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ABSTRACT

A Theory of Employment Guarantees: Contestability, Credibility and Distributional Concerns*

This paper develops a theory of employment guarantees when labour markets are imperfect and when the credibility of government policy announcements could be in doubt. The basic feature of an EGS is that any individual who satisfies a set of specified criteria is guaranteed public employment at a given wage if they want it. Thus, the two factors that define the guarantee are the wage and the ease of access. The problem for the planner is to choose these to maximize a social welfare function. If the labour market is perfectly competitive, then the introduction of an employment guarantee scheme is bound to have efficiency costs, and can only be justified through its positive distributional consequences – this has been the framework for most of the theoretical and empirical analysis of employment guarantee schemes. If the labor market is imperfect, however, the announcement of a credible employment guarantee scheme can improve efficiency through the introduction of contestability in the private labour market. The paper then considers the issue of credibility and solves for an incentive compatible employment guarantee scheme in a rational expectations equilibrium. It is shown that the outcome with a planner who cares only about efficiency can be less efficient than the outcome with a planner whose social welfare function also gives weight to poverty!

JEL Classification: I38, J21, K31 and O12
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1 Introduction

Dating back as early as the 19th century, formal establishment of Employment Guarantee Schemes (EGS) has been a staple of relief policies in response to natural disasters and economic downturns worldwide. Contemporary schemes in many developed and developing countries have evolved to encompass a broad array of objectives: providing income relief by generating employment; constructing and maintaining public infrastructure; ameliorating endemic poverty; improving workers' position to bargain in the private sector and facilitating job search (Drèze and Sen 1991, Lipton 1998, von Braun 1995).

Some of the earliest examples include the 1817 Poor Employment Act and the 1834 Poor Law Amendment Act in Great Britain (Blaug 1963, 1964), the New Deal programs of the 1930's in the United States (Kesselman 1978, Bernstein 1970), and the Employment Guarantee Act of 1978 in the State of Maharashtra in India (Maharashtra Planning Department 1979). In the developing countries of Latin America (Chile 1987), Asia (Pakistan 1992, Bangladesh 1983, Phillipines 1990), and Africa (Botswana 1960, Kenya 1992),[1] a major objective of establishing employment guarantees has been large scale poverty reduction. Meanwhile, many recent programs are notable particularly for the specific limits they impose on reach and accessibility. For example, the Youth Employment Guarantee Act of 1991 in the Netherlands and Egypt's employment guarantee program respectively aim at guaranteeing employment to young persons and college graduates.[2] Still other programs impose limits on access in spatial terms. Tanzania's Special Public Works Programs (1978) was instituted within village limits, with employment guarantee limited only to residents (Teklu 1995). The widely debated National Rural Employment Guarantee Act of India (2005) is one of the most recent attempts to provide statutory basis for a government guarantee of employment initially in 200 rural districts.

This wealth of government initiatives notwithstanding, conceptual understanding of the mechanics of employment guarantee schemes (EGS) in general, and the difference that an official commitment has on the private labor market in particular, has been in short supply. In terms of mechanics, at the core of an EGS are three distinct features: (i) an EGS wage in exchange for labor services, (ii) the ease of access to such employment, and (iii) the degree of contestability that such a wage introduces into the labor market.

[1] See Drèze and Sen 1989, Lipton 1998, Keddeman 1998 and von Braun 1995.

[2] See ILO (2006) for the Netherlands, Assaad (1997) for Egypt, and also Dar and Tzannatos (1999) for a number of OECD countries.

These have each been discussed, though yet to be articulated and analysed as an unit. First and foremost, oft-noted has been the promise of employment guarantees to alleviate poverty by delivering targeted transfers to the poor (Drèze and Sen 1991, Lipton 1998, von Braun 1995)[3] with an accompanying empirical literature and case studies that establish the size of such direct transfer benefits (Ravallion 1991, Ravallion, Datt and Chaudhuri 1993). The EGS wage, when viewed in this light, is arguably akin to direct transfers to the poor rooted firmly in the principles of self-selection subject to financing constraints (Besley and Coate 1992, Besley and Kanbur 1993).

Second, while EGS has been touted as an employment oriented approach to anti-poverty policy-making, or invoked as a countercyclical labor market policy to economic downturns, such a *guarantee* alone has never implied universal elimination of unemployment. This suggests that another key metric by which the effectiveness of EGS can be gauged is the ease of access to such programs. Indeed, whereas a government may perfectly follow through with the letter of an employment guarantee legislation by paying a predetermined EGS wage, discretion with respect to the ease of access to EGS employment can nevertheless be viewed as an implicit employment rationing device, which goes against the original intention of the law.[4]

Lastly, employment guarantees have also been credited for their potential to induce positive labor market responses by improving the bargaining strength of workers (Drèze and Sen 1991, Dev 1995). The efficacy of an EGS accordingly also depends on the extent to which the introduction of such contestability matters. Naturally, this final dimension of an EGS becomes relevant particularly in an imperfectly competitive labor market, and should be expected to have no efficiency enhancing impact when a perfectly competitive framework is the relevant starting point. What is important to note is that in both rural and urban labor markets, there is evidence of market outcomes consistent with imperfect competition and market power (Bardhan and Rudra 1978, Bardhan 1979, 1981, Binswanger et. al. 1984, Card and Krueger 1995, Datt 1997 and Manning 2005).

Once these three individual building blocks of an EGS are spelled out, the question

[3]Rural public works programs have been studied in a number of important contexts: (i) providing income insurance and impacting seasonal agrarian labor markets (A. Basu 2005), (ii) building longer term capital assets (K. Basu 1991), (iii) obviating the need for the dislocation of families in search of jobs and food (Drèze and Sen 1991), and (iv) impacting the flow of rural-urban migration when EGS is location-specific (Ravallion 1990).

[4]The reduction in EGS employment subsequent to the EGS wage hike in Maharashtra is one such case in point (Ravallion, Datt and Chaudhuri 1993, Dev 1995).

of a need for an official commitment to employment guarantees acquires added meaning. The Indian National Rural Employment Guarantee Act of 2005 (NREGA), for example, provides that unless otherwise changed by the Central Government,

> "*the minimum wage fixed by the State Government ... shall be considered as the [EGS] wage rate applicable to that area.*"

Further, the Act specifies 60 Indian rupees per day per person as the absolute minimum EGS wage in any State.[5] In terms of access, the Act further provides that

> "*As far as possible, employment shall be provided within a radius of 5 kilometres of the village where the applicant resides at the time of applying*"

leaving open to discretion therefore the ease of access facing workers who wish to participate.[6]

A legal employment guarantee may therefore either be (i) a complete contract, which stipulates in full detail both the wage and access components of the act or (ii) an incomplete contract, in which one or more of these components are left open to discretion, and are impossible to fix a priori. Of particular interest, therefore, is how the effectiveness of an EGS in offsetting labor market imperfections and in alleviating poverty may be affected by this inability / impossibility of full commitment. There are thus two related sets of issues. The first concerns the labor market consequences of an EGS in which the EGS wage and access are juxtaposed. The second concerns questions of EGS policy formation and wage setting with and without commitment.

In order to evaluate these issues, we introduce a formal model of an EGS in the context of a canonical model of the labor market in which a host of labor market structures, ranging from monopsonistic, oligopsonistic, and all the way to the perfectly competitive case, can be accommodated. As discussed, an EGS is characterized by the EGS wage, and the accessibility of EGS employment expressed in terms of a cost of job search. Analogously, private employment opportunities are also characterized by a market determined wage rate, and the associated cost of job search. In this setting, (i) aggregate productivity slowdowns, (ii) sector and worker specific costs of job search, and (iii) oligopsonistic

[5] See Subbarao (1997) for a tabulation of the EGS wages applied in various employment programs in developing countries such as Bangladesh, Pakistan, Phillipines, Botswana and Chile.

[6] The Indian National Rural Employment Guarantee Act (NREGA) of 2005 contains additional and discretionary terms that can similarly impact access, including for example the provision of child care services for female workers. Indeed, Bhatty (2006) reports the success of the NREGA from an employment and registration standpoint in Dungarpur, Rajasthan, but simultaneously a lack of child care facilities at NREGA worksites. The report also notes the large scale involvement of female workers, and the cost of this neglect in terms of the condition of children.

market power are each potential contributors to the equilibrium size of the pool of unemployed. This simple framework provides a number of insights into the positive and normative aspects of an EGS.

1. **A double-edged sword**: An EGS embodies a policy mix. On one hand, it introduces contestability in labor hiring, expected to raise employment in imperfectly competitive labor markets. On the other hand, it also raises the reservation wage which reduces private employment in the standard way regardless of labor market structure. All else constant, the relationship between the EGS wage and private employment outcomes is accordingly non-monotonic, for a given level of access. Likewise, the relationship between the accessbility of EGS employment and private employment outcomes is also non-monotonic, for a given EGS wage.

2. **Efficiency at no cost**: Despite the complication that arises with non-monotonicity, a unique EGS wage and access pairing that maximizes private employment can be found. Interestingly, this maximum level of private employment corresponds to the perfectly competitive labor market outcome. Thus, if a perfectly competitive labor market describes reality, an EGS at best leaves unchanged, but otherwise strictly decreases private employment. Moving away from the competitive baseline, however, a private employment increasing EGS can always be found. Indeed, an EGS can *costlessly* replicate the competitive labor market outcome, by exploiting to the fullest extent the contestability faculty of the EGS.

3. **Selection, global and local displacement**: A key issue with workfare schemes concerns selection, and the possibility that those who would otherwise be employed nevertheless find the EGS to be preferable, and are selected out of the private labor market simply because an EGS is put in place.[7] The result is a displacement of workers from private sector employment. Since labor market response is non-monotonic respectively in the EGS wage and the ease of access, depending on whether the contestability effect or the reservation wage effect takes on a dominating role, the question of selection is made up of a local and a global component. Thus, evidence showing that a higher EGS wage (and easier access to the EGS) displaces private employment provides insufficient proof that the EGS would not increase private employment relative to the no government intervention benchmark.

[7]Batty (2006) reports examples of job switching subsequent to the NREGA in India.

4. **Aggregate employment targeting**: At its core, an EGS can be thought of as embodying an aggregate (private plus EGS) employment target. Fine-tuning the EGS wage and access in turn provides an added degree of control and allows the right mix of private and EGS employment to be designed into the scheme, given the target. If efficiency improvement is the primary concern, the EGS wage should be set just *high* enough to induce private employers to face competition from the EGS. In contrast, if employment associated with a perfectly competitive labor market is deemed too low, any EGS that reaches the aggregate employment target can trigger the reservation wage effect. Accordingly, the least private employment displacing EGS in this setting requires the EGS wage to be set as *low* as possible, while the aggregate employment target is reached by relaxing access.

