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ABSTRACT

This paper shows how recent developments in the Economics of Information can provide insights into economic relations in less developed countries, and how they can provide explanations for institutions which, in neoclassical theory, appear anomalous and/or inefficient. Sharecropping and other tenancy relationships in the rural sector and wage determination and urban unemployment are both investigated within this perspective.

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ECONOMICS OF INFORMATION AND THE THEORY OF ECONOMIC DEVELOPMENT*

by

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There is a widespread feeling that traditional neoclassical economic theory has little, if any relevance to the problems of less developed economies. Some of the important developments in the theory during the past quarter of the century have provided considerable justification for that view. Though the Fundamental Theorem of Welfare Economics has shown rigorously that there is a set of conditions under which Adam Smith's conjecture concerning the invisible hand has some validity, the conditions required seem particularly inapplicable to the circumstances in which most l.d.c.'s find themselves. In particular, there is not the full set of markets--whether for risks, capital (futures), labor or products--that the theorem requires; information is far from perfect; the assumption of a fixed and known technology seems particularly incongruent with an attempt to understand the process by which l.d.c.'s adopt more advanced technologies and by which new technologies diffuse through the economy; and the first stages of development require the provision of infrastructure, which is a public good, and/or is characterized by strong non-convexities.

The problems I have listed are, of course, well recognized, and they are widely discussed under the rubric of "market failures." The liberal doctrines

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of the 1960's and early 1970's had it that a certain amount of tinkering by a benevolent government could remedy these deficiencies in the marketplace, and with these limited interventions, the market economy would function well, in the way that the classical theory had said it would all along.

To believers of neoclassical theory, the difference between l.d.c.'s and developed countries was a matter of degree: the market failures were perhaps more pronounced and thus stronger government intervention might be called for. To critics, the qualifications were of central importance.

Two developments during the past decade, however, have necessitated a reshaping of these views. The first is well known: many of the attempts by governments, both in l.d.c.'s and developed countries, to remedy the market failures which they saw have been less than successful. If markets do not work, but government interventions to remedy their deficiencies also do not work, where are we to go?

The second is perhaps not so well known: at the same time that the standard neoclassical theory was continually being refined, a number of economists were attempting to construct models of the economy using neoclassical tools of analysis, but introducing more realistic assumptions: they were concerned with investigating the causes and consequences of incomplete markets, imperfect information, and imperfect competition.¹ In many cases, these studies were motivated by an attempt to provide models with a

1. Among these earlier studies were George Akerlof's Theory of Lemons, which became the forerunner of innumerable analyses of markets characterized by adverse selection, in which prices convey information (his work was motivated in part by observations concerning information problems he observed during an extended stay in India); Gary Fields' models of the education market, and Stiglitz's study of education as a screening device, both of which were motivated by their experiences in Kenya (though Michael Spence independently derived a quite similar theory of education as a signal [1974]).

greater relevance to l.d.c.'s; but the models which worked well often also provided considerable insight into the kinds of macro-economic disequilibria observed in developed countries as well.

These two developments are not unrelated: the Economics of Information has focused on the information and incentive problems which are common both to public and private organizations; it has provided at least part of the rationale for Public Failures as well as Private Failures, and has provided a framework within which a more rational basis for the assignment of responsibilities to each sector can be made.

In the first part of this paper I wish to survey some of the more important applications of the economics of information to the theory of economic development, suggesting how the theory provides an explanation of phenomena which, within the traditional neoclassical paradigm, appear irrational and/or inefficient; I wish to go on to show that the policy implications of the alternative paradigm may differ markedly from those of standard neoclassical theory. In the second part of this paper, I shall discuss in very general terms some of the broader implications provided by the perspective of the Economics of Information on the development process and the role of the government in that process.¹

I.

1. Tenancy Relationships in Agriculture: Sharecropping

The prevalence of sharecropping in agriculture in less developed countries

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1. In this survey I shall not provide details of the models on which the analysis is based; accordingly, I shall not be able to provide a complete list of qualifications which need to be made, either to any descriptive statement made or to any policy inference based on those descriptive statements. For these, the reader is referred to the original papers on which this lecture is based.

has always been somewhat of a puzzle to economists. Under sharecropping, a worker receives less than the value of his marginal product, and this seems to introduce an inefficiency. How could an inefficient system of land tenure be so persistent?

One natural answer was that it provided a means of risk sharing. Workers were more risk averse than landlords, and the sharecropping contract allowed the landlord to absorb more of the risk than he would if workers rented the land from the landlord. Thus, the prevalence of sharecropping contracts was related to one of the market failures described earlier, the absence of a complete set of risk markets, in which the worker could insure himself against the many risks which he faced.

