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Market Responses to Anti-Hunger Policies: Effects on Wages, Prices and Employment

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MARKET RESPONSES TO ANTI-HUNGER POLICIES: EFFECTS ON WAGES, PRICES AND EMPLOYMENT*

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ABSTRACT

The way markets respond to anti-hunger policies can have considerable bearing on their effectiveness. This paper investigates market responses to various policies, including direct transfer payments, relief work, food pricing policies, public grain storage, external trade, and public information. A distinction is drawn between the transfer and risk benefits to the poor of anti-hunger policies. One of the main conclusions is that relief work can have significant transfer benefits relative to policy options, although this may require relaxation of some existing restrictions. A trade-off is also identified between the transfer and risk benefits, contingent on the performance of existing risk sharing practices and institutions. Empirical evidence is primarily for South Asia, particularly Bangladesh.

CONTENTS

1. INTRODUCTION

The economy is rarely a passive vehicle for transmitting a policy initiative to its target. People react to policy changes. A policy aimed at one class of people can easily bring with it unexpected gains and losses to others. Nor is it always clear how the target group will be affected, once the economy as a whole has reacted.

In targeting policies towards the needs of the poor in a market economy there will generally be some prices and quantities which appear in their budget constraints but are not controllable by the policy maker. An assessment is called for of how those prices and quantities will respond to the policy intervention before one can determine how welfare of the target group will be affected. Policy design may also be constrained by effects on the welfare of non-target groups. Only policies which keep these effects within certain bounds may be politically feasible in specific settings. For example, in designing policies aimed at raising the welfare of the rural poor one may be constrained to leave the post-tax wage of urban workers unaffected.

This paper surveys and analyses a broad range of anti-hunger policies in market economies, looking particularly at the way market responses can influence policy design. The method of analysis draws on both theoretical and empirical arguments with the latter applying almost exclusively to South Asia, particularly Bangladesh. The policies examined include direct transfer payments, public employment ("relief work" hereafter), food pricing policies, public buffer stocks, external trade policies, and public information policies. The survey is far from even handed. One policy is given more emphasis than the others, namely

relief work, while another potentially important one is not discussed at all, namely land reform. This bias seems in keeping with current emphasis amongst policy makers and this is understandable; in the main, the political preconditions for successful land and tenancy reforms have not been present, while there seems more immediate hope for relief work and similar income transfer policies.

A theme of this study is that anti-hunger policies should be concerned with two conceptually distinct aspects of individual consumption: its level over a period of time and its variability within that period. The need to raise the level of food consumed by those who are hungry is obvious enough. The concern with variability is motivated by the following argument. Consider two individuals with the same total food consumption over one week, say. The first consumes the same amount of food each day while the second consumes it all in one day. I would assert that the second will be more hungry. The key assumption here is that "hunger" is not a simple linear function of the amount of food consumed; rather the amount by which hunger diminishes for a given increment in consumption falls as consumption increases. This seems plausible over a wide range of consumption, although possibly less so at low levels; a small increment in food consumption may make little difference to someone who is on the brink of death by starvation. Figure 1 illustrates the assumed relationship between hunger and food consumption.

"Hunger" is not easily measured. Fortunately, one can say quite a lot about anti-hunger policies without being very specific about the measurement of hunger. It can be used the same way as the concept of "utility" in economics. But the objectives of anti-hunger policies can

sometimes be made more specific if one wishes, and there can be advantages in doing so. To give an example, famine relief is an important part of anti-hunger policy. The most important metric of the success of a famine relief policy is clearly mortality. There are good reasons to believe that the relationship between an individual's chance of death during some interval of time and the individual's food consumption over that interval will look something like Figure 1. The survival prospect may be hopeless at very low levels of food consumption and extra food will do little to alter this. But more generally one would expect that equal increments to food consumption will raise survival chance by progressively smaller amounts until, again, extra food makes little difference (or may even lead to a diminished survival chance).[1] There may well be kinks in the relationship at certain biologically critical levels of consumption but this makes little difference to the main argument and its policy implications.

Thus, whether one thinks of the policy objective as the reduction of hunger in general or of mortality as a particular (extreme) consequence of hunger, there is a case for believing that the variability of food consumption over time may be an important concern of anti-hunger policies. And, with possible exceptions at low levels of consumption, there will be an anti-hunger case in favour of reducing consumption variability over time even if this is not accompanied by an increase in the overall level of consumption.

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1. See Ravallion (1986a, 1987). Empirical evidence of convexity can be found in Preston (1975, 1980), Rodgers (1979), Schultz (1979), Williamson (1984) and Khan (1985).

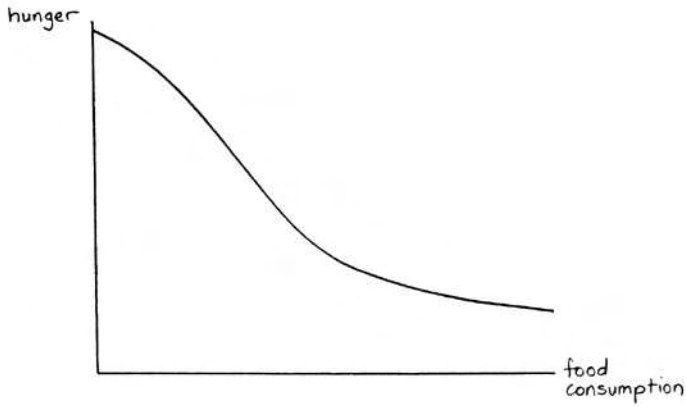

Figure 1

This leads one to distinguish two types of potential benefit to the target group from anti-hunger policies:[2] transfer benefits which occur if the policy increases mean food consumption of the target group over some time period and risk benefits which arise if the policy also reduces the variability of consumption within that period. Many anti-hunger policies will have both transfer and risk effects (and they need not be in the same direction). Nonetheless, it is convenient that most policies can be broadly classified as either transfer policies (where their main effects entail transfer benefits) or stabilization policies (which mainly yield risk benefits). The following two sections use this classification.

2. The following terminology is that of Newbery and Stiglitz (1981).

2. TRANSFER POLICIES

2.1 The Price Effects of Transfers

Much has been said about the possibly adverse effects of transfer payments made to the poor on the prices they face for the goods they consume intensively, such as food.[3] A well-known result here is that, under regular conditions in a stable and competitive exchange economy for two goods, the interpersonal transfer of an amount of one of those goods will raise (lower) its relative price if it is a good for which the donor has a lower (higher) marginal propensity to consume (mpc) than the recipient. The rural poor tend to have a high mpc for food, and it is likely to exceed that of potential donors. Under these conditions, supplementary food aid to the rural poor will result in them paying higher prices for the rest of their food. Such price effects will mitigate the transfer benefits of the aid to its recipient. If there are only two income groups in the economy - those containing the donor and recipient - then the recipient will still be better off. But there are exceptions to even this claim if there is a third income group trading in the same markets as the donor and recipient.

Suppose, for example, that there are two goods, food and a 'luxury' good, and three income groups, one of which (the third group) is not directly involved in the re-distribution. The 'donor' can be thought of as a high income country, the 'recipient' as the rural poor in a low

3. Adverse price effects have often been identified as a constraint on re-distributive policies in LDCs; see, for example, Griffin and James (1981), Sen (1981, Appendix B). The possibility of a "transfer paradox" in a stable competitive economy has received considerable recent attention; see Gale (1974), Chichilnisky (1980), Ravallion (1983a), Dixit (1983), and De Meza (1983).

income country and the third group as the rich in the low income country. The two countries trade freely. It can be shown that the recipient will be worse off when comparing general equilibria of the economy described above if:[4]

i) the donor has a higher mpc for the luxury good than the rich in the low income country,

ii) the rich in the low income country are net demanders of the luxury good (for example, they are rich farmers who trade their food surplus for the luxury good), and

iii) the total compensated substitution effect between food and the luxury good is sufficiently small.

Of course, this is only an example. And a well-informed recipient could never be worse off; the aid will simply be refused. But the example does at least illustrate how important market responses to transfer policies can be to their success.

The extent of integration between the markets facing donors and recipients is clearly an important determinant of those responses. In the above example, all agents trade freely in common markets. However, if donor and recipient are located in different markets (in that there is no trade between them) then the food transfer will increase supply to the recipient market. And so (under regular conditions) the transfer will lower the prices for food facing the recipient. Then recipients for whom the transfer is a supplement to their market purchases will gain in two ways: they will have higher incomes (which now include the imputed money

4. The result is proved in Ravallion (1983a).

value of the aid) and they will face lower food prices. The implication of these arguments is that even generous aid policies which are combined with trade liberalization may well be self-defeating; the aid is likely to be worth more to the recipient if it is combined with restrictions on trade.

All of the above arguments can be applied to other transfer policies. For example, in discussing relief work as a transfer policy, the two goods above can be interpreted as leisure and a composite consumption good. However, the underlying model precludes such an important feature of the economy in which relief work is provided - namely sustained unemployment of labour - that its practical relevance is doubtful. The following sections will examine market responses to transfer policies in models which permit unemployment.

