if the recruiter discriminates by taste. A recruiter discriminates by taste when she agrees with at least one survey statement that reflects taste-based discrimination, namely whether she minds that a North African is appointed as her boss or becomes the spouse of a parent, or whether she believes that North-Africans make France a worse place to live in. In the second column, the dependent variable is a dummy equal to one if the recruiter discriminates statistically. A recruiter discriminates statistically when she agrees with at least one survey statement that reflects statistical discrimination, namely whether she believes that a new hire will be more easily accepted by colleagues or clients if she is French rather than North African, whether at similar diploma and experience levels a North African does not work as hard or as efficiently as a French person and whether there is more uncertainty about a North African's ability to work hard or efficiently. In the third column, the dependent variable is a dummy equal to one if the recruiter discriminates either by taste or statistically.

Controls include the gender, age, education level and origin of the recruiter and the size of the recruiting firm. The origin of the recruiter is defined based on the recruiter's birth place as well as his/her parents' birth place, with individuals born in France from parents who were equally born in France being the reference category. All columns include department and month fixed effects. Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

level, origin and gender of the recruiter as well the size of the firm and department and month fixed effects. Table 5 reports results from a linear probability model that controls for such characteristics to estimate the difference in discriminatory beliefs between employers in the private and public sectors. The dependent variables in the three columns of Table 5 are represented by the taste-based, statistically-based and overall discrimination indicators based on our survey of recruiters. No statistically significant difference emerges between private and public sector recruiters when it comes to discriminatory attitudes, whether these attitudes are taste-based or statistically-based.

All in all, our survey shows that discriminatory beliefs against North Africans are widespread among employers in the private and the public sectors, with no difference across these sectors. To check the external validity of our survey results, we analyzed discriminatory attitudes in the French private and public sectors relying on cross-country values surveys. We find no significant difference in discriminatory attitudes towards minority ethnic groups between the public and the private sectors

(see Appendix A.3).

Hence, the absence of discrimination at the invitation stage does not flow from the absence of discriminatory attitudes on the part of recruiters in the public sector. This result suggests that the absence of discrimination at the invitation stage in the public sector may be compatible with discrimination at other stages. In fact, discrimination in the public sector is likely insofar as North Africans are significantly underrepresented compared with French employees in the public sector (Fougère and Pouget, 2004, Berson, 2016). Moreover, data from the Labor Force Survey that we use to estimate the model of the next section do show that the wage of young unskilled North African males is lower than that of their French compatriots in the private *and* public sectors.²⁰ The absence of discrimination at the invitation stage, highlighted by our correspondence study, may thus not necessarily lead to an absence of discrimination at the hiring stage. The following section explains how such a situation may arise.

4 The Model

This section presents a model of callback and hiring decisions for different types of applicants on different types of jobs. We consider a one period economy. There are two types of workers, North African and French, who can be employed in two sectors: a private sector and a public sector. We focus on the behavior of recruiters, notably their callback and hiring decisions, assuming they get an exogenous number of job applications from North Africans and French youths. Recruiters are risk neutral. Each recruiter has a single vacant job that she tries to fill.

The timing of decisions is as follows. 1/ Employers receive job applications. 2/ Employers pay a fixed cost to screen and choose the applicants invited for job interviews. They observe the origin of applicants indicated in the résumés at zero marginal cost, but inviting an applicant induces sunk costs c associated with the planning of the interview. Employers do not continue inviting applicants for interviews once they have started the interviews. This assumption can be justified by the fixed costs of screening résumés. This implies a two-stage hiring process in which recruiters select résumés in the first stage and proceed to interviews in the second stage. This two-stage process²¹ is consistent

²⁰See Table A7 in Appendix A.8.

²¹As will be clear below, considering a two-stage hiring process in which recruiters invite candidates in the first stage and then proceed to interviews in the second stage is essential to demonstrate that discrimination at the hiring stage can co-exist with no discrimination at the invitation stage. In a hiring process where recruiters sequentially invite and interview candidates one by one, candidates of the preferred group are invited and interviewed first, and other candidates can be interviewed and recruited only if no candidate of the preferred group has been hired. Accordingly, it is not possible that candidates belonging to different groups have the same probability to be invited for interview while

with the hiring process described by human resources instructor’s manuals²² and available empirical evidence.²³ 3/ On each job, employers proceed to the interviews and decide to hire either one or zero applicant. The match-specific output of each job applicant is the sum of two independent random variables: $\zeta + \varepsilon$; the realization of ε is observed at the end of the interview whereas the realization of ζ is observed at the end of the period, once the worker has been hired and has worked. In the absence of interview, employers discover the value of ε once the workers have been hired and have worked. 4/ Hired workers work and generate gains for employers.

At the stage of the hiring decision, the relevant variable concerning the output of type- i , $i = a, f$ (“ a ” for African and “ f ” for French) workers is $y_i = E(\zeta_i) + \varepsilon_i$, where E is the expectation operator. At the stage where employers screen résumés, the realization of ε_i is unknown and the expected output is $E(y_i) = E(E(\zeta_i) + \varepsilon_i) = E(\zeta_i + \varepsilon_i)$.

The *expected* output that will be discovered after the interview stage, $y_i = E(\zeta_i) + \varepsilon_i$, is a random variable because the realization of the random variable ε_i is not known at the stage where résumés are screened. Let us assume that y_i belongs to the interval $[0, y_{\text{sup}}]$ with absolutely continuous cumulative distribution function with respect to Lebesgue measure, denoted by $G^i(y)$, assumed to be identical in each sector. It is assumed that $G^f(y)$ first order stochastically dominates $G^a(y)$, i.e. $G^f(y) < G^a(y)$ for all $y \in [0, y_{\text{sup}}]$.

The difference between the productivity of French and North African workers before and after the interview can arise for several reasons, including the limited ability of managers to interact effectively with North African workers, as stressed by Glover et al. (2017) in their study of discrimination of North African workers in France. In this context, North Africans can face statistical discrimination as employers base their decision to invite applicants for job interviews and to hire them on their group identity, which correlates with productivity. Hence, atypical individuals from the disadvantaged group can suffer discrimination.

The optimal decisions are solved backward. Accordingly, we start by presenting the hiring decisions

they have different probabilities to be hired.

²²See, for instance, Gusdorf (2008): “Selection testing will trim your recruitment pool, but you’ll likely need to narrow your list of candidates even further to establish a reasonable number for interviewing. The nature of the job and how much time you can afford to allot to the interview process will determine how many applicants you choose to interview.”

²³According to the “Job Offer and Recruitment Survey” (OFER) survey, for low skilled white collars in 2016, 99% of recruiters of the private sector have interviewed more than one candidate before taking the recruitment decision. The OFER 2016 survey is a mandatory national-level survey representative of all firms providing information about recruitments. It notably records the number of applications received per job vacancy collected through various channels and documents the selection process. There are 1,411 observations for the recruitment of low skilled white collars in 2016. This survey is available on request at <http://quetelet.progedo.fr/>.

before analyzing the callback decisions.

The hiring strategy

It is assumed that the value of a filled job to the employer in the private sector is equal to its profits. At the stage of the hiring decision, the expected profits are equal to the expected output y minus the wage. The value of the job to the worker is equal to the wage. The wage, which is negotiated, allows the worker to get the share $\beta \in [0, 1]$ of the job surplus, equal to $y - z$ at the hiring stage, where z is the income of unemployed workers. The negotiated wage cannot be smaller than the minimum wage, denoted by w_{\min} . Therefore, the wage of workers whose expected output is equal to y is

$$w(y) = \begin{cases} z + \beta(y - z) & \text{if } y > \bar{y} \\ w_{\min} & \text{if } y \in [w_{\min}, \bar{y}], \end{cases} \quad (1)$$

where $\bar{y} = \frac{w_{\min} - (1 - \beta)z}{\beta}$, and the value of the job is

$$J_r(y) = \begin{cases} (1 - \beta)(y - z) & \text{if } y > \bar{y} \\ y - w_{\min} & \text{if } y \in [R_r, \bar{y}] \end{cases} \quad (2)$$

where

$$R_r = w_{\min}$$

is the reservation productivity.

In the public sector wages are set by collective agreements, which tend to align wages of the public sector to those of the private sector. It is shown, in Appendix A.8, that French and North African workers get the same wage, conditional on their level of education, experience and family situation, whether they work in the public or in the private sector. Accordingly, we assume that workers get the same wage $w(y)$ in both sectors. However, the labor cost is smaller in the public sector because jobs are subsidized. Let us denote by $\sigma \in [0, 1]$ the share of wage which is subsidized. The value of a job with productivity y in the public sector is equal to

$$J_u(y) = \begin{cases} y - (1 - \sigma)w(y) & \text{if } y > \bar{y} \\ y - (1 - \sigma)w_{\min} & \text{if } y \in [R_u, \bar{y}] \end{cases} \quad (3)$$

where

$$R_u = (1 - \sigma)w_{\min}$$

is the reservation productivity.

In both sectors, recruiters choose, once interviews have been conducted, the employable applicant able to produce the highest expected output y . Before making this choice, they have to select the applicants invited for interview.

Recall behavior in the private sector and in the public sector

For the sake of simplicity, the sunk cost per interview, denoted by c , is the only cost of interview. As explained above, this cost is paid at the invitation stage, because it is associated with the planning of the interview. This implies that all applicants invited for interview after the selection of résumés are interviewed. Once all interviews have taken place, the best applicant is chosen if his expected output is above the reservation productivity. Let us consider a recruiter with n^a North African applicants and n^f French applicants. The problem of the recruiter is to select the applicants she wants to interview knowing that she will hire the best candidate after having proceeded to all interviews, provided that he is suitable for the job. In this context, the recruiter compares, for each applicant, the expected profits from the interview with its cost c . The first-order stochastic dominance of the productivity of French workers with respect to that of North Africans implies the following optimal selection strategy (see Appendix A.5):

- 1/ Invite French applicants first and foremost as long as the marginal expected profits of the interview, which decreases with the number of invited applicants, is larger than the interview cost c ;
- 2/ If all French applicants have been invited, or if there are no more French applicants, invite North African workers as long as the marginal expected profit of the interview is larger than the interview cost c .

This optimal strategy implies a mapping from the number of applicants of each type n^a, n^f to the number of applicants of each type who are interviewed, which is denoted by

$$s_j^f(n^f); s_j^a(n^a, n^f),$$

for French and North African applicants respectively, where $s_j^f(n^f) \leq n^f$ is non-decreasing with n^f and $s_j^a(n^a, n^f) \leq n^a + n^f$ is non-decreasing with n^a and decreasing with n^f .

The probability that a type- i , $i = a, f$, worker who applies to a job with n^a and n^f applications gets a recall is equal to s_j^f/n^f for a French applicant and to s_j^a/n^a for a North African applicant. This probability decreases with the number of applicants because applicants compete to get job interviews.

