Globalization and Insecurity

John McLaren and Andrew Newman
University of Virginia and University College, London

November, 2001

1 Abstract.[1]

We construct a simple model of the effect of increased international openness on risk bearing in an environment in which the only risk-sharing institutions are self-enforcing agreements. We show how increased openness can weaken long-term relationships, and hence risk sharing, by increasing the effectiveness of the market, much as some critics of globalization have argued. However, the harm thereby done is tempered by the fact that in order to have such a negative indirect effect, openness must have a *direct* effect that *reduces* risk. It is shown that on balance, globalization reduces risk and raises welfare for those in small countries, but increases risk and reduces welfare for those in large countries.

2 Introduction.

When trade economists study the effect of economic openness on the welfare of workers and on income distribution, the focus usually rests on how trade changes the average wage paid to various categories of worker. For example, much work has tested for "Stolper-Samuelson" effects, under which a rich country on opening up to trade would see an increase in the wages paid to higher-skilled workers and a fall in the wages to unskilled workers (see Slaughter (1998) for a survey). However, when non-economists argue that globalization has large

[1] Preliminary and incomplete. The authors are grateful to seminar participants at Harvard, MIT, the University of Texas, and the University of Virginia, and to the European Summer Symposium in Economic Theory. We have also benefitted from useful conversations with James Malcomson. All remaining errors are the authors'.

social costs, they often argue something more subtle: That increased openness adds to increased *risk* or *insecurity* for individual workers, by breaking down existing relationships.[2]

This paper explores that possibility. We construct a simple model of risk-bearing in an environment in which complete contracts are unavailable for informational reasons. In this envrironment, the only way for an agent to share risk is to develop a long-run relationship with another agent in which the two promise to help each other out when one is suffering from bad luck. This arrangement is enforceable only through the threat that if one reneges, he or she will lose the benefit of the trust on which the relationship was founded, and will need to suffer the whims of the market and search for a new partner. However, the process of globalization makes the market work better, and by breaking down barriers makes it easier to find a new partner. This makes the loss of one's current relationship less frightening, and thus weakens risk-sharing. Thus, in a well-defined sense, globalization does indeed weaken domestic institutions for risk bearing, and this is an indirect cost of the process that needs to be reckoned.

However, it also is a cost that will not arise unless globalization provides a direct benefit in risk reduction. The analysis shows how ambiguous the welfare effects are once these two effects are taken into account. A key conclusion in the basic model is that (within the parameter region of interest) globalization does make life riskier on balance for large countries, but it has the opposite effect in small countries.

The model is highly abstract but is intended to serve as a metaphor for important real-world risk sharing institutions, most notably long-term implicit employment contracts. A number of researchers have argued that long-term relationships in labor markets have been eroded in recent years, and debated the possible reasons (see Farber 1997). Bertrand (1998) argues that US evidence supports the claim that implicit labor contracts have been broken down by international competition, as firms in import-affected industries no longer shield their workers from spot-market wage fluctuations. A journalistic account of a broad erosion of the importance of long-term relationships in Japan in the face of international competition is found in Kristof (1997).

In order to address these questions, we have borrowed ideas from various strands of theory. The theory of implicit contracts was considerably advanced by MacLeod and Malcomson (1989), and is the focus of Thomas and Worrall (1988) and Baker et. al. (1994). Coate and Ravallion (1993) study risk-sharing arrangements through long-run relationships. The idea that a rise in the efficiency of the market can harm exchange appears in some form in MacLeod and

[2] Copious citations of this view can be found in the popular press. For example, Nicholas D. Kristof, New York Times, July 15, 1997, describes a perception that local relationships throughout Japan are breaking up under pressure of globalization; Linda Diebel, Toronto Star, Aprill 11, 2001, cites activists who blame trade openness for increased insecurity for workers; and Mark Abley, Montreal *Gazette*, January 4, 1997, p.B1 reviews popular books linking globalization, insecurity, and "the rarity of permanent jobs." Even World Bank President James D. Wolfensohn has warned of the danger that globalization can produce 'fear and insecurity' (Steven Pearlstein, *Washington Post*, October 1, 2000, p. H1).

Malcomson (1989) and Baker et. al. (1997), and is a focus of Kranton (1996), from which this paper derives some inspiration.

However, none of the ideas in this literature appear to have made their way into the trade literature. Further, although changes in risk institutions have powerful implications for income distribution (as has been emphasized in papers such as Banerjee and Newman (1991)), there appears to have been no attempt to assess the possibility that some of the changes in income distribution that have interested empirical researchers may be due to globalization through that channel. For example, it has been noted by labor economists that in recent years "inequality [has] increased greatly *within* narrowly defined demographic and skill groups" (Katz and Murphy, 1992, p. 35; italics added), as well as between groups. This within-group effect can occur quite naturally through globalization in the types of model proposed here, but is very difficult to produce through Stolper-Samuelson effects or through skill-biased technical change (see Acemoglu (1998), for example). Thus, the effects identified here may be a useful complement to other explanations emphasized in the literature on income inequality.

A provocative monograph that does argue for connections between globalization and risk is Rodrik (1997). An example of such a connection is the increased elasticity of demand for labor in a globalized economy. In a closed economy, a negative productivity shock in sector i would drive down the marginal product of labor there, tending to depress i-workers' wages; but it would also drive up the price of i output, raising the marginal *value* product of labor and providing a cushion for those wages. However, if the country becomes part of a large world market in which it has no influence over prices, that cushion disappears. The Rodrik analysis has done much to put the issue of globalization and risk onto the agenda, but we argue that it omits an important element: private domestic institutions for sharing risk (in particular between employers and employees). A focus of this paper, therefore, is to consider imperfect risk institutions and ask how they respond to the globalized environment. In this respect, the current paper is similar in spirit to Dixit's (1989) criticism of earlier writing on trade and insurance; that literature had mostly assumed away risk markets by fiat, while Dixit showed that allowing for imperfect risk markets instead could dramatically change the conclusions.[3]

We now present the model that we use to study these ideas.

[3]Additional examples can be cited. Newbery and Stiglitz (1981, ch. 23) study an example of an economy in which trade is Pareto-inferior to autarchy because risk-sharing institutions are absent. Helpman and Razin (1978) show that a number of findings in models of trade with uncertainty are reversed if one allows for stock markets.

3 A Pure Exchange Model.

Consider an economy with two countries, A and B, in which there is a continuum of agents of measure X_A and X_B respectively. Each agent in each period receives an endowment of a non-storable, homogeneous consumption good. Each period, the quantity the agent receives is ε^H with probability π and ε^L with probability $(1-\pi)$, where $\varepsilon^H > \varepsilon^L$ and $\pi \in (0,1)$ are constants. Time is discrete, measured in periods indexed from $t = 0$ to ∞. Each agent has a strictly concave von-Neumann-Morgenstern utility function μ and a common discount factor $\beta \in (0,1)$.

Clearly, there are gains from risk sharing and one would expect to see mutual insurance contracts if they are feasible. However, contracting is limited by two factors. First, the endowment an agent receives in a given period is observable only by that agent and another agent who is in the same location. At most two agents can be in the same location at one time, so this compromises the enforceability of risk-sharing contracts. Second, agents can communicate and thus agree on risk-sharing arrangements only if they are in the same location, and they can find themselves at the same location only through a process of random search. This prevents *ex ante* contracts involving more than two participants.

The search mechanism is of a simple Diamond (1982)-type. In any period, if x agents are searching for partners, then $\min\{\widetilde{\phi}x^2, x\}$ of them find partners, where $\widetilde{\phi}$ is a constant that summarizes the effectiveness of the search process. Thus, if the number of searchers is below $1/\widetilde{\phi}$, the probability of finding a match for any one searcher is equal to $\widetilde{\phi}x$. In all of the subsequent discussion, we will constrain parameters so that the number of searchers is below $1/\widetilde{\phi}$.[4]

When two agents get together to form an agreement on risk sharing, they understand that since they cannot write binding contracts, they must agree on a scheme that will be subgame-perfect. Thus, as in Malcomson and Macleod (1984) or Thomas and Worrall (1988), the partners agree to the optimal subgame-perfect equilibrium at the moment they meet (we will often call these 'self-enforcing agreements,' as in that paper). This agreement will typically use the 'grim' punishment of exclusion from the relationship as an enforcement mechanism, if the incentive-compatibility constraint binds; in practice, this means that if ever a partner reneges on the agreement, the other partner will from that point never trust him/her again, and both partners will need to search for a new partner to attain risk sharing again. (Of course, this is not renegotiation-proof; an extension to renegotiation-proofness is part of ongoing work.)