Taken together, these observations shed light on a new dimension of EGS as a labor market policy, and shift its longstanding focus from one which centers on poverty alleviation, to one which also emphasizes efficiency improvement in imperfectly competitive labor markets. This new focus will need to be qualified, however, as we move from what an EGS can accomplish in principle, to scenarios in which the credibility of the policy announcements are in doubt. Two scenarios are taken up in turn, the first involving legislation that fully commits the planner to both the wage and access dimenions of an EGS, while the latter leaves the access component open to ex post discretion, à la Kydland and Prescott (1977) albeit in a different context.

5. **Commitment**: With but one borderline exception, welfare maximization *always* invokes an EGS, regardless of the productivity of public and private employment, and the weight that a government attaches to poverty relative to efficiency. For planners exhibiting no distributional concern, the EGS is set to target aggregate employment to replicate a perfectly competitive labor market, at no cost to the government. Doing so requires a high enough EGS wage to elicit a contestable labor market. For planners who are sufficiently concerned about poverty, the EGS is set to target aggregate employment that exceeds the competitive baseline. Achieving this in the least cost way requires private employment displacement to be minimized. In sharp contrast to the planner concerned only about efficiency, a planner who also cares about distribution needs to adopt an EGS wage that is as close to the poverty line as possible.

6. **Credibility Triggers**: In the face of employers and workers that harbor rational expectation, a government's guarantee of employment will be deemed credible when the

cost to the planner of actually hiring EGS workers is no higher than the perceived benefits of doing so. We find that the credibility of any employment target set out by an EGS can be triggered by three sets of factors. These include labor market triggers such as low labor productivity and oligopsonistic market power; cost triggers such as the revenue (costs) that can be generated from public works, and planners' preference triggers such as a high degree of poverty aversion.[8]

These observations are consistent with many of the historical circumstances under which employment guarantees have been deployed: as a countercylical labor market policy response to economic downturns and disasters, invoked when there are genuine justifications for public works (such as the contruction of the autobahn in post war Germany and the New Deal public works projects), and / or when there is a shift in political power that provides essential support for policy reforms that alleviate poverty.

Even more interestingly, the 1834 Poor Law Amendment Act abolished government grants to supplement low wages, and embarked instead on the prinicple of "less eligibility" in Great Britain. At least in part, this may have been a response to the perceived runaway budget consequences of the 1817 Poor Employment Act, along with the concern that workers who would otherwise find employment in the private sector chose to seek government assistance instead (Blaug 1963, 1964). In contrast, the EGS wage hike in the State of Maharastra in India may have instigated the need to ration EGS employment ex post (Dev 1995, Ravallion, Datt and Chaudhuri 1993, Gaiha 1996). Incidences of EGS job rationing, either when wages or when the demand for work is too high have also been noted for employment programs in Tanzania and Botswana (Subbarao 1997, Teklu 1995). In relation to our findings, these important historical episodes illustrate the possibility of subsequent *surprises* in EGS employment in either direction, whenever the EGS wage is not set with the possibility of ex-post discretion with respect to access in mind.

7. **Choosing an EGS wage:** In our setup, choosing an EGS wage can have real labor market consequences, precisely since it leads employers and workers to the (rational) expectation that access will be limited ex post. This makes the task of setting the EGS wage at the "right" level nontrivial. We have three interesting sets of results, that are in sharp contrast to the almost universal usefulness of an EGS with commitment.

[8]In a companion paper, Basu, Chau and Kanbur (2005) shows that the credibility of a (partially enforced) minimum wage policy, instead of an EGS, is triggered in labor markets where private labor productivity is sufficiently high.

First, if none of the credibility triggers applies, the question of choosing an EGS wage does not even arise since there exists no predetermined EGS wage that can impact private or public labor market outcomes.

At the other extreme, if the credibility triggers are important enough to justify a higher than perfectly competitive level of aggregate employment, the EGS wage should be as close to the poverty line as possble, with access expected to be extended to meet the employment target. In this way, private employment displacement is minimized, and endogenous selection of workers into the pool of EGS laborers, in as much as it is feasible, favors those that face a relatively high cost of job search and are thus otherwise left out of the labor market.

Finally, for credibility triggers that justify intermediate levels of employment between the no government intervention and the perfectly competitive benchmarks, an EGS works purely as an announcement of contestability. Thus, we have an intriguing instance here where the effectiveness of the announcement of EGS in leading to efficiency enhancing change in the labor market now depends critically, among other things, on the distributional concern of the planner in question. In particular, the outcome for a planner who cares only about efficiency could be less efficient than the outcome for a planner who cares about poverty as well.

The rest of the paper is organized as follows. In section 2, the basic model of the labor market is laid out. An EGS is introduced in Section 3, and its impact on private and public sector employment are discussed. Sections 4 - 6 are devoted to workings of an EGS with or without commitment, depending on the kind of objectives that an EGS is expected to accomplish. Section 7 concludes and briefly touches on two useful extensions.

2 The Private Labor Market

There are $N = 1, ..., \infty$ exogenously given number of identical employers and a population of heterogeneous workers with unit mass. For employers, the benefits and costs of labor hiring are characterized respectively by a marginal (and average) value product of labor, $a > 0$, and the wage cost per worker, $w > 0$.

For workers, employment in the private labor market yields a wage benefit w, but at a cost. The cost of job search is given by $tx \geq 0$, and includes a worker-specific component, x and a sector or industry-specific component, t. The worker-specific component parameterizes heterogeneity among workers in terms of their individual access to the private labor market, which can be interpreted as the cost of job search. We assume that the distribution of x among workers is uniform along the $[0, 1]$ range.[9]

The sector or industry-specific job search component, t, gives the informational, locational and / or other skill-related costs required to secure a job from one of the N employers.[10] Employment in the private labor market generates a worker- and sector-specific level of utility $u(x, w) = w - tx$. Every worker supplies inelastically one unit of labor unless otherwise deterred by the cost of job search. Assuming without loss of generality that the reservation utility of every worker is equal to zero, the implied inverse private sector labor supply is given simply by: $w(\ell) \equiv t\ell$, for $\ell \leq 1$.

The N employers engage in non-cooperative competition for laborers: Each employer i maximizes profits $(a - t(\ell_i + \ell_{-i}))\ell_i$ by choice of the desired number of laborers, ℓ_i, taking as given the aggregate labor demand by the rest of the $N - 1$ employers, ℓ_{-i}. Thus, $\ell \equiv \ell_i + \ell_{-i}$. In a symmetric Nash equilibrium ($(N-1)\ell_i = \ell_{-i}$), the marginal value product of labor is equated with the perceived marginal labor cost schedule in the usual way:

$$a = (1 + n)t\ell, \quad n = \frac{1}{N}.$$

Aggregate private labor market outcome is thus a wage and employment pair $\{w_o(n), \ell_o(n)\}$ (Figure 1):

$$\ell_o(n) = \frac{a}{t(1+n)}, \quad w_o(n) = \frac{a}{1+n} < a \tag{1}$$

if $\frac{a}{[t(1+n)]} < 1$. Otherwise, $\ell_o(n) = 1$ and $w_o(n) = t$. As should be expected, these encompass a whole spectrum of labor market outcomes as special cases, ranging from monopsonistic:

$$\ell_o(1) = \frac{a}{2t}, \quad w_o(1) = \frac{a}{2} < a,$$

to perfectly competitive

$$\lim_{n\to 0} \ell_o(n) = \frac{a}{t} \equiv \ell_o(0), \quad \lim_{n\to 0} w_o(n) = a \equiv w_o(0),$$

[9] See Mitra (2006) for example, for evidence of the role of the cost of job search on employment and job mobility in India, and more importantly, the hetergeneity of the cost of job search among workers.

[10] In the sequel, this industry-specific cost of job search (t) will be contrasted with the cost of securing a public sector job made available via the EGS.

if $\frac{a}{t} < 1$, with the equilibrium wage given simply by the marginal value product.

Note that if $\frac{a}{t} < 1$, that is, if the productivity of labor a is low enough and/or the sector-specific cost of job search t is high enough, then regardless of the degree of market power (n), there will be workers for whom search costs are high enough to keep them out of private sector employment. We will refer to these workers as "the unemployed". These are all workers whose utility is at the normalized level of zero – lower than any worker who has employment in the private sector.

3 Employment Guarantees

A principle objective of an EGS is to provide relief to those who are otherwise deterred from joining the workforce because of search costs on the supply side, or a lack of demand due either to low productivity or market power in equilibrium. Let ℓ_g be the number of such EGS workers. The revenue equivalent of the services provided on a per worker basis is denoted as a_g. The revenue parameter a_g can take on positive or negative values depending on whether the gross amount of services provided by the scheme exceeds or is less than the costs of administering the program. We assume that $a_g < a$, in order to rule out findings that by assumption call for the government to effectively nationalize the labor market.

For workers, EGS employment can be characterized by a wage and access pairing, w_g and $t_g \equiv \frac{t}{(1+\tau_g)}$. Both w_g and τ_g (and hence t_g) are policy variables. w_g gives the EGS wage per worker, and $1 + \tau_g \equiv \frac{t}{t_g} > 0$ denotes the relative ease of securing public as opposed to private employment.[11]

For EGS employment to offer relief for those workers who cannot otherwise find private employment, the EGS wage is assumed to be no less than an exogenously given income threshold $\bar{w}_g \geq 0$, that (weakly) exceeds the reservation utility at zero.[12] We assume that $w_o(n) > \bar{w}_g$, and accordingly either EGS or private employment is synonymous with achieving an income level above the exogenous threshold. The determination of $1 + \tau_g > 0$ should be thus thought of as part of the government's decision to provide job information to the pool of otherwise unemployed job seekers, to adjust the physical

[11] We will refer to EGS employment interchangeably with employment secured through the EGS, and private employment interchangeably with employment with one of the N private employers.

[12] The special case of $\bar{w}_g = 0$ thus corresponds to a situation wherein an EGS in fact offers no income relief to any worker.

location of employment openings and / or the skill-requirements associated with EGS employment. In each case, an increase in τ_g improves access and lowers the cost of job search $\frac{tx}{(1+\tau_g)}$.