In this framework, differences in callback rates between French and North Africans may arise absent any discriminatory attitudes because French and North Africans may apply at different rates

to job ads of the public and private sectors (see Appendix A.7). However, given the lack of job opportunities for unskilled youth candidates it is likely that they do not self-select into a particular sector and apply to all job offers that come to their attention. Empirical evidence supports this claim. Appendix A.8 shows that French and North African workers get the same wage, conditional on their level of education, experience and family situation, whether they work in the public or in the private sector. This suggests that differences in sorting between the private and the public sectors is not a first order issue for these populations. Accordingly, we will assume henceforth that the distribution of applications of French and North African applicants is identical in both sectors.²⁴ This allows us to focus on other potential determinants of differences in callback rates between these two sectors, which are likely more empirically relevant in the present context.

In our framework, callback rates depend on the expected values of jobs in each sector. A hike in expected values of jobs in sector j increases the callback rate in that sector. At the limit, if the expected returns to filled jobs in the public sector is very large with respect to the cost of interview, the callback rate in the public sector goes to one, meaning that there is no difference in the callback rate between French and North African applicants in that sector.

Insofar as the difference in expected returns to public and private jobs plays a key role, it is worth stressing that several facts are consistent with this assumption. First, public jobs are strongly subsidized or are financed in a way which implies that their cost for recruiters is low, since budgetary rules often imply that the budget allocated to each particular job cannot be used for any other purposes if the job is not created. Second, our survey of public and private recruiters provides evidence consistent with lower reservation productivity in the public sector than in the private sector (see Appendix A.4), which is consistent with lower labor costs in the public sector. Third, our correspondence study shows that there is no significant difference between callback rates of French and North African candidates who apply to subsidized jobs in the private sector (see Table A4 in Appendix A.4). This finding is consistent with the assumption that jobs that are subsidized or are financed in a way which implies that their cost for recruiters is low induce recruiters to accept recruiting weakly productive workers. Fourth, our correspondence study finds that the callback rate is higher in the public sector for both French and North African applicants, as shown in section 2. Fifth, since there is no price attached to the output in the public sector, the expected returns to jobs is to a large extent the result of the subjective evaluation of recruiters, who may over-evaluate the output.²⁵ Sixth, the fact that there is a

²⁴As shown and discussed further below, this situation may arise in an urn-ball model.

²⁵This property could be introduced into the model with the assumption that the value of output in the public sector

demand for job creation which almost always binds the budget constraint in the public sector suggests that recruiters expect high returns in this sector, while job creation in the private sector is limited by competition which drives the value of marginal jobs downwards.

Let us now explore the impact of this difference in the valuation of jobs between the private and the public sectors on recruitment at the interview stage.

From invitation discrimination to hiring discrimination

On each job, after the interviews, the applicant with the highest productivity y is hired, independently of his origin, if y is above the reservation productivity R_j . This implies that the probability of hiring for a North African applicant on a job with s^a and s^f interviews in sector j , denoted by $p_j^a(s^a, s^f)$, is equal to the probability that he draws the highest productivity among the s^f French applicants and the $s^a - 1$ other North African applicants, or, formally²⁶

$$p_j^a(s^a, s^f) = \int_{R_j}^{y_{\text{sup}}} [G^a(y)]^{s^a} [G^f(y)]^{s^f} \frac{g^a(y)}{G^a(y)} dy, \quad (4)$$

where g^i denotes the density function. A similar formula applies to French applicants:

$$p_j^f(s^a, s^f) = \int_{R_j}^{y_{\text{sup}}} [G^a(y)]^{s^a} [G^f(y)]^{s^f} \frac{g^f(y)}{G^f(y)} dy. \quad (5)$$

These formulas show that the hiring probability of type- i workers is equal to the integral of their reverse hazard rate $g^i(y)/G^i(y)$ weighted by the cumulative distribution function of the maximum productivity of all workers, equal to $[G^a(y)]^{s^a} [G^f(y)]^{s^f}$.

Hence, for the hiring probability of the French applicants to be higher than that of the North African ones at the interview stage, it is sufficient that their productivity reverse hazard rate dominates that of North Africans, i.e. $g^f(y)/G^f(y) \geq g^a(y)/G^a(y)$ for all $y \in [0, y_{\text{sup}}]$,²⁷ as is clear from the

is equal to πy , $\pi > 1$.

²⁶Let us remind readers that: if $y = \max(x_1, \dots, x_n)$ where x_i , $i = 1, \dots, n$ are n independent random variables with CDF F_i , the CDF of y is equal to $\prod_{i=1}^n F_i(y)$. Therefore, the probability that a North African draws a productivity level y larger than the other productivity levels drawn by the other $s^a - 1$ North African and s^f French applicants is equal to the product of the probability that the other applicants draw a level lower than y , $[G^a(y)]^{s^a-1} [G^f(y)]^{s^f}$, times the density $g^a(y)$ for the North African candidate. See Appendix A.6 for the derivation of the following formulas and for the proofs of the other statements made below.

²⁷Note that the reverse hazard rate dominance is a stronger condition than the first order stochastic dominance because the reverse hazard rate dominance implies the first order stochastic dominance but the converse is not true. See, for instance, Shaked and Shanthikumar (2007, theorem 1-B-42, p. 38). However, if $G^a(y) = G^f(y + c)$, where $c > 0$ or $G^a(y) = G^f(by)$, where $b > 1$, and $G^f(y)$ is log-concave (which is satisfied for most common distribution functions including uniform, normal, log-normal, exponential, see Borzadaran and Borzadaran, 2011, Chechile, 2011, Desai et al. 2011), G^f dominates G^a according to the reverse hazard rate criterion since log concavity implies that $g^f(y)/G^f(y)$ is

following expression:

$$p_j^f(s^a, s^f) - p_j^a(s^a, s^f) = \int_{R_j}^{y^{\text{sup}}} [G^a(y)]^{s^a} [G^f(y)]^{s^f} \left(\frac{g^f(y)}{G^f(y)} - \frac{g^a(y)}{G^a(y)} \right) dy. \quad (6)$$

To gauge whether this condition is empirically relevant in our context, we use data from the Labor Force survey to estimate the distribution of productivities of young unskilled North African and French males, conditional on education, labor market experience, family situation and region of residence. It is assumed that wages are determined according to equation (1) and that productivity distributions are log normal.²⁸ Figure 4 displays the probability density functions, the cumulative distribution functions, the French - North African reverse hazard rates difference and the weighted reverse hazard rates (i.e. the function within the integral of equations (4) and (5)) for North African and French applicants. It emerges clearly that the productivity distribution of French reverse hazard rate dominates and first-order stochastically dominates that of North Africans .

From formula (6), it can be deduced that the higher valuation of jobs in the public sector has the following implications for the difference in hiring probability between French and North African candidates.

(i) We have seen that the higher valuation of jobs induces more interviews. When there are more interviewed applicants, the hiring probability of each interviewed applicant drops, because the presence of more competitors reduces the chance for each applicant to draw the highest productivity (see equation (A6) in Appendix A.6). The hiring probability of the French applicants drops more, merely because they held higher hiring probabilities than the North Africans to start with. In this context, the higher callback rate in the public sector acts to decrease discrimination at the hiring stage.

(ii) The higher valuation of jobs in the public sector implies that the reservation productivity is lower in the public sector than in the private sector. The lower reservation productivity increases the hiring probability of each applicant, since it increases the probability that his productivity is above the minimum requirement to be hired. But the hiring probability of the French candidates increases more (see equation (A7) in Appendix A.6), merely because they are more likely than North African candidates to hold the maximum productivity above any reservation threshold. This acts to raise

decreasing. Therefore, in our model, the reverse hazard rate dominance of the expected productivity observed at the end of the interview, $y = E(\zeta) + \varepsilon$, of French applicants arises, for instance, if ε , the component of productivity realized at the end of the interview has a log concave cumulative distribution function and is the same random variable for North African and French workers, while the expectation of ζ , the productivity component discovered after the recruitment, is higher for French workers than for North Africans.

²⁸See Appendix A.8.

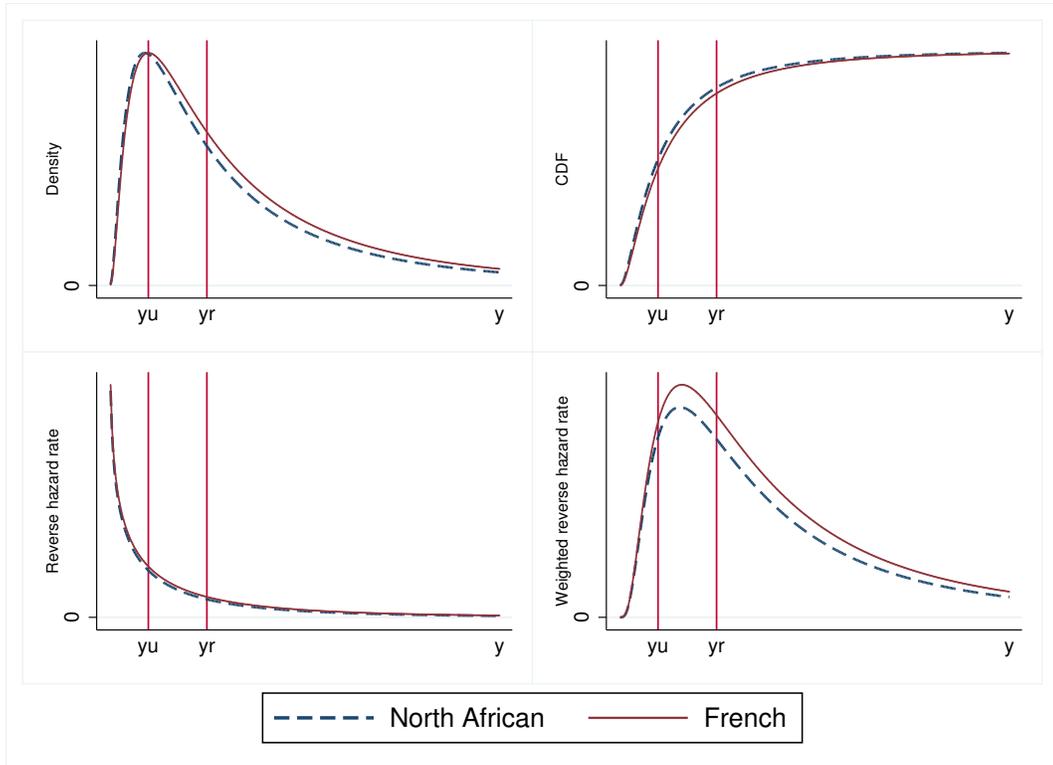


Figure 3: Distributions of productivity of French and North African applicants

Note: This Figure displays the densities, the cumulative distribution functions, the reverse hazard rates difference and the weighted reverse hazard rates (i.e. the function within the integral of equations (4) and (5)) for North African and French applicants for the productivity distributions estimated from the Labor Force Survey (see Appendix A.8). The weighted reverse hazard rate function is depicted assuming one French and one North African applicant. R_r and R_u stand for the reservation productivity in the private and in the public sector respectively, assuming that the subsidy σ , defined equation (3), is equal to $1/3$.

discrimination at the hiring stage because drops in the reservation productivity increase the difference between the hiring probabilities of French and North Africans.

