Human Agency as a Determinant of Material Welfare

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ABSTRACT: Standard economic theory, which assumes that economic agents behave x-efficiently, precludes human agency as an important variable in determining the level of material welfare. But when the quantity and quality of effort involved in the production process is a choice variable, human agency and its particular determinants must play critical roles in affecting the economy. Human agency affects material welfare by affecting not only the efficiency of production but also the extent and the rate of technical change. Human agency, in turn, is motivated by pressure, be it individual, cultural, or market-driven. The model presented here helps to explain both the existence of upward sloping long run supply curves even in the *absence* of external diseconomies as well as the timing of and the adoption of new technology.

INTRODUCTION

The conscious actions of wilful individuals can help determine the level and the rate of growth of gross national product, yet standard economic theory pays little or no attention to individual human agency as a primary determinant of society's material welfare. In any firm where goods and services are produced, economic agents, workers, and members of the firm hierarchy alike, are typically assumed to behave in a manner consistent with profit maximization and cost

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minimization. Standard theory assumes that the behavior of the firm's economic agents is compatible with optimal performance in that firm. Human agency as a determinant of gross national product, therefore, is simply assumed away. But economic theory, if it is to be effective, must better incorporate human agency as a true determinant of a society's material well-being. In order to do so, it becomes necessary to assume that economic agents can choose to behave in a manner consistent with either optimal and suboptimal economic results.

Behavioral economics, unlike standard economic theory, allows for nonprofit-maximizing behavior. Behavioral economics assumes that members of the firm hierarchy are characterized by preferences or objective functions which lead to goals other than profit maximization. In this way, "suboptimal" results become a possibility when modelling firm behaviour.[1] Harvey Leibenstein (1966, 1973, 1979, 1983, 1987), through this development of x-efficiency theory, incorporates the basic results of behavioral economics. However, he further argues that, typically, the preferences of all economic agents differ. In particular, the objective functions of workers and members of the firm hierarchy are assumed to be both different and incompatible. Only under exceptional circumstances, he argues, when all economic agents have preferences consistent with profit maximization and cost minimization, will profits be maximized and costs minimized. Even if all members of the firm hierarchy have as an objective to maximize profits and to minimize costs, these goals will not be realized unless workers have the same preferences. Therefore, x-efficiency theory assumes that, unless the motivational structure and the culture of the firm yield very particular preferences, firms will not tend to produce optimally. Under such conditions the results predicted by standard economic theory become the exception to the rule.[2]

Writing earlier in the century, Joseph Schumpeter (1934 [1974]), was concerned with the general performance of economies. He stands preeminently as one economist who understood that the individual entrepreneur, or more precisely, certain key entrepreneurs, were major determinants of a society's standard of material well-being through their contribution to technical change. Max Weber (1904-1905 [1958]), stands as another well-known thinker who argued that certain mental attributes incorporated into the ideal-typical Puritan work ethic were conducive, and indeed necessary, to capitalist development. The Puritan work ethic, as an ideal type, held that individuals who did not prefer to work hard would be relegated to an economic waste land. Therefore, both of these authors suggest ways in which human agency affects economic change.

AN ALTERNATIVE MODEL OF THE ECONOMIC AGENT

The premise of differential preferences or objective functions amongst economic agents, elaborated upon by Leibenstein, establishes the basis for a model of the economic agent in which human agency is clearly a determinant of material welfare. This model incorporates the results of behavioral economics with those of scholars like Schumpeter and Weber; and supports the importance of human agency, in one form or another, for determining the economic evolution of society. In this article, I develop a model in order to demonstrate how conscious human action can determine differences in productivity among firms and societies and, thereby, differences in their level of material well-being. The basic premise of this model is that economic agents are not all the same and are, therefore, characterized by different objective functions. These different objective functions cause differences in material wealth. This is not to say that other factors do not also play determining roles in generating differences of productivity between firms, or differences in the wealth of nations. Rather, this model simply attempts to isolate the role of human agency in affecting these differences.

As with all economic models, simplifying assumptions are required here. To begin, I assume that there are n industries, each producing a unique and homogeneous product. It is assumed that, within each industry, there are n firms, where n is a large enough number of firms to prevent any one firm from affecting the market price of its output.[3] I further assume that each firm, within each particular industry, is characterized by identical production functions. It is, therefore, also assumed that each firm is producing the same product with the same technology. These assumptions are not unlike those typically made by standard economic theory. I also presuppose that there exist no external economies or diseconomies. Therefore, *ceteris paribus*, in the so called long run, the supply curve is perfectly elastic with respect to price. The short run supply curve can, of course, be characterized by a positive slope. Moreover, all firms are assumed to face the same transaction cost-institutional environment and each firm's economic agents are assumed to possess identical limitations with respect to their capacity to process information. Thus, important exogenous variables which can affect a firm's level of output are the same for all firms within a particular industry.

Standard theory typically assumes that a firm's economic agents have either the same objective function, and/or that the arguments of these objective functions are such that each firm will 'behave' in a manner consistent with profit maximization. Implicit in the notion of profit maximization are two behavioral assumptions. First, it is assumed that economic agents of firms behave in ways consistent with the equating of marginal cost to marginal revenue; furthermore, the same economic agents, workers, managers, and owners alike, must all work as best as they can. In effect, each firm's economic agents maximize their pace and quality of effort per unit of time and thereby minimize a firm's unit costs.[4] Therefore, firms are pressumed to be technically efficient or, in Leibenstein's more meaningful terminology, x-efficient. Even if the firm behaves in a manner consistent with the equalization of marginal revenue to marginal cost, the firm will not be maximizing profits if the latter behavioral assumption does not hold true; the firm would then be x-inefficient. In Figure 1, total profits are given by the area between the marginal cost and marginal revenue curves (P_o). An x-inefficient firm operates with marginal cost curve, MC_1, whereas the x-efficient firm operates with marginal cost curve, MC_o.[5] Total profits, therefore, are greater when the firm is x-efficient, although, in both of the above cases the firm's economic agents behave in a manner consistent with equalizing marginal cost and marginal revenue.