[4] This is a very simple example of a search technology with a 'market-thickness' property. Such a property can be derived from more primitive assumptions, as is done in Kranton (1996). There is some disagreement as to whether or not market thickness effects are a realistic assumption; Pissarides (2000, ch.1), for example, argues for assuming them away. Here, they seem appropriate to assume because anecdotally the ease of finding a new supplier, customer, employer or pool of labor appears to be an important feature of globalization, and the erosion of relationships appears to imply the presence of such an effect. See Warren (1996) for some empirical evidence in favor of market-thickness effects.

We also assume that for any existing partnership, in each period, there is a fixed probability, $(1-\rho)$, that the partnership will be dissolved for exogenous reasons (the letter 'ρ' stands of the probability that the partners will be able to *remain* together). One might think of this as the case in which one partner must move for personal reasons, for example. This is helpful to our argument because it avoids the situation in which all agents wind up in relationships in the steady state; as will become apparent, this would eliminate any scope for discussing the role of globalization.

The sequence of events within each period is as follows. (i) Agents within a relationship learn whether they are to be separated exogenously or not. (ii) Agents without a partner search, and learn whether or not they will identify a new potential (and currently unmatched) partner in this period. (iii) Then negotiations occur between the two new potential partners over the new partnership. (iv) This period's endowment for each agent is revealed. Within a partnership, this is immediately common knowledge. (v) Each partner chooses to surrender a fraction $\theta \in [0,1]$ of her output to her partner (this is the form that risk-sharing takes). (vi) Consumption occurs; in each period this is equal to the agent's output plus net transfers received from the agent's partner.

4 Risk-sharing agreements.

In each period, within the partnership between i and j, there are four possible endowment outcomes: Both partners have large endowments; both have small endowments; i has a large endowment and j has a small one; and vice versa. Clearly, risk sharing requires action only in the latter two, and clearly the relevant action will be for the partner with the large endowment to give some up it up to the partner with the smaller endowment. Thus, the agreement can be characterised by the fraction, θ, of the large endowment surrendered by the agent who receives it to the agent with the small endowment. (It is straightforward to verify that there is no generality to be gained by allowing for payments in both directions.)

Consider a pair of agents negotiating a new relationship. If the incentive compatibility constraint implied by the subgame perfect requirement did not bind, then they would agree to perfect insurance, with $\theta = \theta^{opt} \equiv (\varepsilon^H - \varepsilon^L)/2\varepsilon^H$. This is the value of θ at which consumption of the two partners is equalized. The case of interest, however, will be the case in which the incentive compatibility constraint does bind, so that insurance falls short of the first-best. That constraint is:

$$\mu(\varepsilon^H) - \mu((1-\theta)\varepsilon^H) \leq \beta[V^C(\theta) - V^S], \tag{1}$$

where V^C is the payoff from being in the risk-sharing relationship (the 'C' stands for 'cooperation') and V^S is the payoff from being without a relationship (the 'S' stands for 'search'). Note that V^C depends on the value of θ chosen within the relationship in question, while V^S does not, but rather depends on the level of risk-sharing available in any *future* relationships the partners might have with *other* agents. The left-hand side is the instantaneous benefit to the well-endowed partner from reneging on the risk-sharing promise (or the 'temptation to cheat'), and the right-hand side is the cost in ostracism of doing so (or the 'punishment').

As mentioned above, for the time being we assume that $\overline{\kappa} = 0$. The value of being in the current relationship, then, follows:

$$V^C = \rho(\overline{\mu}^c + \beta V^C) + (1-\rho)V^s,$$

where

$$\overline{\mu}^C(\theta) \equiv \pi^2\mu(\varepsilon^H) + (1-\pi)^2\mu(\varepsilon^L) + (1-\pi)\pi[\mu((1-\theta)\varepsilon^H) + \mu(\theta\varepsilon^H + \varepsilon^L)]$$

is the per-period expected utility of an agent in a relationship with sharing parameter θ. The last two terms denote, respectively, the *ex post* utility of a high-endowment partner whose partner has a low endowment, and *vice versa.* This enables us to write the incentive compatibility constraint as:

$$\mu(\varepsilon^H) - \mu((1-\theta)\varepsilon^H) \leq \frac{\beta\rho}{1-\beta\rho}(\overline{\mu}^C(\theta) - (1-\beta)V^S). \quad (2)$$

Note that by the concavity of μ, the temptation to cheat, measured on the left hand side, is a strictly convex function of the risk sharing parameter θ chosen by the partners, and that the punishment, as measured on the right hand side, is a strictly concave function of θ. The latter attains a maximum at $\theta = \theta^{opt}$.

5 Steady state calculations.

We focus on steady states, which simplifies the analysis in two important ways. First, analysis of equilibrium requires us to keep track of the number of people searching for partners, because this determines how easy it is for anyone out of a relationship to find a new one. Second, it is necessary to compute payoffs to any agent in a relationship as well as any agent out of one. Either of these would be an order of magnitude more difficult outside of a steady state.

Initially, we will do all of these calculations for the post-globalization situation. It will then be straightforward to see how things are different before globalization.

First, we analyse the number of agents searching. Denote the fraction of the total population searching by σ^S (where σ stands for 'share' and S stands for 'search'), and denote the population of the economy in question by X, where $X = X_A$ or X_B without globalization and $X = X_A + X_B$ with globalization. Denote the product $X\widetilde{\phi}$ by ϕ. Then the number of searching agents who find partners in any one period is equal to $\sigma^S X\widetilde{\phi} = \sigma^S\phi$, and the fraction of agents without partners who remain without partners next period is equal to $1-\sigma^S\phi$. The fraction of agents with partners who will be without partners next period is equal to the fraction who lose their relationships exogenously and who fail to find a new one in their search this period, in other words, $(1-\rho)$ times the probability that an agent without a partner finds a new partner. Thus, the steady state fraction of the population without partners satisfies the following equation:

$$\sigma^S = \left(\sigma^S + (1-\sigma^S)(1-\rho)\right)(1-\phi\sigma^S)). \tag{3}$$

The right-hand side of this equation is quadratic in σ^S, with one zero for $\sigma^S < 0$ and another zero where $\sigma^S = 1/\phi > 1$. Between those zeroes, the right hand side is positive. Thus, (3) has one negative root and one positive root less than one; the latter is the steady state value of σ^S. This is depicted in Figure 1, where the parabola indicates the right-hand side expression. Further, since an increase in ϕ shifts the parabola down everywhere, σ^S is a decreasing function of ϕ. A last point is that taking the total derivative of (3) with respect to ϕ and rearranging terms, it is easy to see that $\sigma + \phi(d\sigma/d\phi) = d(\sigma\phi)/d\phi > 0$. This can be summarized thus:

Proposition 1 *For any value of ϕ, there is a unique steady state value of σ^S. It is decreasing in ϕ, with an elasticity less than one in absolute value.*

Thus, we can write $\sigma^S(\phi)$. Essentially, an improvement in search technology makes it easier to find a partner and escape the state of autarchy, reducing the number of searchers in the long run. The finding on the elasticity will be important later.

Second, we analyze the value of being in a relationship and being without one. First, define:

$$\overline{\mu}^S \equiv \pi\mu(\varepsilon^H) + (1-\pi)\mu(\varepsilon^L),$$

the per-period expected utility of an agent without a partner. An agent with a partner will lose the relationship with probability $(1-\rho)$.

Consider an agent in a relationship with sharing parameter θ, who also understands that in any future relationship with different partners the sharing parameter would be the same. In any given periond, this agent will lose the relationship with probability ρ. If this occurs, that agent will become a searcher, and receive the same payoff as any other searcher. With probability $(1-\rho)$, the agent will remain in the relationship. Thus, in a steady state, such an agent's payoff will follow:

$$V^C = (1-\rho)V^S + \rho(\overline{\mu}^C(\theta) + \beta V^C).$$

An agent who is searching, on the other hand, will succesfully obtain a relationship if he or she finds another agent who is not currently in a relationship. This occurs with probability $\phi\sigma^S$, implying that such an agent's payoff must follow:

$$V^S = \phi\sigma^S(\phi)(\overline{\mu}^C + \beta v^C) + (1-\phi\sigma^S(\phi))(\overline{\mu}^S + \beta v^S).$$

Note that for any given value of θ, these two equations define a pair of linear equations in V^C and V^S. These are readily solved, yielding the following.