To this point, it has been shown that the higher valuation of jobs in the public sector entails more invitations to job interviews and so less invitation discrimination because North African applicants are necessarily invited after French applicants. According to point (i) above, the higher number of invitations to job interviews induces more competition among applicants and this affects French candidates more than North African candidates, which translates into less discrimination at the hiring stage. But according to point (ii), the higher valuation of jobs in the public sector increases discrimination at the hiring stage due to the lower reservation productivity, which is more beneficial to French than to North Africans. Indeed, at the hiring stage only the best candidate is retained. Therefore, the higher valuation of jobs in the public sector has an ambiguous impact on discrimination at the hiring stage when it increases the number of invitations to interviews, because it induces two effects of opposite signs. However, the first effect is neutralized for jobs where the employers invite all the applicants to interviews (i.e. the constraint $s^a \leq n^a$ is binding), which corresponds to the situation where there is no discrimination. In that case, drops in the reservation productivity due to the higher valuation of jobs necessarily increase discrimination at the hiring stage. Therefore, if the gap between the valuation of jobs in the public sector and the private sector is large enough, it is possible to have no invitation discrimination but more discrimination at the hiring stage in the public sector than in the private sector. Hence, the absence of invitation discrimination in the public sector is compatible with significant discrimination at the hiring stage, which can be even more important than in the private sector, where French applicants are nevertheless twice as likely to be called back for interview as North African applicants.

To gauge the empirical relevance of this claim, we rely on the estimation of the productivity distributions derived from the model and use the model to evaluate the relation between discrimination at the invitation stage and at the hiring stage. We assume that matches between job openings and applications are determined by an urn-ball matching process²⁹ where job openings are assimilated to urns, and job applications to balls tossed at the urns by job seekers who do not direct their search either to private or to public job ads because it is costly to sort job types.³⁰ In this framework, a

²⁹Hall (1979); Pissarides (1979); Blanchard and Diamond (1994).

³⁰The assumption of random matching in a model with private and public jobs is adopted in Burdet (2012), Bradley, Postel Vinay and Turon (2017), Albrecht, Robayo-Abril and Vroman (2017), while Gomes (2014) and Quadrini and Trigari (2007) assume directed search. The assumption of random matching accounts for the limited possibility to sort job types for low skilled individuals whose geographical mobility and job opportunities are small.

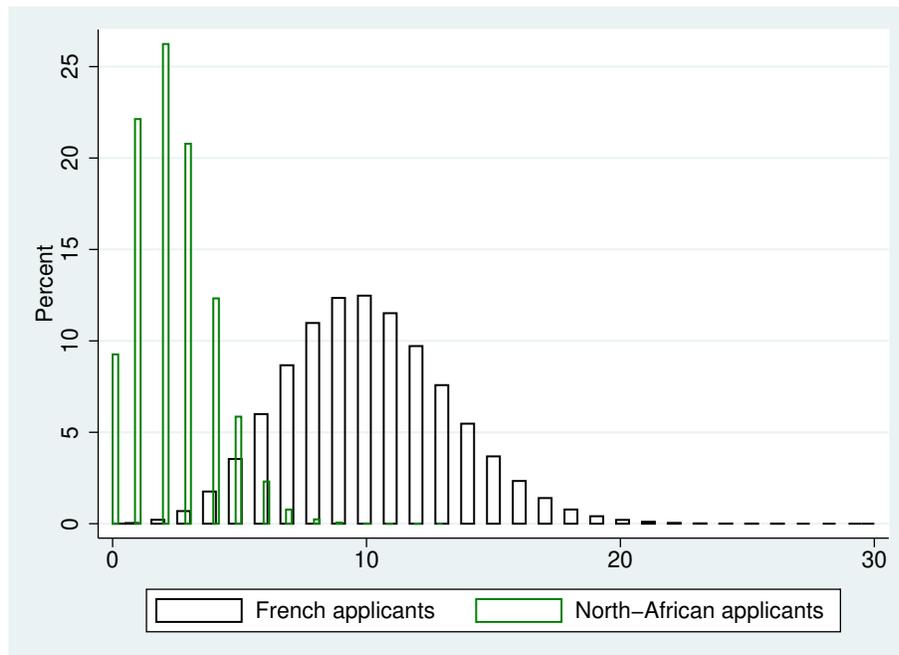


Figure 4: Distribution of applications of French and North African candidates

Legend: 8% of job openings have no North African applicant, while 12.5% of openings have 10 French applicants.

Note: The horizontal axis reports the number of applications per job. The distributions of North African and French applications are approximated by Poisson distributions with parameter N^a/V and N^f/V , respectively, where N^a and N^f denote the number of North African and French applications and V stands for the number of vacant jobs. In line with figures from the Labor Force Survey in 2016 according to which North Africans account for 19% of youth unskilled unemployed males from either French or North African background, it is assumed that 19% of applications are from North Africans. The ratio of the number of vacancies over the total number of applications is equal to 0.08 to match an average of 13 applicants per job (see footnote 32).

match occurs when a ball goes into an urn. As job seekers simultaneously apply for jobs not knowing where other job seekers are sending their applications, some vacancies get no applications, while others may get one or more applications. For the sake of simplicity, it is assumed that each applicant sends one application. Figure 4 displays the distribution of applications among jobs assuming that 19% of applicants are North Africans³¹ and that the labor market tightness (i.e. the ratio of the number of vacancies to the total number of applications) is equal to 0.08.³²

³¹This figure corresponds to the share of North Africans in the population of unskilled males below 30 years of age (either French or North African) in 2016. Source: Enquête Emploi 2016.

³²The value of the labor market tightness has been selected to replicate the average number of applications per filled job for low skilled white collars which is available in the OFER 2016 survey from the Ministry of Labor (see footnote 23). The average number of applications is around 13. Table 6 reports results for other values of the labor tightness going from 0.05 to 0.2, which correspond to from 20 to 5 applications per filled job.

In line with the results of our correspondence study, it is assumed that employers in the public sector interview all candidates, which ensures the absence of invitation discrimination, while employers in the private sector interview all French applicants but only one in two North African applicants. This difference in callback behavior may result from higher valuation of jobs and/or lower recruitment costs in the public sector, as explained above. We compute the probability of recruitment at the hiring stage, defined by equations (4) and (5), for French and North African applicants on each job. This enables us to compute the probability of recruitment, conditional on being called back, for French and North Africans in the private sector and in the public sector. Table 6 reports these probabilities for different values of the labor market tightness assuming that $\sigma = 1/3$, meaning that the subsidy in the public sector reduces labor cost by one third.³³ The value of β , the bargaining parameter of workers, is set to 0.5.³⁴

Table 6: Hiring probability conditional on being called back

	(1)	(2)	(3)	(4)
Sector	French	North African	Difference (1) – (2)	Relative difference (3)/(1)
Tightness = 0.05				
Public	.055	.042	.013	.236
Private	.060	.046	.014	.227
Tightness = 0.08				
Public	.092	.069	.022	.245
Private	.100	.078	.022	.220
Tightness = 0.2				
Public	.258	.178	.079	.308
Private	.283	.238	.046	.161

Note: This Table reports the estimated hiring probability of French and North African applicants at the hiring stage, conditional on being invited for interview, in the private and in the public sector for different values of the labor market tightness (i.e. number of job vacancies over number of applications). Column (1) reports the probability for French applicants, column (2) for North African applicants, column (3) the difference between column (1) and (2), and column (4) reports column (3) over column (1), which corresponds to the difference in hiring probability between French and North African candidates divided by the hiring probability of French applicants. Labor tightness equal to 0.08 corresponds to 13 applications per filled jobs, which is the figure observed in the OFER survey (see footnote 23). Labor tightness equal to 0.05 corresponds to 20 applications per filled jobs. Labor market tightness equal to 0.2 corresponds to 5 applications per filled job. The subsidy σ (see equation (3)) is equal to $1/3$. In this Table, β , which corresponds to the bargaining power parameter of workers, is equal to 0.5. Table A8 in Appendix A.9 reports the results for different values of β .

³³This is a conservative value insofar as the budgetary rules imply that the labor cost faced by recruiters of the non-market public sector is likely close to zero. Larger values of the subsidy entail more discrimination at the hiring stage in the public sector.

³⁴Table A8 in Appendix A.9, which reports results for different values of β , shows that the qualitative results remained unchanged for different values of β . Changes in β impact the hiring probabilities only through their impact on the estimated distributions of productivity since these distributions are estimated from the wage distributions, as shown by equation A8 in Appendix A.8.

Comparison of columns (1) and (2) of Table 6 shows that the hiring probability of North Africans is always smaller than that of French persons in both the private and public sectors. Column (3), also shows that the difference in recruitment probabilities, $p^f - p^a$, gets larger as the labor market tightens. In tighter labor markets the number of invitations to job interview gets smaller, meaning that there is less competition at the hiring stage. Therefore, as explained above (point (i)), this increases the hiring probability more for French than for North African interviewed applicants. From column (3), it is clear that the difference between the recruitment probability of French and North African candidates in the public sector is close to that of the private sector for most parameter values. This is not surprising insofar as the productivity distributions of French and North Africans are very close, a property consistent with previous empirical studies which find significant, but small, unexplained wage differentials between French and North African workers (Aeberhardt et al., 2010, Berson, 2016). The difference between the recruitment probability of French and North African candidates can be either higher or lower in the public sector for the set of parameter values reported in Table 6. Column (4) shows that this difference divided by the hiring probability of French candidates is systematically higher in the public sector than in the private sector. This means that, conditional on being called back, the recruitment probability of North Africans relative to that of French men is always smaller in the public than in the private sector. To put it differently, North Africans are more discriminated against at the hiring stage in the public than in the private sector.

All in all, these results show that by taking into account the difference between the decision to invite job applicants for interviews and the decision to hire applicants once interviewed we can demonstrate that the absence of discrimination at the invitation stage is compatible with significant discrimination at the hiring stage, possibly stronger than when there is discrimination at the invitation stage.

5 Conclusion

Starting from a correspondence study, this article presents a situation in which similar discriminatory preferences and beliefs among employers in both sectors result in distinct outcomes in terms of discrimination at the stage of invitation for interview for minority candidates. We sent 3,188 applications to public and private sector job offers in France, half of them from French applicants and the other half of North African applicants. In the private sector, the callback rate of candidates with North African origins is significantly lower than that of French ones, whereas in the public sector there is no penalty associated with ethnicity and callback rates are similar across both groups. At the same time, our sur-

vey of recruiters, run on a sample of recruiters representative of those addressed in our correspondence study, shows that both sectors display marked discriminatory preferences and beliefs. Moreover, using data from the French Labor Survey we provide evidence that North African low-educated youth are as under-represented among public sector hires and workers as they are among private sector ones. To reconcile these findings, we set out a model in the last section of the paper explaining how, despite similar stereotypes and prejudice on the part of recruiters, a gap in discrimination can nevertheless appear at the interview stage between the private and the public sector. The model shows that the chances to be hired of minority candidates may be smaller after the interviews, even if they are as likely to get invited for an interview as majority candidates. Such a situation arises if one sector has stronger expected returns to job creation leading to lower productivity requirements, despite similar discriminatory beliefs in both sectors. This is consistent with the findings of our survey of recruiters, which show that productivity requirements are less stringent in the public than in the private sector. Thus, our model implies that the lack of discrimination at the interview stage is compatible with the existence of discrimination at the hiring stage, calling into question the ability of correspondence studies to detect unequal treatment of applicants. These results, based on the contrast between the public and private sectors, cast also doubt on the interpretation of differences in discriminatory behaviors obtained by correspondence studies within the private sector, to the extent that productivity differences across firms are also typically large.