It was subsequently shown, however, that transferring risk provided part, but only part, of the explanation of sharecropping: all the possibilities of risk sharing which sharecropping provided could be provided by combining wage and rental contracts, which seemingly lacked the inefficiencies associated with sharecropping (Stiglitz [1974a]). I went on to show, however, that if there were no informational problems, there would, in fact, be no inefficiencies associated with sharecropping; the contract would specify precisely the amount of labor to be supplied by the worker. Cheung (1969), having made a similar observation, argued that accordingly, if sharecropping is widely observed, it must be because of some advantage in transactions costs. While agreeing with the tenor of that argument, it has always seemed to me that referring to transactions costs as an explanation is too easy and incomplete an answer. If the explanation of some important phenomena resides in the nature of the transactions costs, then transactions costs need to be the focus of the analysis, and a more detailed modeling of the structure of

transactions costs and of the implications of alternative institutional structures for transactions costs is required. In a sense, my focus on information costs can be thought of as providing that detailed analysis.¹ The information problems that I focused on were associated with monitoring the actions of the worker: it is prohibitively expensive, under most agricultural environments, to monitor perfectly the actions of the worker, to ensure that he acts in the interests of the landlord; for instance, that he weeds when and as much as he should. It is far less costly to monitor the output of the farm than the worker's input of effort. Moreover, because of the innumerable environmental factors which affect each farm (weather, pestilence, disease), which again cannot be perfectly monitored, by observing output one cannot make a perfect inference concerning the worker's input of effort.

If workers were risk neutral,² then rental contracts would be employed. Rental contracts allow the worker to receive the full value of the marginal product of his efforts. But rental contracts force the worker to absorb all the risk.

On the other hand, with wage contracts the landlord absorbs all the risk, which is a good thing, given that the landlord is so much less risk averse than the worker. However, with a wage contract the worker has little incentive

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1. In this sense, the transactions costs approach, which has been so admirably developed in somewhat different context by Oliver Williamson, and the Economics of Information should be viewed as complementary. While the former has identified a number of broad considerations which are relevant to the design of institutional arrangements, the latter has investigated in detail the implications of one important source of transactions costs, those arising out of the costs of acquiring and transferring information.
 2. And there was no risk of tenants defaulting on their rental payments. The consequences of the possibility of default have been investigated (in a somewhat different context) by Stiglitz and Weiss (1981).

to work; to ensure that he performs requires a high level of monitoring. Though the costs of monitoring may not be too high for certain kinds of crops, for others these costs may make such contracts undesirable.

The equilibrium sharecropping contract is thus seen as a compromise: between the incentive properties of rental contracts and the risk properties of wage contracts.

Changes in the environment and in technology--in the degree of risk, in alternative means by which workers can divest themselves of risk or diversify out of the risk (outside uncorrelated income opportunities), in the degree of risk aversion (as the result of changes in wealth), and in the costs of monitoring--will alter the equilibrium contractual arrangement. Thus, the new theory provides not only an explanation of sharecropping, but also for the observed differences in land tenure systems, both over time and in different locations. Sharecropping is not seen as an inefficient, primitive method of land tenure, but as a rational solution to certain real problems facing these economies.

Indeed, this analysis of sharecropping has served as a prototype of a whole class of information problems known as "principal-agent problems". These are concerned with situations in which one individual (the agent) must take actions which affect another (the principal), where the agent has more information than the principal (the worker knows the weather better than the landlord), but the agent is risk averse. Principal-agent problems arise in labor markets (the employer-employee relationship) and in insurance markets. They are pervasive in all economies; understanding them provides considerable insight into a number of institutional arrangements, both in developed and less developed economies, and alters in a

fundamental way the conclusions reached in standard neoclassical analysis.¹

Let me mention four further applications of this analysis to l.d.c.'s .

A. Cost Sharing²

Most agriculture requires inputs other than labor and land. The question arises, how should those costs, e.g., of fertilizer, be shared between the landlord and the worker? Though sharecropping contracts usually entail some cost sharing, and though the share of costs borne by the worker is frequently his share in output, this is by no means the universal form of contractual arrangement. How do we explain these deviations from what would appear to be the simplest, and most reasonable rule? It seems particularly difficult to explain these departures, in light of the fact that the rule of equating cost share to output share would seem to lead to the efficient utilization of inputs: the worker would set his share of cost

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1. In this lecture I am limiting myself to a discussion of how information analysis affects the analysis of problems facing l.d.c.'s, but I should briefly mention how introducing these concerns alters the standard neoclassical results. First, the usual convexity assumptions are not, in general, satisfied: indifference curves and feasibility sets are not, in general, convex (Arnott and Stiglitz [1983a]); competitive equilibrium may not exist, even when all the other strong assumptions of the standard theory obtain (Arnott and Stiglitz [1983b]); when it does, it may have a quite different character than depicted in standard competitive models, as we have noted here, in the case of agricultural markets. (In other markets, the price paid or received may depend on the quantity traded, and there may be quantity rationing.) When competitive equilibrium exists, it will not, in general, be Pareto efficient (Arnott and Stiglitz [1983c]). (Greenwald and Stiglitz [1984]); and it may not be possible to decentralize efficient resource allocations.
 2. For a more extended discussion of cost sharing contracts, see Braverman and Stiglitz (1983).

equal to the value of the marginal product, times his share in output. When the two are equal, the value of the marginal product would equal the marginal cost (Cf. Heady [1947]). Once we recognize, however, that the reason for sharecropping was the unobservability of effort, we can immediately obtain an explanation of these contractual arrangements: the landlord wishes to encourage the worker to increase his effort; if the application of some other input increases the worker's marginal product, and thus leads him to increase his effort, then the landlord may wish to subsidize that input (paying more than his proportionate share of the costs). Moreover, cost sharing contracts are preferable to contracts in which the landlord specifies the level of input, again because of the information asymmetry between landlords and workers: the worker can adapt the level of inputs to changes in circumstances in a way in which the landlord could not.