3.1 Comparative Statics

Let ℓ_e and w_e denote employment and wage in the private sector in the presence of an EGS with given w_g and τ_g. The EGS aims at employing workers who are otherwise excluded from the private labor market. A plausible way to target these workers involves relaxing access to the EGS ($\tau_g > 0$), though possibly at a lower wage.[13] The utility of private and EGS employment are respectively $w_e - tx$ and $w_g - \frac{tx}{(1+\tau_g)}$. There are thus three groups of workers: those who are better off with (i) private employment, (ii) EGS employment, and (iii) remaining outside of the workforce despite an EGS. With $\tau_g > 0$ and $w_g \leq w_e$, the first group is made up of workers with the lowest search costs, since

$$w_e - tx \geq w_g - \frac{tx}{1+\tau_g} \quad \Leftrightarrow \quad x \leq \frac{(w_e - w_g)(1+\tau_g)}{t\tau_g} = \hat{\ell}_e.$$

Workers in the third group are subject to the highest search costs, since

$$w_g - \frac{tx}{1+\tau_g} \leq 0 \quad \Leftrightarrow \quad x \geq \frac{w_g(1+\tau_g)}{t} = \hat{\ell}.$$

In between, the EGS attracts labor supply $\ell_g = \hat{\ell} - \hat{\ell}_e$ if and only if $\hat{\ell} \geq \hat{\ell}_e$, or equivalently $w_g(1+\tau_g) \geq w_e$. Otherwise, the EGS offers too little in terms of wage and access and aggregate labor supply facing the N employers is the same as if an EGS did not exist: $\ell_e(w_e, w_g, \tau_g) = \frac{w_e}{t}$, with $\ell_g(w_e, w_g, \tau_g) = 0$. In sum, the associated (kinked) inverse labor supply schedule facing the N employers is of the form:

$$w_e(\ell, w_g, \tau_g) = \max\{w_g + \frac{\tau_g t\ell}{1+\tau_g},\ t\ell\}. \tag{2}$$

Since, $\max\{w_g + \frac{\tau_g t\ell}{1+\tau_g},\ t\ell\} \geq t\ell$, the establishment of an EGS directly impacts labor supply by raising the minimal wage that the N employers must offer to secure positive employment. Effectively, the EGS raises the reservation wage of any worker contemplating private sector employment by exactly the amount of the EGS wage w_g.

[13] If, in contrast $\tau_g < 0$, so that t_g is strictly greater than t, the EGS must offer a strictly higher wage than the N employers in order to generate positive employment. In addition, the EGS changes place with private employers and ends up hiring low search cost workers who are employed even without an EGS – an implication that does not appear to correspond well with the stated aims of employment guarantee schemes, that direct competition with private employment is to be avoided.

Likewise, an increase in the ease of access to EGS employment, τ_g, also raises the private sector wage, w_e. Indeed, as $\tau_g \to \infty$, the EGS becomes a *true* universal guarantee of employment:

$$w_e(\ell, w_g, \tau_g) = \max\{w_g + t\ell,\ t\ell\} = w_g + t\ell.$$

On the other hand, as $\tau_g \to 0$, accessing EGS employment is just as costly as accessing private employment,

$$w_e(\ell, w_g, \tau_g) = \max\{w_g,\ t\ell\}.$$

The N employers now effectively operate in a perfectly contestable labor market (Baumol 1982), in which labor supply is perfectly elastic at the EGS wage w_g up until $\ell = \frac{w_g}{t}$.

With these two limiting cases in mind, the labor market implications of an EGS for intermediate values of τ_g should naturally be expected to be mixed, wherein the standard employment deterring effect of a reservation wage hike is interacted with the employment enhancing effect of contestability. The question remains as to which one of the two effects dominate, and for what range of parameter values?

Introducing (2) into the employers' profit maximizing problem, the intersection of the marginal labor cost ($\frac{\partial w(\ell_{-i}+\ell_i, w_g, \tau_g)\ell_i}{\partial \ell_i}$) schedule and the marginal value product (a), evaluated at a symmetric equilibrium once again gives the equilibrium private employment and wage levels. This is shown in Figures 2 a and b. As should be apparent, if the EGS wage and access are jointly too low, $w_g(1+\tau_g) < \frac{a}{(1+n)}$, the EGS has no impact on private employment. At the opposite extreme, if $w_g > a$, the EGS completely displaces private employment. Other than these two limit cases, three possible types of nontrivial equilibrium labor market outcomes $\{\ell_e(n, w_g, \tau_g),\ w_e(n, w_g, \tau_g),\ \ell_g(n, w_g, \tau_g)\}$ can be identified relative to no government intervention scenario:[14]

Proposition 1 *I. If $w_g[1 + \tau_g(1 + n)] < a \leq w_g(1 + \tau_g)(1 + n)$, the EGS raises private employment with no equilibrium EGS employment: $\ell_e = \frac{w_g(1+\tau_g)}{t} > \ell_o(n)$ and $\ell_g = 0$. The private sector wage is simply $w_e = w_g(1 + \tau_g)$.*

II. If $w_g(1 + \tau_g) < a \leq w_g[1 + \tau_g(1 + n)]$, the EGS raises private employment and hires a positive number of EGS workers: $\ell_e = \frac{(a-w_g)(1+\tau_g)}{\tau_g t(1+n)} \geq \ell_o(n)$ and $\ell_g = w_g(1 + \tau_g)/t - \ell_e > 0$. The private sector wage is given by $w_e = \frac{a+nw_g}{1+n} \geq w_o(n)$.

[14]The arguments of ℓ_e, ℓ_g and w_e are dropped whenever there is no risk of confusion in what follows.

III. If $w_g \leq a \leq w_g(1+\tau_g)$, the EGS now lowers private employment, and hires a positive number of EGS workers: $\ell_e = \frac{(a-w_g)(1+\tau_g)}{\tau_g t(1+n)} \leq \ell_o(n)$ and $\ell_g = w_g(1+\tau_g)/t - \ell_e > 0$. The private sector wage continues to be $w_e = \frac{a+nw_g}{1+n} \geq w_o(n)$.

In all cases, w_e is higher than the EGS wage, and the no government intervention wage $w_o(n)$.

The private sector wage effect of an EGS should come as little surprise, since the introduction of an EGS effectively shifts the inverse labor supply schedule upwards. What may be somewhat unexpected, however, is that an EGS can either strictly increase (I and II), or decrease private sector employment (III). The increase in private sector employment should be attributed to contestability, wherein employers are in fact induced to pay a higher wage, and employ more workers than when an EGS does not exist. Here, the introduction of the EGS as an additional source of employment effectively erodes the market power embraced by each one of the N employers. With high enough levels of wage and access (III), however, the reservation effect starts to dominate and employers respond by scaling back labor hiring.

While seemingly straightforward, these three employment regimes embody a wide array useful observations. Our discussion in what follows touches upon three sets of comparative statics results, with respect to the EGS wage, access to the EGS, and market power exhibited by employers in the private sector.

3.2 Non-monotonicity, the EGS wage and access

Our first observation concerns non-monotonicity. At given EGS access ($\tau_g > 0$) and market power ($n > 0$), private employment first rises and eventually falls with successively higher levels of w_g. This is shown in Figure 3, in which schedule L_1^e traces the non-monotonic private labor market employment response to the EGS wage, starting from the no government intervention baseline $\ell_o(n) = \frac{a}{[(1+n)t]}$, given $\tau_g > 0$ and $n > 0$. These correspond to a starting phase (I) in which higher levels of w_g promotes contestability and raises $\ell_e = \frac{w_g(1+\tau_g)}{t}$, followed by two subsequent phases (II and III) in which further increases in the EGS wage trigger the reservation wage effect, causing $\ell_e = \frac{(a-w_g)(1+\tau_g)}{\tau_g t(1+n)}$ to bend downwards.

Taking instead the EGS wage and market power as given, a similar non-monotonic relationship between private sector and EGS employment subsequent to improvements

in access to the latter – in which private employment first rises (I) and then falls (II and III) with access – can be shown using Proposition 1.

3.3 Local and Global Employment Effects

With non-monotonicity, a simple demonstration that the marginal impact of an increase in w_g is a reduction in EGS employment, as is the case with types II and III outcomes, provides insufficient proof that the EGS has unambiguously lowered private employment relative to no government intervention. In Figure 4, where $\tau_g > 0$ and $n > 0$ are once again exogenously given, the private employment outcome labeled $\bar{\ell}_e$ can be achieved either by (i) exploiting the contestability effect of an EGS, by setting the EGS wage at $w_{g_1} = \frac{t\bar{\ell}_e}{(1+\tau_g)}$, or (ii) by raising the wage even further so that the reservation wage effect is triggered with $\hat{w}_{g_2} = a - \frac{t\tau_g\bar{\ell}_e(1+n)}{(1+\tau_g)}$. In both cases, the same private employment level which exceeds the no government intervention level, $\ell_o(n)$, is achieved. However, in (ii) a local increase in w_g always reduces private employment.

3.4 Market Power

If the labor market is perfectly competitive to begin with, it can be easily verified that the range of productivity levels in which the EGS raises total employment with no EGS employment collapses to a single point, $w_g(1+\tau_g)$. The range in which an EGS raises total employment by raising both private and EGS employment likewise collapses to the same point $w_g(1+\tau_g)$. As should be expected, where there is no pre-existing labor market distortion to begin with, the introduction of an EGS at most leaves unchanged, when $a \geq w_g(1+\tau_g)$, or otherwise strictly decreases private employment. Moving away from competitive markets, non-monotonicity is inevitable. Figure 3 demonstrates, where L_1^e, L_2^e and L_3^e constitute a family of private employment schedules with successively decreasing values of n, or equivalently successively more competitive labor market structure.

4 The Desirability of an EGS

Given the wide array of possibilities in which an EGS can be adapted to impact private and EGS employment, the nature of an optimally designed EGS will naturally depend on the ultimate end that a scheme is expected to achieve. With employment determined jointly by the extent of market power, private sector productivity and the cost of job search, an EGS may be used as a means to target (i) private sector employment in order to offset market power, or (ii) private and EGS employment combined in order to

lift workers out of poverty. Furthermore, an EGS may also be deployed to maximize a social welfare function in which a planner's concern for (iii) market efficiency and (iv) income distribution are accounted for. We will examine each of these possibilities in turn.

To fulfill any of one of these objectives, we assume that a lump sum tax $T(w_g, \tau_g)$ is raised in order to finance the EGS. The budget requirements of an employment guarantee involves two types of government expenditures. The first involves the wage cost of the scheme, or simply, $w_g \ell_g(n, w_g, \tau_g)$. The second source of expenditure covers the cost required to reduce the cost of job search for each worker, τ_g. Thus,

$$B_e(w_g, \tau_g) = w_g \ell_g(n, w_g, \tau_g) + \int_{\ell_e}^{\ell_g + \ell_e} (t - \frac{t}{1+\tau_g}) x dx. \tag{3}$$

There are a variety of other modeling options here, but as a benchmark, we assume for the moment that the government does not enjoy any particular advantage, as compared to workers, in managing the cost of job search.[15] As a result, the reduction in the total cost of job search due to a reduction in t_g, and the budgetary requirement for doing so is in fact one for one.[16] Government budget balance requires that

$$T(w_g, \tau_g) = B_e(w_g, \tau_g).$$

4.1 Private Employment Targeting

Consider here a planner with an aim to maximize private employment $\ell_e(n, w_g, \tau_g)$, for any given budget $B_e(w_g, \tau_g) \leq \bar{B} (\geq 0)$. Equivalently, the problem of the planner is simply:

$$\max_{w_g, \tau_g} \ell_e(n, w_g, \tau_g), \text{ s.t. } B_e(w_g, \tau_g) \leq \bar{B}, \ w_g \geq \bar{w}_g.$$

An optimal EGS in this context is in fact straightforward. As shown in Figure 3, for every $\tau_g \geq 0$, and $n > 0$, a maximal level of private employment can be reached through

$$\max_{w_g} \ell_e(n, w_g, \tau_g) = \frac{a(1+\tau_g)}{t(1+\tau_g(1+n))} \tag{4}$$

by setting $w_g = a/(1+\tau_g(1+n))$. Now,

$$\max_{\tau_g} \frac{a(1+\tau_g)}{t(1+\tau_g(1+n))} = \frac{a}{t} = \ell_o(0)$$

[15] See Section 6 for an alternative way of incorporating the budget requirement of reducing the cost of job search.