The inability of correspondence studies to systematically detect hiring discrimination implies that they should be complemented by new investigative methods to be developed by future research.

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A Appendix

A.1 Additional estimations on the correspondence study

Table A1: Discrimination of North-African Candidates by Sector

	(1)	(2)	(3)	(4)	(5)
	All sectors	Private	Public	Private	Public
North African candidate	-.007*	-.013**	-.000	-.013**	-.000
	.004	.005	.006	.005	.006
Controls	<i>no</i>	<i>no</i>	<i>no</i>	<i>yes</i>	<i>yes</i>
Constant (ref: French candidate)	.024**	.033**	.009	-.013**	.036
	.011	.014	.010	.005	.027
N	3,188	1,708	1,480	1,704	1,476
Adj-R ²	.055	.094	.082	.102	.089

Note: The dependent variable is a dummy variable equal to one if the application gets a callback, where a callback is defined as an explicit invitation to an interview. All columns include department and month fixed effects. Estimations in columns 4 and 5 also include as controls: the size of the firm, the NACE code for the economic activity of the firm, the type of contrat offered (fixed-term or open-ended) and the occupation applied for (clearing person, clerk or receptionist). Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

A.2 Additional information about the survey of recruiters

The survey of recruiters was run by telephone in January 2017 on a sample of 1054 hiring managers in the public and private sectors. This survey was conducted in collaboration with the polling institute *Viavoice* (www.institut-viavoice.com) after the approval of the board of the *Chaire Sécurisation des parcours professionnels* (<http://www.chaire-securisation.fr>), which funded this research, under the scrutiny of *Institut Louis Bachelier* (www.institutlouisbachelier.org).

The target population of the survey included all employers to whom applications were sent in the correspondence study. The response rate of these employers, equal to 16%, is slightly above the usual response rates for surveys of firms by telephone interview, which is around 10% in France. The database has been complemented so as to survey a sufficiently high number of employers. Around 24% of the surveyed sample is composed of recruiters from our correspondence study. To ensure comparability of the recruiters interviewed in the survey with those involved in the correspondence study, we relied on the quota method, applied to the following criteria: public-private sector, sector of activity, number of employees and region. We checked that the sub-sample of respondents to the survey involved in the correspondence studies and the sample of all the recruiters who responded to the survey are comparable to the sample of all recruiters involved in the correspondence study. Table A2 provides a comparison between these samples.

Table A2: Correspondence study and survey of recruiters - sample comparisons

	(1)	(2)	(3)
	Correspondence study	Survey of recruiters	Recruiters from survey & correspondence study
<i>Gender</i>			
Female	60.55	67.18	66.00
<i>Sector</i>			
Private	67.37	68.12	59.2
Public	32.63	33.88	40.8
<i>Firm size</i>			
0-19	42.36	47.62	49.20
20-249	39.24	43.94	41.60
250-4999	7.69	8.24	8.80
5000+	0.57	0.19	0.40
<i>Economic activity</i>			
A (Agriculture)	0.35	1.33	1.20
B (Industry)	2.02	3.04	2.40
C (Construction)	0.70	1.71	0
D (Trade)	4.26	5.03	4.00
E (Transportation)	1.01	1.23	1.20
F (Accommodation and food services)	7.95	7.69	6.00
G (Other mainly for-profit services)	24.96	23.81	22.40
H (Other mainly non-profit services)	58.74	57.59	62.80
<i>Region</i>			
Aquitaine	9.27	9.30	8.8
Auvergne-Rhône-Alpes	16.39	14.52	20.4
Bourgogne-Franche-Comté	4.79	4.46	4.8
Bretagne	6.06	5.88	7.6
Centre	5.14	4.93	4.8
Corse	0.53	0.57	1.2
Grand Est	7.60	8.54	8.4
Hauts-de-France	5.18	6.64	3.6
Ile-de-France	13.71	15.37	8.8
Languedoc-Midi-Pyrénées	9.40	10.72	9.6
Normandie	5.10	5.31	4.8
Pays-de-la-Loire	6.46	5.98	6.00
Provence-Alpes-Côte d'Azur	10.37	7.78	11.20
Number of observations	1,594	1,054	250

To the extent that the survey touched upon possible sensitive issues about discriminatory attitudes, the interviewers started the interviews with the following claim: "Hello, I am M XXX of Viavoce institute. We

are currently conducting a survey for researchers at Sciences Po, the Paris School of Economics and Ecole Polytechnique. This survey aims to analyze the access to employment of people of North African origin. The data collected in this survey are strictly confidential. The overall results of the survey will be published in the coming months.” The survey then starts with neutral questions about the characteristics of the respondent and of his establishment. Then there are items about discriminatory attitudes.

More precisely, interviewees are asked to give their opinion on the following statements related to statistical discrimination:

- At the same diploma and experience, a person of North African origin works on average as hard as a person of French origin. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer.
- At the same diploma and experience, a person of North African origin works on average as efficiently as a person of French origin. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer.
- At the same diploma and experience, there is more uncertainty about a person’s ability to work hard if they are of North African origin rather than French. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer.
- At the same diploma and experience, there is more uncertainty about a person’s ability to work efficiently if they are of North African origin rather than French. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer
- A new recruit in your institution will be more easily accepted by his colleagues if he is of French origin rather than North African. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer.
- An employee of your establishment will be more easily accepted by clients or users if he is of French origin rather than North African. Possible answers: strongly agree, somewhat agree, somewhat disagree, strongly disagree, no answer.

The questions related to taste-based discriminations are:

- Would you be embarrassed if someone of North African origin married someone from your immediate family? Possible answers: A lot, a little, not at all, no answer.
- Would you say that the presence in France of people of North African origin makes life.... Possible answers: Less agreeable, no more or less agreeable, more agreeable, no answer.
- Would you be embarrassed if someone of North African origin became your boss at work? Possible answers: A lot, a little, not at all, no answer.

Figures A1 and A2 report the mean replies to these questions. They reveal no statistically significant difference between the private and the public sector. The non-responses, which are always below 3% and are not statistically different between the private and the public sector, are not reported to save space.

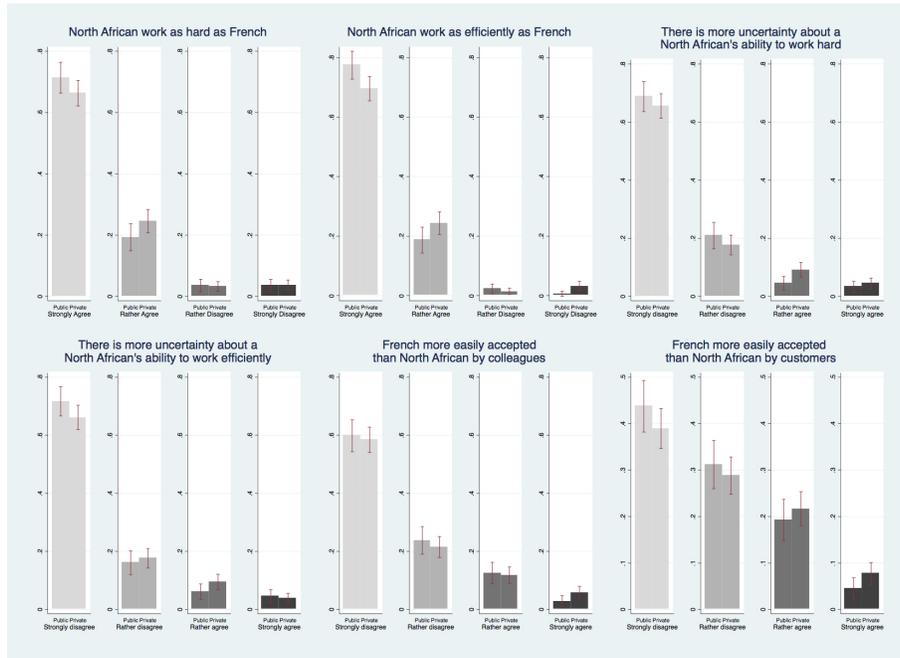


Figure A1: Survey of recruiters in the private and the public sectors - detailed items of statistically-based discrimination

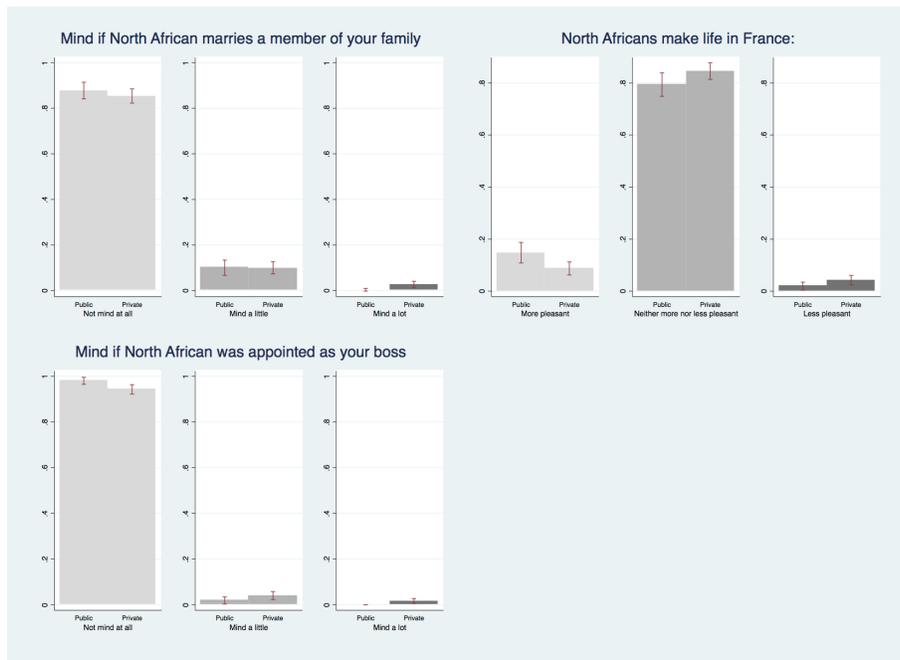


Figure A2: Survey of recruiters in the private and the public sectors - detailed items of tasted-based discrimination

A.3 Evidence from international surveys about discriminatory attitudes in the private and public sectors in France

To check the external validity of the results of our survey of recruiters, we analyzed discriminatory attitudes in the French private and public sectors relying on cross-country values surveys. To our knowledge, there are no international surveys focusing on discrimination-related topics that specifically target employers as respondents. We make use therefore of values surveys which enable us to examine preferences of individuals who are working in the two sectors we are interested in (i.e. not specifically recruiters). Since some of the survey items in our questionnaire were based on the European Social Survey, we relied primarily on this source for our check.³⁵ We use two rounds (2012, 2014) of the European Social Survey in which we identify taste-based discrimination items as well as statistically-based discrimination items. While taste-based discrimination items are similar to those used in our survey,³⁶ those supposed to capture statistical discrimination assess whether the respondent believes that certain ethnic groups or races are born less intelligent or hard-working.³⁷ The analysis is based on 1,463 surveyed employees, with one third of the sample made of workers from the public sector, which is consistent with the sector shares from our recruiters' survey.