Proposition 2 *For given parameters and a given value of θ, the steady-state values V^S and V^C are uniquely defined by their two laws of motion. Thus, holding other parameters constant, we can write $V^S(\theta;\phi)$ and $V^C(\theta;\phi)$. For $\theta \in (0, \theta^{opt}]$, these are both increasing in θ, and $V^C(\theta;\phi) > V^S(\theta;\phi)$. Further, taking into account the effect of a change in ϕ on the steady-state value of σ^S, both $V^S(\theta;\phi)$ and $V^C(\theta;\phi)$ are increasing in ϕ for $\theta \in (0, \theta^{opt}]$.*

Proof. The solution is:

$$V^S(\theta;\phi) = \frac{\phi\sigma^S(\phi)\overline{\mu}^C(\theta) + (1-\beta\rho)(1-\phi\sigma^S(\phi))\overline{\mu}^S}{(1-\beta)(1-\beta\rho(1-\phi\sigma^S(\phi)))}; \tag{4}$$

$$V^C(\theta;\phi) = \frac{(\phi\sigma^S(\phi) + \rho(1-\beta)(1-\phi\sigma^S(\phi)))\overline{\mu}^C(\theta) + (1-\rho)(1-\phi\sigma^S(\phi))\overline{\mu}^S}{(1-\beta)(1-\beta\rho(1-\phi\sigma^S(\phi)))}. \tag{5}$$

It is seen readily that $(1-\beta)V^S(\theta;\phi)$ and $(1-\beta)V^C(\theta;\phi)$ are both weighted averages of $\overline{\mu}^C(\theta)$ and $\overline{\mu}^S$. The weight on $\overline{\mu}^C(\theta)$ in the expression for V^C exceeds the corresponding weight in the expression for V^S, and since $\overline{\mu}^C(\theta)$ strictly exceeds $\overline{\mu}^S(\theta)$ in the range $\theta \in (0, \theta^{opt})$, we must have $V^C(\theta;\phi) > V^S(\theta;\phi)$ in that range as well. Further, since $\overline{\mu}^C(\theta)$ is strictly increasing in that range, both $V^S(\theta;\phi)$ and $V^C(\theta;\phi)$ are as well. Finally, since by Proposition 1 an increase in ϕ will increase the steady-state value of $\phi\sigma^S(\phi)$, an increase in ϕ will increase the weight on $\overline{\mu}^C(\theta)$ in both expressions, which in the indicated range must increase their values. ■

6 Constructing an equilibrium.

Recall the incentive-compatibility constraint (2). If we consider a representative pair of agents negotiating a new relationship, and if both members understand that in any future relationship with other agents they would face a risk-sharing parameter equal to $\overline{\theta}$, then they will choose a risk-sharing parameter $\widetilde{\theta}$ for themselves that is the highest value not exceeding θ^{opt} such that $T(\widetilde{\theta})$ is no greater than $P(\widetilde{\theta}, \overline{\theta};\phi)$ (or will choose $\theta = 0$ if no such value exists), where $T(\widetilde{\theta}) = \mu(\varepsilon^H) - \mu((1-\widetilde{\theta})\varepsilon^H)$ is the temptation of the well-endowed partner to cheat, and $P(\widetilde{\theta}, \overline{\theta};\phi) = \frac{\beta\rho}{1-\beta\rho}(\overline{\mu}^C(\widetilde{\theta}) - (1-\beta)V^S(\overline{\theta};\phi))$ is the punishment for doing so. Denote this optimal decision by $\widetilde{\theta}(\overline{\theta},\phi)$. The problem is illustrated in Figure 2. An equilibrium, then, will be a value of $\overline{\theta} \in [0,1]$ such that $\widetilde{\theta}(\overline{\theta},\phi) = \overline{\theta}$. This is illustrated in Figure 3. Note that by Proposition 2, an increase in $\overline{\theta}$ causes the punishment curve P of Figure 2 to shift down, and so the $\widetilde{\theta}$ curve in Figure 3 must be downward sloping.

It is possible that the vertical intersept of the $\widetilde{\theta}$ curve in Figure 3 will be zero, in which case the problem is uninteresting because there cannot be an equilibrium with any cooperation under any circumstances. To avoid this, we assume:

$$P(\widetilde{\theta},0;0) - T(\widetilde{\theta}) \geq 0 \text{ for some } \widetilde{\theta} \in (0,\theta^{opt}]. \qquad (6)$$

This assures that there could be some cooperation between two agents on a desert island who could never have a chance to find another partner. It is a necessary condition for any cooperation at all. Since

$$P(0,0;0) = T(0) = 0$$

and since P is concave in $\widetilde{\theta}$ and T is convex in $\widetilde{\theta}$, the desert island condition is equivalent to

$$P_1(0,0;0) > T'(0).$$

This can easily be checked for specific functional forms. For example, if $\mu(\cdot) = \log(\cdot)$, then the condition is that $\varepsilon^H/\varepsilon^L > 1 + (1-\beta\rho)/(\beta\rho\pi(1-\pi))$.

Since $P(\widetilde{\theta},\overline{\theta};\phi)$ is continuous in $\overline{\theta}$, and since by Proposition 2 it is decreasing in $\overline{\theta}$, we know that $\widetilde{\theta}(\overline{\theta},\phi)$ decreases continuously as $\overline{\theta}$ rises until the P curve in Figure 2 becomes tangent to the T curve, after which the value of $\widetilde{\theta}$ drops discontinously to zero. This is illustrated in Figure 3, for the case in which this discontinuity occurs to the right of the 45-degree line and so there is an equilibrium.

Note that the discontinuity in the curve in Figure 3 will occur at a value of $\overline{\theta}$ and $\widetilde{\theta}$ for which the P curve and the T curve of Figure 2 will be tangent, so that the derivatives of both functions with respect to $\widetilde{\theta}$ will be equal. Computing these derivatives, setting them equal, and solving for $\widetilde{\theta}$ yields the critical value, θ^{crit}, at which this occurs. The convexity of T and the concavity of P with respect to $\widetilde{\theta}$ ensure that this tangency condition defines a unique value of θ^{crit}. For example, in the log-utility case, the critical value is given by:

$$\widetilde{\theta} = \theta^{crit} = \frac{(\varepsilon^H/\varepsilon^L - 1)A - 1}{(\varepsilon^H/\varepsilon^L)(1+2A)},$$

where $A = \frac{\beta\rho}{(1-\beta\rho)}\pi(1-\pi)$. Note that, regardless of functional form, θ^{crit} does not depend on ϕ.

An equilibrium will exist if the $\widetilde{\theta}$ curve of Figure 3 crosses the 45-degree line, which will be true if and only if $P(\theta^{crit},\theta^{crit};\phi) - T(\theta^{crit}) \geq 0$. Noting that an increase in ϕ, by Proposition 2, will shift the P curve down for any $\overline{\theta}$, thus lowering the maximum $\widetilde{\theta}$ sustainable for any given $\overline{\theta}$, we see that the increase in ϕ shifts the $\overline{\theta}$ curve of Figure 3 to the left. As a result, although condition (6) can be shown to imply that an equilibrium will exist for low values of ϕ, it may not for high values. Let us denote the highest value of ϕ for which the equilibrium exists by ϕ^{crit} (so that $P(\theta^{crit},\theta^{crit};\phi^{crit}) - T(\theta^{crit}) = 0$). We will restrict attention to parameters in the range $\phi \in [0,\phi^{crit}]$; a somewhat more complicated variant of the model in which an equilibrium exists throughout the parameter space is treated in the appendix. That modified model does not present any additional features of interest.

7 The equilibrium, before and after globalization.

We can now turn to the normative analysis of globalization. In the event that $\phi < \phi^{crit}$, globalization strictly lowers θ and σ^S. Thus, globalization has weakened all agents' ability to protect themselves against risk, in the sense that the one available risk-sharing institution – the long-run bilateral relationship – has been weakend.

However, it is immediate that the effect of all of this on overall risk is ambiguous. The reason is that the mechanism through which the partnerships have been weakened, namely the increased ease of finding a new partner when one is without one, consitutes a *prima facie* reduction in risk. The globalization has a direct risk-reducing effect, together with an indirect risk-enhancing effect, and the net effect of these two is unclear.

