EDUCATION, SKILL, AND WAGE INEQUALITY

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California is the nation's largest state and the world's seventh largest economy. Its dynamism and diversity make it a bellwether of social and economic trends in the United States and internationally. As in other parts of the advanced industrialized world, there has been an increase in wage inequality in California in recent years. A report on income distribution in California finds that inequality--as measured by male earnings or by household income--widened during the 1970s and more noticeably in the 1980s, with sharp increases occurring during the recessions of the early 1970s and early 1980s (Reed, Haber, and Mameesh, 1996). While this pattern closely tracked national trends, since 1987 inequality has risen more rapidly in California than the rest of the nation. The top California income decile grew more slowly than its national counterpart, while the bottom declined more rapidly.

Possible Causes of Inequality

The growth of inequality in California and elsewhere has sparked a debate over its causes (Danziger and Gottschalk, 1996). One of the key issues is the relationship between the new information economy and changes in what we call the "education/skill/technology (EST) nexus". Many economists think that increased inequality can be traced to the growing use of new technologies like computers and to related changes in work organization. Some workers are riding the wave of the new information economy by virtue of their having the right skills to prosper in workplaces based on high technology and teamwork. These are the people who former U.S. Secretary of Labor Robert Reich (1991) dubs "symbolic analysts."

If technology is boosting earnings in the upper deciles of the income distribution, why are workers in the bottom deciles falling further behind? Here there is less consensus. Some think the answer has little to do with the EST nexus but instead is due to the impact of trade, immigration, and defense cuts (which were of particular importance in California and similar states like Texas). Others invoke the EST nexus, arguing that there is a growing mismatch mismatch between workers and the workplace. There are, however, two very different conceptions of what is meant by "mismatch."

Work Mismatch

In one view, the mismatch is due to lower-wage U.S. workers being insufficiently prepared for changes occurring inside the workplace. (We call this a type 1 mismatch.) The result is low earnings on the one hand, and employer dissatisfaction with worker quality (or skill availability) on the other. Nationwide, twenty-four percent of small business owners complain that a lack of qualified workers is a threat to their survival, up from thirteen percent three years ago (National Small Business United, 1996). The type 1 mismatch reflects poor educational decisions by workers and/or a failure of the schools to give students workplace-relevant skills. Policy prescriptions for the former involve urging young people to "stay in school" and get as much education and vocational training as possible; as for the latter, there are a myriad of schemes to improve schools and training programs. Like other states, California recently launched a State Job Training Coordinating Council, a School-to-Career Task Force, and other initiatives.

Another kind of mismatch (type 2) occurs when employers fail to take advantage of the increasingly educated workforce found in the United States. That is, employers are failing to raise the skill content of jobs despite rising education levels of the workforce. Precisely why employers are acting this way is not clear. It could be that they are dissatisfied with skill deficiencies that are unrelated to formal education and are adjusting job content accordingly. Alternatively, it may be that employers seek to reduce turnover cost and employee bargaining power by designing jobs that are minimally complex and easy to learn (Attewell 1987), or that they are using unskilled jobs as entry ports to screen people for better jobs (Rosenbaum and Binder 1997). The policy prescriptions associated with type 2 analysis tend to be warnings rather than prescriptions: Unless and until job content and workplace organization are changed, additional social and personal investments in education and training are futile methods for bolstering wages.

Highlights

In this chapter we focus on the skill distribution of jobs in California. We seek to determine whether the skill content of jobs is consistent with wage inequality trends in the state. First we review the literature on skill and inequality. Then we assess job-skill trends in California's workplaces, using data on the state's occupational projections and on the specific vocational requirements of California's growth occupations.

Briefly, our analysis of the fifty occupations that are the largest contributors to absolute employment growth shows that:

- The skill content of these growth occupations is bimodally distributed: many new jobs are being created at the top <u>and</u> the bottom of the skill structure, a phenomenon consistent with both types of mismatch and with widening earnings inequality.

- The direction of change in the 1990s is towards faster growth in the top third of the skill structure, which suggests that inequality might persist even as average wages increase.