Similarly to the results of our recruiters' survey, Figure A6 emphasizes that there is no statistically significant difference between workers from the private and the public sectors concerning taste-based or statistical discriminatory attitudes. Table A3 reports estimation results for a linear probability model that analyzes the relationship between working in the private sector and one's discriminatory attitudes. Being a private sector employee has no significant impact on the likelihood to discriminate, whether taste-based or statistical discrimination is considered. Similarly to the analysis performed on our recruiters' survey data, we build an indicator that considers an individual to engage in discrimination when he expresses either taste-based or statistical-based discriminatory attitudes. Results for this indicator are reported in column 3 of Table A3 and confirm the lack of a relationship between working in the private sector and expressing more pronounced discriminatory attitudes.

³⁵An alternative values survey in which it is possible to distinguish between sector types (market and non-market) is the European Quality of Life Survey. However, survey items from the European Quality of Life Survey focus more on attitudes towards immigrants and their interaction with local culture at large, and are thus less precise at targeting taste-based and statistically-based discrimination. Based on these items for a sample of 1,101 employees from the public and private sectors, Figure A3 and regression results available upon request show that there is no statistically significant difference between private and public sector workers when it comes to attitudes against immigrants.

³⁶The only difference between our taste-based discrimination survey items and those of the ESS is related to the answers scale. In our recruiters' survey, the answer scale is composed of 3 values whereas in ESS, it is composed of 11 values, with answers going from 0 to 10. For coherence with our recruiters' survey, we define taste-based discrimination in ESS considering only extreme answers (0-1-2 and 8-9-10) as indicators of clear acceptance or rejection of discrimination.

³⁷Detailed results by survey item for both taste-based and statistical-based discrimination preferences are presented in Figures A4 and A5.

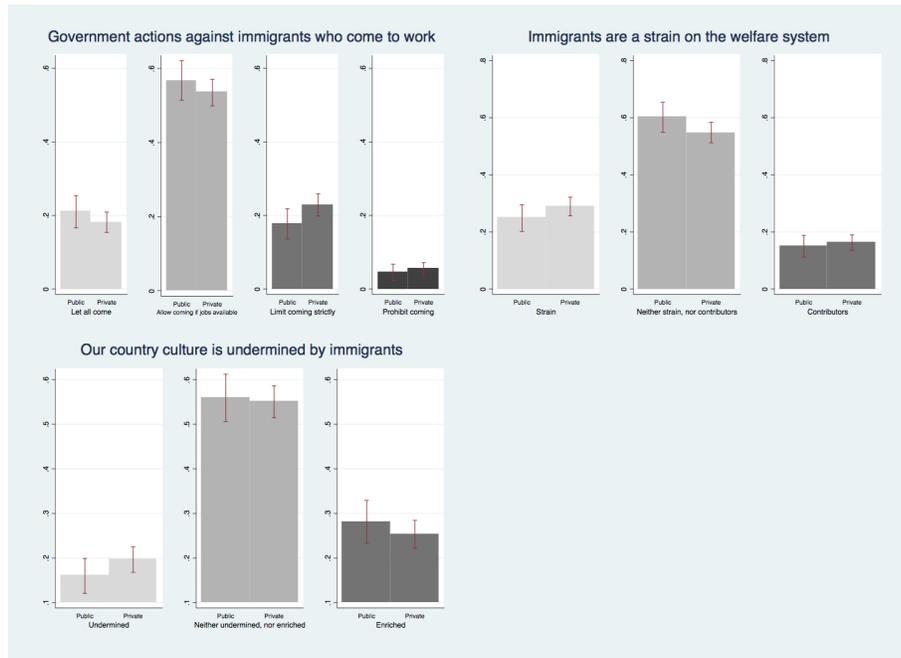


Figure A3: Survey of employees in the French private and public sectors - detailed items of attitudes against immigrants, European Quality of Life Survey

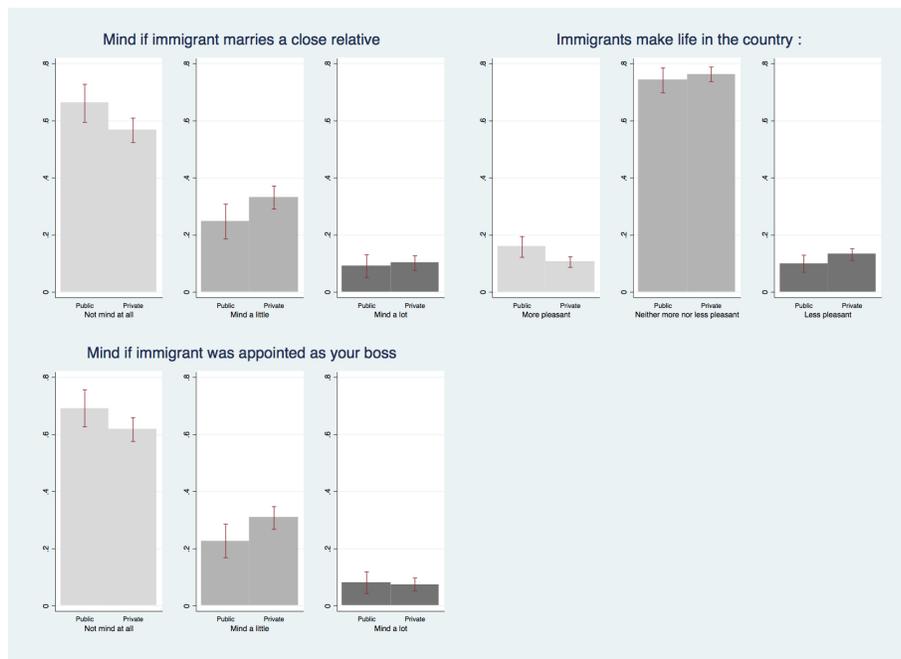


Figure A4: Survey of employees in the private and the public sectors - detailed items of tasted-based discrimination, European Social Survey

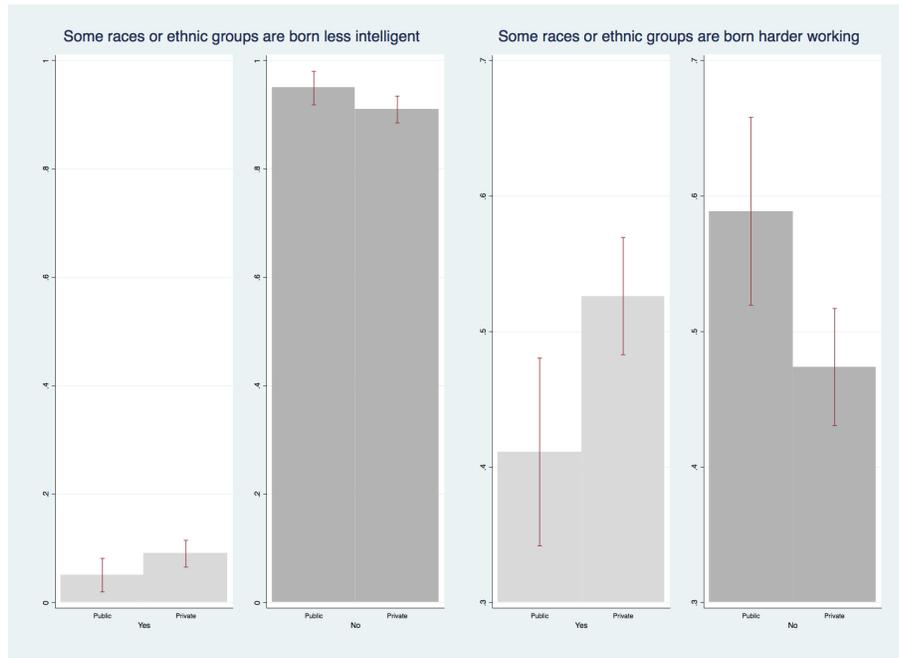


Figure A5: Survey of employees in the French private and public sectors - detailed items of statistically-based discrimination, European Social Survey

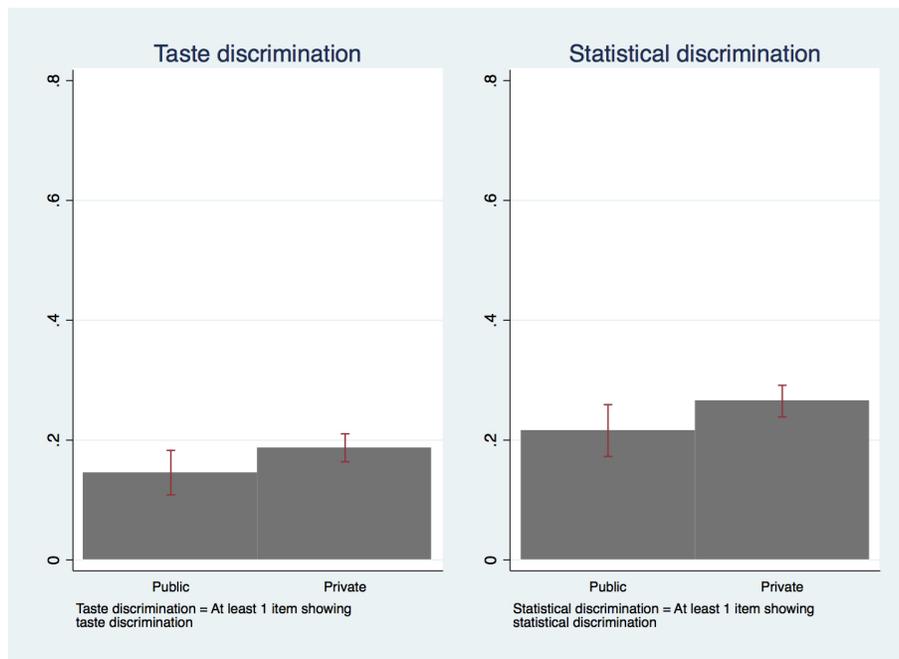


Figure A6: Taste-based and statistical discriminatory attitudes of employees in the French private and public sectors - European Social Survey

Table A3: Discriminatory attitudes of public and private sector employees - European Social Survey

	(1)	(2)	(3)
	Discriminate by taste	Discriminate statistically	Discriminate (taste/statistical)
Employee from the private sector	.060 .064	.065 .053	.102 .067
Controls	<i>yes</i>	<i>yes</i>	<i>yes</i>
Constant (ref: employee from the public sector)	.346 .427	.358 .407	.635* .382
N	1, 106	1, 210	1, 210
Adj-R ²	.489	.652	.576

Note: In the first column, the dependent variable is a dummy equal to one if the employee discriminates by taste. An employee discriminates by taste when he agrees with at least one survey statement that reflects taste-based discrimination, namely whether he minds that an immigrant is appointed as his boss or becomes the spouse of a relative, or whether he believes that immigrants make the country a worse place to live in. In the second column, the dependent variable is a dummy equal to one if the employee discriminates statistically. An employee discriminates statistically when he agrees with at least one survey statement that reflects statistical discrimination, namely whether he believes that some races or ethnic groups are born less intelligent or less hard-working. In the third column, the dependent variable is a dummy equal to one if the employee discriminates either by taste or statistically. Controls include the gender, age, education level, origin and occupation (ISCO code) of the employee, as well as the size and the NACE code of the establishment in which he/she works. The origin of the employee is defined based on the employee's birth place as well as his/her parents' birth place, with individuals born in France from parents who were equally born in France as the reference category. All columns include region and year fixed effects. Robust standard errors are reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

A.4 Empirical evidence about productivity requirement in the public and the private sectors

This appendix provides two sources of empirical evidence indicating that reservation productivity is smaller in the public than in the private sector. The first source arises from our correspondence study while the second comes from the survey of recruiters.

