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Building Blocks in the Economics of Mandates

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ABSTRACT

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The paper constructs an asymmetric information model to investigate the efficiency and equity cases for government mandated benefits. A mandate can improve workers' insurance, and may also redistribute in favour of more "deserving" workers. The risk is that it may also reduce output. The more diverse are free market contracts – separating the various worker types – the more likely it is that such output effects will on balance serve to reduce welfare. It is shown that adverse effects can be reduced by restricting mandates to larger firms. An alternative to a mandate is direct government provision. We demonstrate that direct government provision has the advantage over mandates of preserving separations.

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I. Introduction

In recent years, the case for government regulation of labour markets has been supplemented by a new literature that exploits asymmetric information. Thus, Summers (1989, 179) has argued that government mandates requiring firms to provide benefits can bring about an improvement in welfare in circumstances in which company schemes would be overwhelmed by adverse selection stemming from workers' or firms' private information.

Summers sees adverse selection as relevant specifically to the fringe benefits of health insurance, parental leave, and dismissals protection. In each of these cases, the worker may suffer some unforeseen contingency and the employer then provide a "wage", or "benefit", not matched by work done. This may be an insurance payout (health insurance); or an insurance payout and a guarantee of the job on return to work (parental leave); or the job and a wage when the employer's ability to fire at will is restricted (dismissals protection). And in each case, adverse selection due to asymmetric information may discourage firms from providing the fringe benefit. In the ensuing labour literature, Levine (1991) on dismissals protection, Ruhm (1998) on parental leave, and Encinosa (1999) on health insurance develop the point. Krueger (2000, 119) also points to the importance of adverse selection problems as a rationale for government mandates. Aghion and Hermalin (1989) is another progenitor of the basic idea.

The labour market literature is closely related to a more general and more developed literature on adverse selection in insurance markets, for which the seminal work is by Rothschild and Stiglitz (1976) and Wilson (1977). This general insurance market literature finds that the problem of adverse selection is reduced if insurance companies can offer loss-making contracts subsidised by profit-making contracts (Cave, 1984; Stewart, 1994); or again if in a multiperiod framework insurance companies can use loss experience to reclassify policy holders (Dione and Lasserre, 1987; Cooper and Hayes, 1987). However, we have not thought it appropriate to incorporate these refinements. They imply that a firm routinely offers its workers a rich and varied menu of contracts. Such menus would embrace differing levels of health insurance, parental leave, dismissals protection, and so on, and they are not observed in practice. Indeed, as well as their complexity, adopting a variety of standards for a fringe benefit would typically conflict with "norms of fairness" (Levine, 1991, 296), and also confront legal constraints.

The discussion of labour market mandates has mostly proceeded informally. However, Summers (1989, 182) has called for more formal analysis, the provision of which is a principal task of our paper. The model we build for this purpose is in direct line of descent from Wilson (1977). We follow Hellwig's (1987) game theoretic development of Wilson, translating the model to a labour market context that is richer than the original in view of its technological complexity. We also make central the issue of the role of government.

The question at issue is: can government by mandating labour market benefits increase welfare? In our simple model, where firms are distinguished only by product, in both the separating and pooling cases, a mandate can achieve efficient allocation of income across states (i.e. secure "full insurance"), accompanied by a redistribution of income among workers. In some instances, this redistribution appears equitable **– it** favours "deserving" workers. In this way, both the Summers (1989) case and the redistributive case for mandates is formalised. However, in our general model, with firms differentiated in more important ways, the mandate is shown to reduce output in the separating case. This is because, whereas the free market exploits separation to match worker types efficiently to firms, a mandate imposes pooling and substitutes a random allocation of workers to firms. Whenever a sorting mechanism based on separation exists, it is necessarily eliminated by the imposition of a mandate. In our model, then, a mandate imposing dismissals protection, for example, does not simply affect the economy's pattern of adjustment to shocks, but may reduce productivity directly by causing worker misallocation.[1] In the separating case, a mandate could thus cause a loss of productive efficiency, making it less likely that the mandate is desirable.

One may be able to get round such misallocation when, for example, heterogeneity derives from a distinction between "small" and "large" firms, and where the government is able to target large firms. We show that, in a likely scenario, such a "restricted" mandate can short-circuit adverse effects on labour allocation, thereby providing a case for restricting mandates to large firms. It is clear though that the general problem of firm heterogeneity remains.

Summers (1989) also discusses the advantages of the mandate over direct government provision of the benefit in terms of its not distorting prices. We can, however, point to an advantage of direct government provision. Direct government provision of the benefit can help to preserve separation, and so avoid the mandate's adverse effects on labour allocation.

The outline of the paper is as follows. Section II develops the asymmetric information model and analyses the case of (essentially) homogeneous firms. The scope for achieving welfare improvements within this framework is examined in Section III. The effects of introducing firm heterogeneity are discussed in Section IV. Section V tackles the issue of government provision as an alternative to mandates. Section VI concludes.

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[1] A similar fall in labour productivity, though not on this occasion arising from the asymmetric information mechanism, obtains in the model of Hopenhayn and Rogerson (1993).

II. The Model

There are two types of firm, each type producing a different good, and two types of worker (as defined below). Many firms of each type and many workers of each type play a 3-stage game. In stage 1, each firm offers a contract; in stage 2, each worker accepts one of the contracts on offer; and in stage 3, a firm may if it wishes withdraw the contract offered in stage 1. (Allowing firms to withdraw contracts is consistent with the notion of long-run competitive behaviour. It also ensures that the game has a solution: see Hellwig, 1987.) There are two states of nature for each worker. After completion of the game's three stages, the state of nature is in each case realised and firms and workers receive their payoffs.

The two states of nature correspond to "success" or "failure" on the part of the worker, where for example a worker may fail because of ill health, maternity leave, or an inability to cope with the job. The effect is that a worker's product is less in the "bad" state (failure) than the "good" state (success).

A worker has a continuously differentiable Neumann-Morgenstern utility function, U(.) (the same for all workers), that is separable in income and prices. Thus, fixing the general level of prices (defined appropriately), the worker's utility depends, ex ante, only on the probability of failure and the income received in the different states. Suppose that if a worker accepts a contract (b,w), $U=U_F(b)$ if the bad state occurs and $U=U_S(w)$ in the good state. That is, ex post, utility is state-dependent. Further, suppose that workers are risk averse and worker types distinguished by the probability of failure, P_L for "low-risk" types and P_H for "high-risk" types ($P_L<P_H$).

Labour is the only factor of production and each good is produced under constant returns. For concreteness, call the two firm types "large" firms and "small" firms, even though strictly within the terms of the model, for simplicity, the size of firms is indeterminate. A worker's product is one unit in the good state, e units in the bad state if employed by a large firm ($e<1$), and e_m units in the bad state if employed by a small firm ($e_m<1$). Intuitively, the dependence on type of firm is because the failure of a worker may cause greater difficulties for some types than others. For example, we would argue that absence through illness is more disruptive in small firms than in large firms, where it is easier to arrange cover for absence.[2]

Firms are competitive and risk neutral: competition in the markets for goods and labour drives their expected profits – revenue minus wages – to zero. Let S and S_m be the prices of the goods produced by large and small firms, respectively. Then, for large firms revenue per worker is S in the good state and $F=eS<S$ in the bad state; for small firms it is S_m in the good state and $F_m=e_mS_m<S_m$ in the bad state.