[16] An alternative and equivalent assumption here is that the government provides a transportation cost subsidy to each worker that is equal to $\frac{\tau_g t x}{(1+\tau_g)}$.

by setting $\tau_g = 0$. As such, the promise to guarantee employment alone can replicate the competitive labor market outcome. This is accomplished by an EGS wage and access pairing: $w_g = a$ and $\tau_g = 0$. Here, the EGS elicits the labor market outcome in a perfectly contestable market, in which the government behaves as an otherwise identical employer of *last resort* ($\tau_g = 0$), ready to pay the the competitively determined wage a on demand. In equilibrium, this is accomplished at no cost to the government $B_e(w_g, \tau_g) = 0$.

Two points deserve attention here. First, if the labor market is perfectly competitive to begin with, an EGS can of course never raise employment beyond the no government intervention level (Section 3.4). Second, irrespective of the degree of market power, an EGS can never raise employment beyond the competitive level, for doing so would require employers to pay a wage higher than the productivity of labor, an impossibility if employers are to make non-negative profits.

4.2 Aggregate Employment Targeting

As opposed to maximizing private employment by choice of an appropriate EGS wage and access pairing, another question is how w_g and τ_g might be chosen to achieve an exogenous aggregate employment (EGS plus private employment) target, $\bar{\ell}$, with as much of it achieved via private employment as possible. In other words, the problem of the planner is simply:

$$\max_{w_g, \tau_g} \ell_e(n, w_g, \tau_g), \quad \text{s.t.} \quad \ell_e(n, w_g, \tau_g) + \ell_g(n, w_g, \tau_g) = \bar{\ell}, \quad w_g \geq \bar{w}_g. \tag{5}$$

There are two cases to consider. Suppose first that $\ell_o(n) < \bar{\ell} \leq \ell_o(0)$. Such an employment target can be viewed as primarily efficiency-improving, aimed at delivering a labor market outcome closer to the perfectly competitive level $\ell_o(0)$. By adjusting w_g and τ_g, there exists in fact a continuous schedule of w_g and τ_g pairings that solves the maximization problem above.[17] The most obvious one, which once again invokes contestability, involves setting $\tau_g = 0$ and $w_g = t\bar{\ell}$. Here, the planner similarly behaves as an otherwise identical employer ($\tau_g = 0$), and commits to pay a wage $w_g = t\bar{\ell}$ just enough to expand total employment to $\bar{\ell}$ along the labor supply schedule. This is of course a special case of Proposition 1(I), in which there is no equilibrium EGS employment, and the target $\bar{\ell}$ is fulfilled completely by *expanding* private employment over and above the no government

[17] In particular, any w_g and τ_g that satisfies $w_g(1+\tau_g) = \bar{\ell}$, and belong to employment outcomes type I ($w_g[1 + \tau_g(1+n)] < a \leq w_g(1+\tau_g)(1+n)$, so that the employment target is fulfilled completely by prviate employment ($w_g(1+\tau_g) = t\ell_e(n, w_g, \tau_g) = t\bar{\ell}$) will do the task.

intervention level.[18]

The more interesting case, of course, involves an employment target higher than the competitive level $\bar{\ell} > \ell_o(0)$. To this end, note that for at least $\bar{\ell}$ number of workers to be hired in the aggregate, it must be the case that $w_g - \frac{t\bar{\ell}}{1+\tau_g} \geq 0 \Leftrightarrow w_g(1+\tau_g) - t\bar{\ell} \geq 0$. Denote

$$\bar{w} \equiv w_g(1+\tau_g) \equiv t\bar{\ell} \tag{6}$$

as the wage equivalent of the EGS aggregate employment target. Intuitively, this is the wage that an EGS must offer in order for $\bar{\ell}$ workers to be employed jointly by the private sector and the EGS, if access were to remain at the level of the private sector $\tau_g = 0$. With this definition, an EGS that generates more than the competitive level of employment in the aggregate must also provide a wage equivalent $w_g(1+\tau_g) = \bar{w}$ that exceeds the competitive wage, since

$$t\bar{\ell} > t\ell_o(0) \Leftrightarrow \bar{w} > t\frac{a}{t} = a.$$

As may be expected, an EGS that offers a wage equivalent higher than the competitive wage, or the marginal value product of labor, can adversely impact private employment. In fact, a more precise statement can be had by simply applying the definition of the employment target $\bar{\ell} = \frac{w_g(1+\tau_g)}{t}$ to Proposition 1:

Proposition 2 *I. If $\ell_o(n) \leq \bar{\ell} < \ell_o(0)/(1+n\tau_g/(1+\tau_g))$, an EGS raises private employment with no equilibrium EGS employment: $\ell_e = \bar{\ell} > \ell_o(n)$ and $\ell_g = 0$. The private sector wage is simply the EGS wage equivalent $w_e = \bar{w}$.*

II. If $\ell_o(0)/(1+n\tau_g/(1+\tau_g)) \leq \bar{\ell} < \ell_o(0)$, an EGS raises private employment and hires a positive number of EGS workers: $\ell_e = \frac{(a-w_g)\bar{\ell}}{(t\bar{\ell}-w_g)(1+n)} \geq \ell_o(n)$ and $\ell_g = \bar{\ell} - \ell_e > 0$. The private sector wage is given by $w_e = \frac{a+nw_g}{1+n} \geq w_o(n)$.

III. If $\ell_o(0) \leq \bar{\ell} < \ell_o(0)(1+\tau_g)$, an EGS now lowers private employment, and hires a positive number of EGS workers: $\ell_e = \frac{(a-w_g)\bar{\ell}}{(t\bar{\ell}-w_g)(1+n)} \geq \ell_o(n)$ and $\ell_g = \bar{\ell} - \ell_e > 0$. The private sector wage continues to be $w_e = \frac{a+nw_g}{1+n} \geq w_o(n)$.

This provides an exact demarcation, and shows that the reservation wage (private employment reducing) effect of an EGS takes on a dominating role whenever the EGS

[18] To see this, note that with $\tau_g = 0$ and $w_g = t\bar{\ell}$, the relevant range of Type I employment can be simplified as $t\bar{\ell} < a \leq t\bar{\ell}(1+n)$. By definition of $\ell_o(n)$ and $\ell_o(0)$, this corresponds exactly with the feasible range of aggregate employment target $\ell_o(n) < \bar{\ell} \leq \ell_o(0)$ under consideration here.

aggregate employment target exceeds the competitive employment level (III). Interestingly, Proposition 2 shows that such an EGS necessarily leads to a reduction in private sector employment. Thus, the double-edged EGS in fact comes with a built-in constraint – an EGS that raises total employment beyond the competitive level can never simultaneously raise private employment beyond the no government intervention level.

Also by virtue of Proposition 2(III), observe that given $\ell_o(0) < \bar{\ell}$, EGS employment $\bar{\ell} - \ell_e$ strictly rises with the EGS wage. In other words, in order to minimize EGS employment (displacement of private employment) given the target $\bar{\ell}$, w_g should be set as low as possible. Implicitly, this requires that access τ_g be accordingly relaxed in order to sustain the same aggregate employment target, $\bar{\ell} = w_g(1+\tau_g)$. In sum, the EGS wage and access pairing $\{w_g^*(n,\bar{\ell}), \tau_g^*(n,\bar{\ell})\}$ that minimizes private employment displacement depends critically on the size of the employment target $\bar{\ell}$:

Proposition 3 *For aggregate employment targets satisfying $\ell_o(n) < \bar{\ell} \leq \ell_o(0)$, private employment can be maximzed to match $\bar{\ell}$ exactly with $w_g^*(n,\bar{\ell}) = t\bar{\ell}$, and $1 + \tau_g^*(n,\bar{\ell}) = 1$. The associated EGS employment is equal to zero.*

For aggregate employment targets satisfying $\bar{\ell} > \ell_o(0)$, $w_g^*(n,\bar{\ell}) = \bar{w}_g$, and $1 + \tau_g^*(n,\bar{\ell}) = \frac{t\bar{\ell}}{\bar{w}_g}$. The associated private employment is no greater than the no government intervention level.

There is thus a tight link between the ultimate objective of the EGS employment target and the EGS wage depending on whether the objective is to improve efficiency ($\ell_o(n) < \bar{\ell} \leq \ell_o(0)$), or to combat poverty left unchecked by market forces ($\bar{\ell} > \ell_o(0)$). Interestingly, the relationship between such an EGS wage and the employment target is discontinuous – to be set sufficiently high to elicit contestability if efficiency improvement is the only objective of the EGS, or as low as possible if unemployment associated with perfect competition is deemed too high. In both cases, access is adjusted accordingly to meet the target. What remains to be determined, therefore, is the important question of the optimal choice of employment target.

5 Efficiency, Contestability and Credibility

We now turn to a more general social welfare function, $W(w_g, \tau_g)$, made up of two parts. The first part comprises of the sum of the (i) profits of the N employers ($(a - w_e)\ell_e$), (ii) revenue generated from the EGS ($a_g\ell_g$) and (iii) utility of all workers ($\int_0^{\ell_e}(w_e - tx)dx + \int_{\ell_e}^{\ell_e+\ell_g}(w_g - \frac{tx}{(1+\tau_g)})dx$). The second part is a lump sum tax $T(w_g, \tau_g)$, raised in order to

finance the EGS (Section 4).

