Journal of International Economics 36 (1994) 239–261. North-Holland

Trade adjustment assistance

Welfare and incentive effects of payments to displaced workers

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Received October 1991, revised version received September 1993

We consider several designs for trade adjustment assistance, focusing first on the efficiency trade-off between deadweight losses from raising revenue and inefficient incentives induced by (some) assistance programs. We also focus on distributional objectives using a conservative social welfare function. We consider programs that are conditional on being unemployed, conditional on being employed, and unconditional. We also consider fixed payment programs and 'tapered' programs offering payments proportional to the wage erosion suffered by a given worker. Welfare comparisons are ambiguous in general, but in our basic case an unconditional tapered program is welfare superior to the others considered.

Key words: Adjustment assistance; Displaced workers; Conservative social welfare; Compensation

JEL classification: F13 J38

1. Introduction

There is strong support in the economics profession for the presumption that trade liberalization promotes economic prosperity. At the political level, however, international trade liberalization often is strongly resisted. Perhaps the most obvious reason for resistance is that while trade liberalization may increase aggregate welfare, it will normally make some groups worse off. Typically, such groups are workers (and shareholders) associated with an industry that declines as a result of liberalization, or whole communities that depend on an industry subject to increasing international competition. More

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*Early versions of this paper were prepared for conferences at UC Davis in November 1988 and at the NBER in August 1991. We thank Rob Feenstra, who organized both conferences, for suggesting the general topic for the paper, and we thank participants for their comments. We also thank two anonymous referees for helpful suggestions. Financial support from the Social Sciences and Humanities Research Council of Canada and the Centre for International Business Studies at UBC is gratefully acknowledged.

SSDI 0022-1996(93)01306-Y

broadly, the Stolper–Samuelson theorem reminds us that even in a purely neoclassical world, liberalization will make domestic owners of some factor (or factors) of production worse off.

To an economist trained in welfare economics, such concerns seem perfectly legitimate for, after all, the foundation of welfare economics is the Pareto principle, which suggests that policy changes are desirable if they make some people better off, without leaving others worse off. Since the direct effects of almost any policy will be to generate both winners and losers, satisfaction of the Pareto principle almost always requires some sort of compensation. As a practical matter, full compensation is rarely likely, and many policies will (and should) go ahead even without compensation, but the idea that some compensation should be forthcoming to those who are clearly and significantly damaged by changes in trade policy is a legitimate position.

If we accept the idea that publicly funded compensation is an appropriate policy response to various economic events, such as changes in trade policy, we immediately confront the question: What is the appropriate design for compensation or assistance programs? Our objective in this paper is to examine the welfare properties of competing designs for trade adjustment assistance. In considering program design we address two issues: the efficiency costs of different programs, and the distributional objectives that the programs might be designed to achieve.

The basic efficiency problem with assistance programs is that they may induce costly incentive effects. This problem has been particularly serious in trade policy, where programs designed to provide temporary assistance to industries or individuals harmed by trade not infrequently seem to have the effect of creating long-run wards of the state. More specifically, if program benefits are conditional on being in a disadvantaged state, then potential beneficiaries have incentives to remain disadvantaged. This problem is very obvious in the case of trade adjustment assistance for workers: if workers displaced by a trade shock receive assistance only if they remain unemployed, then they have incentives to avoid finding new employment. Several observers have suggested making trade adjustment assistance less dependent on the subsequent unemployment of displaced workers. Consider, for example, the following statement from Lawrence and Litan (1986, p. 104):

> Rather than paying those [displaced] workers only as long as they remain unemployed – the method of compensation used in the TAA [U.S. Trade Adjustment Assistance] program since 1981 – our proposed system of trade adjustment assistance would encourage readjustment by making additional trade-related compensation available when displaced workers find alternative employment.

The simplest such program (although not favoured by Lawrence and Litan) would be to make assistance unconditional. Workers would receive the same payment whether or not they found subsequent employment. The obvious problem associated with unconditional programs is that they require the use of more government revenue to provide a given level of assistance to the most disadvantaged groups. If this were a pure non-distortionary transfer, it would have no efficiency costs. Most economists believe, however, that the marginal cost of government revenue is high. The discussion in, for example, Ballard et al. (1985) suggests that a marginal cost of between 1.17 and 1.56 per dollar is not unreasonable, i.e. that raising $1.00 of government revenue costs the economy between $1.17 and $1.56, imposing a net efficiency loss of 17–56 cents per dollar. Stuart (1984) suggests a somewhat larger but not dissimilar range. [See Clarete and Whalley (1987) for a comparison of the costs of alternative sources of revenue.]

As we show, even a simple comparison of the costs of conditional assistance to the unemployed (referred to as conditional assistance) and unconditional assistance has some interesting subtleties that make it difficult to determine the best policy. In addition, the public discussion of assistance programs suggests that it is important to also consider distributional or 'fairness' objectives. In particular, there is some sense that it is 'fair' to partially compensate people who are harmed by some policy decision or exogenous event. We introduce a social welfare function that captures this idea [based on the conservative social welfare function proposed by Corden (1974)] so as to examine alternative assistance programs.

A second important design issue, beyond 'conditionality', is whether displaced workers should receive fixed or 'tapered' assistance. A fixed assistance program would pay the the target group a fixed amount, s. Alternatively, Lawrence and Litan (1986) suggest what we call a 'tapered' program in which assistance is an increasing function of the wage erosion suffered by the worker. The simplest such program would provide a proportional payment: workers would receive some fraction of the wage loss suffered in moving to a lower-paying job after the shock.[1]

Interestingly, if we extend proportional assistance to all displaced workers, those who take new jobs and those who do not (using the value of leisure as a wage-equivalent), then, given our basic model structure, the first-best outcome is achieved. This unconditional tapered assistance achieves full efficiency and dominates other programs from a distributional point of view. Allowing for considerations beyond our basic model can, however, undo this dominance result. We are able to characterize conditions under which some partial rankings can be established, but perhaps the main finding of the analysis is that the welfare ranking of programs depends on the values of

[1]The program proposed by Lawrence and Litan (1986) involves a two-part payment consisting of a basic unconditional component and an additional proportional component conditioned on employment.

underlying parameters. Thus it is difficult to make general statements about preferred program designs.