Wage Inequality: A Review

The post-1970 growth in income inequality first registered in the mid-1980s, when a debate occurred over the "declining middle" of the earnings structure (Kuttner 1984). This was a recessionary period of high unemployment and industrial restructuring, causing fears that the U.S. economy was polarizing into a few high-paying jobs and many low paying ones, while the middle--consisting of blue-collar industrial jobs--was said to be shrinking. Even social scientists who were skeptical of extreme versions of the deindustrialization hypothesis found empirical evidence consistent with a declining middle, especially for males employed on a full-time basis (see Table 1).

The next big advance in studies of inequality came in the late 1980s and early 1990s, when researchers started to focus on the declining earnings of less-educated men relative to the college-educated. The rising premium associated with a college education was a change from the 1970s, when a labor-force surge of college-educated baby-boomers caused a decline in the return to college education. As striking as the growth in between-group inequality was the realization that there had been a parallel rise in "within group" inequality, that is, in inequality among workers with similar levels of education and experience. The increase in within-group inequality had been occurring since 1970; by 1987 it had risen by 30 percent (Levy and Murnane 1992; Katz and Murphy 1992). Accounting for the growth of these two kinds of inequality requires different modes of explanation.

Between Groups: After falling during the 1970s, median earnings of college-educated individuals rose during the 1980s and 1990s, while earnings for men lacking post-secondary education fell sharply over the entire period.[1] These facts are consistent with a decreased demand for less educated workers, especially young male high-school graduates and dropouts, and an oversupply of college-educated workers in the 1970s that was followed by an increased demand for, and decreased supply of, educated workers in the 1980s and 1990s. The trends for women are slightly different. By some measures, women without postsecondary education did not experience any wage decline during the 1979-93 period, making the overall increase in wage inequality for women less striking than for men (U.S. Department of Labor 1994; Mishel and Bernstein 1996; Katz and Murply 1992; Levy and Murnane 1992).

What is curious about the rising demand for college-educated workers is that it occurred despite an increase in the cost of employing these workers. Hence, it must be the case that productivity of college-educated workers was rising faster than that of less educated workers. Otherwise, employers would have substituted the latter for the former. Economists infer from these facts the existence of widespread, non-neutral, technological change, i.e., technological change that favors more educated workers (Bartel and Lichtenberg 1987; Bound and Johnson 1992).

College graduates make up about 25 percent of the employed labor force and most of them are in the top third of the earnings distribution. What about workers in the bottom third of the distribution? Currently, 12 percent of the employed labor force lacks high school diplomas and an additional 35 percent have diplomas but no post-secondary education. Most of the individuals in the bottom third of the earnings distribution come from these two groups. Absolute and relative wages have been falling in the 1980s and 1990s for workers in the bottom half of the education distribution. Weekly earnings for full-time male workers with no post-secondary education fell by about 18 percent from 1979 to 1993 (U.S. Department of Labor 1994). [2]

The collapse of earnings for less educated workers has several causes. One significant factor is the shift of employment from high-wage manufacturing to lower-wage service industries. Seven of the ten industries with the largest employment losses in the 1980s were in the manufacturing and heavy construction sector paying above-average weekly wages (Plunkert 1990). These industries were disproportionately affected by the growth of the trade deficit in the early 1980s; trade had particularly deleterious effects on high-school dropouts (Leamer 1991; Katz and Murphy 1992). These industries also were swept by occupational changes entailing a shift away from production jobs held by less educated males to nonproduction jobs held by women and by more educated workers (Borjas et al. 1992). Keep in mind, however, that these skill-driven changes occurred throughout the economy; the shift within all industries away from jobs using less educated workers had a larger effect on inequality than the shift from manufacturing to services (Berman, Bound, and Grilliches 1994). However, the decline of unions, which were concentrated in this sector, was not a significant causal factor (Freeman 1993).

On the supply side, wages were depressed by immigration--a factor of special importance in California (Borjas et al. 1992; Topel 1994)--and by the aforementioned displacement of workers from declining industries in the middle tier of the wage distribution. Between 1979 and 1987, the proportion of 25-34 year-old male high school graduates employed in the manufacturing sector fell from 38 to to 29 percent. During the same period, the proportion of this group employed in the relatively low-paying wholesale and retail sector rose from 18 to 23 percent (Levy and Murnane 1992).