The social welfare function is thus

$$W(w_g, \tau_g) \;=\; (a - w_e)\ell_e + a_g\ell_g + \int_0^{\ell_e}(w_e - tx)dx + \int_{\ell_e}^{\ell_e+\ell_g}(w_g - \frac{tx}{1+\tau_g})dx - T(w_g, \tau_g).$$

By definition of the government budget constraint $T(w_g, \tau_g) = B_e(w_g, \tau_g)$ and substituting for $B_e(w_g, \tau_g)$ from equation (4), the social welfare function above simplifies to

$$\begin{aligned} W(w_g, \tau_g) &= a\ell_e + a_g\ell_g - \frac{t}{2}\left(\ell_e + \ell_g\right)^2 \\ &= [(a - a_g)\ell_e] + \left[a_g - \frac{t\bar{\ell}}{2}\right]\bar{\ell}. \end{aligned} \tag{7}$$

The first term in square brackets spells out the welfare cost associated with the displacement of private employment, as $a > a_g$. The second term in square bracket shows the average net welfare gains associated with expanding employment in the economy. Here, the revenue equivalent of EGS employment a_g, and the cost of job search of each employed workers determine the extent of this potential gain in welfare. A change of variables yield $W(w_g, \tau_g)$ in terms only of the employment target $\bar{\ell}$ and w_g:

$$W(w_g, t\bar{\ell}/w_g - 1) = [(a - a_g)\ell_e(n, w_g, t\bar{\ell}/w_g - 1)] + \left[a_g - \frac{t\bar{\ell}}{2}\right]\bar{\ell}.$$

Evidently, the task of social welfare maximization reduces down to simply the choice of an employment target $\bar{\ell}$, and simultaneously an EGS wage that maximizes private employment, conditional on the target – an exercise that has already been examined in section 4. What the planner's problem here additionally illuminates, as should be evident, is the question of how high the employment target should be.

5.1 Commiting to a Complete Contract

Consider an employment guarantee legislation in which a planner commits to a wage and access pairing, w_g^c and τ_g^c, to maximize the social welfare function $W(w_g, \tau_g)$. Denote $\bar{\ell}^c = w_g^c(1 + \tau_g^c)/t$ as the associated employment target. From (7), and the definition of the EGS employment minimizing wage and access pairing $w_g^*(n, \bar{\ell})$ and $\tau_g^*(n, \bar{\ell})$, it is clear that

$$W(w_g, \tau_g) \leq W(w_g^*(n, \bar{\ell}), \tau_g^*(n, \bar{\ell}))$$

since $a_g - a < 0$. In addition, whenever $\bar{\ell}$ is less than the competitive employment level ($\ell_o(0) = a/t$), social welfare is monotonically increasing in $\bar{\ell}$, since $\ell_g(n, w_g^*(n, \bar{\ell}), \tau_g^*(n, \bar{\ell})) =$

0, with $w_g^*(n, \bar{\ell}) = t\bar{\ell}$ and $\tau_g^*(n, \bar{\ell}) = 0$ (Proposition 3). As soon as $\bar{\ell}$ exceeds $\ell_o(0)$, however, $W(w_g^*(n, \bar{\ell}), \tau_g^*(n, \bar{\ell}))$ is monotonically decreasing in $\bar{\ell}$ since EGS employment strictly rises with the aggregate employment target (Proposition 2). We have

Proposition 4 *For a planner that exercises commitment to both w_g and τ_g, social welfare is maximzed by setting the aggregate employment target at the competitive level $\ell_o(0)(= a/t)$. In addition, $w_g^c = a$, and $1 + \tau_g^c = 1$, and the target $\bar{\ell}^c$ is fully met by expanding private sector employment.*

Proposition 4 shows that the optimal EGS wage is invariant across a wide variety of parameter values of a_g and market power. In particular, so long as the gap between private and EGS productivity is positive, the optimal EGS wage is to be set high enough to elicit contestability in the labor market.

In addition, a strictly social welfare improving EGS can always be found so long as the labor market is imperfectly competitive. Indeed, even if the revenue derived from generating EGS employment is strictly negative ($a_g < 0$), the proposition still calls for the government to invoke to the fullest extent possible the contestability component of the EGS.

Finally, since the planner's objective espouses only efficiency concerns, there is simply no reason why the aggregate employment target should exceed the competitive level, as long as the EGS wage is optimally set. Equivalently, in no case should the government institute an EGS that hires strictly positive number of EGS workers in equilbrium, for the competitive labor market outcome can always be replicated, at no cost to the government.

These findings are provocative particularly since they imply that whenever employers enjoy market power, an EGS can be an extremely cost effective way of raising employment, regardless of the productivity of private and EGS employment. At least at first sight, one can accordingly infer that even in labor markets of the highly skilled, government provision of EGS has an important role to play. This may seem counter-intuitive, and run contrary to the historical circumstances under which an EGS has been invoked in times of massive unemployment and adverse productivity shocks.

In what follows, we accordingly contrast what a complete employment guarantee contract can do in principle as shown above, with what an incomplete contract can hope to accomplish more realistically. We do so by relaxing the assumption that the contract

pins down both w_g and τ_g ex ante, and by examining a set of credibility triggers that ultimately justifies the use of an EGS.

5.2 Discretion and Incomplete Contracts

We assume that from announcement to execution of the EGS, the following sequence of events unfolds:

- the government announces a wage w_g^d to be paid to workers employed under the EGS,
- employers and workers form expectations $E\bar{\ell}$ about the ex post EGS aggregate employment target of the planner, and the corresponding ease of access to the EGS, $E\tau_g$,
- conditional on $E\bar{\ell}$ and $E\tau_g$ private employment contracts are signed for $E\ell_e = \ell_e(n, w_g^d, E\tau_g)$ number of workers,
- having observed $E\ell_e$, the government adjusts the ex post target $\bar{\ell}^d$ and access τ_g^d. By doing so, the government implicitly rations / encourages access to EGS employment, available to any worker at wage w_g^d.

We assume in addition that workers and employers harbor rational expectations. In contrast to the case with commitment, the government in this case is faced with the task of setting an EGS wage $w_g^d \geq \bar{w}_g$, with the full knowledge that private employers and workers can take this wage as a signal of the ex-post accessibility of the EGS.

Beginning with the final stage of the sequence. Let private employment $E\ell_e$ conditional on expectation $E\tau_g$ be given. An ex post social welfare maximizing aggregate employment target $\bar{\ell}^d$ can be achieved by relaxing access $\tau_g^d(w_g^d, \bar{\ell}^d)$ to ensure that the marginal worker $x = \bar{\ell}^d$ is just indifferent between employment as an EGS worker, and receiving his reservation utility:

$$w_g^d - \frac{t\bar{\ell}^d}{1 + \tau_g^d(w_g^d, \bar{\ell}^d)} = 0, \quad \text{or} \quad 1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{t\bar{\ell}^d}{w_g^d}, \tag{8}$$

given the announced EGS wage. Note that τ_g^d is to be distinguished from $E\tau_g$ in that the former is the accessibility of EGS employment, to be chosen by the government conditional on the expectation $E\tau_g$, and the announced EGS wage w_g^d. Put another way, ex post discretionary limits on access (decreasing τ_g^d) works as a rationing device, and

puts checks on total employment $\bar{\ell}^d$. The corresponding level of EGS employment is thus $\ell_g^d = \max\{\bar{\ell}^d - E\ell_e, 0\}$. We are now in a position to examine the planner's ex post problem, in which an ex post employment target $\bar{\ell}^d$ is chosen to maximize the social welfare function (7), taking $E\ell_e$ as given:

$$\max_{\bar{\ell}^d}(a - a_g)E\ell_e + (a_g - \frac{t\bar{\ell}^d}{2})\bar{\ell}^d. \tag{9}$$

Since $E\ell_e$ is ex-ante given, ex post social welfare maximization no longer needs to internalize any private sector employment impact of the EGS. Hence:

Proposition 5 *Given $w_g^d \geq \bar{w}_g$ and $E\ell_e \geq 0$, ex post welfare maximization implies:*

$$\bar{\ell}^d = \frac{a_g}{t}, \;\; \ell_g^d = \max\{\frac{a_g}{t} - E\ell_e, 0\},$$

where ex post EGS employment is increasing in a_g and decreasing in $E\ell_e$. The implied ex post welfare maximizing access to EGS employment $\tau_g^d(w_g^d, \bar{\ell}^d)$ is strictly decreasing in w_g^d, with

$$1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{a_g}{w_g^d}. \tag{10}$$

Intuitively, once employment contracts are signed and total private employment given, the government weighs the marginal benefits a_g of EGS employment relative to the marginal cost $t\bar{\ell}^d$. Ex post accessibility is thus increasing in the productivity of EGS employment a_g. Meanwhile, since the pool of available EGS workers $(w_g^d(1+\tau_g^d)/t - E\ell_e)$ is higher the higher the wage w_g^d (equation (8)), ex post accessibility is inversely related to the wage w_g^d set forth ex-ante.

As shown in section Proposition 2, an EGS produces non-trivial labor market consequences only if the aggregate employment target $\bar{\ell}^d$ is greater than the no government intervention level, $\ell_o(n) = \frac{a}{(1+n)t}$. We now know from Proposition 5 that this requires in effect

$$a_g > \frac{a}{1+n}. \tag{11}$$

Thus, two sets of factors are simultaneously in play in determining the credibility of an EGS. These *credibility triggers* include labor market triggers such as low labor productivity and oligopsonistic market power; and cost triggers such as the revenue (costs) that can be generated from public works. With discretion, the ex post optimal aggregate employment target a_g/t can never be greater than the competitive employment level a/t, whenever $a_g < a$. Furthermore, if a_g is additionally lower than $a/(1+n)$, the aggregate

employment target that applies in a rational expectation equilibrium is so low that an EGS completely loses its ability to impact both private and EGS employment levels ex post.

5.3 Getting the Wage Right

Our next task concerns the government's choice of a wage level w_g^d, which maximizes government welfare in the face of rational expectations. The answer, as it turns out, is surprisingly simple. Since the ex-post optimal aggregate employment target $\bar{\ell}^d$ is given by a_g/t, employers and workers rationally expect that

$$E\bar{\ell} = \frac{a_g}{t}, \quad 1 + E\tau_g = 1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{t\bar{\ell}^d}{w_g^d}. \tag{12}$$

Making use of (7) again, the planner's ex-ante problem is

$$\max_{w_g^d}[(a - a_g)\ell_e(n, w_g^d, \tau_g^d(w_g^d, \bar{\ell}^d)] + \left[a_g - \frac{t\bar{\ell}^d}{2}\right]\bar{\ell}^d, \;\; w_g^d \geq \bar{w}_g.$$

Equivalently, the task involves once again the maximization of private employment ℓ_e, given the ex-post optimal aggregate employment target $\bar{\ell}^d = a_g/t$, and rational expectations of employers and workers in (12). By direct application of Propositions 2 and 3, we have

Proposition 6 *With ex post discretion on access, there are two cases:*

I. If $a_g < \frac{a}{(1+n)}$, the optimal EGS wage is indeterminate, as the ex post optimal employment target is strictly less than the no government intervention level. The announcement of any w_g^d invokes a corresponding adjustment in expectations which determines private employment at the no government intervention level $\ell_o(n) = \frac{a}{[t(1+n)]}$. In equilibrium, $\ell_g = 0$.

