

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

Arnab K. Basu<sup>†</sup>

Nancy H. Chau<sup>‡</sup>

Ravi Kanbur<sup>§</sup>

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**Abstract:** Both raw intuition and past experience suggest that the success of an employment guarantee scheme (EGS) in safeguarding the welfare of the poor depends both on the wage it promises, and the ease with which any worker can gain access. An EGS is thus at once a wage guarantee and a rationing device. We chart the positive and normative limits of such an EGS as an efficiency improving *and* poverty alleviating policy reform in a canonical labor market setting. At its core, an EGS provides an aggregate, not just EGS, employment target. Given the target, the EGS wage and access can be fine-tuned to deliver outcomes ranging from a contestable labor market to a simple universal unemployment benefit. The credibility of any such target, however, is shown to be triggered endogenously by a host of factors: the distributional concerns of the planner, private sector productivity, the prevalence of market power and the need for public works. Paradoxically, 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!

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<sup>†</sup>College of William and Mary, IZA, and ZEF.

<sup>‡</sup>Cornell University, IZA and ZEF. Corresponding Address: Department of Applied Economics and Management, Cornell University, Ithaca NY 14853, USA. Email: hyc3@cornell.edu

<sup>§</sup>Cornell University, CEPR and IZA.

# 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: to provide income relief by generating employment; construct and maintain public infrastructure; ameliorate endemic poverty; improve workers' position to bargain in the private sector and to facilitate job search (Drèze and Sen 1991, Lipton 1998, von Braun 1995).

The origins of EGS can be traced back to the 1817 Poor Employment Act and the 1834 Poor Law Amendment Act in Great Britain (Blaug 1963, 1964), and the New Deal programs of the 1930's in the United States (Kesselman 1978, Bernstein 1970). Large scale poverty reduction remains the primary objective of more contemporary programs in the developing countries of Latin America (Chile 1987), Asia (India 1978, Pakistan 1992, Bangladesh 1983, Philippines 1990), and Africa (Botswana 1960, Kenya 1992),<sup>1</sup>. One notable aspect of these programs, apart from their common stated objective of poverty reduction, lies in 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.<sup>2</sup> 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 (NREGA) 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 distinctive features, which clearly separate the workings of the program from other conventional policies that directly target the private labor market, such as a minimum wage, or a wage subsidy.

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<sup>1</sup>See Maharashtra Planning Department (1979), Drèze and Sen 1989, Lipton 1998, Keddeman 1998 and von Braun 1995.

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

These features include (i) an EGS wage, (ii) the ease of access to EGS employment, and (iii) the degree of contestability that such a scheme introduces into the private labor market. These have each been discussed, though yet to be articulated and analyzed as an unit. First and foremost, oft-noted has been the promise of EGS to alleviate poverty by delivering targeted transfers to the poor through workfare rather than welfare (Drèze and Sen 1991, Lipton 1998, von Braun 1995),<sup>3</sup> and an accompanying empirical literature establishes 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 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 counter-cyclical 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.<sup>4</sup>

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).

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<sup>3</sup>Rural public works programs have been studied in a number of important contexts: (i) providing income insurance and impacting seasonal agrarian labor markets (Basu 2007), (ii) building longer term capital assets (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).

<sup>4</sup>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).

Once these three individual building blocks of an EGS are spelled out, the question 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.<sup>5</sup> 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. The Act contains additional terms that can similarly impact access. These include for example the provision of child care services for female workers, compensation for transportation and living expenses, minimal levels of work site safety regulations, and entitlement to medical treatment in case of injury.<sup>6</sup>

A legal employment guarantee can thus be seen as (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.

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,

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<sup>5</sup>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.

<sup>6</sup>Indeed, Bhatti (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 work sites. The report also notes the large scale involvement of female workers, and the cost of this neglect in terms of the condition of children.

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 worker-specific cost of employment.<sup>7</sup> Analogously, private employment opportunities are also characterized by a market determined wage rate, and the associated worker-specific cost of employment. This setting captures a range of potential contributors to the equilibrium size of the pool of unemployed (including aggregate productivity slowdowns; sector- and worker-specific costs of employment, and oligopsonistic market power), and generates a number of key insights concerning both the positive and normative implications of an EGS.

In terms of positive implications, we find that an EGS is double-edged – it introduces contestability in labor hiring, while it raises the reservation wage. These two properties of an EGS can be fine-tuned by simultaneous choice of EGS wage and access, to generate a full range of outcomes including: (i) replication of the competitive level of private employment despite employer market power at no cost to the government, to (ii) expansion of aggregate employment beyond the competitive level but at a cost, as private employment are displaced.<sup>8</sup> In effect, an EGS can be seen as an *aggregate* (EGS plus private) employment target, to be set depending on the degree of distributional and / or efficiency concerns of the planner. 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.

These observations shift the longstanding focus on the EGS 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 and time consistency (Kydlund and Prescott 1977) of the policy announcements

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<sup>7</sup>For example, this cost of employment may be due to distance, the disutility of work due to lack of child care facilities for female employment, the lack of information about job opportunities, skill mismatch and physical disabilities (Teklu and Asefa 1999, Gaiha 2000, 2005). The size of this cost is likely worker-specific, depending on a worker’s residential location, gender, age, and physical ability. The design of an EGS can alleviate the cost of employment for at least some of these workers, by choice of location, provision of transportation subsidies, provision of child-care, and the employment of the unskilled for unskilled work. All of these are indeed stated goals of the 2005 Indian NREGA, for example.