Finally, some have argued that the collapse of wages in the low-skill labor market may be due to institutional factors that go beyond supply and demand, that is, to a change in employer bargaining power and in social norms regarding low-wage employment (Howell 1997; Mishel and Bernstein 1996).

Within Groups: Since 1970, there has been a steady increase of earnings dispersion among workers at the same level of education and experience. Within-group inequality grew at about the same rate as between-group inequality. For example, the 90/10 ratio of residual earnings for men (with the same education and experience) rose from .9 in 1967 to 1.15 in 1987 (Katz and Murphy 1992). The reasons for this change are not clear. One hypothesis is that rising within-group inequality might be due to greater dispersion of educational quality, although the problem with this explanation is that within-group inequality has been increasing for all age groups, not just for recent graduates (Levy and Murnane 1992). Another possibility is that the growth of within-group inequality is due to the movement of workers from industries with low within-group dispersion (manufacturing) to industries where within-group dispersion is high (services), a point demonstrated by Blackburn (1990). This effect is accentuated by the decline of unions, which historically have pursued egalitarian wage policies within firms and industries (Freeman and Medoff 1984). As unions disappear, along with the regulatory institutions that permitted their standardization policies (Card 1986), there is a rise of within-group dispersion.

But it is the EST nexus that is usually identified as the primary factor behind the growth of within-group inequality. If technological change is associated with an increased demand for skills that are uncorrelated with formal education, then within-group inequality would rise. Such skills could be innate (as with interpersonal skills required for team-based production systems) or they could be imparted through employer training programs, either formal or on-the-job. There is evidence to support these suppositions. Within education groups, the returns to training have increased in recent years, although this effect accounts for only part of the increase in group dispersion (Groshen 1991; Constantine and Neumark 1996).[3]

Evidence on the Role of Skill

Skill, then, plays an important role in the debate over wage inequality. Increasing returns to skill are capable of explaining the growth of between-group dispersion (for skills correlated with education) and the growth of within-group dispersion (for skills unrelated to formal education). The notion that skill is playing a more important role in the labor market meshes with our intuitions about what's occurring inside the workplace, where computers, teamwork, product quality, and customer service are more important than twenty years ago.

Skill Measurement

Unfortunately, there is little agreement among social scientists as to what skill is or how to measure it (Spenner 1988). Neoclassical economists tend to see skill as human capital, something embodied in human beings, whereas many sociologists and heterodox economists (e.g., Thurow 1975) conceptualize skill as a feature of jobs. In our view, skill is a combination of both dimensions. It inheres in people and jobs, and therefore can lead to both types of skill mismatches. Some jobs demand little of the educated people who are available to fill them (type 2), whereas some individuals lack skills that are being sought by ever-more demanding employers (type 1).

Even when researchers agree on a definition, they find skill difficult to measure. Using education or wage levels as a proxy for skill requires a complex set of human-capital assumptions. For example, rising returns to education could simply reflect a growing reliance by high-wage employers on formal educational credentials as a screening device without there having been any change in the way employers utilize education-based skills in the workplace. This is the strong form of what is known as "credentialism." A weaker form of credentialism occurs when employers use education as a proxy for cognitive skills and personality traits correlated with education but not affected by it. Evidence exists to support both phenomena. That is, credentials for many jobs have been ratcheted up without any corresponding change in job content (Berg 1970; Squires 1979).

There has been a variety of attempts over the years to directly assess the skill content of jobs, but most of them have been problematic. Case studies of particular occupations are a very useful source of information but do not permit broad generalizations. Another method for assessing skill is to ask workers to directly report the skill requirements of their jobs. The reports, however, do not concur with skill levels as assessed by job analysts (Cappelli 1993). A third method is to have employers directly report on skill trends in their companies. For example, a recent survey found that only 5 percent of employers indicated a reduction in the skill requirements of their jobs over the last three years, while 56 percent reported an increase in skill requirements (NCEQW 1995). Again, however, this kind of self-reporting is of questionable reliability.