It is also true that, if a firm's output per unit of input is not being maximized, *ceteris paribus,* unit costs to the firm will be higher than they would otherwise be. Unit or average cost equals factor input prices times the quantity of relevant factor inputs required to produce a unit of output. The latter term is the inverse of average factor productivity. In x-inefficient firms, average factor productivity is lower than in relatively x-efficient firms. Therefore, unit costs must be higher in the x-inefficient firms. It follows that, in those firms where economic agents are working harder and better, profits will be higher and unit costs will be lower, *ceteris paribus.*

In this article, I assume that firms can be x-inefficient and that economic agents can therefore choose a wide range of alternative pace and quality of effort combinations per job for any given compensation package or rate of pay. Thus, at one extreme, economic agents are characterized by preferences which yield maximum pace and quality of effort 'bundles.' At the other extreme, economic agents' preferences yield minimum pace and quality bundles. Most economic agents are assumed to prefer pace and quality of effort combinations which yield average pace and quality bundles. Thus, exempting exceptional cases, I assume that economic agents prefer to work less hard and less diligently than what they are capable of.

Consequently, in this model, most economic agents are not imbued with Weber's ideal-typical work ethic. The actual distribution of economic agents by pace and quality of effort preferences is an empirical question. However, a critical assumption of this article is that only in exceptional cases do economic agents *prefer* to work x-efficiently. Furthermore, for simplicity, it is also assumed that economic agents attempt to maximize their utility. Utility maximization simply refers to the assumed desire of individuals to do their utmost to maximize their personal level of spiritual and/or material well-being, given the constraints they face. Utility maximization does not imply that an individual will necessarily work as hard or as well as she or he can. Rather, utility maximization is consistent with both x-efficiency and x-inefficiency. Whether x-efficiency is achieved depends on the economic agents' preferences. X-efficiency requires that economic agents possess very particular preferences or utility functions.

For one person firms, for example, the assumptions listed here would yield a distribution of firms by level of x-efficiency which flows directly from the

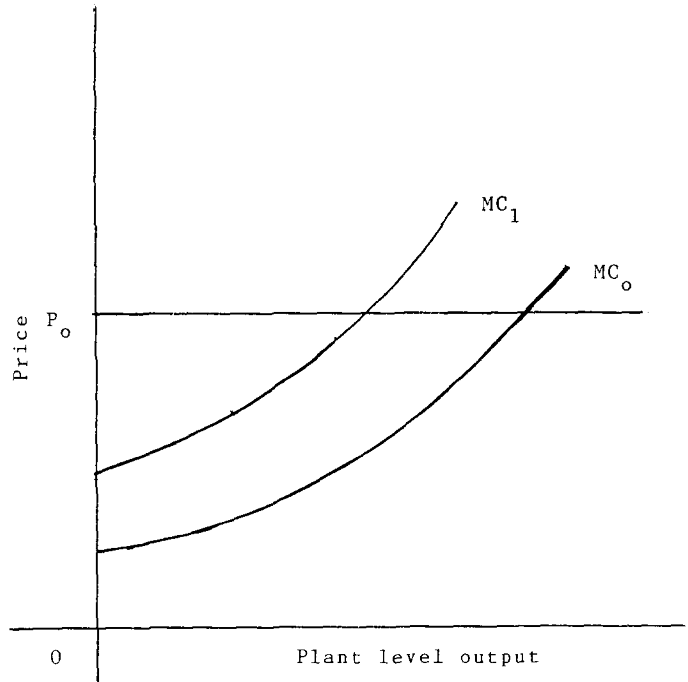

Figure 1

preferences of the owner-operators of the firms. For the multi-person firm, the results are similar, although more complex. Leibenstein (1973) argues that x-efficient production is possible only when all economic agents, workers and members of the firm hierarchy alike, are characterized by preferences which are biased towards maximum pace and quality of effort bundles. Such preferences are, in turn, at least partially a product of a cooperative workplace environment (Leibenstein, 1973; Rozen, 1985, 1990). Otherwise, firms will produce x-inefficiently. For a multi-person firm, x-inefficiency can result simply from members of the firm hierarchy's preferences having biases against x-efficient pace-quality effort bundles.[6] In this case, even if workers are willing to produce x-efficiently, firms will be x-inefficient as long as members of the firm hierarchy are not willing to invest the time and effort required to generate x-efficient production.[7] The distribution of firms by their level of x-efficiency flows directly from the preferences of members of the firm hierarchy. On the other hand, even if members of the firm hierarchy prefer their firms to perform x-efficiently, this will not occur if workers do not have similar preferences. Such dissimilar preferences yield higher monitoring and enforcement costs with respect to contracts. Thus, even when members of the firm hierarchy attempt to equate marginal costs to marginal revenues, the higher contractual transaction costs will yield lower pace and quality of effort bundles than that which would be generated in a world where the preferences of both the workers and the members of the firm hierarchy are oriented towards x-efficient behavior. This assumes that contracts are incomplete with respect to the pace and quality of effort contracted per unit of time. Workers are contracted to provide a specified numbers of hours, weeks, or months of work to the firm. However, workers have some discretion with respect to the pace and the quality of the effort bundles which they choose to supply to the firm, given the positive economic costs involved in writing, specifying, monitoring, and enforcing contracts. In this case, the distribution of firms by their level of x-efficiency is related to the preferences of workers and the manner in which these preferences affect the transaction costs of recruiting and managing the firms' labor force. Finally, x-efficiency need not be realized if the preferences of members of the firm hierarchy are affected by any conflict that might ensue from forcing workers to work harder and more diligently than they would otherwise desire. If such conflict yields disutility, utility maximizing members of the firm hierarchy will place less pressure on workers and workers will work less x-efficiently than they would otherwise (Altman, 1990; Leibenstein, 1979, 1984, 1987). The distribution of firms by their level of x-efficiency is here related to the preferences of *all* of the firm's economic agents.

