The Unintended Consequences of Meritocratic Government Hiring

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ABSTRACT

In an attempt to mitigate the negative effects of clientelism, many governments around the world have adopted meritocratic hiring of public employees. This paper shows that meritocratic government hiring can have unintended negative consequences on macroeconomic aggregates. In many countries, public employees enjoy considerable job security and generous compensation schemes; as a result, many talented workers choose to work for the public sector, which deprives the private sector of productive potential employees. This, in turn, reduces firms' incentives to create jobs, increases unemployment, and lowers GDP. To quantify the effects of this novel channel, we extend the standard Diamond-Mortensen-Pissarides model to incorporate workers of heterogeneous productivity and a government that fills public sector jobs based on merit. We calibrate the model to aggregate data from Greece and perform a series of counterfactual exercises. We find that the adverse effects of our mechanism on TFP, GDP, and unemployment are sizable.

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1 Introduction

In all OECD countries, the government is by far the largest employer. Thus, whether public employees are hired by merit or on partisan criteria ("clientelism") has important implications for political and economic outcomes (Alesina, Danninger, and Rostagno (2001); Robinson and Verdier (2013)). In an attempt to ameliorate the negative effects of clientilism, many governments have adopted means of meritocratic hiring. Selecting the best available employees through non-partisan procedures is believed to promote not only fairness but also economic efficiency. In this paper, we question this commonly held view by highlighting that meritocratic government hiring can have unintended negative consequences on macroeconomic aggregates. We do so by focusing on a channel that has been so far overlooked in the literature. In many countries, public employees enjoy considerable job security and generous compensation schemes; as a result, many talented workers choose to work for the public sector, which deprives the private sector of productive potential employees. This, in turn, reduces firms' incentives to create jobs, increases unemployment, and lowers GDP. The goal of this paper is to model this novel channel and explore its quantitative implications.

We develop a version of the Diamond-Mortensen-Pissarides (DMP) model, extended to include a meritocratic public sector and workers of heterogeneous productivity. As is standard in DMP models, wages in the private sector are negotiated through Nash bargaining and, hence, reflect workers' productivity. In contrast, the public sector can pay its workers any wage it wishes (even one that does not reflect economic fundamentals, like productivity), since it finances public sector compensation by imposing taxes on the private sector. In this environment, workers choose whether to apply for public or private sector jobs, understanding that the private sector rewards higher productivity, but the public sector offers higher job security. Once workers' participation decisions have been made, the government hires the most productive workers who applied for public sector jobs. Taking the behavior of workers and the public sector as given, private firms decide whether to open a vacancy and search for a worker. Firm entry is driven by expectations about profitability, which, in turn, depends on the level of taxes and workers' productivity. Therefore, if the public sector attracts a large pool of high-quality workers or imposes high taxes, the incentives of firms to create jobs deteriorate.

To highlight the main forces at work in our model, consider an increase in the generosity of public sector compensation. This increase reduces private firm entry for two reasons. First, and more obviously, it implies a higher tax burden on firms. Second, it leads to an improvement in the quality of workers who apply for public sector jobs, which through the aforementioned channel weakens the incentives of firms to enter the labor market and open vacancies. Subsequently, workers expect a lower job-finding rate in the private sector, which reinforces the decision of high-productivity workers to abandon the private for the public sector and further reduces firms' incentives to create jobs. The vicious circle just described generates a *multiplier effect*, whereby a wage premium in the public sector (in conjunction with the high job security) can result in severe misallocation of talent that affects the economy's productivity, unemployment, and GDP.

The description of our mechanism so far suggests that a meritocratic government that pays a high wage premium to public employees can have negative effects on macroeconomic aggregates. To explore these effects quantitatively, we calibrate our model to the Greek economy before the 2009 sovereign debt crisis and use it to perform a number of policy-relevant counterfactual exercises. We start by studying the consequences of a reduction in the size of the public sector. We find that a 20% drop in the number of public sector employees leads to a 1.8% increase in private sector's productivity, a 3.5% drop in unemployment, and a 1.7% increase in GDP.[1] These results are sizable and in accordance with Meghir, Pissarides, Vayanos, and Vettas (2017) who suggest that a smaller public sector would improve Greece's macroeconomic performance.

To further investigate the quantitative implications of our mechanism, we carry out two more exercises. First, keeping the size of the public sector fixed, we study the consequences of removing meritocratic hiring. In particular, we assume that rather than selecting the best applicants, the government fills public sector positions with a representative set of all worker types, a strategy we call "random hiring". The calibrated model predicts a 4% increase in private sector's productivity, a 4.8% drop in unemployment, and a 0.9% increase in GDP. Second (and, again, keeping the size of the public sector fixed), we examine the effects of a reduction in public sector compensation. We find that a 10% drop in public sector wages results in a 3.8% increase in private sector's productivity, a 7.3% drop in unemployment, and a 1.3% increase in GDP.

Since our mechanism consists of two main channels, taxes and worker quality, it is important to have a sense of how much each channel contributes to the aggregate results. To do so, we keep the level of taxes constant and repeat the same counterfactual exercises, identifying the effects of policies only due to changes in the quality of available workers in the private sector. The worker quality channel accounts for the bulk of the positive effects found in the reduction of public sector wages and the change of government hiring strategy (from meritocratic to random hiring), while the taxation channel dominates in

[1] This reduction in the size of the public sector large as it may seem is smaller than the actual reduction of 28.3% observed in the Greek economy in the period 2009-2013; see Section 5.1.

the counterfactual concerning the reduction of public sector size. Moreover, to solidify our quantitative results, we do several robustness checks of various model assumptions, including the worker productivity distribution, the degree of job security in the public sector, and the dependence of public sector wages on worker productivity. We find that the results are robust to these modifications and the main messages of the paper remain unaltered.

We should highlight that the analysis conducted in this paper is exclusively positive: we take government practices, including the public sector size and generosity, as given from the data and analyze their macroeconomic implications. Even though we do not solve for the optimal public sector size or wage policy, our analysis still delivers a policy-relevant message: a government that is simultaneously meritocratic and overly generous can have detrimental effects on the economy. To be clear, our goal is not to suggest that governments should abolish meritocratic hiring, but to highlight some of its unintended consequences that have been overlooked in the literature. In fact, we explicitly compare the beneficial vis-a-vis the adverse effects of meritocratic government hiring and provide conditions under which the latter prevail (in Section 3.7). Thus, our model is not hard-wired to conclude that meritocratic hiring is necessarily bad for the economy.

We think that Greece is a particularly good example to highlight the relevance of our mechanism. Public sector jobs in Greece are especially attractive because public employees' absolute job security is established by the Constitution, and the public sector wage premium is between 20 and 35 percent (Lyberaki, Meghir, and Nicolitsas (2017)). Moreover, the Greek government has adopted two meritocratic ways to hire public employees. The first is through the general college-entry examination and the second is through examinations organized by the Supreme Council of Civil Personnel Selection (ASEP). The former is particularly interesting for us because it conveys information about the attractiveness of various career paths. All high school graduates take the general exam, and each school's entry cutoff point (is endogenous and) reflects the score of the marginal student admitted to that school. Strikingly, the 2019 cutoffs for Air Force, Fire, and Police Academies were 18.6 (out of 20), 18.4, and 18.3, respectively, while the cutoff for the nation's best engineering schools were 18.3, 17.5, and 16.4.[2] This evidence suggests that young talented Greek students value very highly the "job-for-life" prospect (and the wage

[2] We report the cutoffs for the most attractive engineering school, namely electrical engineering, for the top three universities: National Technical University of Athens, Aristotle University of Thessaloniki, and University of Patras. As another example, the cutoff for military economists was 18.6, while the cutoff for the nation's best economics department, Athens University of Economics and Business, was 15.8 (https://www.minedu.gov.gr/exetaseis-2/baseis-an/43010-27-08-19-oi-vaseis-kai-ta-sygkritika-ton-vaseon-2).

premium) that comes with a public sector job.

Even though our motivation and data come from Greece, the mechanism identified in this paper is arguably relevant for a large number of countries. The first key ingredient of our mechanism is an attractive public sector. Public sector jobs around the world are attractive for many reasons, the main one being substantial job security.[3] Additionally, in the vast majority of countries public sector employees also receive a significant wage premium; see Gregory and Borland (1999) for developed and Finan, Olken, and Pande (2017) for developing countries.[4] Even for the few exceptions where the public sector wage premium is negative, as in certain developing countries, there are other factors that make public sector jobs attractive, including generous retirement benefits and informal income through corruption (e.g., see Gorodnichenko and Peter (2007) for the case of Ukraine). The second key ingredient of our mechanism, namely, meritocratic hiring, also seems highly relevant: most developed and developing countries hire public employees through examinations overseen by an independent authority.[5] This discussion clarifies that our mechanism is relevant for a large number of countries.

Related Literature. This paper contributes to a recent strand of search and matching literature that analyzes the role and effects of public sector employment and wages. Two papers build on the canonical job ladder model of Burdett and Mortensen (1998): Burdett (2012) introduces a public sector which posts a unique wage; Bradley, Postel-Vinay, and Turon (2017) consider a public sector wage distribution and study worker transitions between the two sectors. A few other papers use the DMP framework. Quadrini and Trigari (2007) study how the introduction of a public sector raises the volatility of unemployment over the business cycle. Hörner, Ngai, and Olivetti (2007) analyze how turbulence interacts with workers' risk aversion to explain the relatively high European unemployment rates. Michaillat (2014) shows that the crowding-out effect of public sector employment is lower during recessions, giving rise to higher government spending multipliers. Gomes

[3] Job security in the public sector is significant even in countries where it is not established by law, like Greece. For instance, Ohanian (2011) estimates that in the U.S. "workers would be willing to work for about 10 percent less compensation in the public sector, given the additional benefit of much higher job security". See also Section 2.1 for an example that demonstrates the great desirability of a "job-for-life" in Italy.

[4] For specific Eurozone countries, Giordano, Depalo, Pereira, Eugène, Papapetrou, Perez, Reiss, and Roter (2011) estimate a public sector wage premium between 20 and 30 percent for Italy, Spain, Ireland, and Slovenia, and above 50 percent for Portugal. Outside of Eurozone, the estimates include a premium close to 50% for Turkey (Tansel (2005)), 18% for Australia (Mahuteau, Mavromaras, Richardson, and Zhu (2017)), and over 60% for India (Glinskaya and Lokshin (2005)).

[5] For instance, in Spain public workers are selected through a set of exams known as oposiciones; in France, as concours or Grands Corps de l'Etat; in Italy, as concorso pubblico; in India, as the Staff Selection Commission - Combined Graduate Level Examination (SSC CGL); and in Turkey, as the Public Personnel Selection Examination (KPSS). Mangal (2021) describes the Indian examination system in a lot of detail.

(2014) computes the optimal public sector compensation policy.

There are few studies that incorporate worker heterogeneity in the DMP framework with a public sector. Gomes (2018) assumes that workers differ along two dimensions in a binary fashion (a worker is either of high or low quality and either has or does not have a college degree) and evaluates a reform connecting the public to the private sector wages. Chassamboulli and Gomes (2019) use a similar framework to analyze the education choices of workers. Albrecht, Robayo-Abril, and Vroman (2018) incorporate heterogeneous human capital and match specific productivity in the model to analyze various distributional questions, such as what types of workers tend to work in the public versus the private sector. Moreover, Chassamboulli and Gomes (2021) enrich the model with a "nepotistic" public sector that offers jobs to workers with political connections, which is the opposite from our meritocratic government. The mechanisms through which government hiring affects the economy in our model are novel compared to the existing literature. Specifically, we are the first to highlight the importance of taxes, as well as average worker quality for job creation in the private sector.

Our mechanism touches upon the important insight of Murphy, Shleifer, and Vishny (1991), namely, that the choice of talented individuals to sort into rent-seeking occupations instead of productive entrepreneurial activities hurts economic growth. The idea that a generous public sector may distort the occupational choice of individuals is explored qualitatively in Jaimovich and Rud (2014) and quantitatively in Cavalcanti and Santos (2021). Gomes and Kuehn (2017) investigate how differences in educational endowments and public employment account for differences in the average firm size and productivity between the United States and Mexico. Finally, since our mechanism speaks to how career choices of individuals affect GDP, our paper is also related to the vast literature on the misallocation of production inputs, surveyed by Restuccia and Rogerson (2017). The focus on unemployment and job creation distinguishes our approach from this very important research agenda.

The rest of the paper is organized as follows. In Section 2, we describe the model and provide a justification for some key modeling choices. In Section 3, we analyze the equilibrium of the model. In Section 4, we describe and implement the calibration strategy. In Section 5, we perform the counterfactual exercises and provide quantitative results. Section 6 includes a series of robustness checks, and Section 7 concludes. Finally, the Appendix contains all theoretical proofs and several extensions of the model.

2 The model

We develop a version of the Diamond-Mortensen-Pissarides (Pissarides (2000)) model in discrete time, extended to include a public sector. The labor force consists of a continuum of heterogeneous workers of measure one. When employed by a firm in the private sector, a worker produces p units of the numeraire good, where p is a random draw from a cumulative distribution function $F(p)$ that is continuous (no mass points) and has support in the interval $P \equiv [\underline{p}, \overline{p}]$. When employed in the public sector the same worker produces αp units of the numeraire, where $\alpha \in (0, 1]$. All workers enjoy a benefit z while unemployed. There exists a large set of homogeneous firms that can enter the labor market and search for a worker. Firms can post one vacancy each and while waiting to recruit a worker, they occur a search/recruiting cost κ per period. The equilibrium measure of firms is determined by a free entry condition. All agents discount future at rate $\beta \in (0, 1)$. Throughout the paper we focus on steady state equilibria.