2.2 Relief Work and Transfers to the Unemployed

Public employment has often been used as policy for relieving poverty and famines in South Asia and a number of recent studies have given strong support for this form of assistance.[5] It is appropriate to the present enquiry to concentrate on the potential transfer benefit from

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5. Relief works were an important part of the Indian Famine Codes of the late nineteenth century; see Bhatia (1967), Akyroyd (1974), Currey (1984) and Rangasami (1985). Similar policies have been followed at various times over recent decades in India, Pakistan and Bangladesh; there have been a number of recent surveys; see Ahmad and Hossain (1985), Bandyopadhyay (1985), Sundaram and Tendulkar (1985). The most famous programme of this sort is probably the "Employment Guarantee Scheme" (EGS) of the State of Maharashtra in India; see Abraham (1980), Dandekar (1983), Herring and Edwards (1983), Lieberman (1985). The EGS provided substantial relief during the severe 1970-73 droughts in Maharashtra; see Oughton (1982) and Dreze (1986). Recent advocates of relief work as an anti-hunger policy include Jodha (1978), Rath (1985), Walker et. al (1986), and Dandekar (1986).

relief work. However, it should be noted that, in general, this will only be one aspect of the benefits and costs to be considered by a public decision maker. For example, a comprehensive welfare economic evaluation of the case for an extra job on a specific project should also take account of the social value of its extra output, net of that of any sacrificed outputs from the worker's alternative activities.[6]

The transfer benefit to a worker from an extra job on relief work is defined as the worker's income gain from that job, net of any costs incurred, including lost (personal) earnings from alternative employment. Ignoring any effects on wages, other employment or other sources of income, an extra job on a rural works project will raise the worker's income by the amount of the wage rate for the job. More plausibly, both wages and other employment will change, although probably with opposite effects on rural incomes; an increase in public works employment is likely to put upward pressure on the agricultural wage rate leading to a reduction in demand for agricultural labour. Both effects have been observed in (for example) Bangladesh's Food for Work Programme (Osmani and Chowdhury, 1983; Ahmad and Hossain, 1985). Thus the income gain to an otherwise unemployed worker from an extra job could be above or below the wage rate for that job.

A simple model can help clarify the issue. The model includes a prominent feature of this setting, namely the existence of urban unemployment

6. In terms of cost-benefit analysis, the transfer benefit from an extra relief work job is one component of the shadow wage rate for that job, which must be exceeded by the social value of its extra output, before the job can be deemed a welfare improvement. But, of course, the shadow wage also includes the marginal social product of labour in its best alternative use. Transfer benefits and costs to other persons may also be involved. For a thorough treatment of the theory of shadow pricing see Dreze and Stern (1985).

associated with labour market dualism between the traditional (rural) sector and the modern (urban) sector in which real wages are relatively rigid. Large scale migration from rural to urban areas is common during lean seasons and famines. The Appendix outlines a model of dual labour markets incorporating the (Harris-Todaro) assumption of unrestricted mobility between the urban and rural sectors. While rigid in the urban sector, wages are assumed to be flexible in the rural sector. Relief workers are paid at the going wage rate in agriculture; there is no scope for undercutting that wage, although this will be relaxed later.

It is shown in the Appendix that, under these conditions, the marginal effect on employment in the agricultural sector (N_a) of an aid financed change in rural public works employment (N_g) is given by $-\varepsilon_a/(\varepsilon_a+N_u/N_a) < 0$, where ε_a is the wage elasticity of demand for agricultural labour (defined to be positive), N_u is the size of the urban workforce (including unemployed workers) and the N's are normalized so that $N_a+N_g+N_u=1$. Thus, even though there is unemployment, an increase in rural public works employment will displace at least some employment in agriculture. When the level of urbanization is low the outcome will resemble a full employment equilibrium in which the displacement will be close to one-to-one; total rural employment will be invariant to the size of the public works programme. For countries such as Bangladesh and India, the level of urbanization (N_u/N_a) is low, say 20 per cent, while the elasticity of demand for agricultural labour is probably in the region of -.7 to -.2.[7] Thus, the displacement effect will be between 20 and 50 per cent of the increase in rural public works employment. While

7. This is the range of elasticities obtained for India by Evenson and Binswanger (1985).

these numbers are only intended to be a very rough guide to the orders of magnitude involved, they do suggest that the displacement of other employment by relief work need not be negligible.

The Appendix also shows that the marginal effect of an increase in public works employment on total rural income

$$Y = w_a(N_a+N_g) \qquad (1)$$

is identical to its effect on the agricultural wage; both are positive and given by

$$\frac{\partial Y}{\partial N_g} = \frac{w_a}{\varepsilon_a N_a + N_u} \qquad (2)$$

This is the recipient's transfer benefit from an extra job on relief work. If it exceeds the wage for that job then extra public expenditure on relief work will have a multiplier effect on rural incomes. This will be the case if the elasticity of demand for labour is less than unity. The necessary and sufficient condition is that $\varepsilon_a < 1+N_g/N_a$. It can also be shown that, for a given value of ε_a, the multiplier will increase as the level of public employment increases; this is because for an iso-elastic (or any convex) demand function, successive increments to the public workforce will bid up the agricultural wage rate by increasing amounts. Further details can be found in the Appendix.

The range of figures considered plausible above for a country such as Bangladesh imply that the transfer benefit will exceed the wage rate, and will do so by quite a wide margin if agricultural labour demand is fairly wage inelastic. To give a numerical example, suppose that

ε_a = .25, N_a = .3 and N_u = .2 (so that, initially, N_g=0). Then the first job on relief work will raise rural income by a factor of 2.5 times the wage rate for that job. Clearly this is quite a substantial multiplier effect. And it will increase slightly as the public works programme expands; for example, under otherwise identical conditions, the multiplier exceeds three when N_g=.3.

It is worth noting that although the above case for public employment rests partly on the existence of unemployment, effective relief work need not be located within the region or sector in which that unemployment is actually found. Thus, relief work in even fully employed rural areas can yield substantial transfer benefits to the poor, although the unemployment is found elsewhere. For the simple model considered above, the transfer benefit is the same whether the extra job is in the urban area or the rural area. More plausibly, food prices will be higher in the cities, in which case the transfer benefit will favour the rural areas.

An alternative to providing relief work is to make transfer payments to the unemployed. There have been numerous, seemingly successful, attempts at targeting transfer policies to the urban poor, such as through rationed food stamps. Can such policies also have a multiplier effect on the total income of the poor, including the rural poor?

A transfer to unemployed urban workers will attract rural workers and so the agricultural wage will be bid-up. This will have a positive effect on rural incomes as long as the wage elasticity of demand for agricultural labour is less than unity. The total income of rural workers and the urban unemployed is

$$Y = w_a N_a + T(N_u - N_m) \qquad (3)$$

where T is the transfer made to each unemployed urban worker. It is easily demonstrated that, under the same conditions as above,

$$\frac{\partial Y}{\partial T} = \frac{N_u - N_m}{\varepsilon_a N_a + N_u} \gtrless N_u - N_m \text{ as } \varepsilon_a \lessgtr 1 + N_g/N_a \qquad (4)$$

Comparing this with (2) it can be seen that the income gain from extra public expenditure on relief work in rural areas equals that from the same expenditure on transfer payments to the urban unemployed. The two policies are perfect substitutes under these conditions. Again this would change in favour of rural relief work if (as is plausible) food prices are higher in urban areas.

2.3 Rural Unemployment and the Wage Rate for Relief Work

There is a widely held view that hiring unemployed workers in a public employment scheme will have little or no effect on wages and employment elsewhere in the economy. The validity of this view is questionable. For example, as in the model of the previous section, relief work can attract workers out of both (urban) unemployment and (rural) employment, with a positive effect on wages in the latter. Wage and employment effects also arise if existence of relief work for unemployed workers alters the bargaining power of employed workers. In a Nash bargaining game (for example) between workers and employers, the wages available on relief work are likely to influence the workers' threat point; the higher the wage rate on relief work, the higher (in general) the bargained wage rate for other employment.

Relief work can also have important short-run effects on labour markets which are in the process of adjusting toward a long-run (market clearing) equilibrium. To illustrate, consider a market in which, because of adjustment costs such as due to contracts, the wage rate does not adjust fully to its market clearing level in any one season; instead, it changes by increments which depend on the level of unemployment - the higher the unemployment, the higher the rate at which wages fall. (This is a standard assumption in analysing the stability of a competitive equilibrium.) Then, under regular conditions (including a downward sloping excess demand function for labour), relief work will raise wages above the level which would have otherwise obtained.

These effects have bearing on the policy choice of a wage rate for relief work, when the available budget for the policy is fixed. A worker's expected wage rate is the weighted mean wage rate for all jobs, with weights given by the probabilities of getting each job (including unemployment). If there are no effects on the wages for other jobs or the probabilities of getting those jobs, and both the budget and size of the workforce are fixed, then an increase in the wage rate for relief work will not affect the worker's expected wage; it will be offset exactly by the (consequent) fall in the number of relief jobs available and, hence, the probability of obtaining one of them. However, this ceases to be true if the wage rate for other employment is bid-up. It can be shown that the effect on the worker's expected income of an increase in the wage rate on relief work is positive if (and only if) the wage elasticity of demand for labour in other work is less than $1/(1+\phi)$ where $\phi = w_g N_g/(w_a(1-N_a)^2)$; see the Appendix.

For example, suppose that the wage rate on relief work is set at the value w_g^* such that all workers who want a relief job at that wage can have it (as recommended by Basu, 1986). Then $\phi = w_g/(w_a N_g)$ and so an increase in the relief wage will increase (decrease) a rural worker's expected wage if the elasticity of demand for labour in other work is less (greater) than $N_g/(N_g + w_g^*/w_a)$. For example, if the level of unemployment is high so that w_g^* is small relative to other wages then an increase in w_g will make workers better off on average as long as the elasticity of demand for labour is less than unity. As I have noted, this is plausible. Of course, unemployment will not still be zero, and workers may prefer to sacrifice some of the gain from a higher expected wage (as a result of a higher relief wage) so as to avoid the risk of their unemployment. I shall consider the risk aspect further in Section 3.