B. Interlinkage¹

In many situations, the landlord is not only the landlord; he is also the provider of credit and, in some cases, the supplier of inputs, the purchaser of outputs, etc. There is, in other words, extensive interlinking between credit, labor, land, and product markets. Earlier allegations that these were means by which the landlord attempted to exploit the worker were never completely convincing: they never explained why, if the landlord was really in a monopoly-monoposony position, he could not exploit all his monopoly power through his land contract, extracting all the surplus from the workers and forcing them down to the subsistence level.

1. This section is based on joint work with A. Braverman (Braverman-Stiglitz [1983]).

Our theory provides an explanation for this phenomenon, equally applicable to competitive and noncompetitive environments. The landlord would like the worker to work harder. In the previous paragraph we noted that the worker's level of effort may well be affected by the supply of other inputs (fertilizer). By the same token, the worker's level of effort may be affected by what goes on in product and credit markets. The former is easy to see: if alcohol decreases productivity, the landlord may wish to restrict consumption of alcohol; if certain kinds of foods increase productivity, the landlord may wish to encourage their consumption by providing meals on the job or by subsidizing them in the company store. If workers can be induced to borrow heavily, and then face the threat of bondage, they may well work harder than they otherwise would.

So far in our discussion, we have focused on the landlord's interest in encouraging the worker to supply greater effort. But there are other decisions which the worker makes which affect the landlord. There are innumerable risk decisions: by harvesting earlier, risk may be reduced, but the average crop may be smaller. By postponing harvest, on average, the crop may be larger, but there is some chance that a hailstorm will destroy a significant fraction of the crop. It should be clear that the interests of the landlord and the tenant are not likely to coincide: the landlord, being less risk averse, may be more concerned with the effects on average output. At the same time, in situations in which bonded labor is not allowed, the landlord may not be able to collect rents at the end of the season, if the crop is bad, and the lender may not be able to force the borrower to repay his loan. The probability of these events is again

affected by the actions of the worker. The availability of credit and the terms on which it is available thus may affect the probability that the worker fails to pay his rent, and the risks he undertakes; and the terms of the tenancy contract may affect the probability that a borrower fails to repay his loan, and the risks he undertakes. There is a clear interdependency in these two contracts, an important externality. Interlinkage provides a way by which this externality is internalized.

In this new view, then, interlinkage is the natural response of the market to a problem of externalities which arises whenever monitoring either effort or risk-taking is costly. Attempts to restrict interlinkage, either directly or indirectly (e.g., through providing credit at greatly subsidized rates, which eliminates the landlord's favorable position for providing credit) thus may reduce the efficiency with which rural markets function, and may, in the long run, make both landlords and workers worse off.

C. Land Reform

One of the central results of the neoclassical paradigm is the clean dichotomy it provides between equity (distribution) and efficiency considerations. Every competitive market equilibrium is Pareto efficient, and every Pareto efficient allocation can be attained through some redistribution of initial endowments.

In the newly developing theory that I have been describing in this lecture, there is not so clean a distinction. First, not only is it recognized that lump sum redistributions do not occur, but it provides an explanation for why redistributive taxes are always distortionary: the

government can only base redistributions on certain observable characteristics of the individual, such as his income, and these characteristics are always alterable. The government does not have the information required to implement an equitable, non-distortionary redistributive scheme.¹

Second, the nature of the contractual arrangements which occur in an economy depends critically on the distribution of wealth, and these contractual arrangements have an important effect on the productivity of the economy. Sharecropping (with its associated second-best distortions) arises because workers do not have the wealth to purchase their own land and to bear the associated risks.² A land reform thus has the potential of substantially increasing the productivity of the economy; because workers obtain the full marginal productivity of their efforts, they may be willing to put in more effort (and to make "efficient" choices of technique).³

Two caveats to the argument that land reform may increase productivity, both based on information theoretic considerations, should, however, be noted. First, agricultural productivity depends not only on

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1. This view of taxation has been put forward in Atkinson-Stiglitz (1980) and Stiglitz (1982c).
 2. More precisely, if all individuals had the same wealth and degree of risk aversion, then there would be no need to transfer risks, and hence, a principal-agent (moral hazard) problem would not arise. If individuals differed in their risk aversion, even with an equalitarian wealth distribution, there would be some risk transferring, and hence some moral hazard problem, but it would be much less significant than under the present wealth distribution.
 3. As we noted earlier, whenever there is a principal-agent problem, the agent may make choices of techniques which are not in the interests of the principal. But even when there is not a principal-agent problem, if there is an incomplete set of markets, and the relative price of the agricultural good is sensitive to the level of output, then, in general, the equilibrium is not (constrained) Pareto efficient.