This can be made clearer using Lorenz curves, because changes in risk in this economy are isomorphic to changes the degree of horizontal inequality. To see why, first consider the realized sum of payoffs of all agents in, for example, country A, which is given by:

$$\int_{j=0}^{1} \sum_{t=0}^{\infty} \beta \mu(c_{j,t}) dj, \tag{7}$$

where $c_{i,t}$ denotes the consumption of worker $j \in [0, 1]$ in period t. Since we are focussing on steady states, and since the aggregate behaviour of the economy at each date will be identical due to the fact that the endowments are iid and and there is a continuum of aggents, this expression is equal to:

$$\begin{aligned} & \frac{1}{(1-\beta)} \int_{j=0}^{1} \mu(c_{j,0}) dj \\ = \; & \frac{1}{(1-\beta)} (\sigma^S(\phi) \overline{\mu}^S + (1 - \sigma^S(\phi)) \overline{\mu}^C(\theta^*)) \\ \equiv \; & W(\theta^*, \phi)/(1-\beta), \end{aligned}$$

where θ^* is the equilibrium level of θ. Thus, all that we need to know about the lifetime risk faced by agents in the economy together is revealed by a one-period snapshot of the population. Further, since the average endowment, and hence the average consumption, is unaffected by globalization, the Lorenz curve in any one period tells us all that we need to know about that. The Lorenz curve for this economy is depicted in Figure 5.

Recall that the value measured on the horizontal axis of the diagram is the cumulative fraction of the population, and the value measure on the vertical axis is the cumulative fraction of consumption, so that for example a point on the Lorenz curve one fifth of the way from the left-hand axis to the right-hand axis represents the share of consumption enjoyed by the poorest one fifth of the population. Recall as well that a shift upward in the Lorenz curve represents an unambiguous reduction in inequality and *vice versa*, while for any pair of economies whose Lorenz curves cross, the two cannot be ranked unambiguously by inequality (see Atkinson (1971) for a classic analysis).

The Lorenz curve for this economy without globalization is represented as the piecewise linear curve *acegi*. There are four distinct groups in the population, as distinguished by their level of consumption: There are agents without partners, some of whom have large endowments and some of whom have small; and there are agents with partners, some of whom have large endowments and some of whom have small. For example, the fraction who are not in relationships and who have small endowments are the poorest group; they number $\sigma^G(1-\pi)$, and the consumption level of each is simply the endowment, ε^L. Thus, their share of total consumption is equal to $\sigma^G(1-\pi)\varepsilon^L/\overline{\varepsilon}$, where $\overline{\varepsilon}$ is the economy-wide average endowment. This is point c in the figure.

Note that the slope of ac is the ratio of the typical unpartnered, low-endowment agent's consumption to the economywide average consumption, and that this is unaffected by globalization. A parallel argument holds for the slope of gi. On the other hand, globalization certainly will lower the fraction σ^S of the population without partners. Therefore, with globalization, point c will slide leftward along the ray ac, to a point like b; and point g will slide rightward along the ray gi, to a point like h. If the share parameter θ for risk-sharing agreements were to be unchanged by globalization, then the new Lorenz curve would be *abdhi*[5], which is everywhere above the old curve, indicating lower inequality and risk. This is the direct effect of globalization: By making it easier to find a partner, it lowers the inherent riskiness of economic life.

However, as indicated, the share parameter θ will indeed change due to globalization, and this will add to riskiness by creating inequality *within* relationships. What this will do is to slide point d of the new Lorenz curve downward. It is possible that it will be driven downward sufficiently that the new Lorenz curve will dip down below the old one, as illustrated with curve *abfhi*; but it is not possible that the new Lorenz curve will be everywhere the old one.

There remains the question of the net effect of globalization on expected utility. Recalling the expression for $W(\theta^*, \phi)$ above, we see that globalization will have two effects. It will lower σ^S, providing a prima facie beneficial effect, but lower θ^*, thus providing an indirect negative effect. A first observation is obvious: Welfare has its minimum at $\phi = 0$, in which case $\sigma^S = 1$ and so welfare equals $\overline{\mu}^S$. Welfare will be strictly above this level whenever $\sigma^S \neq 1$ and $\theta^* \neq 0$; therefore, for sufficiently small ϕ, globalization must be beneficial. Thus, globalization is always good for small countries.

More subtly, welfare is generally decreasing in ϕ in the neighborhood of ϕ^{crit}. The reason is as follows. First, consider the following proposition:

Proposition 3 *The derivative of the equilibrium degree of risk sharing with respect to ϕ, $d\theta^*/d\phi$, takes a limit of $-P_3(\theta^{crit}, \theta^{crit}, \phi^{crit})/P_2(\theta^{crit}, \theta^{crit}, \phi^{crit})$ as $\phi \to \phi^{crit}$.*

[5] The segment bd is parallel to ce, as is dh to eg.

Proof. Consider the derivatives $\widetilde{\theta}_1$ and $\widetilde{\theta}_2$ of the $\widetilde{\theta}$ function depicted in Figure 3. We have $\widetilde{\theta}_1 = -P_2(\widetilde{\theta}(\overline{\theta},\phi),\overline{\theta},\phi)/(P_1(\widetilde{\theta}(\overline{\theta},\phi),\overline{\theta},\phi) - T'(\widetilde{\theta}(\overline{\theta},\phi))) < 0$ (note that the denominator is always negative; see Figure 2). The expression for $\widetilde{\theta}_2$ is similar but has a P_3 in place of the P_2. As ϕ approaches ϕ^{crit}, the numerator of this expression is bounded away from zero and the denominator goes to zero (since where $\theta = \theta^{crit}$, the P and T curves are tangent). For that reason, $\widetilde{\theta}_1, \widetilde{\theta}_2 \to -\infty$ as $\phi \to \phi^{crit}$. Now consider the condition $\theta^* = \widetilde{\theta}(\theta^*, \phi)$, which defines the equilibrium $\theta^*(\phi)$. Differentiating, we obtain $d\theta^*/d\phi = \widetilde{\theta}_1(d\theta^*/d\phi) + \widetilde{\theta}_2 = -[(d\theta^*/d\phi)P_2 + P_3]/(P_1 - T') = -[(d\theta^*/d\phi) + P_3/P_2]/(P_2/(P_1 - T'))$. Thus, $d\theta^*/d\phi = [(d\theta^*/d\phi) + P_3/P_2]\widetilde{\theta}_1$. We know that $(d\theta^*/d\phi)$ and $\widetilde{\theta}_1$ are both negative, so the expression in square brackets must be positive, but for that to hold, $(d\theta^*/d\phi)$ must be less than P_3/P_2 in absolute value, and thus bounded. Since $\widetilde{\theta}_1 \to -\infty$ as $\phi \to \phi^{crit}$, this implies that the term in square brackets must vanish as $\phi \to \phi^{crit}$. ■

One way of interpreting this is in terms of elasticities: The quality of cooperation becomes infinitely elastic with respect to the severity of punishment when cooperation is stretched to the breaking point (in other words, $\widetilde{\theta}_1, \widetilde{\theta}_2 \to -\infty$ as $\phi \to \phi^{crit}$). As a result, in that part of the parameter space an improvement in the quality of search requires an adjustment that leaves the severity of punishment unchanged (in other words, $d\theta^*/d\phi = -P_3/P_2$, so that the (ϕ, θ^*) point moves along a P indifference curve).

This gives us an immediate conclusion:

Corollary 4 *Steady-state equilibrium welfare is a strictly decreasing function of ϕ at $\phi = \phi^{crit}$ if and only if the indifference curve in (ϕ, θ) space for W at that point is flatter than the indifference curve for V^S, or in other words, if and only if:*

$$\frac{V_2^S(\theta^{crit}, \phi^{crit})}{V_1^S(\theta^{crit}, \phi^{crit})} > \frac{W_2(\theta^{crit}, \phi^{crit})}{W_1(\theta^{crit}, \phi^{crit})}. \tag{8}$$

Proof. From the expression for P it is straightforward that $P_3/P_2 = V_2^S/V_1^S$. Thus, the stated condition is equivalent to the following inequality:

$$\lim_{\phi \to \phi^{crit}} \frac{d}{d\phi} W(\theta^*(\phi), \phi) = -W_1(\theta^{crit}, \phi^{crit}) \frac{V_2^S(\theta^{crit}, \phi^{crit})}{V_1^S(\theta^{crit}, \phi^{crit})} + W_2(\theta^{crit}, \phi^{crit}) < 0.$$

■

This proposition is illustrated in Figure 5 by the fact that the path followed by $\theta^*(\phi)$ runs tangent to the V^S indifference curve where ϕ is close to ϕ^{crit}. Thus, if the W indifference curve is flatter than the V^S indifference curve, as shown, an improvement in ϕ in that neighborhood lowers welfare. Condition

(8) is very weak, in that it simply states that an improvement in the search technology matters more to an agent who is currently searching than to the average agent. Indeed, it appears to be satisfied most of the time, and we have yet to find a numerical example in which it is violated.[6] An implication, of course, is that globalization is bad for large countries.