The wage of a worker with productivity p in the private sector, $w(p)$, is determined through Nash bargaining, with $\eta \in (0, 1)$ denoting the worker's bargaining power. Unlike the private sector, where a worker's wage is contingent on productivity, the public sector pays *all* of its workers the common wage $\tilde{w}$ (as a mnemonic rule, symbols with a "tilde" are associated with the public sector). This is a simplifying assumption that can be easily relaxed: all we need for our results to go through is that the public sector rewards higher productivity *less* than the private (see the discussion in Section 2.1, footnote 8, and Section 6.3). To raise funds for wage payments the government can use a fraction $\phi \in [0, 1]$ of the product generated by the public sector. If this source is not enough, the government can impose a flat tax τ on each operating firm/match.

All workers (employed or not) die/retire at the end of each period with probability δ, and deceased/retired workers are replaced by a "clone", i.e., a worker of identical productivity. Clones start their life in the state of unemployment. Additional to the mortality rate δ, private sector jobs are subject to a negative productivity shock. More precisely, existing matches are terminated at the end of each period with probability λ; we often refer to λ as the job destruction or separation rate. The public sector does not suffer from the job destruction shock: a public sector job is terminated only if the worker dies/retires.

We move on to the description of the matching process in the private sector. Suppose there are ν vacant firms and u unemployed workers in the labor market. Then, the total number of matches per period is given by $m(\nu, u)$; as is standard in the literature, we assume that the matching function m exhibits constant returns to scale (CRS) and is increasing in both arguments. With CRS matching the probability with which the typical firm matches with a worker is $q(\theta) \equiv m(1/\theta, 1)$, where $\theta \equiv \nu/u$ is the market tightness in the private sector. Similarly, the probability with which the typical worker matches with a firm is $\theta q(\theta)$. As is standard in the DMP model, $q(\theta)$ is decreasing in θ and $\theta q(\theta)$ is increasing. We do not consider on-the-job search.

There is a fixed number of public sector jobs in any given period, denoted by $\tilde{e} \in (0, 1)$. Since at the end of every period a fraction δ of workers die, in steady state, the government must hire $\delta\tilde{e}$ new workers to replace the deceased ones. Hiring in the public sector does not involve search and matching frictions. The meritocratic government simply chooses the best, i.e., most productive, workers who apply for these jobs. Thus, rather than searching for the right match, the public sector carries out a large scale screening process/examination that helps them select the workers with the highest p. An unemployed worker who applies to a public sector job in period t gets screened/takes the exam in $t+1$ and, if chosen (i.e., if "good enough"), starts working in $t+2$. However, workers must "specialize": if they seek a job in the public sector they cannot match with private firms (i.e., they will not belong to the set u described in the previous paragraph). All agents have perfect foresight and perfect information about all aspects of the model.

2.1 Discussion of modeling choices and empirical relevance

To the best of our knowledge, this is the first paper that develops a DMP model with a *meritocratic public sector*. Therefore, we think it is important to provide justification for some of the model's novel ingredients. In particular, we discuss the following assumptions: (i) hiring in the public sector is conducted through a general examination and not through a matching function, and (ii) wages in the public sector do not reflect worker productivity as much as in the private sector.

First, consider assumption (i), i.e., public sector hiring is not subject to the usual search and matching frictions that characterize private sector hiring. The matching function used in DMP models is meant to capture the time and effort that firms spend in order to find a worker with the right skills for the job (and vice versa). In reality, this process consists of multiple rounds of application screening and interviews. Contrary to that, in many countries the government hires through nationwide exams, which is exactly what we assume here (see also footnote 5). These exams are often on general subjects that do not perfectly reflect the skill requirements of specific jobs. Hence, a meritocratic government that hires the highest-scoring candidates does not necessarily select the most fitting ones. It should be mentioned that assumption (i) is not essential for our results, if anything, it mitigates their quantitative importance: the negative effects of meritocratic government hiring we report would only become larger if one were to add search frictions in public sector hiring. For more details, see the discussion in Sections 3.7 and 4.

The second assumption worth discussing is that public sector wages do not reflect worker productivity as much as in the private sector. This assumption is supported by empirical evidence, since public sector wages feature lower variability than private sector wages (e.g., see Christopoulou and Monastiriotis (2014)).[6] For the case of Greece, as Michael Jacobides puts it in the volume of Meghir et al. (2017) , "As in other countries, Greek civil servants enjoy greater (mostly, absolute) job security than their private-sector counterparts, but face *flatter pay conditions* and slower career progression" (Meghir et al. (2017), p. 641; emphasis added).

We conclude this section with a piece of informal yet extremely relevant evidence. In the summer of 2017 the Bank of Italy advertised 30 job openings; the number of applicants for these jobs reached the staggering number of 85,000. We quote a report on these news:[7]

> Italy's chronic unemployment problem has been thrown into sharp relief after 85,000 people applied for 30 jobs at a bank [. . .] The work is not glamorous - one duty is feeding cash into machines that can distinguish banknotes that are counterfeit or so worn out that they should no longer be in circulation. The Bank of Italy whittled down the applicants to a "shortlist" of 8,000, all of them first-class graduates with a solid academic record behind them. They will have to sit a gruelling examination in which they will be tested on statistics, mathematics, economics and English [. . .] The high level of interest was a reflection of the state of the economy but also of the Italian obsession with securing "un posto fisso" - a permanent job.

We find this quote particularly interesting because it highlights the relevance of the key ingredients of our model:

1. First and foremost, the story highlights the desirability of public sector jobs, one of the pillars of our mechanism. ("[. . .] the Italian obsession of securing 'un posto fisso'.")
2. The story highlights the *attraction of talent* in the public sector ("[. . .] all of them first-class graduates with a solid academic record behind them.")

[6] This is not true only in Greece; the salary of the President of the US is $400,000, while the salary of football coaches at certain private colleges is in the order of 10 million.

[7] https://www.smh.com.au/world/85000-apply-for-30-bank-jobs-in-italy-20170705-gx54dx.html

3. The story highlights the relevance of assumption (i) discussed earlier: the selection of applicants is meritocratic, i.e., through (tough) exams, but not necessarily targeted to finding 'the right person for the job'. ("They will have to sit a gruelling examination in which they will be tested on statistics, mathematics, economics and English", only to find themselves "[...] feeding cash into machines that can distinguish banknotes that are counterfeit [...]")

We also think that this example captures the essence of our mechanism as a whole. Why does the Bank of Italy need to hire such highly talented individuals, who could thrive elsewhere in the economy, to feed cash into machines (or why does the Greek Fire Service need to employ some of the best Greek students; see Section 1)? The answer is, of course, obvious: because they applied for the job and were the best. And it was rational for them to apply because they were offered a generous salary that they can keep forever.

3 Analysis of the Model

3.1 Value functions and optimal behavior

We start with the description of the workers' value functions. Consider first a worker of productivity p employed by a private firm. This agent's Bellman equation satisfies

$$W(p) = w(p) + \beta(1-\delta)\left[(1-\lambda)W(p) + \lambda\hat{U}(p)\right], \tag{1}$$

where $\hat{U}(p)$ is the present discounted value of a worker with productivity p who just became unemployed and can choose to specialize either in the private or the public sector. Next, consider a worker of productivity p employed at the public sector. For this agent the Bellman equation is given by

$$\tilde{W}(p) = \frac{\tilde{w}}{1-\beta(1-\delta)}. \tag{2}$$

Obviously, a worker in the public sector keeps her job for as long as she is alive; also, her wage is independent of her productivity (see discussion in Section 2.1).

Consider next the value functions for unemployed workers, and let us start with a worker of productivity p who just entered the state of unemployment. This worker makes one of the most critical decisions in the model, namely, whether to specialize in the private or the public sector. Formally, this agent's Bellman equation satisfies

$$\hat{U}(p) = \max\{U(p), \tilde{U}(p)\},$$

where $U(p)$ is the value function of an unemployed worker who chooses to search for private sector jobs, and $\tilde{U}(p)$ is the analogous expression for a worker who decides to apply to the public sector. Then, recalling that $\theta q(\theta)$ is the probability of a successful match in the private sector, the former value function must satisfy

$$U(p) = z + \beta(1-\delta)\left[\theta q(\theta)W(p) + (1-\theta q(\theta))\hat{U}(p)\right], \tag{3}$$

and the latter is given by

$$\tilde{U}(p) = z[1+\beta(1-\delta)] + \beta^2(1-\delta)^2\left[\mathbb{1}\{\textit{if hired}\}\,\tilde{W} + \mathbb{1}\{\textit{if rejected}\}\hat{U}(p)\right]. \tag{4}$$

The last expression is intuitive: a worker who decides to apply for public sector jobs will enjoy the benefit z in period t and (conditional on surviving) will take the screening exam in $t+1$; during that time she will remain unemployed and again enjoy z. In $t+2$ (conditional on surviving), the worker will obtain the value $\tilde{W}$ if she is good enough to be hired in the public sector; otherwise she will stay unemployed and obtain $\hat{U}(p)$.

Equations (3) and (4) are written in the most general form, assuming that an agent who is unemployed and looking for a job in either sector can reconsider the choice between the two sectors in the next period, if she remains unemployed. However, since we focus on stationary equilibria, we will hereafter restrict attention to the case where an unemployed worker who chooses to look for jobs in a specific sector in period t will also prefer that sector in any future periods. With this observation in mind, equations (3) and (4) can be written as

$$\begin{aligned} U(p) &= z + \beta(1-\delta)\left[\theta q(\theta)W(p) + (1-\theta q(\theta))U(p)\right], \qquad (5)\\ \tilde{U}(p) &= z[1+\beta(1-\delta)] + \beta^2(1-\delta)^2\left[\mathbb{1}\{\textit{if hired}\}\,\tilde{W} + \mathbb{1}\{\textit{if rejected}\}\tilde{U}(p)\right]. \qquad (6)\end{aligned}$$

Thus, the worker's choice regarding which sector to specialize in is a time invariant one, and it depends only on her idiosyncratic productivity p. Determining which types specialize in which sector is our next important task.

The analysis so far suggests that in order to describe the workers' optimal behavior we need to understand what it means to be "good enough" for the public sector. To that end, two observations are critical. First, since $\tilde{W}$ does not depend on p (see equation 2),

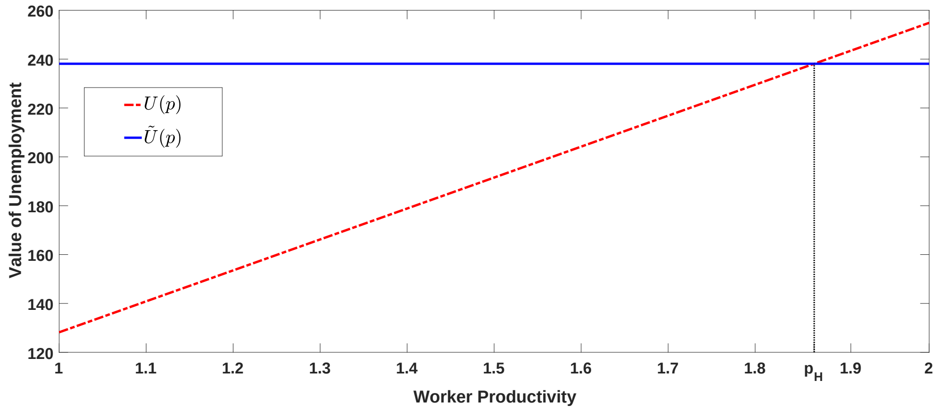


Figure 1. $U(p)$ versus $\tilde{U}$ for workers of various productivities.

(6) implies that $\tilde{U}(p)$ will also be flat in p, for values of p representing workers who get accepted by the public sector. For these values of p, we have

$$\tilde{U}(p) = \tilde{U} = z[1 + \beta(1 - \delta)] + \beta^2(1 - \delta)^2\,\tilde{W}. \tag{7}$$

Second, a more productive worker is more likely to be drawn to the private sector because that sector will reward her high productivity. Formally, this means that $U'(p) > 0$, which for now is a conjecture, but it will be verified in Section 3.3. Therefore, as indicated in Figure 1, there exists a unique $p_H \leq \overline{p}$, such that $U(p_H) = \tilde{U}$. The term p_H plays a crucial role in our analysis since it denotes the productivity of the *most able* worker who chooses to apply to the public sector (also, by definition, the worker who is indifferent between the two sectors). Which other workers apply to the public sector? Any worker indexed by $p > p_H$ would *not want* to apply to the public sector, since for that worker $U(p) > \tilde{U}$. Workers with $p \leq p_H$ would happily work for the public sector, but some of them will not be good enough for the meritocratic government and, importantly, *they know it* because all agents have perfect foresight and perfect information about the fundamental parameters of the model (crucially, $F(p), \tilde{e}$, and δ).