<sup>8</sup>The 1834 Poor Law Amendment Act abolished government grants to supplement low wages, and embarked instead on the principle of “less eligibility” in Great Britain. This reflected, at least in part, the concern that workers who would otherwise find employment in the private sector chose to seek government assistance instead (Blaug 1963, 1964), and the runaway budget consequence of the program.

may be in doubt. Two scenarios are taken up in turn, the first involves legislation that fully commits the planner to both the wage and access dimensions of an EGS, while the latter leaves the access dimension open to ex post discretion.<sup>9</sup> Consistent with many of the historical circumstances under which employment guarantees have been deployed, we find that the ex post credibility of any employment target set out by an EGS can be triggered by three sets of factors: (i) labor market triggers such as low labor productivity and oligopsonistic market power, (ii) cost triggers such as the revenue that can be generated from public works, and (iii) planners' preference triggers such as a high degree of distributional concern.

Accounting for issues with credibility, the task of setting the EGS wage at the "right" level is thus nontrivial, for a high enough EGS wage may lead employers and workers to the (rational) expectation that access will be limited ex post. We have three interesting sets of results. First, if none of the credibility triggers applies, the question of choosing an EGS wage clearly does not arise since equilibrium private and EGS employment are invariant to policy announcement. 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 possible, with access extended to meet the employment target. Doing so minimizes private employment displacement, and tilts the self-selection of EGS workers in favor of those who are otherwise left out of the labor market, due for example to high cost of employment.

Finally, for credibility triggers that justify intermediate levels of employment between the no government intervention and the perfectly competitive benchmarks, the EGS wage should be set just high enough as an announcement of contestability. Thus, we have an intriguing instance here where the effectiveness of the announcement of an EGS in giving rise to efficiency improvements 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

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<sup>9</sup>For example, the EGS wage hike in the State of Maharashtra 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 have also been noted for employment programs in Tanzania and Botswana (Subbarao 1997, Teklu 1995).

and public sector employment are discussed. Sections 4 - 5 are devoted to workings of an EGS with or without commitment, depending on the types of objective that an EGS is expected to accomplish. Section 6 concludes.

## 2 The Private Labor Market

There are  $N = 1, \dots, \infty$  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 employment is heterogeneous among workers, given by  $tx \geq 0$ . This includes a worker-specific component  $x$ , and private sector-specific component  $t$ . The worker-specific component parameterizes heterogeneity among workers in terms of their individual access to the private labor market, expressed as a worker-specific the cost of employment.<sup>10</sup> We assume that the distribution of  $x$  among workers is uniform along the  $[0, 1]$  range.<sup>11</sup>

The private sector cost of employment component,  $t$ , parameterizes any locational, informational, skill-related costs and disutilities, as well as any time away from home required to secure a job from one of the  $N$  employers.<sup>12</sup> Employment in the private labor market generates a worker-specific level of utility  $u(x, w) = w - tx$ . Every worker supplies inelastically one unit of labor unless otherwise deterred by the cost of employment. Normalizing the reservation utility of every worker at zero, the implied inverse private sector labor supply is given simply by:  $w(\ell) \equiv t\ell$ , for  $\ell \leq 1$ .

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<sup>10</sup>Such heterogeneity can arise due to a wide variety of reasons, including differential disutility of work due for example to gender differences, the presence of children and the need for child care within the household, traveling and informational costs required for job search depending workers' residential location from village centers. The cost of employment  $x$  may also be interpreted as productivity difference if unit labor supply is measured in terms of efficiency labor units. Thus, workers with low  $x$  are also those who are relatively productive.

<sup>11</sup>See Mitra (2006) for example, for evidence of the role of the cost of employment on labor participation and job mobility in India, and more importantly, the heterogeneity of the cost of employment among workers. Teklu and Asefa (1999), and Gaiha (2000, 2005) provide evidence of the role of gender differences and the need for child care, physical capabilities, and workers' residential location in labor participation decision in Botswana, Kenya and India.

<sup>12</sup>In the sequel, this private sector cost of employment ( $t$ ) will be contrasted with the cost of securing a public sector job made available via the EGS.

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,  $\ell_i$ , taking as given the aggregate labor demand by the rest of the  $N - 1$  employers,  $\ell_{-i}$ . 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):

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

if  $a/[t(1 + n)] < 1$ . 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

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

if  $a/t < 1$ , with the equilibrium wage given simply by the marginal value product.<sup>13</sup>

Note that if  $a/t < 1$ , that is, if the productivity of labor  $a$  is low enough and/or the private sector cost of employment  $t$  is high enough, there will always be workers that are kept out of private sector employment ( $\ell_o(n) < 1$ ). Henceforth, these workers will be referred to as “the unemployed”. The utility of all such workers is at the normalized level of zero – lower than any worker who has employment in the private sector. Meanwhile, the size of the unemployed population depends on three sets of factors: (i) labor productivity ( $a$ ), (ii) the private sector cost of employment  $t$ , and (iii) the degree of imperfect competition in the labor market  $n$ .