8 Appendix.

Here we discuss a variant to the basic model in which the addition of a vanishingly small amount of noise guarantees the existence of equilibrium across the parameter space.

In this variant, an additional feature of relationships is that they can impose a kind of psychic cost if the two agents do not get along well. This is determined by a random variable κ drawn from a distribution with cdf G, density g, and support $[-\overline{\kappa}, \overline{\kappa}]$, where $\overline{\kappa} > 0$ is a constant; the realized utility of a person in a relationship in a given period is then equal to the utility μ of that period's consumption minus the value of κ for that relationship. (The letter κ stands for 'cost.') The interpretation is that κ gives the per-period disutility (if positive) or utility (if negative) to staying together for that particular pair of agents, based on non-pecuniary factors such as personality. This variable is realized once per relationship, and is iid across relationships. The reason for introducing this variable is that for some portions of the parameter space, if there is no such element of personality (equivalently, if $\overline{\kappa} = 0$), then no equilibrium exists, but an equilibrium does exist for a small postitive $\overline{\kappa}$. We assume that $g(\kappa) > 0$ for $|\kappa| < \overline{\kappa}$. In addition, we assume that if one is in a relationship currently, in order to find out what one's level of κ would be with a given other potential partner, one must (irrevocably) break off the current relationship and move to the same location as the potential partner. Thus, as $\overline{\kappa} \to 0$, it becomes extremely unattactive to search merely in order to find a relationship with a better κ. In the main model in the text, we always had $\overline{\kappa} = 0$, and it was noted that an equilibrium did not exist for all parameter values; now, we will assume that $\overline{\kappa} > 0$, in which case we will be interested in what happens as $\overline{\kappa} \to 0$.

The sequence of events within each period is as follows. (i) Agents within a relationship learn whether they are to be separated exogenously or not. (ii) Agents without a partner search, and learn whether or not they will identify a new potential (and currently unmatched) partner in this period. (iii) Where an agent has identified a new potential partner and the two are in the same location, the psychic cost, κ, of their match is realized and becomes known to both partners. (iv) Then negotiations occur between the two new potential partners over the new partnership. (v) This period's endowment for each agent is revealed. Within a partnership, this is immediately common knowledge. (vi) Each partner chooses to surrender a fraction $\theta \in [0, 1]$ of her output to her

[6] For example, the condition holds for log utility with $\beta = 0.98$, $\rho = 0.95$, $\pi = 0.5$, $\varepsilon^L = 0.1$, and $\varepsilon^H = 3, 4, \ldots 20$. Computational details are available on request.

partner (this is the form that risk-sharing takes). (vi) Consumption occurs; in each period this is equal to the agent's output plus net transfers received from the agent's partner.

Thus, henceforth we will assume that $\overline{\kappa} > 0$. Once we do so, we need to expand the definition of equilibrium. For a given $\overline{\kappa}$, an equilibrium is a function $\widetilde{\theta}(\cdot) : [-\overline{\kappa}, \overline{\kappa}] \longmapsto [0,1]$ such that if a pair with cooperation cost κ are attempting to negotiate a cooperative arrangement, and if they anticipate that any future arrangement either partner may have with future partners will be governed by the function $\widetilde{\theta}(\cdot)$, then their best sustainable level of cooperation will also be described by $\theta = \widetilde{\theta}(\kappa)$. We will be interested in the limit of such equilibria as $\overline{\kappa} \to 0$.[7]

Two observations allow us to simplify the analysis when we let $\overline{\kappa} \to 0$. First, it is possible that a certain fraction of agents who attempt to negotiate a cooperative arrangement will be unable to commit to cooperation, because their P curve has been shifted down by the negative realization of κ and now lies everywhere below their T curve. For these agents, $\widetilde{\theta}(\kappa) = 0$. The set of pairs of agents for whom this is true is now an additional endogenous variable. Of course, the set of agents that *are* able to commit to cooperation are those for whom κ is less than or equal to some threshhold value, say κ^*. The set is thus completely characterised by the fraction $\alpha = G(\kappa^*)$ of new pairs that are able to commit to cooperation. (The letter 'α' stands for 'able to commit.') Second, the range of the portion of $\widetilde{\theta}(\cdot)$ that has positive values will converge to a constant. Thus, in studying the limit of equilibria as $\overline{\kappa} \to 0$, we need to focus on only a value of α and θ. (More formally, we seek a value of α and θ such that for any sequence $\overline{\kappa}_i \to 0$, there is a corresponding sequence of equilibria $\widetilde{\theta}^i(\cdot)$ such that $\widetilde{\theta}^i(\cdot) \longmapsto \theta$ uniformly and the fraction of the set of κ with $\widetilde{\theta}^i(\kappa) > 0$ converges to α.)

It is easy to see that these modifications to the model do not change matters at all in the limit if an equilibrium exists with $\overline{\kappa} = 0$. However, when no such equilibrium exists, allowing for this small bit of noise now guarantees the existence of an equilibrium, if $\overline{\kappa}$ is small enough. The essential point is that, if the fraction α of pairs who are able to commit drops below unity, then the effect is isomorphic to a drop in ϕ. We can define $\widetilde{\phi} = \alpha\phi$ as the effective value of ϕ, and note that if α is less than unity in the steady state, all of the steady state analysis (beginning with Proposition 1) goes through unchanged after replacing ϕ by $\widetilde{\phi}$ everywhere. Thus, heuristically, allowing α to fall shifts the $\widetilde{\theta}$ curve in Figure 3 to the right, restoring equilibrium, at the same time shifting the $P(\widetilde{\theta}, \overline{\theta}, \phi)$ curve of Figure 2 back up until it is approximately tangent to the T

[7] This discussion supposes that it is never advantageous for a partner in a functioning relationship to dissolve the relationship in order to begin a new one with a lower κ. This is valid for two reasons. First, recall that we are assuming that one cannot discover the κ one would experience with a potential partner without separating from one's current partner first. Second, note that in the limit all values of κ will be close to zero, but the expected utility benefit to being in a relationship will be a positive number that does not vanish in the limit. These two features guarantee that as the limit is approached, no one will ever dissolve a functioning relationship in order to pursue a lower value of κ.

curve, leaving it either slightly above or slightly below the point of tangency so that exactly a fraction α of pairs of agents who are negotiating will be able to commit to cooperation.

To see the argument more precisely, fix a value of $\overline{\kappa} > 0$. Suppose that $P(\theta^{crit}, \theta^{crit}; \phi) - T(\theta^{crit}) < 0$, so that there would have been no equilibrium with $\overline{\kappa} = 0$. Now, focus on the class of $\widetilde{\theta}(\kappa)$ functions constructed in the following way. Each function in the class is indexed by a value $\kappa^* \in [-\kappa, \kappa]$, so we will write it as $\widetilde{\theta}(\kappa; \kappa^*)$. For a given κ^*, define $P^*(\theta, \kappa; \kappa^*)$ for any θ and κ by $P^*(\theta, \kappa; \kappa^*) = \frac{\beta\rho}{1-\beta\rho}(\overline{\mu}^C(\theta^{crit}) - B - \kappa)$, where B is such that $T(\theta^{crit}) = \frac{\beta\rho}{1-\beta\rho}(\overline{\mu}^C(\theta^{crit}) - B - \kappa^*)$. Then set $\widetilde{\theta}(\kappa; \kappa^*)$ for $\kappa \leq \kappa^*$ equal to the highest level of θ not exceeding θ^{opt} such that $T(\theta) \leq P^*(\theta, \kappa; \kappa^*)$ (note that this implies $\widetilde{\theta}(\kappa^*; \kappa^*) = \theta^{crit}$), and set $\widetilde{\theta}(\kappa)$ equal to zero for $\kappa > \kappa^*$. Any equilibrium $\widetilde{\theta}$ function would have to be in this class.

