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ABSTRACT

There is a growing disparity between jobs' educational requirements and workers' educational attainments, and also an increasing underutilization of college-educated workers. Changes in the demand for educated labor arise from changes in the U.S. economy's industrial structure and from changes in particular jobs' educational requirements. Changes in industrial structure, which may be related to capitalism's needs regarding labor costs, technology, and workplace control, have reduced the proportion of both high- and low-skilled jobs. Meanwhile, the changing supply of educated labor, resulting from both employers' needs and workers' political struggles, is evidenced by the increase in college-educated U.S. workers. The supply of college-educated workers exceeds the demand. This disparity presents productivity problems. It also causes differences between job and worker characteristics that may lead to dissatisfaction and poor performance. Possible responses to these problems include decision-making changes to increase workers' control, technical changes in job design that retain employer control, or changes in educational practices. More research is needed, however, on the relationship of education to productivity and to unemployment and technological change, and on workplace utilization of education. (RW)

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THE STRUCTURE OF WORK AND THE UNDERUTILIZATION OF COLLEGE-EDUCATED WORKERS

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Abstract

While the demands for a skilled work force have increased in recent years with advances in new technology and industrial transformation, critics have argued that capitalist work organizations tend to be rigid in the short run and act to routinize and deskill jobs in the long run. At the same time, the supply of college-educated labor in many advanced industrial countries has increased beyond the needs of employers. This paper examines the increasing disparity between the educational requirements of jobs on the one hand, and the educational attainments of workers on the other, particularly the underutilization of college-educated workers. It draws on the theoretical literature and recent evidence from the United States. It also explores some of the implications of this phenomenon for the transformation of work and suggests a research agenda to better understand this phenomenon.

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The current economic crisis facing many advanced industrial countries has raised unemployment to new levels. The consequences stemming from this problem are well-known: rising political discontent, declining public revenues (from taxes), and increased demand for social services (unemployment compensation). There is yet another aspect of the current crisis that is equally important but less prominent: the insufficient demand for college-educated labor. The consequences stemming from this problem are also less familiar, but no less important: growing dissatisfaction with work, declining productivity growth, and increasing disruptions in the workplace. The current crises facing most advanced industrial countries involve more than simply an insufficient demand for labor generally; they involve an insufficient demand for higher skilled, more educated labor. And it is the existence of this problem, I will argue, that presents the more compelling challenge to these countries.

The nature of the changing demand for labor--the quality as well as the quantity demanded--would command far less attention if it were not for another condition that faces these industrialized countries: rising educational attainments of the work force. Educational systems have expanded during the last two decades not only because of an increasing demand for educational skills in the labor market, but because of political demands for educational opportunities in order to enhance social mobility. In fact, they have expanded far beyond the level necessary to meet the needs of employers. The result is that the educational attainments of many workers now exceed the educational requirements of their jobs, particularly among young, better educated workers. This imbalance generates problems in the workplace. And it generates problems for the larger society. How these countries deal with this problem will influence the future transformation of work.

This discrepancy between education and work exists to some degree or another in most advanced industrial countries, and even in some developing countries (Irizarry 1980; OECD 1981). The theoretical arguments used to explain the existence of this problem and its

consequences could be applied to many individual countries. I will focus on the United States. The United States has one of the most extensive systems of higher education in the world; it has the most educated work force; and it is here that the problem is probably most acute.

The next section of the paper examines the changing demand for educated labor, both within firms and within the overall economy. The following section examines the changing supply of educated labor in recent times. The third section reviews the problems arising from the disparity between supply and demand. In the remaining two sections I discuss some possible responses and propose a research agenda to further study the nature and implications of this phenomenon.