X-inefficient firms, though, can survive in the market place if imperfect product markets exist or if higher cost producers are sheltered by tariffs, subsidies, and/or tax breaks from the competitive pressures imposed by the more x-efficient firms (Leibenstein, 1979). The relatively x-inefficient firms can also survive in the marketplace when product markets are perfect, even if protection is not afforded to the relatively x-inefficient firms. Low wages can compensate for the low productivity of the x-inefficient firms. By lowering the price of an important factor input, unit costs can be lower than they would otherwise be (Altman, 1990, 1992). As illustrated in Figure 1, the marginal cost curve of the x-inefficient firm can be driven towards MC_0 by reducing wages. Given the state of the market and the extent of protection available to x-inefficient firms, low wages can allow for the persistence of x-inefficient firms in the marketplace. Alternatively, relatively high wage firms can thrive in the marketplace to the extent that the high wages are compensated for by higher productivity. Firms where economic agents work harder and better, firms which are relatively x-efficient, can afford to pay higher wages.

The assumptions underlying this model, which include the simplifying assumption of perfect product market competition, plus the additional assumption of identical profit maximizing and cost minimizing utility functions amongst all economic agents, yield a horizontal industry 'long run' supply curve in the absence of external economies or diseconomies. If, on the other hand, the internal organization amongst various firms and the preferences of these firms' economic agents differ, making some firms more x-efficient than others, given identical factor prices facing all firms in a particular market, the more x-efficient firms will be characterized by lower average and marginal cost curves

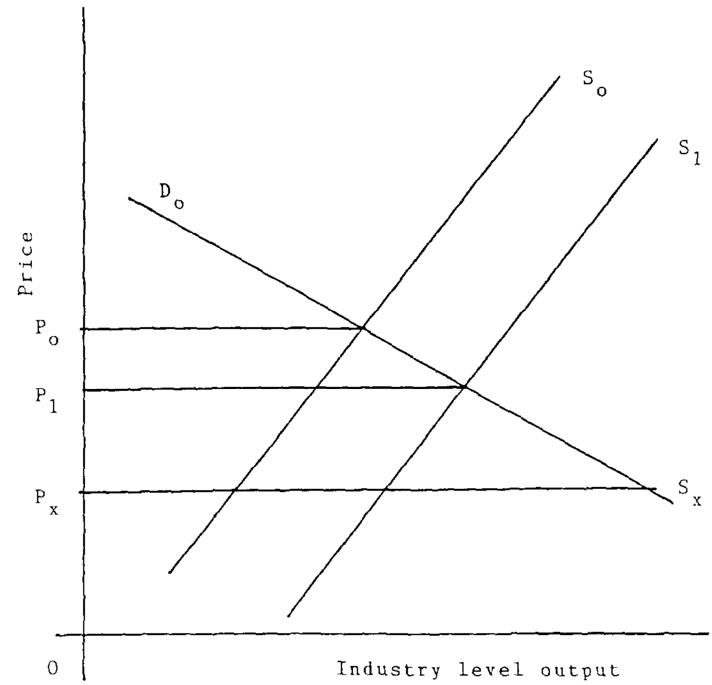

Figure 2

than the less x-efficient firms. This can generate a positively sloped *long run* supply curve for the industry. The more x-inefficient firms can supply output only at a higher price, given their higher unit cost of production. In Figure 2, the more x-inefficient firms constitute the highest portion of the supply curve, while the more x-efficient firms comprise the lower portion of the supply curve. Given a market demand curve D_o, an industry price of OP_o is generated. Those firms which are relatively x-efficient earn economic profits. The more x-efficient the firm, the greater the economic profits. As seen in Figure 2, only the nth firm, the most x-inefficient firm, earns no economic profit.

The existence of economic profits, according to standard economic theory, should induce more firms to enter into a given industry. But such is not necessarily the case in this model. Only firms which are relatively x-efficient (more x-efficient than the nth firm) will be attracted into the industry. Alternatively, the owners of the relatively x-efficient firms can establish more plants within the industry using their economic profits. To the extent that a sufficient number of x-efficient plants can be established in a given industry, it is possible that the long run industry supply curve will be horizontal. In other words, in the short run, output is supplied both by the relatively x-efficient and inefficient firms. But in the long run, x-efficient firms drive out the x-inefficient firms. This effect can generate an industry supply curve of S_x and an equilibrium price of OP_x. Or, if not enough of the relatively x-efficient firms are established in the industry—due to a scarcity of x-efficient economic agents—the long run supply curve will be positively sloped. The relatively x-efficient firms will simply earn economic rents on their x-efficient forms of firm organization and on their economic agents' x-efficient utility functions.