Trade adjustment assistance programs are only one example of compensatory assistance policies. Most of these policies confront similar trade-offs between conditional and unconditional approaches. Perhaps the most frequently discussed conditional transfer program is unemployment insurance, where incentive effects are relatively well documented. [For example, Feldstein and Poterba (1984) find that unemployment insurance raises reservation wages, and Blau and Robins (1986) find that higher unemployment insurance levels reduce various measures of willingness to take on new jobs. It should be noted, however, that Atkinson et al. (1984) report that the British evidence on the incentive effects of unemployment insurance is not very robust]. Our model structure is not specific to the case of trade adjustment assistance, so the results should be taken as general statements about compensation programs.

Although trade policy shocks are not structurally dissimilar to other shocks causing employment dislocations, trade policy is perhaps politically special. Specifically, lobbying power for trade protection may be greater than lobbying power over purely domestic policy responses to shocks. As such, trade adjustment assistance may have a special role as a mechanism for weakening the political attractiveness of protection. It would be particularly interesting to analyze this effect in a model of endogenous protection, although that is beyond the scope of the present paper.

The basic structure of our problem could be thought of as an 'agency' problem. The government is the 'principal' and the workers are agents whose alternative opportunities are private information. Many problems in public finance (and other areas of economics) have this general structure. An early example that explicitly raised the associated agency issues is the optimal tax problem examined by Mirrlees (1971). [See also Arrow (1986) and Weymark (1987).]

Section 2 compares the efficiency costs of fixed payment conditional and unconditional assistance programs, assuming that the level of assistance is set exogenously. In section 3, using a conservative social welfare function, we derive and compare optimal assistance levels for these two programs. Section 4 introduces and describes the effects of tapered assistance. Section 5 discusses further concerns, extensions and generalizations, and section 6 contains a final summary and concluding remarks.

2. Efficiency aspects of conditional and unconditional fixed payment programs

Suppose we have a pool of workers who have been displaced by an exogenous trade shock. We can normalize the size of this pool of workers to be of value 1. Suppose that the old wage was w^o, and that the value of a worker's time while unemployed is v. The workers face heterogeneous employment opportunities, possibly because of pure randomness, or possibly because of differences in skills or attributes that were not important in their previous job, but that are important in alternative jobs. These differences could also reflect different transactions costs for different types of workers (those with families as opposed to single workers, etc.). Let the range of alternative wages, w, be represented by a cumulative distribution function, $F(w)$, and an associated density function, $f(w)$. The support of this distribution is $[0, w^o]$.

Alternative wages are assumed equal to the value of marginal product. Note that even if wages in the initial sector were also equal to the value of marginal product, one could still have 'layoffs' provided that the trade shock were sufficient to drive the value of marginal product in the initial sector below v. Alternatively, to explain the existence of layoffs we could imagine that workers are hired at their (expected) value of marginal product, but that wages do not adjust downward, or the initial sector could be a declining unionized sector while the alternatives are in a competitive sector.

Considering alternative assistance programs raises the question of what they are supposed to achieve. In order to derive the optimal policy one should explicitly identify the benefits of assistance and maximize the benefit function with respect to the policy variables. We do this in section 3. At this stage, however, we simply assume that the assistance level is exogenously set and compare the efficiency costs of conditional assistance to the unemployed and unconditional assistance.

Without compensation, a worker will take a new job if the associated wage exceeds v, the value of time in non-market activities such as household production or leisure. With wages equal to the value of marginal product, this is efficient: workers' time is allowed to its highest value use. However, for those workers with very poor alternatives, this efficiency is of little comfort, for they will be worse off by the amount of the difference between w^o and v.

Consider now a conditional assistance program that pays an amount s to displaced workers who do not find new jobs. A displaced worker who remains unemployed gets a net value of $v+s$. However, a worker who takes a job does not get s, but receives only the wage associated with that job. The worker therefore compares $v+s$ with alternative wages in deciding whether to take a job. The situation is illustrated in Fig. 1.

Workers with alternative wages below v do not work, whether or not assistance is offered. Workers with alternative wages between v and $v+s$ do not work if assistance is available, and this is a source of inefficiency: the inefficiency is equal to the difference between the value of work that could be done by such a worker (w), and the value of that time spent not working, v. The fraction of workers in this category is given by $F(v+s)-F(v)$ and can be

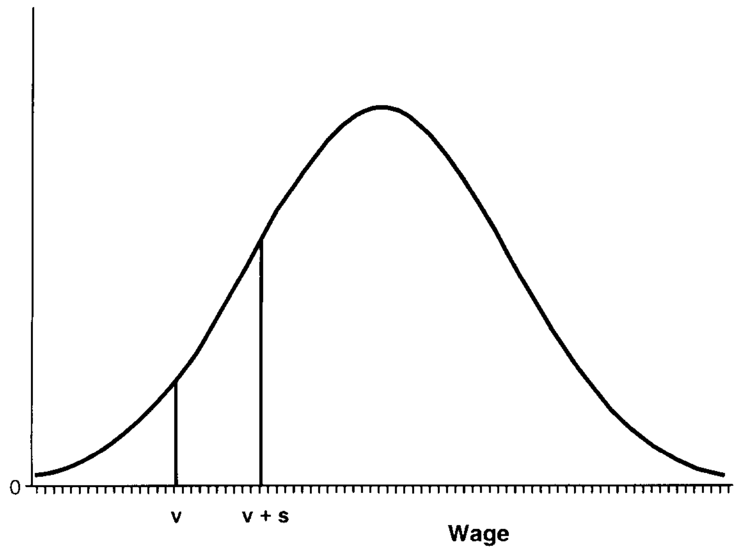

Fig. 1. Wage distribution.

readily seen in Fig. 1. The total amount of money transferred to displaced workers is $sF(v+s)$. We assume that there is a (constant) marginal efficiency cost δ associated with each dollar of revenue raised to fund this transfer. If, for example, the marginal cost of government revenue were 1.30, then δ would be 0.3. So as to focus strictly on the efficiency aspects of the assistance programs, we include only this excess cost of assistance, in effect regarding a simple transfer of resources as neutral. (In section 3 we explicitly attribute some social value to transferring resources to displaced workers).