Assume to start with that $e=e_m$, so that $S_m=S$ and $F_m=F$. (If, say, $S>S_m$ and so $F>F_m$, then workers would do better moving from small to large firms.) Thus we deal first with the case of (essentially) homogeneous firms – the same contracts on offer in the two sectors, workers indifferent between sectors, and supply adjusting to equate prices.

Consider any firm. According to the terms of a contract, the firm pays wages b in the bad state and w in the good state. Thus a contract is a pair of values, (b,w), where b may include a "benefit". Define this benefit as b-F – a benefit is paid if the wage in the bad state is greater than the worker's revenue product. Assuming the benefit cannot be negative, we have

[2] The OECD (1995, 190) surveys parental leave in 19 countries, and states that the absence of a key worker for a long period creates difficulties for small firms. This explains the exemption, for example, of firms employing less than 50 workers from the provisions of the 1993 U.S. Family and Medical Leave Act.

$b \geq F$. In addition, however, a higher minimum level for b – fixed either in absolute terms or as a proportion of w – can be mandated by the government. (The government could also provide the benefit directly; this issue is taken up in Section V.)

Recall that the probability of failure is P_L for a "low-risk" type and P_H for a "high-risk" type. The corresponding "odds ratios" are $Q_L=P_L/(1-P_L)$ and $Q_H=P_H/(1-P_H)$. Thus, the slope of an indifference curve is, for a low-risk type,

(1) $$dw/db = - Q_L U_F'/U_S'$$

and, for a high-risk type,

(2) $$dw/db = - Q_H U_F'/U_S'.$$

As $Q_L<Q_H$, at any point in (b,w) space the low-risk worker's indifference curve is flatter than that of the high-risk worker – the "single crossing property" holds. In Figure 1, $U_L=U_L^*$ and $U_H=U_H^*$ (on which more below) are indifference curves of low-risk and high-risk workers, respectively.

(Figure 1 near here)

Three zero profit lines are also shown in Figure 1. Contracts for which the firm breaks even (on average) when employing a low-risk worker are described by

(3) $$R_L = P_L(F-b) + (1-P_L)(S-w) = 0.$$

The corresponding zero profit line for a high-risk worker is

(4) $$R_H = P_H(F-b) + (1-P_H)(S-w) = 0.$$

The "pooling line" is

(5) $$R = P(F-b) + (1-P)(S-w) = 0,$$

where $P=\theta P_L+(1-\theta)P_H$ and θ is the proportion of low-risk workers. Thus the pooling line describes break-even contracts for randomly selected workers. Let the odds ratio corresponding to P be $Q=P/(1-P)$.

The respective slopes of the three zero profit lines are $-Q_L$, $-Q_H$ and $-Q$, where $Q=P/(1-P)$ and $Q_L<Q<Q_H$. This means the pooling line has a slope which is steeper than $R_L=0$ and flatter than $R_H=0$. Since P approaches P_L as $\theta\to1$, we have also the results that Q approaches Q_L and R=0 approaches $R_L=0$, as $\theta\to1$.

The model is one of asymmetric information. Workers know their own type, but since this is private information firms cannot distinguish among workers. There are two possible solutions to this informed worker/ignorant firm model – a separating equilibrium and a pooling equilibrium. In describing these, it is helpful to define four special contracts, which we denote by E_H, E_L', E_L and E.

First, contract E_H is the contract that maximises the high-risk type's utility,

(6) $$U_H= P_HU_F(b) + (1-P_H)U_S(w),$$

subject to $R_H=0$ (equation (4)). E_H is the best the high-risk worker can do, given that the firm knows the worker's type and breaks even. Let $E_H=(b_H,w_H)$. E_H is characterised by[3]

(7a) $$U_F'(b_H)= U_S'(w_H)$$

(7b) $$w_H= S - Q_H(b_H-F).$$

We denote by U_H* the level of utility attained by the high-risk type at E_H.

Second, and analogously, contract E_L' maximises the low-risk type's utility

(8) $$U_L = P_LU_F(b) + (1-P_L)U_S(w),$$

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[3] The Lagrangean is

$$P_HU_F(b) + (1-P_H)U_S(w) + \lambda[P_H(F-b)+(1-P_H)(S-w)].$$

Differentiating with respect to b and w and equating to zero,

(F1) $$P_HU_F'(b) = \lambda P_H$$

(F2) $$(1-P_H)U_S'(w) = \lambda(1-P_H).$$

(7a) follows from (F1) and (F2). The constraint gives (7b).

subject to R_L=0 (equation (3)). Let $E_L'=(b_L',w_L')$. Accordingly, E_L' is characterised by

(9a) $U_F'(b_L') = U_S'(w_L')$

(9b) $w_L' = S - Q_L(b_L'-F)$.

E_H and E_L' are the points where R_H=0 and R_L=0, respectively, intersect the "full insurance" line. Shown as the dashed line in Figure 1, the full insurance line is defined by $U_F'(b) = U_S'(w)$, and its slope is

(10) $dw/db = U_F''/U_S''$.

Note that, in the case of state-independent utility, we have $U_F(.)=U_S(.)$ and the full insurance line becomes a 45-degree line through the worker origin O.

Because workers are assumed to be risk averse, both U_F'' and U_S'' are negative and the full insurance line has a positive slope. To the left of the line, $U_F'(.)<U_S'(.)$; and to the right, $U_F'(.)>U_S'(.)$. We assume $U_F'(F)>U_S'(S)$, that is, workers are underinsured at the firm origin O′ where they are paid according to their productivity in the two states.

Given $Q_L<Q_H$ (flatter zero profit line associated with the low-risk worker), the full insurance line's positive slope implies $b_L'>b_H$ and $w_L'>w_H$. Thus, wages are higher at E_L' than at E_H in both good and bad states, and at E_L' we have $U_H>U_H$* (the high risk-type's utility at E_H).

Third, consider the contract, E_L, which comes into play when the firm does not know the worker's type. E_L maximises the low-risk type's utility, U_L, subject to R_L=0 and $U_H \leq U_H$*, the incentive compatibility condition. When the latter condition holds, high-risk types have no incentive to switch from contract E_H to E_L, and since $U_H>U_H$* at E_L' the condition is binding. It follows that E_L is determined by the intersection of the indifference curve,

U_H=U_H*, and the zero profit line, R_L=0, and lies between E_L' and the firm origin, O′.[4] Let E_L=(b_L,w_L). By equations (3) and (6), E_L is characterised by

(11a) $$U_H^* = P_H U_F(b_L) + (1-P_H)U_S(w_L)$$

(11b) $$w_L = S - Q_L(b_L-F).$$

We denote by U_L* the level of utility attained by the low-risk type at E_L.

Finally, E is the contract that maximises the low-risk type's utility, U_L, subject to R=0, namely, the pooling line given by equation (5). Let E=(b_P,w_P). Using equation (8), and proceeding as in footnote 2, E is characterised by

(12a) $$Q_L U_F'(b_P) = QU_S'(w_P)$$

(12b) $$w_P = S - Q(b_P-F).$$

Since Q_L<Q, (12a) implies that U_F'>U_S' at E, and E lies on the pooling line to the right of the full insurance line. We will denote by U_L** and U_H**, respectively, the levels of utility attained by low-risk and high-risk types at E.