A.4.1 Evidence from the correspondence study

It is well known that callback rates should be higher when the reservation productivity of recruiters is smaller (e.g. Neumark, 2012). In that case, recruiters are more inclined to invite applicants of the minority group whose productivity is supposed to be smaller compared with that of the majority group for interview. Accordingly, a plausible explanation for the absence of invitation discrimination in the public sector is that jobs are strongly subsidized or are financed in a way which implies that their cost for recruiters is low, inducing public sector recruiters to be willing to recruit weakly productive workers. If this assumption is relevant, one should also observe less invitation discrimination on subsidized jobs than on non-subsidized jobs in the private sector. Table A4 examines whether the effect of ethnicity in the private sector varies by the type of contract to which the individual is applying, namely subsidized or non-subsidized. North Africans appear to be discriminated against when applying to private non-subsidized jobs. Their penalty relative to French applicants remains statistically significant at the 7 percent significance level when the estimation is run through bootstrap on a sample of the same size for subsidized and non-subsidized job offers. However, there is no significant difference between

Table A4: Discrimination of North African Candidates by Sector and Type of Job Offer

	(1)	(2)	(3)	(4)	(5)	(6)
	Private non-subsidized	Private subsidized	Private non-subsidized	Private subsidized	Private non-subsidized (bootstrap)	Private subsidized (bootstrap)
North African candidate	-.022*** .007	-.009 .018	-.022*** .007	-.009 .019	-.022* .012	-.009 .016
Department fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Month fixed effects	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Additional controls	<i>no</i>	<i>no</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
N	1,486	218	1,486	218	218	218
Adj-R ²	.118	.301	.132	.320	.132	.320

Note: The dependent variable is a dummy variable equal to one if the application gets a callback. All columns include department and month fixed effects. Estimations in columns 3-6 also include as controls: the size of the firm, the NACE code for the economic activity of the firm, the type of contract offered (fixed-term or open-ended) and the occupation applied for (cleaning person, clerk or receptionist). Estimations in columns 5 and 6 are based on a bootstrap with 5000 replications with sample of identical size for private subsidized and private non-subsidized jobs. Robust standard errors are clustered at the job level and reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

the callback rates of French and North African candidates who apply to subsidized jobs in the private sector (columns 4 and 6).

A.4.2 Evidence from the survey of recruiters

In line with our conceptual framework, our survey of recruiters assesses the difference in reservation productivity between employers in the private and public sectors by asking about the extent to which a recruiter would be willing to hire a candidate to help him out even if he is not very efficient. Figure A7 displays the opinion of recruiters about productivity requirements in the public and private sectors. Private sector recruiters more often strongly disagree with the statement that it is acceptable to hire an employee to help him out even if he is not very efficient. The difference is large (14 percentage points) and very significant (p-value < 0.001). Table A5 reports results from a linear probability model that controls for the age, education level, origin and gender of the recruiter, as well as the size of the firm and department and month fixed effects, to estimate the difference in productivity requirements between employers in the private and public sectors for different measures of this requirement. In line with the assumption that reservation productivity is higher in the private sector than in the public sector, private sector recruiters appear to require higher productivity from their employees than public sector recruiters.

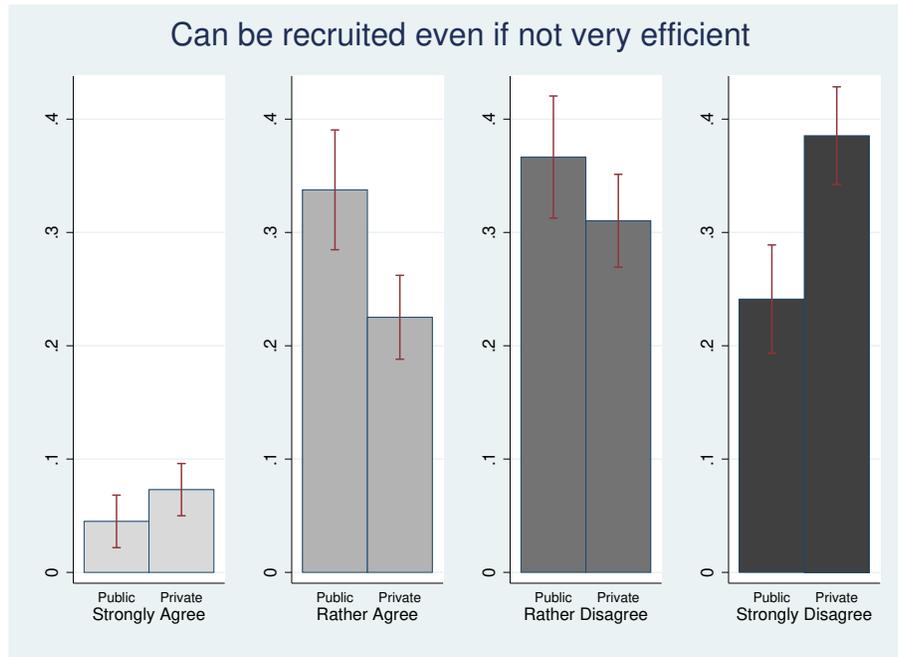


Figure A7: Survey of recruiters in the private and the public sectors - detailed items of productivity requirement

Table A5: Productivity requirements of recruiters

	(1)	(2)	(3)
Recruiter from the private sector	0.182** (0.0767)	0.101** (0.0418)	0.112*** (0.0403)
Observations	798	798	798
Adj-R ²	0.083	0.086	0.081
Controls	Yes	Yes	Yes

Note: In the first column, the dependent variable is equal to the sum of the score of the answers to the statement that it is possible to hire an employee to help him out even if he is not very efficient, where strongly agree = 1, somewhat agree = 2, somewhat disagree = 3, strongly disagree = 4; In the second column the dependent variable is an indicator variable equal to one if the respondent somewhat disagrees or strongly disagrees; In the third column, the dependent variable is an indicator variable equal to one if the respondent strongly disagrees. Controls include the gender, age, education level and origin of the recruiter and the firm size of the recruiting firm. The origin of the recruiter is defined based on the recruiter's birth place as well as his/her parents' birth place, with individuals born in France from parents who were equally born in France being the reference category. All columns include department and month fixed effects. Robust standard errors are reported below the coefficients. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent.

A.5 Optimal hiring behavior

This appendix describes the optimal hiring behavior.

Let us consider a recruiter with a vacant job in sector $j = r, u$, who has received n^a North African applications and n^f French applications. Interviewing an applicant allows the recruiter to discover his expected productivity, denoted by $y = E(\zeta) + \varepsilon$ (see the explanation in section 4). Inviting an applicant for an interview induces sunk cost c associated with the scheduling of the interview. Employers cannot continue inviting applicants to interviews once they have started the interviews and there is no other cost associated with interview than the sunk cost c . This implies a two stage hiring process in which employers first select résumés in the first stage and proceed to all scheduled interviews in the second stage. In this context, the problem of the recruiter is to select the applicants for job interviews knowing that she will hire the applicant with the highest expected productivity, provided that the applicant is suitable for the job, after she has conducted all the interviews. The cumulative distribution function of y is denoted by $G^a(y)$ and $G^f(y)$ for North African and French workers respectively. Let us remind readers that it is assumed that $G^f(y)$ stochastically dominates $G^a(y)$ according to the reverse hazard rate order, i.e. $g^f(y)/G^f(y) \geq g^a(y)/G^a(y)$ for all $y \in [0, y_{\text{sup}}]$, where g^i denotes the density function. This assumption implies that $G^f(y)$ first-order stochastically dominates $G^a(y)$.

Let us now show that the assumption that $G^f(y)$ first-order stochastically dominates $G^a(y)$ implies that the marginal expected profit of calling back a French applicant is always larger than the marginal profit of calling back a North African applicant.

The net expected profit of interviewing s^a and s^f applicants in sector j can be written³⁸

$$E [V_j(y)|s^a, s^f] = \int_{R_j}^{y_{\text{sup}}} J_j(y) d [G^f(y)]^{s^f} [G^a(y)]^{s^a} - c (s^a + s^f). \quad (\text{A1})$$

Let us first analyze the private sector. Integrating by parts and using the definition of

$$J_r(y) = \begin{cases} (1 - \beta)(y - z) & \text{if } y > \bar{y} = \frac{w_{\min} - (1 - \beta)z}{\beta} \\ y - w_{\min} & \text{if } y \in [R_r, \bar{y}], \text{ with } R_r = w_{\min} \end{cases}$$

given by equation (2), we get

$$\begin{aligned} E [V_r(y)|s^a, s^f] &= \left[J_r(y) [G^f(y)]^{s^f} [G^a(y)]^{s^a} \right]_{R_r}^{y_{\text{sup}}} - \int_{R_r}^{\bar{y}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} dy \\ &\quad - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} dy - c (s^a + s^f) \\ &= J_r(y_{\text{sup}}) - \int_{R_r}^{\bar{y}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} dy - c (s^a + s^f). \end{aligned}$$

From this equation, we get

$$\begin{aligned} \frac{\partial E [V_r(y)|s^a, s^f]}{\partial s^f} - \frac{\partial E [V_r(y)|s^a, s^f]}{\partial s^a} &= (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} [\ln G^a(y) - \ln G^f(y)] dy \\ &\quad + \int_{R_r}^{\bar{y}} [G^f(y)]^{s^f} [G^a(y)]^{s^a} [\ln G^a(y) - \ln G^f(y)] dy. \end{aligned}$$

If $G^a(y) > G^f(y)$ for all $y \in [R_j, y_{\text{sup}}]$, i.e. if $G^f(y)$ first-order stochastically dominates $G^a(y)$, the right hand side of this equation is positive, which implies that interviewing French applicants yields more expected profits than interviewing North African applicants. Therefore, recruiters begin to select French applicants before

³⁸Let us remind readers that: if $y = \max(x_1, \dots, x_n)$ where x_i , $i = 1, \dots, n$ are n independent random variables with CDF F_i , the CDF of y is equal to $\prod_{i=1}^n F_i(y)$.

considering North African applicants in the private sector. The same proof applies in the public sector, where $\beta(1 - \sigma)$ is substituted for β , R_u for R_r and $J_u(y_{\text{sup}})$ for $J_r(y_{\text{sup}})$ in the two previous equations.

