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***Jumping the Queue: Nepotism and Public-Sector Pay***

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# JUMPING THE QUEUE: NEPOTISM AND PUBLIC-SECTOR PAY\*

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## Abstract

We set up a model with search and matching frictions to understand the effects of employment and wage policies, as well as nepotism in hiring in the public sector, on unemployment and rent seeking. Conditional on inefficiently high public-sector wages, more nepotism in public-sector hiring lowers the unemployment rate because it limits the size of queues for public-sector jobs. Public-sector wage and employment policies impose an endogenous constraint on the number of workers the government can hire through connections.

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**Keywords:** Public-sector employment; nepotism; public-sector wages; unemployment.

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# 1 Introduction

Governments hire workers to produce public goods, but they do not face the same competitive forces as private firms. As a result, governments use their employment and wage policies to accomplish a multitude of goals: to attain budgetary targets [Gyourko and Tracy (1989)]; to implement a macroeconomic stabilization policy [Keynes (1936)]; to redistribute resources [Alesina, Baqir, and Easterly (2000)]; or to satisfy interest groups for electoral gains [Gelb, Knight, and Sabot (1991)]. This paper builds on the observation that, in several countries, government hiring practices are sometimes based on nepotism.

We define nepotism as the restriction that some jobs in the public sector are reserved for a subset of workers that have political or personal connections. By having access to this subset of jobs, some workers can use their connections to “jump the queue” and find jobs in the public sector faster. Throughout the paper we will sometimes call this non-meritocratic hiring. One dimension that is common to all countries is political appointments. Whenever there is a change in government, there is a subsequent turnover of jobs. The report *Government at a Glance* by OECD (2017) highlights the cross-country differences in staff turnover following a change of government. In countries such as Germany and the UK, there is little turnover, and the changes are mainly in advisory posts. In countries such as Greece and Spain, the turnover extends to layers of senior and middle management. A second dimension is the influence that politicians or civil servants use to hire friends or family members. Besides vast anecdotal evidence of such practices, it is also backed by survey evidence.<sup>1</sup> We analyse data from the *Quality of Government Survey* and the *European Quality of Government Index* and find that these practices are present in the public sector, more than in the private sector, and that they vary widely across European countries. In particular, we find that they are more prevailing in countries with higher public-private sector wage differentials.

Our objective is to study the interaction between public-sector policies, nepotism and unemployment. First, we want to understand the effects of nepotism in the public sector on unemployment. We find a silver lining to nepotistic hiring. Although it is inefficient and is absent in the first-best equilibrium, conditional on inefficiently high public-sector wages, more nepotism lowers the unemployment rate by shortening the queues for public-sector jobs and increasing employment in the private sector. Second, we want to understand how public-sector employment and wage policies influence incentives to use political and personal

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<sup>1</sup>The anecdotal evidence is particularly widespread in Southern European or developing countries, but not exclusively. Recently, the United States president hired his daughter and son-in-law, and a leading French presidential candidate was found to have put his wife, son and daughter employed on the public payroll.

connections to get a public-sector job. We show that nepotism only exists if public-sector wages are too high and that it could be restricted if the government sets the optimal wage.

Given the amount of anecdotal and survey evidence of such practices, it is perhaps surprising the limited research documenting evidence of nepotism or cronyism in the public sector. Scoppa (2009) finds that the probability of working in the public sector in Italy is 44 percent higher for individuals whose parent also works in the public sector. Durante, Labartino, and Perotti (2011) find a higher concentration of last names in universities in Italy relative to the overall population, and that this concentration increased in regions with low civic capital, after a reform decentralizing the university hiring choices. Martins (2010) finds that in Portugal, between 1980 and 2008, over the months preceding an election, appointments in state-owned firms increased significantly compared to private-sector firms. Hiring also increased after elections, but only if a new government took office. Fafchamps and Labonne (2014) find that, following the 2007 and 2010 municipal elections in Philippines, individuals who shared one or more family names with a local elected official were more likely to be employed in better-paying occupations, compared to individuals with the losing candidates' family names. The magnitude of the effect is consistent with preferential treatment of relatives as managers in the public sector. Although these papers provide suggestive evidence of nepotism and cronyism in the public sector, they do not give an unequivocal answer. Given the nature of this activity, it is difficult to design an empirical strategy that identifies clearly non-meritocratic hiring in the public sector, let alone to measure its effects.

We study the conditions that allow for nepotism in hiring in the public sector, and its consequences, from a theoretical angle. We set up a search model in which workers can search for jobs in either the private or the public sector. Employment and wages in the private sector are determined through the usual channels of free entry and Nash bargaining. This ensures that, in the private sector, job-finding rates reflect nothing but match surplus so that identical workers have equal chances of finding a job. In the public sector, by contrast, employment and wages are exogenous. We account for the possibility of nepotism or cronyism in hiring workers in the public sector by assuming that job seekers can use their personal relationships and connections to find a public-sector job. We assume that prior to entering the labor market, workers can pay a cost to get “connections” that is drawn from an exogenous distribution across workers. In our setting, nepotism means that the government reserves some of its jobs for workers with those connections. Under such practices, in equilibrium, workers with connections can more easily find public-sector jobs than similar workers that do not have connections.

This paper contributes to the recent labor market search literature that analyzes the role and effects of public-sector employment and wages. Burdett (2012) includes the public

sector in a job-ladder framework where firms post wages. Bradley, Postel-Vinay, and Turon (2017) further introduce on-the-job search and transitions between the two sectors to study the effects of public-sector policies on the distribution of private-sector wages. Albrecht, Robayo-Abril, and Vroman (2017) consider heterogeneous human capital and match specific productivity in a Diamond-Mortensen-Pissarides model. Michailat (2014) shows that the crowding-out effect of public-sector employment is lower during recessions, giving rise to higher government spending multipliers. Navarro and Tejada (2018) analyse the interaction between public-sector employment and the minimum wage. These papers' objective is to determine how public-sector employment and wage policies affect private employment, the unemployment rate and private wages. They assume that the unemployed randomly search across sectors, and, hence, public-sector policies affect the equilibrium only by affecting the outside option of the unemployed and their reservation wage.

Hörner, Ngai, and Olivetti (2007) study the effect of turbulence on unemployment when wages in the public sector are insulated from this volatility. Quadrini and Trigari (2007) analyze the effects of exogenous business cycle rules on unemployment volatility. Gomes (2015) emphasizes the role of public-sector wage policy in achieving the efficient allocation, while Afonso and Gomes (2014) highlight the interactions between private and public wages. Gomes (2018) examines the heterogeneity of public-sector workers in terms of education. These papers assume that the two sectors's labor markets are segmented, and that the unemployed choose which of the sectors to search in, depending on the government's hiring, separation and wage policies.

We add to this literature by also considering the choice of finding a public-sector job through connections and by analyzing how government policies affect this rent-seeking activity. Moreover, while, in our benchmark model, we assume segmented markets, we also contrast the transmission mechanism and our results with those from a model with random search across sectors. We prefer the assumption of segmented markets because it portrays a realistic mechanism of selection into the public sector, documented empirically by Nickell and Quintini (2002) or experimentally by Bó, Finan, and Rossi (2013), lying at the heart of current policy discussions. High public wages attract many unemployed to queue for public-sector jobs. Conversely, if public wages are too low, few unemployed search in the public sector, which then faces recruitment problems.

Our first main finding is perhaps surprising. Conditional on inefficiently high public-sector wages, more nepotism in the public sector lowers the unemployment rate. When the value of a public-sector job is higher than that of a private-sector job (because of either high wages or a low separation rate), more of the unemployed queue for these jobs, moving away from the private sector. If most of these jobs are available only through connections,

fewer unconnected unemployed are going to queue for public-sector jobs and will search for private-sector jobs instead. Although it fosters an inefficient rent-seeking activity, the recruitment through connections mitigates the adverse effects that high public-sector wages have on employment. The evidence from survey data, shown in Section 2, is consistent with this result.

A corollary of this first result is that, although it entails itself a cost, nepotism might reduce the welfare losses of inefficiently high public-sector wages. In the numerical exercise in Section 7, in a model with segmented markets higher non-meritocracy raises welfare, while in a random search model, although it also lowers unemployment, the effects on welfare are sometimes negative. These effects on welfare still ignore the fact that non-meritocratic hiring might also be reflected on lower productivity in the public sector. This would entail further negative effects on welfare. The measurement of these effects, is itself complicated and is not the purpose of the paper. Our analysis is centered on the labour market and the effects on unemployment. As such we consider that workers are homogeneous with respect to education or ability, and focus only on the advantage of connected workers of jumping the queue - have higher job-finding rates for government jobs.

Although the mechanism is different, this result echoes those found in papers studying referrals – e.g., Horvath (2014) Galenianos (2014) or Bello and Morchio (2017) – which have focused exclusively on the private sector. These papers argue that social networks can improve the matching process by working as an information channel or increasing the efficiency of search. We argue that hiring through connections works differently in the public sector. In the private sector, free entry of firms ensures that the gains of alternative hiring channels translate into job creation, and wage bargaining guarantees that the surplus generated is shared between firms and workers. On the contrary, we view the public sector as having a fixed number of jobs that are safer and better paid, which induces workers to find alternative ways to get them. The mechanism does not involve a better search technology or better information about vacancies, but the knowledge that some vacancies are reserved for a subset of workers with connections. While this helps shorten the queues for public-sector jobs, it does not improve or worsen the match quality, an aspect that is absent in our setting.

Focusing on the public rather than the private sector allows us to understand how policies affect non-meritocratic hiring. In our setting, the government can hire through connections, provided that it pays high enough wages to attract enough searchers. In other words, government employment and wage policies impose an endogenous limit on how many workers it can hire through connections. The constrained-efficient allocation can be achieved with an optimal public-sector wage that simultaneously limits the queues for public-sector jobs and makes it impossible to hire through connections. This second result is supported by the

evidence from the survey data that non-meritocracy in the public sector is associated with higher public-sector wages. It rationalizes why evidence of nepotism in the public sector is common in Southern European countries, in which public sectors pay substantial premia relative to the private sector, while it is absent in Nordic countries, which tend to pay a negative public-sector wage premium.

The paper is structured as follows. Section 2 presents the survey evidence on public-sector hiring practices. Section 3 presents the model economy with two sectors and search and matching frictions. Section 4 describes the main results of the paper. Section 5 examines the constrained-efficient allocation and how the social planner can achieve it. Section 6 analyzes the robustness of the results to three alternative settings, with particular emphasis on the assumption of random search between the private and public sectors. In Section 7, we parameterize the model to the Spanish economy and perform some numerical exercises. Section 8 concludes.

## 2 Survey evidence

While the economics literature on nepotism in the public sector is limited, there is a compelling survey evidence suggesting that the hiring practices of the government are non-meritocratic in several countries. This survey evidence is commonly used in the political science literature focussing on corruption, such as Charron et al. (2017). We use data from two of such surveys.

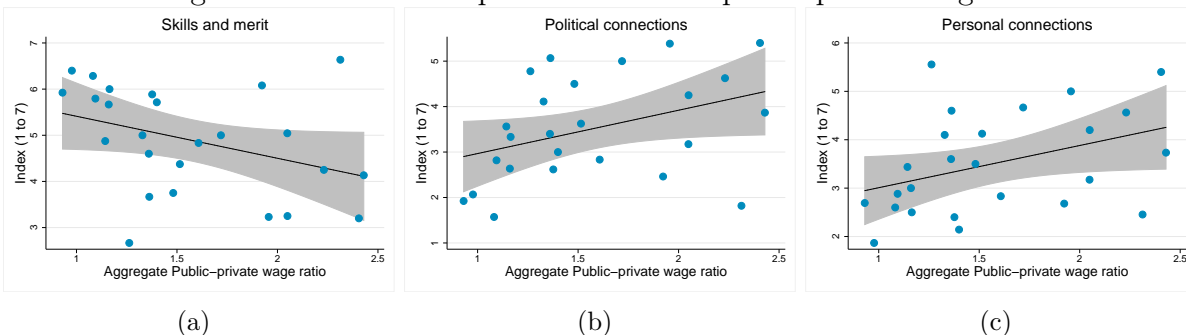
### 2.1 Quality of Government Survey

The first one is the *Quality of Government Survey* (QoG). This is a survey of 1294 public sector experts in 159 countries. They ask experts on the structure and behavior of public administration, such as, hiring practices, politicization, professionalization, and impartiality. See Dahlström et al. (2015) for a description of the dataset.

We use three questions in a section regarding recruitment and careers of public employees. The survey asks the experts whether when recruiting public-sector workers, the (a) skills and merits of the applicants decide who gets the job, (b) political connections decide who gets the job, or (c) personal connections of the applicants (for example kinship or friendship) decide who gets the job. The experts are asked to rate from 1 (hardly ever) to 7 (almost always).

We focus on 30 European countries. A table with the scores by country is in Appendix F. The average score for “skills and merits” is 4.9, varying from 2.7 to 6.6. The average scores for

Figure 1: Recruitment practices and the public-private wage ratio



Source: Indexes of recruitment practices are taken from the Quality of Government Survey. Data on government and private sector employment is from EUROSTAT and OECD. Data on government wage bill and private sector wage bill is from AMECO. See data in Appendix F.

“political” or “personal” connections” are around 3.5, varying from 1.57 to 5.5. As expected, skills matter in hiring workers in the public sector, but what is perhaps more noteworthy is that experts consider political and personal connections to be also important in deciding who gets hired in the public sector. There is, however, a large variation in recruitment practices. In seven countries - Italy, Portugal, Cyprus, Bulgaria, Hungary, Romania and Slovakia - the score for “skills and merit” is lower than both other scores. The 8 countries where the score of skills and merits is highest includes the Nordic countries (Denmark, Finland, Sweden and Norway) plus Luxembourg, Switzerland, Netherlands and Ireland. In those countries, the average index for political or personal connections is lower than 2.5.<sup>2</sup>

These differences in the role of political or personal connections are related to public-sector wages. We use aggregate data to calculate an average public-private wage ratio. Using OECD and AMECO data, we calculate the government’s wage bill over the size of government employment relative to the private sector wage bill over the size of private-sector employment. Figure 1 shows the relation between the three indexes of recruitment practices and the public-private wage ratio. As one can see higher average wages in the public sector is associated with recruitment practices less based on merit (a correlation coefficient of -0.4) and more based on political and personal connections (correlation of 0.4).

<sup>2</sup>While there is a substantial variation in recruitment practices across European countries, there are even larger variation across the other 129 countries. As shown in Appendix F, only in Western Europe and North America, East Asia and The Caribbean the score for “skills and merits” is higher than “personal connections”. In the remaining 100 countries, personal and political connections matter more than skills and merits when recruiting public-sector workers. Non-meritocratic practices seem to be more widespread Sub-Saharan Africa, South Asia and Latin America with average scores above 4.5.



## 2.2 European Quality of Government Index

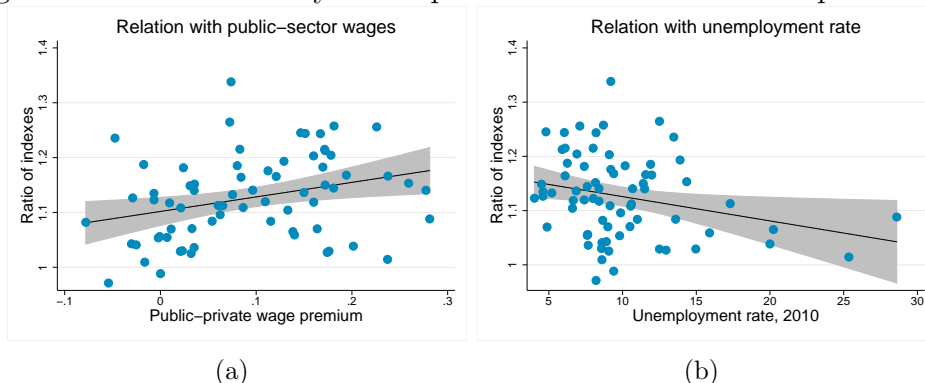
The second survey is based in an EU regional level governance survey, used to construct the *European Quality of Government Index* (EQI). The survey was first ran in 2010 and then repeated in 2013 and 2017. The index focusses on both perceptions and experiences with public-sector corruption, along with the extent to which citizens believe various public sector services are well allocated and of good quality. See Charron et al. (2014).

An advantage of this survey is the more disaggregated level of information at a regional level - NUTS 1 and 2 - albeit for only 21 countries. The disadvantage is the absence of a specific question about recruitment. Instead, the survey asks a more general question on whether workers in the public sector can succeed, varying from 1 (“most people can succeed if they are willing to work hard”) to 10 (“Hard work is no guarantee of success – it’s more a matter of luck and connections”). Interestingly, it also asks the same question about the private sector where the score also varies between 1 to 10.

The average score at country level is 5.6 for the private sector and 6.4 for the public sector, suggesting non-meritocracy is a more relevant problem there. The six countries with lower score for the public sector (more meritocratic) are Austria, United Kingdom, Germany, Denmark, Finland and Sweden. The six countries with higher score for the public sector (less meritocratic) are Bulgaria, Greece, Croatia, Slovakia, Romania and Portugal. The correlation between the scores of the public and private sector is high (0.8), suggesting the behavior in the two sectors go in parallel. As such, we create a new relative index of non-meritocracy, which is the ratio of the score of the public relative to the private sector.

