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Are Transformed Workplaces More Productively Efficient?

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For almost two decades now, the organization of production has been undergoing rapid transformation in both developed and developing economies. The changes represent an attempt by employers to improve productivity and product quality through increased flexibility in the use of labor and greater participation by workers in various production decisions. Flexibility refers to the ease with which workers can be hired and dismissed, as well as to the ease with which they can be moved between job tasks in production. Worker participation involves the elicitation of ideas from, as well as a shifting of the burden of responsibility to, the labor force regarding productivity and product quality.

The various institutional changes in production that these developments have brought forth include the following: the multi-skilling of workers and the increased use of job rotation; the freedom of management to transfer, promote, and dismiss workers; quality circles (labor-management committees that meet regularly on company time to raise problems encountered in production and to brainstorm over solutions); work teams (typically composed of between ten and fifteen workers, and responsible for things such as quality control, troubleshooting, and assigning workers to job tasks); total-quality management techniques (management-driven reforms, wherein top management determines the quality priorities, establishes the systems and procedures to be followed, provides resources for worker training in quality control techniques, and then holds workers responsible for quality and its continuous improvement); and just-in-time production (wherein buffer stocks are eliminated in order to identify and repair problem areas in production).

While there is evidence to suggest that these institutional transformations at work have resulted in minor improvements in labor productivity, there are lingering concerns regarding their negative impact on workers' work lives. Granting management the unilateral right to assign workers to job tasks may lead to increased labor productivity, but it also prevents workers from blocking the arbitrary transfer and promotion decisions of management, something that most twentieth century labor movements have struggled hard to accomplish. Participatory work teams and total-quality management techniques may allow workers to offer insights into production that result in increased productivity and product quality, but they also shift the responsibility for achieving management's output and quality goals directly onto workers, which may burden them with increased labor effort and stress.

Indeed, critics of workplace transformation argue that the recent focus on increased worker participation in production is more rhetoric than reality, and that the organizational changes have essentially reduced the ability of unions to achieve certain workplace rewards for their members (Parker and Slaughter 1994). Other critics have documented the consequences of these transformations at work for worker speed-ups, stress, and certain compromises in the area of health and safety (Rinehart, Huxley, and Robinson 1997). Recent workplace transformations might offer workers a greater voice in production, but they grant little (and perhaps even entail a diminution in) actual decision-making power.

Despite evidence to suggest that transformed workplaces are more productive, the implication of these criticisms is that workplace transformation leads to a worsening of workers' working conditions. This leaves those societies that are currently undergoing transformation of the workplace with difficult questions to answer. Is workplace

transformation truly bad for the work lives of workers? If so, is it possible that the positive consequences of workplace transformation for labor productivity are completely offset by their negative consequences for the working conditions of workers, thereby rendering the workplace transformation movement bad for society as a whole? Are there policy measures or institutional changes that might be adopted in order to correct this deterioration in the quality of workers' work environment, thereby making the workplace transformation movement genuinely socially beneficial?

These are the questions to which I seek answers in this paper. The first section sets out a simple model of production in which workers are assumed to care about such things as the intensity of labor effort and the level of health and safety on the job. A distinction is drawn between "productivity" and "productive efficiency," and the latter is shown to be a much more meaningful measure of social welfare in production. The second section covers empirical findings on the consequences of workplace transformation for the working conditions of workers in the U.S. The final section suggests ways in which the current efforts at workplace transformation might be altered to improve the realization of workers' working conditions concerns.

Productivity Versus Productive Efficiency

I begin with the assumption that workers care about the conditions under which they labor. Thus, the intensity with which they work, their level of health and safety, and the degree to which the decisions of management are just and legitimate are here presumed to be important concerns of workers. Even a cursory understanding of the contemporary labor

process, or of the history of workers' struggles in either the advanced or developing world, suggests that this assumption is clearly a valid one.

While workers are concerned about such things as industrial accidents and the arbitrary promotion criteria of management, they also care about productivity. The claim that productivity influences the well-being of a society requires little justification; labor productivity comparisons are routinely used as the sole basis for comparisons of well-being both across countries and over time in a single country. Productivity enhancements are the source of increases in real consumption levels, something that few workers would willingly turn down, unless of course the increased consumption caused a worsening of conditions in other areas of life that mattered even more.