2.4 Financing Transfer Policies

The above arguments give an optimistic view of the potential rural income gains from an aid financed expansion of a rural public works programme or transfers to the urban unemployed. And this is so even if (as I have assumed) the output of the public works programme has no value to agricultural workers. However, the advantages of these policies are less obvious if the expansion occurs at the expense of other non-labour sources of income for the poor. In particular, suppose that the extra expenditure on relief work is financed entirely by a reduction in rural workers' non-labour income from another source, such as transfer receipts. It is clear that, without any effect on their other wage income, workers would gain nothing from such a change; their total income

would be the same (although they may naturally prefer not to have to work more).

However, this ceases to be true when their employment and wages from other sources are affected by the policy change. For the same model of a dualistic labour market used in Section 2.2, it can be shown that the introduction of a rural public works programme financed by a reduction in workers' other (non-labour) income will increase total income as long as $\varepsilon_a < 1$; a revenue neutral policy change away from transfer payments to relief work will have a positive transfer benefit. Furthermore, it is possible that the transfer benefit from an extra job on public works will continue to exceed the wage rate for that job; for example this will hold for $\varepsilon_a < 1/2$ when both the degree of urbanization and initial transfer receipts are small. The Appendix demonstrates the above results.

This has an implication for the current debate in India between proponents of public employment policies (such as Maharashtra's Employment Guarantee Scheme) and those who prefer transfer policies (such as payments in cash or kind made under the government of India's Integrated Rural Development Programme). Under the above conditions, workers' expected incomes can be raised by cutting their transfer receipts and using the funds so generated to finance extra employment. The same holds for transfer payments to the urban unemployed.

An alternative way to finance transfers is by taxes levied on the modern sector. For example, a large share of the cost of Maharashtra's EGS is financed this way. Such financing will reduce the transfer benefit to the poor if the tax is passed on in modern sector wage rates, leading to diminished employment opportunities in that sector. However,

even if the tax is passed on fully in urban wages, it can be shown that relief work or transfer payments to the unemployed will still produce positive transfer benefits and that, under the same basic conditions as before, that benefit will continue to exceed the government's outlay.[8] The detailed argument is given in the Appendix.

2.5 The Seasonal Allocation of Relief Work

There is little that can be done about the natural constraints on the seasonal allocation of relief work, such as the monsoon. But there are also some man-made constraints. It is often recommended that the timing of relief work should be chosen to avoid competition with the private sector. For example, work on Maharashtra's EGS is usually terminated as soon as harvesting begins. It may well be that the social value of any forgone output from providing relief work in harvest periods is higher than at other times. However, the transfer benefits of relief work are also relevant here. This is obvious when the sole concern is relief from hunger. The transfer benefits also matter when the objective in allocating relief work is to maximize a broader concept of social welfare. The appropriate shadow wage rate for the evaluating relief work is then the marginal social product of labour in alternative employment less the marginal social value of all transfers involved, including that of the worker's income gain (Little and Mirrlees, 1974, Dreze and Stern, 1985).

8. It can also be remarked that, under similar conditions, the value of a transfer payment to rural workers financed by a tax on urban workers will be diminished by its effects on wages and employment. Indeed, it can be shown that rural workers' wage rate will fall by more than the amount of the transfer payment in a Harris-Todaro economy for which the wage elasticity of labour demand is greater in the modern sector than in agriculture (Ravallion, 1984).

Following the arguments of previous sections, it is clear that the practice of avoiding competition with other employment could well reduce the transfer benefits from relief work. It is precisely the existence of competition between public and private employment which makes it possible to achieve high transfer benefits.

The model of dualistic labour markets used in Section 2.2 can be used to illustrate this point. Suppose that a given amount of aid is to be allocated as relief work between the peak and off-peak periods. Also suppose that:

i) the wage rate is lower in the off-peak period,

ii) the wage elasticity of demand for labour is unity in the off-peak period, but less than unity in the peak period.

It is then easily demonstrated that, at the point of introducing relief work, the transfer benefit from an extra job (averaged over the two seasons) will be greater if that job is provided in the peak period. Condition ii) above can be relaxed a good deal without altering the outcome; it is not even necessary that the elasticity of labour demand is greater in the lean period. Denoting the values of all relevant variables in the two periods by the superscripts: h for the peak ("harvest") period and l for the off-peak ("lean") period, the necessary and sufficient condition for the marginal effect on income of an extra job in the peak period to exceed that for the off-peak period is that (from equation 2):

$$\frac{w_a^h}{\varepsilon_a^h N_a^h + N_u^h} > \frac{w_a^l}{\varepsilon_a^l N_a^l + N_u^l}$$

Under this condition, the transfer benefit will be greater if the extra job is provided in the peak period.

There are two important caveats on this argument:

i) The extra relief job in the peak period will, of course, cost more to the funding agency. When the latter's budget is fixed, the relief work should only be provided in the peak period when the transfer benefit from doing so exceeds that from an off-peak job by a margin sufficient to cover the extra cost to the budget. And note that that cost will exceed the initial wage rate since the latter will be bid up. The problem sounds complicated but in fact with a little algebra it can be shown that the decision criterion with a fixed budget is quite simple. The relief work should be provided in the peak period if (and only if):

$$(\varepsilon_a^l - 1)N_{a_a}^l > (\varepsilon_a^h - 1)N_a^h$$

The Appendix proves this result and also discusses the general problem of finding the optimal seasonal allocation of relief work.

ii) In addition to the transfer benefit, it is likely that there will also be a stabilization benefit from providing relief work during low-income periods. And this could outweigh the case in favour of letting all relief work compete with peak period activities. I shall return to this point in Section 3.

Of course, the benefits to the poor have not been the sole reason for providing relief work in the past. For example, one motive for the introduction of Maharashtra's EGS in the early 1970's appears to have been to discourage worker migration to urban areas during the lean

seasons and drought affected years, since some workers were not returning for the next harvest.

Taking the argument a little further, it is not difficult to imagine circumstances in which rural relief work provided in lean periods can have negligible (or even a negative) effect on workers' annual income. By encouraging workers to stay in the village during the off-peak season or during lean years, relief work can be used to keep down the peak period wage rate.

However, there is another, quite common, argument in favour of restricting competition between relief work and other employment. And this is motivated by a concern for transfer benefits to the poor. The argument is that relief work can be made self-targeting, by setting the wage rate low enough to discourage better off workers. This is an advantage over direct transfer payments for which effective targeting has often proved difficult.

> "Targeting is effective, however, only if wages for public employment are substantially below market wages. Otherwise, public employment will attract people other than the poor and will displace private employment." (The World Bank, 1986, p.38)

Clearly this assumes unemployment of the strict (Walrasian) kind in which the wage rate is somehow prevented from falling to its market clearing level. Then there will be idle people who would like to work at the going wage rate, and will also take the work at some lower wage rates (as long as their supply schedule is rising).

There are a number of reasons to doubt the generality of this argument. As was pointed out in Section 2.3, when there is unemployment and labour demand is not too wage elastic, the expected income of a rural worker (who has at least the average chance of getting a job) will fall if the relief wage rate is cut, holding total public expenditure on the policy constant. The self-targeting argument for low wages on relief work as an anti-hunger policy appears to apply best to people with little or no chance of getting any other work, such as minority groups who face discriminatory restrictions on their employment. (For example, the EGS has been popular amongst poor women in Maharashtra; see Dandekar, 1983).

Nor is the assumption of (Walrasian) unemployment plausible in all the circumstances in which relief work could be provided, and so one should be cautious in applying the self-targeting argument generally. It is clearly inappropriate to the peak seasons of high labour demand. As I have already argued, there are likely to be large transfer benefits to workers from stimulating competition in rural labour markets in such periods. And this undoubtedly includes workers who would be attracted at other times into relief work at low wages. Faced with the option, poor workers could easily do better by saving the transfer gains generated by relief work in the peak period than by taking the low wage in off-peak work.

Nor is it obvious that Walrasian unemployment in off-peak seasons is the sole cause of rural poverty. In many places in the subcontinent, real wage rates are highly seasonal, often falling considerably in off-peak seasons as a result of higher food prices and/or lower money wages; see, for example, Chaudhury (1981). Even so, one suspects that this is

rarely enough to clear the markets without adjustment on the supply side. But it is not uncommon in the subcontinent for rural labour markets to also adjust to the seasonality of demand by migration. The able people who remain in the villages generally do some sort of renumerative work, but at a low wage rate or a low rate of profit from self-employed activities.

Under these conditions, the primary cause of rural poverty and hunger in off-peak seasons is not unemployment (again in the strict sense of the term), but low real wages due to low demand for labour. There will be little scope for undercutting the wage rate. Relief work will displace other rural employment and some workers who would have otherwise migrated elsewhere will no longer do so. But these changes are an essential part of the adjustment mechanism which, as previous sections have illustrated, can give rise to substantial transfer benefits from relief work.

2.6 Wage and Employment Effects on Food Pricing Policies

A reduction in the nominal price of food which is not accompanied by an equi-proportional fall in income will raise an individual's food entitlement. More generally, the various prices and quantities which determine income will also respond and so influence the transfer gains from anti-hunger policies such as food price subsidies or export taxes.