We now describe the two possible solutions. First of all, a separating equilibrium occurs when U_L*>U_L**, as depicted in Figure 1. In this equilibrium, firms offer workers the pair of contracts (E_L,E_H), with all low-risk types accepting E_L and all high-risk types accepting E_H. Competition ensures that (E_L,E_H) is the pair of contracts offered. Because firms

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[4] We can show that U_L declines to the right of E_L' on the line R_L=0 (Figure 1). From equation (8), since R_L=0 has slope $-Q_L=-P_L/(1-P_L)$,

(F3) $$dU_L/db = P_L U_F' + (1-P_L)U_S'(dw/db)$$
$$= P_L(U_F'-U_S').$$

As E_L' lies on the full insurance line, we know that, to the right of E_L', U_F'>U_S'. Thus, by (F3), to the right of E_L', dU_L/db>0, and U_L declines as benefits are reduced. U_H likewise declines to the right of E_L' on the line R_L=0, and declines also to the right of E_H on the line R_H=0 (the proofs are similar).

are risk neutral, in equilibrium they bear all the risk in relation to high-risk types, who are fully insured at the point E_H. Because of asymmetric information, firms cannot similarly offer low-risk types the contract E_L'. Firms need instead to identify low-risk types by offering E_L, a contract with a high wage in the good state and a low benefit in the bad state. E_L and E_H both lie on the indifference curve $U_H=U_H*$, so that high-risk types have no incentive to "mimic" the behaviour of low-risk types.[5] A pooling equilibrium does not result in Figure 1 because $U_L=U_L*$, the low-risk type's indifference curve through E_L, does not intersect the pooling line. In other words, there is no contract on the pooling line that the low-risk types prefer to E_L.

Second of all, a pooling equilibrium occurs when $U_L*<U_L**$. In this equilibrium, as depicted in Figure 2, only one contract is offered: contact E. The difference between Figure 2 and Figure 1 is that $U_L=U_L*$ now intersects the pooling line. This means that, in comparison with the separating contracts (E_L,E_H), both types now do better at E. Firms can "deviate" profitably from (E_L,E_H), and so (E_L,E_H) is not the equilibrium. Low-risk types do better at E than at E_L, although mimicked at E by the high-risk types, and accordingly a pooling equilibrium results.

(Figure 2 near here)

In determining whether pooling rather than separation obtains, the magnitude of θ is critical. The larger θ, the more likely is pooling. If θ is close to one, so that the pooling line is close to $R_L=0$, low-risk types suffer little from being pooled with their high-risk counterparts (who are relatively few in number), and low-risk types find separation is not worth its cost in

[5] An assumption here is that the high-risk type cannot obtain insurance outside the firm (cannot "top up" with insurance), on terms that, starting from E_L, allow the high-risk type to attain levels of utility higher than U_H*.

the form of low insurance against the bad state.

In sum, there are two possible solutions to the model. In the case of a separating equilibrium (Figure 1), low-risk types are identified by their choice of contract, namely, a high-wage/low-benefit contract. This is an example of "screening" which benefits low-risk types even if they face a cost in that they cannot be fully insured. In the case of a pooling equilibrium (Figure 2), high-risk types mimic the behaviour of their low-risk counterparts and gain in comparison with their full information contract, E_H. High-risk types gain by pooling. We now proceed to examine the justification for a government mandate in these two situations.

III. Gains in Welfare

It is clear in our model that, since a firm is free to offer any contract it wishes, no government-mandated floor can engineer a Pareto improvement. Rather, competition will ensure that opportunities to make workers better off while firms still break even are not neglected. The mandate can only restrict the set of contracts on offer, transforming a separating equilibrium into a pooling equilibrium (Figure 1), or a pooling equilibrium into a pooling equilibrium with a higher level of benefit (Figure 2). In either case, low-risk workers are made worse off. In Figure 1 they are better off at E_L than at any point on the pooling line; and in Figure 2 better off at E than at any different point on the pooling line.

Summers (1989), however, makes the point that unregulated labour markets with asymmetric information fail to achieve efficiency across states (which requires workers to be fully insured). A mandate can achieve this outcome by imposing as a minimum the benefit corresponding to A in Figures 1 and 2, where A is the point where the pooling and full insurance lines intersect. Such a mandate may be desirable even though it also has a redistributive effect that needs to be taken into account.

To formalise the discussion, we adopt a generalisation of Harsanyi's (1977) social welfare function due to Blackorby et al. (1997), namely,

(13) $$W= \theta f(U_L) +(1-\theta)f(U_H).$$[6]

Such a social welfare function may be thought to overstate utilitarian principles at the expense of individual rights, which figure so much in recent social choice literature (see for example Pattanaik, 1994). But it has the advantage of simplicity and will provide us with insights. Varying our previous notation, let (b_L,w_L) denote the contract accepted by low-risk types and (b_H,w_H) that accepted by high-risk types. Maximising social welfare subject to the population, risk, and productivity conditions, the Lagrangean is

(14) $$\theta[P_LU_F(b_L)+(1-P_L)U_S(w_L)] + (1-\theta)[P_HU_F(b_H)+(1-P_H)U_S(w_H)]$$
$$+ \lambda\{\theta[P_LF+(1-P_L)S] + (1-\theta)[P_HF+(1-P_H)S]$$
$$- \theta[P_Lb_L+(1-P_L)w_L] - (1-\theta)[P_Hb_H+(1-P_H)w_H]\}.$$

The first order conditions then give, together with the zero profit condition,

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[6] An alternative approach that might be considered relies on the concept of a "potential" Pareto improvement. (A potential Pareto improvement occurs when "winners" can compensate "losers" and still come out ahead.) However, when applying this concept in our context, intransitivities arise. A in Figure 1 is a potential Pareto improvement on (E_H,E_L), since redistribution is possible from A to (E_H,E_L') which itself is a Pareto improvement on (E_H,E_L). Thus A is "better" than (E_H,E_L). On the other hand, redistribution is possible also from (E_H,E_L) back to A, so that (E_H,E_L) is no worse than A. A second problem with the concept of a potential Pareto improvement, in our context, is that winners compensating losers would in practice be impossible. When for example A is mandated, forcing pooling, low-risk types cannot be compensated by high-risk types, since the latter are not identifiable. Though a popular tool in many contexts, the concept of a potential Pareto improvement is not useful here.

(15) $$U_F'(b_L) = U_S'(w_L) = U_F'(b_H) = U_S'(w_H).$$

From equations (15), the "first-best" outcome assigns contract A to each worker. (Recall that $U_F'(b)=U_S'(w)$ defines the full insurance line.)

Thus, given our social welfare function, the government can achieve the first-best outcome by mandating full insurance. Mandating A is optimal for two reasons. First, A is on the full insurance line and so we have efficiency across states. Second, A is common to all workers and so we also have efficiency across workers. The redistribution (neglected by Summers) which accompanies the mandate, from low-risk to high-risk workers, is optimal because it equalises the marginal utility of income across workers.

It is worthwhile analysing the change which a mandate brings about. Starting from (E_L,E_H) in Figure 1 or from E in Figure 2, we may think of movement to A as taking place in two steps. There is an initial shift for each type along corresponding "actuarially fair" isoprofit lines, which takes them to the full insurance line. This is a Pareto improvement. Then there is a second shift for each type, which unites them at A. Define "redistribution" as the latter movement.

Under (13), redistribution is good because high-risk types are relatively deprived and therefore also good "utility generators" (that is, they have a high marginal utility of income). An illustration is Summers' example of mandated company health insurance. Here it seems right for the unhealthy to benefit at a minor cost to the healthy. Note, however, that were one to introduce moral hazard into the discussion, high-risk types would no longer automatically emerge as "deserving". Society might prefer to reward a worker for his or her achievement of low risk.