the input of labor (effort), but on other inputs as well. Poor farmers may not have the working capital to obtain the requisite inputs of fertilizer or high-quality seeds, or the resources to make productivity-enhancing improvements to their land. More generally, access to capital markets for small borrowers is likely to be more restricted than for large landlords, and when small farmers do have access, the terms at which they obtain capital may be less favorable; this will adversely affect agricultural productivity. This differential access to capital markets should not be viewed simply as a market imperfection; rather, it may reflect the lenders' experiences with repayments of loans from small versus large borrowers, and the differential costs of assessing who among the small borrowers are good risks.¹

Second, productivity in agriculture may be greatly affected by technical progress; improved seeds, improved fertilizers, and improved farming practices. Large landowners may be in a better position to acquire, and then disseminate, this information, than are small farmers; in any case, given that the costs of acquiring this information may be viewed as a fixed cost, independent of the scale of operation of the farmer, the incentives for large landowners to stay abreast are greater.

D. Technical Progress

There has been a long debate over whether landlords resist innovations which might improve the plight of peasants. Neoclassical theory

1. Stiglitz and Weiss (1981, 1983) have formulated models of competitive capital markets in which there is credit rationing, and in which some classes of potential borrowers are excluded from the market and different classes of borrowers are charged different interest rates.

provides an easy answer to this: any innovation which moves the production possibilities schedule outward will move the utilities possibilities schedule¹ outward; in a competitive economy, no landlord will be in a position to resist the innovation (even if, in the new equilibrium, landlords as a whole will be better off), while any monopolist landlord who was in a position to push his peasants down to the subsistence level would wish to adopt the innovation (Figure 1).

The New Theory has shown that this argument is not necessarily correct. There are innovations which shift the production possibilities curve outward, but shift the utility possibilities schedule inward; these innovations will not be adopted, even though net national income might be increased. The reason for this is simple: some innovations, while increasing the level of output at each level of input, may exacerbate the moral hazard-incentive problems of which we spoke earlier. An innovation which increased the average productivity of workers but decreased the marginal productivity of workers might, in a sharecropping economy, result in the peasant decreasing his work effort, enough so that output is actually reduced and the landlord is worse off. The landlord may, in such instances, attempt to restrict the adoption of these innovations.

2. Wage Determination and Urban Unemployment

The second general application of the New Theory which I wish to discuss today is to the problem of urban wage determination and urban

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1. The utility possibilities schedule gives the maximum utility that one (group of) individuals(s) can obtain given the utility level of all other individuals.
 2. For a more extensive discussion of the theory of technological innovation in these circumstances, see Braverman and Stiglitz ().