The total efficiency cost of this compensation program, denoted C^c, includes both the opportunity cost of lost employment, and the efficiency loss associated with raising revenue to pay for the assistance:

$$C^c = \int_v^{v+s} (w-v)f(w)\,\mathrm{d}w + \delta sF(v+s). \tag{1}$$

Cost C^c is equal to 0 if $s=0$, and is positive for any positive value of s, indicating that any positive assistance level will have efficiency costs.

Now consider the unconditional program. To make the basic efficiency comparison as transparent as possible, we assume that the level of assistance, s, is the same in the unconditional program as in the conditional program. The unconditional program pays compensation s to all displaced workers, irrespective of whether or not they obtain new employment. This restores allocational efficiency in worker decisions, for workers will take a new job if $w+s>v>s$: if the economic value of outside employment exceeds the economic value of being unemployed. The resource cost to the economy of this program, denoted C^u, is simply the distortionary cost associated with raising the transfer payment, s:

$$C^u=\delta s. \tag{2}$$

If $\delta=0$, so that the compensation is a pure non-distortionary transfer, then this program has no efficiency cost. The cost advantage of the unconditional program, denoted A, is the difference in cost between the two programs:

$$A=C^c-C^u=\int_v^{v+s}(w-v)f(w)\,dw-\delta s(1-F)(v+s)). \tag{3}$$

The unconditional program is superior from the efficiency point of view of A is positive. To get a sense of whether A is likely to be positive for reasonable parameter values, consider the following example.

2.1. An example

Suppose that the old wage, w^o, is normalized to equal 1, and that alternative offers are distributed uniformly over the range $[0,1]$. Assume that $v+s\leqq 1$ (i.e. compensation does not 'overcompensate' those who remain unemployed). The value $(1-F(v+s))$ in expression (3) is the fraction of displaced workers who would take a job even if assistance s were conditional on being unemployed. This fraction depends on s, v, and the distribution of w.

For the uniform distribution $f(w)=1$, so the integral in expression (3) simplifies to $\int_v^{v+s}(w-v)\,dw=w^2/2-wv\,|_v^{v-s}=s^2/2$. Denoting the cost difference C^c-C^u by A, we have

$$A=C^c-C^u=s^2/2-s\delta(1-(v+s)). \tag{4}$$

The assistance s in this case can be thought of as a fraction of the overall wage range. If the value of leisure, v, is 0.2 and the value of the old job is 1, then displaced workers who remain unemployed have lost 0.8, and 50 percent compensation to those workers would imply that $s=0.4$. If we take the value $\delta=0.5$ as reasonable, then Eq. (4) becomes

$$A=C^c-C^u=0.08-0.08=0. \tag{5}$$

For this particular contrived example, the conditional and unconditional programs have equal efficiency cost. It is clear that by modifying the parameters slightly we can make either program more costly. For example, if

$v=0.2$, $s=0.3$ and $\delta=0.5$, the cost of the unconditional program is 25 percent higher than the cost of the conditional program.

2.2. Comparative statics

More generally, it useful to see how the comparative efficiency of the unconditional program is affected by changes in the underlying parameters δ and v. These comparative static effects are easily obtained by taking derivatives of Eq. (3):

$$\mathrm{d}A/\mathrm{d}\delta = -s(1-F(v+s))<0, \tag{6}$$

$$\mathrm{d}A/\mathrm{d}v = sf(v+s) - \int_{v}^{v+s} f(w)\,\mathrm{d}w + \delta s f(v+s). \tag{7}$$

First, as shown by Eq. (6), higher levels of δ make unconditional compensation less attractive. This is easily understood from the fact that for any given value of s, the unconditional program involves a larger total transfer to displaced workers than does the conditional program.

Turning to Eq. (7), an increase in the value of leisure, v, always increases the number of displaced workers choosing unemployment and therefore increase the total funds transferred under the conditional program. Since the funds transferred under the unconditional program are unchanged, this effect favors the unconditional program, as indicated by the positive third term of (7). Moreover, if $f'(w) \geqq 0$ over the region between v and $v+s$ (which includes the uniform distribution as a special case), then an increase in v (weakly) increases the proportion of inefficient unemployment under the conditional program, so that the unconditional program becomes more attractive overall [Eq. (7) is positive]. Fig. 1 illustrates this case. An increase in v shifts the range of inefficient unemployment to the right, causing inefficient unemployment to increase and making the conditional program more costly. If, in contrast, $f'(w)<0$ between v and $v+s$, then an increase in v reduces the proportion of inefficient employment under the conditional regime, making the outcome ambiguous. The comparative static effects are summarized in Proposition 1.

Proposition 1. Relative to the conditional program,

(i) *an increase in the cost, δ, of raising revenue makes the unconditional program less attractive;*

(ii) *an increase in the value of leisure makes the unconditional program more attractive if $f'(w) \geqq 0$ for $w \in [v, v+s]$. If $f'(w)<0$ over this range, then the outcome is ambiguous.* □

A corollary to part (ii) of Proposition 1 is that an improvement in outside prospects (i.e. an upward shift in the distribution of wage offers), holding the value of leisure constant, will make the unconditional program less attractive if $f'(w) \geqq 0$ over the relevant range. Part (ii) of Proposition 1 also allows the following observation. If v were low relative to w^o, but most workers had alternative wage offers that were very close to w^o, and if s were such that $v+s$ were lower than most alternative wage offers, then the conditional program would be more attractive, for most workers would take alternative jobs, even though the subsidy is offered only for those who remain unemployed. In this case, making the subsidy unconditional greatly increases the resource cost of the program, and has very little impact on the employment decision. Conversely, if most workers have alternative offers that are far from w^o, and s is such that $v+s>w$ for most workers, then the unconditional program costs little more than the conditional program, and substantially improves the efficiency of employment decisions.

These results indicate that the relative efficiency of unconditional and conditional assistance is very sensitive to the underlying economic structure of the problem. During a recession the unconditional program might be preferred, because the distribution of alternative offers is poor, while in a boom the conditional program might be more efficient.

3. Optimal assistance programs

Section 2 considers a pure efficiency cost comparison of conditional and unconditional assistance, assuming that the actual assistance level is exogenous. Our next step is to investigate the optimal level of assistance for both the conditional and unocnditional regimes, and then to compare the two regimes at their optimal assistance levels. Considering this problem forces us to confront a difficult but important question: What exactly are assistance programs of this sort supposed to achieve? More formally: What is the objective function that should be maximized in selecting an 'optimal' policy?