We conclude that the set of types who apply for public sector jobs (when unemployed) will be a connected set, $\tilde{P} \equiv [p_L, p_H] \subset P$, and the only thing that remains to be characterized is the lower bound of that set, p_L.[8] Since workers who are not good enough

[8] In Section 2 we claimed that one does not need $\tilde{w}$ to be constant, and that the main results of the paper would go through as long as the public sector rewards higher productivity *less* than the private sector. Figure 1 can help clarify that claim. Suppose that the term $\tilde{U}$ in the figure was not flat but increasing in p, only with a *lower slope* than $U(p)$. Then, it would still be true that the set of workers who apply to the public sector is a connected set $\tilde{P}$, and the upper bound of that set would still be marked by the marginal type who is indifferent between the public and the private sector. We implement this extension in Section 6.3.

to be employed by the public sector will not bother applying, p_L will be determined so that the measure of workers who apply for public sector jobs are just enough to cover the demand for public employees. As we show in Appendix A, p_L satisfies:[9]

$$F(p_L) = F(p_H) - \frac{\tilde{e}}{(1-\delta)^2}. \tag{8}$$

The next proposition offers a summary of the workers' optimal behavior.

Proposition 1. *There exists a set of worker types $\tilde{P} \equiv [p_L, p_H]$, where p_H satisfies $U(p_H) = \tilde{U}$ and p_L solves equation (8), such that workers with $p \notin \tilde{P}$ never apply for public sector jobs. For workers with $p > p_H$ this is so because they prefer to go to the private sector. For workers with $p < p_L$ this is so because they correctly predict that they would not be accepted in the public sector. Workers with $p \in \tilde{P}$ can be distinguished in three groups. The first is workers who were just born (to replace a deceased worker of identical productivity) and have just applied to the public sector. The second is workers who were born and applied for a public sector job in the previous period, and are currently being screened. The last group is the remaining workers in $\tilde{P}$ who are currently working for the public sector.*

Proof. The proof follows immediately from the previous discussion and the proof of equation (8) in Appendix A. □

In sum, combining public sector exams with perfect foresight and perfect information leads to full segmentation between the two labor markets. This feature of the model is desirable for several reasons. First, it is empirically relevant, as argued by Chassamboulli and Gomes (2019). The authors also develop a model featuring perfect segmentation as a consequence of barriers to enter the public sector. They suggest that "...These entry barriers may represent national entry exams or jobs that are restricted to workers with political capital. We think that the assumption of segmented markets portrays a realistic mechanism of selection into the public sector in several countries...".[10] Second, full seg-

[9] Equation (8) holds when the implied p_L is (weakly) greater than $\underline{p}$. In all our quantitative results, this is always satisfied. In theory, however, it is possible that we could have $p_L < \underline{p}$. In that case the public sector would not be able to attract enough workers to fill all its jobs. Thus, strictly speaking, the lower bound of the set $\tilde{P}$ is the minimum between the value of p_L implied by (8) and the lowest possible type, $\underline{p}$.

[10] Additionally, Chassamboulli, Fontaine, and Gomes (2020) show that the quantitative importance of the flows between public and private sectors is limited for public sector employment. Specifically, they show that the flows between public sector and unemployment explain 86% of the observed variation of public sector employment. Hence, by focusing on the flow from unemployment to the public sector, we include the most important source of variation of public employment in our model and we do not miss much by abstracting from other flows.

mentation leads to a model that is vastly more tractable than the alternatives.[11] Finally, the full segmentation assumption does not deliver the main results, in fact, it may very well be mitigating their quantitative importance (for more details, see the discussion in Sections 2.1 and 4).

We conclude this subsection with the firms' value functions. Let V denote the value function of a firm with an open vacancy and $J(p)$ the value of a firm that has matched with a worker of productivity p. Then, we have

$$\begin{aligned} V &= -\kappa + \beta q(\theta) \int_{p \notin \tilde{P}} J(p) dF(p), & (9) \\ J(p) &= p - w(p) - \tau + \beta(1-\delta)(1-\lambda) J(p), & (10) \end{aligned}$$

where $q(\theta)$ is the matching probability for the typical firm and τ is the flat tax imposed by the government. Given free entry of firms, in any equilibrium we must have $V = 0$. Therefore, equations (9) and (10) imply

$$\kappa = \frac{\beta q(\theta) \left[\mathbb{E} \left(p - w(p) | p \notin \tilde{P} \right) - \tau \right]}{1 - \beta(1-\delta)(1-\lambda)}. \tag{11}$$

Equation (11) admits the standard interpretation, i.e., it states that the market tightness is such that the expected profit from a new job must be equal to the expect cost of filling the vacancy. Even though equation (11) is not very informative (as we have not yet solved for $w(p)$), it does highlight an important channel in our model. Firm entry is driven by profitability expectations and profitability depends on worker productivity; but firms correctly predict that the set of workers with whom they may match have $p \notin \tilde{P}$. Thus, when the set $\tilde{P}$ includes very productive workers (equivalently, when p_H is very high) the incentives for private firms to enter the labor market and create vacancies will be weak. Naturally, expectations of high taxes (in order to finance high wages in the public sector) also discourage firm entry.

[11] To give a flavor of the problems that arise when we depart from full segmentation, consider a world with a noisy exam process, such that agents with $p < p_L$ have a chance to get a public sector job. These types will apply to both public and private sector jobs, but it is reasonable to assume that higher types has a greater chance of getting hired in the public sector (the exam is noisy but not completely random). Hence, different types have different representations into the unemployment pool, precisely because they have a different chance of getting a public sector job. Consequently, to compute the expected value of a vacancy, firms have to keep track of the distribution of unemployed workers of different productivities, making the firm value function much more complicated than the one given in equation (9).

3.2 Bargaining and the Wage Curve

With the value functions for all agents laid out, we can now move on to the bargaining problem. Consider a meeting between a firm and a worker of productivity $p \notin \tilde{P}$. The bargaining problem can be expressed as follows:

$$\max_{w(p)} \left[W(p) - U(p)\right]^{\eta} J(p)^{1-\eta}.$$

As is standard in the DMP model, the first-order maximization condition reduces to

$$(1-\eta)[W(p) - U(p)] = \eta J(p), \tag{12}$$

which simply states that the worker's surplus will be equal to a fraction η of the total surplus of the match. To solve for the wage $w(p)$, we first replace the value functions $W(p), U(p)$, and $J(p)$ from equations (1), (5), and (10), respectively.[12] After some algebra, we find that

$$\begin{aligned} w(p) &= (1-\eta)z + \eta(p-\tau) + \beta(1-\delta)\theta q(\theta)(1-\eta)[W(p) - U(p)] \\ &= (1-\eta)z + \eta(p-\tau) + \beta(1-\delta)\theta q(\theta)\eta J(p), \end{aligned}$$

where the last equality follows from (12). Replacing $J(p)$ from (10) into the last expression delivers the final version of our private sector wage curve:

$$w(p) = \frac{\left[1-\beta(1-\delta)(1-\lambda)\right](1-\eta)z + \left[1-\beta(1-\delta)\left(1-\lambda-\theta q(\theta)\right)\right]\eta(p-\tau)}{1-\beta(1-\delta)\left[1-\lambda-\eta\theta q(\theta)\right]}. \tag{13}$$

Clearly, the wage is increasing in the worker's idiosyncratic productivity, and also increasing in the unemployment benefit z, since the latter implies a higher outside option for the worker. Moreover, it is easy to show that, for any p, $w(p)$ is increasing in the market tightness θ because a higher θ implies an effective increase in the worker's bargaining position: a worker can threaten the firm that she will walk away from the negotiations, and the higher the θ (and the $\theta q(\theta)$), the more credible the threat.

3.3 Worker optimal behavior and firm free entry revisited

Having derived the wage curve allows us to characterize the workers' behavior and the firms' entry decision more sharply. This task is performed in the following two lemmas.

[12] Also noting that for workers with $p \notin \tilde{P}$ we can replace $\hat{U}(p)$ with $U(p)$ in (1).

Lemma 1. *a) The value function $U(p)$ is strictly increasing in p.*
b) The upper bound of the set $\tilde{P}$ is given by

$$
\begin{aligned}
p_H &= \tau - \frac{1-\beta(1-\lambda)(1-\delta)}{\beta(1-\delta)\eta\theta q(\theta)} z + \frac{[1-\beta(1-\delta)(1-\lambda-\eta\theta q(\theta))]}{\beta(1-\delta)\eta\theta q(\theta)} \\
&\times \left[(1+\beta(1-\delta))^2 z + \beta^2(1-\delta)^2\tilde{w}\right]. \qquad (14)
\end{aligned}
$$

Proof. See Appendix A. □

Part (a) of Lemma 1 formally verifies a conjecture made in Section 3.1, namely, that $U(p)$ is increasing, which helped us characterized the set $\tilde{P} \equiv [p_L, p_H]$ of workers who specialize in public sector jobs. Part (b) of the lemma provides a sharp characterization of p_H, the productivity of the most able worker who chooses the public sector. Although the formula provided in equation (14) is rather complex, one thing is quite obvious: a higher $\tilde{w}$ will undoubtedly lead to a higher equilibrium p_H. As already mentioned, the lower bound of $\tilde{P}$, p_L, is determined in equation (8), and its value is such that the measure of workers who apply for public sector jobs is equal to the mass of these jobs.

Figure 2 summarizes the equilibrium wage for all employed workers. Workers with $p \in \tilde{P}$ work in the public sector and receive $\tilde{w}$. The remaining workers work in the private sector and receive a wage $w(p)$, given by equation (13), and increasing in their productivity. Notice that while $U(p_H) = \tilde{U}$, we have $w(p_H) > \tilde{w}$. In words, the wage $w(p_H)$ that makes the critical worker indifferent between working in the private or the public sector must be higher than $\tilde{w}$; this is because $\tilde{w}$ is a wage that the (public sector) worker will keep for ever, while $w(p_H)$ is a wage that the worker will keep only for as long as the match with the private firm is active.[13]

The next lemma provides a precise characterization of the firms' entry decision.

Lemma 2. *The free entry condition in this economy satisfies*

$$
\kappa = \frac{\beta q(\theta)(1-\eta)\left\{\mathbb{E}\left[p|p \notin \tilde{P}\right] - \tau - z\right\}}{1-\beta(1-\delta)\left[1-\lambda-\eta\theta q(\theta)\right]}. \qquad (15)
$$

Proof. Substitute the wage function from (13) into equation (11). After some algebra one arrives at the desired result. □

[13] Notice that for any $p \in \tilde{P}$, the percentage difference $(w(p) - \tilde{w})/w(p)$ captures the monetary value of job-security provided by the public sector. Based on our calibration of Section 4, this is estimated at 9.48% for the marginal type, p_H, and 4.71% for the average public sector employee. For a more careful estimation of this value, see Fontaine, Galvez-Iniesta, Gomes, and Vila-Martin (2020).

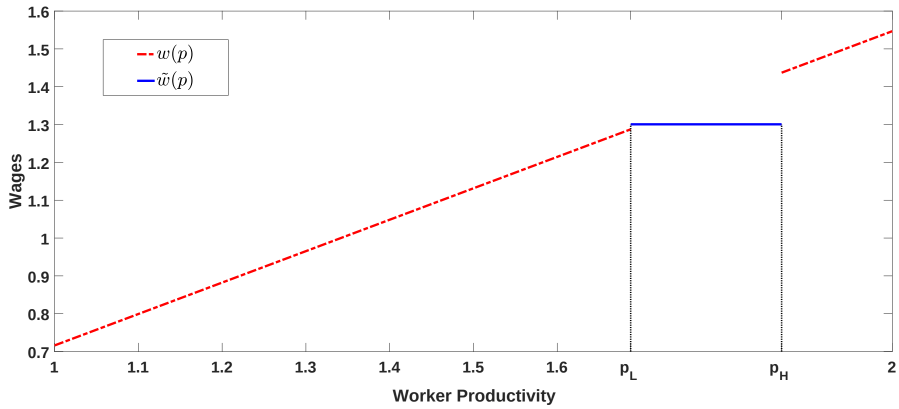


Figure 2. Equilibrium wages for workers of various productivities.

Equation (15) is just a restatement of (11), using the specific functional form for the wage function, i.e., equation (13). Once again, we can see that the firms' entry decision will be affected by their expectations of the average productivity of workers. As firms predict that the workers with whom they can match come from the set $P \setminus \tilde{P}$, any economic factor that contributes to a high p_H (most notably a high $\tilde{w}$) will reduce the firms' incentives to enter the labor market and create jobs.

3.4 The Beveridge Curve

So far we have studied the optimal behavior and the value functions of workers in the various states of the world, but we have not specified the measures of workers in each of these states. This task is performed in this section. Let u denote the mass of unemployed workers in the private sector. In any given period the mass of agents who move out of the state of unemployment is:

$$[\delta + \theta q(\theta)]u.$$

How many agents move into unemployment in each period? The answer is given by[14]

$$(\delta + \lambda)\left[1 - u - \frac{\tilde{e}}{(1-\delta)^2}\right] + \delta u.$$

[14] Recall from Section 3.1 and Appendix A that $\tilde{e}/(1-\delta)^2$ is the measure of *all* agents who specialize in public sector jobs; this includes those who are currently working or being screened and those who just applied. Thus, $1 - u - \tilde{e}/(1-\delta)^2$ is the measure of all employed workers in the private sector. These workers either lose their jobs, with probability λ, and move to unemployment, or die, with probability δ, and get replaced by a clone who, by assumption, starts her life as unemployed. The term δu stands for the clones who came to replace workers who died while in the state of unemployment. Notice that the term δu also appears in the flow out of unemployment, so ultimately it is not going to affect the Beveridge curve.