Let us determine the optimal number of French applicants invited for interview in the private sector. The net expected profit of interviewing $s^f < n^f$ French applicants is

$$E [V_r | s^f] = \int_{R_r}^{y_{\text{sup}}} J_r(y) d [G^f(y)]^{s^f} - cs^f. \quad (\text{A2})$$

which can be written, thanks to integration by parts:

$$E [V_r | s^f] = J_r(y_{\text{sup}}) - \int_{R_r}^{\bar{y}} [G^f(y)]^{s^f} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} [G^f(y)]^{s^f} dy - cs^f. \quad (\text{A3})$$

If $E [V_r(y) | s^f]$ reaches a maximum for $s^f \leq n^f$, the first-order condition for the optimal choice of the number of interviews is

$$\frac{\partial E [V_r(y) | s^f]}{\partial s^f} = 0 \iff - \int_{R_r}^{\bar{y}} \ln [G^f(y)] [G^f(y)]^{s^f} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} \ln [G^f(y)] [G^f(y)]^{s^f} dy = c$$

The second order condition is satisfied since

$$\frac{\partial^2 E [V_r(y) | s^f]}{\partial (s^f)^2} = - \int_{R_r}^{\bar{y}} (\ln [G^f(y)])^2 [G^f(y)]^{s^f} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} (\ln [G^f(y)])^2 [G^f(y)]^{s^f} dy < 0$$

If $E [V_r(y) | s^f]$ reaches a maximum for $s^f > n^f$, it is worth calling back all French applicants, i.e. $s^f = n^f$. Thus, the optimal value of s^f is defined by

$$s_r^f(n^f) = \left\{ \max s^f \leq n^f \mid - \int_{R_r}^{\bar{y}} \ln [G^f(y)] [G^f(y)]^{s^f} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} \ln [G^f(y)] [G^f(y)]^{s^f} dy \geq c \right\}. \quad (\text{A4})$$

If all French applicants are invited for interview, the employer can consider inviting North African applicants. The net expected profit of inviting n^f French applicants and s^a North African applicants is

$$E [V_r(y) | s^a, n^f] = J_j(y_{\text{sup}}) - \int_{R_r}^{\bar{y}} [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy - c(n^f + s^a).$$

The same reasoning as before implies that this net expected profit is a concave function of s^a . Thus the optimal value of s^a is defined by

$$s_r^a(n^a, n^f) = \left\{ \max s^a \leq n^a \mid - \int_{R_r}^{\bar{y}} \ln [G^a(y)] [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy - (1 - \beta) \int_{\bar{y}}^{y_{\text{sup}}} \ln [G^a(y)] [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy \geq c \right\}. \quad (\text{A5})$$

The same reasoning applies in the public sector, where we find that

$$\begin{aligned} s_u^f(n^f) &= \left\{ \max s^f \leq n^f \mid - \int_{R_u}^{\bar{y}} \ln [G^f(y)] [G^f(y)]^{s^f} dy - [1 - \beta(1 - \sigma)] \int_{R_u}^{y_{\text{sup}}} \ln [G^f(y)] [G^f(y)]^{s^f} dy \geq c \right\} \\ s_u^a(n^a, n^f) &= \left\{ \max s^a \leq n^a \mid - \int_{R_u}^{\bar{y}} \ln [G^a(y)] [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy \right. \\ &\quad \left. - [1 - \beta(1 - \sigma)] \int_{R_u}^{y_{\text{sup}}} \ln [G^a(y)] [G^f(y)]^{n^f} [G^a(y)]^{s^a} dy \geq c \right\} \end{aligned}$$

At this stage we have shown that the optimal invitation strategy of the n^a, n^f applicants whose resumé have been inspected is

1/ Invite French applicants first and foremost as long as the marginal expected profits of the interview (which decreases with the number of invited applicants) exceed the interview cost c ;

2/ If all French applicants have been invited (or if there is no French applicant), also invite North African workers as long as the marginal expected profits of the interview exceed the interview cost c .

This optimal strategy implies a mapping from the number of applicants of each type n^a, n^f , to the number of invitations for an interview of each type, s_j^a, s_j^f .

It can be checked, by differentiation of the conditions defining the optimal number of invitations, that the optimal number of invitations of each type satisfies the following properties: $s_j^f(n^f) \leq n^f$ is non-decreasing with n^f and $s_j^a(n^a, n^f) \leq n^a + n^f$ is non-decreasing with n^a and decreasing with n^f .

A.6 Hiring probability of applicants invited to job interview

This appendix computes the hiring probability of type- i applicants on a job in sector j when there are s^a and s^f individuals called back for interview. During the interview, each applicant draws an output level y . The applicant who draws the highest y is recruited. The cumulative distribution function of the maximum output drawn by type- i applicants when there are s^i interviewed applicants, on a job in sector j , is $[G^i(y)]^{s^i}$.

1. Let us consider a job in sector j with $s^f > 0$ and $s^a = 0$ interviews. The probability that one of the type- f applicants is recruited after an interview on this job is

$$\Pr[m_f > R_j] = 1 - [G^f(R_j)]^{s^f} = \int_{R_j}^{y_{\text{sup}}} d[G^f(y)]^{s^f} = \int_{R_j}^{y_{\text{sup}}} s^f g^f(y) [G^f(y)]^{s^f-1} dy$$

where m_f denotes the maximum output drawn by type- f applicants; R_j is the reservation output in sector j ; $g^f(y)$ stands for the derivative of function $G^f(y)$. The hiring probability for a type- f applicant is equal to the hiring probability that a type- f applicant is hired divided by the number of type- f applicants, which implies that the hiring probability for a type- f applicant in sector j is

$$p_j^f(0, s^f) = \int_{R_j}^{y_{\text{sup}}} g^f(y) [G^f(y)]^{s^f-1} dy$$

This probability decreases with the number of applicants:

$$\frac{\partial p_j^f(0, s^f)}{\partial s^f} = \int_{R_j}^{y_{\text{sup}}} \ln[G^f(y)] g^f(y) [G^f(y)]^{s^f-1} dy < 0$$

2. Let us consider a job in sector j with $s^f > 0$ and $s^a > 0$ interviews. The probability that one of a type- i applicants is recruited on this job is

$$\begin{aligned} \Pr[m_i > m_{i'}] \Pr[m_i > R_j] &= \int_{R_j}^{y_{\text{sup}}} [G^{i'}(y)]^{s^{i'}} d[G^i(y)]^{s^i}, i' \neq i \\ &= \int_{R_j}^{y_{\text{sup}}} [G^{i'}(y)]^{s^{i'}} s^i g^i(y) [G^i(y)]^{s^i-1} dy \end{aligned}$$

where $g^i(y)$ stands for the derivative of function $G^i(y)$, m_i denotes the maximum output drawn by type- i applicants. This expression shows that the hiring probabilities depend on the cumulative distribution functions and on the number of applicants of each type. The probability of hiring for a type- i applicant is equal to the probability that a type- i applicant is recruited divided by the number of type- i applicants. Thus, we get, from the previous equation:

$$p_j^i(s^a, s^f) = \int_{R_j}^{y_{\text{sup}}} [G^{i'}(y)]^{s^{i'}} g^i(y) [G^i(y)]^{s^i-1} dy, i' \neq i.$$

Therefore, we get

$$p_j^f(s^a, s^f) - p_j^a(s^a, s^f) = \int_{R_j}^{y_{\text{sup}}} [G^a(y)]^{s^a} [G^f(y)]^{s^f} \left(\frac{g^f(y)}{G^f(y)} - \frac{g^a(y)}{G^a(y)} \right) dy$$

which is positive if

$$\frac{g^f(y)}{G^f(y)} > \frac{g^a(y)}{G^a(y)} \text{ for all } y \in [R_j, y_{\text{sup}}]$$

which corresponds to the assumption that $G^f(y)$ reverse hazard rate dominates $G^a(y)$. Note that the reverse hazard rate dominance implies that the difference in probability of hiring between French and North Africans is lower but remains positive when the number of interviews $s^a \rightarrow \infty$ and $s^f \rightarrow \infty$.

To analyze the consequence of increases in the number of applicants, we look at the derivative of the difference in hiring probabilities of French and North Africans with respect to the number of interviewed North African applicants:

$$\frac{\partial (p_j^f(s^a, s^f) - p_j^a(s^a, s^f))}{\partial s^a} = \int_{R_j}^{y_{\text{sup}}} \ln [G^a(y)] [G^a(y)]^{s^a} [G^f(y)]^{s^f} \left(\frac{g^f(y)}{G^f(y)} - \frac{g^a(y)}{G^a(y)} \right) dy \quad (\text{A6})$$

Increases in the number of North African applicants reduces hiring discrimination if this term is negative, i.e. if the difference between the probability of hiring after the interview for French and North Africans drops. This is necessarily the case if $G^f(y)$ stochastically dominates $G^a(y)$ according to the reverse hazard rate order.

Let us now look at increases in the reservation productivity R_j . We get

$$\frac{\partial (p_j^f(s^a, s^f) - p_j^a(s^a, s^f))}{\partial R_j} = - [G^a(R_j)]^{s^a} [G^f(R_j)]^{s^f} \left(\frac{g^f(R_j)}{G^f(R_j)} - \frac{g^a(R_j)}{G^a(R_j)} \right) \quad (\text{A7})$$

which is necessarily negative if $G^f(y)$ reverse hazard rate dominates $G^a(y)$. Therefore, the lower reservation productivity in the public sector vis-à-vis the private sector induces more discrimination at the hiring stage in the public sector than in the private sector.

A.7 Callback rates when French and North Africans apply differently to job ads: an example

Competition between applicants implies that the callback rates could depend on the distribution of applications across job offers. To put it differently, differences in callback rates between French and North Africans may arise absent any discriminatory beliefs because French and North Africans apply differently to job ads. To see this, let us consider a simple case, summarized in Table A6, with two jobs in the private sector, two jobs in the public sector, two French applicants and two North African applicants. Each individual sends two applications: one in the public sector and another in the private sector. Employers want to interview one applicant only on each job, without making any distinction between French and North Africans. Assume that job 1 in the private sector gets two applications from the two North Africans and one application from a French applicant while job 2 gets the application from the remaining French worker. The callback probability of French applicants is equal to 1/3 on job 1 and to one on job 2, which yields an average callback rate of 2/3. The callback probability of North Africans is equal to 1/3. It is smaller than that of French applicants because North African applications are concentrated on jobs that attract many applicants. If job 1 and job 2 attract the same number of French and North African applicants in the public sector, their callback rates are identical. Therefore, differences in callback rates across sectors may arise from differences in the distribution of applications across job offers, absent any differences in the discriminatory behavior of employers.

Table A6: Impact of differences in application strategies of North Africans in the public and private sectors

	Private sector		Public sector	
	Job 1	Job 2	Job 1	Job 2
Applicants	f, a	f, a	f, a, a	f
North Africans invitation probability	1/2	1/2	1/3	-
French invitation probability	1/2	1/2	1/3	1

Note: Applicants stands for the number of applicants of each type. f means one French applicant and a means one North African applicant. Job 1 of the private sector has 1 French applicant and 1 North-African applicant. Since employers call back only one applicant without discriminating, the probability of invitation of each applicant is equal to 1/2 on this job.