When, for whatever reason, more of the relatively x-efficient firms are established in an industry, the industry supply curve is shifted outward, as shown in Figure 2, from S_0 to S_1. This shift generates a lower industry product price of OP_1. The lower price forces out of the industry the most x-inefficient firms. These x-inefficient firms can only survive if the market *pressures* introduced by the new and relatively x-efficient firms result in x-inefficient firms becoming progressively more x-efficient. This, in turn, causes further outward shifts of the industry supply curve, along with a further reduction in the market place. Thus, as firms become more x-efficient, as firms become better organized, as economic agents choose to work harder and better, and as more x-efficient firms enter an industry, increased market pressure is introduced into an industry, making the entire industry itself more x-efficient. It is possible to generalize this result for an entire economy. The introduction of more x-efficient firms into one or more industries in an economy, or the increased x-efficiency of existing firms, it then follows, makes the entire economy more x-efficient. *Ceteris paribus,* a given society's level of material well-being thus increases.[8]

Up to this point, I have assumed that factor prices are the same for all firms within a given industry. This, however, need not be the case. Relatively x-inefficient firms need not respond to the increased market pressures brought to bear by the introduction of more x-efficient firms into an industry by becoming more x-efficient. Take the case, for instance, where increasing x-efficiency requires that members of the firm hierarchy work harder and more diligently, or also necessitates that they change the organizational structure of the firm, and/or reduce hierarchical perks. Owners and managers may opt not to become more x-efficient if such behavior runs contrary to their prevailing preferences, and if an alternative exists which is more consistent with their preferences. One such alternative might be to reduce wage rates in order to reduce costs. This would, perhaps, involve breaking unions or lobbying the state to reduce protection for labor organizations.[9] If wage reductions do not involve reductions in labor productivity such that unit costs rise as a consequence of wage cuts, lower wage rates can result in relatively x-inefficient firms remaining competitive in the industry. To the extent that labor organizations and/or the legal infrastructure of society preclude wage cuts as an option left to the firm hierarchy, the firm hierarchy's options are thereby reduced; reorganizing for increased x-efficiency becomes the next best alternative to eventual bankruptcy.

When the preferences of the firm's economic agents are not consistent with x-efficient production, one can expect that options other than increasing x-efficiency, such as wage cuts, will be sought after. When such options no longer exist, one can then expect firms to become more x-efficient. Apart from wage cuts, firms can also seek protection from the state through subsidies and tax breaks. When increased competitive pressures are introduced by foreign firms, protection can be afforded through increased tariffs and quotas, and so on. Yet another option that is available to x-inefficient firms is the construction of new plants in regions or countries where low wages and few nonpecuniary benefits to labor is the ruling tendency. This option also serves to reduce the pressure on x-inefficient firms to become more x-efficient. Once wage rates and state policies become variables in the model, the introduction of more x-efficient firms need not result in a more x-efficient and, thereby, in a more productive society. Whether or not increased x-efficiency is generated through an increase in such competitive pressures depends on options available to the relatively x-inefficient firms. Given the scarcity of low wage options in comparison to the choice of becoming more x-efficient, the downward inflexibility of wage rates increases the likelihood that relatively x-inefficient firms will become more x-efficient as a consequence of increased competitive pressures.

The industry supply curve can be affected also by exogenous changes in preferences among economic agents which lean towards more x-efficient behavior. Such behavior includes the introduction of more dynamic, work oriented entrepreneurs. Such entrepreneurs, by introducing more x-efficient firms into an industry, shift the industry supply curve outward and, moreover, pressure the relatively x-inefficient firms into becoming more x-efficient if, it should be remembered, lowering compensation to labor is not an economic option available to the firm hierarchy. One can, therefore, expect that, in societies where there exist a relatively greater supply of x-efficient entrepreneurs, there will be more productive and cost competitive firms and industries.

Firms can also be induced to become more x-efficient through increased wage rates to particular firms in an industry, and through increased labor compensation in general. Higher wage rates cause unit costs to rise and can result in firms being priced out of the market. However, when higher wage rates remain a binding constraint on particular x-inefficient firms (and capital flight to a low wage region is not a viable option), high wage firms must become more x-efficient if they are to survive on the marketplace. Higher wages can, consequently, force the economic agents in a firm, workers and members of the firm hierarchy alike, to change their preferences towards more x-efficient behavior; this situation effectively shifts the industry supply curve outward. If such a shift more than compensates for the inward shift of the industry supply curve caused by an increase in labor compensation, the increase in x-efficiency also pressures the relatively x-inefficient and highest cost producers in an industry into becoming more x-efficient. Once again, this hypothesis presumes that lowering labor compensation and capital flight are not viable options. But even if increased wage rates do not induce a net shift in an industry supply curve, any resulting increases in the level of x-efficiency makes the industry and, therefore, society at large, more productive. It increases the potential level of material well-being in society.

Unlike standard economic theory where, in effect, all firms in an industry are assumed to be the same, and all economic agents are assumed to behave in a manner consistent with x-efficient production, the model presented in this article assumes that economic agents have different preferences. These preferences can result in firms characterized by different unit costs operating within the same industry in long run 'equilibrium'. Moreover, I assume that economic agents typically possess preferences which are not compatible with the realization of x-efficient production. Economic agents have a distinct preference for leisure or, more precisely, for *not* maximizing the pace and quality of effort and labor time inputted into the process of production. For this reason, economic agents with more x-efficient preferences serve to pressure a firm comprised of individuals with relatively less x-efficient type preferences into becoming more x-efficient. Also, since economic agents are assumed not to be typically characterized by an ideal-typical work ethic, shocks to the industry are important; increased wage rates, for example, serve to force higher levels of x-efficiency in those firms experiencing higher levels of labor compensation. Finally, any downward inflexibility in wage rates prevents firms from choosing wage cuts as a route to remaining cost competitive in the face of overwhelming competitive pressures imposed by relatively more x-efficient firms.