We correlate this index with a measure of public-sector wage premium and of unemploy-

Figure 2: Non-meritocracy in the public sector relative to the private sector



Source: The y-axis has the ratio of the index for the public over the index for the private. A number larger than 1 means the public sector is perceived to be less meritocratic than the private sector. Both indexes are taken from European Quality of Government Index dataset. The public-sector wage premium is estimated with microdata from the 2010 Structure of Earnings Survey. Unemployment rate is taken from Eurostat.

ment rate. The public-sector sector wage premium at a regional level is estimated using microdata from the 2010 *Structure of Earnings Survey*. Relative to the aggregate measures of public-sector premium, these regressions allow us to control for the characteristics of public-sector workers. Following the literature estimating public sector wage differentials, i.e. Katz and Krueger (1991), Disney and Gosling (1998) or Christofides and Michael (2013), we regress the log of the gross hourly wage on a gender dummy, region, age, education, occupation and a part-time dummy. We include a public-sector dummy interacted with the available region that measures the public-sector wage premium. Some small countries do not have the regional (NUTS 1) identifiers, while for other countries the NUTS 1 are aggregated into larger regions. We end up with 70 observations.

The first graph in Figure 2 shows that the positive association between non-meritocracy and wages that existed at a country level is also present at a regional level. Notice that the non-meritocracy index is larger than 1 in all but two observations, meaning that it is perceived as more widespread in the public sector. The second graph shows a negative association between non-meritocracy in the public sector and unemployment that is predicted with our model. We claim that hiring based on connections limits the negative effect on unemployment by reducing the queues for public-sector jobs, particularly when public-sector wages are high.

We show this association more rigorously in Table A3. Columns (1) and (2) reflect

Table 1: Regression of the ratio of indexes of non-meritocracy

	Baseline variables			Alternative variables		
	(1)	(2)	(3)	(4)	(5)	(6)
Public-sector wage premium	0.265** (2.62)		0.384*** (3.74)	0.723*** (4.48)	3.484*** (3.81)	0.459** (2.22)
Unemployment rate		-0.003* (-1.71)	-0.006*** (-3.12)			
× High public wage				-0.009*** (-4.16)	-0.038*** (-2.98)	-0.010*** (-3.51)
× Low public wage				-0.002 (-0.95)	0.000 (0.02)	-0.006* (-1.86)
Observations	70	70	70	70	70	70
R-squared	0.09	0.041	0.207	0.283	0.194	0.169

*Notes: The t-statistics are shown in brackets. \*\*\* indicates significance at the 1% level, \*\* at 5% level, and \* at the 10% level. The dependent variable is the ratio of the non-meritocracy index for the public sector over the index for the private sector. It increases when the public sector is perceived to be less meritocratic than the private sector. The index is constructed with data taken from European Quality of Government Index dataset. The public-sector wage premium is estimated with microdata from the 2010 Structure of Earnings Survey. Unemployment rate is taken from Eurostat. In column (5) we use an alternative index which is the difference between the index for the public over the index for the private. In column (6) we use an alternative index which is the ratio between the index for the public sector (answer by only public sector workers) over the index for the private sector (answered by only private sector workers).*

the association shown in Figure 2. When regressing our index on both variables, both are statistically significant at 1 percent, as shown in column (3). In column (4) we interact unemployment rate with dummies for countries above and below the median public-sector wage premium. The negative relation with unemployment rate is only present in countries with high public-sector wages. In columns (5) and (6) we calculate our index in a different way. In column (5) we calculate the index in differences of public and private sector scores, rather than in ratio. In column (6) we calculate the public-sector score based only on respondents working in the public sector and the private sector score based on respondents working in the private sector only, before computing the ratio. In both alternatives we have similar results. In Appendix F, we show the regressions of unemployment rate on public-sector wages and the index of non-meritocracy. Mirroring the results in this table, it shows that unemployment is negatively associated with non-meritocracy in the public-sector, particularly when its wages are high.

The evidence in this section, based on survey data, finds a positive association between public-sector wages and nepotism and a negative association with between nepotism in the public sector and the unemployment rate, stronger in regions with higher public-sector wages. Clearly, the association between these variables can have several explanations. Given the problems to design an empirical strategy that identifies nepotism in the public sector and its effects, we develop a model that provides one interpretation of these associations.

### **3 Model with nepotism in the public sector**

#### **3.1 Preliminary considerations**

The defining characteristic of the public sector is that it does not sell its goods or services - it supplies them directly to the population. There is no market price. Governments finance employment, not by selling goods, but by using the power of taxation. As such, the public sector does not have shareholders and it does not maximize profits. The decisions regarding employment reflect different government objectives. Even in determining public-sector wages (or wage growth) there is a discretionary component that can create widely documented wage differentials vis-à-vis the private sector. As such, the usual mechanisms that drive the private sector adjustments studied by economists do not map into the public sector.

Our modeling choices reflect this view of the public sector. We discuss two particular assumptions. As in other papers in the literature on public-sector employment, i.e. Bradley, Postel-Vinay, and Turon (2017) or Albrecht, Robayo-Abril, and Vroman (2017), we assume that the government wage is exogenous. We view the public-sector wages not as an equi-

librium outcome (i.e. private wages) but a policy variable (i.e. unemployment benefits or government spending). Notice that public-sector wages is a payment in units of private-sector goods (financed with taxation), not in units of public-sector goods, hence they are not necessarily dependent on the (marginal) productivity of the public sector. Public-sector wages might be influenced by several factors, such as unions, redistribution or elections. We do not take a stance as to why public-sector wages are high or low. We take them as exogenous and compare them with the optimal wage. Also, we assume that for the public sector to function, it requires an exogenous number of public-sector workers. The only role of the government is to maintain its level of employment constant.

The second assumption is that we consider homogeneous workers in terms of education, ability and productivity. We do not take a stance as to whether connected workers are more or less productive than other public-sector workers. A common argument is that workers that get jobs through connections are of worse quality. This would be reflected on the quality of the public-sector. To measure this, we would need a metric on the productivity of the public sector and of workers in the public sector, as well as the value of public-sector services. We think that such endeavour would require too many assumptions that would not be consensual nor based on evidence. Furthermore, as the public sector is a large-scale employer in the economy, our focus is on its effects on the labour market and unemployment, which we believe are of first-order importance. Notwithstanding, we should keep in mind, when analysing the welfare results, that non-meritocracy could have an extra negative effect on welfare due to lower quality of public-sector output.

## 3.2 General setup

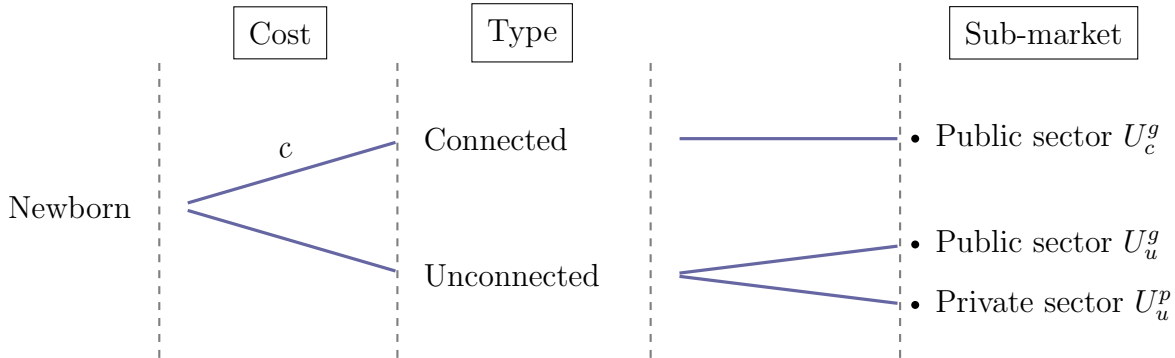
We consider a search and matching model with private-sector firms and a public sector. Workers can be either employed and producing or unemployed and searching for a job. Each private-sector firm is endowed with a single vacancy that can be vacant or filled (job). At each instant,  $\tau$  individuals are born (enter the labor market) and die (retire) so that the working population is constant and normalized to unity. All agents are risk-neutral and discount the future at a common rate  $r > 0$ , and time is continuous.

All individuals, prior to entering the labor market, can obtain connections by paying a cost  $c$ . The cost is distributed across individuals according to the cumulative distribution function  $\Xi(\cdot)$  on  $[0, \bar{c}]$ . If a family member works in the public sector, the cost of connections is low. If getting connections requires the affiliation with a political party, it is more costly. Some jobs in the public sector are reserved for workers with connections. By obtaining connections workers can gain access to these “connected” jobs and thus have priority – a

higher job-finding rate – for public-sector jobs.

An endogenous proportion of the population (those whose connection cost is sufficiently low) become “connected”. For a connected individual, using his/her connections to find a job in the public sector job, i.e., searching for a connected public-sector job, strictly dominates all other options. But, if an individual is unconnected, then she has a further decision of whether to search for jobs in the private sector or for jobs in the public sector through standard search in the market.<sup>3</sup> The two sectors are segmented. In Section 6.1, we consider the case in which workers without connections search randomly for jobs in both sectors. Figure 3 depicts these choices. In total, there are three active markets: the private sector and the two public-sector submarkets, one for connected and one for unconnected workers. Variables are indexed by the superscript  $x = [g, p]$ , where  $g$  refers to the public (government) sector and  $p$  to the private sector, and the subscript  $j = [c, u]$ , where  $c$  refers to connected and  $u$  to unconnected. A searching (unemployed) worker receives a flow of income  $b$ , which can be considered the opportunity cost of employment.

Figure 3: Decision of newborn



### 3.3 The Private sector

The private and public sectors differ in two aspects: hiring practices and wage-setting. The rate at which workers are hired into private-sector jobs is endogenous and depends on firm profits and job entry. In particular, firms open vacancies and search for suitable workers until all rents are exhausted. The rate at which workers find private-sector jobs depends positively on the tightness,  $\theta = \frac{v^p}{u^p}$ , where  $v^p$  is the measure of private-sector vacancies, and  $u^p$  is the

<sup>3</sup>Throughout the paper, we use the terms “connected jobs/vacancies” to refer to the jobs that the government reserves for job seekers with connections. We use the term “unconnected jobs/vacancies” to refer to the rest of the government jobs that are filled by workers without connections through standard search in the market. Moreover, we use the terms “connections sector” and “no-connections sector” to refer to these two public sub-sectors.

number of workers that are unemployed and searching in the private sector. Workers are hired into private-sector jobs at Poisson rate  $m(\theta)$ , and private-sector firms fill vacancies at rate  $q(\theta) = \frac{m(\theta)}{\theta}$ .

The output  $y$  of a match between a worker and a firm is independent of the “connections” status. Wages in the private sector, denoted as  $w^p$ , are determined by Nash bargaining, such that the worker gets a share  $\beta$  of match surplus while the rest goes to the firm. With higher match surplus, firms expect to generate larger profits from creating jobs; firm entry is higher; and workers can more easily find jobs and also earn higher wages. Hence, the private-sector hiring and wage-setting procedures are, in a sense, meritocratic. Equally productive individuals have equal chances of finding private-sector jobs and equal wages that reflect nothing but their productivity (match surplus).

A vacant firm bears a recruitment cost  $\kappa$ , related to the expenses of keeping a vacancy open and looking for a worker. When a vacancy and a worker are matched, they bargain over the division of the produced surplus. The surplus that results from a match is known to both parties. After an agreement has been reached, production commences immediately. Matches in the private sector will dissolve at the rate  $s^p$ . Following a job destruction, the worker and the vacancy enter the market and search for a new match.

### 3.4 Government

In the public sector, by contrast, policies are taken to be exogenous. To produce some government services, the government hires an exogenous number of workers. In each period, the government has to hire enough workers to replace the workers that exogenously separate or retire. That means hiring  $(s^g + \tau)e^g$  workers, where  $s^g$  is the separation rate. A fraction  $\mu$  of jobs are reserved for workers who have connections.

The matching function in the public sector is  $M_j^g = \min\{v_j^g, u_j^g\}$ . To maintain its employment level, the government must be able to attract a number of searchers in each segment,  $u_j^g$ , at least equal to the number of job openings,  $v_j^g$ , meaning that  $M_j^g = v_j^g$ . Otherwise public-sector services break down. As we will show in Lemma 2, this imposes a condition on public-sector wages to be high enough to attract at least the same number of searchers as of vacancies. We choose this particular functional form for public-sector matching technology for simplicity and clarity. First, it makes the concept of queues in the public sector clearer. When there are more unemployed than vacancies, the vacancy filling rate for the government is 1, and all the unemployed in excess are queuing. As we will show, this makes the efficient wage a very clear and intuitive object, easy to calculate. Second, such assumption has been used in other papers, i.e. Quadrini and Trigari (2007) and there is evidence that the elas-

ticity of matches with respect to unemployed is much lower in the public sector than in the private (Gomes (2015)). This does not mean that there are no matching frictions, only that they are one-sided. Nothing substantial would change in the model if the matching function in the public sector were Cobb Douglas:  $M_j^g = (v_j^g)^\eta (u_j^g)^{1-\eta}$ . In this case, the vacancy filling probability of the government would no longer be 1, and it would need to set the vacancies endogenously such that the total number of matches would equate exactly the number of workers that retire or separate. Solving for  $v_j^g$  we would obtain  $v^g = (M_j^g)^{\frac{1}{\eta}} / (u_j^g)^{\frac{1-\eta}{\eta}}$ , but the job-finding of unemployed would be the same. Hence, our main results, detailed in Section 4, still go through under this alternative assumption of identical matching technologies across the two sectors.

We assume that the recruitment is part of the role of the government and is done by its workforce. Since the government's objective is to maintain employment level ( $e^g$ ) by hiring enough workers to replace those that separate or retire, it follows that  $v_u^g = (1 - \mu)(s^g + \tau)e^g$  and  $v_c^g = \mu(s^g + \tau)e^g$ . Connected and unconnected workers find public-sector jobs at rate  $m_c^g = \frac{\mu(s^g + \tau)e^g}{u_c^g}$  and  $m_u^g = \frac{(1-\mu)(s^g + \tau)e^g}{u_u^g}$ , respectively.<sup>4</sup> For the moment, we set  $\mu = \bar{\mu}$ , where  $\bar{\mu}$  is an exogenous parameter reflecting the target fraction of jobs the government aims to fill through connections. In Section 4.2, we analyze the case in which the government cannot reach its target because there are not enough workers with connections.

As will become clearer below, because public-sector employment is exogenous, the productivity of workers in the public sector is not important for the results to follow. We can therefore avoid making any assumption regarding the productivity of connected and unconnected workers in the public sector.

Notice that in this setting, where the government has a fixed employment level, the separation rates  $s^g$  play a double role: they reflect the expected duration of the match but also determine the number of new hires. Higher separations reduce the value of employment in the public sector but, at the same time, increase the vacancies and make an unemployed worker more likely to find a job there. Also, we assume that the separation rates, as well as other labor market friction parameters, are exogenous.

Finally, the public-sector wage,  $w^g$  is the other exogenous policy variable. We ignore the issue of how the government finances its wage bill and assume that it can tax its citizens in a non-distortionary lump-sum tax.

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<sup>4</sup>We considered a less segmented way to model the connected and unconnected market. In particular, we considered a setting with only one public-sector market in which both connected and unconnected workers were searching randomly for jobs. Connected workers have higher efficiency of search in the public-sector (which would be the exogenous variable reflecting nepotism) and hence a higher job-finding rate. In such setting, the composition of the public-sector employment of connected and unconnected workers would be endogenous. All the results and intuition would be similar to our baseline setting, but at a cost of more mathematical complexity.

### 3.5 Value functions, Free entry, Wages

Let  $U_u^p$  and  $E_u^p$  be the values (expected discounted lifetime incomes) associated with unemployment (searching for a job) and employment, respectively, in the private sector. These are defined by:

$$(r + \tau)U_u^p = b + m(\theta) [E_u^p - U_u^p], \quad (1)$$

$$(r + \tau)E_u^p = w^p - s^p [E_u^p - U_u^p]. \quad (2)$$

The values associated with unemployment in the public sector with and without connections are given, respectively, by:

$$(r + \tau)U_u^g = b + m_u^g [E_u^g - U_u^g], \quad (3)$$

$$(r + \tau)U_c^g = b + m_c^g [E_c^g - U_c^g]. \quad (4)$$

While the wage in the public sector does not depend on connections, the values of being employed are different for workers with and without connections:

$$(r + \tau)E_u^g = w^g - s^g [E_u^g - U_u^g], \quad (5)$$

$$(r + \tau)E_c^g = w^g - s^g [E_c^g - U_c^g]. \quad (6)$$

On the private-sector firm side, let  $J_u^p$  be the value associated with a job and  $V_u^p$  be the value associated with posting a private-sector vacancy and searching for a worker to fill it. These values are given by

$$rJ_u^p = y - w^p - (s^p + \tau) [J_u^p - V_u^p], \quad (7)$$

$$rV_u^p = -\kappa + q(\theta) [J_u^p - V_u^p]. \quad (8)$$

In equilibrium, free entry drives the value of a private vacancy to zero:

$$V_u^p = 0. \quad (9)$$

Wages are determined by Nash bargaining between the matched firm and worker. The outside options of the firm and the worker are the value of a vacancy and the value of being unemployed, respectively. Let  $S_u^p \equiv J_u^p - V_u^p + E_u^p - U_u^p$  denote the surplus of a match. With Nash bargaining, the wage  $w^p$  is set to a level such that the worker gets a share  $\beta$  of the surplus, and the share  $(1 - \beta)$  goes to the firm. This implies two equilibrium conditions of



the following form:

$$\beta S_u^p = E_u^p - U_u^p \quad (1 - \beta) S_u^p = J_u^p - V_u^p. \quad (10)$$

Setting  $V_u^p = 0$  in (8) and imposing the Nash bargaining condition in (10) gives:

$$\frac{\kappa}{q(\theta)} = (1 - \beta) S_u^p. \quad (11)$$

Using (1)-(7) together with (10) and the free-entry condition  $V_u^p = 0$ , we can write:

$$S_u^p = \frac{y - b}{r + \tau + s^p + \beta m(\theta)}, \quad (12)$$

and the free-entry condition as

$$\frac{\kappa}{q(\theta)} = \frac{(y - b)(1 - \beta)}{r + \tau + s^p + \beta m(\theta)}. \quad (13)$$

This job-creation condition sets the expected costs of having a vacancy (left-hand-side) equal to the expected gain from a job (right-hand-side). It can be used to determine the equilibrium market tightness  $\theta$  and, in turn, the rates at which workers find jobs in the private sector,  $m(\theta)$ .