II. If $a_g \in [\frac{a}{(1+n)}, a)$, the ex post optimal employment target lies between the no government intervention and the perfectly competitive employment levels. The announcement of an EGS wage $w_g^d = a_g$ maximizes social welfare by invoking rational expectations, $1 + E\tau_g = 1$. In equilibrium, private employment coincides with the employment target $\bar{\ell}^d = \frac{a_g}{t}$, and $\ell_g = 0$.

Proposition 6 highlights the importance of the productivity of public workers and market power in the design of a social welfare maximizing EGS when access cannot be committed to ex-ante. First, for public works that are sufficiently unproductive, $a_g < \frac{a}{(1+n)}$,

the annoucement of any EGS wage inevitably lacks credibility. In a rational expectation equilibrium, private employment and wage levels are unaffected, and the universal applicability of an EGS in raising private employment levels as shown in Proposition 5 is completely lost.

With respect to market power, note that if perfect competition prevails and $n = 0$, there is no case for an EGS since the range $[\frac{a}{(1+n)}, a)$ reduces to a single point $a > a_g$. Thus, we have yet to uncover a single instance wherein a social welfare maximizing EGS hires a strictly positive number of EGS workers. We turn to this question in the next section.

6 Distributional Concern

Much of the focus in the literature on employment guarantees has to do with income distribution concerns within a competitive labor market framework, and with credible policy commitment. The basic framework is one where a competitive labor market nevertheless leaves some individuals at low levels of income both inside and outside the labor market. The introduction of an employment guarantee scheme under the assumption that government announcements on the parameters (wage and access) are credible, is now justified in terms of raising the income of those who are currently below a poverty line. In what follows, we add distributional concerns to the efficiency considerations embodied in the social welfare function discussed in the previous section, in a setting where credibility is also an issue.

We adopt a very simple formulation of distributional concern – the government cares about the number of workers whose income is below the exogenously given poverty line w_p. Thus, the EGS income thresshold $\bar{w}_g$ is now set at the poverty line w_p. The weight given to this concern relative to efficiency is γ:

$$\begin{aligned}\Omega(w_g, \tau_g) &= (a - w_e)\ell_e + a_g\ell_g + \int_0^{\ell_e}(w_e - tx)dx + \int_{\ell_e}^{\ell_e+\ell_g}(w_g - \frac{tx}{1+\tau_g})dx - T(w_g, \tau_g) \\ &\quad -\gamma H\end{aligned}$$

where H is simply the poverty headcount ratio (Foster, Greer and Thorbecke 1984) or the percentage of workers below a poverty line, w_p. Thus, $H = 1 - \ell_e - \ell_g$. Making use of the government budget constraint, $\Omega(w_g, \tau_g)$, the social welfare function above once again simplifies to

$$\Omega(w_g, \tau_g) = [(a - a_g)\ell_e] + \left[a_g + \gamma - \frac{t\bar{\ell}}{2}\right]\bar{\ell} - \gamma.$$

The first term in square brackets as before spells out the welfare cost associated with the displacement of private employment, as $a > a_g$. The second term in square bracket incorporates the government's distributional concern γ as an additional source of social welfare gains upon an expansion of employment. With this social welfare function, it can be shown by simple extension of the arguments in Section 5.1, that with full commitment:

Proposition 7 *For a planner that exercises commitment to both w_g and τ_g, and a social welfare function augmented with distributional concern, there exists a critical level γ^c, with*

$$\gamma^c > (a - a_g)\left(1 + \frac{w_p}{(a - w_p)(1+n)}\right) > a - a_g \Leftrightarrow a_g + \hat{\gamma}^c > a$$

such that if and only if $\gamma \leq \gamma^c$, the aggregate employment target is set at the competitive level $\ell_o(0)(= a/t)$, with no equilibrium EGS employment: $\bar{\ell}^c = \ell_o(0)$, $w_g^c = a$, and $1 + \tau_g^c = 1$. Otheriwise, with $\gamma > \gamma^c$, employment target $\bar{\ell}^c$ exceeds the perfectly competitively baseline, and implicitly solves:

$$\bar{\ell}^c = \frac{a_g + \gamma}{t} - \frac{(a - a_g)(a - w_p)w_p}{(t\bar{\ell}^c - w_p)^2(1+n)} > \ell_o(0).$$

In addition, $w_g^c = w_p$, and $1 + \tau_g^c = t(\bar{\ell}^c / w_p)$. There is strictly positive EGS employment, and private employment is strictly less than the no government intervention baseline $\ell_o(n)$.

Proof: Appendix.

The second part of the proposition shows that productive EGS employment and distributional concern go hand in hand in determining the welfare maximizing wage and accessibility of EGS employment. In order to justify strictly positive EGS employment in equilibrium, and hence at least some displacement of private sector workers, it must be the case that $a_g + \gamma$ strictly exceeds the productivity of private employment a. However, in order to accommodate such a high aggregate employment target, displacement of private employment is inevitable (Proposition 2).

In addition, with the discretion and incomplete contracts framework of Section 6, it can be shown that:

Proposition 8 *Given $w_g^d \geq w_p$ and $E\ell_e \geq 0$, ex post maximization of the social welfare function augmented with distribution concern implies an aggregate employment target and an EGS employment level:*

$$\bar{\ell}^d = \frac{a_g + \gamma}{t}, \quad \ell_g^d = \max\{\frac{a_g + \gamma}{t} - E\ell_e, 0\},$$

where actual EGS employment is increasing in a_g and decreasing in $E\ell_e$. The implied ex post welfare maximizing access to EGS employment $\tau_g^d(w_g^d, \bar{\ell}^d)$ is strictly decreasing in w_g^d, with

$$1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{a_g + \gamma}{w_g^d}. \tag{13}$$

For a planner exhibiting distributional concern, the marginal benefits of EGS employment ex post should be revised to read $a_g + \gamma$. Ex post accessibility is thus increasing the weight attached to distributional concern γ. Since an EGS produces non-trivial labor market consequences only if the aggregate employment target $\bar{\ell}^d$ is greater than the no government intervention benchmark, we require

$$a_g + \gamma > \frac{a}{1+n}. \tag{14}$$

In other words, the weight attached to distributional concern now serves as an additional credibility trigger. Even more importantly, since the ex-post optimal aggregate employment target is no less than $\frac{(a_g+\gamma)}{t}$ as shown in the proposition, a planner who cares sufficiently about distribution may well credibly apply an ex-post employment target that strictly exceeds the competitive employment level. Indeed,

Proposition 9 *With ex post discretion on access, and a social welfare function augmented with a concern for distribution, there are three cases:*

I. If $a_g + \gamma < \frac{a}{(1+n)}$, the optimal EGS wage is indeterminate, as the ex post optimal employment target is strictly less than the no government intervention level. The announcement of any w_g^d invokes a corresponding adjustment in expectations, which then jointly implies private employment at the no government intervention level $\ell_o(n) = a/[t(1+n)]$. In equilibrium, $\ell_g = 0$.

II. If $a_g + \gamma > a$, the ex post optimal employment target exceeds the perfectly competitive level, $\bar{\ell}^d = \frac{a_g+\gamma}{t} > \ell_o(0) = a/t$. To minimize private sector employment displacement / EGS employment, the optimal EGS wage should be set at the poverty line. In equilibrium, access is adjusted to accommodate $\ell_g > 0$ and $\ell_e < \ell_o(n)$.

III. If $a_g + \gamma \in [\frac{a}{(1+n)}, a)$, the ex post optimal employment target lies between the no government intervention and the perfectly competitive employment levels. The announcement of an EGS wage $w_g^d = a_g + \gamma$ maximizes social welfare, by invoking the rational expectation $1 + E\tau_g = 1$, and an ex post aggregate employment target $\frac{(a_g+\gamma)}{t}$ greater than $\ell_o(n) = \frac{a}{[t(1+n)]}$. In equilibrium, $\ell_g = 0$.

Figure 4 summarizes these results in $\{a, a_g + \gamma\}$ space, and emphasizes the intricate balance between the (i) welfare maximizing EGS wage, (ii) private and public sector labor productivity, (iii) the degree of imperfect competition in the labor market, and (iv) weight attached to distributional concern. For credibility triggers that justify intermediate levels of aggregate employment targeting between the no government intervention and the perfectly competitive baselines, an EGS works purely as an announcement of contestability. Thus, we have an intriguing instance here where the effectiveness of the announcement of EGS in effecting efficiency enhancing change in the labor market now depends critically on the distributional concern of the planner in question. Of course, the relevance of this announcement effect depends on whether the labor market is imperfectly competitive to begin with (equivalently, if the range $[a/(1+n), a]$ is nonempty).

Comparing an EGS with commitment (Proposition 7) and an EGS with discretion (Proposition 9), two points are evident. For planners exhibiting relatively low levels of concern for distribution, the cost of policy discretion comes in the form of an inability to elicit efficiency improving labor market reforms. In particular, the credibility of an EGS to improve efficiency is now questionable in labor markets with high private sector productivity (if the inequality $a_g + \gamma > a/(1+n)$ if violated).

At the opposite extreme, for planners exhibiting relatively high levels of distributional concern, the cost of policy discretion now comes in the form of an inability to design a wage and access combination into an EGS that displaces private sector employment the least. Thus, for given private sector productivity, a higher degree of poverty aversion also entails a higher level of private employment displacement. For example, for γ in the range $(a - a_g, \gamma^c)$, an EGS with commitment can only be justified on the grounds of efficiency improvement (Proposition 7), and should never lead to displacement of private employment. With ex-post discretion, however, the same planner sets the EGS wage at the poverty line, implying strictly positive displacement of private employment (Proposition 9).

7 Concluding Remarks and Extensions

This paper has taken the first step towards understanding the labor market implications of an EGS, and the role of employment policy legislations when the ex-post credibility of an EGS may be in doubt. While we have shown that the effectiveness of an EGS depends critically on the feasibility of commitment, and whether the credibility triggers

apply in the case of discretion, there remains a host of other important factors that warrants future research. Here, we briefly touch upon two simple extensions of the basic model.

7.1 Managing the Cost of Job Search:

We have so far assumed a neutral scenario wherein the government enjoys no particular advantage over workers in managing the cost of job search. In a variety of useful contexts, the government may well be in a better position to overcome the costs associated with job search and employment. Examples of such potential cost savings include the provision of child care for female workers, as well as job training and skill upgrading to be provided publicly as a part of the EGS. Of course, the converse may just as well be true, if, for example, the marginal cost of public finance is large enough. Each of these possibilities impacts the ex post budget cost of an EGS. Let λ_g be the marginal cost of public funds, and λ_t denote any advantages that the government enjoys in lowering the cost of job search and employment. The budget requirement of the EGS is thus:

$$B_e(n, w_g, \tau_g) = (1 + \lambda_g) w_g \ell_g(n, w_g, \tau_g) + (1 + \lambda_g - \lambda_t) \int_{\ell_e}^{\ell_g + \ell_e} (t - \frac{t}{1 + \tau_g}) x dx.$$

Incorporating this into the government's welfare function at once yields an additional set of useful findings. For example, if $\lambda_g < \lambda_t$ and the marginal cost of public funds is not too high, it can be readily shown an ex post welfare optimal employment target is all the more likely to exceed the no government intervention private employment benchmark. Of course, a sufficiently high marginal cost of public funds λ_g has the exactly opposite effect, and serves only to offset the credibility of an employment guarantee, however much a government may embrace distributional concern.