Equating these two flows (they must be equal in a steady state equilibrium) and solving with respect to u yields:

$$u = \frac{(\delta + \lambda)\left[1 - \frac{\tilde{e}}{(1-\delta)^2}\right]}{\delta + \lambda + \theta q(\theta)}. \tag{16}$$

Equation (16) is our version of the Beveridge curve. As is standard, steady state unemployment is decreasing in the market tightness θ and increasing in the job destruction rate λ (it is also increasing in the mortality rate δ). In our model, equilibrium unemployment also depends on the size of the public sector. More specifically, a large number of public sector jobs ($\tilde{e}$) leads to lower steady state unemployment, other things equal, because getting a job in the public sector is not subject to search frictions.[15]

3.5 Government budget constraint and aggregate product

To conclude the analysis of the model we need to specify the government budget constraint. As we have discussed in Section 2, to cover the public sector wage bill, $\tilde{e}\tilde{w}$, the government raises funds through two sources. First, it can use a fraction ϕ of the product generated by the public sector. What we are modeling here is the market component of public sector output; that is, the goods that the government produces and sells to the public: postal services, public utilities, sales of state-owned enterprises, etc. Second, the government can impose a flat tax τ on each operating firm/match. Therefore, the government budget constraint satisfies:

$$\tilde{e}\tilde{w} = \tau\left[1 - u - \frac{\tilde{e}}{(1-\delta)^2}\right] + \tilde{e}\phi \int_{p \in \tilde{P}} \alpha p \, dF(p). \tag{17}$$

Equation (17) is straightforward, once we observe that the term inside the square bracket is the mass of employed workers in the private sector (see footnote 14). For convenience, henceforth we will define this term as e:

$$e \equiv 1 - u - \frac{\tilde{e}}{(1-\delta)^2}.$$

[15] This is yet another manifestation of the fact that our assumption of no search and matching frictions in the public sector mitigates the quantitative importance of our results. Nevertheless, we adopt this assumption because we believe it is empirically relevant; see the discussion in Section 2.1.

After replacing u from the Beveridge curve and some algebra, we can write:

$$e = \left[1 - \frac{\tilde{e}}{(1-\delta)^2}\right] \frac{\theta q(\theta)}{\delta + \lambda + \theta q(\theta)}. \tag{18}$$

That is, we can express the mass of employed workers in the private sector as a function of parameters of the model and the market tightness.

Given this discussion our economy's GDP can now be simply written as

$$Y = e \int_{p \notin \tilde{P}} p \, dF(p) + \tilde{e} \int_{p \in \tilde{P}} \alpha p \, dF(p). \tag{19}$$

But it is important to keep in mind that while public employment $\tilde{e}$ is a parameter, private employment, e, is an endogenous variable that depends (among other things) on $\tilde{e}$.

3.6 Definition and characterization of equilibrium

Definition 1. A steady state equilibrium for the model of the meritocratic public sector consists of the objects $\left(u, p_L, p_H, \theta, \tau, \{w_p\}_{p \notin \tilde{P}}\right)$, and can be characterized as follows:

1. Given $\theta \Rightarrow u$ can be derived from the Beveridge curve, i.e., equation (16).
2. Given $(\theta, \tau) \Rightarrow p_H$ can be derived from the workers' optimal decision, i.e., equation (14).
3. Given $p_H \Rightarrow p_L$ can be chosen so that the demand for public sector employees is satisfied, i.e., equation (8).
4. Given $(\theta, p_L, p_H) \Rightarrow \tau$ can be derived from the government budget constraint, i.e., equation (17).
5. Given $(p_L, p_H, \tau) \Rightarrow \theta$ can be derived from the firm free entry condition, i.e., equation (15).
6. Given $(\theta, \tau) \Rightarrow \{w_p\}_{p \notin \tilde{P}}$ can be derived from the wage curve, i.e., equation (13).

Proposition 2. *A steady state equilibrium exists as long as*

$$\kappa < \frac{\beta(1-\eta)\left\{\mathbb{E}\left[p | p \in [\underline{p}, \overline{p} - (\tilde{e}(\overline{p} - \underline{p}))/(1-\delta)^2]\right] - \tau - z\right\}}{1 - \beta(1-\delta)(1-\lambda)}.$$

This equilibrium is always unique.

Proof. See Appendix A. □

Summary of the main channels at work: With the analysis of the model and the definition of equilibrium laid out, we can now highlight the main channels at work in an intuitive way. In particular, we demonstrate that an increase in the generosity of public sector wages, i.e., an increase in $\tilde{w}$, can generate a *vicious circle* or *multiplier effect*.

More precisely, consider an increase in the public sector wage, $\tilde{w}$. This increase will result in a lower equilibrium market tightness for two reasons, one *direct* and one *indirect*. To see the direct reason, note that with a higher $\tilde{w}$ firms realize that if they match they will have to pay higher taxes to fund the higher public wage bill. Too see the indirect reason, consider the behavior of the worker with productivity $p_H + \varepsilon$. This worker had initially chosen to search for jobs in the private sector, but now, with the higher $\tilde{w}$, she chooses to switch to the public sector, i.e., the set $[p_L, p_H]$ shifts to the right. Firms realize that the quality of workers with whom they can match has deteriorated, and this is the second force that discourages their entry. But we are not done. Workers also have rational expectations and realize that θ just dropped. This reinforces the decision of the marginal p_H type to abandon the private for the public sector: yes, the private sector rewards workers for their high p, but when θ is low workers will have to wait very long to find a job in the private sector. Thus, we obtain a further shift of the set $[p_L, p_H]$ to the right, which, in turn, further lowers firm entry.[16] The vicious circle just described (also depicted in Figure 3) goes on and on causing the initial increase in $\tilde{w}$ to generate a multiplier effect. Quantifying this effect is one of the tasks of the following sections.

3.7 Is meritocratic government hiring (necessarily) bad?

Before we move on to the next task of the paper, which is to calibrate the model to the Greek economy and carry out a number of counterfactual exercises, it is important to highlight again a message that has already been brought up in the Introduction: there is nothing wrong with meritocratic government hiring per se, and, importantly, our model is not hardwired to deliver such as result.

To make this point clear, we compare our baseline (meritocratic government) model with a model where the government hires workers randomly from the whole distribution of types, a strategy we call "random hiring".[17] Recalling the definition of GDP from

[16] A subtle force at work here is that the initial decrease in θ reinforces a further decrease in that variable (on top of the one caused by the shift of $[p_L, p_H]$), because a lower θ implies fewer matches, and that means that the wage bill, $\tilde{e}\tilde{w}$, will be borne by fewer firms, yet another factor that discourages firm entry.

[17] We are not trying to argue that this model is a good alternative to meritocratic hiring, and we are certainly not saying that governments should adopt this type of hiring. We are only saying that, if one

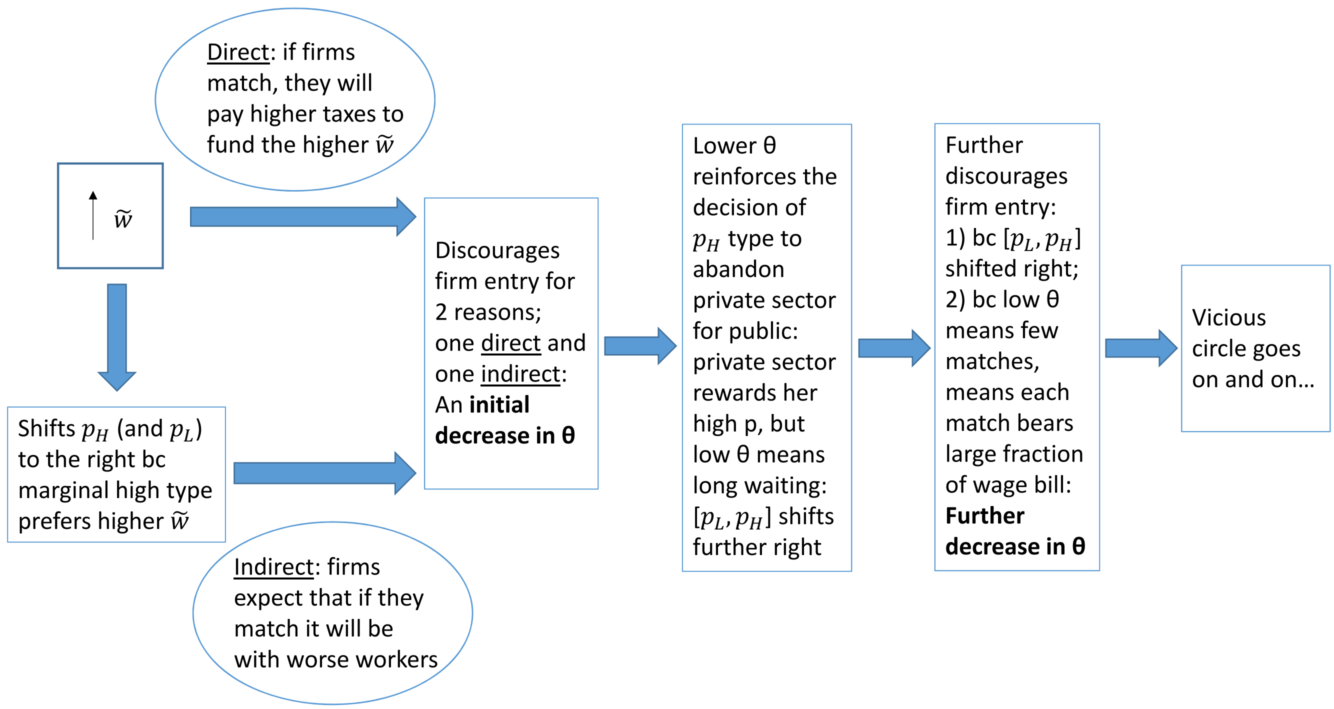


Figure 3. The main channels at work in our model.

equation (19), and assuming a uniform distribution of types, allows us to write the GDP of the baseline model as:

$$Y = e\Pi + \tilde{e}\alpha\tilde{\Pi}, \tag{20}$$

wants to ask whether meritocracy is good for the economy, this "random hiring" model is a reasonable theoretical benchmark to which the meritocratic model should be compared.

where the multipliers of the terms e and $\tilde{e}$ stand for the average productivity of workers in the private and the public sector, respectively, defined as

$$\Pi \equiv \frac{\underline{p} + p_L}{2} \frac{p_L - \underline{p}}{(p_L - \underline{p}) + (\overline{p} - p_H)} + \frac{p_H + \overline{p}}{2} \frac{\overline{p} - p_H}{(p_L - \underline{p}) + (\overline{p} - p_H)}, \tag{21}$$

$$\tilde{\Pi} \equiv \frac{p_H + p_L}{2}. \tag{22}$$

On the other hand, the GDP in the counterfactual model with random hiring is given by

$$Y_R = e \frac{\underline{p} + \overline{p}}{2} + \tilde{e}\alpha \frac{\underline{p} + \overline{p}}{2}. \tag{23}$$

This expression is significantly simpler than the analogous one in (20) because, under this specification, the average productivity of workers in both sectors is the unconditional mean of all possible types. (Of course, in the case of the public sector the average productivity is also multiplied by α.)

Asking whether meritocratic hiring is (always) bad for the economy, as we do in the title of this section, amounts to asking whether Y_R is always greater than Y. The answer to both questions is no. Certainly meritocratic hiring tends to generate a channel that hurts GDP. If the government hires very productive workers, these workers will no longer be available to private firms, which, in turn discourages firm entry and decreases GDP.

However, meritocratic hiring also generates several channels whereby GDP can increase. First, and most obvious, employing the best possible workers has a direct positive effect on the average productivity of public sector workers, i.e., the term $\tilde{\Pi}$ in equation (20).[18] Second, and more subtle, to pay wages the government uses taxes but also a fraction ϕ of the product generated by public workers. Thus, hiring more productive public workers can increase the size of the government wage bill that is self-funded, which will then decrease taxes and encourage firm entry (or, at least, not discourage it too much; see equation 11). There is a third channel that is also quite subtle. In our model public worker hiring is not subject to search frictions (all workers who apply to the public sector will get hired after the 'exam' period), and public sector jobs do not get destroyed.[19] Thus, hiring great workers in the public sector is not only good because of their higher productivity (the first channel described in this paragraph), but also because these great workers are

[18] Strictly speaking, this statement is true if the public sector wage is relatively high; more details will follow.

[19] At least in the baseline model. In Section 6.2 we explore the possibility in which public sector jobs also get exogenously destroyed. But, in any case, we have provided strong evidence supporting the assumption that the job destruction rate is lower in the public than it is in the private sector.

allocated in the sector characterized by less severe frictions. (Good workers find a job faster and keep it for a longer time, on average.)