It remains that, with homogeneous firms, mandates can improve efficiency across worker states, and will have redistributive effects that in many cases are seen as desirable.

The policy implications are indeed quite striking. Yet, as we shall see, the picture can alter quite dramatically once we relax the assumption of identical firms.

IV. Heterogeneous Firms

The problem in a nutshell is that enforced pooling may lead to the misallocation of workers in a world of heterogeneous firms. As noted earlier, employing high-risk workers creates greater difficulties for small than for large firms. To demonstrate that misallocation may occur, we replace our assumption, $e_m=e$, by $e_m<e$. A worker's product in the bad state is now less in the small-firm sector than in the large-firm sector. This implies $F_m<F$ and $S_m>S$. (Note that $S_m\leq S$ implies $F_m<F$, and $F_m\geq F$ implies $S_m>S$, so alternative revenue structures satisfying $e_m<e$ are not consistent with equilibrium. In Section III, given $e_m=e$, a similar argument justified $F_m=F$ and $S_m=S$.) Assume there is a separating equilibrium (Figure 3). Intuition suggests that efficiency now requires differences in contracts between small and large firms so as to bring about an appropriate matching of workers to firms. We explore this.

As before, let the separating contracts be (E_L,E_H), where $E_L=(b_L,w_L)$ and $E_H=(b_H,w_H)$. Firms are competitive and cannot make positive profits employing either worker type. Thus,

(16a) $P_Lb_L + (1-P_L)w_L \geq P_LF_m + (1-P_L)S_m$

(16b) $P_Hb_H + (1-P_H)w_H \geq P_HF + (1-P_H)S$

(16c) $P_Lb_L + (1-P_L)w_L \geq P_LF + (1-P_L)S$

(16d) $P_Hb_H + (1-P_H)w_H \geq P_HF_m + (1-P_H)S_m$.

Suppose, hypothetically, that low-risk types work for large firms and high-risk types for small firms. We can replace weak inequality in (16c) and (16d) by equality. Substituting (16c) into (16a) and (16d) into (16b), and re-arranging, gives

(17a) $S_m-S\leq Q_L(F-F_m)$

(17b) $S_m - S \geq Q_H(F - F_m)$.

Since $S_m > S$, $F_m < F$ and $Q_H > Q_L$, this is a contradiction. Low-risk types working for large firms and high-risk types working for small firms does not occur.

We are left with just three possibilities:

(A) Only high-risk types work for large firms and only low-risk types for small firms;

(B) A mix of low- and high-risk types works for large firms, but only low-risk types for small firms;

(C) A mix of low- and high-risk types works for small firms, but only high-risk types for large firms.

Case (B), which seems the most likely, is illustrated in Figure 3. Since both types of firm employ low-risk workers, the zero profit line, $R_L=0$, is common to the two types of firm and touches the corner of each box. Large firms offer both E_L and E_H, separating the low-risk from the high-risk types. Small firms offer only E_L.

(Figure 3 near here)

We now investigate what happens when pooling replaces separation. In general, prices alter, so let the new prices be S' and S_m'. After pooling, for large firms revenue per worker is S' in the good state and F' =eS' in the bad state; for small firms it is S_m' in the good state and $F_m' = e_m S_m'$ in the bad state. New revenues per worker will have the same structure as old revenues per worker, that is, $F_m' < F'$ and $S_m' > S'$.

A common feature of (A), (B) and (C) is low-risk types work for small firms and high-risk types work for large firms, and it follows that weak inequality can be replaced by equality in (16a) and (16b). Substituting (16a) into (16c), and (16b) into (16d), gives

(18a) $S_m - S \geq Q_L(F - F_m)$

(18b) $S_m - S \leq Q_H(F - F_m)$.

The break-even relations under pooling are, from (6),

(19a) $Pb_P + (1-P)w_P = PF_m' + (1-P)S_m'$

(19b) $Pb_P + (1-P)w_P = PF' + (1-P)S'$.

Equating the two right hand sides of (19) gives, for pooling,

(20) $S_m'-S' = Q(F'-F_m')$.

Recall that the general level of prices is fixed, so when pooling replaces separation prices S and S_m vary in opposite directions. We consider the three cases in turn:

Case A: Weak inequality can be replaced by strict inequality in (16c) and (16d), and so too in (18a) and (18b). Clearly, prices in the large-firm sector may either rise or fall, with opposite variation in the small-firm sector;

Case B: Weak inequality can be replaced by equality in (16c), and so too in (18a). Since $Q>Q_L$, it follows from (18a) and (20) that prices rise in the large-firm sector and fall in the small-firm sector. Intuitively, the effect pooling has on small firms is to worsen the mix of workers;

Case C: Weak inequality can be replaced by equality in (16d), and so too in (18b). Since $Q<Q_H$, it follows from (18b) and (20) that prices fall in the large-firm sector and rise in the small-firm sector. Intuitively, the effect pooling has on large firms is that costs rise, due to workers are no longer being identifiable as high-risk.

Diagrammatically in case (B), the (F,S) box contracts and the (F_m,S_m) box expands to the point where the pooling line touches the corners of each. The large-firm sector expands and the small-firm sector contracts. Under pooling, competition requires the two types of firm to have a common pooling line (Figure 3).

We now come to an important result we wish to prove, which is that in any of the three cases the switch in regime from separation to pooling causes a decline in average income. Rigorously, we can show this decline in each of the three cases. First note that, since both sectors break even, average income under pooling is $PF'+(1-P)S' = PF_m'+(1-P)S_m'$.

Case A: From (16a) and (16d), average income under separation is greater than $PF_m+(1-P)S_m$ and, from (16b) and (16c), also greater than $PF+(1-P)S$. Whether $S'<S$ (and so $F'<F$), or $S'>S$ (and so $F'>F$), average income falls.

Case B: From (16b) and (16c), average income under separation equals $PF+(1-P)S$. Since average income under pooling is $PF'+(1-P)S'$, and we also know $S'<S$ (and so $F'<F$), average income falls.

Case C: From (16a) and (16d), average income under separation equals $PF_m+(1-P)S_m$. Since average income under pooling is $PF_m'+(1-P)S_m'$, and we also know $S_m'<S_m$ (and so $F_m'<F_m$), average income falls.

The situation is different where market forces have already resulted in pooling. If workers are randomly allocated to begin with, designers of mandates do not have this type of misallocation to worry about.

Our discussion suggests that it may be desirable to restrict the coverage of mandates. We focus on case (B), which as we have said seems the most likely of the three cases. Suppose full insurance is mandated in case (B), but with the mandate restricted to large firms. Small firms are free to screen out high-risk types. A curious situation results, which is they do so by offering the same contract as large firms.

To demonstrate this, let E_L be the contract which small firms offer. The contract which large firms offer is A, located (as before) where the large-firm pooling line intersects the full insurance line (see Figure 4). Recall that the low-risk type's indifference curve through A is flatter than the high-risk type's indifference curve through A (an instance of the single crossing property). Denote these two indifference curves by U_L' and U_H'. The argument is simple. Firstly, since low-risk workers work in both sectors, they are indifferent between E_L and A, so E_L lies on U_L'; secondly, by the incentive compatibility condition, high-risk workers too are indifferent between E_L and A, so E_L lies on U_H'. Thus, E_L=A.