In a world where individuals prefer not to be x-efficient in production, pressure becomes increasingly important in inducing x-efficient behavior. Such pressure is, by definition, not a factor in a world where economic agents' utility maximizing behavior is consistent with x-efficient production. By affecting labor compensation and managerial and entrepreneurial esprit, human agency affects unit costs and can, thereby, serve to pressure firms into becoming more productive. Human agency thus affects the level of potential material well-being not only within an industry, but also within the larger economy and the society.

More generally, human agency makes a direct impact on the constraints faced by firms. Therefore, although this model suggests that more dynamic entrepreneurs, downward inflexibility in labor compensation, and upward pressure in labor compensation generate important incentives for x-efficiency, whether or not any increased x-efficiency is generated depends on whether or not firms can remain competitive without their economic agents becoming more x-efficient. To the extent that a firm can induce the state to compensate it for its higher costs, it need not become more x-efficient. Also, to the extent that the state facilitates reductions in the bargaining power of labor, the firm is afforded an extra degree of freedom (the ability to reduce labor compensation) when facing competition from more x-efficient firms. This condition, of course, reduces pressure on the firm; it is no longer compelled by the labor market to become more x-efficient.

HUMAN AGENCY AND TECHNICAL CHANGE

I have thus far assumed that technology remains constant for all firms. However, the logic of the model specified here applies *pari passu,* to a world with technical change. By technical change I refer to changes in technology consistent with inward shifts of the production isoquant or with outward shifts of the production function. The assumption that individuals are characterized by different objective functions, with only a minority being characterized by a 'Puritan work ethic,' is consistent with the notion of Schumpeterian entrepreneurs. Certain individuals drive technical change through their application of new and old technology to particular industries. Other individuals help to drive technical change by developing new technologies which can eventually be applied by the entrepreneur or, more generally, by the firm hierarchy. My concern is with the process of applying new and old technology, as opposed to the process of innovation. By adopting higher productivity technologies, some firms shift the industry supply curve outward, forcing technically backward firms to adopt newer or older previously unused technology.

If all economic agents possess identical x-efficient objective functions and the process of technical change were costless in terms of money and/or utility, new technology would be adopted by all firms simultaneously, provided the new technology yielded lower unit costs. In a Schumpeterian world, the process of technical change is neither automatic nor instantaneous. In the first instance, technical change can be expected to be distributed in patterns similar to the distribution of the Schumpeterian entrepreneur. Once the new technology is adopted by the more aggressive Schumpeterian owners or managers, the less aggressive, less highly motivated owners and managers of the other firms are forced by competitive pressures into adopting the lower cost technology. In the Schumpeterian world, therefore, technical change is adopted *willingly* only by the few. Those that follow the leader do so as a consequence of competitive market pressures. But in the absence of the Schumpeterian entrepreneur what drives the process of technical change? What drives non-Schumpeterian entrepreneurs to initiate the process of technological change?

In the model presented here, pressure on economic agents is an important causal factor driving technological change in any economy. It is assumed that apart from unique individuals—the Schumpeterian entrepreneur if you will—economic agents, writ large, have a strong preference for not working as hard and as diligently as they can; they are characterized by x-inefficient objective functions. To the extent that technological change involves applying more time and effort into the process of production at least in the short run while the new technology is being introduced, it is assumed that most individuals would prefer not to engage in *costly* technological change.

One important implication of these assumptions is that increasing wage rates, together with the downward inflexibility of wage rates, can induce and speed up the process of technological change. Assume that a firm is operating along isoquant Q_o as in Figure 3. Total costs of production are given by the isocost line a'j. The relative prices of labor and capital are given by the slope of the isocost line a'j, which yields a unique equilibrium combination of capital and labor given by point e of isoquant Q_o. If a firm faces higher wage rates given, for example, by the slope of isocost line ac, Q_o of output can be produced only at a higher unit cost. The higher wage rate will only result in a profit maximizing firm using a different factor input combination, given by point e' of isoquant Q_o. A change in technology can result in Q_o of output being produced at the same unit cost as when wage rates are lower. This result is generated when the change in technology is such that isoquants Q_o and Q_1 represent the same amount of output. The profit maximizing from then operates at point e" of isoquant Q_1. Here unit costs are the same for the high wage firms using the new technology embodied in isoquant Q_1 as they are in low wage firms using the old technology embodied in isoquant Q_o. The high wage firms will therefore be the ones using the new technology and producing at higher levels of productivity; the process of technical change will commence even in the absence of a Schumpeterian entrepreneur.