Economists have a simple conceptual tool for illustrating the capability a society possesses for satisfying the wants and desires of its members – namely, the production possibility frontier. We typically depict this relationship as one involving the trade-off of one consumer good for another – for example, guns for butter. However, assuming that workers care about the conditions under which they labor, we might also apply the framework to a situation in which there is a trade-off of consumption goods for working conditions.

Why must society trade-off consumption goods for better working conditions? One reason is that the “production” of industrial safety or a clean and pleasant work environment uses up valuable resources. To enhance industrial safety, for example, requires that steel be produced and placed in the toes of shoes or that safety devices be manufactured and attached to dangerous machinery. In this case, “producing” greater safety clearly requires that we give up some other goods in return. A second reason for the trade-off is that such things as

reduced labor effort or avoiding accidents in production may lead to a lower rate of direct production. A slower work pace, which makes the worker less exhausted at the end of the workday, leads to less output produced. Taking greater care to avoid accidents may require a slower work pace or may require that two workers be present when one is climbing a ladder, which lowers the available human energy that can be devoted to the direct production of consumer goods.

Figure 1 depicts three different production possibility frontiers, corresponding to three fundamentally different ways of organizing production. Holding constant the quantity of productive resources available to society, we can re-configure the axis representing the output of consumption goods so that it measures “productivity” – that is, aggregate output divided by aggregate inputs (the latter being constant). I label the axis representing the quality of workers’ working conditions simply “working conditions.” One may think of this as an aggregate measure of the quality of the work environment for workers, regarding for example cleanliness, a moderate work pace, and health and safety.

Each production possibility frontier gives the combination of productivity and working conditions available to society, holding constant the amount of productive resources, the technology and organization of production, and the set of accompanying institutions (property rights, norms, and customs) that affect production. A society operating on its production possibility frontier is “productively efficient.” A society becomes more “productively efficient” by moving to a higher production possibility frontier, through some technological or organizational innovation in production.

Armed with this simple graph, we are now in a position to illustrate an important insight. Let us begin by assuming that prior to the recent transformations at work – that is,

before the development of greater labor flexibility in production and before the attempts to elicit greater participation and responsibility from workers – we were at point A in the graph, with corresponding productivity level P. The insight comes from noting that the move to a higher productivity level – such as P' in the graph – need not indicate an improvement in productive efficiency. The increase to productivity level P' may be accomplished through a genuine improvement in productive efficiency (consistent with a move to points C and D in the graph), or by speeding up the intensity of labor effort and compromising workplace health and safety (consistent with a move to point B in the graph). Thus, *the observation that transformed workplaces exhibit increased levels of productivity tells us nothing about whether productive efficiency, or social welfare, has been enhanced.*

It is stunning how under appreciated is this simple and yet extremely important insight. A host of scholars have devoted significant research attention to the relationship between workplace transformation and labor productivity. Teasing out the impact of changes in the organization of production on productivity is an extremely complicated empirical exercise. However, many of the empirical analyses of the relationship between transformed workplaces (e.g., the multi-skilling of workers, work teams, quality circles, total-quality-management techniques, and just-in-time production arrangements) and labor productivity find a modest positive relationship. In perhaps the most careful study to date, Ichniowski et al. (1997) find that steel plants utilizing worker participation through joint-communication committees and teams achieve marginally higher levels of labor productivity than steel plants without employee participation.

A careful empirical exploration of the impact of workplace transformation on labor productivity is an invaluable exercise. However, there is an air about many of these studies,

more explicit in some than in others, and in the literature more generally suggesting that evidence of a positive causal relationship is evidence that the workplace transformation movement enhances productive efficiency and is generally good for society. The problem with such a notion, as our simple graphical analysis makes so very clear, is that it invokes a measure – namely, productivity – that is wholly inadequate for the task of judging either productive efficiency or social welfare.¹

Given these findings of a positive impact of workplace transformation on productivity, the important question to ask is whether the observed productivity increase stems from a genuine improvement in productive efficiency, or instead from a worsening of working conditions. Note that a given productivity increase may result from a combination of both forces. The move from point A to point E in Figure 1, for example, results in a productivity increase (P to P''), part of which (P to P') is due to a worsening of working conditions, and part of which (P' to P'') is due to a genuine improvement in productive efficiency. Anytime there is a genuine improvement in productive efficiency, it is possible, through appropriate policy measures and institutional changes, to achieve a higher level of productivity without the negative consequences for working conditions (moving from point E to point C, for example).