(Figure 4 near here)

Although E_L=A, small firms are able to screen out high-risk types. Intuitively, this is because they are free to offer a high-wage/low-benefit contract that is attractive to low-risk types, but not to high-risk types. Large firms cannot follow suit. The restricted mandate benefits small firms, since low-risk types, pooled with high-risk types in large firms, are cheaper. There is also no loss of output, since exempted small firms continue to employ only low-risk types. Thus, in spite of firm heterogeneity, the restricted mandate avoids misallocation of workers.

The caveat in all of this is that there may be additional forms of heterogeneity, other than the small firm/large firm distinction. Mandates may need to be restricted in further and more complex ways if misallocation is to be avoided.

V. Government Provision

As an alternative to mandates, governments may themselves provide the fringe benefit directly. For expositional convenience, we will analyse such provision in the framework of the simpler one-box (e_m=e) model. Prices are equal (S=S_m), and worker revenue is S in the good state and F (=F_m) in the bad state.

Suppose the government pays a worker a benefit z in the bad state, so that the worker's utility becomes U_F(b+z). This provision is financed by a break-even tax of Qz on the worker in the good state, so that in the good state the worker's utility is U_S(w-Qz). (Recall that Q=P/(1-P).) Diagrammatically, an increase in government provision shifts the worker origin, O, rightward and downward in relation to the revenue box (see Figure 5).

We investigate first the effect of varying government provision on E, the low-risk worker's preferred contract on the pooling line. Recall that b≥F – the benefit paid by a firm cannot be negative. Thus E can be either an interior solution to the left of the firm origin, O′, or the corner solution, E=O′. As an interior solution, E is characterised by[7]

(21a) $Q_L U_F'(b_P+z) = QU_S'(w_P-Qz)$

(21b) $w_P-Qz = S - Q(b_P+z-F)$.

Equations (21) determine b_P+z and w_P-Qz uniquely. Thus, when E is an interior solution, any variation in government provision of the benefit is exactly offset by a compensating variation in firm provision. An increase in z neither affects the total benefit, b_P+z, nor the net wage, w_P-Qz, while worker utilities at E, U_L^{**} and U_H^{**}, are likewise unaffected. Intuitively, the explanation for this result is that E is governed by the low-risk type's preferences, and the terms on which the low-risk type obtains additional benefits are the same irrespective of whether these are provided by firms or by government. In either case, cost is based on *average* risk. Consequently, as z increases, b_P is reduced until eventually b_P=F. Diagrammatically, E moves toward the revenue box until it coincides with the firm origin O′ (Figure 5). Ultimately, if not initially, we arrive at the corner solution,

[7] Adapting (5) and (8), the Lagrangean for the determination of E is

$$P_L U_F(b+z) + (1-P_L)U_S(w-Qz) + \lambda[P(F-b) + (1-P)(S-w)].$$

Differentiating with respect to b and w, and equating to zero,

(F4) $P_L U_F' = \lambda P$

(F5) $(1-P_L)U_S' = \lambda(1-P)$.

Dividing gives (21a). The constraint gives (21b).

E=O′, where the firm provides no benefit.

(Figure 5 near here)

We can also investigate the effect of varying government provision on the pair of separating contracts for high-risk and low-risk workers, E_H and E_L (as defined in Section II), and on worker utilities associated with these contracts. Omitting proofs (which are available from the authors on request), the results are:

(A) At E_H, the utility of high-risk types increases with government provision z, and total benefit, b_H+z, also increases. The intuitive explanation for this increased utility of high-risk types is that they obtain additional benefits on good terms. Although they experience greater than average risk of failure, they are taxed at just average risk;

(B) At E_L, the utility of low-risk types may or may not increase with government provision z, though total benefit, b_L+z, will again increase. The redistributive effect in this case operates against low-risk types - experiencing lower than average risk of failure, they are taxed at average risk. However, there is a further effect. As z increases, low-risk types can receive a higher level of benefit without being mimicked by high-risk types and, paradoxically, this beneficial effect can more than offset the pure redistributive effect.[8]

We now draw some conclusions about the effects of direct government provision on labour markets. Absent government provision, there can be either pooling or separation, but for the sake of argument let us suppose pooling. Figure 6 illustrates.

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[8] This Pareto improvement result is also derived heuristically by Wilson (1977, 200), although he errs in claiming that Pareto improvements can always be achieved. A similar effect occurs when a firm, which is able to offer more than one contract, uses a profit-making contract aimed at low-risk types to balance a loss-making contract designed for high-risk types. The advantage gained is that the subsidised high-risk types are less inclined to mimic the low-risk types (see Cave, 1984, in the insurance market context).

(Figure 6 near here)

Equations (21) show that, as z increases from zero, there is at first no net effect on workers' benefits, wages, or welfare. But this situation does not persist. At some point, as z increases, there occurs a switch in regime from pooling to separation. There has to be separation when E reaches E=O′, as low- and high-risk types are both better off with the separating contracts, (E_L,E_H), than with pooling at O′. Each type gains from obtaining insurance at a cost that is actuarially fair. Interestingly, as depicted in Figure 6, there may be a range within which increases in z achieve Pareto improvements (see (A) and (B) above). Beyond this, increases in z, by subsidising high-risk types at the expense of their low-risk counterparts, continue to make high-risk types better off, but now penalise low-risk types.

We see that government provision has the advantage over a mandate that it is able to retain separation, and also convert pooling into separation. Losses, arising under mandates due to the misallocation of labour (documented in Section IV), are avoidable with government provision. Another advantage is that the taxes which fund government provision can be progressive. Taxes are, however, distortionary. These distortions, which are crucial to the argument of Summers (1989), fail to appear in our model because of the full employment assumption and also by reason of the focused nature of the taxes concerned. Relaxation of these assumptions means that distortions would surface. That said, we have demonstrated that government provision has certain advantages over mandates ignored in the extant literature.

VI. Conclusion

This paper has provided the infrastructure for asymmetric information arguments favouring government labour market mandates. We have shown that mandates may improve welfare both by redistributing and by overcoming adverse selection. They can bring about an efficient allocation of income across worker states, and the accompanying redistribution of income across workers will in some instances accord with notions of equity. Mandates may, however, also reduce output. Specifically, where worker types are separated in a world of heterogeneous firms, mandates may lower productive efficiency, substituting a random allocation of labour for the purposive sorting mechanism that in regular markets exploits separation. We have reported that targeting may be able in some measure to side step these inefficiencies.

A further concern of the paper has been the issue of direct provision of the benefit by government. It is conventional to argue that mandates dominate government provision because of the greater tax distortions associated with the latter. Yet, we were able to show that direct provision can have the advantage of avoiding any misallocation attendant upon pooling and the consequent randomisation of labour allocation. Direct provision may thus be a more efficient redistributive tool, less costly in its implied output losses.

To conclude, our framework has been broad. An important task for the future is to identify and parameterise those mandates that fit the mould of adverse selection. We will then be able to assess the practical importance of adverse selection, and the redistributive (and possible disincentive) effects of mandates. Other issues that may need to be accommodated within the existing insurance framework include the availability of external insurance (allowing workers to top-up their firm benefits), and cross-subsidisation (even though ruled out here on grounds of complexity and institutional barriers).