A better way to go is to use data collected by objective job analysts. Cappelli (1993) relies on proprietary data from job evaluation studies conducted by a management consultancy and finds evidence of a slight rise in the skill requirements of production jobs in manufacturing. On the other hand, he finds evidence of both upskilling *and* deskilling of clerical jobs. Another source of data collected by objective analysts is the Dictionary of Occupational Titles (DOT), which contains a variety of direct measures of the skill requirements of jobs. Using DOT data, Howell and Wolff (1991) find a strong upgrading of cognitive and interactive skills in jobs between 1960 and 1985, although the rate of growth of these skills has substantially slowed in recent years.

The absence of a clear skill trend is reflected in meta-analyses of skill. These analyses do not support the notion of an economy-wide "deskillling" of occupations. Neither, however, do they adduce evidence for the view that average job-skill levels are rising: either as a result of automation, a growing reliance on computing technology, or other factors (Spenner 1988; Gallie 1994). The failure to find strong evidence of economy-wide skill upgrading casts doubt on studies that attribute educational premia to rising skill requirements of jobs. This is not to deny that the rise in between-group inequality is related to trends in the skill content of jobs, only that we need more direct evidence to prove it.

What about the relationship between skill and within-group inequality? Recall the argument associated with the type 1 mismatch: Schools are not turning out the kinds of skills (interpersonal, cognitive, job-specific) that employers increasingly need and are willing to pay higher wages for. This could be because the schools are out of touch with the labor market or because these skills are incapable of being taught in a formal educational setting. Hence employers are spending more money on selection (to detect the desired skills in individuals with similar educational levels) and on training.

Here too, the evidence is rather indirect. One approach is to control for education and experience and interpret the residual as "unobserved skill," a form of unobserved heterogeneity. The returns to this residual have been rising steadily since the mid-1960s (Juhn, Murphy, and Pierce 1993; Katz and Murphy 1992). Although that is an interesting finding, it leaves unanswered the question of what, precisely, is being measured by the residual. The answer could be cognitive and interactive skills of the sort found in the DOT (Murnane, Willett, and Levy, 1995; Howell and Wolff, 1991). Another answer is provided by Krueger (1993), who finds that workers using computers in the 1980s had substantially higher wages--10 to 15 percent higher--than workers with the same characteristics (education, gender, experience) who did not use computers. Krueger's interpretation is that the wage premium reflects the productivity effects of facility with computers, a skill only weakly related to education attainment. But the power of this finding is, however, in some doubt. A recent study by DiNardo and Pischke (1996) finds equally large wage differentials for on-the-job use of calculators, telephones, pens, and pencils--even for those who work while sitting down.

Remaining Uncertainty

Where does this leave us? It may well be the case that there is an economy-wide movement towards more advanced technology and work organization practices that is benefiting educated workers while causing a type-1 mismatch for less educated workers. In that case, all we need are better data to prove that this is what's driving inequality. On the other hand, there are skeptics who find it hard to believe that the fall in wages for the bottom 80 percent of American males is largely due to their being "unskilled." Casual empiricism shows some support for the type-2 mismatch, i.e., that many employers are *not* raising the skill content of their jobs and, in some instances, may be reducing them, despite improvements in the late 1980s and early 1990s in skills possessed by the U.S. workforce (as measured by formal education levels or by test-score results; see Applebome 1996; Koretz 1987). While on-the-job training does boost wages, many employers still do not do much formal training. These tend to be establishments that lack career-type employment policies and high-performance work practices (Erickson and Jacoby 1997; Kalleberg and Moody 1996; Osterman 1995; Frazis, Herz, and Horrigan 1995). Moreover, in California there are relatively more of these establishments--in every size class-- than there are nationwide (Jacoby et al., 1997.) So the growth of inequality could stem from a growing disparity in employers--not only in workers--a disparity that, like inequality, is particularly marked in California.

The Data

Our starting place for analyzing employment and skill trends in California is the occupational projections prepared by the state's Employment Development Department (EDD), which are issued every three years based on survey data collected over the preceding three-year period. Manufacturing establishments are surveyed in the first year, then nonmanufacturing establishments, and trade and government establishments are surveyed in the third year. Data are collected for over 700 occupations, using the occupational employment statistics (OES) coding system.