If the low wage firms adopt the new technology, their unit costs fall below those of the high wage firms. Nevertheless, the disutility of engaging in the costly process of technical change might outweigh the utility of lower unit costs. In this sense, low wage firms face no pressing economic incentive to engage in technological change unless a new technology which is clearly dominant is developed, such as is the case represented in isoquant Q_2. The level of output represented by Q_2, is equal to that represented by Q_o and Q_1. Unit costs at Q_2 faced by the high wage firms are therefore lower than at Q_1 (the isocost curve shifts inward from a'c' to d'd) and are also lower than the unit costs faced by the low wage firms employing the technology embodied in isoquant Q_o. However, if low wage firms can force wage rates down even further, yielding isocost curve d'g, the low wage firms need not adopt the new technology to survive—their unit costs would once again equal those of the high wage firms employing the most advanced technology (Q_2). The development and adoption of new technology can be regarded as a substitute for lowering wage rates (or lowering factor prices in general). Unless an alternative technology clearly dominates in terms of unit costs, low wage firms have little incentive to engage in technical change or innovation, since both exercises involve, at least initially, the investment of additional time and effort. Technical change *must* occur if firms cannot keep wage rates or other factor prices from rising, or if firms cannot force factor prices downward when faced with competition from more cost competitive firms.

The existence of x-inefficiency can also affect the rate or presence of technical change. In the example above, the low wage firms engage in technical change if the alternative technology is clearly dominant at the prevailing wage rate.

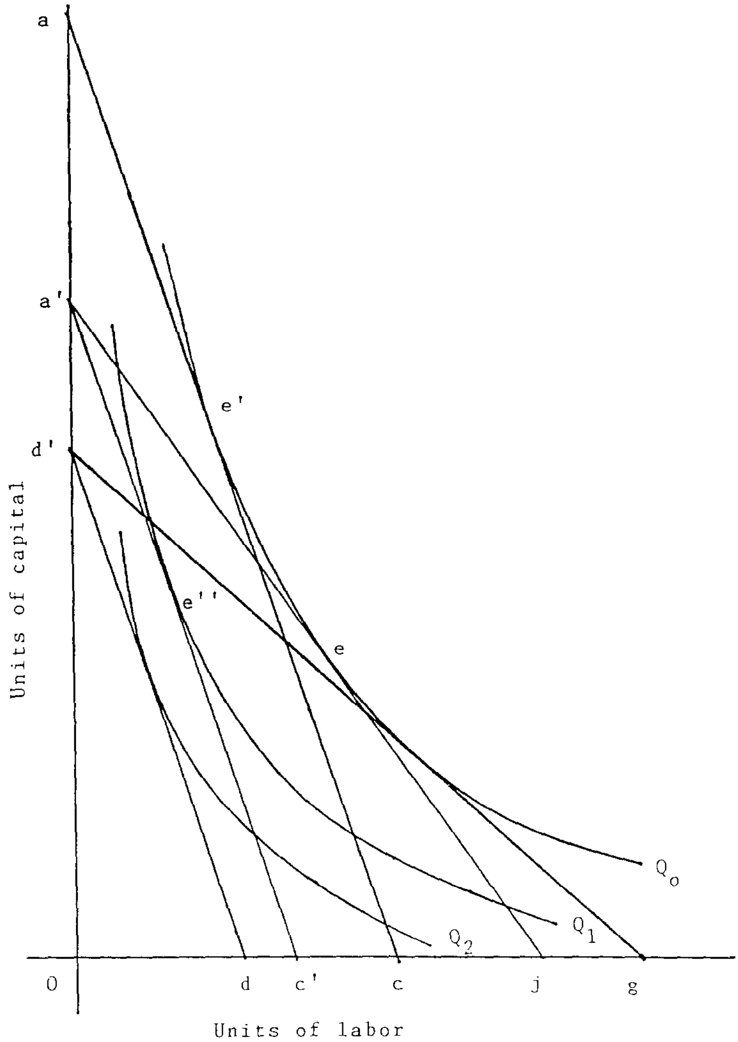

Figure 3

If this alternative technology is embodied in isoquant Q_2, it is adopted by those low wage firms characterized by the relative price of labor given by isocost line a'j. However, if members of the firm hierarchy expect that the potential shift of the production isoquant from Q_o to Q_2 cannot be realized, if the firm's existing internal organization promotes significant levels of x-inefficiency, the alternative technology need not be dominant; it would not then be adopted by the low wage firms. If, due to x-inefficiency, the production isoquant is expected to shift inward only to Q_1 or, even worse, somewhere between Q_o and Q_1, unit costs will remain lower for the low wage x-inefficient firms under the old technology. For technical change to occur in the low wages firms, the level of x-inefficiency expected to be embodied in the new technology would have to be significantly reduced. The existence of x-inefficiency can therefore, impede, or even prevent, technical change. Increasing wage rates can both induce technical change and reduce the level of x-inefficiency. The reduction in the level of x-inefficiency itself has the effect of making the introduction of previously unused technology a more economical proposition to members of the firm hierarchy.[10]

In this model, technical change is an economic event induced through pressure placed upon the firm's economic agents—in particular on the members of the firm hierarchy. The clear exception here is that of the Schumpeterian entrepreneur who executes technical change without being pressured to do so. I have emphasized the role played by increasing wage rates and the downward inflexibility of wage rates and, more generally, by increasing factor prices and their downward inflexibility; their role is crucial in inducing technical change. Such pressure is required for technical change to occur in a systematic manner to the degree that economic agents and, in particular, members of the firm hierarchy prefer to expend less time and effort on the job than is required, at least initially, if the process of technical change is to take place. Once technical change is induced in some firms—regardless of its cause—the industry supply curve shifts outward. This, in turn, coaxes firm hierarchies of low wage firms to introduce the new technology and/or reduce the level of x-inefficiency to the extent necessary to allow these firms to survive at the lower equilibrium market price (see Figure 2). Of course, there are alternatives to technical change; the firm hierarchy can attempt to lower wage rates for other factor prices, or attempt to engage in activity that guards the older technology firms from increased competitive pressures. However, it is technical change, not reductions in factor prices, which yield increases in the potential material well-being of society.