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<sup>13</sup>Note that this equilibrium outcome where all employers pay identical wages can also be achieved in an environment where firms compete for workers by choice of (i) a base pay, and (ii) a compensation for the cost of employment. All else equal, workers with low cost of employment  $tx$  will be favored, for the compensation required to induce these workers to prefer private employment is lower. With competition in base pay and compensation for employment costs, the base pay for workers with low  $x$ 's will be bided upwards, for otherwise, incentive remains for employers to outbid another to gain the worker with lower  $x$ . In equilibrium, wage payment offers (base plus compensation for costs of employment) to all workers regardless of their worker-specific  $x$  must be the same. Together these give the wage payment  $w$  in our model, set in equilibrium at the minimal wage payment required to induce the marginal worker to prefer private employment. We thank a referee for encouraging us to think in these terms.

### 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 employment costs on the supply side, or a lack of demand due either to low productivity or market power in equilibrium. Let  $\ell_g$  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  $t_g \equiv t/(1 + \tau_g)$ . Both  $w_g$  and  $\tau_g$  (and hence  $t_g$ ) are policy variables.  $w_g$  gives the EGS wage per worker, and  $1 + \tau_g \equiv t/t_g > 0$  denotes the relative ease of securing EGS as opposed to private employment.<sup>14</sup>

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.<sup>15</sup> 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 thus be 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 location of employment openings and / or the skill-requirements associated with EGS employment.<sup>16</sup> In each case, an increase in  $\tau_g$  improves access and lowers the cost of employment  $tx/(1 + \tau_g)$ .

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<sup>14</sup>We will refer to EGS employment interchangeably with public employment secured through the EGS, and private employment interchangeably with employment with one of the  $N$  private employers.

<sup>15</sup>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.

<sup>16</sup>For example, the Indian NREGA in 2005 addresses this question of access by emphasizing unskilled manual work, providing supplemental transportation compensation when employment is provided outside of a worker's village, free medical treatment to injured workers, child care in work sites, and work place safety requirements. The extent to which these measures offset the cost of employment naturally depends on a worker's skill level, gender, age, physical ability and propensity to injury. Correspondingly, we model efforts to ease access as a proportional reduction in the cost of employment. Doing so enables the EGS to better target those with higher employment of employment to begin with (high  $x$ ).

### 3.1 Comparative Statics

Let  $\ell_e$  and  $w_e$  denote employment and wage in the private sector in the presence of an EGS with given  $w_g$  and  $\tau_g$ . One way for an EGS to target workers who are otherwise excluded from the private labor market involves relaxing access to the EGS ( $\tau_g > 0$ ), though possibly at a lower wage.<sup>17</sup> The utility of private and EGS employment are respectively  $w_e - tx$  and  $w_g - tx/(1 + \tau_g)$ . 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 costs of employment, since

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

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

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

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:  $\ell_e(w_e, w_g, \tau_g) = w_e/t$ , with  $\ell_g(w_e, w_g, \tau_g) = 0$ .<sup>18</sup> In sum, the associated (kinked) inverse labor supply schedule facing the  $N$  employers is of the form:

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

Now, since  $\max\{w_g + \tau_g t \ell / (1 + \tau_g), t\ell\} \geq t\ell$ , the establishment of an EGS directly impacts labor supply by raising the minimal wage that the  $N$  employers must offer to secure

<sup>17</sup>If one assumes, in contrast  $\tau_g < 0$ , an 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 by hiring workers with the lowest cost of employment, or equivalently those who are employed even in the absence of an EGS. These implications violate the stated aims of employment guarantee schemes, that direct competition with private employment is to be avoided.

<sup>18</sup>This self-selection among workers into private employment, EGS employment and unemployment is consistent with empirical evidence to date. Teklu and Asefa (1999) and Gaiha (2000, 2005) demonstrate that workers who are least able to find work (e.g. those who are disabled, and those who live in very remote rural areas) fail to participate either in private or EGS employment. Meanwhile, although some privately employed workers may have switched from private to EGS employment, the extent of displacement varies. See for example Batty (2006) for evidence of job switching from private to EGS employment subsequent to the NREGA, and Gaiha (2002) for evidence of reverse job switching from EGS to private employment subsequent to an expansion of private employment opportunities in the Amadnagar district of the Indian state of Maharashtra.

positive employment. Effectively, the EGS raises the reservation wage of any worker contemplating private sector employment by exactly the amount of the EGS wage  $w_g$ .

Likewise, an increase in the ease of access to EGS employment,  $\tau_g$ , also raises the private sector wage,  $w_e$ . Indeed, as  $\tau_g \rightarrow \infty$ , 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  $\tau_g \rightarrow 0$ , accessing EGS employment is just as costly as accessing private employment,<sup>19</sup>

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

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  $\tau_g$  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 ( $\partial w(\ell_{-i} + \ell_i, w_g, \tau_g)\ell_i/\partial \ell_i$ ) 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,  $w_g(1 + \tau_g) < a/(1 + n)$ , 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 cases, three possible types of non-trivial 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:<sup>20</sup>

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<sup>19</sup>As an alternative interpretation, suppose that the cost of employment includes an additive component as well:  $T + tx$  in the private sector, and  $T_g + t_g x$  for EGS employment, with  $T$  and  $T_g$  positive. These imply that the ease of access to an EGS through  $T_g$  applies uniformly to all potential workers. A reduction in  $T_g$  is thus observationally equivalent to an increase in EGS pay  $w_g$ , with  $\tau_g = 0$  and  $t = t_g$  set at unity. In equilibrium, the EGS loses its ability to selectively target workers, for all employed workers will be hired by the EGS ( $w_g - T_g > w_e - T$ ), or otherwise none at all will be. We thank an anonymous referee for pointing this out to us.