One standard approach to optimal policy selection is to specify a social welfare function in which different individuals may be given different weights, possibly depending on some conditioning variable such as income. It is our view, however, that piecemeal or program-specific assistance programs are based in part on notions related to the Pareto principle: that there is social value in partially compensating individuals who are disadvantaged by some policy or other shock. The amount of the social value probably depends (inversely) on the relative wealth of the disadvantaged group, but even in cases where the disadvantaged group has higher average income than those funding the transfer (taxpayers) there seems to be some value placed on compensation.

Whether such value judgements are reasonable is a matter of some controversy in the literature on the foundations of welfare measure, and we do not propose to resolve that controversy here. We simply observe that if the motivation for various assistance programs is that partial compensation relative to this status quo has some social welfare significance,[2] then certain policy results are implied. The idea that the status quo has special welfare significance of this sort is captured in the 'conservative social welfare function' proposed by Corden (1974) and discussed by Deardorff (1987).

One natural way of incorporating a value of compensation is to assume that some positive value is associated with transferring income to displaced workers who are made worse off by a trade shock, up to the utility level at which they are fully compensated. While this is only one of several reasonable alternative specifications, we feel that it provides a useful benchmark for piecemeal welfare analysis.

More formally, worker utility is simply equal to money income plus utility from leisure if unemployed. Social welfare is equal to aggregate private utility, except that displaced workers with utility levels below w^o have weight $1+\alpha$ applied to them, instead of weight 1. If displaced workers have final utility above w^o, then that portion of their income below w^o receives weight $1+\alpha$, and that portion above receives weight 1.

Let W^0 represent social welfare, let N represent the total size of the worker pool in the rest of the economy (relative to the displaced workers, which is assumed to be of size 1), and let y be average income in the rest of the economy. In the absence of an assistance program, aggregate social welfare is then given by

$$W^0=(1+\alpha)\left[vF(v)+\int_v^{w^o} wf(w)\,\mathrm{d}w\right]+Ny. \tag{8}$$

3.1. Conditional assistance

Now consider the conditional program. In this case displaced workers have utility level w if they take new jobs, and utility level $v+s$ if they remain unemployed. The total assistance payment must be financed at cost $1+\delta$ per dollar raised. Setting out the objective function associated with maximizing welfare is simplified if we recognize at the outset that it will never be optimal to provide an assistance level of more than w^o-v. If the assistance level did exceed w^o-v, then all workers would have net utility in excess of w^o. Thus the subsidy would, at the margin, take resources from the rest of the

[2]A more direct justification for, in effect, weighting losses from the status quo more heavily than gains can be found in experimental work by psychologists, notably Kahneman and Tversky (1979), who find that a monetary loss from the status quo induces a utility loss that is much larger in absolute value than the utility gain associated with an equal monetary gain.

economy at cost $1+\delta$ (or 'excess cost' δ), but would only have value 1 when transferred to displaced workers to raise their incomes above w^{o}. Such a transfer reduces social welfare at rate δ and therefore cannot be optimal. Letting W^{c} denote total welfare under the conditional program, it follows that

$$W^{c}=(1+\alpha)\left[(v+s)F(v+s)+\int_{v+s}^{w^{o}} wf(w)\,\mathrm{d}w\right]-(1+\delta)sF(v+s)+Ny. \quad (9)$$

The net benefit, B^{c}, from the conditional program is just the difference between W^{c} and W^{0}. Subtracting Eq. (8) from (9) and rearranging yields

$$B^{c}=(\alpha-\delta)sF(v+s)-(1+\alpha)\int_{v}^{v+s}(w-v)f(w)\,\mathrm{d}w. \quad (10)$$

The first term of Eq. (10) represents the value of transferring total assistance $sF(v+s)$ of social value $1+\alpha$ per dollar at social cost $1+\delta$ per dollar, yielding a net benefit of $\alpha-\delta$ per dollar. The second term represents the foregone value of earnings by those displaced workers who have wage offers above v but below $v+s$ and who therefore choose to remain unemployed. Note that these earnings have social value $1+\alpha$ per dollar because, if earned, they would have gone to displaced workers earning less than w^{o}.

The optimal policy obtained by maximizing B^{c} fits into one of three possible solution categories. There may be a corner solution with no compensation ($s=0$). There may alternatively be a corner solution at which the optimal policy is full compensation ($s=w^{o}-v$). Finally, there is an interior solution characterized by the following first- and second-order conditions:

$$\mathrm{d}B^{c}/\mathrm{d}s=(\alpha-\delta)F(v+s)-(1+\delta)sf(v+s)=0,$$

$$\mathrm{d}^{2}B^{c}/\mathrm{d}s^{2}=(\alpha-2\delta-1)f(v+s)-s(1+\delta)f'(v+s)<0. \quad (11)$$

For the case of a uniform distribution of w over the interval $[0,1]$, the interior solution for s is $s=(\alpha-\delta)v/(1+2\delta-\alpha)$, where the second-order condition implies that $1+2\delta-\alpha>0$.

The 'no compensation' corner arises if $\mathrm{d}B^{c}/\mathrm{d}s$ is negative at $s=0$. As can be seen from (11), this arises if the premium, α, placed on transferring income to displaced workers is less than or equal to the efficiency cost, δ, of raising revenue. At the other end of the scale, α could be sufficiently greater than δ to make $\mathrm{d}B^{c}/\mathrm{d}s>0$ at $s=w^{o}-v$. In this case the transfer motive overwhelms the efficiency cost of raising revenue, giving rise to a solution at the 'full compensation' corner. The internal solution arises at intermediate values of the difference between α and δ.