The EDD's projections are based on estimates derived from studying the historical relationship beween California and national employment. No macroeconomic model is used in these projections, although macroeconomic principles are incorporated by basing the California projections on national projections developed by the Bureau of Labor Statistics. The BLS takes account of many factors, including technological change, which enters the projections via an input-output model that adjusts for anticipated changes in industrial input requirements. In general, the BLS and EDD projections have been too conservative, underpredicting occupational growth in expanding occupations and underpredicting decline in contracting occupations. Thus the EDD did not accurately forecast the shrinkage in aerospace-related jobs in California in the early 1990s. Overall, however, the BLS and EDD projections have been reasonably accurate (Childs 1995; Rosenthal 1992).

Our next step was to compare the top 50 occupations in the 1990-2005 projections (hereafter referred to as "the 1990 projections", issued in 1993) to the top 50 occupations in the next set of projections, which cover the period 1993-2005 ("the 1993 projections", issued in 1996), to identify recent trends in occupational growth (see Table 2). These 50 occupations account for a considerable share of total predicted employment growth in California: 62 percent for the 1990 projections and 59 percent for the 1993 projections (see Table 2). The top 50 did not change very much between the two projections; thirty-eight occupations were in the top fifty for both projections (see Table 3); twelve occupations that did not appear on the 1990 list were added to the 1993 top fifty (Table 4).

What can we say about the skill levels of California's growth occupations? And what can we say about changes in occupational skill at the margin, that is, about the occupations that do not appear on both lists? Our third step is to analyze the skill content of the top fifty jobs, for which we rely on the Dictionary of Occupational Titles (DOT). There are problems attached to using the DOT as a measure of long-term skill change. Different editions of the DOT are not commensurable with each other. And the DOT itself has some problems of reliability and validity (Miller, Treiman, Cain, and Roos 1980). On the other hand, the DOT is based on objective measurements of job skills by trained analysts, is regularly updated (most of the occupations we analyzed had been updated in the 1980s and early 1990s) and it measures over 40 variables for over 12,000 jobs. It is not flawless but it is direct, comprehensive, and superior to other measures.

Specific Vocational Preparation

A key variable measured by the DOT is "specific vocational preparation" (SVP). SVP measures the "amount of time required by the typical worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation" (U.S. Department of Labor, 1993). SVP can be acquired in school, work or other setting, either formally (through classroom or shop training) or informally (through learning by doing). Analysts who calculate SVP do consider an employer's formal educational and training requirements, so there is the possibility that the measure might be affected by credentialism (i.e., by educational requirements unassociated with underlying job skills).

On the other hand, the ratings take into account many other factors than the employer's stated vocational preparation requirements. SVP is scaled from 0 (only short demonstration needed for average performance) to 9 (over ten years' preparation needed). A four-year college curriculum counts as 2 years of SVP; each year of graduate school is 1 year of SVP. Hence an SVP level of 5 is consistent with a high-school education, level 6 with post-secondary education, and level 7 is considered equivalent to possessing a baccalaureate degree.[4]

To calculate SVP levels from the Occupational Employment Statistics (OES) data, we used a crosswalk for moving from OES to DOT classifications. When there was more than one DOT occupation associated with an OES occupation, we assigned the OES occupations the average value of SVP for the DOT occupations. Finally, by matching DOT occupations with 1993 weekly earnings data from the Current Population Survey, we were able to calculate the earnings atttached to the top fifty occupations. (These are national, rather than California, earnings.)

Findings

We broke our top fifty occupations into three skill-level groups: low (SVP 0 to 4); medium (SVP 5 to 6); and high (SVP 7 to 9). Occupations in the low group do not, in principle, require training equivalent to high-school completion. Occupations in the medium skill group are consistent with high-school completion or post-secondary education short of a baccalaureate (e.g., community college). Those in the high group require training at a baccaulaureate level or higher.