Imposing the free-entry condition (11) for private-sector vacancy creation, the Nash bargaining solution implies that

$$w^p = b + \beta(y - b + \kappa\theta). \quad (14)$$

**Lemma 1** *Tightness and wages in the private sector are independent of the government employment and wage policies ( $e^g$ ,  $w^g$ ,  $s^g$  and  $\mu$ ).*

This lemma is a useful intermediate result and follows directly from equations (13) and (14). Government employment and wage policies do not affect wages and tightness in the private sector. It implies that they affect the equilibrium only by affecting the connections decision of the newborn or the scale of the private sector through the number of newborns directing their search towards the private sector. Given a constant tightness, policies that make the public sector more attractive will drain workers from the private sector and reduce, one-to-one, the number of vacancies, leaving private wages unchanged.

### 3.6 Newborn's Decisions

We can summarize the three options of the newborn as

$$(r + \tau)U_u^p = b + \frac{m(\theta)}{r + \tau + s^p + m(\theta)}[w^p - b] \quad (15)$$

$$(r + \tau)U_u^g = b + \frac{m_u^g}{r + \tau + s^g + m_u^g}[w^g - b] \quad (16)$$

$$(r + \tau)U_c^g = b + \frac{m_c^g}{r + \tau + s^g + m_c^g}[w^g - b]. \quad (17)$$

These three options were depicted in Figure 3 in sub-section 3.2. Workers without connections can search in either the public or the private sector. In equilibrium, the values of these two options have to equate:

$$U_u = U_u^g = U_u^p. \quad (18)$$

This condition determines the number of unconnected searchers in the public sector,  $u_u^g$ , which is the variable that compensates any asymmetry in the value of the job in the two sectors. An increase of the value of a public-sector job,  $E_u^g$ , (driven by either higher wages or lower separations) raises the number of unemployed searching in the public sector and lowers their job-finding probability ( $m_u^g$ ), such that its effect on  $U_u^g$  is neutralized.

Alternatively, workers can use connections to find jobs only in the public sector. In what follows, we drop the superscript  $g$  in  $U_c^g$  and set  $U_c \equiv U_c^g$ . The newborn will choose the option that, given her  $c$ , gives the highest value between:

$$\text{Max}\{U_u, U_c - c\}. \quad (19)$$

A worker with connections cost  $c$  chooses to obtain connections only if the benefit,  $U_c - U_u$ , exceeds the cost, that is, only if  $c \leq U_c - U_u$ . The threshold level of  $c$  at which a worker is indifferent between using and not using connections to find a public-sector job is, therefore, given by

$$\tilde{c} = U_c - U_u. \quad (20)$$

**Lemma 2** *There exists a public-sector unconnected market with employment level  $e^g$ , provided that it pays a sufficiently high wage  $w^g \geq \underline{w}_u^g$ . There exists a public sector of size  $e^g$  with a connected market where  $\mu = \bar{\mu}$ , provided that it pays a sufficiently high wage  $w^g \geq \underline{\underline{w}}_c^g > \underline{w}_u^g$*

The exact expressions for  $\underline{w}_u^g$  and  $\underline{\underline{w}}_c^g$  are in Appendix A. This lemma, depicted graphically in Figure 4, states that the public sector needs to pay a sufficiently high wage in order to

Figure 4: Lemma 2: the role of public-sector wage



attract enough job seekers to fill its vacancies and maintain a constant employment level. Note that, if the public-sector wage is above this threshold,  $\underline{w}_u^g$ , some unemployed will prefer to queue for public-sector jobs. This threshold depends positively on private-sector wages,  $w^p$ , and unemployment benefits,  $b$ . However, for the government to be able to fill  $\bar{\mu}$  of its vacancies with workers that have connections, this wage has to be higher. The wage paid to a public-sector employees is independent of how he/she was hired (with or without connections). Nevertheless, the benefit from using connections to jump the queue is larger when public-sector wages are larger, because then, more workers are searching for public-sector jobs (i.e. there are longer queues for these jobs) and getting one of them without connections takes much longer. For the government to be able to attract enough workers with connections to fill  $\bar{\mu}$  of its vacancies with such workers, the wage must be high enough, so that the benefit from having connections compensates the costs of acquiring them. This second threshold wage,  $\underline{w}_c^g$ , depends positively on  $\underline{w}_u^g$  and on the size of the connections sector  $\bar{\mu}$ . In what follows, we assume that the public-sector wages are always above  $\underline{w}_c^g$ , meaning that the government can fill any target fraction  $\bar{\mu}$  of its vacancies through connections. Note, however, that if the public-sector wage is lower but still above  $\underline{w}_u^g$ , the government is able to attract some connected job searchers but not enough to fill its target fraction  $\bar{\mu}$ . We analyze the case in which it can not in Section 4.2 and in the numerical exercise in Section 7.

**Lemma 3** *If a connections sector exists ( $\tilde{c} > 0$ ), the job-finding rate in the connections sector is higher than in the unconnected sector ( $m_c^g > m_u^g$ ).*

This lemma follows directly from equations (18) and (20). They imply that the value of searching for a job in the public sector is higher for connected than for unconnected workers which, given that wages and separation rates are the same for both types of workers, can only be achieved with a smaller queue for connected workers.

### 3.7 Equilibrium Allocations

Workers' cutoff  $\tilde{c}$  determines their selection into two groups: those who use connections to find public-sector jobs ( $L_c^g$ ) and those who do not have connections ( $L_u$ ). We can measure

each of these two groups' share in the labor force as:

$$L_c^g = \Xi(\tilde{c}) \quad (21)$$

$$L_u = 1 - \Xi(\tilde{c}) \quad (22)$$

Among the workers who do not have connections, some will be attached to the private sector ( $L_u^p$ ) and some to the public sector ( $L_u^g$ ). Hence,  $L_u = L_u^p + L_u^g$ .

Using (10)-(13) and (15)-(17), we can write the cutoff as:

$$\tilde{c} = \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{u_c^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{u_c^g}} [w^g - b] - \frac{\beta\kappa\theta}{(1 - \beta)} \right]. \quad (23)$$

**Definition 1** *A steady-state equilibrium consists of a cut-off cost  $\{\tilde{c}\}$ , private sector tightness  $\{\theta\}$ , and unemployed searching in each market  $\{u^p, u_c^g, u_u^g\}$ , such that, given some exogenous government policies  $\{w^g, e^g, \bar{\mu}\}$ , the following apply.*

1. *Private-sector firms satisfy the free-entry condition (13).*
2. *Private-sector wages are the outcome of Nash Bargaining (14).*
3. *Newborns decide optimally their investments in connections (equation 19), and the population shares are determined by equations (21)-(22).*
4. *The search between the public and private sectors by the unconnected unemployed satisfies equation (18).*
5. *Flows between private employment and unemployment are constant:*

$$(s^p + \tau)e^p = m(\theta)u^p. \quad (24)$$

6. *Population add-up constraints are satisfied:*

$$L_u^g = (1 - \mu)e^g + u_u^g, \quad (25)$$

$$L_c^g = \mu e^g + u_c^g, \quad (26)$$

$$L_u^p + L_u^g + L_c^g = 1 \quad (27)$$

7. *The government fills its target fraction of vacancies through connections  $\mu = \bar{\mu}$ .*

## 4 Main results

This section details the main results, under three propositions. All the derivations and proofs are shown in Appendix A, including the proof that the equilibrium exists and is unique.

### 4.1 Nepotism, public-sector wages and unemployment

**Proposition 1** *An increase in  $\bar{\mu}$  decreases the number of workers searching for public-sector jobs (decreases  $u^g = u_u^g + u_c^g$ ), increases the number of workers in the private sector (i.e., increases  $L_u^p = 1 - L_u^g - L_c^g$ ) and increases the employment rate.*

This result is perhaps surprising but is quite logical and consistent with evidence in Figure 2. As shown in Lemma 2, the existence of a connections sector requires that the public-sector wage is high enough. Under this condition, there are large queues of unconnected workers for public-sector jobs. With a higher fraction of public-sector jobs being reserved for workers with connections, the value of trying to find (searching for) a public-sector job without connections decreases. Workers have more incentive to direct their search towards the private sector or to obtain connections. Since it is costly to obtain connections, some of them – those whose connection cost is high – abandon search in the public sector and search for private-sector jobs instead. With a constant tightness in the private sector, job creation goes up one-to-one as the number of searchers and overall employment increases.

**Proposition 2** *An increase in  $w^g$  increases the number of workers searching for public-sector jobs (increases  $u^g = u_u^g + u_c^g$ ) decreases the number of workers in the private sector (i.e., increases  $L_u^p = 1 - L_u^g - L_c^g$ ) and decreases the employment rate. These negative effects are smaller when  $\bar{\mu} > 0$  than when  $\bar{\mu} = 0$ .*

A higher wage in the public sector makes the value of searching for a job there higher and shifts workers away from the private sector, thereby lowering the employment rate. When a fraction of jobs in the public sector are reserved for workers with connections, the number of unconnected workers that queue for public-sector jobs is smaller. Some choose to use connections in order to find public sector jobs. But because obtaining connections is costly, the total increase in the number of workers queuing up for public-sector jobs is smaller. The number of workers that abandon search in the private sector in response to the increase in  $w^g$  is therefore smaller. Hence, the recruitment through connections mitigates the negative effects of more generous public-sector policies on employment. This proposition is consistent with evidence from Table A3.

## 4.2 When nepotism is bounded: a limit to $\mu$

We now relax the assumption that  $\mu$  is isolated from labor market conditions. We show that in situations in which the public-sector wage premium is large enough to maintain public-sector employment, but not large enough to generate queues of connected jobs searchers, changes in wages can influence the size of the connected sector.

We interpreted  $\bar{\mu}$  as the government's target fraction of vacancies to be filled through connections. The government is able to use connections at the maximum – fill a fraction  $\mu = \bar{\mu}$  of jobs through connections – provided that it pays a sufficiently high wage to attract enough connected job searchers. According to Lemma 2, there exists a wage,  $\underline{w}_c^g$ , at which the government is able to attract exactly  $u_c^g = \bar{\mu}(s^g + \tau)e^g$  connected job searchers. Hence, for any wage  $w^g \geq \underline{w}_c^g$ , the government is able to fill a fraction  $\bar{\mu}$  of jobs through connections.

If the government wage is lower, but still high enough to attract some connected job searchers,  $\underline{w}_c^g > w^g > \underline{w}_u^g$ , the number of connected job searchers is lower, but still positive:  $0 < u_c^g < \bar{\mu}(s^g + \tau)e^g$ . In this case also, a connected sector exists ( $\mu > 0$ ), but the government is restricted to fill only a fraction  $\mu < \bar{\mu}$  of vacancies through connections, where  $\mu$  is such that  $u_c^g = \mu(s^g + \tau)e^g$ . The remaining vacancies  $(1 - \mu)$  are filled by unconnected workers. Using (26), we can solve for  $\mu$  and write:

$$\mu = \frac{L_c^g}{e^g(s^g + \tau + 1)}. \quad (28)$$

This equation states that there are no connected workers queuing for jobs: the total number of connected workers  $L_c^g$  equals the new hires  $\mu(s^g + \tau)e^g$  plus those already employed in the public sector  $\mu e^g$ .

In the limiting case, where  $w^g = \underline{w}_u^g$ , there is no benefit from using connections because there are no queues for public sector jobs and no worker has the incentive to use connections to find a public-sector job; hence,  $u_c^g = 0$ , which means that  $\mu = 0$ .

To sum up, we generalise Condition 7 in Definition 1, by replacing it with

$$\mu = \begin{cases} \bar{\mu} & \text{if } w^g \geq \underline{w}_c^g \\ \frac{L_c^g}{e^g(s^g + \tau + 1)} & \text{if } \underline{w}_c^g > w^g > \underline{w}_u^g \\ 0 & \text{if } w^g = \underline{w}_u^g. \end{cases} \quad (29)$$

**Proposition 3** *Provided that the public-sector wage is high enough to attract some connected job searchers, but not high enough to generate queues of connected job searchers, the fraction of vacancies that the government fills through connections,  $\mu$ , is smaller, the smaller the public-sector wage  $w^g$  and the larger the size of public-sector employment,  $e^g$ . If  $w^g = \underline{w}_u^g$ ,*

there is no nepotism ( $\mu = 0$ ).

The government can fill a higher fraction of jobs through connections when the public-sector wage is higher because the supply of connected job searchers is larger. Larger public-sector employment means that the number of workers that the government needs to hire each period, to replace those that separate due to retirement or other reasons, is also larger, while the number of connected workers searching for jobs is smaller. Hence, the proportion of government jobs filled by connected job searchers is smaller.

This proposition tells us how government policies place a constraint on the level of nepotism and is consistent with evidence in Figure 1. Governments that have large employment levels but offer low premia to their workers – such as those in Nordic countries – will have endogenous limits on hiring through connections. We examine the effects of government policies in this generalized framework in the numerical exercise in Section 7.

## 5 Efficiency

### 5.1 Constrained-efficient allocation

The social planner’s problem and the first-order conditions are shown in Appendix B. There are three types of inefficiencies in this model: i) the existence of a connections sector that propels newborns to take on rent-seeking activities; ii) the existence of queues for public-sector jobs; and iii) the usual thick-market and congestion externalities.

Inefficiencies i) and ii) are both solved by setting the optimal wage. To avoid queues and given the assumption of the min matching function in the public sector, the government should set a public-sector wage such that  $u_u^g = v_u^g = (s^g + \tau)e^g$ . In other words, at any instant both the job-finding rate for government jobs and its vacancy-filling rate should be 1, which implies setting  $\underline{w}_u^g$ . This same wage, according to equation (29), eliminates the connections sector ( $u_c^g = v_c^g = 0$ ). This shows that the connections sector is inefficient only when the public-sector wage is set optimally.

We then show that the inefficiency iii) is solved with the Hosios condition. The Hosios condition in private-sector bargaining guarantees that the thick market and the congestion externalities are internalized.

### 5.2 Optimal $\mu$ conditional on inefficient public-sector wage

Suppose, now, that the public-sector wage is high enough so that the government can fill its target fraction  $\bar{\mu}$  of vacancies through connections; that is,  $w^g > \underline{\underline{w}}_c^g$ . In this case, a connec-

tions sector exists, as some workers find it optimal to use connections. The question that arises is whether or not the existence of a connections sector, under inefficient government policies, improves welfare. To address this question, we discuss the impact of increasing  $\bar{\mu}$  ( $\mu = \bar{\mu}$ ) on net surplus. Net surplus is total output net of vacancy posting costs, plus unemployment income, minus the resources spent in connections. Since public-sector employment is fixed, an increase in total output can be achieved by an increase in private-sector employment, which ultimately requires shorter public-sector queues.

As summarized in Proposition 1, an increase in  $\bar{\mu}$  raises employment in the private sector and, thus, increases output and net surplus. However, we cannot conclude that a larger connections sector means higher net surplus overall, because an increase in  $\bar{\mu}$  also induces some workers to use connections, thus increasing the total resources wasted. If obtaining connections is difficult and costly for most workers, relative to the benefit of being employed in the public sector, then an increase in  $\bar{\mu}$  is more likely to drive workers away from the public sector and cause a large shift in workers' search towards the private sector, resulting in a large increase in private employment, but naturally also a larger waste of resources with connection costs. If, on the other hand, obtaining connections is easy and the benefit of a public-sector job large, then an increase in  $\bar{\mu}$  will have a small impact on private employment and will, instead, cause a larger shift towards forming connections.

We cannot establish that an increase of  $\bar{\mu}$  is optimal, given an inefficient public-sector wage policy. As discussed above, the connections costs, the size of public-sector wages, and other public-sector benefits are important. However, the interesting point here is that we cannot rule out that nepotism in the public sector can increase welfare when wages are inefficient, because it raises output production and shortens public-sector queues. We address this question again in the numerical exercise in Section 7.

## 6 Extensions

In this section, we discuss and compare the effects of nepotism and government policies on employment under three alternative model assumptions: i) random search in the unconnected market; ii) competitive search in the private sector; and iv) the existence of a “connections premium.” We further compare the alternative models introduced here in the quantitative exercise in Section 7.