Now, suppose that a given pair of agents are attempting to negotiate a cooperative agreement, and they both anticipate that any future cooperation either partner might have with any future partner would be characterized by $\widetilde{\theta}(\kappa; \kappa^*)$. Then, one can compute their anticpated value to searching and hence the analogue to the 'punishment' curve of Figure 2, and thus for any given value of the κ in their current relationship, one can compute the θ that they would choose. Thus, a given anticipated future $\widetilde{\theta}(\kappa; \kappa^*)$ curve induces a current $\widetilde{\theta}(\kappa; \kappa^*)$ curve. Any anticipated value of κ^* that would induce current partners to choose the same value would be an equilibrium. Next, note that an increase in the anticipated κ^* results in an improvement in the anticipated distribution of θ by first order stochastic dominance, so a higher anticipated value of κ^* increases the value to searching, thereby shifting the punishment curve down and thus leading to a reduction in the induced κ^*. This dependence of the induced κ^* on the anticipated κ^* is continuous, because all of the effects of the anticipated κ^* on future expected utilities are continuous. Further, if the anticipated κ^* equals $\overline{\kappa}$, the induced current κ^* will be equal to $-\overline{\kappa}$, provided that $\overline{\kappa}$ is small enough (since $P(\theta^{crit}, \theta^{crit}; \phi) - T(\theta^{crit}) < 0$), while if the anticipated κ^* equals $-\overline{\kappa}$, the induced current κ^* will be equal to $\overline{\kappa}$, provided that $\overline{\kappa}$ is small enough (by (6)). Thus, in between there is a unique equilibrium κ^*, and hence an equilibrium value of $\alpha = G(\kappa^*)$.

Taking the limit as $\overline{\kappa} \to 0$, we see that this always yields a value of α just equal to the level required to make $P(\theta, \theta^{crit}; \phi)$ tangent to $T(\theta)$; furthermore, since $\widetilde{\theta}(\kappa^*, \kappa^*) = \theta^{crit}$ at all times, the range of positive values of θ converge to the single value $\theta = \theta^{crit}$.

This is summarized in the following proposition.

Proposition 5 *If $P(\theta^{crit}, \theta^{crit}; \phi) - T(\theta^{crit}) \geq 0$, then the limit of equilibria as $\overline{\kappa} \to 0$ is the unique solution to $\widetilde{\theta}(\overline{\theta}, \phi) = \overline{\theta}$ with $\alpha = 1$, and is just the same as the equilibrium with $\overline{\kappa} = 0$. If $P(\theta^{crit}, \theta^{crit}; \phi) - T(\theta^{crit}) < 0$, then the limit of equilibria as $\overline{\kappa} \to 0$ has $\theta = \theta^{crit}$ and a value of $\alpha < 1$ such that $P(\theta^{crit}, \theta^{crit}; \alpha\phi) - T(\theta^{crit}) = 0$.*

The comparative statics implied by this analysis are as follows. For ϕ below ϕ^{crit}, increases in ϕ worsen the degree of cooperation as reflected in the decrease in θ, but they increase the fraction of people who are in relationships, as reflected in the decline in σ^S. However, everyone who finds a potential partner succeeds in committing to cooperation, as reflected in the fact that $\alpha = 1$. Past that critical value of ϕ, the fraction of pairs who can commit to cooperation declines so that $\alpha\phi$ is a constant, and so the fraction of the population who are in a relationship is also constant, as is θ, which remains equal to θ^{crit}.

References

[1] Acemoglu, Daron (1998). "Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality." *Quarterly Journal of Economics* CXIII:4 (November), pp. 1055-90.

[2] Baker, George; Robert Gibbons; and Kevin J. Murphy (1994). "Subjective Performance Measures in Optimal Incentive Contracts." Quarterly Journal of Economics 109:4 (November), pp. 1125-56.

[3] Baker, George; Robert Gibbons; and Kevin J. Murphy (1997). "Implicit Contracts and the Theory of the Firm." National Bureau of Economic Research Working Paper: 6177 (September).

[4] Banerjee, Abhijit V. and Andrew F. Newman (1991). "Risk-Bearing and the Theory of Income Distribution," *Review of Economic Studies* (April).

[5] Bertrand, Marianne (1998). "From the Invisible Handshake to the Invisible Hand? How Import Competition Changes the Employment Relationship." Princeton Industrial Relations Section Working Paper 410 (December).

[6] Coate, Stephen and Martin Ravallion (1993). "Reciprocity without Commitment: Characterization and Performance of Informal Insurance Arrangements." Journal of Development Economics 40:1 (February), pp. 1-24.

[7] Dixit, Avinash K. (1987). "Trade and Insurance with Moral Hazard." Journal of International Economics 23:3/4 (November), pp. 201-20

[8] Farber, Henry S. "The Changing Face of Job Loss in the United States, 1981-1995". Brookings Papers on Economic Activity (Microeconomics 1997), pp. 55-128.

[9] Helpman, Elhanan and Assaf Razin (1978). "Uncertainty and International Trade in the Presence of Stock Markets." *Review of Economic Studies* 45:2 (June), pp. 239-50.

[10] Kranton, Rachel E. (1996). "Reciprocal Exchange: A Self-Sustaining System." American Economic Review 86:4 (September), pp. 830-51.

[11] Kristof, Nicholas D. (1997). "Real Capitalism Breaks Japan's Old Rules." New York Times, July 15.

[12] MacLeod, W. Bentley and James M. Malcomson (1989). "Implicit Contracts, Incentive Compatibility, and Involuntary Unemployment. Econometrica 57:2 (1989), pp. 447-80.

[13] MacLeod, W. Bentley and James M. Malcomson (1993). "Investments, Holdup, and the Form of Market Contracts American Economic Review 83:4 (September), pp. 811-37.

[14] Newbery, David M. G., and Joseph E. Stiglitz (1981). *The Theory of Commodity Price Stabilization.* Oxford: Oxford University Press.

[15] Osborne, Martin J. and Ariel Rubinstein (1990). *Bargaining and Markets.* San Diego: Academic Press.

[16] Pissarides, Christopher (2000). *Equilibrium Unemployment Theory* (2nd edition). Cambridge, MA: MIT Press.

[17] Rodrik, Dani (1997). Has Globalization Gone Too Far? Washington, DC.: Institute for International Economics.

[18] Slaughter, Matthew J. (1998). "International Trade and Labor-Market Outcomes," *Economic Journal*, 108:450 (September), pp. 1452-1462.

[19] Thomas, Jonathan and Tim Worrall (1988). "Self-enforcing Wage Contracts," *Review of Economic Studies* 55:4 (October), pp. 541-54.

[20] Warren, Ronald S. (1996). "Returns to Scale in a Matching Model of the Labor Market," *Economics Letters* 50:1 (January), pp. 135-42.