Pessimism and Optimism

There is cause for pessimism in these projections. (see Table 5) *First, in both the 1990 and 1993 projections, jobs at the lowest SVP levels will account for the bulk of employment growth among the top fifty growth occupations in California.* Thus over the period 1993-2005, nearly half (45 percent) of the employment growth in the top fifty will occur in occupations that do not require a level of education consistent with high-school completion. *Second, the U-shape of the projections is consistent with observed trends in wage inequality; job growth is highest at the low- and high-skill ends of the occupational distribution but relatively low in the middle tier.*

On the other hand, there also is cause for optimism. *The trend in the occupational projections made in the 1990s is toward faster growth in the highest SVP occupations*, which accounted for 25 percent of top-fifty employment growth in the 1990 projections versus nearly 39 percent in the 1993 projections. The twelve occupations that dropped off the top fifty list mostly were in SVP levels 4 through 6, whereas the twelve that were added were mostly at SVP levels 7 and 8 (see Table 4). Also, for the 38 occupations on both lists, the sharpest cuts in projected growth were made for occupations at SVP levels 1 and 4, and the sharpest increases occurred for occupations at SVP levels 6 and 7. As a result of these compositional changes, the weighted SVP average rose from 4.4 in the 1990 projections to 5.0 in the 1993 projections. While the correlation between an occupation's employment growth and its SVP level was negative ($r = -.21$), this correlation was not significant at the five percent level.

We wondered whether the observed rise in average SVP level was primarily due to a change in occupational composition (the 12 ins and outs) or to a change in projections for the 38 occupations on both lists (see Table 6). We found that new occupations entering the top fifty list were responsible for about two-thirds of the change in projections at the highest tier (SVP levels 7 to 9), whereas change in the bottom tier (SVP levels 0 to 4) was about evenly divided between compositional and projectional effects. In other words, the rise in average SVP levels is being driven by a shift to new growth occupations, several of which (e.g., computer systems analyst, medical assistant, electrical engineer) are clearly riding the wave of technological change. Such technological change can be driving increases in both between- and within-group inequality.

We also were interested in determining the gender content of occupational growth by SVP level. Will men suffer, relative to women, as a result of displacement from male-dominated occupations in the middle range of the SVP rankings? Or are women underrepresented in the fastest growing occupations with the highest SVP levels? We found some interesting results. Women are disproportionately represented in the top fifty occupations, accounting for 55 percent of employment in those jobs over the next twelve years (based on 1993 employment-gender patterns).

On the other hand, the average SVP level for women in the top fifty is slightly lower than for men (4.88 versus 5.1). This is due to the fact that women are still underrepresented in the highest SVP categories (8 and 9), which include the most highly skilled and remunerated occupations (see Table 7) If there is a ray of hope here, it lies in the fact that the robust projected growth of female-dominated, low-skill occupations may provide job opportunities for some of the AFDC mothers who are being compelled to enter the workforce, although such women will have to compete with other unemployed persons for those jobs.

Skill and Wages

Are we correct in inferring a link between SVP and wages, that is, do higher SVP occupations command higher wages? Unfortunately, we do not have recent state-level occupational wage data, so we are forced to use national data. Our pay measure is U.S. average weekly salaries, which better captures pay in upper-tier, salaried occupations than do hourly wage data. As Table 8 shows, there is a close relationship between SVP and salaries (r= .73, significant at the .05 level). Just as average SVP levels rose over the two projections, so did average weekly pay: from $456.60 in the 1990 projections to $501.80 in the 1993 projections. That's the good news. The bad news is that the latter figure is less than the national pay average in 1993 ($547), which means that the fastest employment growth is coming in occupations whose pay rates are, on average, slightly lower than the average for all occupations. Another way of putting this is to say that the SVP levels of all occupations in 1993 were higher than the SVP levels of the fastest-growing occupations (given the correlation between earnings and SVP levels) (see Appendix).

Conclusions and Policy Implications

Those concerned about the labor-market origins of wage inequality will find cause both for hope and for discouragement in projections of California's future. This is because projections for the most rapidly growing occupations in California are bimodally distributed: The middle tier of occupations--those requiring skills consistent with a high-school diploma--is not slated to grow very rapidly over the next ten years. Meanwhile, the projections show rapid growth of highly skilled occupations paying high wages and rapid growth of unskilled occupations paying relatively low wages. The net effect is one in which the average pay and skill levels of the fastest growing occupations in California are slightly below average pay and skill levels for the entire stock of occupations, a finding that coheres with data on lagging real wages in the United States since the 1980s.