<sup>20</sup>The arguments of  $\ell_e$ ,  $\ell_g$  and  $w_e$  are dropped whenever there is no risk of confusion in what follows.

**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  $w_e = \frac{a+nw_g}{1+n} \geq w_o(n)$ .*

*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.*

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 an EGS as an additional source of employment effectively erodes the market power embraced by each one of the  $N$  employers. With sufficiently high 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  $w_{g1} = \frac{t\bar{\ell}_e}{(1+\tau_g)}$ , or (ii) by raising the wage even further so that the reservation wage effect is triggered with  $\hat{w}_{g2} = a - \frac{t\tau_g\bar{\ell}_e(1+n)}{(1+\tau_g)}$ . 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. As shown,  $L_1^e$ ,  $L_2^e$  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 such a scheme is expected to achieve.<sup>21</sup> With employment determined jointly by the extent of market power, private sector productivity and the cost of employment, 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 on employers  $T(w_g, \tau_g)$  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 employment for each worker,  $\tau_g$ . Thus,

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

There are a variety of other modeling options here, but as a benchmark, we assume that the government does not enjoy any particular advantage, as compared to workers, in managing the cost of employment.<sup>22</sup> The reduction in the total cost of employment due to a reduction in  $t_g$ , and the budgetary requirement for doing so will henceforth taken to be one for one.<sup>23</sup> Government budget balance requires that

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

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<sup>21</sup>There is a host of other possible labor market policies that may be used to offset the combination of reasons why unemployment prevail in the labor market we consider. In a companion paper, (Basu, Chau and Kanbur 2007a), we take up the issue of minimum wage laws when enforcement is costly and commitment to reform and enforcement may not be credible. In footnote 26, we briefly discuss the findings of this minimum wage setup, and highlight the important differences that a lack of commitment makes. Other examples policy reforms include a wage subsidy, or a tax-cum-transfer scheme with unemployment insurance for example. It is well known that the effectiveness of these policies depends importantly on the credibility of the policy commitment (e.g. Boadway, Cuff and Marceauc 2003). A full ranking analysis of each of these policies and combinations thereof is devoted to future work.

<sup>22</sup>For an alternative way of incorporating the budget requirement of reducing the cost of employment, see the working paper Basu, Chau and Kanbur (2007b).

<sup>23</sup>An alternative and equivalent assumption here is that the government provides a transportation cost subsidy to each worker that is equal to  $\frac{\tau_g t x}{(1 + \tau_g)}$ .

## 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:

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

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

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

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

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

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 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 private employment beyond the no government intervention level (Section 3.4). Second, irrespective of the degree of market power, an EGS can never raise private 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  $\tau_g$  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:

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

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  $\tau_g$ , there exists in fact a continuous schedule of  $w_g$  and  $\tau_g$  pairings that solves the maximization problem above.<sup>24</sup> An obvious choice, 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 intervention level.<sup>25</sup>

The more interesting case involves an *aggregate* 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

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

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 wage equivalent that outstrips the competitive wage ( $a$ ) can adversely impact private employment. More precisely, apply the definition of the employment target  $\bar{\ell} = w_g(1 + \tau_g)/t$  to Proposition 1, we have

**Proposition 2** *I. If  $\ell_o(n) \leq \bar{\ell} < \ell_o(0)/(1 + n\tau_g/(1 + \tau_g))$ , the 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  $w_e = \bar{w}$ .*

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<sup>24</sup>In particular, any  $w_g$  and  $\tau_g$  pair that satisfies  $w_g(1 + \tau_g) = \bar{\ell}$ , and belongs to employment outcomes type I ( $w_g[1 + \tau_g(1 + n)] < a \leq w_g(1 + \tau_g)(1 + n)$ ) will suffice. The aggregate employment target is met in this case completely by expanding private employment ( $w_g(1 + \tau_g) = t\ell_e(n, w_g, \tau_g) = t\bar{\ell}$ ).

<sup>25</sup>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.

II. If  $\ell_o(0)/(1+n\tau_g/(1+\tau_g)) \leq \bar{\ell} < \ell_o(0)$ , the 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  $\ell_o(0) \leq \bar{\ell} < \ell_o(0)(1+\tau_g)$ , the EGS now lowers private employment, and hires a positive number of EGS workers:  $\ell_e = \frac{(a-w_g)\bar{\ell}}{(t\bar{\ell}-w_g)(1+n)} \leq \ell_o(n)$  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 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  $\tau_g$  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 maximized 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  $1 + \tau_g^*(n, \bar{\ell}) = t\bar{\ell}/\bar{w}_g$ . 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, Distributional Concerns and Credibility

We now turn to a more general social welfare function,  $\Omega(w_g, \tau_g)$ , made up of three 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 third part introduces distributional concerns. We adopt a very simple formulation – the government cares about the number of workers whose income is below the exogenously given poverty line  $w_p$ . Thus, the EGS income threshold  $\bar{w}_g$  is now set at the poverty line  $w_p$ . The weight given to this concern relative to efficiency is  $\gamma$ . The social welfare function is thus:

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

where  $H$  is simply the poverty head count 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, the social welfare function above 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 spells out the welfare cost associated with the displacement of private employment, as  $a > a_g$ . The second term in square brackets shows the average net welfare gains associated with expanding employment in the economy. Here, the revenue equivalent of EGS employment  $a_g$ , the distributional concern of the government,  $\gamma$ , and the cost of employment of each employed workers jointly determine the extent of this potential gain in welfare. A change of variables yields  $\Omega(w_g, \tau_g)$  in terms solely of the employment target  $\bar{\ell}$  and  $w_g$ :

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

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 Committing to a Complete Contract

To establish a benchmark for subsequent comparison, consider an employment guarantee legislation in which a planner commits to a wage and access pairing,  $w_g^c$  and  $\tau_g^c$ , to maximize the social welfare function  $\Omega(w_g, \tau_g)$ . Denote  $\bar{\ell}^c = w_g^c(1 + \tau_g^c)/t$  as the associated employment target. There are two sets of considerations. First, regardless of the degree of distributional concern, our discussion in section 4.1 suggests that an EGS can be gainfully used to target private employment at no cost to the government. Meanwhile, employment beyond the competitive level may be justified if  $\gamma$  is sufficiently large. We have thus:

**Proposition 4** *For a planner that exercises commitment to both  $w_g$  and  $\tau_g$ , and a social welfare function augmented with distributional concern, there exists a critical level  $\gamma^c$ , with*

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

*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  $1 + \tau_g^c = 1$ . Otherwise, with  $\gamma > \gamma^c$ , employment target  $\bar{\ell}^c$  exceeds the perfectly competitively baseline, and implicitly solves:*

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

*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:** See the Appendix.

Accordingly, 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.

The proposition also 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, 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).

Importantly, 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  $\gamma \leq \gamma^c$ , the optimal EGS wage is to be set high enough to elicit contestability in the labor market  $w_g^c = a$ . Meanwhile, for  $\gamma > \gamma^c$ , with aggregate employment target accordingly set beyond the competitive level, private employment displacement is minimized by choice of an EGS wage at the poverty line, while access is relaxed to accommodate the desired number of workers.

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, and even if the planner is concerned only with efficiency. One may thus infer that even in labor markets of the highly skilled, government provision of EGS can have an important role to play. This may seem counter-intuitive at least at first sight, for such an inference runs 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 contrast what a complete employment guarantee contract can do in principle as established 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  $\tau_g$  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  $\tau_g^d$ . 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. A key difference with the case of commitment is that access to the EGS is not written into law, and is thus subject to discretion ex post. 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 not working at all:

$$w_g^d - \frac{t\bar{\ell}^d}{1 + \tau_g^d(w_g^d, \bar{\ell}^d)} = 0, \quad \text{or} \quad 1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{t\bar{\ell}^d}{w_g^d}, \quad (7)$$

given the announced EGS wage. Note that  $\tau_g^d$  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 (decreases in  $\tau_g^d$ ) 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:

$$\max_{\bar{\ell}^d} (a - a_g)E\ell_e + (a_g + \gamma - \frac{t\bar{\ell}^d}{2})\bar{\ell}^d - \gamma. \quad (8)$$

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

**Proposition 5** *Given any  $w_g^d \geq w_p$  and  $El_e \geq 0$ , ex post maximization of the social welfare function augmented with distribution concern implies an aggregate employment target and an EGS employment level:*

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

where actual EGS employment is increasing in  $a_g + \gamma$  and decreasing in  $El_e$ . 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

$$1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{a_g + \gamma}{w_g^d}. \quad (9)$$

Intuitively, once employment contracts are signed and total private employment given, the government weighs the marginal benefits  $a_g + \gamma$  of EGS employment relative to the marginal cost  $t\bar{\ell}^d$ . Ex post accessibility is thus increasing in the productivity of EGS employment ( $a_g$ ) adjusted in such a way that reflects the distributional concern of the planner  $\gamma$ . Meanwhile, since the pool of available EGS workers  $(w_g^d(1 + \tau_g^d)/t - El_e)$  rises with the EGS wage  $w_g^d$ , 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

$$a_g + \gamma > \frac{a}{1+n}. \quad (10)$$

Thus, three sets of factors are simultaneously in play. These *credibility triggers* include: labor market triggers such as low labor productivity and oligopsonistic market power ( $a$  and  $n$ ); cost triggers such as the revenue (costs) that can be generated from public works ( $a_g$ ), and finally, planner's preference triggers subsumed under the term ( $\gamma$ ). With discretion, the ex post optimal aggregate employment target  $(a_g + \gamma)/t$  can indeed be greater than the competitive employment level  $a/t$ , whenever  $a_g + \gamma > a$ .

At the other extreme, if  $a_g + \gamma$  is 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. A special case is a planner who cares only about efficiency ( $\gamma = 0$ ). Since  $a_g < a$ , such a planner will of course never target employment beyond the competitive level. Meanwhile, if in addition

$a_g < a/(1+n)$ , any EGS policy announcement aimed at enhancing labor market efficiency will be deemed to lack credibility.

### 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  $(a_g + \gamma)/t$ , employers and workers rationally expect that

$$E\bar{\ell} = \frac{a_g + \gamma}{t} = \bar{\ell}^d, \quad 1 + E\tau_g = 1 + \tau_g^d(w_g^d, \bar{\ell}^d) = \frac{t\bar{\ell}^d}{w_g^d}. \quad (11)$$

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

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

Equivalently, the task involves once again the maximization of private employment  $\ell_e$ , given the ex-post optimal aggregate employment target  $\bar{\ell}^d = (a_g + \gamma)/t$ , and the rational expectations of employers and workers in (11). By direct application of Propositions 2 and 3, we have

**Proposition 6** *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 5 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,<sup>26</sup> (iii) the degree of imperfect competition in the labor market, and (iv) weight attached to distributional concern.