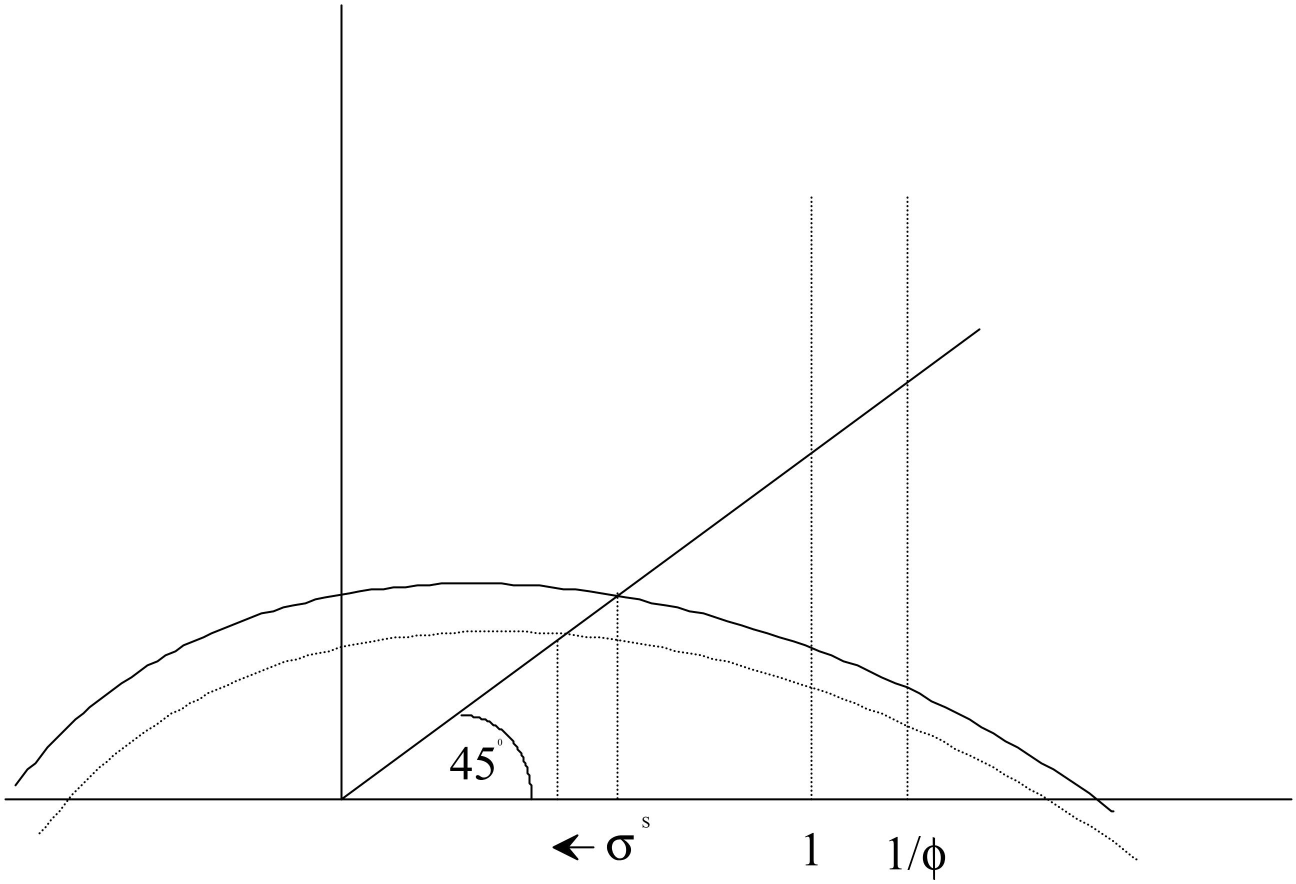

Figure 1: The Determination of the Steady-State Number of Searchers: Endowment Model.

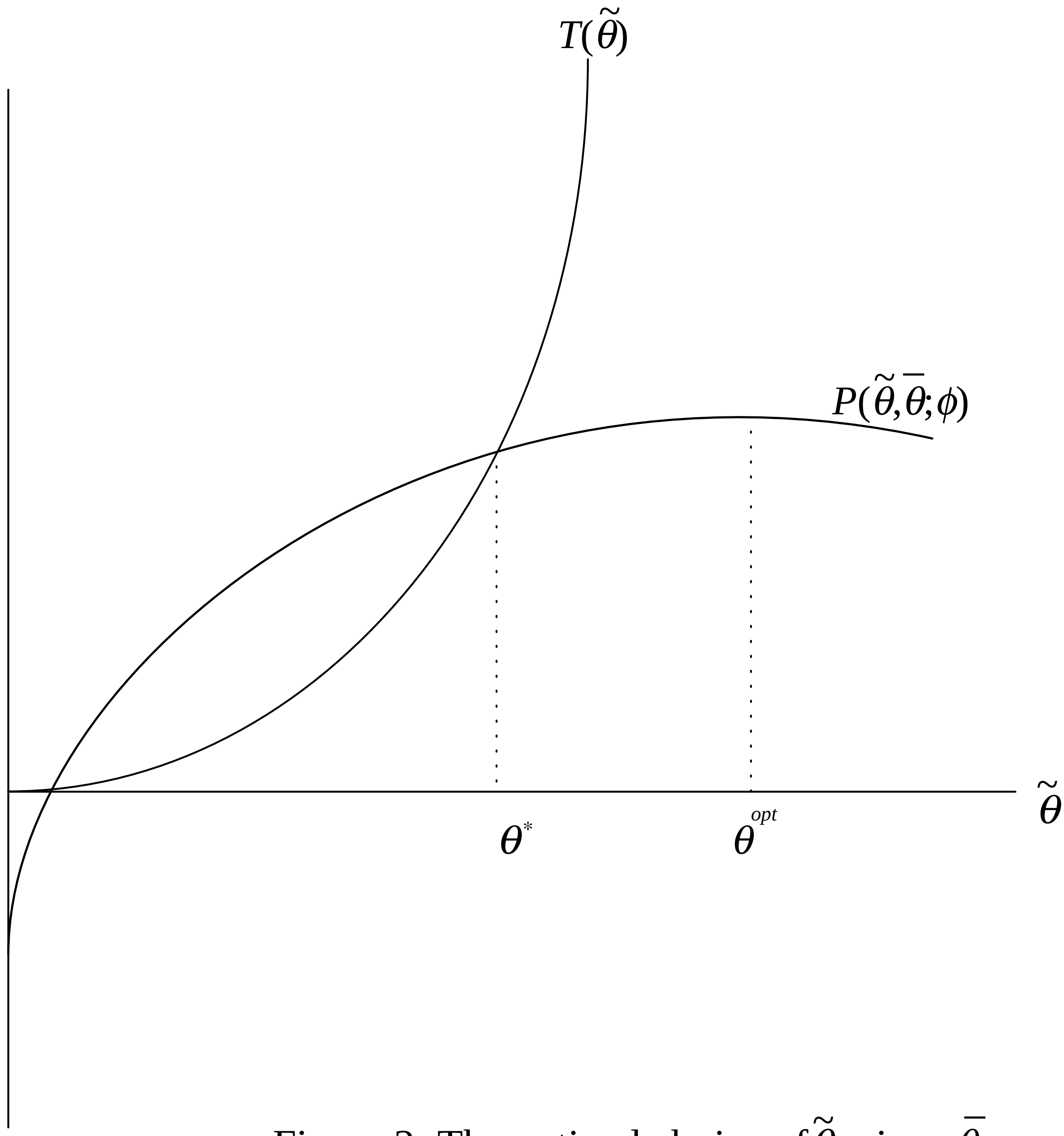

Figure 2: The optimal choice of $\tilde{\theta}$, given $\bar{\theta}$.

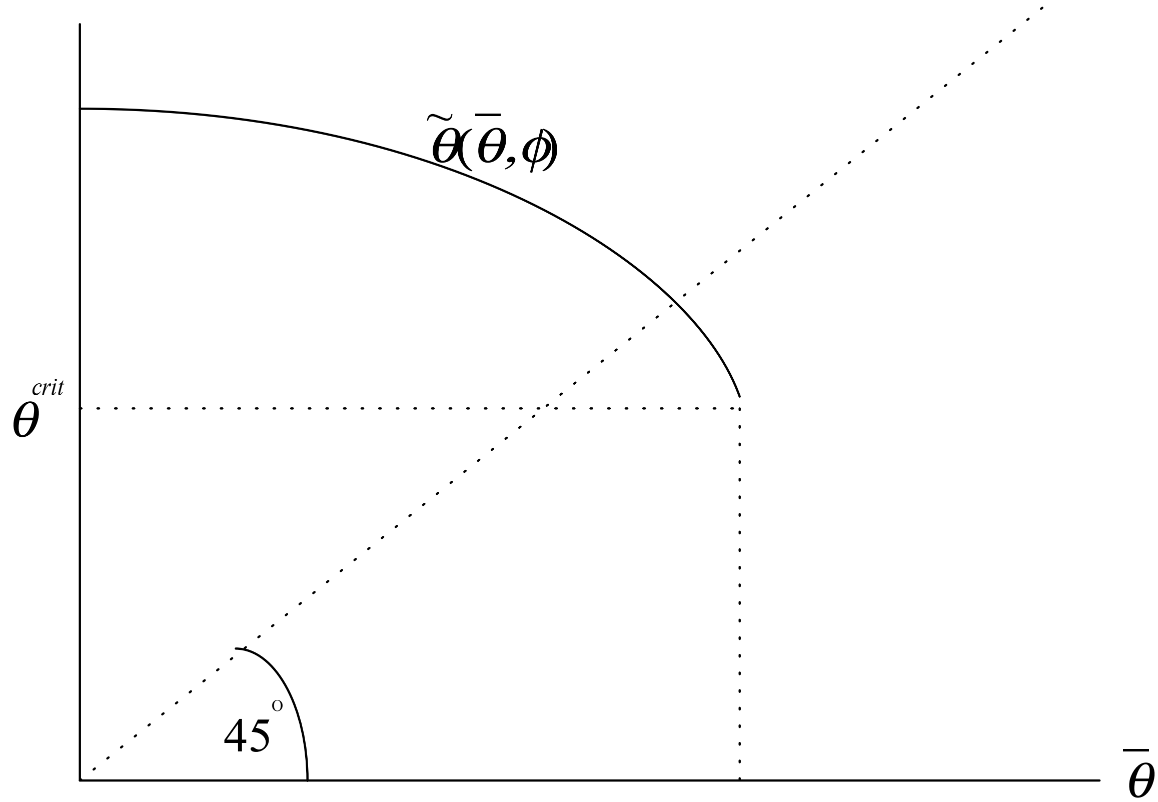

Figure3: Construction of the Equilibrium.