In discussing these effects I will concentrate on landless (or near landless) rural workers as the policy's main target group. Then our interest is to determine the effects of changes in food prices on their wages and employment.

An important distinction here is between policies which drive a wedge between consumer and producer prices and those which do not. A potential link between food prices and wage earnings in agriculture is through the demand side of the labour market. This link is broken if the fall in price paid for food by a consumer can be achieved without altering the price received by the producer.

However, consumer price subsidies on foodgrains can be costly. The government must finance the subsidized component of grain consumption, and not just for the poor. (Although limited price discrimination is usually possible in urban areas and this is one way of making transfers to the urban poor, such as discussed in Section 2.2.) The enforcement cost can also be high in rural areas. For this reason, many governments have preferred intervention aimed at keeping the domestic market price low (for both producers and consumers). A common means of doing so is by taxing food exports. Another is by promoting domestic production of (non-traded) foods, such as by subsidizing inputs to their production.

The anti-hunger case in favour of such a food pricing policy is contentious when other prices and quantities determining food entitlements of the poor are responsive to the policy. In particular, it has been argued that, by stimulating food production and the demand for agricultural labour, high food prices may actually benefit workers, even when they are net demanders of food.[9] This argument rests heavily on the assumption that, through the demand side effects on the agricultural

9. See, for example, Brown (1979). This is presumably the reasoning behind a recent World Bank Policy Study when it argues that (in reference to countries such as India and Bangladesh): "Low food prices clearly benefit the urban poor, but they have no effect on subsistence farmers and an ambiguous effect on the landless". (World Bank, 1986, p.40).

labour market, higher (lower) food prices will lead to (at least) equi-proportionally higher (lower) agricultural wages.

Is this plausible? I would be surprised if anyone who has observed the movements over time in agricultural wages in South Asia would argue that food price increases were generally passed on fully in wages within, say, the current season. Short-run stickiness of wages in both directions is a common feature of agricultural labour markets in South Asia and elsewhere.[10]

The argument may be a good deal more plausible over a longer period of time sufficient for markets to clear. In a simple partial equilibrium model of an agricultural labour market which clears at notional labour demand and supplies, themselves depending solely on the real wage in terms of food, an increase in the nominal price of food will be passed on fully in the nominal wage rate.

But this is not generally true in a dualistic labour market in which, although rural wages are flexible, the modern sector wage rate is fixed (in terms of either one good, or a composite good). Under similar assumptions to those made in previous sections, it can be shown that an increase in the price of food will lead to a deterioration in the food wage rate in agriculture, except in the special case in which both labour demand and the food wage rate are fixed in the modern sector. (See the Appendix for details.)

Bangladesh's experience over the last three decades does not suggest that food price increases are passed on fully in the agricultural wage

10. For evidence see, Rath and Joshi (1966), Lal (forthcoming), and Ravallion (1982). Further evidence for Bangladesh is given below.

rate, even in the long-run. Boyce and Ravallion (1986) have examined the dynamics of agricultural wage adjustment to the prices of agricultural and industrial goods over this period. Their econometric model is

$$w_t = \alpha_0 + \alpha_1 w_{t-1} + \beta_0 p_t + \beta_1 p_{t-1} + \gamma_0 q_t + \gamma_1 q_{t-1} + \delta t + \mu_t \qquad (5)$$

where w_t is the nominal wage rate at time t, p_t is the money price of rice and q_t is the money price of cloth. All these prices are in log form. If the long-run real wage rate in terms of food is neutral to an equi-proportional change in <u>both</u> goods prices (leaving the relative price of food for clothing constant) then this model must satisfy the following homogeneity restriction on its parameters:

$$\alpha_1 + \beta_0 + \beta_1 + \gamma_0 + \gamma_1 = 1 \qquad (6)$$

This assumption is strongly supported by the data; on imposing homogeneity, one obtains the following estimate (in error correction form[11]):

$$\Delta w_t = \underset{(4.0)}{.81} - \underset{(3.9)}{.20}(w-p)_{t-1} - \underset{(2.8)}{.13}(p-q)_{t-1}$$

$$+ \underset{(4.2)}{.23}\Delta p_t + \underset{(2.9)}{.15}\Delta q_t$$

$$+ \underset{(1.6)}{.23\times10^{-2}}t - \underset{(2.5)}{.39\times10^{-3}}t^2 \qquad (7)$$

$R^2 = .81$ SEE = .054 D-W = 1.69 n = 31

The short-run elasticity of the agricultural wage rate to the price of

11. For further discussion of this dynamic specification see Hendry, Pagan and Sargan (1984) or Hendry and Richard (1983). For a similar application see Ravallion (1982).

rice is .23, implying that the rice wage rate has a short-run elasticity of -.77 to the price of rice. Adjustment is more complete in the long-run, but even so the implied long-run elasticity of the rice wage rate to the price of rice is -.45.[12]

It appears then that, for Bangladesh at least, the desirable short-run effects of lower food prices on the incidence of hunger would be reinforced by the more long-term effects on real wage rates. While the final transfer benefit will probably be mitigated by reduced demand for labour, it is likely to be positive since wage elasticities of demand in this setting are unlikely to exceed unity.

12. This is obtained by setting $\Delta w_t = \Delta p_t = \Delta q_t = 0$ and solving for $(w-p)_t = (w-p)^*$ for all t as a function of $(p-q)_t = (p-q)^*$. Also note that the time trend t in (10) is set to zero at the mid-point of the series (so that t and t^2 are orthogonal). The result in (10) suggests a turning point in real wages at about the midpoint (1965); real wages in Bangladesh's agriculture have been on a downward trend since then.

3. STABILIZATION POLICIES

3.1 Are Stabilization Policies Needed?

The anti-hunger case in favour of stabilization is less straightforward than that for transfer policies. This is because, even in the most traditional societies, there already exist practices and institutions which are involved in spreading risks over time and sharing them between people. And it is conceivable that they work quite well.[13]

To illustrate, consider the (hypothetical) situation of an individual who holds rational expectations of his or her future income and has access to a perfect capital market. This person will be able to make food consumption invariant to fluctuations in food entitlements around their life-time mean. He or she could, of course, still starve; but this will be because of an inadequate lifetime wealth rather than the volatility of food entitlements.

However, if these (admittedly very strong) conditions do not hold in practice then there will also be scope for policy interventions aimed at expanding the individual's opportunities for buffering consumption from fluctuations in entitlements. For example, government loans or subsidies may be used to stimulate the use of private but cooperatively used storage facilities. There are also possibilities for intervention in rural credit markets (such as the widely praised Grameen Bank in Bangladesh; see Hossain, 1984; Ahmad and Hossain, 1985). To give another

13. For example, though little evidence is presented, Morris' (1974) faith in existing risk sharing practice and institutions has led him to be critical of famine relief policies. For a critical assessment of Morris' views see Jodha (1975). Also see Torry's (1986a) recent discussion of the debate.

example, the introduction of a government backed financial asset with guaranteed food purchasing power could offer an attractive alternative to storage and would avoid the familiar problem of declining real asset prices in terms of food during famines.

So how well do existing risk sharing institutions work?

The traditional practice for spreading food risk over time is asset storage. The main asset used is foodgrain stock, although other real assets (such as land) and money are also used in market economies. Foodgrain storage can be done in the simplest subsistence economy and is undoubtedly the most long-standing risk-sharing practice. In the more complex rural societies now typical of Asia, a number of social institutions are also involved in risk sharing; these can be classified under two headings: the moral economy and markets.

A widely accepted historical picture of the evolution of risk sharing practices and institutions in South and Southeast Asia suggests increasing reliance by the poor on markets.[14] It is believed that, as transport and communications started to improve from about the mid-nineteenth century, trade progressively replaced on-farm asset storage. Also, increasing rural landlessness, (particularly over recent decades) has been associated with an increasing reliance by the poor in the subcontinent on markets for labour, credit and grain. It is also widely believed that the moral economy has declined in importance as a risk sharing institution in South and Southeast Asia.[15] And there is

14. See, for example, Bhatia (1967) and Béteille (1980).

15. This has been argued by, Scott (1976), Jodha (1978), Béteille (1980) and Collier (1981). Nonetheless, Ravallion and Dearden (1986) find that the pattern of voluntary transfer payments in rural areas of Central Java is inequality reducing.

some evidence that institutions such as patronage are vulnerable to severe shocks such as famines.[16]

The reasons for some of these changes are far from clear and their full explanation is beyond the scope of this paper. But they do suggest that variability of consumption over time may depend a good deal on performance of markets as risk sharing institutions in agrarian economies. I shall briefly discuss some of the empirical evidence on the performance of rural credit markets and foodgrain markets in South Asia, and its bearing on anti-hunger policies.

Credit Markets

Popular opinion in the subcontinent is that rural credit markets work rather badly. In fact, the debts arising from access to credit from professional money lenders have been widely identified as an important cause of the impoverishment and vulnerability to famine of the peasantry. Many observers have thought the levels of indebtedness found in rural India to be excessive; by this view, the problem is not the lack of access to credit but its abundance.

The basis for this judgement has not always been obvious, and appears often to be more a reflection of the observer's values than problems facing the indebted agriculturalist. Take, for example, Malcolm Darling's description of the extravagance he found in Ferozepore in Central Punjab after the expansion of irrigation:

16. See, for example, Lewis and Barnouw (1958), Jodha (1978), Greenough (1982). Also see Torrey (1986b) who argues that the ways in which the 'moral economy' of a Hindu Indian village changes during a famine are consistent with pre-famine moralities and social structures.