The Changing Demand for Educated Labor

The demand for educated labor changes for two reasons: shifts in the industrial structure of the economy that alter the distribution of jobs, and changes in the educational requirements of individual jobs. The occupational structure, and hence the demand for educated labor, varies across industries. Manufacturing and other goods-producing industries employ a larger percentage of semi-skilled, blue collar workers, while government and other service industries employ a larger proportion of professional, technical, and office workers. A shift in the industrial structure of the economy from goods producing to service producing will shift the occupational structure and increase the demand for educated labor. Such a shift has taken place in the United States. Between 1950 and 1980, employment in manufacturing industries increased by 33 percent. During the same period employment in service industries increased by 230 percent and government employment increased by 168 percent (U.S. Employment and Training Administration 1981, p. 211). These changes have shifted the occupational structure. By 1980 over 25 percent of all jobs in U.S. were in professional, technical, and managerial areas--the most skilled occupations and the ones where most

college-educated workers are employed (U.S. Bureau of Labor Statistics 1981, p. A-20).

Changes in the educational requirements of individual occupations also affect the aggregate demand for educated labor. These changes are more difficult to measure and harder to explain. Most people believe that the skill requirements of jobs in advanced economies have steadily increased over time, especially in recent years. Most of these increases are attributed to advances in technology. Electronics and other forms of technology are affecting a wider array of industries and jobs. Word processors, computers, and calculators are transforming office work as well as manufacturing. It is commonly believed that the use of machines and technology requires more and higher order skills on the part of workers.

Not everyone agrees. In fact, some critics charge that the structure of work under capitalism generally reduces the demand for a skilled workforce. Braverman (1974) takes this position. He argues that the division of labor under capitalism evolves in a unique and inevitable way: capitalists control the production process and hence workers, who sell their labor power (the capacity to perform work) in exchange for a wage. Production tasks are divided into simple, routine parts so that the least skilled and lowest paid workers can be employed--a concept first noted by Adam Smith, but later refined by Charles Babbage:

> Babbage's principle is fundamental to the evolution of the division of labor in capitalist society. It gives expression not to a technical aspect of the division of labor, but to its social aspect. Insofar as the labor process may be dissociated, it may be separated into elements some of which are simpler than others and each of which is simpler than the whole. Translated into market terms, this means that the labor power capable of performing the process may be purchased more cheaply as dissociated elements than as a capacity integrated in a single worker. Applied first to the handicrafts and then to the mechanical crafts, Babbage's principle eventually becomes the underlying force governing all forms of work in capitalist society, no matter in what setting or at what hierarchical level (Braverman 1974, pp. 81-82).

Job tasks become fragmented into their respective parts. And the process can be applied to all types of jobs and all types of settings, from office work to manufacturing. Typing pools, word processing centers, and other specialized clerical services have now replaced many secretaries in offices.

Technology aids this process. Capitalists employ technology through machinery, not only to increase the productivity of labor, but also to increase their control of the production process:

> Machinery offers to management the opportunity to do by wholly mechanized means that which it had previously attempted to do by organizational and disciplinary means. The fact that many machines may be paced and controlled according to centralized decisions, and that these controls may thus be in the hands of management, removed from the site of production to the offite--these technical possibilities are of just as great interest to management as the fact that the machine multiples the productivity of labor (Braverman 1974, p. 195).

But more important, the application of technology actually reduces requisite job skills. This conclusion, as Braverman reports, was reached by James Bright of the Harvard Business School more than 20 years ago. After studying the evolution of mechanization in a variety of U.S. manufacturing firms during the 1950s, Bright concluded that the skill requirements of jobs first increase and then decrease sharply as the degree of mechanization increases (Bright 1966). Thus as jobs become fragmented into smaller component parts, they also become deskilled.

The evolution of work under capitalism is not simply a technical process. The concentration of capital has produced larger and larger firms--monopolists, conglomerates, multi-national corporations--that employ very large workforces. Currently in the United States, half of all employees work in only 2 percent of firms, and more than a quarter work in only one-third of one percent of firms (U.S. Department of Health, Education, and Welfare 1973, p. 21). These firms have large, complex work hierarchies. And they require more advanced forms of control. Edwards (1979) argues that capitalists employ bureaucratic as

well as technical control. Forms of evaluation, promotional policies, organizational rules--all are manifestations of bureaucratic control that dictate, together with technical control, the social relations of production and help capitalists to maintain control of production.