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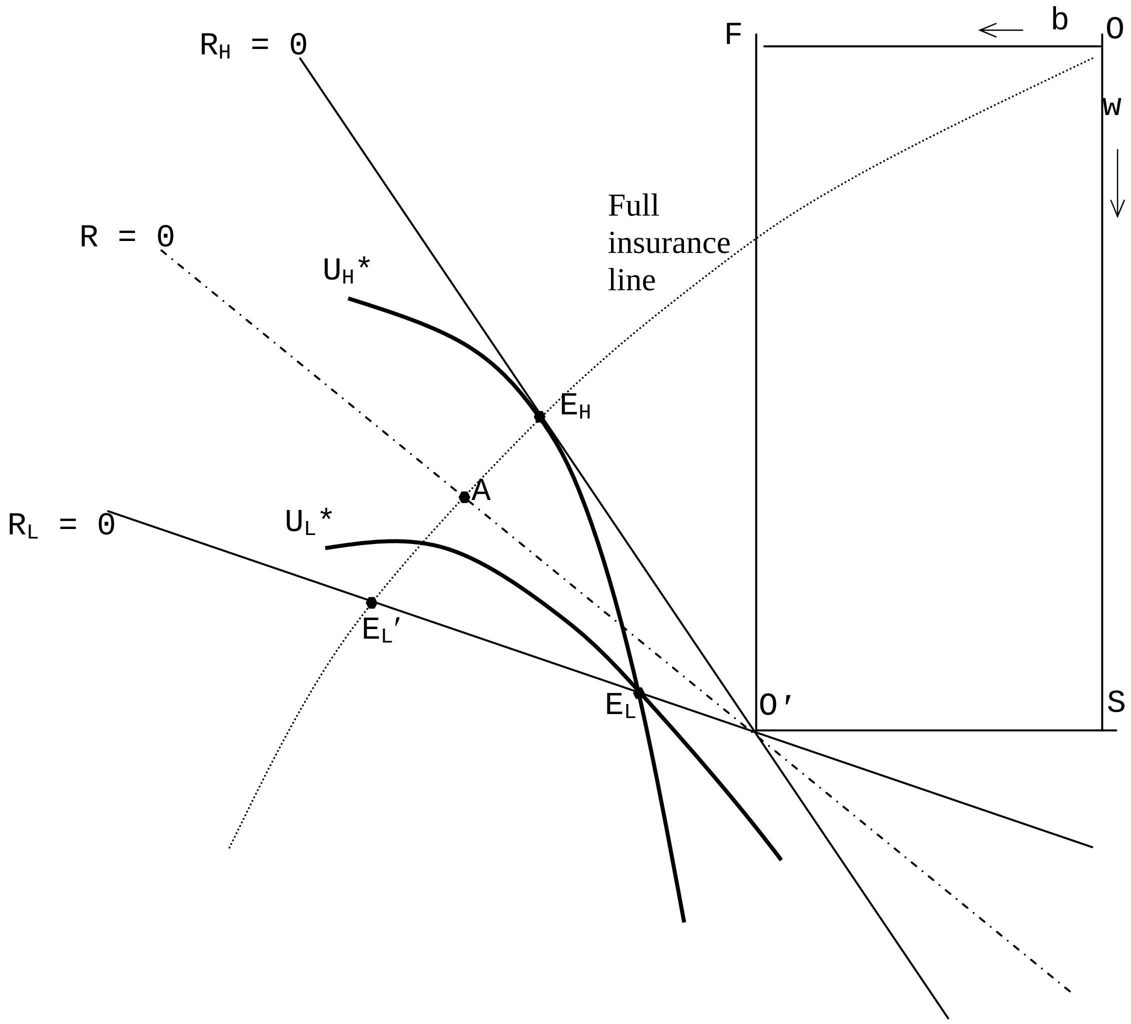