"The sudden acquisition of wealth, due more to good fortune than to effort, partially demoralized the people, stimulating extravagance, dissipation and drink. The money-lender, who might have been shaken off altogether, secured a firmer hold than ever". (Darling, 1947, p.71).

It is hard to see why someone should not want to go into debt in order to raise current consumption after an unanticipated increase in future income. And this is exactly what the peasants of Ferozepore appear to have done. The only genuine cause for concern here would seem to be if future income is systematically overestimated or if there are monopolies or other distortions to credit markets. Such conditions would prevent the peasant from achieving her or his most desired spread of consumption over time, consistent with life-time wealth at competitive rates of interest. While there can be no a priori presumption that such conditions did not exist, the evidence in the literature is far from convincing.

Careful observation of the way rural credit institutions work in practice can, however, provide very useful insights. Studies of rural credit institutions in India have often revealed a complex, highly fragmented structure involving a variety of interest rates and contractual agreements often involving interlinkage with other markets. But it is difficult to come to a firm conclusion about market performance from such studies. For example, although the rationing of credit according to collateral (particularly land) is common, it may be unavoidable when lenders are risk averse and they face incomplete information and imperfect insurance markets (Stiglitz and Weiss, 1981;

Binswanger and Sillers, 1983). As a consequence, even a landless worker with very good future income prospects can readily starve. To give another example, the fact that the interest rates charged by professional money lenders typically exceed those charged by formal (government sponsored) sources need not reflect a market imperfection. Money lenders can often provide credit far more quickly than the formal market, and farmers are often willing to pay a higher rate of interest for this service (Bhende, 1983; Binswanger et. al, 1985).

An alternative approach to assessing market performance in this setting is to examine the way consumption is actually allocated over time, looking particularly for signs of a divergence from the allocation one would expect to be made in a perfect capital market in which agents hold rational expectations of future income prospects. The main result used in this approach is due to Robert Hall (1978) who demonstrated that the joint life-cycle/rational expectations hypotheses imply that the residuals from regressing consumption against its own lagged value in the previous period should be uncorrelated with all information available in that period. Past tests of the Hall hypothesis have largely been based on aggregate time series data for developed countries.[17] Elsewhere I have tested the Hall proposition on household level panel data over 1976-1980 for three villages in dry regions of peninsular India (Ravallion, 1986b). These data give a convincing rejection of the proposition; a number of variables in the lagged information set are found to have individually and jointly significant correlations with the residuals of an AR1 model of consumption. The intertemporal allocation of household

17. These have been motivated by the long-standing concern of economists and policy makers with the effectiveness of temporary changes in national income as a macroeconomic stabilization policy.

consumption in these villages is not consistent with the optimal allocation of life time wealth that one would expect in a perfect (including informationally efficient) capital market.

This said, it must also be remarked that households in these villages are generally able to (quite substantially) insulate their consumption from income fluctuations. When averaged over all households, the short-run marginal propensity to consume out of current income is low, ranging from .18 to .29. It does increase as income or wealth falls, but at a slow rate, so that even households with negligible wealth have, on average, a low marginal propensity to consume from current income; my estimates range from .17 to .35. Risk sharing practices and institutions may not work as well as they could, but they are active in these villages.

Foodgrain Markets

Nor has the popular opinion been that foodgrain markets work well. The interests of buyers and sellers are naturally opposed over price. Relations between merchants and the rural and urban poor in the subcontinent have often deteriorated to the point of violence when food prices rise. "Hoarding" by merchants is a popular explanation for the high grain prices observed during many famines.[18]

While hostility toward the private grain trade during famines is common, and can be readily understood, it does not necessarily reflect a sound judgement of market performance. Hoarding can be a highly desirable response of current foodgrain markets to future scarcity. And

18. See, for example, Das (1949), Greenough (1982), Hartmann and Boyce (1983), Arnold (1984), Try (1984) and Steele (1985).

it can be desirable from the point of view of the survival chances of the rural poor as well as the profits of speculative traders; anyone close to death now from starvation is likely to want food stocks to be released, but it is possible for this to result in many more people starving in the future. The crucial question here is how well stockholders have anticipated future scarcity.

But one should be equally cautious of the faith in markets which some economists hold. Consider, for example, Peter Bowbrick's claim that:

> "There is an enormous literature on speculation, hoarding and storage dating back at least to Adam Smith. One thing is agreed - that the uninformed layman's criticisms of speculation are unfounded. .... Hoarding, like speculation, is a bogeyman invoked by politicians and administrators." (Bowbrick, 1986, pp.118-121).

As Sen (1986) has noted (in response to Bowbrick), anyone familiar with the theoretical conditions needed to support such a faith in markets should be reluctant to share that faith without some good evidence.[19] And the evidence provided by many past studies of agricultural market performance has been of doubtful value.[20]

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19. Not even the "ideal" conditions of competitive (price taking) behaviour with perfect foresight are sufficient to guarantee that speculation is price stabilizing; see Hart and Kreps (1986).

20. The conventional (and popular) tests for "efficiency" through spatial and temporal market integration have been criticised by Blyn (1973), Harriss (1979), Rudra (1982), and Ravallion (1986d, 1987), in which alternative tests for market integration are proposed which avoid the main problems of the received methods. And the new tests suggest very different conclusions about the "performance" of rice markets in Bangladesh during the 1974 famine. Heytens (1986) has applied some of my (1983b) methods to Jones's (1972) data for Nigeria and shown that the results cast considerable doubt on Jones's earlier conclusion that the Nigerian markets for food staples are well integrated.

Elsewhere I have examined the "hoarding" issue at length and have offered some evidence for Bangladesh (Ravallion, 1985a, b, 1987). I shall only summarize my conclusions here.

A convincing case can be made to support the view that rice hoarding prior to anticipated production losses was excessive during the 1974 famine in Bangladesh, when compared with the likely outcome under competitive conditions with rational expectations. Overreaction to new information on future scarcity appears to have had a de-stabilizing influence on the markets. Rice prices rose to unnecessarily high levels, particularly in the autumn of 1974 when agricultural employment was also low (and probably even more so than is usual for that season). And prices fell equally dramatically before the arrival of the next winter's (late and heavily depleted) harvest. Thus the worst months of the famine in terms of deaths occurred before the decline in food output due to flooding. The high and unstable foodgrain prices in Bangladesh cannot plausibly have been generated by an efficient market and they do appear to have been a major contributing factor to excess mortality.

In summary: from the available (albeit rather sketchy) evidence it appears that there is scope for anti-hunger policies which aim to improve the performance of existing risk sharing practices and institutions.[21]

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21. It should be emphasised that the aim of stabilization policies in this context is not to raise mean consumption but to buffer current consumption opportunities from income fluctuations. It can be argued that stabilization is an important part of the social security function of anti-hunger and other 'basic-needs' oriented social policies such as those pursued by Sri-Lanka up to 1977. Failure to consider this aspect of such policies can lead to confusion when interpreting evidence on their basic-needs performance; for an example, see my (1986e) comments on Bhalla and Glewwe (1986).

The remainder of this section will examine likely market responses to some of the policies that have been advocated in the past.

3.2 Public Storage

A policy implication of the above results is that price stabilization may have an important role in anti-hunger policies, particularly famine relief. Public buffer stocks are the traditional instrument for this purpose.

The effects of public storage in stabilizing consumption by the poor depend crucially on the way markets work. Policy makers and governments have often been ignorant of these effects; indeed, they have sometimes acted as if private storage does not exist. But an increase in the government's stocks will invariably displace at least some amount of private storage. Indeed, if markets are competitive and the price expectations on which private storage decisions are based are rational then the displacement effect will be one-to-one; changes in the government's stock level will have no effect on the total amount of storage in the economy. Of course, this is a very special case and (as I have argued above) an implausible one in at least one setting. More generally, public storage probably matters. But it is also clear that the effects of buffer stocks depend crucially on the nature of the private grain trade.

A brief elaboration of this point will illustrate just how important market responses can be. My work in Bangladesh rice markets has taught me how influential information can be on markets. An important part of that information is the level of the government's foodgrain stock, itself

determined by the government's past procurement efforts and by food aid and imports. When this is believed to be low, the traders expect future prices to be high. But they do not have rational expectations; I found that their ex-post forecasting errors are generally and quite strongly correlated with ex-ante information (Ravallion, 1987). Combining these observations, one can paint a rather grim picture of what can happen to such an economy if public stocks get too low and this is known. Indeed, it is entirely possible that, at low levels of public storage, an injection of grain into the economy will be completely ineffective in bringing the price of grain down; all of the drop in public stocks will be absorbed into private storage. The markets will make a successful speculative attack on the government's stock position. I have argued elsewhere that this is quite a plausible interpretation of conditions in Bangladesh during the 1974 famine (Ravallion, 1987). Indeed, this may well be the most important lesson from Bangladesh's experience in 1974. And it can be argued that greater public confidence in the government's ability to stabilize food consumption was an important reason why Bangladesh was able to (narrowly) avoid further famines in 1979 and 1984 (Osmani, 1986).

3.3 Trade and Stabilization

International trade in food has recently been advocated as an alternative and less costly stabilization policy to buffer stocks.[22] The essence of the partial equilibrium argument is simple: by raising the local food price relative to prices elsewhere, shocks to domestic consumption opportunities should be at least partly offset by an increase in imports or fall in exports. Then trade should help buffer aggregate domestic consumption from random shocks to, for example, price expectations or production possibilities.