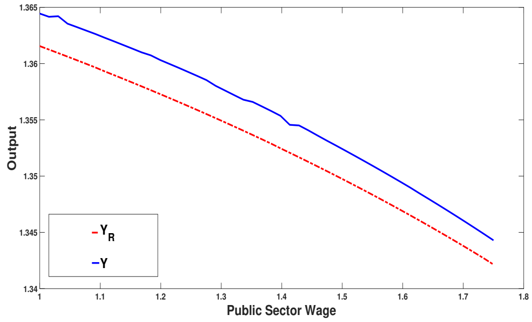
Mathematically, the comparison of these two systems can be summarized as follows. Suppose we are in a world where public hiring is random, so that both the public and the private sector are hiring workers whose average productivity is $(\underline{p}+\overline{p})/2$. Now, suppose that the government moves to a meritocratic hiring system, and, to fix ideas, suppose that the public sector wage $\tilde{w}$ is generous enough so that the average productivity of workers who apply to the public sector increases, i.e.,

$$\alpha \frac{p_H + p_L}{2} > \alpha \frac{\underline{p} + \overline{p}}{2} \Rightarrow p_H + p_L > \underline{p} + \overline{p}.$$

In this case, moving to the meritocratic system has an obvious positive effect: it increases the average productivity of workers in the public sector (the term $\tilde{\Pi}$) in equation (20). But it also has two negative effects. First, it reduces the value of the average productivity of workers in the private sector (the term Π) in equation (20). Second, precisely because the productivity of workers who are available to the private sector has declined, it (also) reduces firm entry and, consequently, the mass of private sector employment, e. (This is why we have been careful to remind the reader that, unlike $\tilde{e}$, the term e is endogenous.)

Whether the meritocratic system can deliver a higher GDP compared to the counterfactual model ultimately depends on parameter values. The discussion so far suggests that meritocracy is more likely to deliver the desirable results if a combination of the following holds true: i) α is high (the public sector is relatively efficient); ii) ϕ is high (the government can self fund a large part of the wage bill); and iii) the public sector wage $\tilde{w}$ is not too high (in Section 3.6 we described in detail that a high $\tilde{w}$ discourages firm entry, thus, hurting GDP.) These results are presented in Figure 4. The left panel of the figure illustrates the case of a relatively high α and ϕ. We see that in this case, regardless of $\tilde{w}$, GDP in the model with meritocratic hiring always prevails. The right panel of Figure 4 illustrates the case of a high α and an intermediate ϕ, and we now observe that the value of $\tilde{w}$ plays a critical role. For low values of $\tilde{w}$ the meritocratic system still prevails, but for high values of $\tilde{w}$ meritocratic hiring is outperformed by random hiring.

This last observation shows that meritocratic government hiring can be bad for the economy even if the public sector is as productive as the private one. Meritocratic hiring can be bad for the economy (compared to our counterfactual) even if the public sector is as productive as the private sector, i.e., $\alpha = 1$ (which is the value that α obtains in the right panel of Figure 4). This can happen when $\tilde{w}$ is relatively high and ϕ is relatively low, which implies that the government has to distort the economy (and discourage firm



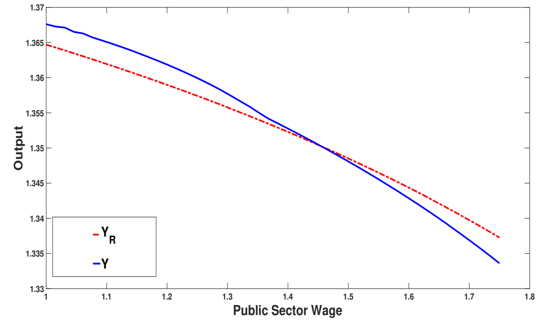


Figure 4. Various measures of output for different values of public sector wages. Both panels show the GDP of the meritocratic economy (Y) and the GDP of the economy with random hiring (Y_R). For the left panel, $\phi = 0.45$ and $\alpha = 0.95$; for the right panel, $\phi = 0.13$ and $\alpha = 1$.

entry) by imposing high taxes.

4 Calibration

Our focus is the Greek economy before the sovereign debt crisis of 2009, starting in early 1990's. We set a period in the model to be a month in calendar time. Several parameters that have direct empirical counterparts are set exogenously. The discount factor β is set to 0.9959, consistent with a 5% annual interest rate. We set the separation rate λ to 0.7 %, following the calculations of Hobijn and Şahin (2009). The distribution of worker productivity $F(p)$ is assumed to be uniform and we normalize its support to $[1, 2]$. Following Shimer (2005), we set the unemployment benefit z to 40% of average worker productivity. The average replacement rate in Greece is 35% of the worker's previous wage according to OECD. We choose a slightly higher value in accord with the literature.[20] Furthermore, we follow Hagedorn and Manovskii (2008) and set the vacancy creation cost κ to 58.4% of average worker productivity.[21]

We now move on to the calibration of α, the fraction of worker's productivity re-

[20] Actually, a 35% replacement rate for Greece is probably an overstatement. There are many eligibility constraints and recipients are eligible for at most twelve months. According to Hobijn and Şahin (2009), over half of the Greek unemployed are jobless for over a year, which means that half of the unemployed population at any point in time are not eligible for unemployment benefits. However, home production and undeclared labor are sizeable in Greece (see Meghir et al. (2017), p.p. 635-637; Schneider and Enste (2000)), which reassures us that the choice of z is realistic.

[21] We cannot use empirical values of tightness in our calibration, as Hagedorn and Manovskii (2008), because there are no vacancy data for Greece. If actual values of θ were available, we could use them to calibrate κ from the job creation equation. Since we use the job-finding rate to calibrate the parameter of the matching function γ, setting κ exogenously amounts to a normalization, as explained in Shimer (2005).

flected in public sector jobs. To the best of our knowledge, there are no data sets on the actual productivity of Greek public sector employees; thus, we have decided to use estimates of the public-private productivity differential from the literature.[22] Schmitz (2001), using data from Egypt and Turkey, calibrates government TFP to be half of private TFP. Cavalcanti and Santos (2021), focusing on Brazil, calibrate the public sector TFP to be 72% of the private sector TFP.[23] Moreover, the literature on state-owned enterprises (SOEs), summarized in Megginson and Netter (2001), has provided many estimates on the public-private productivity differential. Depending on the productivity measure and data source, these estimates vary from a wedge of 13% (Frydman, Gray, Hessel, and Rapaczynski (1999)) to 73% (Boardman and Vining (1989)) in favor of the private sector. Based on these estimates, we choose $\alpha = 0.75$ to achieve a 25% wedge in the productivity of a worker when employed in the public sector. This number is on the lower end of the available estimates and, in light of the evidence provided in Meghir et al. (2017), probably is a conservative choice.[24] The values of externally calibrated parameters are summarized in Table 1.

Table 1: Exogenously Set Parameters

Parameter	Description	Value	Source
β	Discount Factor	0.9959	Annual Interest Rate of 5%
λ	Separation Rate	0.7 %	Hobijn and Şahin (2009)
$\underline{p}$	Lowest Worker Productivity	Normalization	1
$\overline{p}$	Highest Worker Productivity	Normalization of worker population	2
F	Worker Productivity Distribution	Uniform	$p \in [1, 2]$
z	Value of non-employment	40% of Average productivity	Shimer (2005) and OECD 2001-2009
κ	Vacancy Cost	58.4% of Average productivity	Hagedorn and Manovskii (2008)
α	Productivity Wedge in Public Sector	0.75	Literature on SOEs

We calibrate the remaining parameters through the model. We use a CES matching

[22] Jacobides (2017) provides indirect evidence for the low performance of Greek public sector employees: i) Greece ranks below developing countries in international comparisons of citizens' satisfaction with key state services, such as health, education, and social protection; and ii) Greece has a very high gap between value-added tax due and value-added tax collected, indicating a serious inability to organize tax-collection government agencies more effectively. See Meghir et al. (2017), p.p. 632-643.

[23] Although there are many similarities between these countries and Greece, there is no capital in our model. Hence, we need to interpret these estimates with caution and probably consider them as a lower bound for our calibration.

[24] Michael Jacobides' study in Meghir et al. (2017) provides several reasons why the same worker would be less productive in the public than the private sector ($\alpha < 1$). First, the incentive structure of the public sector is extremely ineffective, because the performance measures used are crude and play almost no role for promotion decisions. Second, the human resource practices and the organizational structures are antiquated and very often irrational, leading to a severe mismatch between the skills needed and the skills public servants have. Third, the Greek public sector is plagued by massive "legal formalism", an extended set of laws and rules regulating all aspects of public administration. As a result, public employees fall back on formalistic rules at every turn and devote most of their energy and time in mindless procedural tasks.

function, as in Den Haan, Ramey, and Watson (2000), to make sure transition probabilities in our model are between zero and one: $q(\theta) = (1 + \theta^{\gamma})^{-\frac{1}{\gamma}}$ and $\theta q(\theta) = (1 + \theta^{-\gamma})^{-\frac{1}{\gamma}}$. This leaves us with six internally calibrated parameters: $\tilde{w}$, γ, η, $\tilde{e}$, δ, and ϕ. To pin down the public sector wage $\tilde{w}$, we use information about the public sector wage premium. As reported in Lyberaki et al. (2017), the available evidence shows that conditional on worker characteristics wages in the public sector have been between 20 and 35 percent higher than in the private sector. We use a public sector wage premium of 20% to be conservative. To pin down the parameter γ of the matching function, we use the job-finding rate of the Greek economy, estimated by Hobijn and Şahin (2009) at 6% per month. Following Shimer (2005), we set workers' bargaining weight η equal to the elasticity of the matching function at the equilibrium tightness, imposing constrained efficiency in equilibrium (Hosios (1990)).[25] This allows us to focus on output and productivity losses due to government's meritocratic hiring and not due to inefficient levels of vacancy creation. Moreover, we pin down the measure of public sector jobs $\tilde{e}$ using OECD data on the fraction of Greek workers employed in the public sector.[26]

Table 2: Internally Calibrated Parameters

Parameter	Description	Value
$\tilde{w}$	Public Sector Wage	1.301
γ	Matching Function Parameter	0.278
η	Worker's Bargaining Power	0.458
$\tilde{e}$	Public Sector Jobs	0.18
δ	Exit Probability	0.13%
ϕ	Fraction of Public Sector Output used for Wages	0.195

We use an average unemployment rate of 10%, based on OECD data for 1998-2009, to pin down the probability a worker exits the labor market δ. Finally, we calibrate ϕ, the fraction of public employees' output used to pay public sector wages, as follows. In the OECD database, we can find the time series for total government revenue and tax revenue from 1995 to 2009. Through the lens of the model, the only source of government revenue other than taxes is the fraction of output produced in the public sector and not

[25] For an intuitive generalization of the Hosios condition in settings where the match output depends on labor market tightness, see Mangin and Julien (2021).

[26] Unfortunately, the Government at a Glance series for public employment as a percentage of total employment goes back until 2007. The average for 2007-2009 is a bit less than 18%. We use 20% because the number of public employees was much higher in the period 1980-2000, as shown by Panagiotis Karkatsoulis and Efi Stefopoulou with data from the Ministry of Interior; see Meghir et al. (2017) p.p. 677-686. Interestingly, the OECD average of public sector employment as a percentage of total employment has also been close to 20% for at least the last ten years.

spent in other uses. Hence, we calibrate ϕ such that the ratio of tax revenue over total government revenue in the model is equal to the empirical one. The values of the parameters calibrated through the model are summarized in Table 2. As shown in Table 3, our calibration strategy makes the model match the calibration targets almost exactly (the difference between model-implied and data moments is in the order of 10^{-4}).

It is important to note that our counterfactual results in Section 5 should be interpreted as *lower bounds* of the effects of meritocratic government hiring on the labor market; this is the case mainly for two reasons. First, we assume that hiring in the public sector is frictionless. If this were not the case, finding a job in the public sector would be linked to additional delays and inefficiencies, exacerbating the quantitative impact of our mechanism. Second, agents' perfect foresight about all aspects of the environment implies that workers with $p < p_L$ will never apply for public sector jobs. However, in reality, many workers who are not 'good enough' for the public sector will participate in the screening process nevertheless. Incorporating this waste of resources in our model would only amplify the adverse effects of our mechanism.

Table 3: Matching the Calibration Targets

Target	Data	Model
Public/Private Wage Ratio	1.2	1.2
Job-Finding Rate	6%	6%
Percentage of Employment in Public Sector	20%	20%
Unemployment Rate	10%	10%
Tax Revenue/Total Revenue Ratio	80%	80%

5 Quantitative Exercises

In this Section, we present the quantitative results of various policy exercises that change the size and composition of the public sector. We focus on the main macroeconomic variables of general interest: i) output (Y), given in equation (19); ii) output produced by the private sector, given by $Y_P \equiv e \int_{p \notin \tilde{P}} p \, dF(p)$, iii) output produced by the public sector, given by $\tilde{Y} \equiv \tilde{e} \int_{p \in \tilde{P}} \alpha p \, dF(p)$, iv) unemployment rate (u), given in equation (16); v) average private sector productivity, given by $E_P(p) \equiv \int_{p \notin \tilde{P}} p \, dF(p)$; vi) average private sector wage, given by $E_P(w) \equiv \int_{p \notin \tilde{P}} w(p) \, dF(p)$; vii) average public sector productivity, given by $\tilde{E}(p) \equiv \int_{p \in \tilde{P}} p \, dF(p)$; and viii) level of taxes (τ), implied by equation (17) . The quantitative results are summarized in Table 5 and analyzed in the rest of this Section.