Figure 1: Separating Equilibrium

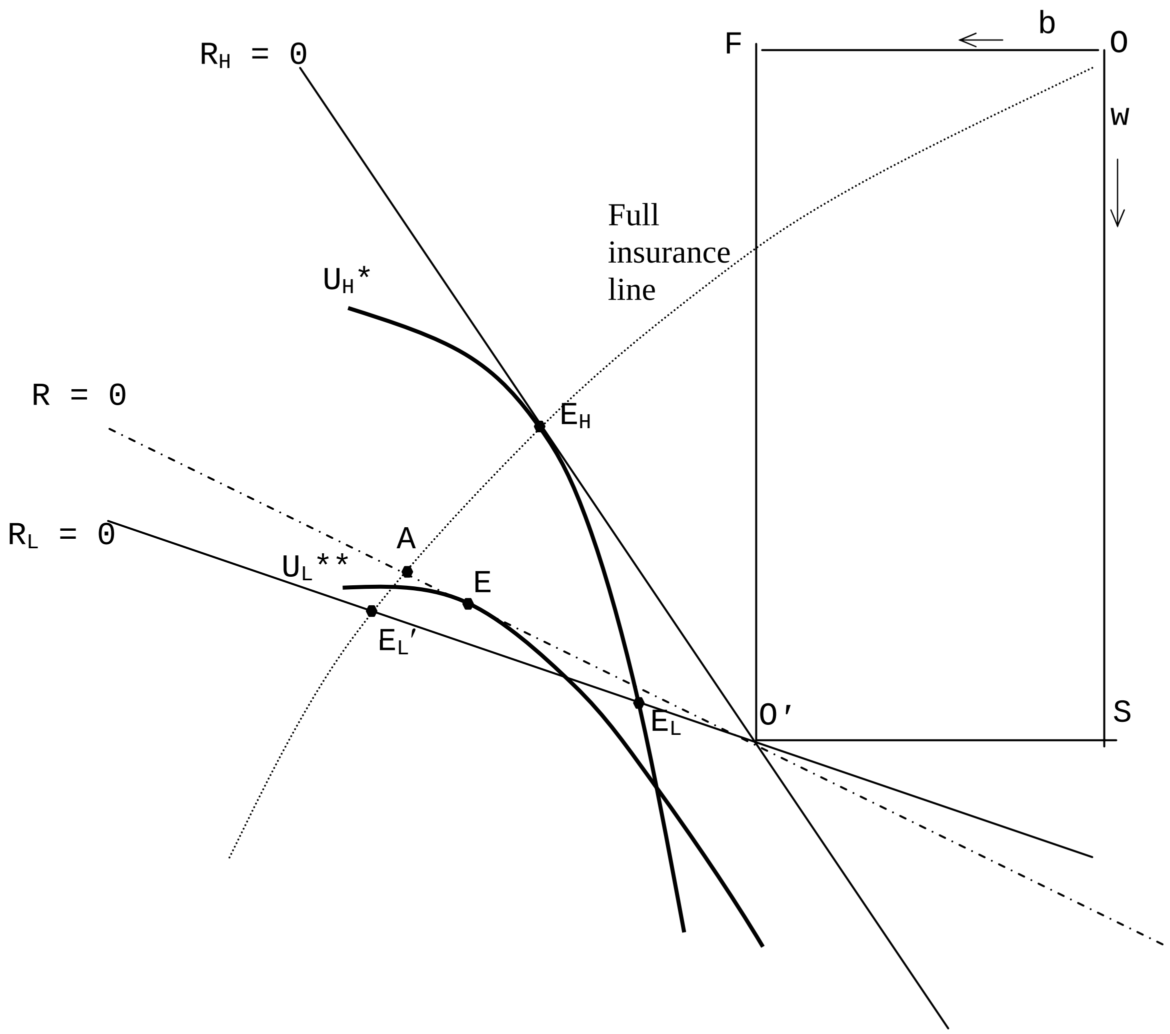

Figure 2: Pooling Equilibrium

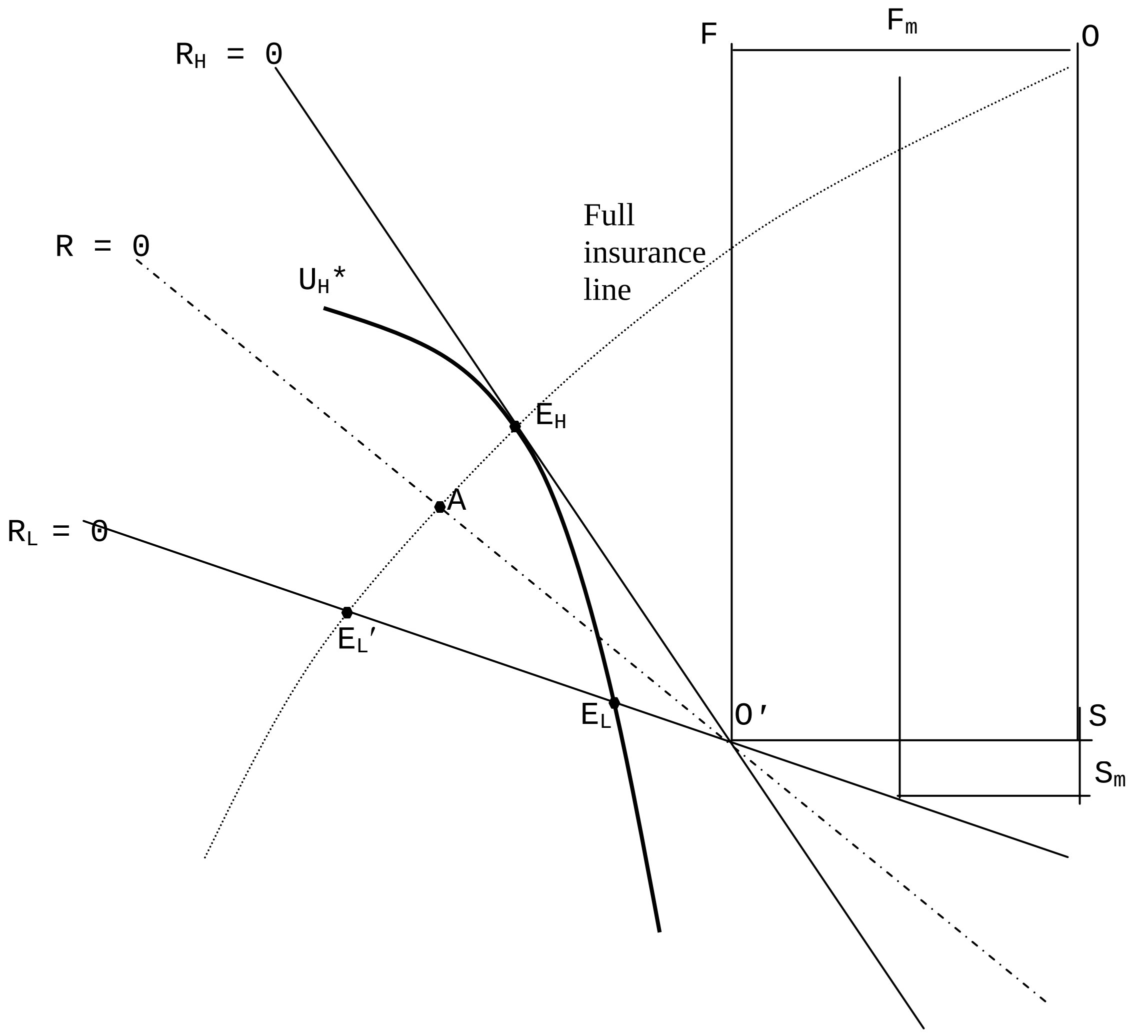

Figure 3: Separation with Two Boxes

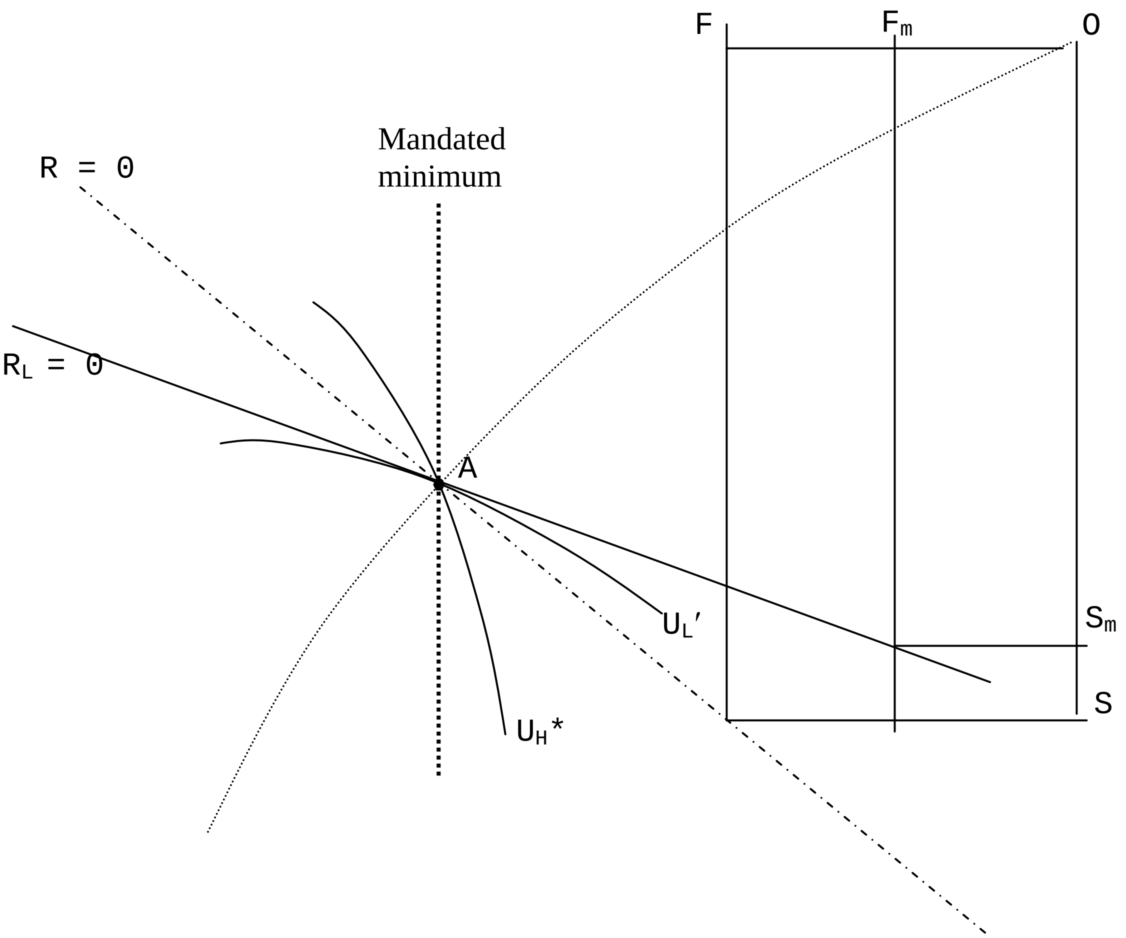