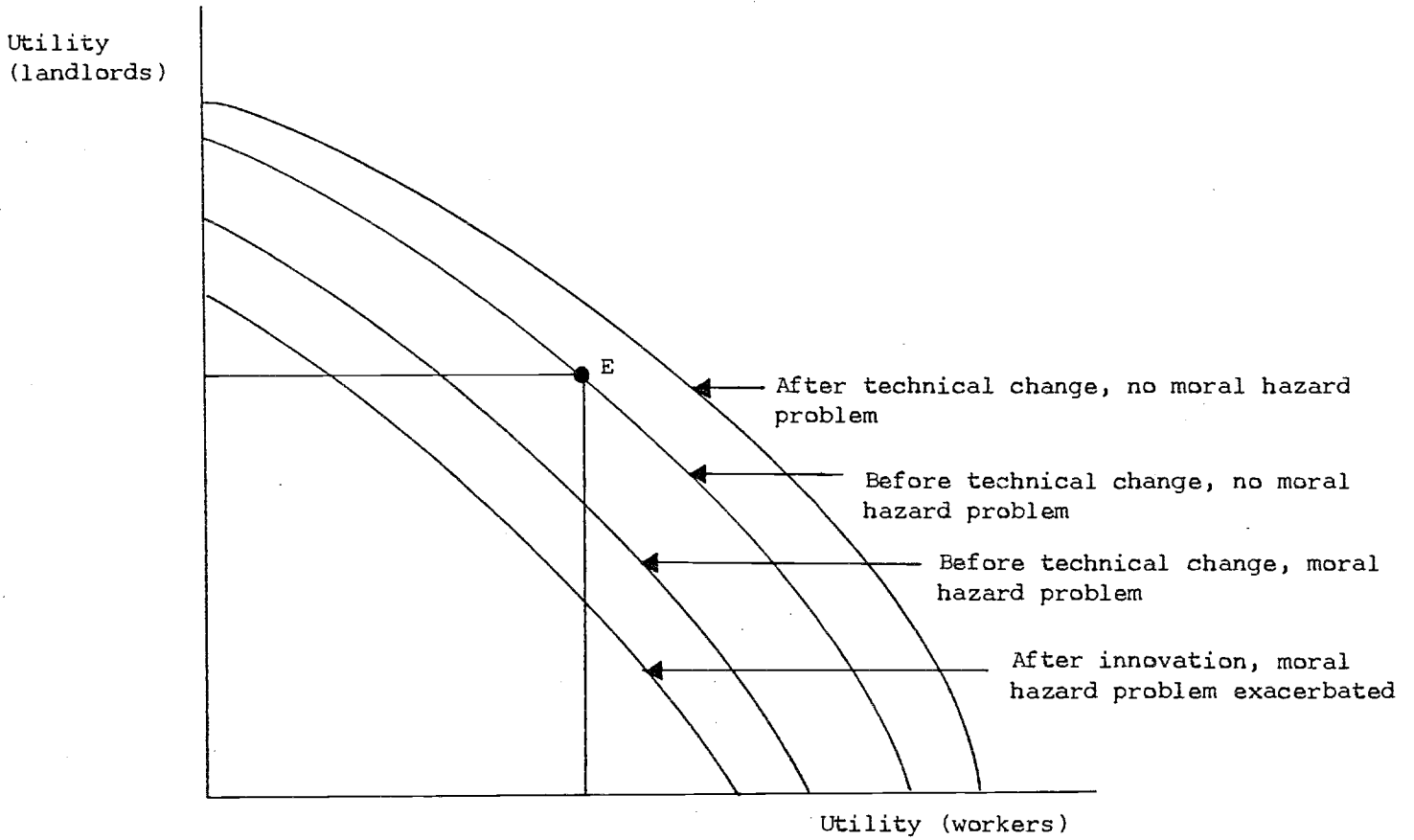


Figure 1

A technical change which, in the absence of moral hazard, moves the utilities possibilities schedule unambiguously outward, and will always be adopted, with moral hazard may move the utilities possibilities schedule inward.

unemployment. It has long been noted that wages in the urban sector seem persistently higher than those in the rural sector, and that these high wages are associated with extensive urban unemployment. (High levels of unemployment have also been a persistent feature of more developed countries as well.) Wages at above market-clearing levels seem inconsistent with traditional neoclassical economic theory. Earlier development economists ascribed these high wages to institutional rigidities, unions, etc. These theories--if they can be called that--have always seemed a bit unsatisfactory. First, they never gave much insight into what policies might change the urban wage, or indeed, what policies were feasible. If unions "set" the real wage, would it respond to an increase in food prices by raising money wages, to keep workers' utility constant? Many analyses of how the government should reduce urban unemployment have been predicated on a rigid wage model which presumes a level of naivete on the part of unions, if it is they who are setting the wage, which is hard to believe. Second, unemployment has characterized--and continues to characterize--economies in which unions are not strong.

The New Theories provide an explanation for high wages, i.e., wages above market-clearing levels. All that is required is that productivity of workers increases with wages and that workers are not paid on a strictly piece-rate basis.

Whenever productivity increases with wages, it is possible that market equilibrium will be characterized by unemployment. The usual argument for why market equilibrium is characterized by full employment is that, if there is an excess supply of workers, the unemployed worker approaches

the firm, offering his services at a lower wage than that paid to the current employees. The wage is thus driven down, the demand for labor increased, and the supply decreased; the process continues until full employment is attained. But if productivity depends on wages, the employer will not necessarily hire a worker who offers to work at a lower wage; the employer may believe that his productivity will be lower, sufficiently lower than his labor costs will actually be increased. Thus, there may be an equilibrium with unemployment, with no forces leading to a reduction in wages. The wage which minimizes labor costs (minimizes the wage per efficiency unit) is called the efficiency wage and is depicted in Figure 2.

There are several reasons that productivity may increase with wages. Earlier work (Leibenstein) focused on a nutritional relationship, though more recent work (Bliss-Stern) has raised questions concerning this. But the Economics of Information has provided two other sets of explanations.

First, workers differ in their abilities, but firms may not be able to ascertain perfectly who is better and who is worse. But firms know that if they pay a higher wage they will get a higher quality applicant pool. Thus, firms will not cut wages, in the face of excess supply of labor, because of the fear that it will reduce the quality of their applicant pool. (See Stiglitz [1976a], Weiss [1980]).

Second, firms seldom can monitor costlessly, or perfectly, the actions of the workers. To induce workers to work hard, there must be some "punishment" for being caught shirking. Consider an economy in