It would be useful here to reconcile the results of this model with better known conclusions drawn from Ester Boserup's (1965, 1981) model of technical change, and with those of the more recent, but nevertheless important model, of Reuven Brenner (1983). Both argue that population growth serves to stimulate innovative activity and to encourage the adoption of new or hitherto unused old technologies. In Boserup's model, population growth serves to reduce the land to labor ratio which, in turn, reduces output per unit of land and, *ceteris paribus,* also reduces output and, finally, income per peasant farm family. In order to keep income per family from falling, more labor intensive techniques of production need to be applied. An alternative, not necessarily new, technique of production is adopted. In effect, farm families must work more, as well as harder, to keep yields from falling. Increasing wage rates play no role in affecting technical change or changes in techniques of production. If anything, the Boserup model is most consistent with falling real wages.

For the model presented in this article, higher wage rates encourage technical change because they threaten the competitive position of the firm and even its very survival. In the Boserup model hired hands are not important, the family farm is analogous to the firm in my model. Boserup sees the survival of the family farm as threatened by an increasing population. The pressure, thus brought to bear by external factors, forces the farm family to work harder and longer.

According to Brenner's ingenious causal hypothesis on technical change, increasing population coerces economic agents to engage in innovative activities. Brenner argues that innovation is analogous to gambling. It is a risky activity. Increasing population, he argues, results in some economic agents finding themselves in a relatively worse economic position; they are lower down on the economic totem pole. Since Brenner assumes that economic agents prefer to be higher rather than lower on the wealth or income distribution ladder, any deterioration in an economic agent's relative position induces such an economic agent to engage in more innovative or risky activity. Such activity could shift the firm's production isoquant inward if the firm adopts the newly developed technology. In the Brenner model, higher wage rates serve no positive role in inducing innovative activity.[11]

In the model presented here, though, any event threatening the economic well-being of the firm, or of economic agents, writ large, can produce a reaction which is directed towards at least preserving the *ex ante* economic status of the threatened firm or individual. For innovative activity to be precipitated, an economic agent's or a firm's position on the income distribution ladder need not be affected. On the other hand, neither innovative activity nor technical change need result from pressure against economic agents or firms in my model. Any activity which yields similar results with less work, or effort, or risk (where economic agents are adverse to risk), can instead be adopted; for instance, reducing wage rates is one possible strategy. Nevertheless, according to both Boserup's and Brenner's models, as well as mine, pressure plays a crucial role not only in affecting, but also in initiating, positive economic change since, in all three cases, the *typical* economic agent is behaving x-inefficiently in the absence of pressure.

UTILITY, LEISURE, AND WELFARE

One implication of the model presented here is consistent with standard economic theory; there is no such thing as a free ride. A more x-efficient economy, and one characterized by higher rates of technical change, requires economic agents to work harder and more diligently and to take more risks—Brenner's (1983) point bears repeating—than economic agents in a less x-efficient society with less technical change. Since I hypothesize that most individuals, apart from those characterized by an ideal-typical work ethic, prefer not to work as hard and as diligently as they can, pressure which forces individuals to engage in x-efficient behavior or to engage in technical change can be expected to reduce the utility of most individuals. This situation would not be the case if, over time, the preferences of these individuals change towards more x-efficient behavior and behavior which is more conducive to technical change, resulting in a different work ethos.

The first case discussed in this article examines the impact of dynamic entrepreneurs on the economy. Such entrepreneurs force less dynamic entrepreneurs to become more cost efficient. If this results in the latter group of entrepreneurs engaging in more x-efficient behavior, the utility of this group might be reduced. What of the employees? If it is possible to force employees to become more x-efficient without compensating them in a manner consistent with their preferences, the utility of the employees can be expected to diminish. However, if more x-efficient behavior can be induced only by providing the employees with incentives (such as increases in real income or improvements in working conditions) it is possible for the utility of employees to increase or, at the very least, not to diminish. Alternatively, if firms can become more cost efficient by cutting the price of labor, and this option is preferable to the members of the firm hierarchy, the utility of the employees can be expected to fall, whereas the utility of the entrepreneurs need not change either way. The potential level of society's material well-being though, will increase only if firms become more x-efficient.

Technical change, it is assumed, forces itself upon all but the most dynamic, energetic entrepreneurs—those characterized by the ideal-typical 'Puritan work ethic'. Higher wage rates become one source of pressure-induced technical change. Since technical change is a costly process in terms of extra time and effort, at least on the part of the firm hierarchy, forced technical change can be expected to reduce the utility of members of the firm hierarchy. To the extent that technical change also involves increased risk (Brenner, 1983), there is an additional cost associated with technical change which can further reduce the members of the firm hierarchy's utility. But technical change results ultimately in increased output per worker and thereby contributes, at least potentially, towards increasing the material well-being, and thereby the utility, of employees. Once technical change is realized in the firm, it is unlikely that the new technology will be more costly to maintain than the old, less productive, technology. Therefore, once adopted the new technology can yield the same utility to members of the firm hierarchy as did the old technology. To compete with the more technically advanced firms, the less advanced firms can choose to cut wage rates instead of opting for technical change. This option may be chosen if wage rates are flexible downward and if the process is less costly than embarking on the process of technical change, though wage reduction does diminish both the material well-being of workers and their utility.