Of course the effects of trade on the interpersonal distribution of consumption are also of concern here; for example, while famine mortality can be reduced by stabilizing consumption over time, trade is also likely to affect mortality via its effects on interpersonal distribution. If (as is common) restrictions on trade are used to keep domestic grain prices below world prices then free trade could well have sufficiently adverse effects on interpersonal distribution to mitigate its stabilizing influence on intertemporal distribution.

The experience of British India around the turn of this century provides a rare opportunity for studying a famine vulnerable economy with easy access to foreign markets. British India had virtually unrestricted external trade for many decades prior to the First World War and highly variable aggregate foodgrain production. The subcontinent was a net exporter of foodgrains (particularly rice) for most of the period, which included a number of severe famines (Bhatia, 1967; Ghose, 1982).

22. See, for example, Weckstein (1977), Bigman and Reutlinger (1979), Reutlinger (1982) and The World Bank (1986).

Thus free trade in foodgrains is likely to have reduced Brit India's aggregate grain consumption. To the extent that price elasticities of (net) demand for staple foodgrains tend to decline with the amount consumed, higher grain prices are also likely to have adversely affected interpersonal distribution.[23] But did it help stabilize consumption over time? Sluggishness in trade's response to domestic scarcities can arise from, for example, domestic price stickiness, the existence of long term contracts and delays due to transport. Following Sen's (1981) theory of "slump famines", strong and adverse income effects in the famine region can also undermine the potential for stabilization by trade.

The stabilizing performance of trade can be tested by regressing exports against output; a positive coefficient indicates that trade helped buffer domestic availability from output fluctuations. Allowing for dynamic effects and using Blyn's (1966) estimates of foodgrain output (Y) and net trade flows (X) for British India (excluding Burma) over the period 1892 to 1914, I obtained the following result (both quantities in million tons):

$$X_t = \underset{(4.7)}{-6.9} + \underset{(4.0)}{.51X_{t-1}} + \underset{(5.0)}{.075(Y_t+Y_{t-1})} \quad R^2 = .67 \text{ Durbin h} = .34 \qquad (8)$$

A significant positive marginal rate of export is indicated, although the effect is small in the short-run: only 7.5 per cent of a fall in output would have been passed on to trade. Export sluggishness is also indicated by the significantly positive effect of lagged exports. And so the long-run marginal rate of export of about 30 per cent is a good deal

23. Income effects are likely to reinforce this; see Ravallion (1987).

higher than the short-run figure. Nonetheless, even in the long-run, the stabilization of aggregate availability by free trade was far from complete.

While these results are not encouraging, there may be scope for government intervention using trade taxes or quotas aimed at enhancing the responsiveness of external trade to domestic prices. A stabilizing tax on trade is one in which exports are taxed (imports subsidized) when output is below normal while otherwise exports are subsidized (imports taxed). The main drawback of such policies is thought to be the induced instability of tax revenue (Reutlinger, 1982). Elsewhere I have calculated a fully stabilizing trade tax, designed to be revenue neutral in the long-run (Ravallion, 1987, Ch.7). The revenue variation would have been considerable. For example, as a percentage of the total budget of the government of India in 1900, tax revenue would have ranged from 73 to 66, with a standard deviation of 34. These results confirm the view that revenue instability of a stabilizing trade tax is likely to be large. This suggests that some form of monetary buffer stock, such as the IMF's food financing facility, may be essential for the future success of such policies.[24]

3.4 Relief Work as an Income Stabilizer

It has been argued that relief work policies can also generate sizeable stabilization benefits when the available work is allocated to low-income periods. One recent study which compared the risk benefits of

24. For further discussion of the IMF's food financing programme see Huddleston et al. (1984) and The World Bank (1986).

such a scheme to crop insurance policies for dryland agriculture in India concluded that, despite its shortcomings, "... a public works programme like the EGS is the best institutional bet to protect a large number of poor rural households from the ravages of income variability ..." (Walker, et al., 1986, p.A-86).

The stabilization case for relief work can make it desirable to allocate some work to off-peak seasons even when this reduces the transfer benefit. To illustrate, consider the problem of allocating a fixed budget for relief work between two seasons. Wages and employment behave according to the basic model of Section 2.2; to reiterate: workers are mobile between the rural sector in which real wages are flexible and an urban sector in which the wage rage is fixed above its market clearing level. The seasonal allocation of relief work is chosen to minimize hunger over the year, where hunger in each season is a convex function of that season's income. For analytical convenience that function is also assumed to have a constant elasticity, the value of which (following common practice in risk analysis) is interpreted as a measure of (relative) aversion to the risk of hunger. The Appendix shows that the budget set B of affordable seasonal distributions of relief work is strictly convex; as depicted in Figure 2. However, as the Appendix also shows, there is the possibility of a non-convexity in the set H of all possible seasonal distributions of relief work which guarantee that annual hunger does not exceed any given amount. This is also illustrated in Figure 2. Furthermore, the lower the aversion to hunger risk, the more likely it is that there will be a non-convexity in H. (Noting that seasonal income is a strictly convex function of relief work under the above assumptions; see the Appendix for details.) For example, if hunger

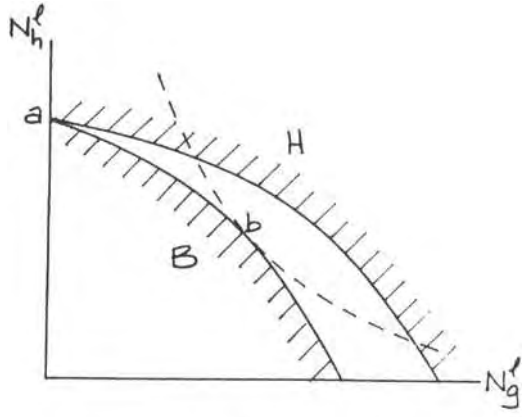

Figure 2

is linear in income so that the policy objective is simply to maximize annual income; then H will not even be weakly convex. But as aversion to the risk of hunger increases, the lower boundary of H will become more linear, and eventually the set becomes convex.

Consider now the situation in which annual income is maximized by providing all of the relief work in the peak period (as will be the case under the conditions in Section 2.5). Then, following the above argument, there will be some degree of aversion to the risk of hunger which would justify shifting some of the available work to the off-peak season. This is illustrated in Figure 2 where the dotted line indicates the new lower bound for H obtained with (sufficient) aversion to risk. This shifts the optimal seasonal distribution of the relief work from a to an interior point such as b.

An important caveat on this argument is that relief work may not be the best way to achieve the benefits to the poor of greater stability of consumption over time. As I have discussed earlier, assets generated in peak periods can be saved. There may also be useful ways of combining public employment and credit schemes, to permit workers in lean times to borrow from their future labour incomes, paying the loan back in the form of relief work. While it is likely that some consumption stabilization will make poor people less hungry, it is also desirable that the policy pursued should minimize the cost (in terms of annual or life-time wealth of the poor) of achieving a given degree of stability.

3.5 Public Information

There have been a number of recent attempts to identify key indicators for early warning on food crises in vulnerable economies such

as Bangladesh and Ethiopia.[25] The idea is not new. For example, the Madras Famine Code of 1883 strongly recommended monitoring grain prices as an indicator of famine (Rangasami, 1985), and the Bengal Famine Code of 1918 outlined an elaborate early warning system (Currey, 1984). And it seems that quite a few of the severe famines in Asia and Africa over the last 100 years or so were anticipated, and within a reasonable time; this is true of the last major famine in each continent, i.e., the 1974 famine in Bangladesh and the recent famine in Ethiopia.[26]

In the light of these observations, one is naturally left wondering whether further effort at famine forecasting is called for. It seems that the main problem here is lack of response, rather than lack of warning. But this may be too negative a view. Further work on early warnings may be justifiable on two counts: i) it is clear that publicity matters, particularly if it draws international attention to domestic inertia, and ii) existing early warning systems can undoubtedly be improved upon.

The anti-hunger case for public information policies in general (of which famine early warnings are an example) also rests on the nature and performance of existing institutions. For example, there are conditions under which the prices observed in a competitive market with rational expectations will fully reveal all relevant inside information to market

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25. See, for example, Eusuf and Currey (1979), Crow (1984), Cutler (1985), Desai (1986).

26. On the early warnings of the Bangladesh famine see, for example, Alamgir (1981), Ravallion (1987, Ch.3). On the Ethiopian famine see Kumar (1986).

participants.[27] Then governmental efforts aimed at information dispersal will be futile.

However, as I have argued above, these conditions are implausible for the foodgrain markets of at least one famine vulnerable economy, Bangladesh. The existence of significant informational inefficiencies in Bangladesh rice markets suggests that there may be a useful role for government in providing better information. Information may be an important consumption stabilizer.

So, what information should be collected? Much attention in the recent famine forecasting literature has focused on the price of the staple foodgrain.[28] This variable is often used as an indicator of aggregate foodgrain supply, although this seems misguided since aggregate supply may be a poor indicator of the food entitlements of famine vulnerable individuals (Sen, 1981). But the price of the staple foodgrain is one of the key variables determining the latter. This is obvious enough for the relative price of food. There are also some compelling reasons for suspecting that the nominal price of food also matters. As I have argued in Section 2.6, in economies in which the poor depend heavily on their trade entitlements one often observes short-run stickiness of another important price: the nominal wage in agriculture. Thus an increase in the money price of food results in a deterioration in the food entitlement of the main asset of the poor, their capacity for work. There is now a good deal of empirical evidence suggesting that the

27. This is demonstrated by Grossman (1976). Also see Grossman and Stiglitz (1980).

28. See, for example, Cutler (1985), Desai (1986).

money price of food matters to the poor.[29]

Following these observations, the econometric problem of forecasting the money price of the staple foodgrain can be viewed as central to the more general problem of anticipating the short run collapses in the food entitlements of the rural and urban poor which cause their starvation during famines (Sen, 1985). So, what is the best way to go about forecasting food prices?