Before turning to a discussion of the impact of workplace transformation on working conditions, it is important to make clear why employers would adopt new institutional arrangements in production even if these arrangements were not more productively efficient – that is, even if the productivity increase emanating from the new workplace institutions stems entirely from worsened working conditions. The answer is that profits may rise even though productive efficiency does not. Indeed, this will be the

case if employers are not forced to compensate workers for worsened working conditions through higher wages or other benefits. Marxian and Institutional economic analyses view this as a distinct possibility because they see the labor market transaction as distinct from the transaction that takes place in production. For Marx (1961), employers purchase labor-power, or the potential for work, in the labor market, and then proceed to extract labor, or actual work done, in the process of production. He viewed the two – the labor market and the labor process – as distinct realms. Commons (1970) drew a similar distinction in his contrasting of “bargaining” transactions and “managerial” transactions. Under such circumstances, market-determined wages and benefits may remain the same even though production-determined labor intensity, and thus productivity and profits, rise.

In neoclassical economics, there is no such distinction between production and market transactions, because working conditions outcomes in production are reflected in the market price of labor. This is known as the theory of compensating wage differentials, which has its origin in the writings of Adam Smith (1994). If new institutional arrangements in production lead to worsened working conditions, freely mobile workers will seek employment in other sectors or refuse participation in the labor force altogether, thereby driving up wages to employers and driving down profits. Of course, any impediment to the free mobility of labor – including not just unemployment but specific human capital and non-portable fringe benefits – may disrupt the ability of labor markets to register the working conditions concerns of workers in the way envisioned by the theory of compensating differentials. This would give rise to the possibility of a new technology or new set of institutional arrangements in production generating greater

output for given labor hours (i.e., enhanced productivity) and greater output for given wages (i.e., enhanced profits) through worsened working conditions.²

The Impact of Workplace Transformation on Working Conditions

What does the empirical evidence tell us about the impact of workplace transformation on the working conditions of workers? If the workplace transformation movement has resulted in an improvement in the conditions of work for workers, then, combined with the empirical results regarding its impact on productivity, there would be overwhelming evidence in support of the claim that transformed workplaces are productively more efficient than their untransformed counterparts. If, however, transformed workplaces are found to worsen the working conditions of workers, then a claim of superior productive efficiency, and thus the possibility of enhanced social welfare, must be called into question.

Unfortunately, there has been much less careful analysis of the relationship between workplace transformation and working conditions than there has been of the productivity impact of workplace transformation. Moreover, most of the evidence regarding the impact of transformed workplaces on working conditions comes from case studies, and many from the automobile industry in particular. While more careful empirical research is clearly called for in this area, the evidence thus far accumulated on the impact of workplace transformation on working conditions is not cause for great optimism.

A series of recent case studies – many conducted in Japanese auto transplants, where workplace transformation is likely to be the most extensive – suggests that productivity is higher in transformed workplaces, but that at least part of this productivity increase stems from the greater pace and stress of work. For example, Womack et al. (1990) note that Japanese transplants in the U.S. auto industry can assemble vehicles with an average of 21.2 hours of labor compared to 25.1 hours for other domestic auto plants. Brown and Reich (1989) found that productivity increased by roughly 50 percent when the NUMMI auto plant – a Toyota-GM joint venture in Fremont, California – was transformed from its former operation as GM-Fremont.

A number of studies explicitly link this increased productivity to harder or more sustained effort by workers. Treece (1989) found, for example, that workers at the NUMMI plant worked fifty-five seconds out of every minute, while at the comparable, but untransformed, GM-Linden plant workers worked only forty-five seconds out of every minute. Babson's (1993) survey of workers at the Mazda plant in Flat Rock, Michigan revealed that three-quarters of the surveyed work force felt that their work pace was so intense that they would be either injured or worn out before they reached retirement.

Several studies also exist which implicate transformed workplaces in the worsening health and safety of workers in production. This effect appears to be due to the increased speed of production, but also to the pressure placed on workers for enhanced quality. The link between rationalization of production, work pace, and workplace health and safety has been emphasized in several case studies. Berggren et al. (1991), visited a number of Japanese transplants in the US and found growing health and safety complaints related to the intense pace, repetitive job tasks, and long hours. At Mazda they found extremely high

levels of repetitive strain injuries – referred to in the public health literature as “cumulative trauma disorders” (CTDs) – and an injury rate three times the level of other U.S. auto plants (1991).