First, for sufficiently high levels of private sector productivity relative to  $a_g + \gamma$ ,  $a_g + \gamma < \frac{a}{(1+n)}$ , the announcement 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 no longer applies. Comparing an EGS with commitment (Proposition 4) and an EGS with discretion (Proposition 6), the cost of policy discretion here 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  $a_g + \gamma > a/(1+n)$  is violated).

At the other extreme, for planners exhibiting relatively high levels of distributional concern, with  $a_g + \gamma > a$ , the EGS hires a strictly positive number of workers. Even here, however, policy discretion comes at a cost, in the form of an inability to design a wage and access combination ex ante that displaces the least amount of private sector employment. Specifically, for  $\gamma$  in the range  $(a - a_g, \gamma^c)$ , an EGS with commitment can only be justified on the grounds of efficiency improvement (Proposition 4), 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 6).

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

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<sup>26</sup>In a companion paper (Basu, Chau and Kanbur 2007a), we examine the issue of a credible minimum wage. It is shown that one of the conditions for a credible minimum wage policy requires that private labor productivity be sufficiently high. This is in sharp contrast to a credible EGS shown here, where the credibility of the EGS requires that private labor productivity be sufficiently low. These two forms of labor market policies can thus be seen as complementing each other, depending on whether the relevant labor market is characterized by relatively high, or low labor productivity.

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).

## 6 Concluding Remarks and Extensions

This paper has taken the first step towards understanding the labor market implications of an EGS. An EGS features a wage guarantee and a rationing device. The distinction between the two allows us to highlight an EGS as a policy capable of targeting aggregate employment, where the individual wage and access components can be adjusted so as to allow for an appropriate mix of private and EGS employment to be designed into the target. Aggregate employment targeting made possible by an EGS can potentially serve two distinct types of purposes: to enhance efficiency in labor markets plagued by employer market power, and to alleviate poverty by employing workers otherwise left out of the labor market.

We paid particular attention to the timing of the policy, distinguishing between the case where there is full commitment of wage and access, and where the ex-post credibility of an EGS may be in doubt. It is shown that the credibility of an EGS is triggered by private productivity downturns, excessive market power, and a concern for distribution by the planner. Ironically, therefore, planners who care only about efficiency are shown to lack credibility when an EGS is used to implement efficiency enhancing labor market reforms.

There remains a host of other important issues that warrants future research. To name two such examples, we have so far assumed a neutral scenario wherein the government enjoys no particular advantage over workers in managing the cost of employment. But in a variety of useful contexts (e.g. child care provision, job training and skill upgrading), the government may well be in a better position to overcome the costs associated with employment. Alternatively, the planner is assumed to care about the poverty headcount ratio. The exact manner in which a distributionally sensitive loss functions may be expected to impact the labor market implications of an EGS is an important question that warrants further attention.

## Appendix

**Proof of Proposition 4:** 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  $\gamma$  must be sufficiently larger than  $\gamma^c$  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  $\bar{\ell} < a/t$ , 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

$$\begin{aligned} \bar{\Omega}_2(\ell_o(0)) &= \left( \frac{a - a_g}{1+n} + a_g + \gamma - \frac{a}{2} \right) \frac{a}{t} - \gamma \\ &< \bar{\Omega}_1(\ell_o(0)) = \left( \frac{a}{2} + \gamma \right) \frac{a}{t} - \gamma. \end{aligned} \tag{12}$$

Thus, the solution to  $\text{argmax}_{\bar{\ell}} \bar{\Omega}_2(\bar{\ell}) = \bar{\ell}_2^c(\gamma)$  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  $\frac{\partial \bar{\Omega}_2(\bar{\ell})}{\partial \bar{\ell}} = 0$ , or

$$\bar{\ell}_2^c = \frac{a_g + \gamma}{t} - \frac{(a - a_g)(a - w_p)w_p}{t(t\bar{\ell}^c - w_p)^2(1 + n)} > \ell_o(0). \quad (13)$$

Since the right hand side of (16) is strictly increasing in  $\gamma$ , the locally maximum employment target  $\bar{\ell}_2^c(\gamma)$  is likewise strictly increasing in  $\gamma$ , 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

$$\bar{\Omega}_1(\bar{\ell}_1^c) > \bar{\Omega}_2(\bar{\ell}_1^c) \quad (14)$$

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  $\gamma$ . 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*