## 6.1 Random search between the private sector and the unconnected public sector

We start by analyzing the case in which the workers without connections cannot direct their job search exclusively towards the public or the private sector. We assume that these workers search randomly for jobs in the two sectors. A matching function  $m(v_u, u_u)$  determines the total number of matches between unconnected workers and jobs and  $m(\theta)$ , where  $\theta = \frac{v_u}{u_u}$ , gives the rate at which unconnected workers match with (either private or government) vacancies. Since they search randomly for jobs, the total number of vacancies available to them, consists of both private-sector  $v^p$  and government  $v_u^g$  ( $v_u = v^p + v_u^g$ ) vacancies, where  $v_u^g$  is the number of public-sector vacancies available to unconnected workers. They find jobs in the private sector at rate  $m(\theta)\nu^p$  and in the public sector at rate  $m(\theta)(1 - \nu^p)$ , where  $\nu^p = \frac{v^p}{v_u}$  is the fraction of private-sector vacancies in the total number of vacancies available to workers without connections.

The key difference between the model with random search and segmented markets is the value of unemployment for unconnected workers. It changes because they now randomly search for jobs in both sectors. Specifically,

$$(r + \tau)U_u = b + m(\theta)\nu^p [E_u^p - U_u] + m(\theta)(1 - \nu^p) [E_u^g - U_u]. \quad (30)$$

Under segmented markets, tightness in the private sector is independent of any government policy (see Lemma 1) because the outside option (unemployment value) of workers searching for private-sector jobs – and, thus, the private-sector wage – is independent of government policy. Under random search, by contrast, the outside option of searching workers also includes the possibility of finding a public-sector job. As can be seen by equation (30), the outside option of unconnected workers is a convex combination of the value a public-sector job ( $E_u^g$ ) and the value of a private-sector job ( $E_u^p$ ) with weights reflecting the relative number of vacancies in the two sectors. Thus, public-sector wages, employment opportunities, and separation probabilities (as well as the lack of meritocracy in the public sector) affect private-sector wages. More specifically, the private-sector wage of a worker is given by

$$w^p = b + \beta [y - b + \nu^p \theta \kappa] + (1 - \beta)D(w^g - b), \quad (31)$$

where  $D = \frac{(1-\nu^p)m(\theta)}{r+\tau+s^g+(1-\nu^p)m(\theta)}$  measures how much public-sector wages influence private-sector wage bargaining. A free-entry condition as in (11) determines the number of vacancies in the private sector. But now the match surplus,  $S_u^p = \frac{p-w^p}{r+s^p+\tau}$ , which decreases as the wage increases, depends also on public-sector policy and nepotism. In addition, the cutoff connec-

tion cost,  $\tilde{c} = U_c^g - U_u$ , changes to reflect that the value of unemployment to unconnected workers is now given by (30). The full set of equations describing the model with random search, a formal definition of a steady-state equilibrium and conditions for existence of a steady-state equilibrium are in Appendix C.

In general, under random search, the effects of government policies work through: i) the selection into connected and non-connected workers (as in segmented markets); and ii) the outside option of unconnected workers and its impact on private-sector wages. We show in Appendix C that:

**Proposition 4** *An increase in  $w^g$  lowers job creation (lowers  $\theta$ ), induces more workers to obtain connections and queue for public-sector jobs (i.e., increases  $L_c^g$  and lowers  $L_u$ ) and lowers the employment rate.*

The increase in the public-sector wage improves a worker's payoff from searching for a job in the public sector. This improves the outside option of searching workers pushing their wage in the private sector up and reducing firm incentives to create jobs. At the same time, it induces more workers to obtain connections, fewer workers to search in the private sector; and more workers to queue for public-sector jobs. Both the decrease in  $\theta$  ( $m(\theta)$ ) and the decrease in  $L_u$  lower the employment rate. If  $\mu = 0$ , meaning that no connections sector exists, then all effects work only through the outside option. In the other extreme case, where  $\mu = 1$  (meaning that  $v_u^g = 0$ ,  $\nu^p = 1$ ,  $D = 0$ , and all government vacancies are for connected workers), tightness and wages in the private sector become identical to those obtained under segmented markets, and all effects work through the selection into connected and non-connected workers, as in segmented markets.

### 6.1.1 The effect of nepotism on job creation and employment

As discussed above, under random search, public-sector policies work not only through the selection into connected and unconnected workers, but also through their impact on private-sector wages and in turn, tightness. For this reason, the effect of nepotism on employment can be either positive or negative. With a higher fraction of public-sector jobs being retained for workers with connections, a larger fraction of workers who do not have connections end up in private- instead of public-sector jobs (i.e.,  $\nu^p$  increases, shifting weights in (30) from  $E_u^g$  to  $E_u^p$ ). Assuming that government jobs are more valuable to workers than private jobs are (that is,  $E_u^g > E_u^p$ ), the presence of nepotism in the public sector worsens the outside option of unconnected workers; private wages decrease; and job creation in the private sector increases

with a positive impact on employment.<sup>5</sup> In addition to this job-creating effect, a decrease in the fraction of public-sector jobs available to non-connected workers makes the option of investing in connections more attractive. More workers seek public-sector jobs through their connections, and the number of connected workers queuing up for public-sector jobs increases, with a negative impact on employment.

In segmented markets, a decrease in the fraction of government jobs available to non-connected workers has a positive impact on employment because some workers, those whose cost of obtaining connections is large, will direct their search towards the private sector. Under the assumption of random search this positive effect is not present, because workers cannot direct their search towards the private sector. On the other hand, under random search there is an additional positive effect on employment, which is not present under segmented markets: nepotism hurts the outside option of workers thereby increasing private-sector job creation.

## 6.2 Competitive search in the private sector

Suppose now that, as in the benchmark model, the two sectors, private and public, are segmented. However, we depart from the assumptions of Nash bargaining and random search in the private sector. Instead, as in Moen (1997), we introduce a competitive search equilibrium in the private sector. To this end, we assume that the private-sector market consists of submarkets with different posted wages and equilibrium tightness.

In each submarket, there is a subset of unemployed workers and firms with vacant jobs that are searching for each other. A matching function determines the number of matches in each submarket. Unemployed workers are free to move between submarkets. They choose to search for a job in the submarket that yields the highest expected income. Since workers are ex-ante identical, and movement across submarkets is free, in equilibrium, the value of search is equal across submarkets. A market maker determines the number of submarkets in each market and the wage in each submarket. The wage is chosen to maximize the value of a vacancy, and since all vacancies in the same submarket are identical, they offer the same wage. There is free entry of vacancies in each submarket, which drives the value of a vacancy to zero, and determines the number of vacancies posted in each submarket. In Appendix D, we present the full set of Bellman equations describing the optimal behavior of workers and firms, the equilibrium conditions and the model solution.

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<sup>5</sup>We get the opposite result on job creation if  $E_u^g < E_u^p$ , while if  $E_u^g = E_u^p$ , nepotism in the public-sector has no impact on the outside option, and this job creation effect is no longer present. However, as shown in Appendix C, the sufficient condition for the existence of a steady-state equilibrium under random search is  $E_u^g \geq E_u^p$ .

We show, in Appendix D, that the equilibrium conditions determining job creation and the Nash bargaining wage in this alternative setup are identical to those obtained in the benchmark model when the Hosios condition holds. Hence, the results discussed in Sections 4 and 5 carry over to this alternative assumption of competitive search in the private sector.

### 6.3 Connections premium

In the benchmark model, we consider that connected and unconnected workers enjoy the same benefits of working in the public sector. We also assume that the costs incurred by the newborns to get connections were wasted. We now assume that newborn pay connections costs to current connected public-sector workers so that current workers will help fast-track them into the public sector. These payments are the “connections premium”,  $\Upsilon$ , which will further raise the value of working in the public sector for connected workers.

$$(r + \tau)E_c^g = w^g + \Upsilon - s^g [E_c^g - U_c^g]. \quad (32)$$

In equilibrium, this connections premium depends on the threshold of connections costs,  $\Upsilon = \Upsilon(\tilde{c})$ . The total connections cost paid by newborns is  $\tau \int_0^{\tilde{c}} c\xi(c)dc$ , where  $\xi$  is the pdf of the distribution of connection costs. To avoid creating further interactions between sectors, we assume that newborns’ total connections cost is divided equally among connected workers:

$$\Upsilon(\tilde{c}) = \frac{\tau \int_0^{\tilde{c}} c\xi(c)dc}{\bar{\mu}e^g}. \quad (33)$$

In principle, this extension could create multiple equilibria, with people expecting high returns of connections investing in connections (creating a lot of side payments) or people expecting low returns of connections not investing in connections (generating few side payments). We show, in Appendix E, that provided some regularity conditions on the distribution of connections costs are satisfied, there are no multiple equilibria.

In Section 7, we also compare quantitative results in this alternative setup to those obtained in the benchmark model, in which no such connections premium exists.

## 7 Numerical exercise

It is not our objective in this section to do a full quantitative exercise. Such an exercise would face the same problems as the empirical work on non-meritocratic hiring discussed in the introduction – the identification of the fraction of public-sector workers hired through

connections and the distribution of connection costs would be problematic. However, we think that a simple numerical exercise can help us improve our understanding of the model. The objective of our numerical exercise is threefold. First, we want to inspect whether under a reasonable parametrization, conditional on an inefficient wage policy, hiring through connections increases or decreases welfare. Second, given the endogenous limits that government policies place on  $\mu$  discussed in Section 4.2, and given a set of parameters, we might be in a region where: i)  $\mu$  is not constrained and is equal to  $\bar{\mu}$  or ii)  $\mu$  is constrained. Changes in government policy may switch the economy from one region to the other, making it difficult to solve for their effect in the full model analytically. In our quantitative exercise we account for such switches and are able to characterize the full effect of policy changes. Finally, we want to compare the benchmark model with the alternative models proposed in Section 6 – in particular, to compare the transmission mechanisms under the assumptions of segmented markets and random search.

## 7.1 Parametrization

We parameterize our benchmark model with segmented markets to match the Spanish economy at a quarterly frequency, drawing largely on the *Spanish Labour Force Survey (SLFS)* and the *Structure of Earnings Survey (SES)* microdata for the period 2005-2015. A set of parameters is directly fixed to values taken from the data, while a second set of parameters targets steady-state values. We chose Spain because it is one of the countries where there is widespread anecdotal evidence of nepotism and cronyism.<sup>6</sup> Table 2 lists all the parameters, their values and the data sources.

From the *Spanish Labour Force Survey*, we calculate the stocks and flows of public- and private-sector workers and the unemployed. These are shown in Appendix F. Around 13.2 percent of the labour force works in the public sector ( $e^g = 0.132$ ). Following Fontaine et al (2018), we construct data on worker flows to calibrate the separation rates by sector. The numbers are  $s^g = 0.022$  and  $s^p = 0.044$ , imply that the private sector has a higher separation rate than the public sector.

We consider, in the private sector, a Cobb-Douglas matching function with matching efficiency  $\zeta$  and matching elasticity with respect to the unemployment of  $\eta$ . As the matching efficiency and the cost of posting vacancies are not separable, we normalize the matching efficiencies  $\zeta = 1$ . The costs of posting vacancies,  $\kappa$  is set to target the unemployment rate of 18 percent, the average of the sample. The matching elasticities are set to the common

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<sup>6</sup>Recently the press exposed that in the “Tribunal de Cuentas”, the Spanish institution in charge of invigilating economic and financial irregularities in the public sector, close to 100 of its 700 workers were family members or friends of the directors or of important politicians in Spain.

Table 2: Parameterization of segmented markets model

<b>Fixed parameters</b>	<b>Source</b>	<b>Values</b>
Government employment	<i>Spanish LFS</i>	$e^g = 0.132$
Job-separation rate (private)	<i>Spanish LFS</i>	$s^p = 0.044$
Job-separation rate (public)	<i>Spanish LFS</i>	$s^g = 0.022$
Matching elasticity	Standard	$\eta = 0.5$
Bargaining power of workers	Hosios Condition	$\beta = 0.5$
Discount rate	Standard	$r = 0.012$
Retirement rate	Standard	$\tau = 0.006$
Matching efficiency	Normalization	$\zeta = 1$
Productivity	Normalization	$y = 1$
Fraction of connected government jobs	Quality of government survey	$\bar{\mu} = 0.40$
Connections costs upper bound	Set exogenously	$\bar{c} = 55$
<b>Other parameters</b>	<b>Target (Source)</b>	<b>Values</b>
Public-sector wage	Public-sector wage premium ( <i>SES</i> )	$w^g = 1.027$
Cost of posting vacancies	Unemployment rates ( <i>LFS</i> )	$\kappa = 6.31$
Unemployment benefit	Replacement rate ( <i>EC</i> )	$b = 0.398$

value of 0.5, and the Hosios condition is assumed to hold ( $\eta = 0.5$ ).

We use microdata from the *Structure of Earnings Survey*, for the waves of 2002, 2006, 2010 and 2014, to calculate the public-sector wage premium. We run regressions of the log gross hourly earnings on a dummy for the public sector, controlling for region, gender, age, occupation, year and part-time and find that the premium is 13.9 percent. We set the public-sector wages such that  $\frac{w^g}{w^p} = 1.139$ . A recent paper by Dickson, Postel-Vinay, and Turon (2014) argues that the lifetime premium in the public sector is lower than that measured by standard cross-section methods. They report that, in Spain, it is 7.17 percent. We report exercises using their numbers. We also report the equilibrium under the efficient public-sector wage premium:  $\frac{w^g}{w^p} = 0.91$ . The fact that the optimal wage premium is negative reflects mainly the facts that the expected duration of a job in the public sector is longer.

Salomäki and Munzi (1999) find that the unemployment benefit net replacement rate is 44 percent in Spain. We set  $b = 0.398$  to target this number. Additionally,  $r = 0.012$  and  $\tau = 0.006$  target a yearly interest rate of about four percent and an average working life of 40 years.

The most relevant parameters are the fraction of jobs reserved for people with connections,  $\bar{\mu}$ , and the distribution of connections costs,  $\Xi(\cdot)$ , but identifying them is subject to

the difficulties that prompted us to approach this question from a theoretical angle. Regarding  $\bar{\mu}$ , we proxy it with data from the *Quality of Government Survey*. For Spain, the index for “skills and merit” is 5 while for both “political” and “personal connections” is 3.2. Dividing one by the sum of the two, we get  $\bar{\mu} = 0.4$ .<sup>7</sup> The distribution of connections costs is assumed to be uniformly distributed between 0 and 55, set exogenously. This distribution implies that the deadweight cost of corruption is 0.1 percent of the total consumption of private-sector goods. Most of the exercises consist of varying these parameters. We vary the parameter  $\bar{\mu}$  from 0 to 1 and consider high and low values for the upper bound of the distribution of connections costs of  $\bar{c} = 10$  and  $\bar{c} = 100$ .

In the baseline steady-state, the government can achieve its target fraction  $\bar{\mu}$  of jobs, meaning that  $\mu$  is unconstrained.

## 7.2 Effects of nepotism

We start by analyzing the effects of nepotism in public-sector hiring for different combinations of public-sector wages and connections costs. We take into account that changes in policies or parameters might trigger the endogenous limit of  $\mu$  to bind, as determined by equation 29. Sometimes the government might not be able to fill its targeted  $\bar{\mu}$  fraction of jobs through connections. Figure 5 shows how different variables vary with  $\bar{\mu}$  for three different wage policies: the benchmark policy with premia of 13.9 percent; an intermediate wage policy with premia of 7 percent; and the efficient wage policy consisting of premia of -9 percent. We examine the effects on unemployment rates, the fractions of connected workers, and welfare, calculated as private-sector production net of the connections costs (as in Section 5), relative to the efficient allocation. As in Gomes (2015), the optimal policy is a negative public-sector wage premium in order to compensate for the higher relative job security.

Under the efficient wage policy,  $\mu$  is constrained to be zero. There are no queues for public-sector jobs and no connections sector. Unemployment rate is roughly 3 percentage points lower. The higher public-sector wages are responsible for the higher unemployment and a 2.5 percent lower welfare relative to the efficient scenario.