Table 4: Baseline Economy

Y	Y_P	$\tilde{Y}$	u	$E_P(p)$	$E_P(w)$	$\tilde{E}(p)$	τ
1.28	1.04	0.24	10%	1.44	1.08	1.78	0.26

Table 4 summarizes the results for the baseline economy, which is the model of Section 2 evaluated at the calibrated parameter values of Section 4. The GDP of the baseline economy is equal to 1.28, much lower than the unconditional aggregate worker productivity of 1.50. This reflects the fact that the private sector is plagued by matching frictions (which result in an unemployment rate of 10%), as well as that the private sector employs workers of relatively low productivity. Average private sector productivity is equal to 1.44; this is much lower than the private sector-equivalent productivity of public sector workers, which equals 1.78, indicating the distorted allocation of talent. Another measure of this distortion in talent allocation is the very high productivity of the type who is indifferent between the public and private sectors, p_H, which is equal to 1.87 (Figure 1). To finance public sector wages, the government takes away, on average, $\frac{\tau}{E_P(p)}$ = 18% of output from each firm-worker match, a substantial fraction. The low productivity together with high taxes result in a low average wage for private sector workers equal to 1.08; as mentioned above, public sector wage is 1.3, yielding a 20% public sector premium (Figure 2). Finally, tax revenue ($e\tau$) is equal to 0.19, which amounts to almost 15% of GDP.

Table 5: Quantitative Effects of Policy Changes

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	1.66%	0.85%	1.29%	0.45%
Y_P	7.39%	4.65%	4.85%	0.57%
$\tilde{Y}$	-23.17%	-15.63%	-14.13%	0%
u	-3.50%	-4.80%	-7.30%	-7.90%
$E_P(p)$	1.79%	3.95%	3.80%	4.12%
$E_P(w)$	7.29%	4.13%	6.99%	3.76%
$\tilde{E}(p)$	-3.93%	-15.62%	-14.04%	-15.17%
τ	-23.41%	3.23%	-10.88%	5.65%

5.1 Reduction in the number of public employees

The first exercise we consider is a 20% drop in the measure of public jobs $\tilde{e}$. At first glance, the magnitude of this exercise may seem large. However, this number is actually smaller than the actual drop in the number of public employees that Greece experienced in the period 2009-2013.[27] As we can see in the second column of Table 5, the economy experiences sizable gains after the decrease in the number of public employees. The government now pays fewer workers; hence, taxes drop by almost 25%. As a result, private sector matches are more profitable and higher-productivity workers apply to private sector jobs: the indifferent worker's productivity, p_H, is 1.78, lower than the baseline economy, and average private sector productivity increases by 1.8%. Lower taxes and higher worker productivity in the private sector imply higher private sector wages: wages are 7.3% higher than in the baseline economy. The private sector employs more productive workers and, since their output fully reflects their productivity, this raises GDP by more than 1.66%.

Another striking implication of this exercise is the 3.5% drop in unemployment. This drop may seem relatively small at first sight; it is important, however, to pause for a moment and evaluate its significance. In the calibrated model, public sector jobs absorb 18% of the labor force. After the reform under consideration takes place, 3.6% of the labor force return to the unemployment pool and look for a job in the private sector. When there is such a large increase in the number of unemployed workers, one would expect an increase in the unemployment rate. However, the unemployment rate actually drops by 0.35 percentage points. The reason, of course, is the increase in job creation by firms: lower taxes, along with the improvement in the quality of the unemployment pool make hiring more attractive and firms respond by creating more vacancies. This increase in job creation is so large that it more than compensates for the massive increase in the number of unemployed workers, leading to an ultimate reduction of the unemployment rate compared to the baseline economy.[28]

5.2 Change of government hiring strategy

The second exercise we consider is a change in the hiring strategy of the public sector: the government uses random hiring to fill public sector positions. This is the same hiring strategy we considered in Section 3.7.[29] Filling public sector jobs with random hiring

[27] The number of public sector employees decreased from 942,625 in 2009 to 675,530 in 2013, a 28.3% drop. As explained by Christopoulou and Monastiriotis (2015), this drop was due to a large number of public employees choosing to retire early, because of the forthcoming reforms in the pension system.

[28] We should highlight that this is a comparison between steady states. Unemployment would take some time to adjust and transition to its new steady state. In DMP models, however, vacancies are a jump variable and the response of firms is almost immediate, hence we do not expect this transitional period to be long.

[29] As we argued in Section 3.7, this is not to be viewed as a literal policy recommendation but, rather, as a thought experiment to facilitate comparison with the meritocratic hiring benchmark. That said, variations of this hiring strategy have been employed by the public sector. For example, the Greek Ministry of Edu-

has interesting implications for macroeconomic aggregates, as seen in the third column of Table 5. The productivity of both private and public sector employees is equal to the aggregate, since all worker types are represented in both sectors. As a result, wages in the private sector are 4.1% higher than in the baseline economy. Unemployment is also lower by 4.8%, reflecting the increase in firm entry due to the higher quality of the pool of unemployed workers in the private sector. Interestingly, however, taxes are slightly higher than in the baseline model. The reason is, of course, the 15% drop in public employees' productivity. Hence, the reform under consideration comes with a cost; the government needs to increase taxes to finance wages (see equation (17)). However, our calibration implies that the increase in worker productivity in the private sector is more than enough to compensate for the drop in match surplus due to higher taxes; ultimately, firm entry increases, leading to a 0.85% increase in GDP compared to the baseline model.

5.3 Reduction of public sector wage

Finally, we consider a 10% drop in public sector compensation, $\tilde{w}$, which makes the public sector wage premium (almost) disappear. Although the magnitude of the reform may seem large, it is absolutely realistic. If anything, the magnitude of our exercise is significantly smaller than the magnitude of the drop implemented by the Greek government during the recent crisis: Greek public employees experienced a 25% wage drop in the period 2009-2013, as documented by Christopoulou and Monastiriotis (2015).[30]

In our view, this exercise fully captures the essence of our mechanism. The reduction in $\tilde{w}$ eradicates the public sector wage premium but keeps the number of public employees constant. This makes public-sector jobs more similar to the private-sector ones and changes the choice of sector trade-off for high-quality workers. Hence, any macroeconomic gains from the reform should be attributed to lower taxes and the improvement in the quality of the unemployment pool in the private sector. And the gains are indeed substantial: private sector productivity increases by 3.8%, almost eliminating the misallocation of talent, and private sector wages increase by 7.3%; taxes and unemployment drop by 10% and 7.3% respectively; and, most importantly, GDP increases by 1.3%.

The careful reader may point out that reducing the public sector wage premium leads

cation fills a small number of term teaching positions with teachers from a list that includes pretty much every person with the appropriate teaching degree; the main factor of selection is the applicant's seniority, so applicants who graduated earlier have a higher probability of selection. Merit plays a minimal role in this process, which implies that, conditional on the time spent in the list, every applicant has the same probability of being selected.

[30] For a substantial part of this period, however, the public sector wage premium in Greece actually increased, since wages in the private sector experienced a more pronounced drop.

to lower output produced by the public sector, since it now attracts workers of lower quality. One wonders whether we can reduce the wage premium, keeping the total public sector production constant at its pre-reform level, and still achieve positive overall effects. It turns out that the answer is affirmative, as can be seen in the last column of Table 5. Since the reduction in $\tilde{w}$ attracts workers of lower productivity in the public sector, the measure of public sector jobs, $\tilde{e}$, has to increase to keep public sector output constant. To pay for the increase in $\tilde{e}$ the government increases taxes by 5.7%. This lowers the match surplus and, as a result, the improvement in private sector wages is not as large as in the other reforms (it is still substantial, however). Despite the increase in taxes, the positive entry effect is so large that it more than compensates for the higher taxation, leading to improved macroeconomic aggregates: unemployment decreases by 8% and output increases by 0.5%.

5.4 Worker quality versus taxes

As we have mentioned several times, there are two channels through which the combination of meritocratic hiring with overly generous public sector wages can distort macroeconomic outcomes. First, the direct effect of high taxation and, second, the lower quality of available workers in the private sector. In this section, we decompose the aggregate effects of the same policy changes shown in Table 5 into a tax and a worker quality component. Our paper is one of the few that introduces taxes into a search model with a public sector, hence, this decomposition allows us to understand the importance of this novel channel for our quantitative results. To that end, we repeat the same policy experiments as above while we adjust the level of ϕ (fraction of public sector output used to pay wages; see equation (17)) to keep taxes constant at the baseline economy level of 0.26. The results presented in Table 6 capture solely the equilibrium response of firms to the differences in the quality of the unemployment pool induced by various policy changes.

The quality channel accounts for the bulk of the positive effects on output found in our policy experiments. The policy reform for which worker quality has the lowest impact (around 47%) is the reduction in the number of public employees, while the reform with the largest impact (more than 85%) is random hiring. The reduction of public sector wages is very close to the random hiring case though, with the composition of the unemployment pool accounting for around 70% of the output gains. This is natural, given the workings of our mechanism. The reduction of public sector premium and the change in hiring strategy directly affect the quality of workers in the private sector: the composition of the pool of unemployed accounts for the bulk of the gains in private sector productiv-

Table 6: Quantitative Effects of Policy Changes due to Composition

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	0.77%	0.73%	0.88%	0.59%
Y_P	5.41%	4.76%	3.88%	0.65%
$\tilde{Y}$	-19.38%	-15.63%	-12.13%	0%
u	3.20%	-5.50%	-4.30%	-9.40%
$E_P(p)$	0.81%	3.95%	3.26%	4.26%
$E_P(w)$	1.00%	4.83%	3.96%	5.06%
$\tilde{E}(p)$	0.79%	-15.62%	-12.10%	-15.74%

ity (fifth row in Table 6). The reduction in the number of public employees lowers the tax burden but does not change the fact that good public jobs absorb a substantial measure of productive workers from the private sector. Hence, the output gains found when the number of public employees decreases are mostly due to the taxation channel.

Another way to see this is to notice that the increase in private sector productivity due to worker quality when the number of public employees decreases is only 45% of the total increase (fifth row, second column in Table 6). The bulk of productivity gains in this scenario comes from the lower tax burden on private worker-firm matches. Interestingly, without taxes, both unemployment and public sector productivity would increase when the public sector employs less workers. Clearly, the taxation channel is the main driver in this experiment. Finally, the gains in private sector wages follow private sector productivity closely (sixth row in Table 6): the improvement in worker quality accounts for the majority of the gains under random hiring and lower public sector wages, but for only 14% of wage gains when the number of public sector employees is reduced.

6 Examining the quantitative impact of various assumptions

In the previous Section, we presented a quantitative evaluation of the effects of meritocratic hiring when combined with a public sector wage premium. To do so, we used the framework analyzed in Sections 2 and 3 together with a number of parameterizing assumptions. The aim of this Section is to evaluate the quantitative impact of these assumptions on the numerical results we obtained in Section 5. First, we present results for values of α (the fraction of workers' productivity in the public sector) larger than the one used in our main analysis. Next, we consider three assumptions: i) the lack of separation shocks in the public sector, ii) a unique wage for all public sector employees, and iii) a uniform distribution of worker ability. We modify these assumptions one by one and check how much our quantitative results change after each modification.

6.1 Workers' productivity in the public sector

We recalibrate the model using the same targets but for $\alpha = 0.85$ and $\alpha = 1$. Most of the model parameters barely change, implying that the chosen moments identify the model parameters well. The only parameter that changes is ϕ, which declines accordingly to keep the ratio of tax to total government revenue as in the data (the value of ϕ is 0.17 when $\alpha = 0.85$ and 0.15 when $\alpha = 1$). Using these parameter values, we run the same policy experiments as in Section 5. Tables 7 and 8 present the results.

Table 7: Quantitative Effects of Policy Changes for $\alpha = 0.85$

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	1.04%	0.40%	0.91%	0.43%
Y_P	7.35%	4.56%	4.83%	0.56%
$\tilde{Y}$	-23.09%	-15.51%	-14.07%	0%
u	-3.42%	-4.43%	-7.24%	-7.85%
$E_P(p)$	1.77%	3.92%	3.79%	4.11%
$E_P(w)$	7.26%	4.06%	6.96%	3.73%
$\tilde{E}(p)$	-3.89%	-15.53%	-14.10%	-15.31%
τ	-23.42%	3.23%	-10.88%	5.65%

There are two important takeaways from Tables 7 and 8. First, for almost all experiments, GDP increases (first row), although the magnitude of the changes is smaller than the one obtained in the previous section. This is expected, since the productivity differential between sectors is now smaller (or non-existent for $\alpha = 1$). Hence, the misallocation of workers across sectors is limited and sending workers of higher productivity in the private sector yields smaller gains. The magnitude of the changes though is still positive (other than the small negative value in the random hiring counterfactual with $\alpha = 1$), indicating that the reforms we examine induce macroeconomic gains through lower taxation even when $\alpha = 1$. Second, the percentage changes of all other variables are very similar to the percentage changes observed in Table 5. In other words, the macroeconomic implications of our model regarding productivity, unemployment, taxes, and wages do not depend on the value of α.