Bimodal skill growth also is consistent with trends in wage inequality. We found that the highest-skill occupations pay wage premiums relative to less skilled occupations, just as other studies have observed premiums for a college education. Unfortunately, we can't tell from our data whether these premia reflect returns to higher education or to skills unrelated to formal education; thus we can't parse our findings into between- and within-group inequality. Yet amidst the gloom, there are some signs of hope: We found that the projections shifted in the mid-1990s and began to show more rapid growth of high-skill than low-skill occupations.

This still leaves open the pressing issue of what, precisely, is driving the continued growth of low-skill, low-pay occupations: is it due to the declining quality of the labor force (type I mismatch) or to an unwillingness of employers to upgrade the skill content of jobs in line with the workforce's qualifications (type II mismatch)?

Complaints from California employers over the declining quality of California's school graduates suggests a type-I mismatch: employers would like to upgrade occupations but are constrained by skill shortages. *This finding points policymakers in the direction of improving educational and training quality in the state.* If employers could hire workers with higher basic-skills levels, then they might well invest more in formal training programs, which would raise productivity and wages.

On the other hand, consider this: In 1995, 19 percent of the nation's population aged 18 or older had education levels below high school completion, yet the projections of California's fastest growing occupations for 1993-2005 show that 45 percent of these jobs will require skills consistent with less than a high school education. (Current Population Survey 1996)[5] We do think that the state's schools can be improved. But attention needs also to be paid to the "demand" side, that is, to the fact that employers are offering jobs whose skill requirements are more modest than workers are capable of meeting. *A second policy response should be to educate employers--not only workers--by getting firms to adopt new technology, new forms of work organization, and employee training programs.*

Although additional research is required, we think that both types of mismatches are occurring, both in California and the nation as a whole. We do know that some employers are upgrading skill levels and providing formal training. On the other hand, a significant number of employers are undershooting: failing to take advantage of a workforce that is capable of doing more than is being asked of it (Erickson and Jacoby 1997).

To close this gap will require a new approach--one that targets employers and attempts to educate them about the value of training. This might mean creating programs to publicize to the employer community what the state's top training companies are doing, either through newsletters, films, or conferences; establishing a Baldridge-type competition for training awards, to be jointly administered by public-private bodies; and convening conferences that would offer employers a chance to share ideas about training, work organization, and related matters.

The state could also initiate a program of systematic research on employer-provided training and innovative work practices, showing what "works", that is, what types of training are proving most successful for the state's employers. This is analogous to the research done by agricultural extension and similar groups.

In short, a two-pronged approach--focusing on schools and workplace training--is the most effective way to remedy the problems associated with wage inequality in California. Otherwise we risk becoming a permanently two-tiered society.

Appendix

We utilized regression analysis to take a closer look at the relationship between SVP and salaries for occupations (see Table 9). In brief, the regressions show that the relationship between SVP and salaries is nonlinear, and that the nonlinearity is due to significant exponential returns to the highest SVP categories---a source of wage inequality.

Model 1 attempts to discern whether there is a nonlinear effect of SVP on weekly salaries. Including the square of SVP (SVP^2) improves the model's fit. Given the limited range of the SVP categories, the insignificant linear term and the significant quadratic suggests that wages rise exponentially with skill requirements.

Model 2 determines whether there is a change in the SVP-salary relationship for the new occupations entering the top fifty between 1990 and 1993, and whether the shift is nonlinear. It includes the variable NEW, which is coded 1 if the occupation is one of the 12 new occupations and zero otherwise. And it includes an interaction term, NEWSVPSQR, which is the square of the interaction between NEW and SVP. (In a previous model, the nonquadratic interaction term was insignificant.) The results do not differ significantly from Model 1. They imply that there was no shift in the "monetary value" of SVP for occupations entering the top fifty between 1990 and 1993, even for occupations whose SVP levels were at the upper end of the range. This is not, however, a test of whether "returns" to skill or education increased over this period. All it really tells us is that the SVP-wage relationship for the twelve new occupations is similar to that of the other occupations in the top fifty.