The transformation of work under capitalism and the corresponding reduction in requisite job skills is supported by a variety of other evidence. A study of the U.S. steel industry for the period from 1890 to 1920 documents its transformation from a predominantly craft industry with individual workers maintaining a high degree of control, to a more highly automated, diversely structured industry with more control residing with capitalist owners and managers (Stone 1973). Clerical work underwent a similar transformation from a independent craft trade performed by men to a highly structured, routinized set of jobs largely performed by women (Davies 1973). The field of data-processing provides a more recent case (Kraft 1977; Greenbaum 1979).

Recent estimates for the United States economy as a whole, based on detailed descriptions of all jobs, show that changes in the skill requirements of individual occupations have tended to narrow the distribution of requisite job skills--reducing the proportion of high-skilled as well as low-skilled jobs in the economy. Moreover, while occupational shifts have tended to upgrade aggregate skill requirements overall, these changes have been less than experienced in earlier decades (Rumberger 1981a).

Yet, there are always technical skills required by some of the work force. Capitalists, in order to lower costs and maintain control over the production process, always try to minimize the number of highly skilled workers they must employ. In addition, as capital moves into new markets and as new technologies develop, initially a larger percentage of workers in those areas may require technical skills before jobs become more fragmented. To effectively integrate workers into the wage labor system, to get them to accept and function in a hierarchical, depersonalized work environment, also requires they have a number of other characteristics. These include such personality traits as

motivation, perseverance, and docility as well as modes of self-presentation, such as manner of speech and dress (Bowles and Gintis 1976, pp. 94-95). Thus there is always some demand for educated labor in any advanced economy.

The Changing Supply of Educated Labor

Many people, conservatives and radicals alike, believe the educational system functions to serve the economic and political needs of the larger society. Through the educational system young people learn the skills, develop the attitudes, and acquire the personalities they need to function competently as adults. But many radicals view formal education in capitalist countries as a way of maintaining and reproducing capitalist hegemony. Bowles and Gintis (1976) support this view. They argue that the American educational system helps to mediate the contradictions inherent in the capitalist workplace and aids the reproduction of economic inequality. To do this, the educational system corresponds in structure and content to the system of work found in capitalist economies.

Structural correspondence is reflected in similar patterns of hierarchy, authority, and bureaucracy: the hierarchical relations among administrators, teachers, and students are similar to the social relations between managers and workers; the lack of control students have over their education and the alienation they often feel as a result reflect a similar lack of control and alienation that workers find in their adult economic lives; and the use of extrinsic rewards--grades and test scores--in schools parallels the use of extrinsic rewards--wages--found in the workplace. Schools also correspond in content. They teach technical skills and develop social characteristics that will facilitate the successful integration of young people into the capitalist wage-labor system.

Different levels of schooling correspond to different levels of the job hierarchy for which they prepare students. Elementary and secondary

schools emphasize rules and utilize external supervision, since students who only complete this level of schooling go into the lowest level jobs where rules and external supervision are common. Postsecondary institutions develop internal norms and require less external supervision, reflecting the characteristics of higher level jobs that university graduates frequently acquire. And since the amount and type of schooling young people receive is influenced by their social class background, the educational system also legitimizes the selection and allocation of students for unequal economic positions on seemingly meritocratic grounds.

Education is predominantly a State function and thus is not under the direct control of the dominant class. But more traditional Marxists (e.g., Lenin) argue that capitalists maintain their hegemony through their control of the State (Carnoy, forthcoming). Their economic power translates into political power, so they are able to dictate their needs through the State apparatus, including their needs for an educated workforce. In the United States this influence began with the development of mass education in the nineteenth century (Spring 1972). As the demands of the capitalist economy have changed, due to growth and the accumulation process, the educational system has changed to meet the new demands for an educated labor force. This "radical functionalist" view of education and work appears quite similar to more orthodox views of functionalism (Bowles and Gintis 1981).