7.2 More General Loss Functions

In place of the poverty head count, suppose instead that the loss function is distributionally sensitive. In particular, let the loss function be given by

$$\gamma \left((1 - \frac{w_g}{w_p}) \ell_g + (1 - \ell_e - \ell_g) \right)$$

where w_p is the predetermined poverty line. This is a special case of the Foster, Greer and Thorbecke family of poverty measures, and privately employed workers are assumed to enjoy wage income greater than the poverty line. With this single deviation from our

basic model, it can be verified that the ex post welfare maximizing and discretionary τ_g, is once again systematically related to the ex ante legislated EGS wage, with

$$\bar{\ell^d} = \frac{a_g}{t} + \gamma\frac{w_g^d}{tw_p}, \;\; \ell_g^d = \max\{\frac{a_g}{t} + \gamma\frac{w_g^d}{tw_p} - E\ell_e, 0\} \;\text{ and }\; 1 + \tau_g^d(w_g^d, \bar{\ell^d}) = \frac{t\bar{\ell^d}}{w_g^d},$$

where $a_g + \frac{\gamma w_g^d}{tw_p}$ replaces $a_g + \gamma$ in Proposition 8, and represents the ex-post marginal welfare gains of hiring one more worker under the EGS. By inspection, an exogenous increase in the EGS wage once again leads to the expectation that access $\tau_g^d(w_g^d, \bar{\ell^d})$ will be limited ex post. Incorporating this revised welfare loss associated with poverty aversion into the government welfare function,[19] it is easy to see that setting the EGS wage at less than the poverty line only strengthens the adverse welfare impact of private employment displacement, as the marginal poverty impact of raising private employment is strictly greater than raising EGS employment, or $\gamma > \frac{\gamma w_g^d}{w_p}$. While beyond the scope of this paper, the exact manner in which distributionally sensitive loss functions may be expected to impact the labor market influence of an EGS an important question that warrants further attention.

[19]Government welfare now reads:

$$\Omega(w_g, \tau_g) \;\; = \;\; [(a - a_g + \gamma(1 - \frac{w_g}{w_p}))\ell_e + \left[a_g + \gamma\frac{w_g}{w_p} - \frac{t\bar{\ell}}{2}\right]\bar{\ell} - \gamma.$$

whenever w_g is less than the poverty line, or whenever $1 > \frac{w_g}{w_p}$. By inspection, the marginal welfare impact of a reduction in ℓ_e $((a - a_g + \gamma(1 - \frac{w_g}{w_p}))$ is strictly larger than when a poverty head count is employed $(a - a_g)$.

Appendix

Proof of Proposition 7: We begin with two observations: the government objective function (i) is piece-wise continuously differentiable in $\bar{\ell}$ and (ii) exhibits a discrete jump exactly at $\bar{\ell} = \ell_o(0) = a/t$, the competitive baseline. To complete the proof, we show that for an employment target greater than the competitive baseline to be a global maximum, the poverty aversion parameter γ must be sufficiently larger than γ^c as displayed in the Proposition.

For (i), we note from Proposition 2 that three cases can be identified. For $\bar{\ell} < \ell_o(n)$, the no government intervention baseline, an EGS has no impact on welfare as private employment is unaffected and no worker opts for EGS employment. Thus,

$$\Omega(w_g, \tau_g)|_{1+\tau_g = t\bar{\ell}/w_g} = \bar{\Omega}_o = (a + \gamma - a/2(1+n))a/(t(1+n)).$$

For $\bar{\ell} \in [\ell_o(n), \ell_o(0)]$, $\ell_e(n, w_g, (t\bar{\ell}/w_g) - 1) \leq \ell_e(n, w_g^*(\bar{\ell}), \tau_g^*(\bar{\ell})) = \bar{\ell}$. It follows that for $\bar{\ell} \leq \ell_o(0)$,

$$\begin{aligned}
\Omega(w_g, \tau_g)|_{1+\tau_g = t\bar{\ell}/w_g} &= [(a - a_g)\ell_e(n, w_g, t\bar{\ell}/w_g - 1)] + \left[a_g + \gamma - \frac{t\bar{\ell}}{2}\right]\bar{\ell} - \gamma \\
&\leq \Omega(w_g^*(n, \bar{\ell}), \tau_g^*(n, \bar{\ell})) \\
&= (a + \gamma - \frac{t\bar{\ell}}{2})\bar{\ell} - \gamma \equiv \bar{\Omega}_1(\bar{\ell}).
\end{aligned}$$

Thus, government welfare is increasing (strictly increasing) in $\bar{\ell}$ for $\ell < a/t$, and $\gamma \geq (>)0$. In addition, $\max_{\bar{\ell}} \bar{\Omega}_1(\bar{\ell}) = (a/2 + \gamma)a/t - \gamma$ by setting the employment target $\bar{\ell}_1^c = a/t$ at the competitive level. For $\bar{\ell} > \ell_o(0)$, $w_g^*(\bar{\ell}) = w_p$. Thus, $\ell_e(n, w_g, t\bar{\ell}) \leq \ell_e(n, w_g^*(\bar{\ell}), \tau_g^*(\bar{\ell})) = (a - w_p)(\bar{\ell})/[(t\bar{\ell} - w_p)(1+n)] < \bar{\ell}$. It follows that,

$$\begin{aligned}
\Omega(w_g, \tau_g)|_{1+\tau_g = t\bar{\ell}/w_g} &\leq \Omega(w_p, \tau_g)|_{1+\tau_g = t\bar{\ell}/w_p} \\
&= \frac{(a - a_g)(a - w_p)\bar{\ell}}{(t\bar{\ell} - w_p)(1+n)} + (a_g + \gamma - \frac{t\bar{\ell}}{2})\bar{\ell} - \gamma \equiv \bar{\Omega}_2(\bar{\ell}).
\end{aligned}$$

It can be readily verified that $\bar{\Omega}_2(\bar{\ell})$ is strictly concave in $\bar{\ell}$ for $\bar{\ell} > a/t$. Part (ii) of our argument now follows straightforwardly, since

$$\begin{aligned}
\bar{\Omega}_2(\ell_o(0)) &= \left(\frac{a - a_g}{1+n} + a_g + \gamma - \frac{a}{2}\right)\frac{a}{t} - \gamma \\
&< \bar{\Omega}_1(\ell_o(0)) = (\frac{a}{2} + \gamma)\frac{a}{t} - \gamma. \qquad (15)
\end{aligned}$$

Thus, the solution to $argmax_{\bar{\ell}} \bar{\Omega}_2(\bar{\ell}) = \bar{\ell}_2^c(\gamma)$ characterizes a local maximum. In particular, $\bar{\ell}_2^c(\gamma)$ is a corner solution, at the competitive baseline $\ell_o(0)$ if and only if $\frac{\partial \bar{\Omega}_2(\bar{\ell})}{\partial \bar{\ell}}|_{\bar{\ell} = \ell_o(0)} \leq$

0, or

$$\gamma \leq \hat{\gamma} \equiv (a - a_g)\left(1 + \frac{w_p}{(a - w_p)(1+n)}\right).$$

For $\gamma > \hat{\gamma}$, $\bar{\ell}_2^c(\gamma)$ implicitly solves $\frac{\partial \bar{\Omega}_2(\bar{\ell})}{\partial \ell} = 0$, or

$$\bar{\ell}_2^c = \frac{a_g + \gamma}{t} - \frac{(a - a_g)(a - w_p)w_p}{(t\bar{\ell}^c - w_p)^2(1+n)} > \ell_o(0). \tag{16}$$

Since the right hand side of (15) is strictly increasing in γ, the locally maximum employment target $\bar{\ell}_2^c(\gamma)$ is likewise strictly increasing in γ, whenever $\gamma > \hat{\gamma}$.

Finally, to confirm that $\bar{\ell}_2^c$ characterizes a global maximum, we require in addition that

$$\bar{\Omega}_1(\bar{\ell}_1^c) = \bar{\Omega}_1(\ell_o(0)) \leq \bar{\Omega}_2(\bar{\ell}_2^c).$$

To this end, note from (15) that

$$\bar{\Omega}_1(\bar{\ell}_1^c) > \bar{\Omega}_2(\bar{\ell}_1^c) \tag{17}$$

for any $\gamma \geq 0$ and hence, for any $\gamma \geq \hat{\gamma}$. In addition, by the envelope theorem,

$$\frac{\partial[\bar{\Omega}_1(\bar{\ell}_1^c, \gamma) - \bar{\Omega}_2(\bar{\ell}_1^c, \gamma)]}{\partial \gamma} = \bar{\ell}_1^c - \bar{\ell}_2^c = \ell_o(0) - \bar{\ell}_2^c < 0,$$

and thus the difference $\bar{\Omega}_1(\bar{\ell}_1^c, \gamma) - \bar{\Omega}_2(\bar{\ell}_1^c, \gamma)$ is monotonically decreasing in γ. By the intermediate value theorem, there exists $\gamma^c > \hat{\gamma}$ such that $\bar{\Omega}_1(\bar{\ell}_1^c, \gamma) - \bar{\Omega}_2(\bar{\ell}_1^c, \gamma) < 0$ whenever $\gamma > \gamma^c$. The global maximum of the government maximization problem $\bar{\ell}^c = \bar{\ell}_2^c > \ell_o(0)$. Otherwise, $\bar{\ell}^c$ is set at the competitive baseline, $\bar{\ell}_1^c$.