Table 8: Quantitative Effects of Policy Changes for $\alpha = 1$

Variable	Reduced $\tilde{e}$	Random Hiring	Reduced $\tilde{w}$	Reduced $\tilde{w}$ (Constant $\tilde{Y}$)
Y	0.19%	-0.16%	0.38%	0.41%
Y_P	7.37%	4.57%	4.85%	0.57%
$\tilde{Y}$	-23.15%	-15.55%	-14.14%	0%
u	-3.51%	-4.51%	-7.32%	-7.93%
$E_P(p)$	1.78%	3.94%	3.80%	4.12%
$E_P(w)$	7.28%	4.08%	6.98%	3.74%
$\tilde{E}(p)$	-3.95%	-15.58%	-14.14%	-15.33%
τ	-23.41%	3.27%	-10.88%	5.65%

6.2 Separations in the public sector

We introduce an exogenous shock $\tilde{\lambda}$ that sends public sector workers to unemployment. This separation shock changes the value of being employed in the public sector into:

$$\tilde{W}(p) = \tilde{w} + \beta(1-\delta)\left[(1-\tilde{\lambda})\tilde{W}(p) + \tilde{\lambda}\tilde{U}(p)\right], \tag{24}$$

while the value of being unemployed in the public sector stays as in (4). Moreover, in order to maintain a measure of $\tilde{e}$ public sector jobs at each period, the government needs to hire a measure of $(\delta + \tilde{\lambda})\tilde{e}$ workers at each period. It is straightforward to notice that the addition of this shock does not change our specialization result. Given perfect foresight, only workers who are good enough to get hired by the public sector choose to take the public sector exam. The addition of $\tilde{\lambda}$ only enlarges the mass of workers who apply in each period, removing a larger measure of types from the private sector.

As explained in the Introduction, complete job security for Greek public sector employees is part of the Greek Constitution. Thus, we do not have an empirical moment to calibrate $\tilde{\lambda}$. In general, it is well-documented that separation shocks are much smaller in the public than the private sector; see, e.g., Fontaine et al. (2020). Since the point of this exercise is to evaluate how much the addition of $\tilde{\lambda}$ affects our quantitative results, we set it to half the value of separation shocks in the private sector and run the same counterfactuals as before. Table 9 presents the results. The results are very similar to the results from the economy without separations in the public sector, showing that our predictions are robust to this assumption.

Table 9: Quantitative Effects of Policy Changes with separations in the public sector

Variable	Reduced $\tilde{e}$	Random Hiring	Reduced $\tilde{w}$	Reduced $\tilde{w}$ (Constant $\tilde{Y}$)
Y	1.66%	0.79%	1.31%	0.43%
Y_P	7.33%	4.47%	4.84%	0.53%
$\tilde{Y}$	-23.13%	-15.21%	-14.08%	0%
u	-3.42%	-4.33%	-7.24%	-7.65%
$E_P(p)$	1.76%	3.85%	3.80%	3.99%
$E_P(w)$	7.26%	3.99%	6.98%	3.60%
$\tilde{E}(p)$	-3.91%	-15.22%	-14.10%	-14.83%
τ	-23.45%	3.15%	-10.90%	5.53%

6.3 Productivity-dependent wages in the public sector

Another assumption we made in our benchmark analysis is that public sector workers are paid the same wage regardless of their productivity. As explained in Section 2.1, this assumption is well-suited for Greece, since public sector wages feature lower variability than private sector wages. Moreover, our specialization result does not hinge on this assumption. However, to examine the quantitative impact of this feature on our numerical results, we modify the wage policy of the public sector. Specifically, we make public sector wages dependent on workers' productivity in a linear fashion: $\tilde{w}(p) = \bar{w} + \zeta p$. Although the incentive structure in the Greek public sector is highly ineffective (see our conversation in Section 2.1 and footnote 24), this wage policy also captures the fact that the public sector is comprised of different type of workers and tasks and that individuals in higher level positions (with higher productivity) receive higher wages.

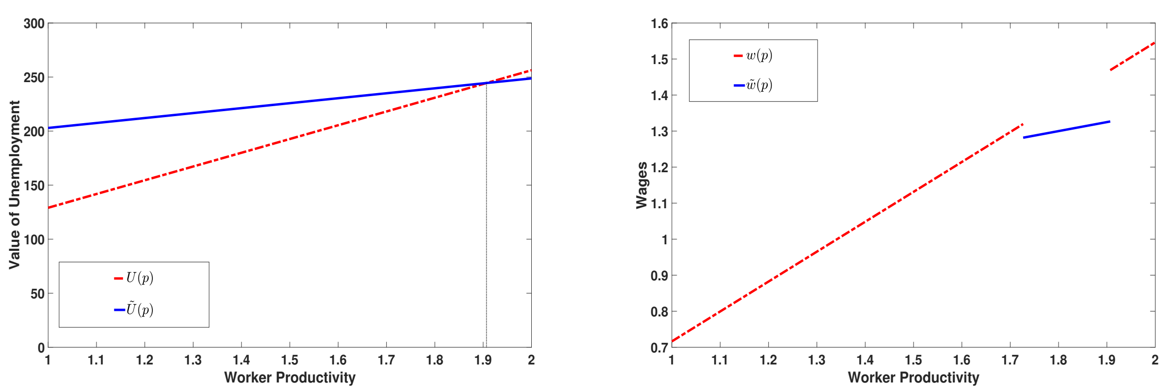


Figure 5. Value of unemployment (left panel) and equilibrium wages (right panel) for workers of various productivities when public sector wage is an increasing function of workers' productivity.

To parameterize $\bar{w}$ and ζ, we follow a similar strategy to what we did for the separation shocks: we choose a benchmark value for these parameters and measure how much our quantitative results are affected by the different parameter values. We experimented with three parameterizations for ζ: a high ($\zeta = 0.4$), medium ($\zeta = 0.25$), and low value ($\zeta = 0.1$). We adjusted the value of $\bar{w}$ such that the productivity of the indifferent worker p_H and the unemployment rate are close to their benchmark values (the values for $\bar{w}$ are 0.57, 0.85, and 1.13, respectively). In Table 10, we report the results for the medium values and in Appendix B.3 we report the results for the high and low values for robustness. If anything, our counterfactual experiments have a larger impact on GDP than in the benchmark scenario, showing that our numerical implications are robust to the wage policy in the public sector. The results are very similar for the high and low values of ζ, as shown in Tables 14 and 15 in Appendix B.3.

Table 10: Quantitative Effects of Policy Changes with productivity-dependent public sector wages

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	1.93%	1.15%	1.35%	0.48%
Y_P	8.56%	5.57%	5.10%	0.67%
$\tilde{Y}$	-25.90%	-17.42%	-14.36%	0%
u	-4.98%	-6.77%	-7.67%	-8.07%
$E_P(p)$	2.69%	4.57%	3.98%	4.10%
$E_P(w)$	8.82%	6.45%	7.29%	3.92%
$\tilde{E}(p)$	-7.39%	-17.44%	-14.38%	-15.26%
τ	-25.37%	-4.08%	-11.28%	4.70%

6.4 Workers' productivity distribution

Finally, we would like to understand the impact of the assumed worker productivity distribution on our results. Since this is a model of misallocation of worker types across sectors, the worker productivity distribution may play an important role on the magnitude of the counterfactual exercises. Hence, as another robustness check, we choose to parameterize worker productivity in the model with a log normal distribution, as it is a popular choice in the empirical literature.[31]

[31] However, this choice comes with several caveats. As explained by Eckstein and Van den Berg (2007), without data on workers' unemployment durations, the parameters of the log normal distribution are not identified. That is, without using data on unemployment durations, data on wages cannot pin down both the mean and variance of the worker productivity distribution. Given that we do not have access to this

Table 11: Internally Calibrated Parameters with Log Normal Worker Productivity

Parameter	Description	Value
$\tilde{w}$	Public Sector Wage	1.216
γ	Matching Function Parameter	0.272
η	Worker's Bargaining Power	0.462
$\tilde{e}$	Public Sector Jobs	0.18
δ	Exit Probability	0.1%
ϕ	Fraction of Public Sector Output used for Wages	0.143
σ	Standard Deviation of Worker Productivity	0.599

To keep things comparable with our benchmark scenario, we fix the mean of the log normal distribution at the same level as in our benchmark exercise with the uniform distribution ($\mu = 1.5$). We use the standard deviation of log wages, reported in Depalo, Giordano, and Papapetrou (2015), Table 3, p. 996 (who report wage statistics from many Eurozone countries), to calibrate the variance of the worker productivity distribution. The other calibration targets stay the same; the calibrated parameters can be found in Table 11. Finally, since the support of the log normal starts at 0, we impose two other changes in the model: taxes become proportional to the profit of the firm and unemployment benefits become proportional to the productivity of the worker. This is the most straightforward way to make sure that even very low productivity workers and matches will participate in the labor market in equilibrium.

Table 12: Quantitative Effects of Policy Changes with log normal worker productivity

Variable	Reduced $\tilde{e}$	Random Hiring	Reduced $\tilde{w}$	Reduced $\tilde{w}$ (Constant $\tilde{Y}$)
Y	1.36%	-3.81%	0.87%	0.08%
Y_P	6.38%	-1.11%	3.98%	0.15%
$\tilde{Y}$	-21.37%	-16.02%	-13.20%	0%
u	-1.91%	-1.31%	-5.24%	-5.34%
$E_P(p)$	1.05%	-1.29%	3.23%	3.28%
$E_P(w)$	6.48%	0.45%	6.78%	3.62%
$\tilde{E}(p)$	-1.72%	-16.04%	-13.21%	-13.19%
τ	-22.79%	-7.75%	-14.09%	-0.89%

Table 12 reports the results for the same counterfactual exercises as before but for the economy with log normal worker productivity. The main takeaway from Table 12 is that

data, our benchmark choice of a uniform distribution was made to sidestep these issues. Obviously, another reason to work with the uniform distribution is its tractability, which allowed us to establish analytical results in the first part of the paper.

the positive effect of the reforms we have discussed are robust to the worker productivity distribution. Cutting down the size of the public sector or the public sector wage premium leads to a 1.36% or 0.87% increase in GDP, respectively. Reducing the public sector wage premium but keeping public sector output constant also improves the economy's GDP but the effect is small, 0.08% (the drop in unemployment is quite sizable, though).

The only result that is not robust to the worker productivity distribution is the random hiring counterfactual. Although unemployment decreases by 1.31%, the economy's GDP actually decreases by 3.81%, a sizable drop.[32] Our intuition is based on the shape of the log normal distribution. Log normal has a fat left tail close to zero, and in equilibrium these workers look for jobs in the private sector. At the same time, the private sector recruits the very few high productivity workers on the right tail of the distribution. The public absorbs an interval of workers with relatively high productivity, with $p_L = 1.46$ and $p_H = 1.78$. Under random hiring, the public has to recruit from the whole support and its output drops by 16%. The output of the private also drops though: the private sector shares the few high productivity workers with the public and the mass of types added from the public are not enough to compensate for this loss. As a result, random hiring decreases the output of both sectors and the whole economy.

Despite the reversal in the sign of the effect of random hiring on GDP, the lessons of our analysis do not change. It is important to remind the reader that random hiring is not a literal policy recommendation. Rather, as we highlighted in Sections 3.7 and 5.2, it is a benchmark that helped us implement a thought experiment to understand the workings of the model. The main pragmatic policy recommendations concern a reduction in the size of the public sector or a reduction in the public sector wage premium. Our analysis shows that implementing these two reforms would produce robust positive aggregate effects under a wide range of model specifications.

7 Conclusion

In this paper, we highlight a novel channel through which meritocratic government hiring can have unintended negative consequences on macroeconomic performance. A meritocratic and generous government absorbs high-quality workers from the private sector, which, in turn, weakens the incentives of firms to create jobs, increases unemployment, and lowers GDP. Our model extends the Diamond-Mortensen-Pissarides framework to

[32] This is similar to what we observed in the counterfactuals for $\alpha = 1$, in which random hiring also led to a drop in GDP.

include workers of heterogeneous productivity and a government that fills public sector jobs based on merit. To evaluate the significance of our mechanism, we calibrate the model to aggregate data from Greece and perform a series of counterfactual exercises. We find that the adverse effects of our mechanism on TFP, GDP, and unemployment are sizable. While our motivation and data come from Greece, we argue that our mechanism is relevant for a large number of countries.

Two important clarifications regarding the message of the paper should be made. First, we believe that key positions in public administration should be filled by highly talented individuals. This paper is not about these jobs, it is about the large mass of public sector jobs that, arguably, do not need to be filled with the most stellar workers of the economy: the majority of positions in the tax authorities, various ministries, postal services, public utility companies, police, army, etc. Second, our message is not that governments should abolish meritocracy; of course, the best individuals who apply should be hired. What we *are* saying is that governments should not make the aforementioned positions so excessively attractive (by offering overly generous compensation schemes on top of de facto job security) that stellar individuals want to apply to them.

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A Proofs

Proof. Proof of equation 8.

Recall that in any period, and in the steady state, the government needs to hire $\delta\tilde{e}$ new workers. As we have established in the main body of the paper, due to perfect foresight and perfect information about all aspects of the environment, workers who are not good enough to be hired in the public sector will never apply there. Thus, if we knew p_H, we could find p_L by setting it in a way so that the measure of (unemployed) workers who apply to the public sector is enough to fill the demand for public sector jobs.