Yet correspondence alone fails to explain adequately the development and functioning of the schools. The structure of work changes from the inherent and constant struggle between capitalists and workers as well as from the growth and accumulation of capital. Similarly, the educational system changes due to the struggle between capitalist employers and workers that takes place in the political arena. Yet here workers, as citizens, have more rights and more power. The political systems in many capitalists countries are founded on principles of democracy--one person, one vote. So workers, who comprise the majority of citizens, enjoy more influence although not political

equality. The relationship between education and work can best be characterized as one of correspondence and contradiction, a dialectical relationship:

> While the influence of the work structure has exerted constant pressures to maintain a corresponding educational structure for reproducing labor power for the capitalist mode of production, the educational system also has its own semi-autonomous dynamic which causes it to diverge in certain respects from the overall pattern of correspondence and mediation of the internal contradictions of capitalist production. At some point this divergence will trigger or exacerbate the manifestations of the contradictions in production, with deleterious consequences for the further expansion of production and the reproduction of existing relations. At that point, both the education and production systems will be characterized by "reforms" which will attempt to mediate the contradictions through alterations in the nature of work relationships and corresponding modifications in education (Levin 1980a, pp. 155-156).

The expansion of postsecondary education in many advanced capitalist countries during the last two decades exemplifies the dialectical relationship between education and work. Part of this expansion was fueled by the growth of technology and the economy overall that required a more educated work force. But another part was fueled by the demands of citizens for equality of opportunity through education. In the United States demands by Blacks, women, and the poor for greater educational opportunity led to greater access and public support of higher education. The proportion of young people attending college grew phenomenally. And the educational attainments of young workers increased dramatically. By 1979 almost one-quarter of all young Americans had completed a college degree (U.S. Bureau of the Census 1980, p. 61).

The Growing Disparity Between Supply and Demand

A variety of evidence suggests that the supply of college-educated labor far exceeds the demand for college-trained workers in the United States. One-third of the adult workers in a recent survey report that

they have skills which are not used in their present jobs (Staines and Quinn 1979). Recent college graduates report they do not use all the skills they acquired in college, especially those who are employed outside their major field of study (U.S. Bureau of Labor Statistics 1974; Bisconti and Solmon 1976). Studies that have contrasted the educational attainments of workers with the requirements of their jobs report great disparities between the two, even as far back as 1950 (Berg 1970; Rawlins and Ulman 1974). More recent evidence shows the situation has grown particularly acute in the last two decades, when the number of young college graduates entering the labor market has surged (Rumberger 1981b, 1981c). An increasing proportion of college graduates now work outside of professional and managerial occupations, where college training is rarely necessary (U.S. Bureau of the Census 1980, p. 62).

Not everyone views this situation with alarm. Most neoclassical economists believe that a gap, if it exists at all, is no more than a short-run phenomenon. Neoclassical economic theory assumes that employers are completely flexible in their use of labor and the "human capital" (skills developed from education and training) of their workers. In order to maximize profits, employers effectively utilize the skills of their workers through substitution among workers and between labor and capital. In reality, of course, there may be a short-term disequalibrium between supply and demand. But in the long-run demand for and supply of educated labor will always reestablish an equilibrium (Freeman 1976).

But others believe that the situation is long-term and endemic to capitalist economies. And other theoretical perspectives suggest that employers are not completely flexible in their use of labor and the skills of their work force. The tasks and skill requirements for jobs may be established independently of the supply of educated labor, so that workers can be overqualified for the jobs that they hold (Thurow 1975). Although employers may raise the screening or entry requirements of jobs as a result, those requirements have little to do with the tasks or skills required (Taubman and Wales 1974). And the process of

fragmenting and deskilling jobs will continue to take place, despite the availability of highly skilled labor (Braverman 1974).