The graphs reveal that the effects of nepotism seem to be larger the more inefficient the public-sector wage is. In this numerical exercise, hiring through connections indeed raises welfare. As shown in Proposition 1, it lowers the unemployment rate. By restricting access to public-sector jobs to those with connections, workers are discouraged from searching for

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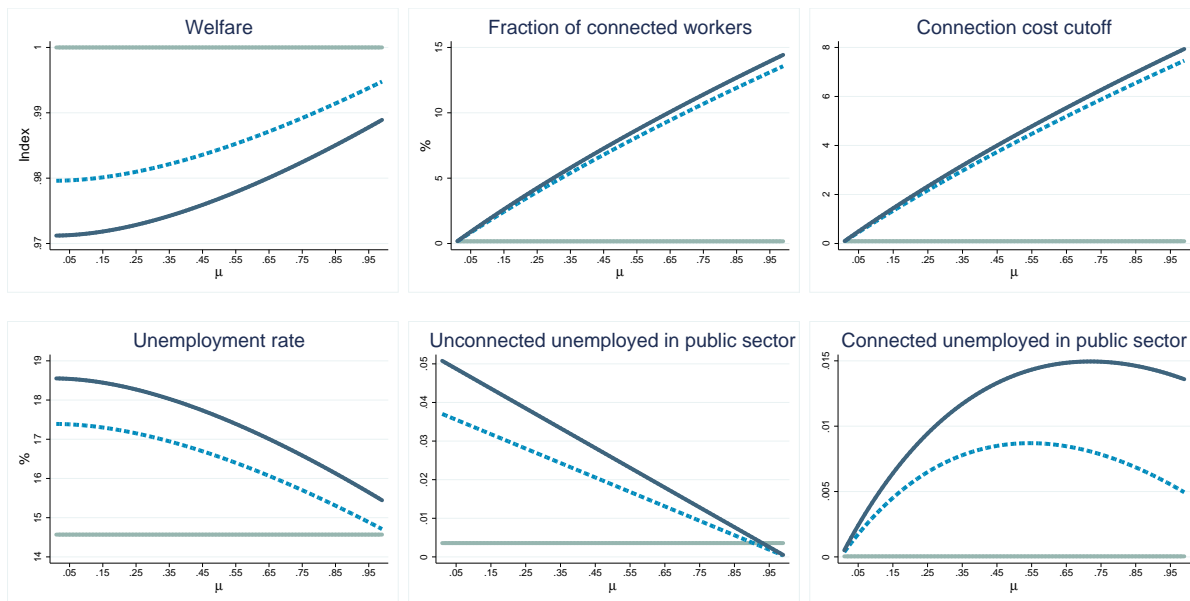
<sup>7</sup>Alternatively, we use the wider Corruption Perception Index for 2006. The index varies from 1 (more corrupt) to 10 (least corrupt). We select 30 European countries and normalize the least corrupt country (Finland, with 9.6 points) to a  $\bar{\mu} = 0$  and the most corrupt country (Romania, with 3.1) to  $\bar{\mu} = 1$ . As shown in the figure in Appendix F, we calculate  $\bar{\mu}$  of the remaining countries by mapping their index in the relative position within the maximum and the minimum. Spain, with an index of 6.8, is attributed a  $\bar{\mu}$  equal to 0.43.

unconnected vacancies in the public sector, and turn to the private sector. As tightness is constant, there is a one-to-one effect on private vacancies. While, indeed, the fraction of connected workers increases - with the respective increase in deadweight loss - this is outweighed by the increase in private-sector employment. Thus, welfare increases.

Figure 6 reproduces the same exercise for three levels of connections costs. Again, for this set of parameters, an increase in  $\bar{\mu}$  increases welfare. The increase is larger for high levels of connection costs. When the connections costs are higher, the connections market becomes more exclusive. When increasing  $\bar{\mu}$ , more workers are pushed into the private sector, which implies larger decreases in unemployment and larger increases in welfare.

In Figure 6, the kink observed for high connections costs reflects the fact that, because it is so costly to get connections, the endogenous limit binds for  $\mu$ . As shown in Lemma 2, the minimum wage for the government to be able to fill a fraction  $\bar{\mu}$  of jobs through connections -  $\underline{w}_c^g$  - is increasing in  $\bar{\mu}$ . If the public-sector wage is not high enough to sustain a large connections sector (that is  $w^g < \underline{w}_c^g$ ), the endogenous limits bind and  $\mu$  is determined by equation (28), and hence changes in  $\bar{\mu}$  do not affect the equilibrium.

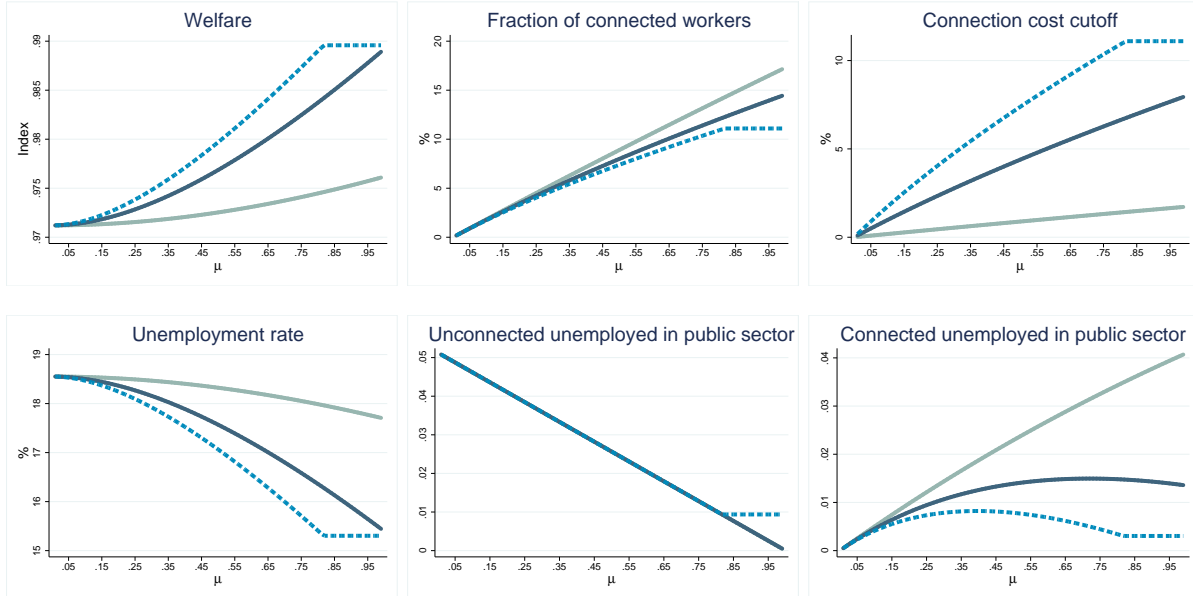
Figure 5: Effects of nepotism, role of public-sector wages



Note: We vary  $\bar{\mu}$  along the x-axis. The **dark blue line** is the benchmark calibration ( $w^g/w^p = 1.139$ ). The **light green line** is the scenario with efficient public-sector wages ( $w_h^g/w_h^p = 0.908$ ). The **bright blue dashed line** is the scenario with an intermediate public-sector wage premium ( $w^g/w^p = 1.072$ ). Welfare is expressed as a fraction of the efficient steady state. In the scenario with efficient public-sector wages,  $\mu$  is constrained to zero. In all the other scenarios  $\mu$  is unconstrained. Tightness and wages in the private sector are constant and independent of public-sector wages or nepotism ( $\theta = 0.06$ ,  $w^p = 0.901$ ).



Figure 6: Effects of nepotism, role of connections costs



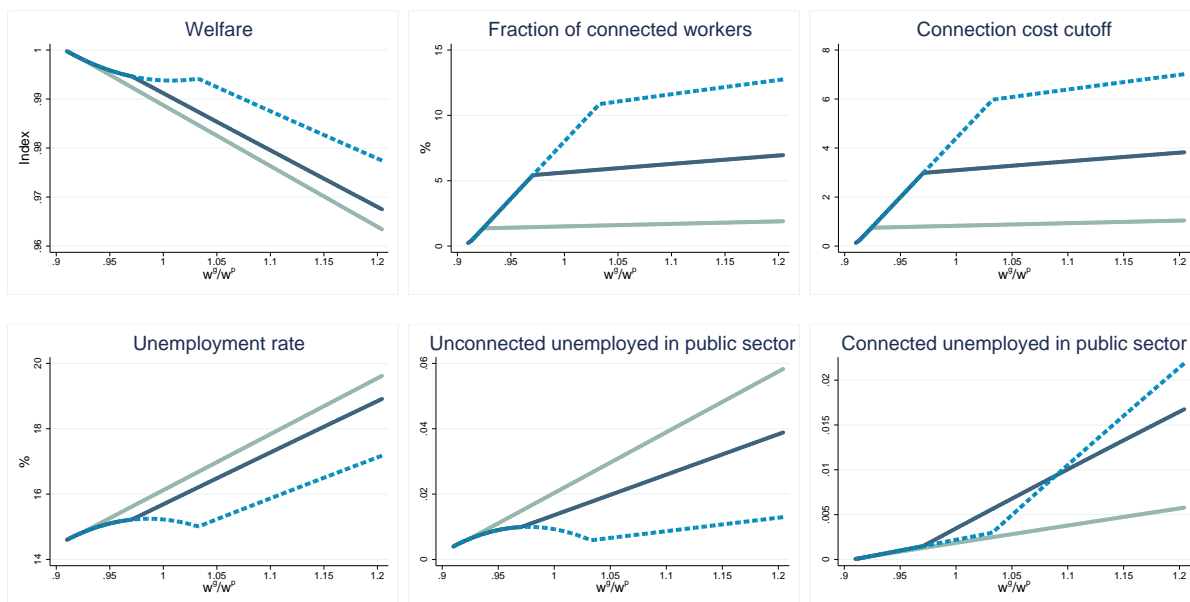
Note: We vary  $\bar{\mu}$  along the x-axis. The **dark blue line** is the benchmark calibration ( $\bar{c} = 55$ ). The **light green line** is the scenario with low connections costs ( $\bar{c} = 10$ ). The **bright blue dashed line** is the scenario with high connections costs ( $\bar{c} = 100$ ). Welfare is expressed as a fraction of the efficient steady state. In the scenario with high connections costs,  $\mu$  becomes constrained. Tightness and wages in the private sector are constant and independent of public-sector wages or nepotism ( $\theta = 0.06$ ,  $w^p = 0.901$ ).

### 7.3 Effects of policies

Figure 7 shows the effect of public-sector wages, for three levels of target  $\bar{\mu}$ : 0.2, 0.40 and 0.8. In general, decreasing public-sector wages raises welfare, since, as outlined in Proposition 2, cutting public-sector wages has a positive effect on the employment rate. A 10 percent cut in the wages of public-sector workers lowers the unemployment rate by 1.5 percentage points. However, for some combination of parameters (high  $\bar{\mu}$ ), there is a region in which  $\mu$  becomes constrained. In that region welfare declines with wage cuts. This happens because, as shown in Proposition 3, in the constrained case  $\mu$  decreases with wage cuts. Decreasing  $\mu$  means freeing up public jobs for job searchers that do not have connections. This pushes more unemployed workers to queue for public-sector jobs, and increases the unemployment rate.

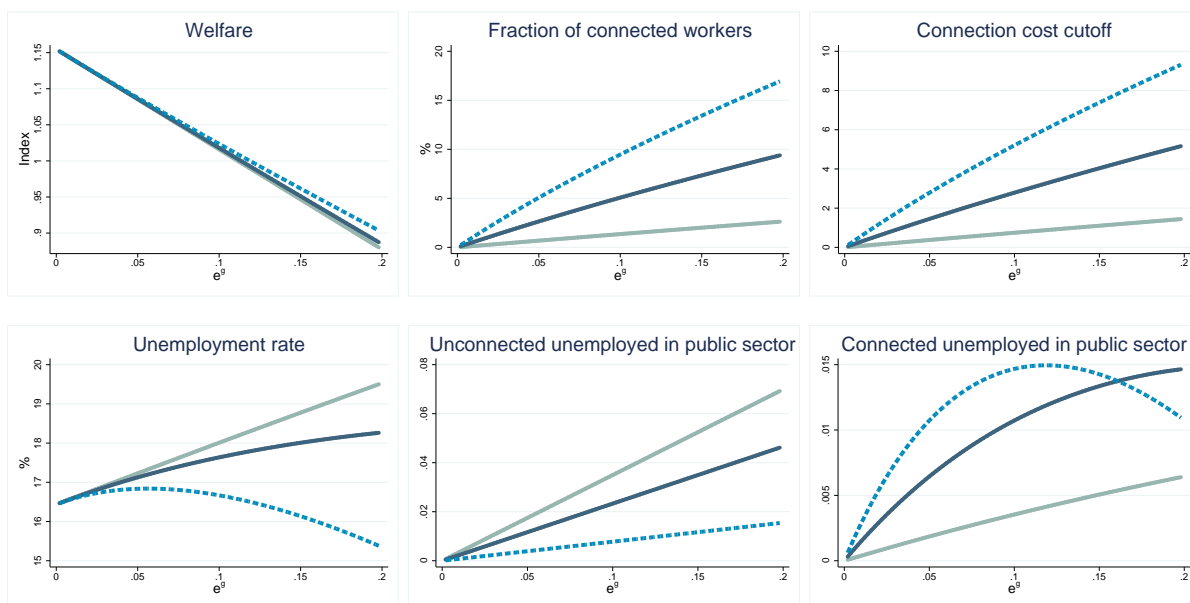
Figure 8 shows the effects of increasing public-sector employment. The effect of increasing public-sector employment on the selection of workers into the two sectors resembles those of increasing public-sector wages. In both cases the value of searching in the public sector goes up and this drains workers from the private to the public sector. The fact that higher public-sector employment lowers welfare follows trivially from the lack of assumption on the value of public-sector production. What is interesting to notice is that it can increase or

Figure 7: Effects of public-sector wages



Note: The *dark blue line* is the benchmark calibration ( $\bar{\mu} = 0.4$ ). The *light green line* is the scenario with low nepotism ( $\bar{\mu} = 0.2$ ). The *bright blue dashed line* is the scenario with high nepotism ( $\bar{\mu} = 0.8$ ). Welfare is expressed as a fraction of the efficient steady state. In all scenarios, when skilled public-sector wages are low,  $\mu$  becomes constrained. Tightness and wages in the private sector are constant and independent of public-sector wages or nepotism ( $\theta = 0.06$ ,  $w^p = 0.901$ ).

Figure 8: Effects of public-sector employment



Note: The *dark blue line* is the benchmark calibration ( $\bar{\mu} = 0.4$ ). The *light green line* is the scenario with low nepotism ( $\bar{\mu} = 0.2$ ). The *bright blue dashed line* is the scenario with high nepotism ( $\bar{\mu} = 0.8$ ). Welfare is expressed as a fraction of the efficient steady state. In all scenarios,  $\mu$  is never constrained. Tightness and wages in the private sector are constant and independent of public-sector wages or nepotism ( $\theta = 0.06$ ,  $w^p = 0.901$ ).

decrease unemployment, depending on the level of nepotism. In line with the results outlined in Proposition 2 for the case of increasing  $w^g$ , high nepotism prevents large increases in the queues for public-sector jobs, which helps reduce unemployment. Conversely, when most public-sector jobs are available to unconnected workers, more job openings at high wages, attract a disproportionate number of searchers raising unemployment.

## 7.4 Comparing different models

We now compare the results from the baseline segmented market model with those from the alternative models discussed in Section 6. For the model in which search in the public and private sectors is random, we reparameterize the cost of posting vacancies to target the steady-state unemployment rate ( $\kappa = 7.31$ ). We follow the same procedure for the model with a connections premium ( $\kappa = 6.29$ ). Once recalibrated, the steady state of the remaining variables is very close to that of the benchmark model.

Table 3 shows the effects of three different policies: i) a decrease in  $\bar{\mu}$  from 0.4 to 0.2; ii) an increase in  $\bar{\mu}$  from 0.4 to 0.6; and iii) a ten-percent decrease in public-sector wages.

We start by comparing the model with segmented markets with the model of random search. Graphs with a more detailed comparison are shown in Appendix G. We can see in the table that random search in the labor market weakens the effects of policies on unemployment. Although the effects go in the same direction, the mechanisms at work are different. Under random search, nepotism affects tightness ( $\theta$ ) positively and private wages

Table 3: Effects of policies under different models

<b>Policy</b>	<b>Segmented markets</b>	<b>Random search</b>	<b>Connections premium</b>
<i>Reduction of nepotism to <math>\bar{\mu} = 0.20</math></i>			
% $\Delta$ welfare	-0.28%	0.22%	-0.31%
$\Delta$ fraction of connected	-3.10 p.p.	-3.12 p.p.	-3.16 p.p.
$\Delta$ unemployment rate	0.48 p.p.	0.12 p.p.	0.42 p.p.
<i>Increase of nepotism to <math>\bar{\mu} = 0.60</math></i>			
% $\Delta$ welfare	0.40%	0.00%	0.45%
$\Delta$ fraction of connected	2.85 p.p.	2.89 p.p.	2.94 p.p.
$\Delta$ unemployment rate	-0.68 p.p.	-0.30 p.p.	-0.61 p.p.
<i>Reduction of public-sector wages by 10 percent</i>			
% $\Delta$ welfare	1.36%	0.88%	1.35%
$\Delta$ fraction of connected	-0.74 p.p.	-0.68 p.p.	-0.76 p.p.
$\Delta$ unemployment rate	-1.80 p.p.	-1.03 p.p.	-1.82 p.p.

Note: The random search and connections premium models are recalibrated ( $\kappa = 7.31$ ) and ( $\kappa = 6.29$ ).

negatively. By having fewer unconnected vacancies, the outside option of an unemployed worker bargaining with a firm is weaker, pushing wages down and raising job creation. This effect on private wages raises the public-sector wage premium endogenously.

As discussed above, the effect of  $\bar{\mu}$  on welfare are ambiguous. As Figure A4 in Appendix G shows, under this parametrization, and in contrast with segmented markets, the effect is negative. When we move from  $\bar{\mu} = 0.40$  to  $\bar{\mu} = 0.20$ , welfare increases by 0.22 percent. When moving to  $\bar{\mu} = 0.60$ , welfare also increases but marginally.