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Figure 1
The Private Labor Market

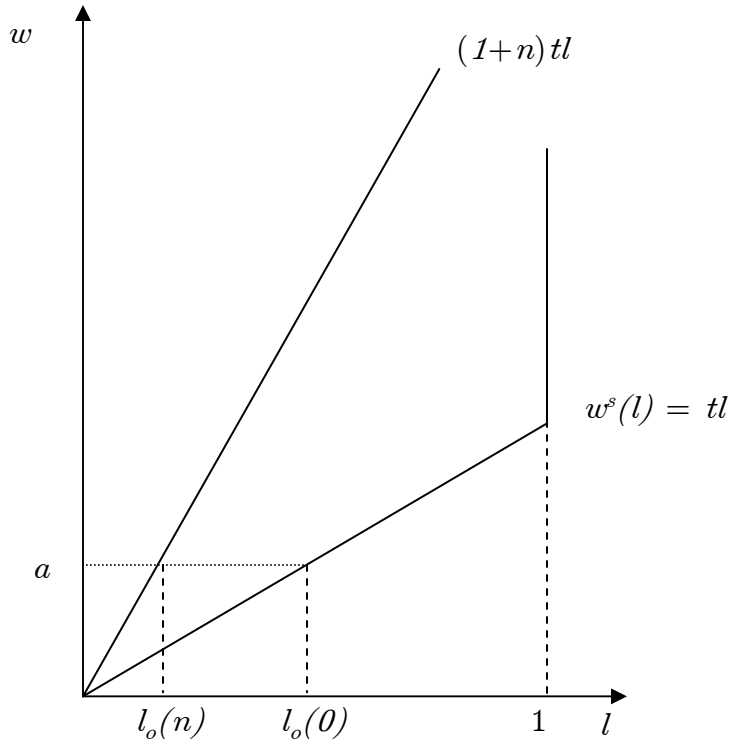

Figure 2a
Employment and Wages with an EGS

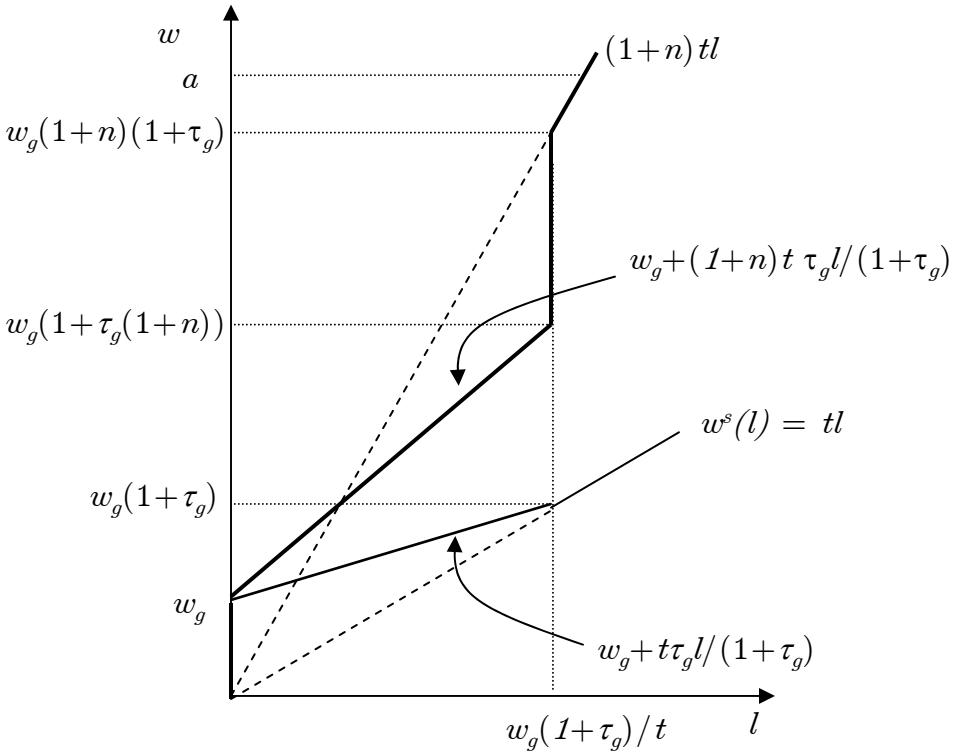

Figure 2b
Employment and Wages with an EGS

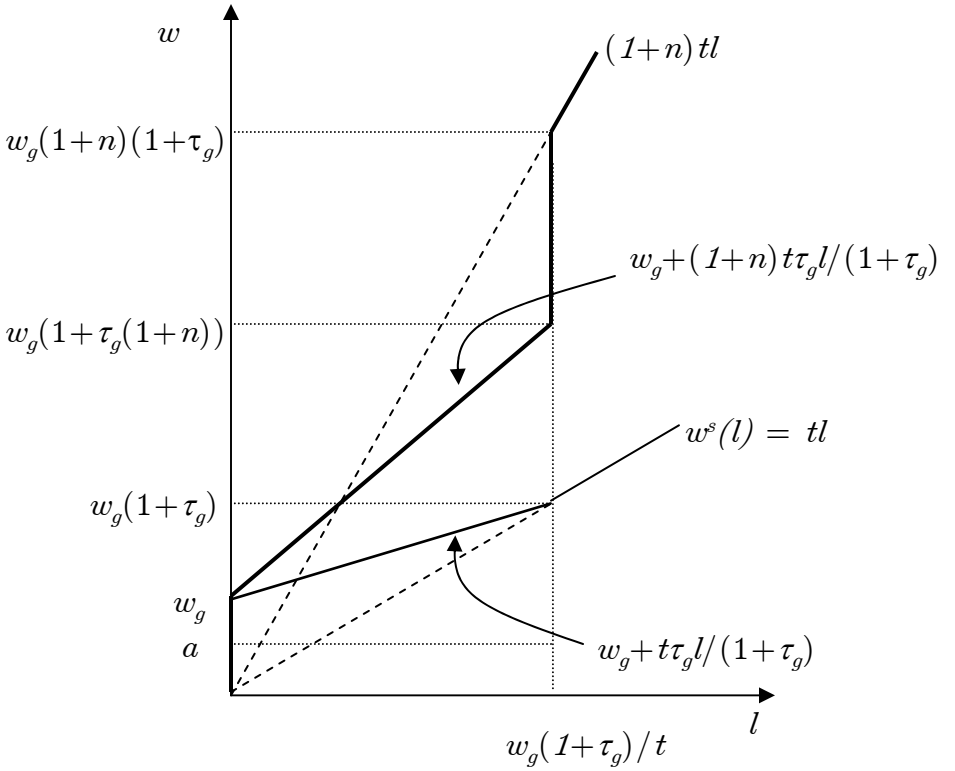

Figure 3
Private Employment and the EGS Wage

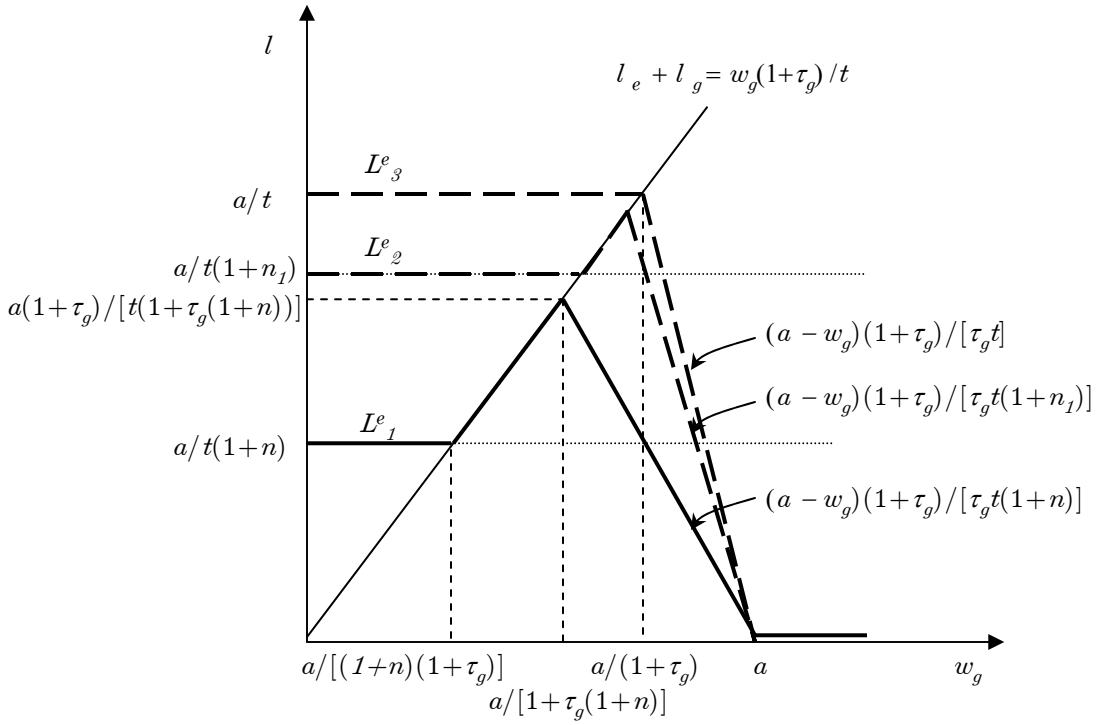

Figure 4
Local and Global Effects of an EGS

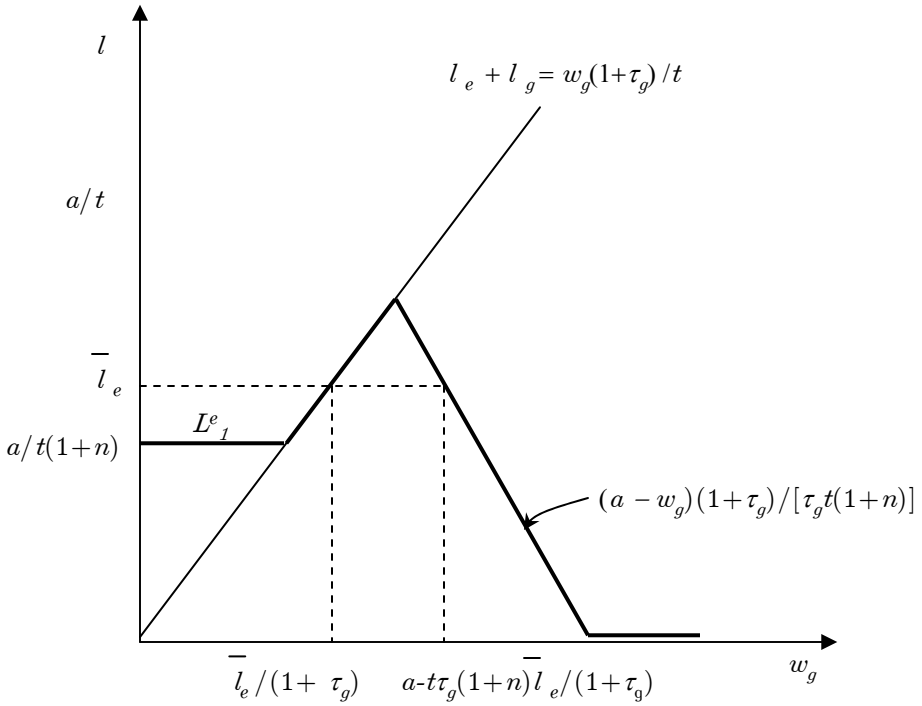

Figure 5
Contestability, Credibility and
Distributional Concern