Rinehart et al.’s (1997) case study of the CAMI auto plant in Canada – a joint venture between GM and Suzuki that began production in 1989 – makes a link between workplace transformation, increased intensity of labor effort (including increased hours and overburdened jobs), and rising rates of CTDs in particular. A survey of workers in the plant revealed that roughly 40 percent felt that their jobs exposed them to repetitive strains "all the time or often." Over a two-year period – from 1992 to 1994 – the number of CTD-related illnesses more than doubled, increasing from roughly 12 percent of all reported injuries and illnesses to roughly 33 percent.

While these studies offer suggestive evidence on the relationship between transformed workplaces and working conditions, case study findings from one industry hardly constitute the kind of evidence that is needed to implicate the workplace transformation movement in a general worsening of conditions for workers more generally. An expansion of the findings to include other types of working conditions is necessary, as is an expansion of the industries that have undergone study. Concentrating, for the moment, only on the relationship between workplace transformation and health and safety (and narrowing the focus to CTDs in particular), there is suggestive evidence of the generalizeability of the case-study findings to a wider variety of transformed industries.

The workplace transformation movement originated in the U.S. in the late 1970s and early 1980s, in part as an attempt to resolve the persistent productivity problems that had surfaced roughly a decade earlier, and in part as an answer to the growing import

competition from Japan and elsewhere. A 1992 survey of U. S. manufacturing establishments with at least fifty workers found, for example, that roughly half of the surveyed plants had embarked on experiments with quality circles, work teams, or total quality management techniques (Osterman 1994). Thus, there was a dramatic increase in the extent of experimentation with transformed workplaces in the U.S. in a very short period of time.

Cumulative trauma disorders – conditions such as carpal tunnel syndrome which have their origins in repeated pressure, vibration or motion – have witnessed an equally dramatic rise over roughly the same time period in the U.S. Between 1982 and 1997, the rate of cumulative trauma disorders (CTDs) per 10,000 workers rose from 3.6 to 32, an annual average growth rate of 52.6 percent. Over the same period, CTDs rose from 21.4 to 64.4 percent of all new cases of illness. And by the early 1990s, illnesses associated with CTDs caused the longest absences from work among leading health and safety related events and exposures (U.S. Department of Labor 1992).³

Of course, the fact that CTD rates rose during the period of rapid workplace transformation in the U.S is only suggestive evidence regarding the impact of workplace transformation on working conditions. The evidence would be much stronger if we could establish a direct relationship between the emergence and spread of the workplace transformation movement and the rise in CTDs. In a series of recent empirical explorations (Fairris and Brenner 2001; Brenner, Fairris, and Ruser forthcoming), a firm statistical relationship has been found between cumulative trauma disorders and transformed workplaces in the U.S. The findings suggest that two aspects of transformed workplaces – quality circles and just-in-time production techniques – are particularly problematic for

worsening CTDs.⁴ Quality circles and just-in-time production methods are both positively and statistically significantly associated with CTD rates across a wide variety of manufacturing establishments. Moreover, their quantitative impact on CTD rates is sizeable, accounting for as much as 50 percent of the mean CTD rate in a sample of larger manufacturing establishments (Brenner, Fairris, and Ruser forthcoming).

Are Transformed Workplaces More Productively Efficient?

The empirical evidence connecting transformed workplaces to worsened levels of health and safety, increased labor effort, and greater worker stress in production suggests that at least part of the productivity increase associated with workplace transformation may be due to a worsening of working conditions. More research is required on the total package of workers' workplace concerns before we can convincingly claim that the aggregate package of working conditions has deteriorated, and that part of the productivity impact of workplace transformation is due to a worsening of the work environment for workers. Improvements in other types of working conditions – in the areas of cleanliness, for example, or the amount of physical strength required to do the job – might more than compensate for the worsening of other working conditions.⁵