3.2. Unconditional assistance

We now consider the optimal policy with unconditional assistance. Letting σ represent the assistance level in this regime, displaced workers will have utility $w+\sigma$ if they take jobs at wage w and utility $v+\sigma$ if they remain unemployed. Workers will take jobs if the wage w exceeds v. Note that some workers will now be overcompensated, especially those with alternatives close to the old wage, w^{o}. Only that fraction of their income below w^{o} is given welfare weight $1+\alpha$. The rest is given weight 1. As with the conditional program, writing out the welfare function is simplified if we recognize that it will never be optimal to provide an assistance level exceeding $w^{\mathrm{o}}-v$. Total welfare for this regime, denoted W^{u}, is as follows:

$$W^{\mathrm{u}}=(1+\alpha)\left[vF(v)+\int_{v}^{w^{\mathrm{o}}} wf(w)\,\mathrm{d}w+\sigma\right]-\alpha\int_{w^{\mathrm{o}}-\sigma}^{w^{\mathrm{o}}}(w+\sigma-w^{\mathrm{o}})f(w)\,\mathrm{d}w$$
$$-(1+\delta)\sigma+Ny. \tag{12}$$

Total welfare in this regime is simply total payments to displaced workers weighted by $1+\alpha$, minus α times payments above w^{o}, minus the cost of raising the total assistance payment, σ, plus the value of earnings elsewhere in the economy. Taking the difference, B^{u}, between W^{u} and base welfare W^{0} yields

$$B^{\mathrm{u}}=(\alpha-\delta)\sigma-\alpha\int_{w^{\mathrm{o}}-\sigma}^{w^{\mathrm{o}}}(w+\sigma-w^{\mathrm{o}})f(w)\,\mathrm{d}w. \tag{13}$$

The first term in Eq. (13) is the assistance payment multiplied by the difference between the premium on transfers to displaced workers and the excess cost of raising revenue, and the second term subtracts the social transfer premium for payments that lead to incomes above w^{o}.

As with the conditional program, the optimal solution is at the 'no compensation' corner ($\sigma=0$) if δ is larger than α. In other words, no assistance is socially warranted if the social value of transferring assistance to displaced workers is less than the efficiency cost of raising revenue. Also, as before, the 'full compensation' corner ($\sigma=w^{\mathrm{o}}-v$) arises if α is sufficiently greater than δ. However, in contrast to the conditional scheme, those workers who choose to take alternative jobs will be overcompensated at the full compensation corner. The final possibility is an interior solution characterized by the following first-order condition:

$$\mathrm{d}B^{\mathrm{u}}/\mathrm{d}\sigma=\alpha F(w^{\mathrm{o}}-\sigma)-\delta=0. \tag{14}$$

We can interpret this first-order condition as capturing the following trade-off. Increases in σ have the advantage of raising workers' compensation, but as σ rises, the fraction of this increased payment going to workers with total income level below w^o falls, reducing the marginal social value of further increases in assistance. This declining marginal benefit must be compared with the (constant) marginal efficiency cost, δ, of raising more revenue.

3.3. Comparing conditional and unconditional assistance

Our task now is to compare conditional and unconditional assistance assuming that the optimal assistance level would be chosen for either regime. In principle, this comparison is ambiguous in that there are circumstances in which either the conditional regime or the optimized unconditional regime may provide higher social welfare, depending on the underlying parameters α, δ, and v, and on the distribution of wage offers. Some circumstances under which the unconditional program is welfare superior, are indicated by the following two propositions.

Proposition 2. If the underlying parameters are such that the solution in both regimes is at the 'full compensation' corner: $s=\sigma=w^o-v$, *then the unconditional regime offers higher social welfare than the conditional regime.*

Proof. The difference between the welfare in the two regimes is obtained from Eqs. (10) and (13):

$$B^u - B^c = (\alpha-\delta)(\sigma - sF(v+s)) + (1+\alpha)\int_v^{v+s}(w-v)f(w)\,dw$$

$$-\alpha\int_{w^o-\sigma}^{w^o}(w+\sigma-w^o)f(w)\,dw. \tag{15}$$

Substituting $s=\sigma=w^o-v$, and noting that $F(v+s)=F(w^o)=1$, yields

$$B^u - B^c = \int_v^{w^o}(w-v)f(w)\,dw \geqq 0. \tag{16}$$

This proves the result. □

Provided α is sufficiently large relative to δ, the optimal solutions are corner solutions at $s=\sigma=w^o-v$. The efficiency costs of raising revenue to make excess payments under the unconditional regime are then never sufficient to offset the costs of inefficient unemployment in the conditional regime.

It is noteworthy that Proposition 2 holds for any distribution of wages, $f(w)$. Other comparative properties do depend on this distribution. Proposition 3 depends on the assumption that $f(w)$ is uniform. The uniform distribution is in some ways a 'neutral' distribution in that it eliminates effects arising purely from changes in the value of the density function over different ranges of alternative wages.

Proposition 3. If the distribution of wage offers is uniform and $\alpha > \delta$, *then the unconditional program offers strictly higher welfare than the conditional program. If* $\alpha \leqq \delta$, *then the programs are equal and* $s = \sigma = 0$.

Proof. See the appendix. □

The basic intuition as to why the unconditional program tends to be favored in these cases is as follows. The conditional program has two comparative disadvantages, given our welfare function. First, the conditional program creates waste by inducing some workers for whom the wage exceeds the value of leisure to remain unemployed so as to receive (costly) transfers. Secondly, the conditional program fails to compensate those workers who take jobs but still earn less than the old wage, w^o. The marginal social value of a dollar transferred to these workers is $1+\alpha$, and the unconditional program does channel income to workers in this position. Given that $\alpha > \delta$, this effect tends to make the unconditional program more attractive. The only disadvantage of the unconditional program is that it overcompensates: it pays some workers an overall return above w^o, with a net social loss of δ for every dollar of overcompensation. For the uniform distribution, however, this cost of overcompensation always is small compared with the first two effects, so the unconditional program dominates.

A high value of δ relative to α would of course tend to make the unconditional program very unattractive, but it drives both regimes to the corner solution at $s = \sigma = 0$. However, as suggested by the above discussion, there are some circumstances that improve the relative attractiveness of the conditional program. For example, the conditional program is made more attractive if the wage distribution is skewed so as to reduce the proportion of workers in the range where they become inefficiently unemployed under a conditional program. It is also made relatively more attractive by an increase in the proportion of workers in the range where they would be overcompensated by the unconditional program.