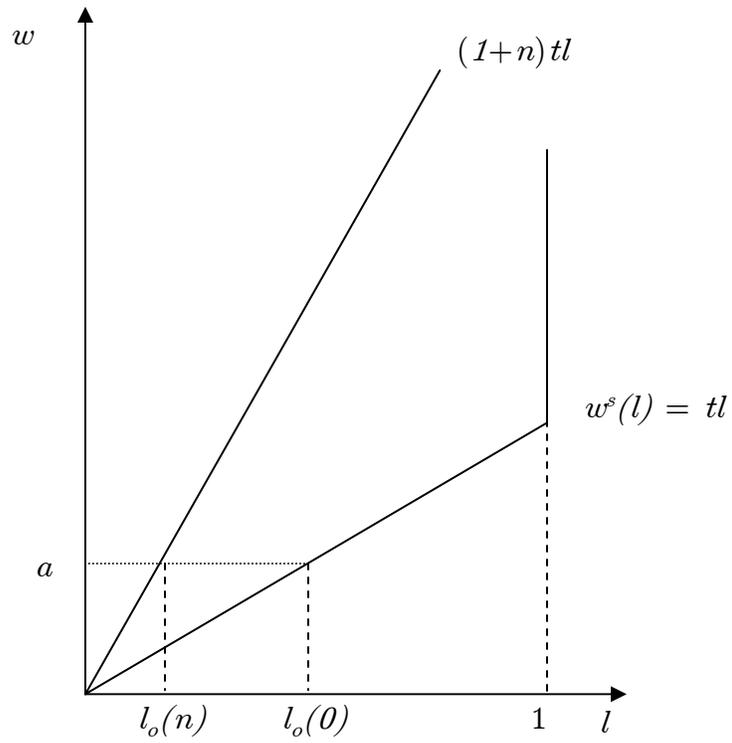


Figure 2a  
Employment and Wages with an EGS

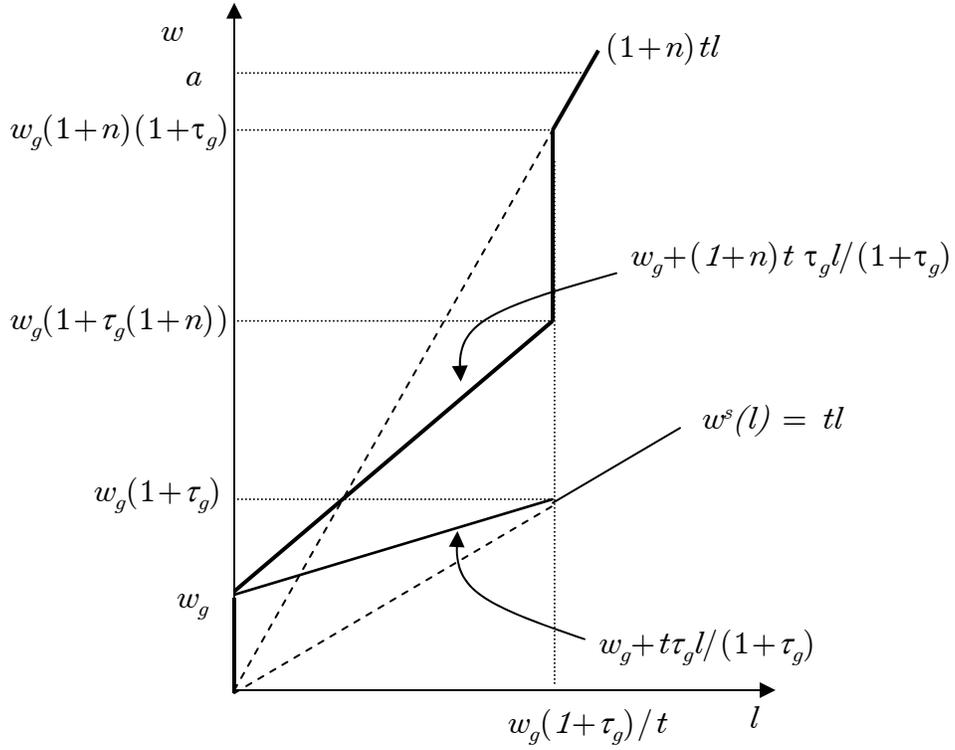


Figure 2b  
Employment and Wages with an EGS

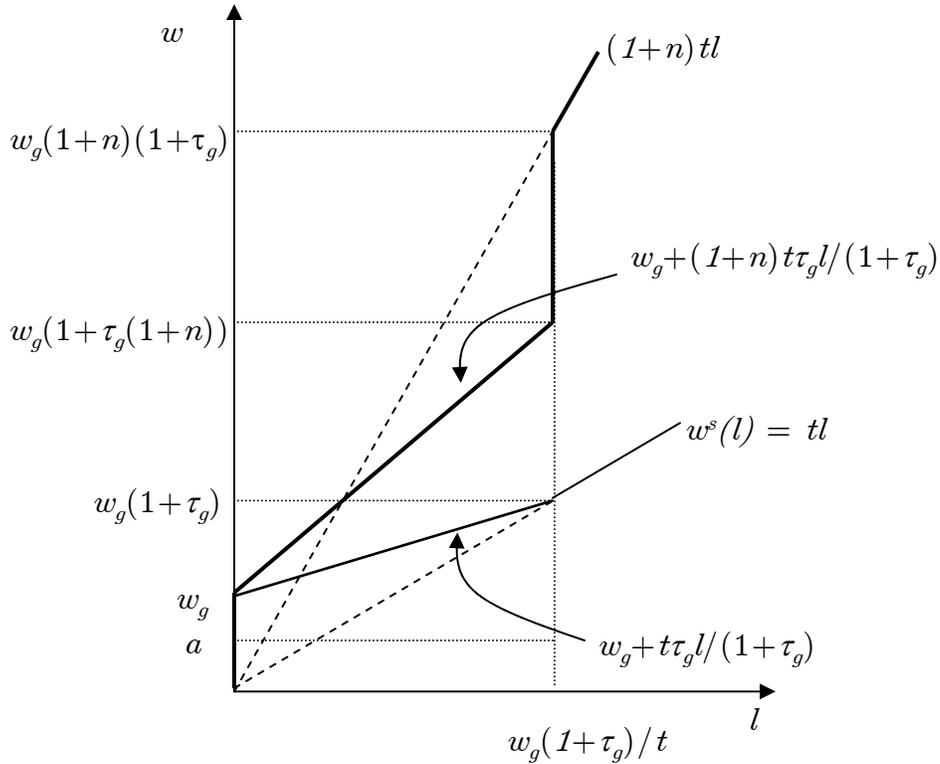
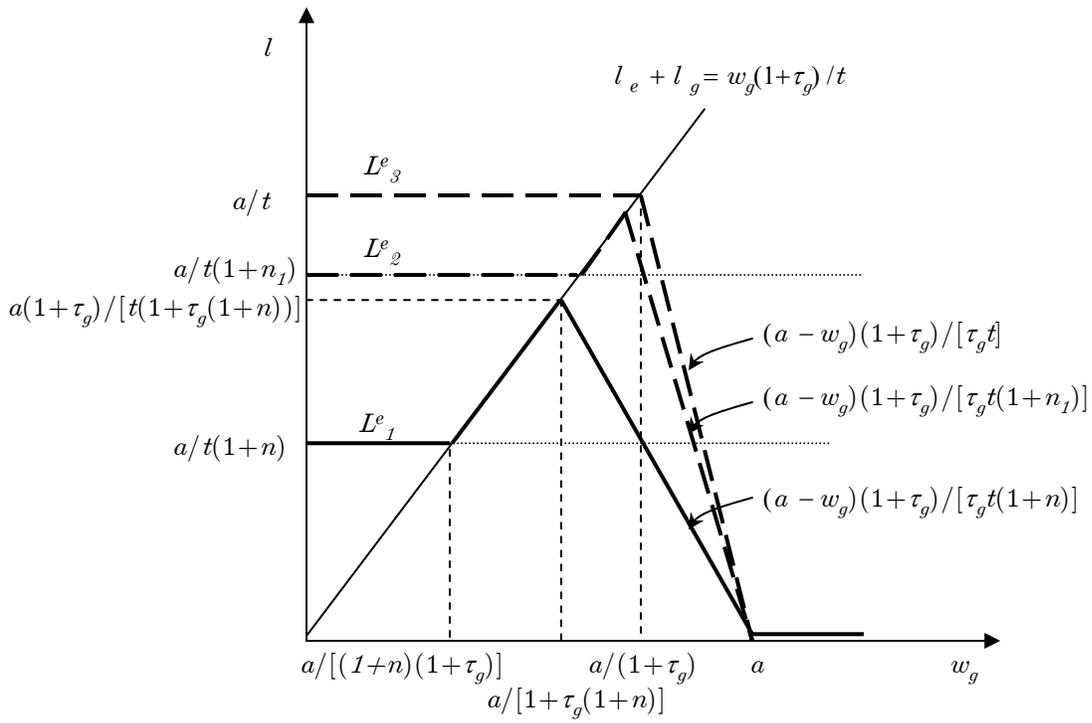