Once we are able to say with some certainty whether the entire package of working conditions in transformed workplaces is inferior to those that existed before the emergence of the workplace transformation movement, we can begin to address the more fundamental question raised by the theoretical analysis above. If the entire package of working conditions has indeed declined at the same time that productivity has risen, is the productivity increase entirely accounted for by the deterioration in working conditions? That is, are we on the

same production possibility frontier as before, having merely moved, as it were, from point A to point B in Figure 1? Or, instead, is there evidence of an enhancement in productive efficiency, whereby we have moved to a higher production possibility frontier but with a worsened quality of working conditions?⁶

If there is no evidence of a productive efficiency enhancement as a consequence of the workplace transformation movement, on basic principles of both distributive justice and social efficiency some sort of policy measures should be instituted to improve the working conditions of workers. If it is discovered that part of the observed productivity increase in transformed workplaces is due to a genuine enhancement in productive efficiency, then with suitable policy measures both productivity and the quality of working conditions can be improved. Policy measures and appropriate institutional changes can insure that the rewards from the new workplace regimes are equitably shared between the various stakeholders in production.

What kinds of policy measures or institutional changes could accomplish a redistribution of the rewards from production, leading to the improvement of working conditions for workers? I shall focus this discussion largely on improvements in health and safety since this is the area for which we have evidence of negative consequences for workers as a result of the workplace transformation movement. The policy measures and institutional changes that come most readily to mind are improved government regulation and an increase in the ability of unions to influence conditions in production.

Government regulation of workplace health and safety is the norm in many developed and developing countries. Typically, regulatory agencies set standards for workplace health and safety and then enforce those standards with the help of on-site

inspections and fines for violators. However, labor market regulations such as these are often enforced in a haphazard fashion, especially in the developing world (Bruton and Fairris 1999).

Centralized labor movements that are successful in removing wages from competition and thereby insuring wage increases for union members have great difficulty in simultaneously granting workers the autonomy to bargain and regulate working conditions at the plant level. This has been true historically for both developed and developing economies. To the extent unions become proficient at negotiating plant-level regulations dictating workplace health and safety, they are likely to lose some of their ability to act collectively to influence wages across plants and industries. If the twin goals of improved wages and improved working conditions are desirable, and if unions are deemed an appropriate mechanism for accomplishing the former, then a more decentralized, plant-level worker voice mechanism appears to be called for to influence working conditions.

Works councils represent a form of decentralized worker voice that deserves the attention of policy makers who wish to improve workplace health and safety. Most prominent today in German industrial relations, works councils are democratic worker organizations that operate at the plant level and which are mandated by the state for firms above a certain size and endowed by the state with statutory rights of participation. German works councils, for example, are granted the right to consultation with management over a wide range of workplace issues (excluding wages) and co-determination rights over a more limited range of workplace issues (such as health and safety).

There is increasing interest by the U.S. and other countries in a system of statutory working conditions rights enforced by the mandatory presence of works councils as a way

of bolstering government regulation of the workplace (e.g., Rogers and Streeck 1995). If properly empowered with the responsibility for enforcing governmental safety standards, works councils may act as an efficient form of enforcement, certainly superior to that of the occasional government safety inspector. Moreover, when works councils are given strong rights of participation with management in determining workplace outcomes (for example, the right to halt unsafe production), government standards can be stated in broad terms, leaving decentralized negotiations to resolve the specifics. This kind of flexibility has many advantages given that workers' working conditions preferences vary as much as do employers' costs of satisfying them.

The challenge facing societies that are undergoing workplace transformation is to reorganize the process of production in ways that lead to a genuine improvement in productive efficiency, not just productivity, and to see to it that this efficiency enhancement is shared, according to reasonable criteria of distributive justice, by all of the stakeholders in production. To date, the proponents of workplace transformation have offered no evidence to show that there has been a genuine enhancement in productive efficiency as a result of these developments in production. Moreover, even if such evidence does eventually emerge, there is empirical support for the claim that the rewards from this efficiency improvement are not being justly distributed between employers and workers. The productivity increase that is attained in transformed workplaces appears to result, at least in part, from the worsened working conditions of workers.

ENDNOTES

¹ It is important to make clear that we have said nothing thus far regarding social welfare. In order to venture into that terrain, we must provide society's relative valuation of consumption goods and working conditions. In general, however, we can say that an improvement in productive efficiency makes possible an improvement in social welfare. Moreover, if point A in Figure 1 was a social optimum, then it is generally considered that a move to point B represents a decrease in the welfare of society. Thus, suppose that workplace transformation increases productivity, but also increases intensity of labor effort and reduces workplace health and safety. If the net costs to workers outweigh the gains to employers and consumers from this development, the increased productivity cannot be said to improve welfare in any of the conventionally-accepted notions of that term – that is, in neither a Pareto or Kaldor-Hicks sense.