Some Marxists view the overeducated work force simply as a part of the reserve army of labor. It constitutes a ready supply of labor that can be drawn into the active work force when needed for economic expansion, and it serves as a means of controlling the active work force by exerting downward pressure on wages, thereby increasing the power of employers (through the threat of dismissal) and capitalists profits (Bowles and Gintis 1976, p. 114). Thus an oversupply of skilled workers in the labor force can have functional importance in capitalist economies.

Not only is the condition of "overeducation" more long-term, but the problem it poses to the contemporary economy is serious. It promotes job dissatisfaction that could lead to absenteeism, work disruptions, and worker turnover (Rumberger 1981c). Both government and business leaders have acknowledged the problem of integrating young, better educated workers into the job hierarchy. One recent government report in the United States outlined the severity of this problem (U.S. Department of Health, Education, and Welfare 1973).

The most serious economic consequence of this condition may be its effect on productivity. Whereas the United States enjoyed rapid growth in labor productivity through most of this century, this trend began to reverse in the middle 1960s (Denison 1979). By the late 1970s labor productivity actually declined. Economists have long maintained that education has contributed significantly to economic growth, even during recent economic downturns (Denison 1979). Yet the continued increase in the educational attainments of the American work force make the recent decline in productivity even more disturbing. It may be more than coincidental that this decline has occurred during a period when the labor market opportunities of college graduates have also declined. Previous research suggests a connection.

Industrial psychologists have long maintained that the key to understanding an array of workplace attitudes and behaviors, including

job satisfaction, job performance, turnover, and absenteeism, is to study the interaction between the characteristics of workers--their needs, skills and abilities, aspirations and expectations, personalities--and the characteristics of their jobs--the physical aspects (salary, tasks, promotional possibilities) as well as their social aspects (e.g., peers and supervisors). Research indicates that discrepancies between these two sets of characteristics can promote adverse responses in two ways. First, individuals whose skills are underutilized in their jobs are more likely to be dissatisfied, have poorer mental health, and exhibit poorer work performance than other workers (Vroom 1964). Second, workers with unfulfilled expectations, whether they concern remuneration or other job characteristics, display similar responses (Vroom 1964; Sheppard and Herrick 1972). Although little of the empirical literature tests directly whether increasing levels of overeducation adversely affects productivity, the literature is consistent with that view. Further empirical verification is currently underway (Levin and Rumberger 1981).

Implications and Responses

The current disparity between education and work in advanced capitalists countries has serious economic consequences. Individuals who must accept jobs incommensurate with their level of training suffer from personal disappointment and frustration; firms who must deal with problems of worker dissatisfaction, performance, absenteeism, and industrial sabotage lose their competitive position at home and in the international market place; and society who supports the educational system suffers from the waste of human resources and the economic consequences. The severity of these consequences requires responses. What form will they take?

Responses could be initiated at two levels. One would concentrate on the utilization of educated labor in the workplace, which would affect the demand for education in the labor market. Reforms could be

initiated within existing firms. Employers could more effectively utilize the abilities and talents of their employees, give workers more responsibility and accountability for their actions and work, and ultimately have them contribute more productively to work. In recent years a number of changes along these lines have been initiated that show promising results. In Sweden, the Saab/Trollhatten body assembly plant experienced a worker turnover rate of 53 percent in 1974, but by 1980 it had declined to about 14 percent as a result of major changes in production that incorporated workers into assembly teams having responsibility for internal assignments, scheduling, training, maintenance and purchase of equipment, and regular job rotation (Logue 1981).

Yet these examples are rare and are unlikely to be undertaken in most existing capitalist firms. Employers are most likely to adopt technical changes, such as redesigning jobs, rather than political changes that affect how decisions are made. The latter threaten the control capitalists currently maintain over production. Even initiating "industrial democracy" in the workplace may not be enough:

> The conception of a democracy in the workplace based simply upon the imposition of a formal structure of parliamentarism ...upon the existing organization of production is delusory. Without the return of requisite technical knowledge to the mass of workers and the reshaping of the organization of labor--without, in a word, a new and truly collective mode of production--balloting within factories and offices does not alter the fact that the workers remain as dependent as before upon "experts," and can only choose among them, or vote for alternatives presented by them. Thus genuine workers' control has as its prerequisite the demystifying of technology and the reorganization of the mode of production (Braverman 1974, p. 445).