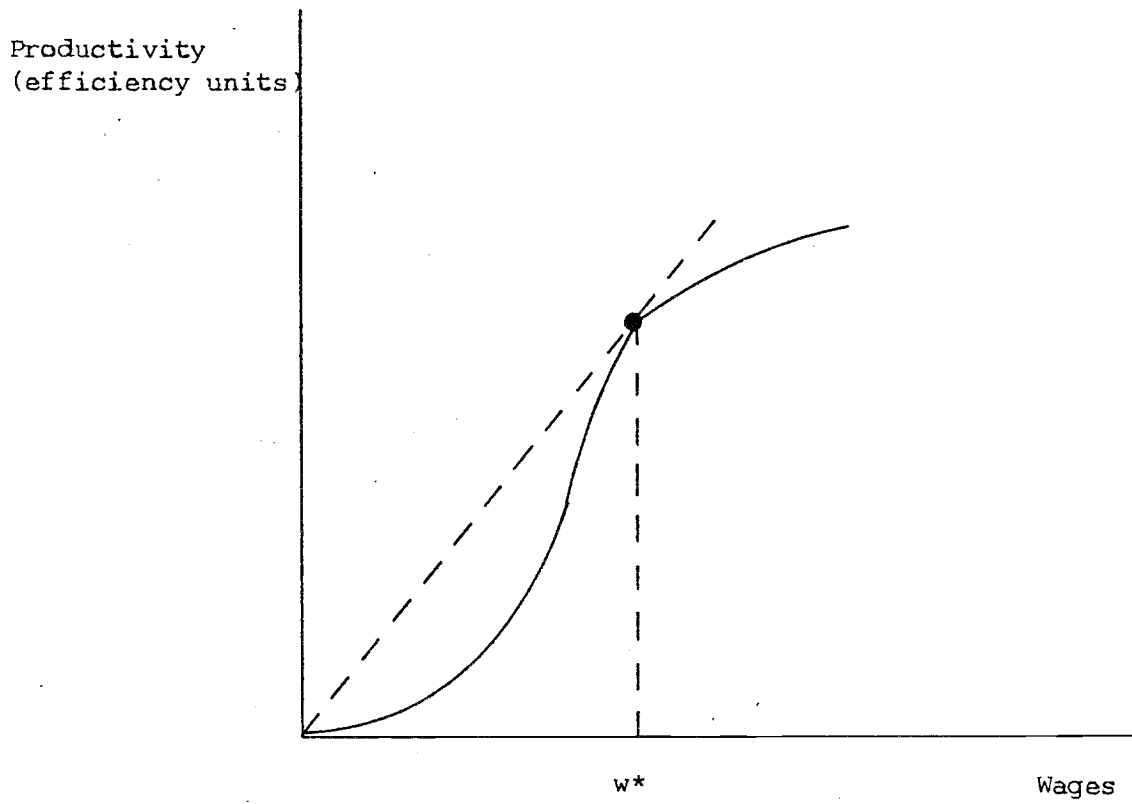


Figure 2

The efficiency wage, w^* , minimizes the labor costs per efficiency unit.

which all workers are identical (so no worker is more of a shirker than another) and all firms are identical. In neoclassical theory, equilibrium would be characterized by all workers receiving the same wage and there being no unemployment. If a worker shirked, the worst punishment that he could be given would be to be fired; but since there is no unemployment, he would be immediately rehired: the worker would have no incentive not to shirk. To induce workers to work, a firm might attempt to raise its wage over rivals; but since all firms are identical, they all try to raise their wages. At the higher wages, their demand for labor is reduced. There is an equilibrium level of unemployment. The unemployment acts as a discipline device for workers: now there is a real cost to shirking (even if when they eventually get rehired they get paid the same wage that they did in the previous job). (See Shapiro-Stiglitz [1984], Calvo [1979].)

This example illustrates a more general principle: when, because of the relationship between wages and productivity, wages are rigid (in the sense explained above), unemployment may serve as an equilibrating device.

These are not the only explanations of the relationship between wage and productivity. Lowering the wage may increase labor turnover, and if there are specific training-hiring costs which are borne by the firm, this will increase the firm's total labor costs.¹ (See Stiglitz, 1974a, 1974b.)

1. For a more extended discussion of these alternative theories, see Stiglitz (1982a, 1984a), Akerloff (1984), and Yellon (1984).

Thus, we have shown that one of the fundamental tenets of neoclassical economics, the law of supply and demand, which holds that competitive equilibrium requires the equality of demand and supply, is not, in general, valid. Equilibrium may be--and frequently appears to be--characterized by an excess supply of laborers.

These arguments apply with equal force to other markets as well. Equilibrium in capital markets may be characterized by credit rationing, by an excess demand for capital. Increasing the rate of interest may have adverse selection effects--the applicant pool may have a higher probability of default--and adverse incentive effects--those who do borrow may have an incentive to undertake greater risks.¹

Not only does the New Theory provide an explanation for an important set of phenomena which neoclassical theory cannot explain, but it also has strong policy implications. We consider here only three.

A. Wage Subsidies

In the older view, the presence of unemployment meant that the opportunity cost of labor was zero, and firms should be induced to hire more workers. Thus, a common prescription recommended in the 1960s was for the government to provide a wage subsidy. Most of these analyses assumed, however, that the urban wage would remain unchanged; our analysis suggests that some fraction of the wage subsidy may be shifted towards workers. (The extent of shifting will depend on the source of the relationship

1. Thus, the standard paradigm requires that the employer (the lender, the landlord) be able to observe perfectly (and costlessly) the actions of the employee (borrower, tenant) so that the compensation of the agent depends precisely on his actions (and only on his actions).

between wages and productivity, and the form of the wage subsidy; whether the wage subsidy is an ad valorem wage subsidy or a specific wage subsidy will, in this theory, have an important effect on the extent of shifting. If there is shifting, then the higher urban wage may result in more migration from the rural sector, the equilibrium level of unemployment may increase, and the level of national income might actually decrease.

B. Unemployment Compensation

In some versions of the New Theory, unemployment compensation may actually increase the unemployment rate and lead to a lower level of national income. This is true, for instance, of the model where unemployment is serving as a discipline device for workers. The penalty that a worker faced upon being fired depends on the magnitude of unemployment compensation; the larger the unemployment compensation, the lower the cost of being fired, and hence, the higher the wage must be to induce workers not to shirk.