Turning, now, to the model with connections premium, it tends to amplify the effects of policies on the number of connected workers, but because the premium represents only 1.3 percent of public-sector wages, the effects are quantitatively similar to those in the benchmark model.

To sum up, we can draw three main conclusions from this section. First, under the baseline model, parameterized to a country with a large public-sector wage premia, welfare is increasing in  $\bar{\mu}$ , but this is not always true in the random search model. Second, public-sector wage cuts have a large quantitative effect on reducing the unemployment rate. Third, in the random search model, the effects of policies on unemployment are qualitatively similar but quantitatively smaller than in the model with segmented markets. The same holds for the “connections premium” model.

## 8 Conclusion

This paper provides a benchmark model to understand how public-sector hiring and wage policies affect rent-seeking decisions and employment. The model takes in account one pervasive characteristic in many public sectors - that not all hiring is meritocratic. Our results provide insights that can explain some European cross-country facts.

Previous literature has highlighted the problems of setting high public-sector wages. For example, Gomes (2015) and Afonso and Gomes (2014) shown that they generate higher unemployment. Cavalcanti and Santos (2017) argue that higher wages might lead to misallocation of resources with a lower entrepreneurship rate. We highlight an additional negative effect. Higher public-sector wages might lead workers to pursue rent-seeking activities.

We have shown that the existence of a “connections” market for public jobs requires that public-sector wages are very high compared to those in the private sector. This result is consistent with evidence that Southern European countries, known for having non-meritocratic hiring, have a higher public-sector wage premium, while Nordic countries, in which governments follow more meritocratic hiring, tend to have a lower or a negative public-sector wage premium. The results also suggest why Southern European governments might maintain the

status quo of the hiring process. Conditional on high public-sector wages and long queues for public-sector jobs, the existence of nepotism in hiring for government jobs actually lowers unemployment. Given the high public-sector wage premium, the presence of nepotism in the public-sector might be constrained efficient.

In our model, we do not have to take a stance as to whether connected workers are more or less productive than other public-sector workers. A common argument is that workers that get jobs through connections are of worst quality. If this were the case, the result that hiring through connections lowers unemployment would still go through. Additionally, there would be an extra negative effect of welfare due to lower quality of public-sector output. However, if one were to generalize the model, it is not clear whether a social planner would want more high-quality workers in the public or the private sector. A definite answer would require specifying the importance of high-quality workers in private- and public-sector production and its value, for which there is little empirical evidence available.

The connections market that we have emphasized could not exist in the private sector in the same form. We have shown that in the public-sector connected workers are given priority for jobs even if the surplus they generate is not larger than that of workers without connections. In the private sector this is not possible. Wage bargaining and free-entry of firms would ensure that job-finding rates would reflect nothing but match surplus. Obtaining connections would help find jobs in the private sector faster only if connections could help improve the match surplus or only if employers could somehow benefit more from hiring through connections than through standard search in the market. If not, the endogeneity of job-creation – that is absent in the public sector – would eliminate any incentive to become connected.

While this paper was motivated by differences across European countries, several of the results are useful to think more widely about public sectors in developing countries. Finan, Olken, and Pande (2015) describe a growing body of field experiments in developing countries exploring the personnel economics of the state. Our model can provide a theoretical foundation to help designing field experiments. The literature commonly argues that higher wages for civil servants are necessary to avoid corruption in the public sector. We show that, on the other hand, higher wages for civil servants creates an asymmetry with the private sector, which might itself create an incentive for a different type of corruption.

Although we have emphasized the role of nepotism in recruiting government employees, our model is very general, and some of the results can be extrapolated to other country-specific public-sector characteristics. Dickson, Postel-Vinay, and Turon (2014) find that countries with a positive lifetime premium of the public sector, France and Spain in their sample, are also the countries that require costly entry procedures, such as national exams.

We could reinterpret the model, considering the cost of connections as the cost of preparing for an exam, and  $\mu$  the fraction of civil servants hired through an exam. We would conclude that, although this channel could be inefficient, conditional on an inefficient wage policy, it might be one way to minimize the effects on unemployment. The parameters of such model could be identified and estimated allowing for a more meticulous quantitative analysis.

## References

- AFONSO, A., AND P. GOMES (2014): “Interactions between private and public wages,” *Journal of Macroeconomics*, 39, 97–112.
- ALBRECHT, J., M. ROBAYO-ABRIL, AND S. VROMAN (2017): “Public-Sector Employment in an Equilibrium Search and Matching Model,” *Economic Journal*, Forthcoming.
- ALESINA, A., R. BAQIR, AND W. EASTERLY (2000): “Redistributive Public Employment,” *Journal of Urban Economics*, 48(2), 219–241.
- BELLO, S. L., AND I. MORCHIO (2017): “Like Father, Like Son: Occupational Choice, Intergenerational Persistence and Misallocation,” Discussion paper.
- BÓ, E. D., F. FINAN, AND M. A. ROSSI (2013): “Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service,” *The Quarterly Journal of Economics*, 128(3), 1169–1218.
- BRADLEY, J., F. POSTEL-VINAY, AND H. TURON (2017): “Public sector wage policy and labour market equilibrium: a structural model,” *Journal of the European Economic Association*, Forthcoming.
- BURDETT, K. (2012): “Towards a theory of the labor market with a public sector,” *Labour Economics*, 19(1), 68–75.
- CAVALCANTI, T., AND M. SANTOS (2017): “(Mis)Allocation Effects of an Overpaid Public Sector,” Discussion paper.
- CHARRON, N., C. DAHLSTRM, M. FAZEKAS, AND V. LAPUENTE (2017): “Careers, Connections, and Corruption Risks: Investigating the Impact of Bureaucratic Meritocracy on Public Procurement Processes,” *The Journal of Politics*, 79(1), 89–104.
- CHARRON, N., L. DIJKSTRA, AND V. LAPUENTE (2014): “Regional governance matters: quality of government within European Union member states,” *Regional Studies*, 48(1), 68–190.
- CHRISTOFIDES, L., AND M. MICHAEL (2013): “Exploring the public-private sector wage gap in European countries,” *IZA Journal of European Labor Studies*, 2(15).

- CHRISTOFIDES, L. N., AND P. PASHARDES (2002): “Self/paid-employment, public/private sector selection, and wage differentials,” *Labour Economics*, 9(6), 737–762.
- DAHLSTRÖM, C., J. TEORELL, S. DAHLBERG, F. HARTMAN, A. LINDBERG, AND M. NIS-TOTSKAYA (2015): “The Quality of Government Expert Survey II A Report,” Discussion paper.
- DICKSON, M., F. POSTEL-VINAY, AND H. TURON (2014): “The lifetime earnings premium in the public sector: The view from Europe,” *Labour Economics*, 31(C), 141–161.
- DISNEY, R., AND A. GOSLING (1998): “Does it pay to work in the public sector?,” *Fiscal Studies*, 19(4), 347–374.
- DURANTE, R., G. LABARTINO, AND R. PEROTTI (2011): “Academic Dynasties: Decentralization and Familism in the Italian Academia,” NBER Working Papers 17572, National Bureau of Economic Research, Inc.
- FAFCHAMPS, M., AND J. LABONNE (2014): “Do Politicians’ Relatives Get Better Jobs? Evidence from Municipal Elections,” Discussion paper.
- FINAN, F., B. A. OLKEN, AND R. PANDE (2015): “The Personnel Economics of the State,” NBER Working Papers 21825, National Bureau of Economic Research, Inc.
- FONTAINE, I., I. GALVEZ-INIESTA, P. GOMES, AND D. VILA-MARTIN (2018): “Labour market flows:accounting for the public sector,” Discussion paper.
- GALENIANOS, M. (2014): “Hiring through referrals,” *Journal of Economic Theory*, 152(C), 304–323.
- GELB, A., J. B. KNIGHT, AND R. H. SABOT (1991): “Public Sector Employment, Rent Seeking and Economic Growth,” *Economic Journal*, 101(408), 1186–1199.
- GOMES, P. (2015): “Optimal public sector wages,” *Economic Journal*, 125, 1425–1451.
- (2018): “Heterogeneity and the public sector wage policy,” *International Economic Review*, Forthcoming.
- GYOURKO, J., AND J. TRACY (1989): “The Importance of Local Fiscal Conditions in Analyzing Local Labor Markets,” *Journal of Political Economy*, 97(5), 1208–31.
- HÖRNER, J., L. R. NGAI, AND C. OLIVETTI (2007): “Public Enterprises And Labor Market Performance,” *International Economic Review*, 48(2), 363–384.
- HORVATH, G. (2014): “Occupational mismatch and social networks,” *Journal of Economic Behavior and Organization*, 106(C), 442–468.
- KATZ, L. F., AND A. B. KRUEGER (1991): “Changes in the Structure of Wages in the Public and Private Sectors,” NBER Working Papers 3667.

- KEYNES, J. M. (1936): *The General Theory of Employment, Interest and Money*. Macmillan, 14th edition, 1973.
- MARTINS, P. S. (2010): “Cronyism,” IZA Discussion Papers 5349.
- MICHAILLAT, P. (2014): “A theory of countercyclical government multiplier,” *American Economic Journal: Macroeconomics*, 6(1).
- MOEN, E. R. (1997): “Competitive Search Equilibrium,” *Journal of Political Economy*, 105(2), 385–411.
- NAVARRO, L., AND M. TEJADA (2018): “On the Interaction between Public Sector Employment and Minimum Wage in a Search and Matching Model,” Discussion paper.
- NICKELL, S., AND G. QUINTINI (2002): “The consequences of the decline in public sector pay in Britain: a little bit of evidence,” *Economic Journal*, 112(477), F107–F118.
- OECD (2017): “Government at a Glance 2017,” Discussion paper.
- QUADRINI, V., AND A. TRIGARI (2007): “Public Employment and the Business Cycle,” *Scandinavian Journal of Economics*, 109(4), 723–742.
- SALOMÄKI, A., AND T. MUNZI (1999): “Net Replacement Rates of the Unemployed. Comparison of various approaches,” European Commission Economic Papers 133.
- SCOPPA, V. (2009): “Intergenerational transfers of public sector jobs: a shred of evidence on nepotism,” *Public Choice*, 141(1), 167–188.



# COMPANION APPENDIX

## Jumping the queue: nepotism and public-sector pay

Andri Chassamboulli and Pedro Gomes

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# A Proofs of propositions

## A.1 Lemma 2

We consider that the public-sector unconnected labour market breaks down if the government is not able to hire enough workers to replace the workers that have lost their job. At the limit, it means the government needs to post a wage, defined as  $\underline{w}_u^g$ , such that it attracts at least  $(1 - \mu)(s^g + \tau)e^g$  job searches. This means  $u_u^g = (1 - \mu)(s^g + \tau)e^g$  and the job-finding rate is 1 ( $m_u^g = 1$ ). Applying this to (16) and then setting  $U_u^p = U_u^g$  gives

$$b + \frac{1}{r + \tau + s^g + 1} [\underline{w}_u^g - b] = (r + \tau)U_u^p$$

Substituting the  $(r + \tau)U_u^p$  by equation (15) we get

$$\underline{w}_u^g = \frac{(r + \tau + s^g + 1)m(\theta^*)}{r + \tau + s^p + m(\theta^*)} [w^{p,*} - b] + b$$

where  $\theta^*$  and  $w^{p,*}$  are the equilibrium tightness and wages in the private sector.

If  $\mu = 0$  then no connections sector exists and all workers hired into the public sector are unconnected. If, on the other hand, a connections sector exists then a share  $\mu$  of public-sector workers are hired through connections. For the existence of a connections sector, through which the government is able to hire a fraction  $\mu$  of its employees the government needs to attract at least  $\mu(s^g + \tau)e^g$  connected job searchers. This occurs when the government pays a higher wage,  $\underline{w}_c^g$ , so that queues in the public sector are long enough to induce enough job searchers to use connections to get government jobs.

$$\underline{w}_c^g = \underline{w}_u^g + \Xi^{c,-1}(\mu(s^g + \tau)e^g)(r + \tau + s^g + 1)$$

where  $\Xi^{c,-1}$  is the inverse of the distribution of connection cost. What it means is that, at the margin, the government has to pay high enough wages such that public-sector queues are long enough and a sufficiently high mass of newborns decide to pay the cost and obtain connections.

Notice that  $\underline{w}_c^g$  is increasing in  $\mu$ , while  $\underline{w}_u^g$  is independent of  $\mu$ . If  $\mu = 0$  then we get  $\underline{w}_c^g = \underline{w}_u^g$ , whereas if  $\mu = \bar{\mu}$  then  $\underline{w}_c^g = \underline{\underline{w}}_c^g$  where

$$\underline{\underline{w}}_c^g = \underline{w}_u^g + \Xi^{c,-1}(\bar{\mu}(s^g + \tau)e^g)(r + \tau + s^g + 1)$$

## A.2 Proof of Existence and Uniqueness of a Steady-State Equilibrium

**Proof.** It can be easily verified that the free-entry condition in (13) pins down a unique equilibrium value for tightness in the private sector  $\theta^*$ . To complete the proof of existence

and uniqueness we need to show that with  $\theta^*$  substituted in, the threshold condition in (23) gives a unique equilibrium value for  $\tilde{c}$ .

Let us write (23) as:

$$\tilde{c} - \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}} (w^g - b) \right] = \frac{1}{r + \tau} \frac{\beta \kappa \theta}{(1 - \beta)} \quad (34)$$

where  $L_c^g = \Xi(\tilde{c})$ . The left-hand-side of (34) increases with  $\tilde{c}$ . This means that with  $\theta^*$  substituted in we can use (34) to solve for the equilibrium value of  $\tilde{c}$ . The equilibrium conditions (13) and (23) thus give a unique set of equilibrium values  $\tilde{c}^*$  and  $\theta^*$ . This completes the proof of existence and uniqueness. ■

### A.3 Proof of Proposition 1

**Proof.** First, we show that  $\frac{dL_u^p}{d\mu} > 0$  (where  $\mu = \bar{\mu}$ ):

Let  $L^g = L_u^g + L_c^g$  denote the total number of workers that are either employed or are searching in the public sector. Using conditions (18) and (20) to solve, respectively, for  $L_u^g$  and  $L_c^g$ , and then adding them up gives:

$$L^g = e^g \left[ \lambda + (1 - \lambda)(w^g - b) \left[ \frac{\mu}{\tilde{c}(r + \tau) + \frac{\beta}{1 - \beta} \kappa \theta} + \frac{1 - \mu}{\frac{\beta}{1 - \beta} \kappa \theta} \right] \right] \quad (35)$$

where  $\lambda = \frac{r}{r + s^g + \tau}$ . Recall that the equilibrium value of  $\theta$  is given by equation (13) and is independent of  $\mu$ ; thus  $\frac{d\theta}{d\mu} = 0$ . Given this, we can write:

$$\frac{dL^g}{d\mu} = \frac{\partial L^g}{\partial \mu} + \frac{\partial L^g}{\partial \tilde{c}} \frac{\partial \tilde{c}}{\partial \mu} \quad (36)$$

and using (34) we can derive that

$$\frac{\partial \tilde{c}}{\partial \mu} > 0 \quad (37)$$

Moreover, it can be easily verified from (35) that  $\frac{\partial L^g}{\partial \mu} < 0$  and  $\frac{\partial L^g}{\partial \tilde{c}} < 0$ , implying from (36) that

$$\frac{dL^g}{d\mu} < 0.$$

Given that  $L_u^p = 1 - L^g$ , it follows that  $\frac{dL_u^p}{d\mu} > 0$ .

Next we show that  $\frac{du^g}{d\mu} < 0$ . The number of workers searching in the public sector with and without connections are given, respectively, by  $u_c^g = L_c^g - \mu e^g$  and  $u_u^g = L_u^g - (1 - \mu)e^g$ . By adding them up we get  $u^g = u_u^g + u_c^g = L^g - e^g$ . The number of workers employed in the public sector,  $e^g$ , is exogenous and independent of  $\mu$ , while, as shown above,  $\frac{dL^g}{d\mu} < 0$ . It follows that  $\frac{du^g}{d\mu} < 0$ .

Finally, we show that the employment rate ( $e$ ) increases. That is,  $\frac{de}{d\mu} > 0$ . The total employment rate is given by  $e = e^g + e^p$ , where  $e^g$  is exogenously set by the government, while  $e^p$  can be derived from (24) and (27):  $e^p = \frac{m(\theta)L_u^p}{s^p + \tau + m(\theta)}$ . Adding them up gives:

$$e = e^g + \frac{m(\theta)(1 - L^g)}{s^p + \tau + m(\theta)} \quad (38)$$

Evidently,  $\frac{de}{d\mu} > 0$ , since  $\theta$  is independent of  $\mu$ , while  $\frac{dL_u^p}{d\mu} > 0$ .

■

## A.4 Proof of Proposition 2

First, let us show that the number of workers searching in the public sector increases as the public-sector wage increases; that is  $\frac{dL^g}{dw^g} > 0$ , which ultimately implies that  $\frac{dL^p}{dw^g} < 0$ , since  $L_u^p = 1 - L^g$ .

Using condition (18) we can solve for  $L_u^g$  and obtain:

$$L_u^g = (1 - \mu)e^g \left[ 1 + (1 - \lambda) \left( \frac{w^g - b - \frac{\beta}{1-\beta}\kappa\theta}{\frac{\beta}{1-\beta}\kappa\theta} \right) \right] \quad (39)$$

where  $\lambda$  is as defined above (in Proposition 1).