Next, recall that agents who start working in the public sector in period t must apply in period $t-2$ and get screened in period $t-1$. Also, recall that all agents die with probability δ at the end of every period. Thus, in order to have $\delta\tilde{e}$ new workers in period t, it must be that a mass of $\delta\tilde{e}/(1-\delta)^2$ workers applied to the public sector in $t-2$. Also, it must be that $\delta\tilde{e}/(1-\delta)$ of these workers (survived and) were being screened in period $t-1$. Since we are in steady state, that means that in *any* period t, there is a measure

$$\frac{\delta\tilde{e}}{(1-\delta)^2}$$

of workers who apply to the public sector (to start working in $t+2$); a measure

$$\frac{\delta\tilde{e}}{1-\delta}$$

of workers that are currently screened (to start working in $t+1$); and, of course, a measure $\tilde{e}$ of workers who are currently working in the public sector. Summing up these three masses we find that the measure of *all* workers who "specialize" in the public sector (in whatever stage) is $\tilde{e}/(1-\delta)^2$. Then, equation (8) simply states that p_L should be chosen so that the measure of all workers who specialize in public sector jobs, $F(p_H)-F(p_L)$, equals the measure $\tilde{e}/(1-\delta)^2$. $\square$

Proof. Proof of Lemma 1.

a) To simplify the notation and the proof, define the terms

$$\begin{aligned} D_U &\equiv 1-\beta(1-\delta)\left(1-\theta q(\theta)\right), \\ D_W &\equiv 1-\beta(1-\delta)\left(1-\lambda\right). \end{aligned}$$

Notice that $D_U, D_W \in (0,1)$, and that with these definitions we can rewrite the workers' value functions as

$$W(p) = \frac{w(p) + \beta(1-\delta)\lambda U(p)}{D_W}, \tag{25}$$

$$U(p) = \frac{z + \beta(1-\delta)\theta q(\theta) W(p)}{D_U}. \tag{26}$$

Applying total differentiation with respect to p in (25) and (26) yields (respectively)

$$\frac{\partial W(p)}{\partial p} = \frac{1}{D_W}\left[\frac{\partial w(p)}{\partial p} + \beta(1-\delta)\lambda \frac{\partial U(p)}{\partial p}\right], \tag{27}$$

$$\frac{\partial U(p)}{\partial p} = \frac{1}{D_U}\beta(1-\delta)\theta q(\theta)\frac{\partial W(p)}{\partial p}. \tag{28}$$

Combining the last two expressions allows us to write

$$\frac{\partial W(p)}{\partial p} = \frac{D_U \frac{\partial w(p)}{\partial p}}{D_W D_U - \beta^2(1-\delta)^2\lambda\theta q(\theta)}. \tag{29}$$

Inspection of the wage curve (equation 13) immediately reveals that $\partial w/\partial p$ is positive and so is D_U. Thus, $\partial W/\partial p > 0$ if and only if the denominator of (29) is positive. This, in turn, will be true if and only if

$$[1-\beta(1-\delta)(1-\theta q(\theta))][1-\beta(1-\delta)(1-\lambda)] > \beta^2(1-\delta)^2\lambda\theta q(\theta).$$

After some algebra one can verify that the last expression is equivalent to

$$[1-\beta(1-\delta)][1-\beta(1-\delta)(1-\lambda-\theta q(\theta))] > 0,$$

which is always satisfied. We conclude that $\partial W/\partial p > 0$, and then from (28), we must also have $\partial U/\partial p > 0$, which concludes the proof.

b) One needs to substitute the wage function from (13) into $U(p)$ and solve $U(p_H) = \tilde{U}$ with respect to p_H. Here is the easiest way to do that. In the bargaining solution described in (12), we can replace $W(p), U(p)$, and $J(p)$ from (1), (5), and (10), respectively, to obtain

$$U(p) = \frac{w(p) - \eta(p-\tau)}{(1-\eta)[1-\beta(1-\delta)]}.$$

Replacing $w(p)$ from (13) into the last expression yields:

$$U(p) = \frac{[1-\beta(1-\delta)(1-\lambda)]\, z + \beta(1-\delta)\theta q(\theta)\eta(p-\tau)}{[1-\beta(1-\delta)]\,[1-\beta(1-\delta)(1-\lambda-\eta\theta q(\theta))]}.$$

The last step is to set the last expression equal to $\tilde{U}$, described in equation (7) and solve for p. After some algebra we arrive at the desired result. $\square$

Proof. Proof of Proposition 2.

The proof of equilibrium existence and uniqueness follows the same methodology as in the standard DMP model; see Pissarides (2000).

First, as is standard in DMP models, an equilibrium exists as long as the vacancy cost is not too high. The sufficient condition requires that as $\theta \to 0$ the typical firm has an incentive to enter the labor market and open a vacancy. In our model, as $\theta \to 0$, $p_H \to \overline{p}$ (without firm entry even the best worker types want to work for the public sector), and $p_L \to \overline{p} - (\tilde{e}(\overline{p} - \underline{p}))/(1-\delta)^2$ (from equation (8)). Therefore, from equation (15) evaluated at $\theta \to 0$, a sufficient condition for existence is[33]

$$\kappa < \frac{\beta(1-\eta)\left\{\mathbb{E}\left[p|p \in [\underline{p}, \overline{p} - (\tilde{e}(\overline{p}-\underline{p}))/(1-\delta)^2]\right] - \tau - z\right\}}{1-\beta(1-\delta)\,(1-\lambda)}.$$

Second, regarding uniqueness, the key observation is that due to the monotonicity of the value of unemployment (Lemma 1), p_H is always uniquely determined, and, from equation (8), the same is true for p_L. With unique p_L and p_H and since the RHS of equation (15) is strictly decreasing in θ, we conclude that the equilibrium level of θ is also uniquely determined. Given this, the equilibrium u is unique from equation (16), which, in turn, implies a unique τ from equation (17). Finally, given the uniqueness of all other endogenous variables, the wage function is also uniquely determined from equation (13). This concludes the proof.

$\square$

[33] Where τ and $\tilde{w}$ adjust in the background to guarantee that the budget constraint of the government is satisfied

B Quantitative Extensions

B.1 Alternative definition of output

The definition of output we use in the main body of the paper is given by equation (19), which is repeated here for easier reference:

$$Y = e \int_{p \notin \tilde{P}} p \, dF(p) + \tilde{e} \int_{p \in \tilde{P}} \alpha p \, dF(p).$$

We also report the results of the counterfactual exercises using an alternative measure of output that includes the value of public sector wages output:

$$Y = \left[1 - u - \frac{\tilde{e}}{(1-\delta)^2}\right] \int_{p \notin \tilde{P}} p \, dF(p) + \tilde{e}\tilde{w}. \tag{30}$$

Instead of the actual output produced by the public sector, equation (30) uses the total value of public sector wages. This measure follows the national account practice of measuring public sector output with the wage bill of public sector employees. As we can see in Table 13, the quantitative results of the counterfactual exercises are of similar orders of magnitude for both measures of output. If anything, the gains for GDP following the national accounts methodology are larger than the ones obtained using model-based direct measures of output.

Table 13: Summary of Quantitative Results with Alternative Definition of Output

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Main Y	1.66%	0.85%	1.29%	0.45%
Alternative Y	2.35%	3.80%	1.98%	0.77%

B.2 Policy comparative statics

For completeness, we present different measures of output for various levels of public sector wages and employment. To produce these comparative statics, we set the parameters at the calibrated levels of Table 2 and we change one parameter at a time. To produce Figure 6, we change the level of public sector wage $\tilde{w}$. To produce Figure 7, we change the level of public sector employment $\tilde{e}$. We depict the following measures of output: the left panel contains the GDP of the meritocratic economy (Y) and the GDP of the economy with random hiring (Y_R); the right panel contains the output produced by the public sector ($\tilde{Y}$) and the output produced by the private sector (Y_P) in the meritocratic economy.

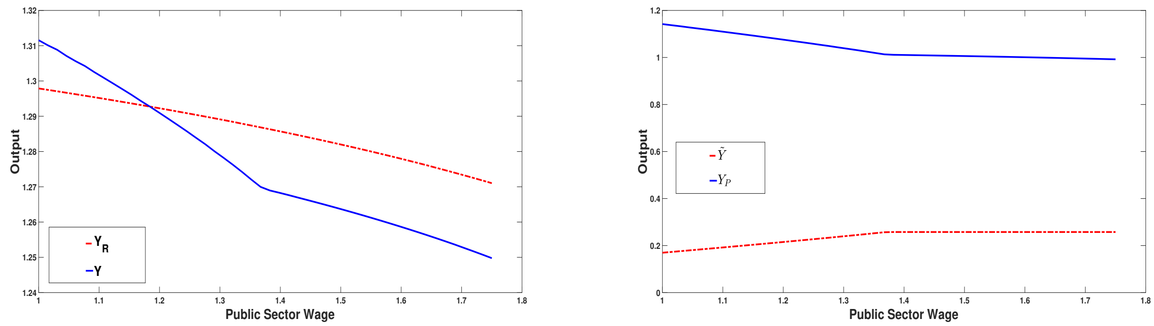

Figure 6. Various measures of output for different values of public sector wages. The left panel contains the GDP of the meritocratic economy (Y) and the GDP of the economy with random hiring (Y_R). The right panel contains the output produced by the public sector ($\tilde{Y}$) and the output produced by the private sector (Y_P) in the meritocratic economy.

The two Figures confirm the lessons learned from the main analysis of the paper. First, focusing on the left panels, random hiring dominates meritocracy for high values of $\tilde{w}$ and $\tilde{e}$. As these variables become smaller, the output under random hiring increases faster than the output under meritocracy, and becomes larger after a benchmark level of either $\tilde{w}$ or $\tilde{e}$. Second, as $\tilde{w}$ and $\tilde{e}$ increase, the output of the public sector increases, while the output of the private sector decreases. Of course, this reflects both the fact that the public sector becomes larges (as $\tilde{e}$ grows), as well as a selection effect: the public attracts better workers when it becomes larger and pays better.

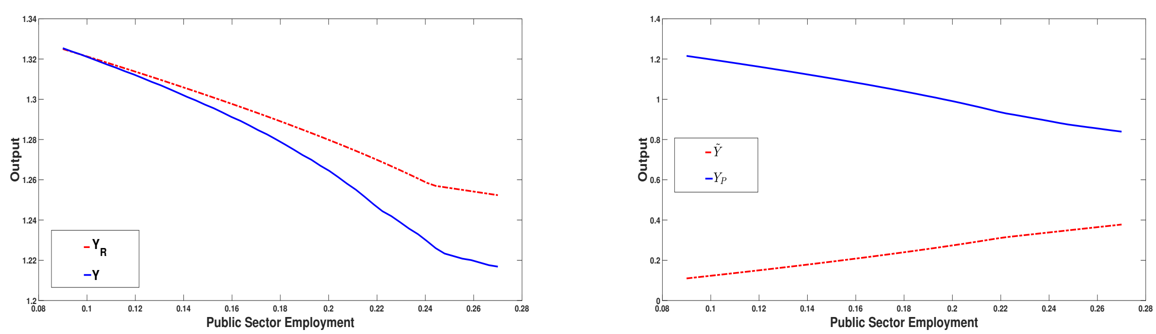

Figure 7. Various measures of output for different values of public sector employment. The left panel contains the GDP of the meritocratic economy (Y) and the GDP of the economy with random hiring (Y_R). The right panel contains the output produced by the public sector ($\tilde{Y}$) and the output produced by the private sector (Y_P) in the meritocratic economy.

B.3 Robustness of productivity-dependent public sector wages

Tables 14 and 15 present the results of the counterfactual policy exercises for different values of $\bar{w}$ and ζ. As a reminder, the wage policy of the public sector is parameterized as $\tilde{w}(p) = \bar{w} + \zeta p$ to make the wage contingent on workers' productivity. For Table 14, the value of $\bar{w}$ is 0.57 and ζ is 0.4. For Table 15, $\bar{w}$ is 1.13 and ζ is 0.1. The results are of a similar order of magnitude (if anything, they are larger) with the results of Table 10, with medium values of $\bar{w}$ and ζ, as well as with the benchmark results of Table 5.

Table 14: Quantitative Effects of Policy Changes with increasing public wages for high ζ

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	2.39%	1.39%	1.43%	0.48%
Y_P	10.42%	6.22%	5.37%	0.65%
$\tilde{Y}$	-30.74%	-18.55%	-14.93%	0%
u	-7.43%	-8.42%	-8.12%	-8.32%
$E_P(p)$	4.11%	4.97%	4.21%	4.14%
$E_P(w)$	11.42%	8.13%	7.72%	4.02%
$\tilde{E}(p)$	-13.42%	-18.56%	-14.94%	-15.40%
τ	-29.15%	-9.43%	-11.82%	4.51%

Table 15: Quantitative Effects of Policy Changes with increasing public wages for low ζ

Variable	**Reduced $\tilde{e}$**	**Random Hiring**	**Reduced $\tilde{w}$**	**Reduced $\tilde{w}$ (Constant $\tilde{Y}$)**
Y	1.77%	1.01%	1.42%	0.50%
Y_P	7.84%	5.28%	5.32%	0.71%
$\tilde{Y}$	-23.97%	-17.08%	-15.12%	0%
u	-4.08%	-5.68%	-7.87%	-8.37%
$E_P(p)$	2.13%	4.44%	4.16%	4.32%
$E_P(w)$	7.87%	5.29%	7.64%	4.07%
$\tilde{E}(p)$	-4.93%	-17.07%	-15.11%	-15.94%
τ	-23.92%	0.57%	-11.69%	5.27%