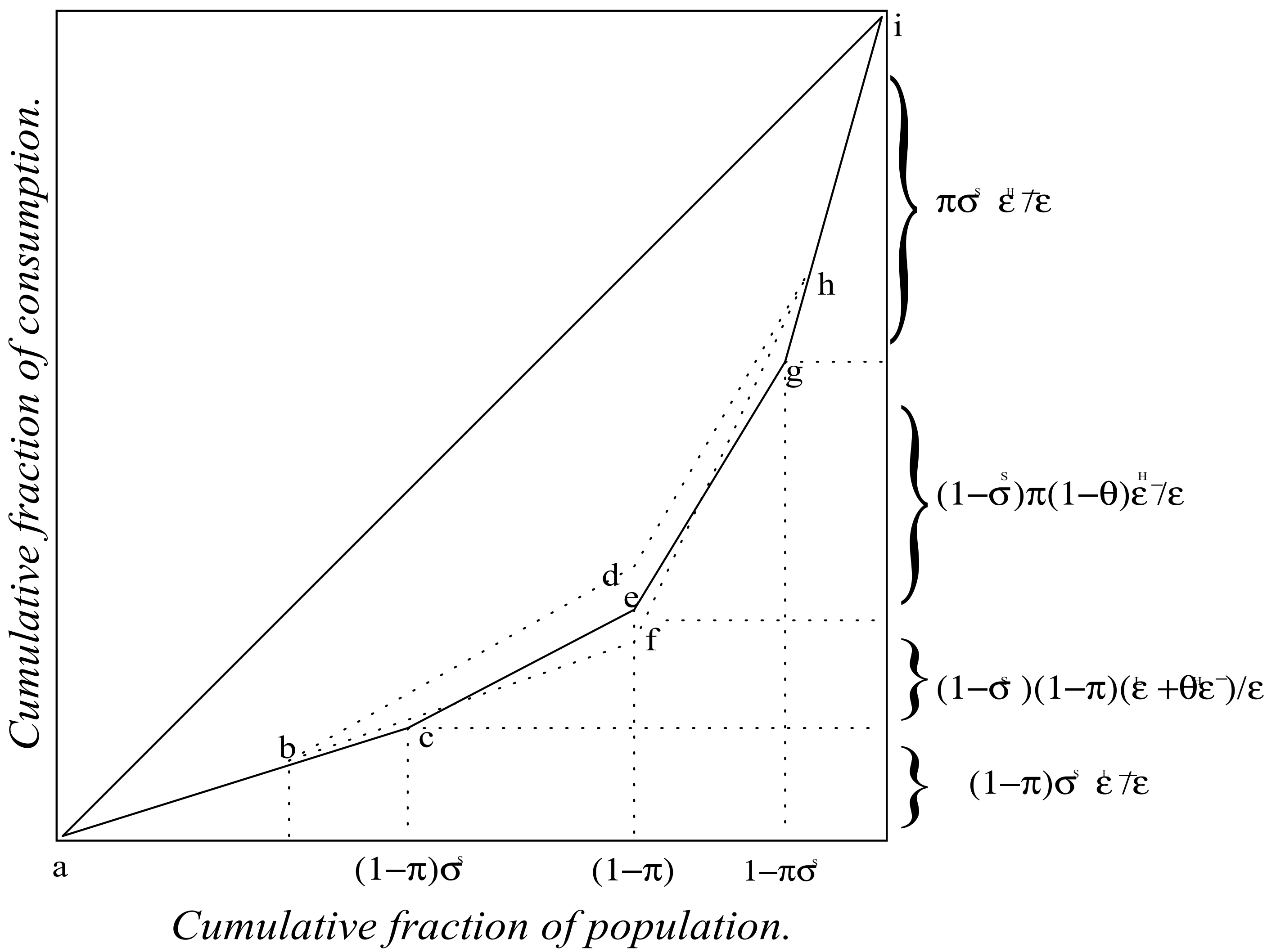

Figure 4: Income distribution effects of globalization.

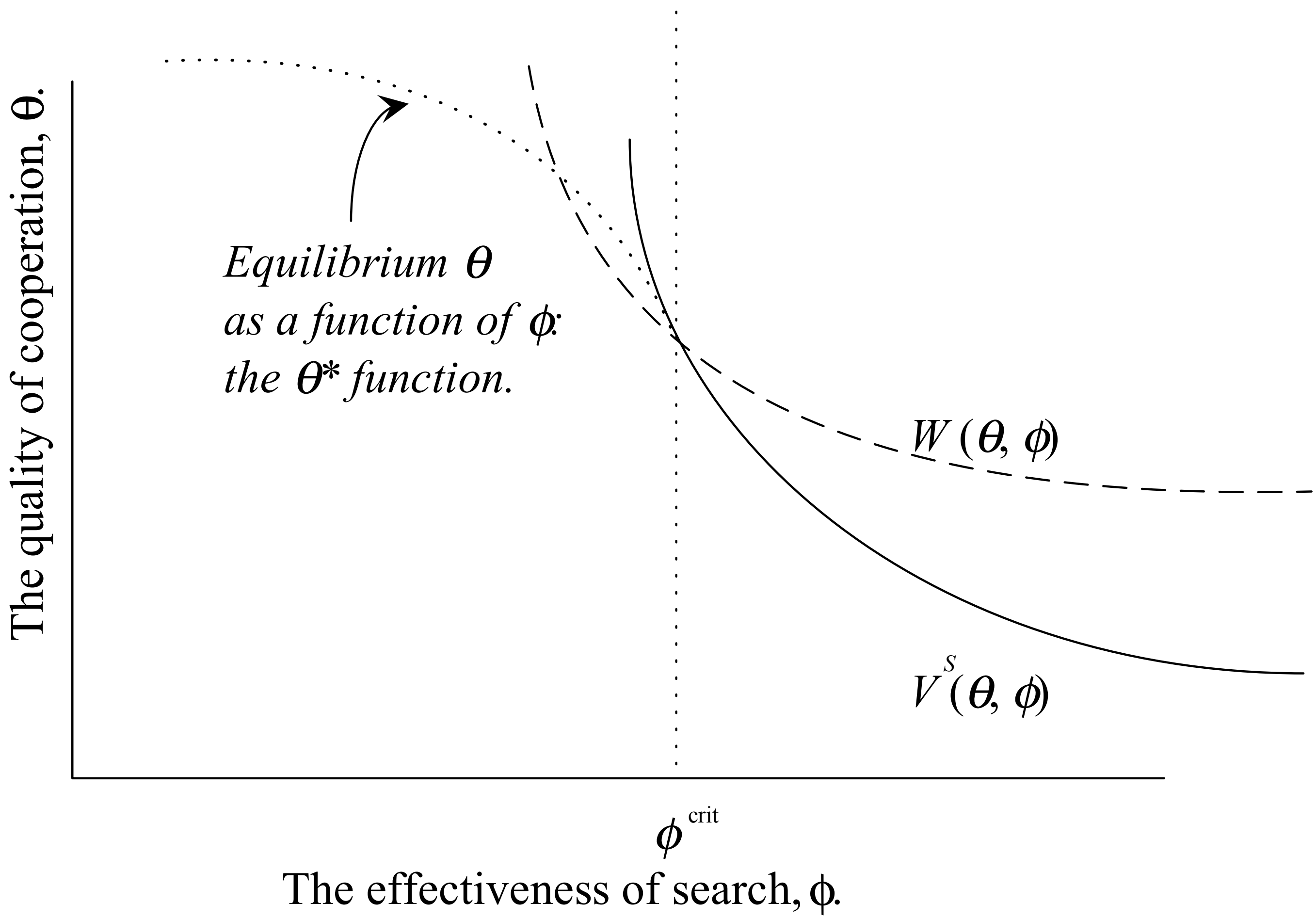

Figure 5: When globalization is harmful at the margin.