For example, suppose that most alternative wage offers are between 0 and v, and the rest are between w^* and w^o, where w^* is slightly less than w^o. If $\alpha > \delta > 0$, it is then easy to find parameter values under which the optimal compensation in the conditional regime is at $s = w^* - v$. This yields no inefficient unemployment and, as well, minimizes the social loss from not fully compensating displaced workers. (After compensation, displaced workers who remain unemployed have utility w^*, whereas those taking alternative jobs have somewhat higher utility. By assumption, w^o is not much greater than w^*.) As for the unconditional regime, suitable choices for the various parameters will yield lower maximized welfare than in the conditional regime. The basic problem with the unconditional regime is that its disadvantage (overcompensation at net social cost δ per dollar) is very acute in this case. There is a substantial density of workers with alternative wages close to w^0 to whom any subsidy payment is mostly overpayment. This leads to Proposition 4.

Proposition 4. There are distributions of wage offers and parameter values for which the conditional program is preferred to the unconditional program.

Proof. A specific example sufficient to establish this result formally is presented in the appendix. □

Proposition 4 shows that the conditional regime can dominate the unconditional regime. But is this of any practical consequence? How likely is it that wage incomes would in fact be skewed in the requisite way? Although this would appear to be a very special case, we argue that a common feature of the institutional environment, namely minimum wage legislation, can greatly increase the potential relevance of this case. A minimum wage set at w^* could give rise to the above described distribution of wages, particularly if the industry subject to the wage shock is a relatively low wage industry.

To see this, suppose the minimum wage is set at w^*. Workers who, in the absence of minimum wage legislation, would have received offers between v and w^*, would either receive higher wage offers or no offers at all. The de facto distribution of wages then has some mass above w^* and the rest below v. Payments to the unemployed that bring their utility up to a level just below the level associated with a minimum wage job would then not cause any inefficient unemployment. (The existing inefficient unemployment is a consequence of the minimum wage legislation.) Moreover, if the average wage of workers initially subject to the shock is not much higher than the minimum wage, then the social loss from not fully compensating displaced workers is kept to a minimum.

Some plausible modifications to the social welfare function can also increase the relative attractiveness of the conditional program. One modification would be to penalize more heavily the overcompensation that arises under the unconditional program. As things stand, our welfare function is agnostic about overcompensation, in that payments above w^o count on a dollar-for-dollar basis in social welfare. (They do cost $1+\delta$ per unit so there is some penalty.) Some observers might regard overcompensation in this context as distinctly unfair and might therefore prefer to count overpayments at some value less than 1 per unit. We do not pursue this possibility further, but the effect of this adjustment is fairly obvious. A sufficiently large penalty will make the unconditional program less attractive than the conditional program.

A different modification would be to consider a social welfare function that puts a premium of α only on transfers to those workers whose alternative wage is less than v. Transfers to other workers would count only with unit value in social welfare. Such transfers do, however, impose an efficiency cost, δ. Since the conditional program compensates fewer such workers, adopting this social welfare function enlarges the range of parameter values for which the conditional program is preferred.

4. Tapered assistance

4.1. Tapered assistance with v known

The conditional and unconditional programs we have considered so far are fixed assistance programs in that all targeted workers in a given program receive the same fixed subsidy, s (or σ). A more sophisticated variant is that targeted workers receive a subsidy that is proportional to the loss arising from the trade shock, which we refer to as 'tapered' assistance. Tapered assistance could be unconditional, conditional on being employed [as suggested by Lawrence and Litan (1986)], or conditional on being unemployed. This third case, however, is equivalent to the conditional fixed payment program, as workers would receive a fixed proportion of fixed loss $w^{\mathrm{o}}-v$.

We first consider unconditional tapered assistance, defined as follows. Workers receive a subsidy payment $s=\rho(w^{\mathrm{o}}-w)$ if a job is taken, and $s=\rho(w^{\mathrm{o}}-v)$ if the worker remains unemployed, where $\rho<1$. We obtain the following striking result.

Proposition 5.

(i) *For any payment rate, $\rho<1$, the unconditional tapered assistance program is fully efficient in the sense that the efficient amount of employment occurs, and there is no overpayment.*

(ii) *The conservative social welfare function introduced in section 3 approaches a full maximum as the payment rate, ρ, approaches* 1.

Proof.

(i) With unconditional tapered assistance, a worker takes a job if $w+\rho(w^{\mathrm{o}}-w)>v+\rho(w^{\mathrm{o}}-v)$. This condition reduces to $w>v$, which is the condition for efficiency in job choice. It is also immediate that if $\rho<1$, no worker receives a full income above the original wage.

(ii) For $\rho\leqq 1$, social welfare is given by the following conservative social welfare function:

$$W = W^0 + (\alpha - \delta)\left[\rho(w^\circ - v)F(v) + \rho \int_v^{w^\circ} (w^\circ - w)f(w)\,\mathrm{d}w\right],$$

where W° is given by Eq. (8). For $\alpha > \delta$, the derivative of W with respect to ρ is strictly positive for $\rho < 1$. The derivative of the appropriate welfare function is strictly negative for $\rho > 1$. At $\rho = 1$ there is a slight ambiguity, as workers then become indifferent between working and not working. If we assume that some would work and some would not, then welfare drops discontinuously at $\rho = 1$. The optimum is given by the limit as ρ approaches 1. □

Proposition 5 is a strong result that would seem to create a strong presumption in favor of the unconditional tapered program as the program of choice. Within the structure considered here, this program achieves the first best (asymptotically as ρ approaches 1) and strictly dominates the other programs.

It is interesting to compare the unconditional tapered program with the proposal that tapered assistance be received only if employment is taken. In this case the payment is given by $s = \rho(w^\circ - w)$ if a job is taken, and $s = 0$ if not. A worker then takes a job if $w + \rho(w^\circ - w) > v$. This condition determines a critical value of wage offers, above which workers will accept jobs and below which they would not. The critical value will be less than v, indicating that some workers who should not work from the efficiency point of view will in fact take jobs in order to get the additional subsidy from the assistance program. Thus inefficient employment is the additional deadweight loss associated with tapered assistance that is conditional on employment.