Grain is storable and stockholders can be presumed to care about profits so their expectations about future prices matter for predicting current prices. For example, I have argued elsewhere that traders' price expectations were an important driving force in the crucial short-run dynamics of rice price formation during the Bangladesh famine. And, as was noted in Section 3.1, there were very significant departures of actual price movements from those implied by a competitive equilibrium with rational expectations.

This raises a problem for the design of early warning systems: it is the old problem Keynes talked about of how to forecast the forecasts of others. It is far from clear how an agency should go about forecasting the diverse forecasting errors of others, but at least we know that when expectations are non-rational they do generate errors which are predictable from ex-ante information. For example, the forecasting

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29. For example, past famines in South Asia have often revealed a strong and almost instantaneous association between an increase in the money price of food staples and famine mortality (Ravallion, 1986a, 1987, Ch.2). There is also empirical evidence for India of a positive association between the money price of food staples and the incidence of poverty; see, for example, Saith (1981) and Dharm Narain's work reported and discussed in Mellor and Desai (1985).

errors of rice stockholders during the Bangladesh famine appear to have been particularly sensitive to two items of information widespread around mid-1974: i) the numerous reports of flood damage to the next winter rice harvest, particularly around the time of its transplanting, and ii) the information accumulated over the previous six months or so suggesting that neither the Bangladesh government nor foreign sources could be relied upon to stabilize future food availability (Ravallion, 1987). I have also looked closely at the price expectations of a number of prominent Bangladeshi rice traders in the winter of 1983-84. Then I found that each one of twenty-two sampled traders sytematically over-estimated changes in rice prices over 70 trading days; forecasting errors (expected-actual) were positively correlated with lagged prices and expectations (Ravallion, 1985b; 1987). All such correlations can be exploited to achieve improved forecasting precision.

These observations lead me to suggest another source of information for an early warning system. Why not ask the traders what they expect? There are two obvious problems that might arise here: Firstly, the traders might not tell you, or they might mislead you. The way relations sometimes are between private grain traders and governments this is plausible. But it is a common form of madness for governments to adopt a position of hostile ignorance to the private trade. I have found that wholesale rice merchants in Bangladesh can be quite forthcoming about their expectations provided you can get their confidence. The second problem to be anticipated is that, as I have already noted, their expectations could well be informationally biased. However, I have found that even surveyed expectations which are biased can provide very

substantial improvements in ... ...st-sample forecasting performance of the sorts of time series extrapolations commonly employed (such as univariate ARIMA models). For example, my survey information on traders' expectations in Bangladesh permits an impressive 80 per cent drop in the ten-day ahead forecasting error variance of a model of day-to-day rice prices based solely on past prices and a time trend (Ravallion, 1987, ch.6). While the traders may be prone to the same psychological "follies" which lead many of us to hold biased expectations of our future, they do know a lot about the things that determine foodgrain prices, including, of course, their own expectations.

As a final comment, forecating famines is unlike more familiar econometric forecasting problems in one important respect. In econometric forecasting it is common, indeed (to my knowledge) universal, to use the conditional mean of the forecasted variable for a given model as the forecast. In the language of statistical decision theory, this will be the optimal forecast for a least squares loss function defined on forecasting errors, or, more generally, any convex symmetric loss function.[30] Is this symmetry assumption appropriate to famines? I suspect not. When forecasting the probability of a famine next year, it is likely to be worse in terms of lives lost if one underestimates that probability by a given amount than if one overestimates it by that amount. Then to minimize mortality one should use a biased estimate of the probability of famine. Of course, the econometrician must then be willing to forgo some loss in terms of that favourite goal, forecasting precision.

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30. For further discussion see Granger (1969) and De Groot (1970).

4. CONCLUSIONS

Market responses can enhance or undermine anti-hunger policies. This paper has tried to illustrate how an understanding of those responses can provide important clues for policy analysis and design.

Transfer policies such as relief work or payments to the unemployed can have significant multiplier effects on incomes of the poor. In a dualistic economy with mobility between a rural flexi-wage sector and an urban fix-wage sector with unemployment, the multiplier effect will be large when the wage elasticity of demand for labour in agriculture is low. Such multiplier effects can be exploited in policy design to achieve the most cost effective aid.

For example, relief work is generally confined to alleviating poverty from rural unemployment in lean periods. While the social opportunity cost from such a restriction on the policy is likely to be low, this is also true of the transfer benefit to the poor, once market responses are considered. Indeed, under this restriction, the policy cannot generally be expected to achieve the most cost effective aid - in the sense of maximizing the recipient's transfer benefit for a given outlay on the policy. It is likely that a greater benefit to the poor will be possible for the same public expenditure by allocating some of the relief work to times and places at which it competes with other employment. The potential gains from doing so exist for various methods of financing the policy - including revenue neutral financing from the worker's other transfer receipts.

Low prices for staple foods can also have significant transfer benefits to both urban and rural poor. And this is so even when likely market responses are considered. Past experience in South Asia suggests that changes in food prices are unlikely to be passed on fully in the agricultural wage rate, even in the long-run. The desirable short-run effects of low food prices on the welfare of the rural poor would probably persist.

The extent of a person's hunger over a period of time is also likely to depend on the variability of food consumption within that period. There is evidence suggesting that the poor face imperfect (or even non-existent) risk related markets and that there has been an erosion over time of traditional risk sharing practices and institutions (such as patronage). Thus the stabilization benefits to the poor from alternative anti-hunger policies should also be considered.

Public employment policies illustrate how there can be a trade-off between the transfer and risk benefits to the poor of a policy change. For example, in spite of the potential transfer benefit from not doing so, there may be a stabilization case for providing relief work in lean periods of low and wage elastic labour demand.

However, it is far from clear that relief work and similar transfer policies are the best available instruments for this purpose. There are other policies which can help here, such as rural credit schemes, and which might fruitfully be integrated with transfer policies. There is also a potentially important role for price stabilization policies, using public storage and/or external trade. The choice between these policies depends crucially on market responses, including the way speculative

foodgrain markets respond to information on the government's actions. There is also scope for improved public information as part of stabilization policy. Studies of the way markets have worked in the past, particularly during food crises, can throw considerable light on appropriate policy initiatives.

Appendix

The following argument proves the claims made in Section 3.2 concerning the effects of relief work on rural incomes under labour market dualism. The model is:

$$w_i = f_i(N_i) \quad f_i' < 0, \quad i = a,m \tag{A1}$$

$$N_a + N_u + N_g = 1 \tag{A2}$$

$$w_a N_u = w_m N_m \tag{A3}$$

where w_i is the real wage rate in sector i, which can be either agriculture (i=a) or manufacturing (i=m) and N_i is the number of workers in sector i. N_u denotes the number of workers in the urban sector comprising those employed (N_m) and those unemployed (N_u-N_m). N_g workers are employed on public works projects at the going wage rate in rural areas w_a and their wage bill is financed by aid. Unemployment arises because the wage in the manufacturing sector is assumed to be fixed above its market clearing level. The model is closed by the assumption (following Harris and Todaro, 1970) of free mobility between urban and rural sectors which, under risk neutrality, implies equality of the agricultural wage rate with the expected urban wage, $w_m N_m/N_u$, as indicated in equation (A3).[31]

31. This will overestimate the expected urban wage if incoming workers have a lower probability of obtaining a job than the incumbents (see, for example, Mazumdar, 1976). The following analysis can be modified to permit incomplete labour turnover without substantial change to the main argument in Section 2.2. For a critical overview of the Harris-Todaro model see Basu (1984).

Fixity of w_m implies that N_m and, hence, $w_a N_u$ are also fixed. Then,

$$w_a dN_u + N_u f'_a dN_a = 0 \qquad \text{(A4)}$$

Also, from (A2):

$$dN_u + dN_a + dN_g = 0 \qquad \text{(A5)}$$

The solution of the last two equations for

$$dN_a/dN_g = \frac{-w_a}{w_a - N_u f'_a} = -k\varepsilon_a N_a < 0 \qquad \text{(A6)}$$

as claimed, where $k = 1/(\varepsilon_a N_a + N_u)$ and $1/\varepsilon_a = -f'_a N_a/w_a$. From (A1), the corresponding effect on the agricultural wage of an expansion of relief work is

$$dw_a/dN_g = kw_a \qquad \text{(A7)}$$

Consider now the effect of public works employment on total rural income Y: $= w_a(N_a+N_g) = w_a(1-N_u)$ by (A2). Since $w_a N_u$ is fixed by the manufacturing wage, the effect of a change in N_g on Y is identical to its effect on w_a as given by (A7). By inspection, it follows that

$$dY/dN_g \gtrless w_a \text{ as } \varepsilon_a N_a + N_u \gtrless 1$$

as claimed in Section 2.2. Thus, k is the rural income multiplier associated with an expansion of relief work. Also note that $\varepsilon_a N_a + N_u \geq 1$ implies (with A3) that $\varepsilon_a \geq 1 + N_g/N_a \geq 1$. So $dY/dN_g > w_a$ as long as $\varepsilon_a < 1$. Furthermore, for given ε_a, the rural income multiplier is a strictly increasing function of N_g; on noting that $k = 1/((\varepsilon_a - 1)N_a - N_g)$ and that (A6) holds , one finds that

$$\partial k/\partial N_g = k^3(\varepsilon_a^2 N_a + N_u) > 0$$

Section 2.2 also discusses the transfer benefits from payments to the urban unemployed. In this case, equations (A1) and (A2) are unchanged, but (A3) is replaced by

$$w_a N_u = w_m N_m + T(N_u - N_m) \qquad (A8)$$

(since the expected urban income of a rural worker now includes the transfer payment T to the urban unemployed). The analysis proceeds as before and equation (4) in Section 2.2 is readily obtained.