² For a fuller exposition of these ideas, see Fairris 1995.

³ It must be noted that while CTDs are rapidly becoming a major occupational health and safety concern for the U.S. workplace, they affect a much smaller percentage of the workforce than do injuries. For example, in 1997 the rate of CTDs was still less than one-tenth of the rate for other workplace injuries (U.S. Department of Labor 1992).

⁴ Quality circles may threaten labor solidarity, thereby undercutting workers' ability to resist speedups. They also encourage workers to feel responsible for improvements in productivity and product quality, which may incline workers to work too fast at the risk of injury or illness. Just-in-time production eliminates buffer stocks, thereby increasing the speed of production by preventing workers from working ahead or building up banks in order to create temporary rest periods in production.

⁵ A recent survey of workers by Freeman and Rogers (1999) suggests that overall job satisfaction may be higher in transformed workplaces.

⁶ The next step, of course, would be to use this information to make some judgements about the welfare consequences for society of the workplace transformation movement. We have said very little about this issue in the present paper, except to point out that evidence of a genuine enhancement in productive efficiency provides the basis for an increase in social welfare. In this case, with the use of certain policy measures, it is possible to attain an improvement in both productivity and working conditions. In the absence of such policy measures, however, one would have to claim that the worsened working conditions are somehow more than compensated for by wage increases or benefits to other members of society, such as employers or consumers. Osterman (2000) finds little support for the claim that wages increase as a result of workplace transformation.

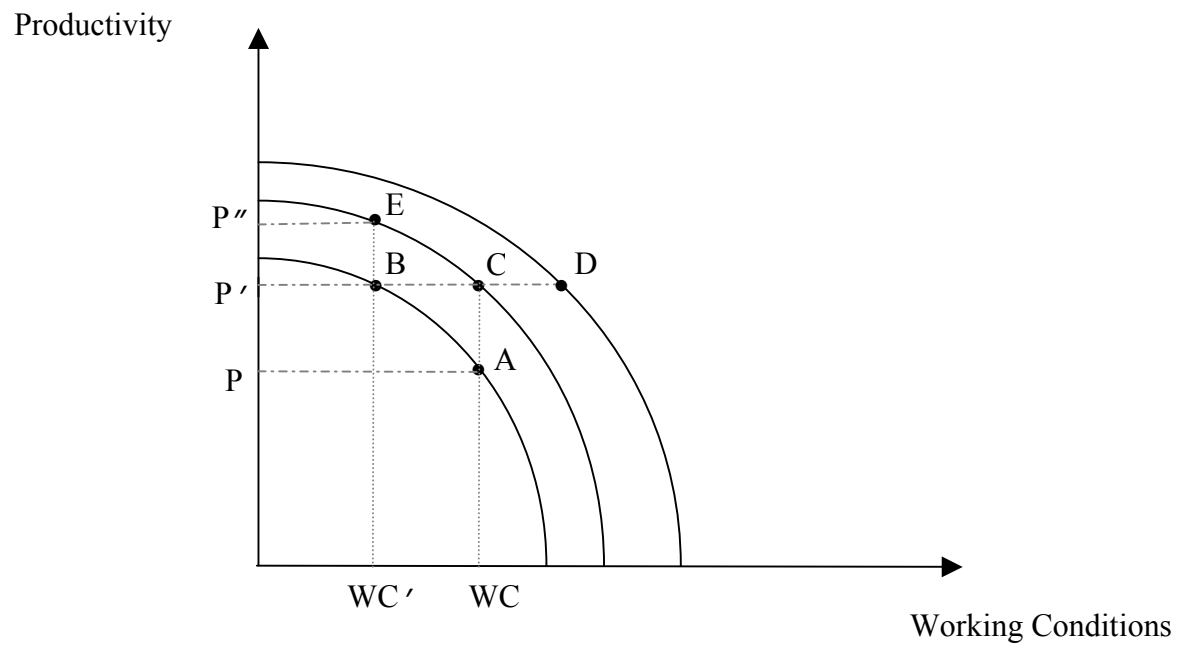


Figure 1

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