The total number of workers attached to the public sector is given by  $L^g = L_u^g + L_c^g$  where  $L_u^g$  is as derived above and  $L_c^g = \Xi(\tilde{c})$ . Taking the derivative with respect to  $w^g$  gives:

$$\frac{dL^g}{dw^g} = \frac{dL_u^g}{dw^g} + \frac{dL_c^g}{d\tilde{c}} \frac{d\tilde{c}}{dw^g} \quad (40)$$

It is straightforward to verify from (39) that  $\frac{dL_u^g}{dw^g} > 0$ . Moreover,  $\frac{dL_c^g}{d\tilde{c}} = \xi(\tilde{c}) > 0$  and using (34) we can derive that:

$$\frac{d\tilde{c}}{dw^g} = \frac{M}{r + \tau + \frac{M(1-M)(w^g - b)}{L_c^g - \mu e^g} \frac{dL_c^g}{d\tilde{c}}} > 0 \quad (41)$$

where  $M = \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}$ . It follows from (40) that:

$$\frac{dL^g}{dw^g} > 0 \quad (42)$$

Using (34), (35) and (41) we can further show that:

$$\frac{dL^g}{dw^g} = e^g(1 - \lambda) \left[ \frac{\mu}{\tilde{c}(r + \tau) + \frac{\beta}{1-\beta}\kappa\theta} \left( 1 - \frac{r + \tau}{r + \tau + \left( \tilde{c}(r + \tau) + \frac{\beta}{1-\beta}\kappa\theta \right) \frac{(1-M)}{L_c^g - \mu e^g} \frac{dL_c^g}{d\tilde{c}}} \right) + \frac{1 - \mu}{\frac{\beta}{1-\beta}\kappa\theta} \right] \quad (43)$$

Note that if  $\mu = 0$  then

$$\frac{dL^g}{dw^g} = e^g(1 - \lambda) \left[ \frac{1}{\frac{\beta}{1-\beta}\kappa\theta} \right] \quad (44)$$

Comparing (43) to (44) shows:

$$\frac{dL^g}{dw^g} \Big|_{\mu=0} > \frac{dL^g}{dw^g} \Big|_{\mu>0} \quad (45)$$

and the increase in the number of workers searching in the public sector due to an increase in the public-sector wage is larger when  $\mu = 0$  than when  $\mu > 0$ .

Since  $L_u^p = 1 - L^g$  and  $u^g = L^g - e^g$ , the decrease and increase, respectively, in  $L_u^p$  and  $u^g$ , is also larger when  $\mu = 0$  than when  $\mu > 0$ .

## B Efficiency

As also mentioned in the text, the existence of a connections sector and of queues for public-sector jobs are both inefficient. These two types of inefficiencies can be eliminated by setting  $\mu = 0$ , which implies  $L_c^g = 0$ , and  $w^g = \underline{w}^g$ , which ensures that  $u_u^g = (s^g + \tau)e^g$  and the job-finding rate for government jobs is 1. We next compare the central planner's solution to the decentralized one, described in the text, and show that the remaining inefficiency, the congestion externalities can be eliminated with the Hosios condition.

We follow Hosios (1990), Charlot and Decreause (2005), among others, and set  $r = 0$ , so that the central planner maximizes the steady-state surplus. The planner's problem is to choose  $\theta, u^p$  to maximize total output, plus unemployment income, minus job creation costs. Given that public sector employment is fixed. The planner's objective is to

$$\max(1 - L^g) [(1 - u^p)y + u^p b - \theta \kappa u^p]$$

s.t

$$u^p = \frac{s^p + \tau}{s^p + \tau + m(\theta)}$$

We set the Langrangian

$$\mathcal{L} = (1 - L^g) [(1 - u^p)y + u^p b - \theta \kappa u^p] + \phi \left[ u^p - \frac{s^p + \tau}{s^p + \tau + m(\theta)} \right] \quad (46)$$

The three optimality conditions are

$$\frac{\partial \mathcal{L}}{\partial \theta} = 0 \Rightarrow \phi \frac{m'(\theta)}{s^p + \tau + m(\theta)} = (1 - L^g) \kappa \quad (47)$$

$$\frac{\partial \mathcal{L}}{\partial u^p} = 0 \Rightarrow \phi = (1 - L^g) [y - b + \kappa \theta] \quad (48)$$

$$\frac{\partial \mathcal{L}}{\partial \phi} = 0 \Rightarrow u^p = \frac{s^p + \tau}{s^p + \tau + m(\theta)} \quad (49)$$

Substituting (48) into (47) gives:

$$\frac{\kappa}{q(\theta)} = \frac{\eta(y - b)}{s^p + \tau + m(\theta)(1 - \eta)} \quad (50)$$

where it may be useful to recall that  $m(\theta) = \theta^\eta$  and  $m'(\theta) = \eta q(\theta)$ . It is easy to verify by comparing (50) to (13), that given  $r = 0$ , if  $\beta = (1 - \eta)$ , then the decentralized equilibrium is identical to the central planner's solution.

## C Random search

### C.1 Setup

In this appendix we give the full set of equations of the model with random search and characterize its steady-state equilibrium. Further, we show that in the limiting case where  $\mu = 1$  the model with random search becomes identical to the model with segmented markets and we provide proofs of Proposition 4.

The values of being unemployed and employed for connected workers remain as in the Benchmark model; given by (4) and (6). The same holds for the values of being employed in either the private or the public sector for unconnected workers (equations 2 and 5), and the values of a private-sector filled jobs and vacancies (equations 7 and 8). The cutoff connection cost as well as the selection of workers into the two groups,  $L_c^g, L_u$ , also remain as given in equations (21) and (22). As discussed in the text, only the value of unemployment for unconnected workers changes. It is now given by equation (30). The Nash bargaining wage of the private sector changes accordingly and is as given in (31).

Both government and private firms that seek to hire workers through regular search in the market meet with workers at rate  $q(\theta) = \frac{m(\theta)}{\theta}$ , where  $\theta = \frac{v_u^p + v_u^g}{u_u}$ . The number of vacancies in the private sector is determined endogenously by free entry that drives the value of a private-sector vacancy to zero,  $V_u^p = 0$ . The government needs to post enough vacancies for workers without connections to ensure that the total number of matches with such workers,  $q(\theta)v_u^g$ , equals the number of unconnected workers that it needs to hire. Hence, the government posts  $v_u^g$  vacancies to ensure  $q(\theta)v_u^g = (1 - \mu)(s^g + \tau)e^g$ .

Setting  $V_u^p = 0$  and using the Nash bargaining conditions in (10), we can write the surplus of a private-sector match as

$$S_u^p = \frac{y - b - D(w^g - b)}{r + \tau + s^p + (1 - D)\beta m(\theta)\nu^p} \quad (51)$$

and the zero-profit condition that determines job creation in the private sector becomes:

$$\frac{\kappa}{q(\theta)} = \frac{(1 - \beta)(y - b - D(w^g - b))}{r + \tau + s^p + (1 - D)\beta m(\theta)\nu^p} \quad (52)$$

We can write the threshold level of connection costs,  $\tilde{c} = U_c^g - U_u$ , as:

$$\tilde{c} = \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{u_c^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{u_c^g}}(w^g - b) - D(w^g - b) - (1 - D)\frac{\beta\kappa\theta\nu^p}{(1 - \beta)} \right] \quad (53)$$

As in the benchmark model we treat public sector employment as an exogenous policy variable. There are  $e^g$  workers employed in the public sector. Among these workers,  $\mu^g$  are workers who were hired through connections ( $e_c^g$ ) and the remaining  $(1 - \mu)e^g$  are workers hired through regular search in the market ( $e_u^g$ ). The number of workers employed in the private sector is endogenous and depends on job creation in the private sector as well as conditions in the public sector. The labor force of workers without connections consists of those employed in the public sector, those employed in the private sector ( $e_u^p$ ), and the

unemployed ( $u_u$ ). Hence,  $u_u = L_u - (1 - \mu)e^g - e_u^p$ . By equating the flows in,  $m(\theta)\nu^p u_u$ , to the flows out of the state where a worker is employed in the private sector,  $e_u^p(s^p + \tau)$  we obtain:

$$e_u^p = \frac{m(\theta)\nu^p [L_u - (1 - \mu)e^g]}{m(\theta)\nu^p + \tau + s^p} \quad (54)$$

$$u_u = \frac{(\tau + s^p) [L_u - (1 - \mu)e^g]}{m(\theta)\nu^p + \tau + s^p} \quad (55)$$

Given  $\theta = \frac{v_u^p + v_u^g}{u_u}$  and  $q(\theta)v_u^g = (1 - \mu)(s^g + \tau)e^g$ , we can use (55) to write:

$$\nu^p = \frac{s^p + \tau}{m(\theta)} \left[ \frac{m(\theta) [L_u - (1 - \mu)e^g] - (1 - \mu)(s^g + \tau)e^g}{(s^p + \tau) [L_u - (1 - \mu)e^g] + (1 - \mu)e^g(s^g + \tau)} \right] \quad (56)$$

Using (54) and (56) we can write the total employment of workers without connections,  $e_u = e_u^p + (1 - \mu)e^g$  as:

$$e_u = \frac{m(\theta)L_u + (1 - \mu)e^g(s^p - s^g)}{s^p + \tau + m(\theta)} \quad (57)$$

## C.2 The case $\mu = 1$

If  $\mu = 1$ , then, as can be seen from (56),  $\nu^p = 1$ , which implies  $D = 0$ . Setting  $\nu^p = 1$  and  $D = 0$  in (31), (52) and (53) gives:

$$w^p = b + \beta [y - b + \theta\kappa] \quad (58)$$

$$\frac{\kappa}{q(\theta)} = (1 - \beta) \left( \frac{y - b}{r + s^p + \tau + \beta m(\theta)} \right) \quad (59)$$

$$\tilde{c} = \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}} (w^g - b) - \frac{\beta\kappa\theta}{(1 - \beta)} \right] \quad (60)$$

The zero-profit condition in (59) gives a unique equilibrium values for  $\theta$  which is independent of government policy or conditions in the government sector. Moreover, the zero-profit condition in (59), private-sector wages in (58) and the cut-off cost in (60) are identical to those obtained under segmented markets (equations 13, 14 and 23, respectively). Hence, if  $\mu = 1$ , private-sector job creation and tightness, wages, as well as the composition of the labor force in terms of connections in the model with random search are identical to those obtained under segmented markets.

## C.3 Definition of Equilibrium

A steady state equilibrium consists of a cut-off cost  $\{\tilde{c}\}$ , tightness  $\{\theta\}$ , and unemployed  $\{u_u, u_c^g\}$ , such that, given some exogenous government policies  $\{w^g, e^g, \mu\}$ , the following apply.



1. Private-sector firms satisfy the free-entry condition (52).
2. Private-sector wages are the outcome of Nash Bargaining (31).
3. Newborns decide optimally their investments in connections and the population shares are determined by equations (21)-(22).
4. Flows between private employment and unemployment are constant

$$(s^p + \tau)e^p = m(\theta)\nu^p u_u^p,$$

5. Population add up constraints are satisfied:

$$L_u = e^p + (1 - \mu)e^g + u_u \quad (61)$$

$$L_c^g = \mu e^g + u_c^g \quad (62)$$

$$L_u + L_c^g = 1 \quad (63)$$

## C.4 Proof of Existence and Uniqueness

**Proof.** To prove the existence and uniqueness of a steady state equilibrium under random search we show below that the free-entry condition in (52) gives a unique equilibrium value for  $\theta$ . The equilibrium values of the cut-off costs can then be determined by substituting the equilibrium value of  $\theta$  in equation (53). Then using (21) and (22) we can determine  $L_u$  and  $L_c^g$ , which in turn, together with the equilibrium value of  $\theta$  can be substituted in equations (31), (54), (55), (61) and (62) to determine wages and employment in the private sector.

The job creation condition in (52) and the cut-off connection cost in (53) can be written as:

$$\frac{\kappa}{q(\theta)} = \frac{(y - b - OO)}{r + \tau + s^p} \quad (64)$$

$$\tilde{c} = \frac{1}{r + \tau} [A_c - OO] \quad (65)$$

where  $A_c \equiv \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}} (w^g - b)$ ,

$$OO = D(w^g - b) + (1 - D) \frac{\beta}{1 - \beta} \kappa \theta \nu^p \quad (66)$$

is the expression for the outside option of workers, and  $D = \frac{(1 - \nu^p)m(\theta)}{r + \tau + s^g + (1 - \nu^p)m(\theta)}$ .

Taking the derivative of (66) and (65) with respect to  $\theta$  we obtain:

$$\frac{dOO}{d\theta} = \frac{\partial OO}{\partial \theta} + \frac{\partial OO}{\partial \tilde{c}} \frac{d\tilde{c}}{d\theta} \quad (67)$$

$$\frac{d\tilde{c}}{d\theta} = \frac{1}{r + \tau} \left[ \frac{\partial A_c}{\partial L_c^g} \frac{dL_c^g}{d\tilde{c}} \frac{d\tilde{c}}{d\theta} - \frac{dOO}{d\theta} \right] \quad (68)$$

where

$$\frac{\partial OO}{\partial \tilde{c}} = -\frac{(1-D)m(\theta)(E_u^g - E_u^p)(s^p + \tau)(1 - \nu^p)}{(s^p + \tau)[L_u - (1 - \mu)e^g] + (1 - \mu)e^g(s^g + \tau)} \frac{dL_u}{d\tilde{c}} \quad (69)$$

$$\frac{\partial OO}{\partial \theta} = (1-D)q(\theta) \left[ (1 - \nu^p)\eta \left( \frac{E_u^g m(\theta) + E^P(s^p + \tau)}{s^p + \tau + m(\theta)} - U_u \right) + \nu^p (E_u^p - U_u) \right] \quad (70)$$

Recall that  $L_c^g = \Xi(\tilde{c})$  and  $L_u = 1 - \Xi(\tilde{c})$  so that  $\frac{dL_c^g}{d\tilde{c}} = \xi(\tilde{c}) > 0$  and  $\frac{dL_u}{d\tilde{c}} = -\xi(\tilde{c}) < 0$  (where  $\xi$  is the pdf of the distribution of connection costs). It can also be easily verified that  $\frac{\partial A_c}{\partial L_c^g} < 0$ .

Equations (67) and (68) can be used to solve for  $\frac{d\tilde{c}}{d\theta}$ :

$$\frac{d\tilde{c}}{d\theta} = \frac{-\frac{\partial OO}{\partial \theta}}{r + \tau - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c}) + \frac{\partial OO}{\partial \tilde{c}}} < 0 \quad (71)$$

Plugging the above into (67) we get:

$$\frac{dOO}{d\theta} = \frac{\partial OO}{\partial \theta} \left[ \frac{r + \tau - \frac{\partial A_c}{\partial L_c^g}}{r + \tau - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c}) + \frac{\partial OO}{\partial \tilde{c}}} \right] > 0 \quad (72)$$

For private and unconnected public-sector jobs to exist it must be the case that  $E_u^p - U_u > 0$  and  $E_u^g - U_u > 0$ , respectively, which ensures that they generate positive profits. This ensures that  $\frac{\partial OO}{\partial \theta} > 0$ . As can be seen from (69) sufficient (but not necessary) condition to ensure also that  $\frac{\partial OO}{\partial \tilde{c}} > 0$  is  $E_u^g - E_u^p > 0$  meaning that the value to an unconnected worker is higher when that worker is working for the government than in the private sector. If this condition holds then we know for sure that the term in the bracket of (72) is positive and thus,  $\frac{dOO}{d\theta} > 0$ , while as shown in (71)  $\frac{d\tilde{c}}{d\theta} < 0$ . If  $\frac{dOO}{d\theta} > 0$  holds, then the right-hand-side of (64) is decreasing while its left-hand-side is increasing in  $\theta$ . Equation (64) thus pins down a unique equilibrium value for  $\theta$ , which can then be used to solve for  $\tilde{c}$  and the rest of the endogenous variables. ■

## C.5 Proof of Proposition 4

**Proof.** From (64) and (65) we get:

$$\frac{d\theta}{dw^g} = - \left[ \frac{\frac{\partial OO}{\partial w^g} \left( r + \tau - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c}) \right) + \frac{\partial OO}{\partial \tilde{c}} \frac{\partial A_c}{\partial w^g}}{\left( r + \tau - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c}) \right) \frac{\partial OO}{\partial \theta} - \frac{\kappa q'(\theta)}{q^2(\theta)} (r + s^p + \tau) \left( r + \tau - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c}) + \frac{\partial OO}{\partial \tilde{c}} \right)} \right] \quad (73)$$

$$\frac{d\tilde{c}}{dw^g} = \frac{\frac{\partial A_c}{\partial w^g} - \frac{\partial OO}{\partial w^g} (1 - B)}{r + \tau + \frac{\partial OO}{\partial \tilde{c}} (1 - B) - \frac{\partial A_c}{\partial L_c^g} \xi(\tilde{c})} \quad (74)$$

where  $B \equiv \frac{\frac{\partial OO}{\partial \theta}}{\frac{\partial OO}{\partial \theta} - \frac{\kappa q'(\theta)}{q^2(\theta)}(r+s^p+\tau)}$ .