A particularly promising direction for changing the structure of work and the utilization of education within the workplace lies in producer cooperatives, where workers own and control the firms they work in. Here collective incentives replace individual incentives. Work is organized for the collective benefit of all the employees. And workers' skills are less likely to be underutilized:

> Cooperatives are also able to rotate work roles among members and train workers for a variety of jobs. This convention enhances the attachment and interest of workers in the work process and organization relative to performing a routine and repetitive task, and it also improves their ability to work with colleagues in a flexible manner. Likewise, it gives them an opportunity for continuous skill development and reduces the problem of absenteeism of any particular worker on any particular day, since several workers can perform any particular task (Levin 1980b).

In fact, cooperatives offer the potential to fully utilize all workers' skills, capacities, and talents--to achieve what Maslow (1970) calls self-actualization.

But cooperatives are difficult to start. They require capital, and most capital is controlled by capitalists. Yet some change is possible. In the United States workers have bought and taken control of firms that their capitalist owners have deemed unprofitable (Stern, Wood, and Hammer 1979, Chapter 2). Such instances are rare, however. To more fully promote economic democracy in existing capitalist countries requires more fundamental reforms in the public as well as the private sectors (Carnoy and Shearer 1980). And it requires struggle. Reforms have taken place, more in some countries (e.g., Sweden) than in others. Whether true economic democracy can ever be achieved in a capitalist economy, even within a political democracy, remains to be seen.

Other responses to this situation would focus on educational practices, which would affect the supply of education in the labor market. Public subsidies for higher education could be cut. Some critics argue that public subsidies in higher education are unnecessary because private incentives to invest in additional schooling will ensure an ample supply of trained labor (Friedman 1962). But many people feel that public investment in postsecondary education yields social as well as individual benefits that far exceed social costs (Bowen 1980). More important, many groups view education as the path to social mobility and strongly favor its continued support. Even the cutbacks in federal support of higher education proposed by the current government in the

United States face stiff opposition. Mass support for public subsidies of education is likely to continue.

The government could alter the content and form of education it subsidizes. In the United States the pressure for more postsecondary schooling opportunities has led to a vast community college system. Critiques charge that this "secondary" system of higher education satisfies the demand for more postsecondary schooling without jeapordizing the role of traditional four-year colleges in preparing individuals for the highest-level jobs in the economy (Karabel 1972). Stratified systems of higher education that perform similar functions exist in other capitalist countries as well (Millot 1981). Promoting vocational and career education may also act to curtail the demand for higher levels of education and reduce individual expectations for high-level jobs (Grubb and Lazerson 1975).

Responses to the current disparity between education and work could help curtail this condition and reduce the problems associated with it. But it is unlikely that this situation will change markedly in the near future. In fact, the condition will likely worsen as younger, better educated workers continue to replace older, less educated workers in the labor market.

Toward a Research Agenda

Much of the preceeding discussion has been speculative. While theoretical explanations of this phenomenon exist, they are often inadequate. Though empirical evidence to verify the existence of this phenomenon and to support various theoretical explanations can be found, it is not compelling. And while possible responses to this situation can be illustrated with examples, there are too few examples to be conclusive. Further research is needed in all these areas. It should address a number of issues.

Education and Productivity

To determine whether college graduates are underutilized in the labor market and, more important, whether this situation has deleterious consequences for productivity, requires a thorough understanding of the relationship between education and productivity generally. Current theoretical explanations are lacking.