C. Shadow Wages

The observation of extensive urban unemployment led many economists to conclude that the shadow wage of workers was zero.

Subsequent work in the 1960s and early 1970s emphasized that increasing employment might increase consumption, and thus decrease the surplus which is available for investment. Thus, if investment is more highly valued at the margin than consumption, the shadow wage will be positive (though so long as consumption has some marginal value, less than the urban wage). In the new view, increasing urban employment has at least

two important effects that need to be taken into account. First, it affects the equilibrium level of wages in the urban sector. Second, the change in the wage, as well as the change in the employment level, results in migration from the rural sector. In the polar case where both the urban and rural wage remain unchanged, and migration continues to the point where the expected urban wage (that is, the wage times the probability of getting the job) equals the rural wage, the unemployment rate will remain unchanged, the loss in output in the rural sector is just equal to the urban wage, and there is no change in aggregate consumption. Thus, independent of the social weight attached to investment, the shadow price on labor is just the urban wage. Although this is clearly a polar case, it is clearly more reasonable than the other polar cases investigated in the literature, e.g., which assume that there will be no migration from the rural to the urban sector.¹

II.

In the previous sections I have attempted to sketch how the New Economics of Information has changed our views of how markets work, of the nature of equilibrium as well as the efficiency of competitive markets. In this section, I want to explore some of the insights which the New Theory provides on the broader issues of the nature of the development process and the role of the government. By their nature, my remarks in this section are intended to be more speculative than those of the preceding section.

1. For a more extensive development of these ideas, see Stiglitz (1982b), and Sah and Stiglitz (1984).

What distinguishes less developed countries from more developed countries? This is a question which has been at the center of debates over the development process for decades. If one could identify the critical determinants, one presumably might have greater hope for intervening, in a positive way, to assist this process.

For a while, there was a view that a principal difference between developed and less developed economies was the level of capital accumulation; this diagnosis led to an immediate prescription: transfer (either by gifts or loan) capital and the difference between the developed and the less developed countries will be significantly lessened. Though a lack of capital is obviously associated with a lack of development, this in itself is not a sufficient explanation--if it were, presumably the return to capital would be high, and the usual market forces would be at work leading to a transfer of capital from developed to less developed countries.

Others have attributed the lack of development to a lack of human resources, with the obvious prescription that what is required is investment in human capital. Though again, this may be important, it is only part of the explanation: the high levels of unemployment among the educated in some l.d.c.'s, and the large numbers of the highly educated working at jobs utilizing few of their skills suggests that something more is at stake.

A third "missing factor" that is often noted is rather more vague than the preceding two; it is referred to as entrepreneurship, the ability to organize resources, to produce goods and services that are wanted by

other individuals, and to market and deliver those goods and services. Again, though this may be part of the explanation, there are cultures which are noted for their entrepreneurial talents; ethnic groups which, when they migrate to other countries, seem to flourish, but within their native environment seem unable to bring about the transformation of their own country.

Though the absence or presence of entrepreneurship by itself is not sufficient to account for the state of the economy, entrepreneurship combined with certain other critical ingredients may be. An analysis of these may provide some insight into the appropriate role of the government.

First, and most important, there must be an appropriate linkage between entrepreneurship and capital: it is not only the aggregate level of investment that is important, but also the allocation of capital resources. And it is not just the allocation of resources among sectors, which has been the focus of traditional planning analyses, it is also the allocation of (capital) resources among managers. We all know that there are some enterprises in an industry which turn out to be very profitable, other enterprises within the same industry which are much less so. Intra-industry variability in profits may be as large as inter-industry variability. Though there are a large number of factors which account for these differences, part of the difference lies in what we can refer to loosely as the quality of management. The allocation of resources among alternative management teams is one of the central problems facing capitalist economies. It is an information problem, and a problem to which society devotes an enormous amount of resources. (Indeed, it corresponds

to the selection problem discussed earlier.) It is, however, a problem which has been ignored within the planning literature.

We also noted in our earlier discussion the importance of the incentive problem in market economies. The problem of incentives does not, of course, disappear when an enterprise is taken over by the government. The issue of the appropriate design of incentives is as important for state enterprises as it is for private enterprises.

The government, it used to be argued, had an advantage over private enterprises in resolving another information problem: in coordinating decision making. But this view ignores the enormous amount of information exchange and coordination which occurs in decentralized market economies. Before U.S. Steel constructed its steel mills on the southern shore of Lake Michigan, it had to ensure that it had an assured source of supply for the necessary inputs (coal, limestone, iron ore) and it attempted to ascertain whether there would be a ready market for its output. An enormous amount of coordination, of information exchange, was required, but it occurred in a decentralized manner. Thus, the question is not whether there should be coordination, but how that coordination is to occur, where the locus of information exchange should be. If information transmission and processing were costless and if there were no incentive problems--so everyone transmitted all of his information accurately--clearly there would be everything to be gained and nothing to be lost; from the centralization of information. But these assumptions are no more realistic than the assumption that goods are costlessly produced, and drop, freely from the sky, like manna from Heaven.