As shown above (in Section C.4)  $\frac{\partial OO}{\partial \theta} > 0$  and  $\frac{\partial OO}{\partial \tilde{c}} > 0$  while  $q'(\theta) < 0$ . These imply that the denominators in the above expressions are always positive. We know in addition that  $\frac{\partial A_c}{\partial w^g} > 0$ ,  $\frac{\partial A_c}{\partial L_c^g} < 0$  and  $\frac{\partial OO}{\partial w^g} > 0$ , meaning that the numerator in the bracket of (73) is positive also. Further, from (65) we can verify that for  $\tilde{c} > 0$  it must be the case that  $\frac{\partial A_c}{\partial w^g} - \frac{\partial OO}{\partial w^g} > 0$ , which ensures, also, that the numerator of (74) is positive. It follows, then, that

$$\frac{d\theta}{dw^g} < 0 \quad (75)$$

$$\frac{d\tilde{c}}{dw^g} > 0 \quad (76)$$

Using (57) we can easily verify that total employment  $e = e_u + \mu e^g$  will decrease with an increase in  $w^g$  since:

$$\frac{de}{dw^g} = \frac{de}{d\tilde{c}} \frac{d\tilde{c}}{dw^g} + \frac{de}{d\theta} \frac{d\theta}{dw^g}$$

and

$$\begin{aligned} \frac{de}{d\tilde{c}} &< 0 \\ \frac{de}{d\theta} &> 0 \end{aligned} \quad (77)$$

Since  $L_c^g = \Xi(\tilde{c})$ ,  $L_u = 1 - \Xi(\tilde{c})$  and  $\frac{dL_c^g}{dw^g} > 0$ , it follows that  $\frac{dL_c^g}{dw^g} > 0$  and  $\frac{dL_u}{dw^g} < 0$ . ■

## D Competitive Search in the Private Sector

As mentioned in the text, under competitive search, the private sector consists of submarkets. In each submarket there is a subset of unemployed workers and firms with vacant jobs that are searching for each other. The number of matches in submarket  $n$  is  $m(v_n, u_n) = (v_n)^\eta (u_n^p)^{(1-\eta)}$ ,  $m(\theta_n)$  is the job finding rate and  $q(\theta_n)$  the job filling rate. For a worker in submarket  $n$

$$(r + \tau)U_{u,n}^p = b + m(\theta_n) [E_{u,n}^p - U_{u,n}^p] \quad (78)$$

$$(r + \tau)E_{u,n}^p = w_n^p - s^p [E_{u,n}^p - U_{u,n}^p] \quad (79)$$

Unemployed workers are free to move between submarkets. They will choose to search for a job in the submarket that yields the highest expected income. Since workers are ex-ante identical and movement across submarkets is free, this means that  $U_{u,n}^p = U_u^p$ . Using (78) and (79) we can write:

$$m(\theta_n) = \left( \frac{(r + \tau)U_u^p - b}{w_n^p - (r + \tau)U_u^p} \right) (r + \tau + s^p) \quad (80)$$

The values of vacancies and filled jobs in submarket  $n$  satisfy

$$rV_{u,n}^p = -\kappa + q(\theta_n) [J_u^p(w_n^p) - V_{u,n}^p] \quad (81)$$

$$rJ_u^p(w_n^p) = y_n - w_n^p + (s^p + \tau) [V_{u,n}^p - J_u^p(w_n^p)] \quad (82)$$

Using (81) and (82) to solve for  $V_{u,n}^p$  gives

$$rV_{u,n}^p = \frac{-\kappa(r + s^p + \tau) + q(\theta_n)(y_n - w^p)}{r + q(\theta_n) + s^p + \tau} \quad (83)$$

In a competitive search equilibrium a market maker determines the number of submarkets in each market and the wage in each submarket. The wage is chosen to maximize the value of a vacancy. All vacancies in the same submarket offer the same wage. Setting the derivative of (83) with respect to  $w_n^p$  equal to 0 we get the first order condition for optimal wages:

$$-(1 - \eta)(r + s^p + \tau) \frac{d\theta_n}{dw_n^p} [y_n - w_n^p + \kappa] = \theta_n(r + s^p + \tau) + m(\theta_n) \quad (84)$$

There is free entry of vacancies in each submarket, which drives the value of a vacancy to zero. Setting  $V_{u,n}^p = 0$  in (83) gives:

$$\frac{\kappa}{q(\theta_n)} = \frac{y_n - w^p}{r + s^p + \tau} \quad (85)$$

Taking the derivative of (80) with respect to  $w_n^p$  we obtain

$$\frac{d\theta_n}{dw_n^p} = - \left( \frac{\theta_n}{w_n^p - (r + \tau)U_u^p} \right) \frac{1}{\eta} \quad (86)$$

Using (85) and (86) to substitute for  $\kappa$  and  $\frac{d\theta_n}{dw_n^p}$ , respectively, in (84) and then solving for  $w_n^p$  we get

$$w_n^p = (1 - \eta)y_n + \eta(r + \tau)U_u^p \quad (87)$$

Using (80) and (85) we can substitute for  $(r + \tau)U_u^p$  in (87) and obtain

$$w_n^p = b + (1 - \eta)(y_n - b + \theta_n \kappa) \quad (88)$$

Substituting  $w_n^p$  from (88) into (85) we get the job creation condition in each submarket

$$\frac{\kappa}{q(\theta_n)} = \frac{\eta(y_n - b)}{r + s^p + \tau + (1 - \eta)m(\theta_n)} \quad (89)$$

Notice that if  $y_n = y$ , meaning that productivity is the same across all submarkets then  $\theta_n = \theta$  and  $w_n^p = w^p$ . All submarkets offer the same wage and job finding rate. If in addition the Hosios condition holds, i.e.  $1 - \eta = \beta$ , then job creation, market tightness and the Nash bargaining wage in the Benchmark model described in the text (see equations 13 and 14) are identical to those derived under competitive search.

## E Connections Premium

With the introduction of a connection premium all other Bellman equations but the value of being employed in the public sector for a connected worker ( $E_c^g$ ) remain as in the Benchmark model described in Section 3. It follows that all equilibrium conditions remain the same, but equations (23) that determine the cut-off connection costs. The cut-off connection cost now change to take into account that the existence of a connection premium increases the value of being a connected and employed public employee. In particular, equation (23) becomes:

$$\tilde{c} = \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}} \left( w^g - b + \frac{\tau \int_0^{\tilde{c}} c \xi(c) dc}{\mu e^g} \right) - \frac{\beta \kappa \theta}{(1 - \beta)} \right] \quad (90)$$

As shown in Appendix A.2, equations (13) gives unique equilibrium value for  $\theta$ . To guarantee the existence and uniqueness of a steady-state condition we need to show that with the equilibrium value of  $\theta$  substituted in, equation (90) gives a unique equilibrium value for  $\tilde{c}$ . Rearranging terms in (90) we can write:

$$\tilde{c} - \frac{1}{r + \tau} \left[ \frac{\frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}}{r + \tau + s^g + \frac{\mu(s^g + \tau)e^g}{L_c^g - \mu e^g}} \left( w^g - b + \frac{\tau \int_0^{\tilde{c}} c \xi(c) dc}{\mu e^g} \right) \right] = \frac{1}{r + \tau} \frac{\beta \kappa \theta}{(1 - \beta)} \quad (91)$$

Since the right-hand-side of the equation above is independent of  $\tilde{c}$  a unique equilibrium value of  $\tilde{c}$  exists if the left-hand-side of the equation above is increasing in  $\tilde{c}$ . Sufficient (but not necessary) condition for the left-hand-side of (91) to be increasing in  $\tilde{c}$  is:

$$1 - \frac{m_c^g}{r + \tau + s^g + m_c^g} \frac{\tau}{r + \tau} \frac{\tilde{c} \xi(\tilde{c})}{\mu e^g} > 0$$

Sufficient but not necessary condition for the above inequality to be always satisfied is

$$\bar{c} \xi(\bar{c}) \leq \mu e^g$$

## F Data

Table A1: Quality of government survey - European Countries

Country	QoG Indexes			Aggregate public-private wage ratio
	Skills and Merit	Political connections	Personal connections	
Austria	5.00	5.00	4.67	1.72
Belgium	5.71	3.00	2.14	1.40
Bulgaria	3.23	5.38	5.00	1.96
Croatia	4.20	4.10	3.80	
Cyprus	3.20	5.40	5.40	2.41
Czech Republic	5.00	4.11	4.10	1.33
Denmark	6.29	1.57	2.60	1.08
Estonia	4.67	3.33	3.56	
Finland	6.00	3.33	2.50	1.16
France	5.67	2.64	3.00	1.16
Germany	5.89	2.62	2.40	1.38
Greece	4.13	3.87	3.73	2.43
Hungary	3.67	5.07	4.60	1.36
Iceland	4.83	2.83	2.83	1.61
Ireland	6.64	1.82	2.45	2.31
Italy	3.25	4.25	4.20	2.05
Latvia	4.60	3.40	3.60	1.36
Lithuania	4.88	3.56	3.44	1.14
Luxembourg				0.88
Malta	3.75	4.50	3.50	1.48
Netherlands	6.08	2.46	2.68	1.92
Norway	6.40	2.07	1.87	0.98
Poland	5.50	2.80	3.20	
Portugal	4.25	4.63	4.56	2.23
Romania	4.24	4.94	4.33	
Slovakia	2.67	4.78	5.56	1.26
Slovenia	4.38	3.63	4.13	1.51
Spain	5.04	3.17	3.17	2.05
Sweden	5.92	1.92	2.69	0.93
Switzerland	6.20	3.00	2.80	
United Kingdom	5.79	2.82	2.88	1.09

*Note: Indexes of recruitment practices are taken from the Quality of Government Survey. Data on government and private sector employment is from EUROSTAT and OECD. Data on government wage bill and private sector wage bill is from AMECO.*

Table A2: Quality of government survey - World regions

Region (no of countries)	QoG Indexes		
	Skills and Merit	Political connections	Personal connections
Eastern Europe and post Soviet Union (25)	3.71	4.54	4.28
Latin America (16)	3.44	4.86	4.51
North Africa and the Middle East (11)	3.32	4.71	4.14
Sub-Saharan Africa (25)	3.60	4.92	5.11
Western Europe and North America (22)	5.51	2.92	1.99
East Asia (4)	5.32	2.87	3.08
South-East Asia (7)	4.35	4.44	4.57
South Asia (6)	3.78	4.78	5.67
The Pacific (1)	3.66	5.00	4.83
The Caribbean (3)	4.00	4.08	3.75

Note: Indexes of recruitment practices are taken from the Quality of Government Survey. Average for different world regions.

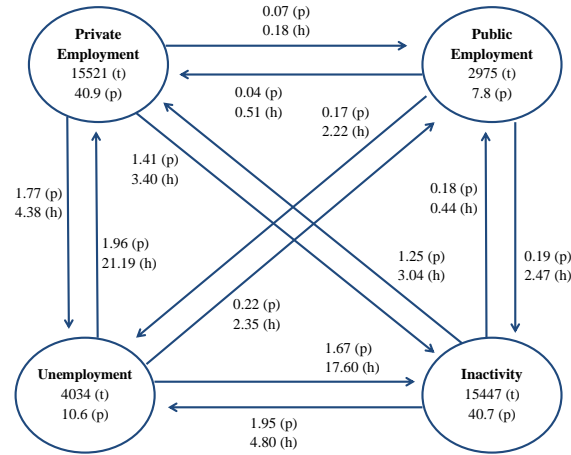
Table A3: Regression of the unemployment rate

	Baseline variables			Alternative variables		
	(1)	(2)	(3)	(4)	(5)	(6)
Public-sector wage premium	19.2*** (3.31)		24.6*** (4.29)	49.0*** (4.93)	43.0*** (5.78)	41.8*** (4.23)
Ratio of indexes of non-meritocracy		-20.4*** (-1.71)	-20.4*** (-3.12)			
× High public wage				-23.2*** (-3.70)	-6.51*** (-4.24)	-18.1*** (-3.61)
× Low public wage				-18.8*** (-3.02)	-0.21 (-0.17)	-14.1* (-2.73)
Observations	70	70	70	70	70	70
R-squared	0.14	0.041	0.248	0.335	0.343	0.325

Notes: The *t*-statistics are shown in brackets. \*\*\* indicates significance at the 1% level, \*\* at 5% level, and \* at the 10% level. The dependent variable is the unemployment rate. The ratio of the non-meritocracy index for the public sector over the index for the private sector, increases when the public sector is perceived to be less meritocratic than the private sector. The index is constructed with data taken from European Quality of Government Index dataset. The public-sector wage premium is estimated with microdata from the 2010 Structure of Earnings Survey. Unemployment rate is taken from Eurostat. In column (5) we use an alternative index which is the difference between the index for the public over the index for the private. In column (6) we use an alternative index which is the ratio between the index for the public sector (answer by only public sector workers) over the index for the private sector (answered by only private sector workers).

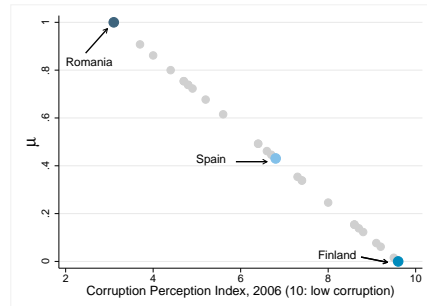
## G Segmented Markets Vs Random Search

Figure A1: 4-state stocks and flows, Spain



Source: Spanish Labour Force Survey, average 2005-2015. The worker stocks and flows are expressed as total number of people in thousands (t), as a percentage of the working-age population (p) or as a hazard rate (h). See Fontaine et al (2018) for details. For the calibration, we excluded the flows from and to inactivity.

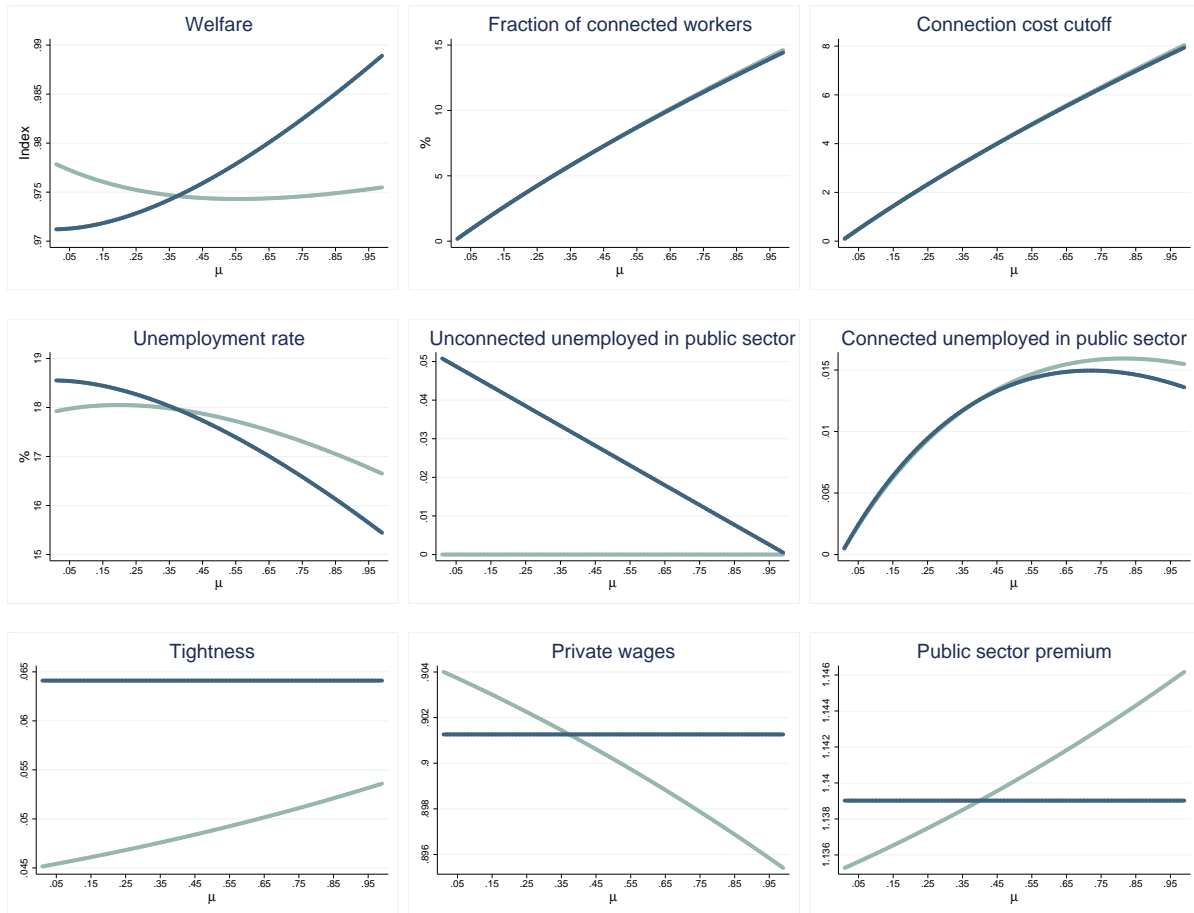
Figure A2: Alternative calculation of  $\bar{\mu}$



Source: Corruption Perception Index, 2006, Own calculations.



Figure A4: Effects of nepotism



Note: The *dark blue line* is the economy with segmented markets. The *light green line* is the economy with random search.