The result used in Section 2.3 is obtained as follows. A proportion N_a of the workforce gets farm employment at the wage w_a. A number N_g of the remainder get public employment at the wage w_g while the rest remain unemployed. The (expected) income of a worker is then:

$$Ew = w_a N_a + w_g N_g/(1-N_a) \qquad (A9)$$

(noting that the probability of getting public employment is $N_g/(1-N_a)$). The public budget is $R = w_g N_g$ and this is assumed to be fixed. A change in w_g affects N_a through its effect on w_a. Then,

$$\frac{\partial Ew}{\partial w_g} = N_a(1-\varepsilon_a(1+\phi))\frac{\partial w_a}{\partial w_g} \gtrless 0 \qquad (A10)$$

as $\varepsilon_a \lesseqgtr 1/(1+\phi)$ whenever $\partial w_a/\partial w_g > 0$, as claimed in Section 2.3, and where

$$\phi = \frac{R}{w_a(1-N_a)^2} > 0$$

Note that the inequalities in (A10) reverse if $\partial w_a/\partial w_g < 0$.

The argument in Section 2.4 concerning the choice between income transfers and relief work is based on equations (A1)-(A3), augmented to include an additional source of income for rural workers in the form of a transfer payment T per worker. (A1) and (A2) remain the same, but (A3) becomes

$$(w_a + T)N_u = w_m N_m \qquad \text{(A11)}$$

The expansion of relief work is now at the expense of transfers; the total public budget for re-distribution is

$$R = (N_a + N_g)T + w_a N_g \qquad \text{(A12)}$$

which is fixed. Using (A1) and (A2) to eliminate w_a and N_u from (A11) and (A12), one obtains equations in which N_a and T are implicit functions of N_g, $w_m N_m$ and R, noting again that fixity of w_m implies that $w_m N_m$ is also fixed. It is readily verified that the slopes with respect to N_g of these implicit functions are:

$$\frac{\partial N_a}{\partial N_g} = (w_a + T)/J < 0 \qquad \text{(A14)}$$

$$\frac{\partial T}{\partial N_g} = -(w_a + T)(f_a' N_u - w_a)/J < 0 \qquad \text{(A13)}$$

when both are evaluated at $N_g = 0$ and where the Jacobian has the value:

$$J = -N_a(w_a - f_a' N_u) - T \qquad \text{(A14)}$$

The total income of agricultural workers is now:

$$Y = (w_a + T)(N_a + N_g) = w_a N_a + R \qquad \text{(A15)}$$

Differentiating with respect to N_g and using (A1), (A12), (A13) and (A14) one obtains, after some straightforward algebra:

$$\frac{\partial Y}{\partial N_g} = (w_a + T)(1 - 1/\varepsilon_a)w_a/J \qquad \text{(A16)}$$

And so

$$\frac{\partial Y}{\partial N_g} \gtrless w_a + T \quad \text{as} \quad \varepsilon_a \lessgtr \frac{N_a}{1-N_a+T/w_a}$$

Thus, when $N_u = T = 0$, $\partial Y/\partial N_g > w_a + T$ iff $\varepsilon_a < 1/2$, as claimed in Section 2.4.

Consider next the case discussed in Section 2.4 in which the relief work is financed by a tax on employed workers in the modern sector. The model again includes equations (A1) and (A2). However, the equilibrium condition between the two sectors, (A3), must be replaced by

$$w_a N_u = \bar{w} N_m \qquad \text{(A17)}$$

where $\bar{w}$ is the (fixed) post-tax wage in the modern sector,

$$\bar{w} = w_m - t \qquad \text{(A18)}$$

The budget constraint on the policy is now:

$$w_a N_g = t N_m \qquad \text{(A19)}$$

Rural income is again given by $Y = w_a(N_a + N_g)$, except that now modern sector employment will be affected by changes in rural public works employment via their effect on the pre-tax wage rate. Then it is

readily verified that, for $\varepsilon_a<1$ and $\varepsilon_m<1$,

$$\frac{\partial Y}{\partial N_g} = \frac{\partial w_a}{\partial N_g} + \varepsilon_m N_m \frac{\partial w_m}{\partial N_g} > w_a \qquad \text{(A20)}$$

where, on implicitly differentiating the model with respect to N_g at $N_g=0$,

$$\frac{\partial w_a}{\partial N_g} = kw_a(1-\varepsilon_m) > 0 \qquad \text{(A21)}$$

$$\frac{\partial w_m}{\partial N_g} = w_a/N_m > 0 \qquad \text{(A22)}$$

(noting that $k = 1/(\varepsilon_a N_a + N_u) > 1$ for $\varepsilon_a < 1$).

To examine the effects of a change in the price of food (as discussed in Section 2.6), wages in the basic model above are now interpreted as nominal wage rates. The labour demand functions now equate the nominal wage rates to marginal revenue products:

$$w_a = pf_a(N_a) \qquad \text{(A23)}$$

$$w_m = qf_m(N_m) \qquad \text{(A24)}$$

Equations (A2) and (A3) are unchanged. The real wage rate in the modern sector is now fixed in terms of a composite good with weights a and b on food and clothing respectively. Thus

$$w_m/(ap + bq) = \bar{w} \qquad \text{(A25)}$$

On differentiating the model with respect to p and solving for the

implicit derivative of w_a one obtains, in elasticity form:

$$\frac{\partial \log w_a}{\partial \log p} = \frac{cN_u(1-\mathcal{E}_m) + N_a\mathcal{E}_a}{N_u + N_a\mathcal{E}_a} < 1 \qquad \text{(A26)}$$

if $\mathcal{E}_m < 1$, where $c = ap/(ap + bq)$, as claimed in Section 2.6.

The following variation on the basic model is used in discussing the optimal allocation of relief work between seasons in Sections 2.5 and 3.4. As in Section 2.5, superscripts l and h are used to denote the values of all variables in the off-peak ("lean") and peak ("harvest") periods. The policy problem is to allocate a fixed revenue R between expenditure on rural relief work in the two seasons so as to maximize the workers' welfare over the year. Welfare in each season is an increasing and strictly concave function of income in that season and this is simply summed across seasons to give total annual welfare. Following the discussion in Section 1, "welfare" may here be interpreted as the absence of hunger. Wages and employment in each season satisfy the basic model above.

The problem is then to choose N_g^l and N_g^h to maximize

$$u(Y^l) + u(Y^h) \quad u' > 0, \quad u'' < 0 \qquad \text{(A27)}$$

subject to the budget constraint

$$w_a^l N_g^l + w_a^h N_g^h \leq R \qquad \text{(A28)}$$

where wages and employment satisfy equations (A1) to (A3) in each season. On noting that (A27) is strictly quasi-concave in incomes, the problem will have an interior solution if i) income for each season is at least

weakly concave in public employment and ii) the set of N_g^l, N_g^h values satisfying the constraints is (at least weakly) convex. However, while the latter condition holds for this model, the former one need not. The key point is that the wage rate for each season can be a strictly convex function of the amount of relief work provided in that season; on differentiating equation (2) in Section 3.2 with respect to N_g at constant demand elasticities:[32]

$$\frac{\partial^2 w_a}{\partial N_g^2} = (1 + kN_u + \varepsilon_a^2 kN_a) w_a k^2 \quad > 0 \qquad \text{(A29)}$$

While this implies that the constraint set satisfying (A28) is strictly convex, it also means that the objective function (A27) need not be quasi-concave in employment. Indeed, it will be strictly quasi-convex for linear u.

Section 2.5 discusses the seasonal allocation when only transfer benefits matter, i.e., u is linear. For the transfer benefit from an extra peak period job to be positive, when that job is financed by a cut in the budget allocation to the lean period, one requires that

$$\frac{\partial Y^h}{\partial N_g^h} + \frac{\partial Y^l}{\partial N_g^l} \cdot \frac{\partial N_g^l}{\partial N_g^h} > 0 \qquad \text{(A30)}$$

where the last derivative on the LHS is evaluated along the upper boundary of the budget constraint (A24), giving

$$-\frac{\partial N_g^h}{\partial N_g^l} = \frac{w_a^l + N_g^l \partial w_a^l / \partial N_g^l}{w^h + N_g^h \partial w_a^h / \partial N_g^h} \qquad \text{(A31)}$$

The decision criterion used in Section 2.5 is then readily obtained.

32. Noting that $dN_u/dN_g = -kN_u$; this follows from (A5) and (A6), recalling that $k = 1/(\varepsilon_a N_a + N_u)$.

The result discussed in Section 3.4 and illustrated in Figure 2 follows from the fact that starting from the point "a" ($N_g^1 = 0$, $N_h^1 = R/w_a^h$) an increase in the elasticity of the function u will reduce the (absolute) slope of the contours of (A27). By continuity of the function u, there will exist a critical value of that elasticity above which the problem will have an interior solution.

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