We already know from Proposition 5 that the tapered unconditional program optimized over ρ dominates the optimized tapered program conditional on being employed. In addition, for any given value of $\rho < 1$, the tapered unconditional program dominates the tapered program conditional on being employed. The reason is that the tapered conditional program has two unambiguous disadvantages relative to the unconditional program. As discussed, it induces inefficient employment and, in addition, it provides no compensation to unemployed workers who, according to the assumed social welfare function, 'should' be compensated. As there are no offsetting advantages, the welfare ranking is clear. By similar reasoning, it can be seen that the tapered unconditional program also dominates the tapered program conditional on being unemployed, which is equivalent to the fixed payment conditional program. The comparison with the fixed payment unconditional program is, however, ambiguous, but because the unconditional tapered program approaches the first-best outcome as ρ approaches 1, we know that at some sufficiently high value of $\rho < 1$, it can be made to dominate all the other programs, even if the assistance levels are optimally chosen within those programs.

4.2. Tapered assistance with v unknown

From subsection 4.1 it would seem that tapered unconditional assistance is a very appealing program design. A key component of the design is that the value of non-market time, v, must be known. In practice, the value of non-market time would vary over individuals, and any one individual's value of time would surely be private information, unknown to the government. Thus the program would have to be structured with some 'representative' value of v, denoted v^*, as the base for paying unemployed displaced workers. Such workers would receive $\rho(w^o - v^*)$. It follows immediately that employment choices would no longer be completely efficient. Workers with actual values of v less than v^* would sometimes take jobs with inefficiently low wages, whereas workers with actual values of v greater than v^* would sometimes choose to remain inefficiently unemployed.

The tapered program conditional on employment would be structurally unaffected by the unobservability of v, as payments are made only on the basis of actual wage opportunities. Thus the unobservability of v seems to reduce the relative attractiveness of the tapered unconditional program. In fact, introducing a distribution for v into the analysis of fixed programs and tapered programs greatly increases both the algebraic complexity of the analysis and the apparent intrinsic ambiguity of the program rankings.

5. Extensions

So far we have considered a very simplified environment so as to focus on the trade-off between the distortionary costs of raising revenue and the distorted post-shock employment decisions induced by some types of assistance programs. We have abstracted from other potentially very important considerations. We have, for example, treated the initial condition of the labor market as exogenous. More specifically, the initial pool of displaced workers is assumed to be unaffected by the assistance program in place.

We might, however, expect that a generous assistance program would attract additional workers to the sector in the first place. We have not modelled the ex ante labor market explicitly, but most reasonable models, including both competitive and unionized variants, would have the property that a more generous assistance program would act as a general wage subsidy to the sector, increasing initial employment in the sector. Even if such programs were in place for the entire economy, employment decisions would be distorted toward sectors that were particularly vulnerable to the shocks covered by the program. This effect would obviously increase the distortionary cost of all the programs considered here, with the size of the additional distortion being positively related to the (expected) per worker transfer.

Tapered assistance programs appear relatively more attractive if one considers the following related possibility concerning the post-shock decisions of firms and workers. Some displaced workers will obtain alternative jobs offering wages close to their current wages. If, in addition, they get fixed assistance, some may actually be better off as displaced workers than if they kept their old jobs. Such workers would have an ex ante incentive to become displaced. Unless the government knows exactly how many workers should be displaced by a given trade policy shock, which seem unlikely, firms and workers have an opportunity to exploit taxpayers by distorting the layoff decision. More generally, it is possible that some minimum degree of injury (as represented, for example, by the total size of the layoff) would be required for a given layoff to qualify for assistance. If so, the firm and union would have an incentive to create a larger layoff than is efficient in order to quality for the program.

Additional complications in modelling the labor market would, of course, give rise to additional complications in designing an optimal assistance program. If, for example, the ex post labor market involved two-sided search with the employers being unable to observe a worker's productivity, we would get the usual informational market failures which would, in themselves, create a rationale for some sort of intervention. These informational market failures may be important, but they are separate from the issues we focus on. They might, however, interact with trade issues in interesting ways as, for example, in Riordan and Staiger (1993).

We have also not modelled the trade shock itself. We could, of course, write down an explicit distribution from which the trade shock is drawn. Such an exercise would be necessary if one were to model the ex ante employment decisions of workers, as described above. However, as our analysis focuses just on ex post decisions (i.e. on decisions made after the trade shock occurs), more explicit modelling of an exogenous trade shock within this context would have no effect.

A more subtle possibility, however, is that the trade shock itself might be endogenous; it might be influenced by the existence and structure of an assistance program. If, for example, an assistance plan (such as the tapered assistance plan) expedited movement from the industry, this industry might be a more attractive target for foreign rivals. An effective assistance program has the opposite commitment effect from investments in capital: it creates a commitment to give up a commercial rivalry easily and therefore makes the sector or industry easier prey for predatory strategies.

6. Concluding remarks

In this paper we have undertaken a comparison of possible trade adjustment assistance programs using a relatively simple model of worker behavior. One class of programs targets assistance at those who remain unemployed after a trade shock. Such programs have the obvious disadvantage of creating an incentive to remain unemployed. A program might, conversely, target benefits only at those who become employed. Such a program has the converse cost that workers are induced to take jobs that are not worthwhile from an overall efficiency point of view. A third alternative is to make assistance benefits unconditional, which has the advantage of leaving employment decisions undistorted. The disadvantage of unconditional programs is that it costs more to achieve a given benefit level per targeted worker. If there is a deadweight cost to raising revenue, then there is a clear trade-off between this revenue cost and the efficiency benefit of unconditional programs.

A second program design issue is whether benefits should be fixed at a given level per worker or whether they should be 'tapered' in the sense of being proportional to the actual loss suffered as a result of the trade shock. Provided that the value of non-market activities is known, a tapered unconditional assistance program achieves full efficiency.

Efficiency is not the whole story, as distributional issues inevitably arise as part of the debate over adjustment policy. This raises the fundamental question of what compensation programs are designed to accomplish. We offer a particular social welfare function that captures the compensation objective that we believe underlies much of the discussion of assistance programs. We are able to solve for the optimal level of assistance in both the unconditional and conditional fixed payment programs and compare the optimized values of the two. In general, depending on the underlying parameter values, it is possible for either program to be welfare superior, demonstrating the inherent uncertainty about the comparative welfare properties of trade adjustment assistance programs.

For our basic model, the tapered unconditional program can be made to welfare-dominate any of the other programs considered through an appropriate choice of the assistance level. If, however, the model is generalized to the case in which non-market opportunities are unknown and vary from individual to individual, then the unconditional tapered program no longer achieves full efficiency and does not necessarily dominate the other programs.