Education enhances productivity in the neoclassical perspective. According to this view, employers effectively utilize the skills and abilities--human capital--of their workers in order to enhance productivity and maximize profits. Human capital enhances productivity by enabling workers to make more effective allocative decisions, to complement the use of other inputs (capital), and to more readily adapt to technological change.

Other theoretical views question the notion that education always enhances workers' productivity. Thurow distinguishes between the skills possessed by workers and the skill requirements of their jobs, implying that the former might exceed the latter in certain job situations. Theories of labor market segmentation suggest that education and training may enhance productivity and lead to higher earnings in some segments, but not others. And Braverman argues that the process of deskilling takes place despite the availability of more skilled labor power. All these views suggest that employers will not always utilize the skills and abilities of their workers effectively--a direct challenge to one of the basic tenets of human capital theory.

Yet little evidence exists that directly supports these claims. Most empirical work has focused on the observed positive relation between education and earnings. The linkages between education and productivity on the one hand, and between productivity and earnings on the other hand are either assumed or tested indirectly. Few studies have ever tested directly the neoclassical view tying increased education to increased productivity, except in the case of agricultural production. And few studies have attempted to test directly the notion that workers' wages are directly proportional to their productivity within the firm. The rich industrial psychology literature, which

explores the linkages between individual productivity and a host of other workplace attitudes and behavior, has yet to be integrated into a more complete view of education and productivity.

Education, Unemployment, and Technological Change

Not only has increased education been viewed as a way of enhancing labor productivity in advanced industrial countries, it has also been viewed as a means for reducing unemployment. Yet just as the first assumption appears to be simplistic and unsupported, so does the second. The educational attainments of work forces in most countries have continued to increase in recent times, yet unemployment in most cases has increased, not decreased. The educational attainments of the unemployed in the United States have achieved parity with the employed population during the last decade, suggesting that the unemployed are not simply lacking in educational skills.

The study of education and unemployment complements the study of education and productivity. Both concern the utilization of education in the productive process. The former addresses the quality of labor employed, the latter addresses the quantity of labor employed. To understand the problem of unemployment, one must explore the role of physical capital and technological change. Physical capital contributes to productivity and generates profits. It can replace the need for human capital and it can generate the need for specific types of human capital. How are decisions made as to what proportions of labor and capital to employ in production? Are they simply made on the basis of available prices and marginal productivities, as neoclassical economists argue? And given available prices and technology, does the existence of widespread unemployment in many capitalist countries simply result from insufficient capital investment?

The role of technology is particularly troublesome. Many people believe that technology simply develops under its own natural course as society advances. Others believe that it develops and is employed in particular ways in capitalist economies. The lower capital investment

per worker found in socialist economies and cooperative enterprises suggest that there is considerable latitude in the amount and type of capital investment required to achieve full employment.

The Utilization of Education in the Workplace

A variety of experiments at least suggest that education can be more effectively utilized in the workplace. But many of these experiments have been designed for other purposes and thus fail to provide direct proof. Many have been carried out in conventional capitalist firms under the guise of industrial democracy. And they are most often initiated by employers and their managers, not by workers. What are the limits of these changes and how likely is it that they will ever be widely adopted in capitalist enterprises? What roles can workers and unions play in initiating these changes?

Many skeptics argue that substantive reforms in existing capitalist firms are impossible to achieve. The alternative, short of full-scale social revolution, is to promote the development of worker cooperatives or employee ownership of existing firms. In these firms workers control the means of production and reap the profits from their labor. Whether workers try to take control of an existing firm or start a new one, they require capital. They also face a number of legal difficulties. But optimistic proponents believe a social transformation from an economy dominated by capitalists to one dominated by cooperative enterprises is possible. It will require the widespread support and participation of individuals. It will require political reforms. And it will require solutions to these problems.

This research agenda is by no means complete. It merely suggests the range of theoretical, empirical, and experimental research that may improve our understanding of education and work. The challenge facing many countries today is to fully employ the unused talents of its citizens, the underemployed and the unemployed alike. The challenge facing the research community is to determine how that can be accomplished.

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