Both increasing the level of x-efficiency and engaging in technical change are assumed to be costly processes. To become more x-efficient involves a continuous increase in the quantity and quality of effort directed towards the process of production. This reduces both the short run and the long run utility of different economic agents. Who benefits from increasing x-efficiency depends largely upon the dispersion of the increased output which flows from increasing x-efficiency, and on the marginal utility which economic agents associate with the increase in material welfare. Such welfare is relative to the marginal disutility associated with the increased quantity and the quality of effort required to increase x-efficiency. Technical change, by contrast, involves a largely short term increase in costs for the firm hierarchy; these costs can then cause them a short run decrease in their own utility. Costs may also be incurred among employees, an example being short term job loss. However, in the *long run* it is considerably more difficult to identify losers in the process of technical change.

CONCLUSION

In standard economic theory, a society's level of material well-being is determined mainly by the production function and by exogenously given technical change. Institutions can also play a role in the process of wealth generation through the exogenous constraints they impose on firm behavior. Economic agents behave x-efficiently. In this sense, individuals are devoid of free will. Economic agents cannot choose to deviate from x-efficient behavior and, for this reason, they cannot be pressured into becoming more x-efficient. In an economic world where individuals are understood to have some freedom in imposing their preferences with respect to the quality and pace of effort in their job performance, and these preferences are seen to deviate from x-efficient behavior, human agency can have significant effects on the efficiency and growth of an economy. Those individuals imbued with a strong work ethic can strongly influence the level and rate of growth of a society's material production, given the economic and institutional constraints faced by firms.

Certain fundamental testable hypothesis are implied by the model presented in this study. If a strong work ethic characterizes economic agents, this can be expected to make their firms, industries, and societies materially wealthier than they would otherwise be. Such firms, industries, and societies impose competitive pressures on the economic agents of other firms, industries, and societies to engage in more x-efficient behavior. Such behavior can be avoided by sheltering the threatened economic entities from competitive pressures, or by cutting factor prices such as wage rates. The latter strategies will keep firms, industries, and societies relatively less productive and, thereby, relatively impoverished. Another hypothesis suggested by my model is that, *ceteris paribus,* low wage industries and societies should tend to experience lower levels of x-efficiency and slower rates of technical change than those achieved by higher wage industries and societies.

The model of human agency and differential preferences presented in this article strongly suggests that an important facet of any inquiry into the 'Wealth of Nations' should be a focus on the work culture of firms and of societies in general. Work culture as well as institutions which either encourage increases in labor compensation or impede its reduction, act as mechanisms for realizing improvements in a firm's, an industry's, or a society's competitive position in the market place. Such hypotheses and queries into economic development can be relevant only in an economic world where individuals are understood to be able to choose to behave x-inefficiently and, in the real world, actually to do.

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NOTES

1. See Leibenstein (1979, pp. 69-74) for an excellent summary of behavioral economics and Kaufman (1989, 1990) for a recent expression of the behavioral view of the firm. See Shen (1991) for a mathematical exposé of x-inefficient behavior of economic agents. Simon (1991) treats effort as a variable—thereby allowing for x-inefficiency—which is a function of an economic agent's wealth and the available opportunities to realize more wealth. On the latter subject see the earlier and critical work of Brenner (1983).
2. See also Altman (1990) and Frantz (1988, pp. 1-103).
3. This assumption of perfect product market competition differs from the product market assumption of behavioral economics in general as well as that of x-efficiency theory where it is assumed that imperfect product markets exist. These imperfect product markets allow for economic agents to engage in non-optimal behavior. Perfect product market competition would force optimal behavior on the firm's economic agents.
4. More recent literature in microeconomic theory, known as efficiency wage theory, argues that effort per unit of labor time is a variable and need not be typically at some maximum. However, this literature assumes that members of the firm hierarchy will behave in a manner consistent with minimizing the efficiency wage or the wage to marginal product of labor ratio. In that model, a unique real wage minimizes the efficiency wage and this unique wage will, at a minimum, be searched for by members of the firm hierarchy. See Akerlof and Yellen (1984, 1986), Katz (1986), and Solow (1986).
5. If a firm is more x-efficient, more effort per unit of labor-time is inputted into the process of production. This increases labor productivity. This, in turn, reduces marginal cost, as marginal cost equals the wage rate times the inverse of marginal product of labor when labor is the only factor input.
6. Scitovsky (1943-44) demonstrates that, for profit maximization to take place, the utility of the entrepreneur can only be maximized when profits are maximized, irrespective of the sacrifice incurred in terms of time and effort.
7. Tomer (1987) points out that x-efficient production requires the investment of organizational capital which includes a sacrifice in terms of time and effort on the part of members of the firm hierarchy.
8. A helpful measure of the *potential* level of material well-being per capita is real gross national product (GNP) per capita or GNP/P. The higher the level of x-efficiency, the higher the level of output per worker. This higher level of labor productivity is a product of a greater pace of effort per unit of labor time inputted into production process. The level of labor productivity can be written as GNP/L, where L is the number of workers employed in the process of production (I assume that all workers are employed for the same number of hours). GNP/P can be broken down as follows: ((GNP/L)*L)/P. Thus GNP per capita increases as the level of x-efficiency increases.

9. See Bluestone and Harrison (1988, 1990) for a discussion of low wage strategies towards regaining a competitive position on the market place.
10. See Leibenstein (1973) for a discussion of the relationship between x-inefficiency and technical change.
11. Although increasing wages explicitly play no positive role in inducing technical change, such a positive causal relationship is consistent with the logic of Brenner's model. As long as higher wage rates cause a fall in the relative economic position of members of the firm hierarchy, one would expect that the firm hierarchy would be induced to engage in technical change if this serves to restore or improve the firm hierarchy's standing in the distribution of income or wealth.

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