A.8 Wage and productivity distributions of French and North Africans

This appendix presents the estimation of the distributions of productivity of French and North African applicants, conditional on education, experience, region of residence and family situation. The productivity distributions of North African and French applicants, $G^j(y)$, $i = a, f$, are estimated assuming that wages in the private sector are determined by the bargaining solution described equation (1):

$$w(y) = \begin{cases} z + \beta(y - z) & \text{if } y > \bar{y} \\ w_{\min} & \text{if } y \in [w_{\min}, \bar{y}] \end{cases} ,$$

where $\bar{y} = \frac{w_{\min} - (1-\beta)z}{\beta}$, and that the same wage function $w(y)$ applies in the public sector. Therefore, we estimate the distributions of productivities derived from this equation, which yields

$$y = \frac{w(y) - z(1 - \beta)}{\beta} \text{ if } w(y) > w_{\min} \text{ and } y \leq \frac{w_{\min} - z(1 - \beta)}{\beta} \text{ otherwise} \quad (\text{A8})$$

In the benchmark estimations, it is assumed that $\beta = 0.5$ and that the income of individuals on the dole, z , is equal 50% of the average wage. To consider a population similar to that of our correspondence study, we use data from the 2008-2017 waves of the French Labor Force Survey in order to get a sufficient number of observations. In line with our correspondence study, the analysis is restricted to young males, below 30 years of age who have completed their initial education, whose level of education is below high school diploma, with French nationality and born in France. North Africans are defined as individuals born in France both of whose parents were born in countries of North Africa (Algeria, Morocco, Tunisia) while French are defined as individuals both of whose parents were born in France.

To the extent that our estimation of productivity distributions relies on the distribution of wages, we start by presenting some descriptive evidence about wages of North Africans and French in the public and the private sectors before proceeding to the presentation of the estimation of productivity distributions.

A.8.1 Empirical evidence about wages

We first analyze the wages in the public and in the private sectors. The analysis is limited to the monthly wage of full time workers in order to avoid important measurement errors. To compare wages conditional on individual characteristics, we run standard Mincer earnings regressions, where the log-wage is the dependent variable and explanatory variables include the number of years of education, the number of years of labor market experience, dummies for the household composition and fixed effects for the region of residence and for the year.

To account for the presence of the minimum wage, the wage distribution is left-truncated at the minimum wage level and log wages are estimated with the maximum likelihood method. Note that we use this strategy because there is no discontinuity in the wage distribution at exactly the minimum wage with the Labor Force Survey data (see Laroque and Salanié, 2002, for a discussion of this issue). Another strategy could be to assume that wages are contaminated by measurement errors. However, the main source of measurement errors below the minimum wage is likely due to the fact that there are many jobs the status of which allows the employers to circumvent the minimum wage regulation, especially for young workers. Insofar as the status of these jobs is not well reported in the Labor Force Survey, many observations are below the minimum wage. Since these jobs are generally subsidized, it is more appropriate to discard the information from these observations and to truncate the wage distribution at the minimum wage to infer the distribution of productivities from the distribution of wages.

Table A7, columns (1), (2) and (3) show that the log monthly wages of French, North African and of the whole population of French and North Africans are not significantly different in the public and in the private sectors, conditional on the observable characteristics taken into account in this Table. Column (4) shows that North Africans face a wage penalty in the private and in the public sectors. The coefficient associated with the public sector is larger in absolute value, but not significantly different from the private sector coefficient (p -value = 0.18).

A.8.2 Productivity distributions

In order to estimate the wage distributions of French and North African workers conditional on characteristics accounted for in Table A7, we compute the residuals from the regression of log monthly wages for all workers, corresponding to the regression reported in column (3) of Table A7. Once we have computed the residuals from the regression of log wages, we define the wage level of a French person as the mean wage of the whole sample times the exponential of his residual and the wage level of a North African as the mean wage of the whole sample times the exponential of his residual. Then we compute the productivity y of each individual from equation (A8). We assume that productivities y are lognormally distributed; the distribution of y is Log- $\mathcal{N}(\mu^i, \sigma^i)$, $i = a, f$. We do so for consistency with the theoretical model, which assumes that the productivity distribution has a finite upper bound, so that the productivity distribution is right-truncated at an arbitrary upper bound, equal to 10^6 . Moreover, we estimate distributions left-truncated at R_r , i.e. for $w(y) > w_{\min}$. The estimation of the productivity distribution of French workers yields $\mu^f = 7.70$ (standard error = 0.004), $\sigma^f = 0.287$ (standard error = 0.003); and that of North Africans: $\mu^a = 7.65$, (standard error = 0.015), $\sigma^a = 0.292$ (standard error = 0.010). The fit of the estimations of the productivity distributions are displayed on Figure A8. These estimates are used to yield Figure 4.

Table A7: Wage equations

	(1)	(2)	(3)	(4)
Public	-0.00290 (0.00999)	-0.0371 (0.0253)	-0.00437 (0.00947)	-0.00261 (0.0100)
North African				-0.0260*** (0.00859)
North African \times Public				-0.0322 (0.0279)
Education	0.0409*** (0.0105)	0.0136 (0.0215)	0.0377*** (0.00957)	0.0378*** (0.00959)
Education ²	-0.000593** (0.000281)	0.000161 (0.000587)	-0.000504* (0.000257)	-0.000503* (0.000258)
Experience	0.0223*** (0.00311)	0.0291*** (0.00825)	0.0228*** (0.00290)	0.0230*** (0.00291)
Experience ²	-0.000223 (0.000207)	-0.000667 (0.000545)	-0.000271 (0.000193)	-0.000268 (0.000193)
Observations	10,991	1,215	12,206	12,206

Note: Public is a dummy equal to one if the person is employed in the public sector. North African is a dummy equal to one if the individual is of North African origin and to zero if he is of French origin. Education is the number of years of education and Education² is the squared number of years of education. Experience is the number of years of labor market experience; Experience² is the squared number of years of labor market experience. In column (1): French only; In column (2): North Africans only; In column (3): French and North Africans; In column (4): French and North Africans, the explanatory variables are the North African variable interacted with the Public variable (French in the private sector is the reference group), and other control variables indicated in the table. All regressions include region fixed effects and year fixed effects, as well as dummies for household composition. Regressions are truncated at the minimum wage using maximum likelihood. Robust standard errors are reported in parentheses. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent. Source: Enquête emploi (INSEE) 2008-2017.

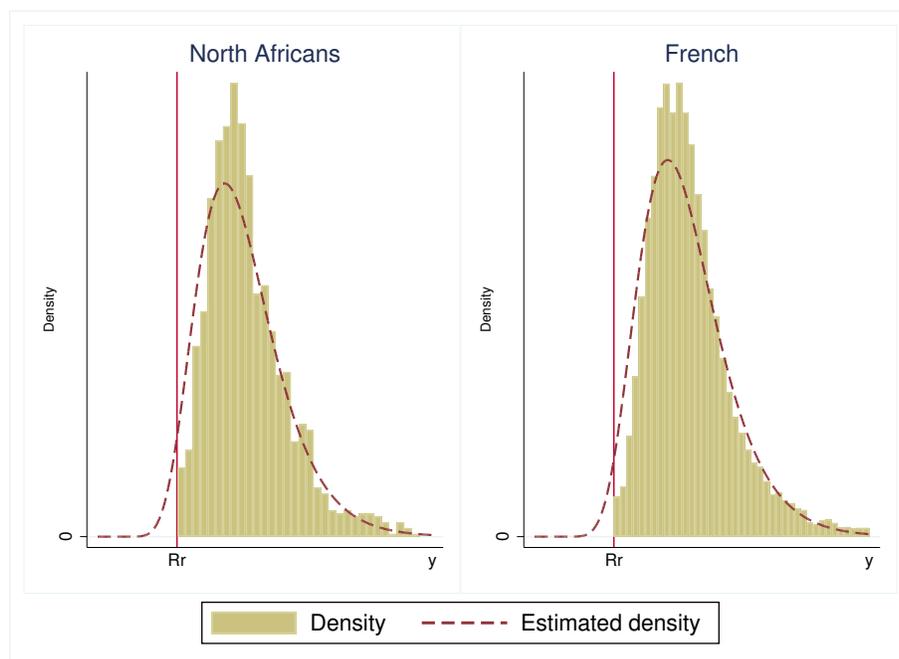


Figure A8: Fit of the estimations of the log-normal distributions of the productivity distributions of North Africans and French

A.10 Examples of applications

Application email messages

For the type 1 application, the email message was the following :

Dear Madam, Dear Sir,

Following your offer XXX for a job of YYY, I am pleased to send you my application.

Please find enclosed my cover letter and my resume.

Yours sincerely,

ZZZ

For the type 2 application, the email message was the following :

Dear Sir/Madam,

I am pleased to submit my application for the position YYY following your offer XXX published on the Pôle Emploi website.

My CV and my cover letter are enclosed.

Yours faithfully,

ZZZ

Type 1 application :

Alexandre Martin
5, rue du Général Logerot
01000 Bourg-en-Bresse
Phone: 07 60 64 10 54
alexandre.martin.0895@gmail.com

Date xxxxx

Subject: Application for a position of reception officer

Dear Madam, Dear Sir,

Your advertisement for the recruitment of a home agent, published on the Pôle Emploi website, caught my attention.

Having taken the training to obtain the professional baccalaureate "Home- customer and user relationship", I have developed good communication skills and acquired the techniques required to welcome a varied audience.

My experience as a mailbox distributor for Adrexo has also led me to be self-directed and organized. Likewise, as a volunteer for an association offering activities for children, I was able to show good interpersonal skills with other volunteers.

In addition, I wish to say that I have good knowledge of office tools, so I can easily adapt to your information and communication systems.

I would like to use my skills within your organization and I am at your disposal for any further information.

Thanking you for your attention, I beg you to believe, Madam, Sir, in the assurance of my best regards.

Alexandre Martin

Alexandre Martin

5, rue du Général Logerot, 01000, Bourg-en-Bresse

alexandre.martin.0895@gmail.com

Tél: 07 60 64 10 54

Born 23/08/1995, Paris

Nationality: French

Single

Professional experience

June 2014-July 2014 **Distributor through mailboxes**
Adrexo
Type of contract: CDD, 2 months

Education

2012-2014 Preparation of Baccalauréat professionnel "Accueil- relation clients et usagers"
2012 Brevet des collèges

IT and languages

Software Word, Excel, Internet
Languages English: beginner (speaking and writing)

Complementary information

Driving licence

Interests

Swimming, running
Volunteer for an association offering activities for children

Application reply email messages

Type 1 reply to the employer who contacted the applicant :

Dear Madam, Dear Sir,

Thank you for your reply to my application. Nevertheless, I have just accepted another employment offer.

Yours sincerely,

ZZZ

Type 2 reply to the employer who contacted the applicant :

Dear Sir/Madam,

Thank you for your interest in my application. However, I cannot give you a positive answer. I have just accepted another job proposal.

Yours faithfully,

ZZZ