(Note that the traditional competitive paradigm, as exemplified by the work of Arrow and Debreu, is no more realistic in this respect than the traditional planning literature: they assume that all information exchange occurs via prices, ignoring the importance of other signals and methods of information acquisition and dissemination.)

If the major source of market failure was one of the simple forms discussed in the early 1960s, e.g., externalities, the role of the government would be clear. It would need to intervene, to ensure either through price or regulatory interventions, that these externalities become effectively internalized. The government simply needs to change the incentives facing private firms, to ensure that they act in accord with what is socially desirable. But if a major source of market failure is associated with the information problems with which we have been concerned in this lecture, there is no obvious prescription. The information problems, of selection, of incentives, of coordination and information exchange, are no different for the government than for the private sector, and indeed, in some dimensions, they may clearly be worse. One may argue that there are market forces which work to ensure that those who are entrusted to the management of capital and human resources are those who have a comparative advantage in doing so. There is no reason to believe that the electoral process (when it works) works to select public officials who have a comparative advantage in selecting good managers, or who have a comparative advantage in designing incentive structures which ensure that individuals work hard, and that their work is directed at pursuits which are or might be construed to be in the National Interest. (Indeed, the fact that so many governments have

devised regulatory systems and tax structures of such complexity and with so many distortions that much of the talented resources are devoted to dealing with these regulations, attempting to avoid their most deleterious consequences and to tax arbitrage, to taking advantage of the inconsistencies and differential tax rates which arise inevitably within these complex tax structures, suggests that governments may be particularly inept at solving these problems, for reasons which may be explained by the nature of the political process).

Similarly, governments, noting the prevalence of credit rationing, have often intervened to improve the functioning of capital markets. They have simply assumed that the imperfection of the credit market was just another manifestation of the imperfection of market economies. A government could easily intervene, to design a better functioning capital market, allocating capital on a more rational basis. The experience in many countries in which governments have attempted this is not entirely favorable: default rates have been high, real interest rates have been kept at low levels, access to credit has been based more on political considerations than on economic considerations, and overall, there has been little evidence that a greater degree of "rationality" in resource allocation has been achieved. Our analysis again provides some insight into this public failure: we have argued that credit rationing will occur in competitive markets characterized by imperfect information, where the lender is imperfectly informed concerning the characteristics of potential borrowers and cannot perfectly monitor their actions. These selection and incentive problems are no less important when the government takes over

responsibility for allocating credit. Indeed, the problem becomes exacerbated, because political consideration may become paramount in the allocation of credit, in a way which they do not in a market economy.

In this lecture, I have attempted to argue that the information problems which are central to private market economies are equally important in public enterprises; that they give rise to public (government) failures, just as they give rise to private (market) failures. I have not, however, had time to show more precisely how Information Analysis can provide some insights into the specific nature of public failures, into the widely observed phenomena of excessive red tape and rapid growth in the size of the administrative labor force in the public sector. A detailed analysis of the incentive structures within the public sector can, I believe, provide us with considerable insight into these phenomena.¹

IV. Concluding Remarks

In conclusion, let me reiterate the general theme of this lecture: traditional economic theory has ignored the central problems associated with costly information. When due attention is paid to these information theoretic considerations, the basic propositions of neoclassical analysis no longer remain valid: market equilibrium may not exist, even when all

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1. The analysis which I have presented often seems so much like simple common sense that it hardly deserves to be called an economic theory. (This is in contrast to lessons of neoclassical economics, which seemingly can only be learned through the discipline of a rigorous graduate school training.) Let me say two things in my defense. First, there is nothing as uncommon as good common sense; and the fact that the theory that we have developed here is in accord with everyday observations is to be viewed as a virtue, not a vice. Second, rigorous formulations of the ideas presented here have been developed elsewhere. Understanding these more rigorous formulations does require an understanding of the kinds of tools acquired in a disciplined graduate school training. Thus, while the lessons learned in graduate school may no longer be valid, the techniques of analysis have not yet become obsolete. See Stiglitz (1978, 19

the underlying preferences and production sets are "well behaved"; when equilibrium exists, it is, in general, not Pareto efficient; it may not be possible to decentralize efficient resource allocations; the separation between efficiency and equity considerations which characterizes traditional neoclassical theory no longer obtains; market equilibrium may be characterized by an excess demand for credit or an excess supply of labor (that is, the law of supply and demand no longer holds). The theory which has been developed explicitly incorporating information theoretic considerations provides an explanation of phenomena about which traditional theory simply had nothing to say.

In this lecture, I have been particularly concerned with showing how this New Theory can provide insights into markets in less developed economies, to show how it can provide explanation for institutions which in neoclassical theory appear anomalous and/or inefficient. In some cases, it yields clear implications for policy, implications which are at variance with those emerging from traditional neoclassical analysis. In other cases, all we have obtained so far is a word of caution: information problems may give rise to public (governmental) failures just as they give rise to market failures. The analysis of the appropriate role of the government is far more complex than traditional analyses lead us to believe. But if we have learned this simple lesson, we may have learned a lot.

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