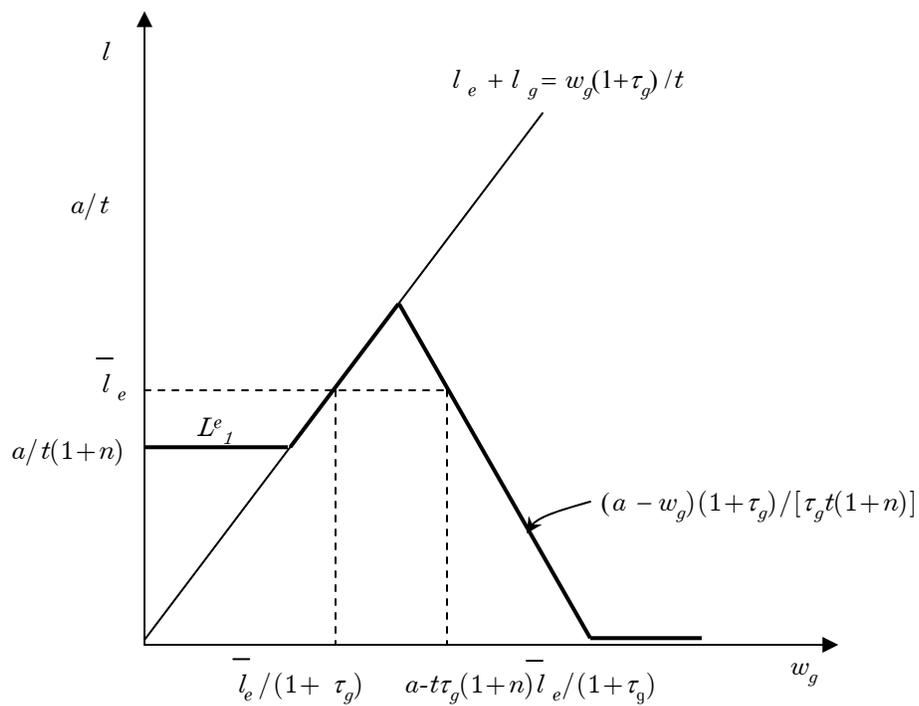


Figure 3  
Private Employment and the EGS  
Wage



*Figure 4*  
*Local and Global Effects of an EGS*



*Figure 5*  
*Contestability, Credibility and*  
*Distributional Concern*