We have assumed that all sources of revenue have equal marginal resource cost (as would be implied by overall minimization of the social cost of raising a given amount of revenue). It is quite possible, however, that some sources of revenue might, in practice, be more efficient than others. Lawrence and Litan (1986) suggest financing trade adjustment assistance with (possibly temporary) tariffs. This would make such programs more attractive if tariffs had, on the margin, relatively low efficiency cost associated with them, although Clarette and Whalley (1987) argue that tariffs actually have higher distortionary cost than commodity taxes set at comparable rates.

Another concern has to do with rent-seeking. There is a large body of literature arguing that much of the value of any transfer program will be consumed by resources devoted to lobbying and other activities focused on expanding one's share of the resources being transferred. [See, for example, Bhagwati et al. (1984).] To the extent that an unconditional trade adjustment assistance program expands the total resources being transferred, increased consumption of resources in rent-seeking is likely to be an additional source of welfare loss.

Finally, there is the general problem of why workers displaced by a particular class of events (such as trade shocks) should be treated differently from workers displaced for other reasons. For that matter, it is often difficult to distinguish whether a particular group of workers has been displaced by an international trade event or by some other event, or by some combination of shocks emanating from various sources. There is actually nothing trade-specific in our modelling, so the issues raised in this paper apply immediately to a wide range of assistance programs.

A general inference to be drawn from our results is that optimal policy design is sensitive (over empirically relevant ranges) to underlying parameter values, particularly the cost of raising revenues. Our analysis also reinforces the obvious point that we need to be clear about the objectives of assistance policies before we can talk usefully about appropriate policy design.

Appendix

Proof of Proposition 3. First, note that if $\alpha \leqq \delta$, then no assistance is called for under either the conditional or unconditional regimes, and the two programs are equivalent. Our objective is to show that if $\alpha > \delta$ and the distribution of wage offers is uniform, then the unconditional program always is preferred to the conditional program. Without loss of generality we may assume that the old wage is 1 and that wage offers are distributed on [0, 1]. Rewriting expression (15) for the uniform distribution yields

$$B^u - B^c = [\sigma(2(\alpha-\delta)-\alpha\sigma) - s(2(\alpha-\delta)(v+s)-(1+\alpha)s)]/2. \tag{A.1}$$

There are four potential cases to consider: both s and σ could be corner solutions, both could be internal solutions, or one could be at a corner while the other is interior. The case in which both s and σ are at corner solutions has been covered by Proposition 2.

If s is internal, from (11) and (14) of the text we obtain $s = (\alpha-\delta)v/(1+2\delta-\alpha)$, and, from (A.1)

$$B^u - B^c = [\sigma(2(\alpha-\delta)-\alpha\sigma) - s(\alpha-\delta)v]/2. \tag{A.2}$$

If σ is at a corner, we have $\sigma = 1-v$ and $\delta < \alpha v$. From (A.2), $B^u - B^c =$

$[\sigma(\alpha v-\delta)+(\alpha-\delta)(\sigma-sv)]/2$. Noting that $\sigma > sv$ since $\sigma > s$ and $v < 1$, it follows that $B^u > B^c$.

If σ is internal, then $\sigma=(\alpha-\delta)/\alpha$, and from (A.2)

$$B^u - B^c = (\alpha-\delta)^2(1+2\delta-\alpha-\alpha v^2)/2\alpha(1+2\delta-\alpha). \tag{A.3}$$

For σ to be internal it must be the case that $\delta > \alpha v$ implying that $-\delta v < -\alpha v^2$. Substituting this in (A.3) yields

$$B^u - B^c > (\alpha-\delta)^2(1+2\delta-\alpha-\delta v)/2\alpha(1+2\delta-\alpha). \tag{A.4}$$

For s to be internal we must have $1+2\delta-\alpha > v(1+\delta) > \delta v$. It follows from (A.4) that $B^u > B^c$.

Finally, consider the case in which s is at corner ($s=1-v$), and σ is internal at $\sigma=(\alpha-\delta)/\alpha$. From (A.1) we can obtain:

$$2(B^u - B^c) = (\sigma - s)(\alpha v - \delta) + s^2 > 0. \tag{A.5}$$

Expression (A.5) must be positive as $s > \sigma$ and $\alpha v - \delta < 0$ if σ is internal. □

Proof of Proposition 4. An example in which the conditional program dominates the unconditional program. Consider the following parameter values: $\alpha=0.5$, $\delta=0.45$, $v=0.2$, $w^o=1$, and $w^*=0.8$. Suppose that the distribution of alternative wage offers is piecewise uniform with the following density:

$$f(w)=\begin{cases} 4, & \text{if } 0 \leqq w \leqq 0.2, \\ 0, & \text{if } 0.2 \leqq w \leqq 0.8, \\ 1, & \text{if } 0.8 \leqq w \leqq 1.0. \end{cases}$$

Thus most workers (80 percent of them) receive alternative offers less than the value of leisure, while the other 20 percent receive offers of between 80 and 100 percent of the old wage.

For the conditional regime, we calculate the optimal value of s using first-order condition (11) from the text. As $s=w^*-v=0.6$ the derivative $\mathrm{d}B^c/\mathrm{d}s$ is negative, while at any $s<(w^*-v)$ the derivative is positive, implying that the solution is a corner solution at $s=w^*-v=0.8-0.2=0.6$. This is the subsidy level that raises all workers receiving offers below v up to utility level w^*, but it induces no inefficient unemployment. Any further increases in s would generate inefficient unemployment.

As for the unconditional regime, the optimal value of σ is obtained from first-order condition (14), from which it follows that the solution is an interior solution at $\sigma = 0.1$. (The second-order condition for an internal solution is satisfied.) Note that $\alpha w^* - \delta < 0$ so we are not at a corner solution.

Noting that $F(v+s) = 0.8$ and that all integrals over the range v to $v+s$ are zero, we can use expression (15) to calculate the difference between the maximized value of the two regimes. The difference, $B^c - B^u$, is 0.02. Recalling that we have normalized the old wage to be 1 and the size of the worker pool to be 1, this means that the conditional regime offers an improvement in social value over the unconditional regime of about 2 percent of the old wage per worker.

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