Figure 4: Restricted Mandate

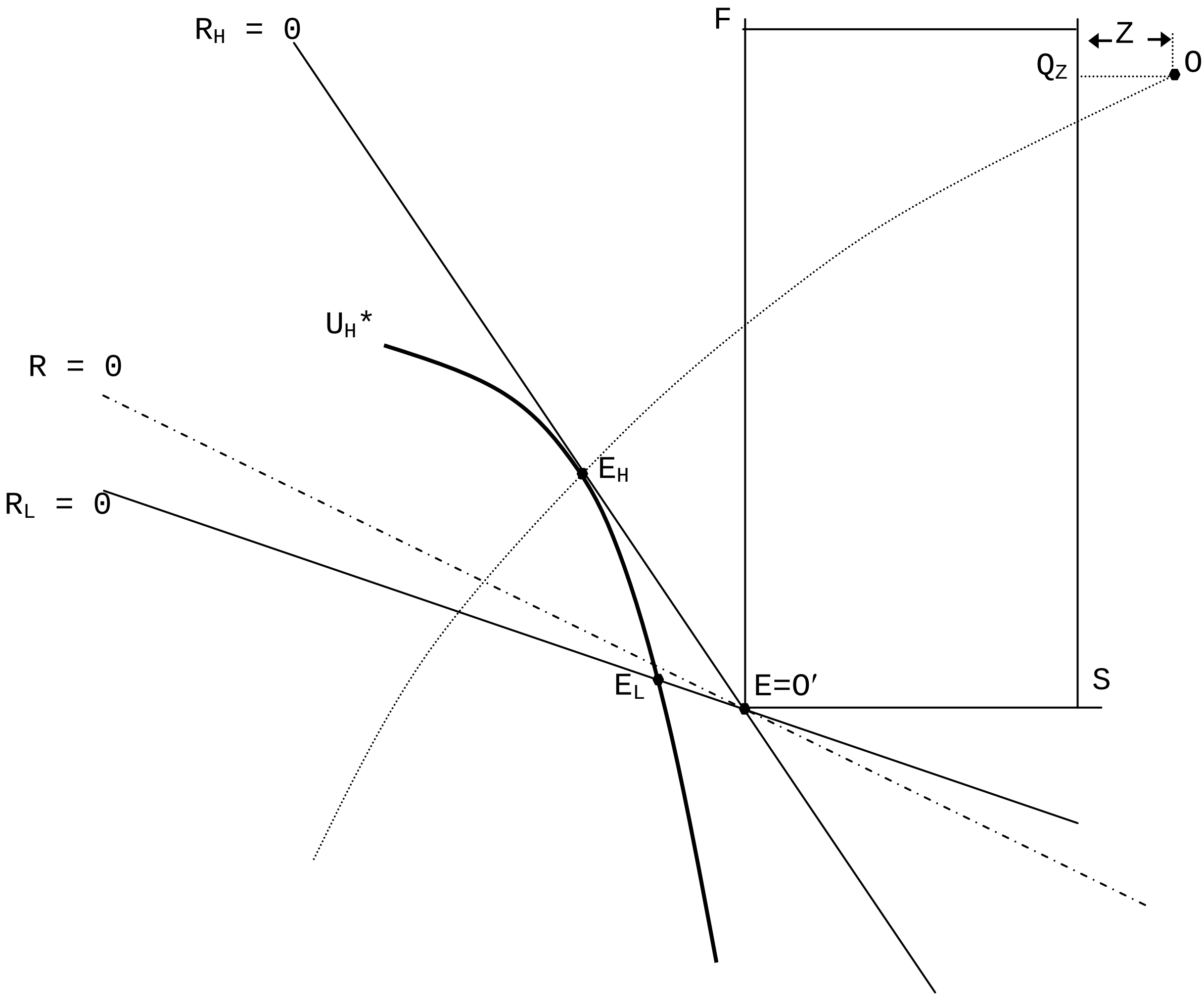

Figure 5: Government Provision

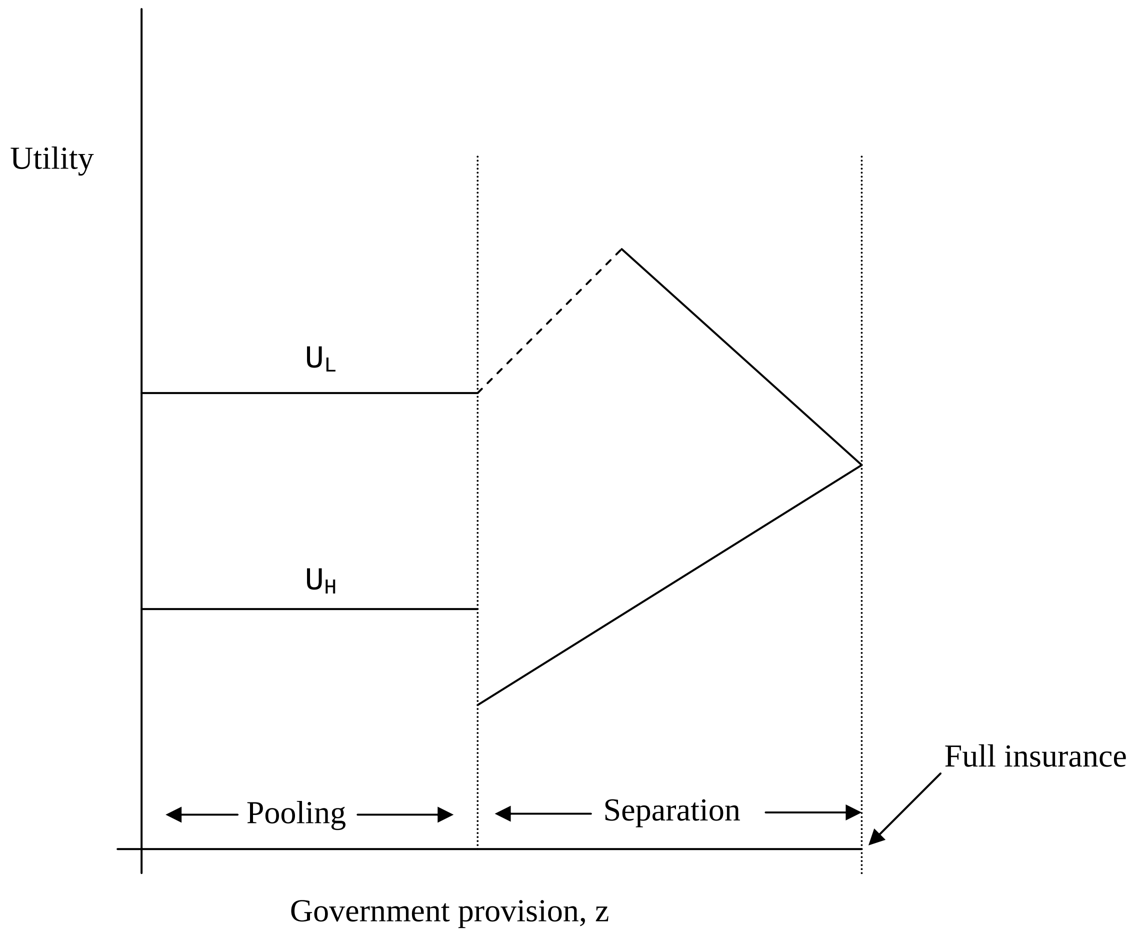

Figure 6: Welfare Effects of Government Provision – State Independent Utility