Model 3 includes two additional variables, DEMAND and FEMALE. DEMAND measures the actual percentage change in employment between 1990 and 1993. One might expect this proxy for employer demand to be positively related to relative salary levels. FEMALE is the national percentage of women employed in each of the occupations used in this analysis. We thought this would be another appropriate control variable, because of wage disparities between male- and female-dominated occupations. While the DEMAND variable does not have a meaningful effect on wages, FEMALE does: wages fall by .3 percent for every 1 percent increase in an occupation's female representation, reflecting pay disparities between male- and female-dominated occupations.

Model 4 more finely determines the shape of the curve that describes the SVP-wage relationship by testing whether each distinct SVP value has a significant effect. Given the fact that SVP is a proxy for skill requirements and is not a continuous variable, we recoded it into indicator variables (SVP 2 is the numeraire.) The results indicate that SVP 7 and SVP 8 are significantly different from the numeraire. The model also allows us to test whether any of the other SVP categories are significantly different from each other.[6] Comparing the SVP coefficients against one another reveals that SVP 7 is significantly different from SVP 1 and SVP 2. Again, this analysis suggest that the highest SVP levels are commanding statistically significant wage premiums, presumably the same premium associated with higher education that other studies have observed.

Finally, Model 5 adds the DEMAND and FEMALE variables to the dummy analysis. The results are similar to those for earlier models: the magnitude and significance of each SVP category does not change from model 5, nor does the effect of FEMALE change.

Overall then, these results show that the relationship between SVP and wages is positive but nonlinear, giving the highest wages to those in the highest-skill growth occupations. The relationship is stable over time, unaffected by occupational demand, but sensitive to the gender composition of an occupation.

Endnotes

1. Although entry-level wages for new college graduates fell in the 1980s, after about ten years in the labor force the earnings profiles of 1980s graduates attain parity with the profiles of 1970s graduates (U.S. Department of Labor 1994).

2. There is another way of seeing this: Using as a cutoff the real wage level that defined the bottom two deciles of the wage structure in 1979, Mishel and Bernstein (1996) find that 33.6 percent of the workforce was earning less than that amount in 1993.

3. The other explanation of growing within-group inequality is that there is increased dispersion of educational quality within educational groups. Increased enrollments in private schools may be one cause of this. Another factor is the growing proportion of high school graduates who have GED degrees, which may not be quality-equivalent to other high school degrees. (Cameron and Heckman, 1993)

4. SVP levels are mutually exclusive. Level 1= short demonstration only;

4. SVP levels are mutually exclusive. Level 1= short demonstration only; 2=anything beyond level 1 up to and including one month; 3=over one month and up to and including three months; 4=over three months up to and including six months; 5=over six months up to and including one year; 6=over one year up to and including two years; 7=over two years up to and including four years; 8=over four years up to and including ten years; 9=over ten years.

5. The test statistic is t=(ßi-ßj)/[var(ßi)+var(ßj)-2cov(ßißj)].

6. California's educational attainment levels are not available for 1995, but in the 1990 Census they closely tracked national levels, with 23.8 percent of those 25 or older having less than a high school education, versus 24.8 percent nationwide.

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Table 1. The Declining Middle
(percentage of distribution)

Lawrence (1984)	1969	1983
Low	16	23
Middle	56	47
High	28	30
Kosters/Ross (1987)	**1973**	**1985**
Low	8	14
Middle	75	65
High	17	20

Table 2: Percentage of Total Projected Growth Accounted for by the 50 Fastest Growing Occupations

	Total Growth All	Total Growth Top 50	Top 50 As Percent of Total
1990-2005 Projections	3,079,752	1,912,028	62.1%
1993-2005 Projections	3,230,307	1,896,935	58.7%

Table 3: 1990 Employment, 1990 and 1993 Growth Projections for 50 Fastest Growing Occupations in 1990, and Corresponding SVP Level

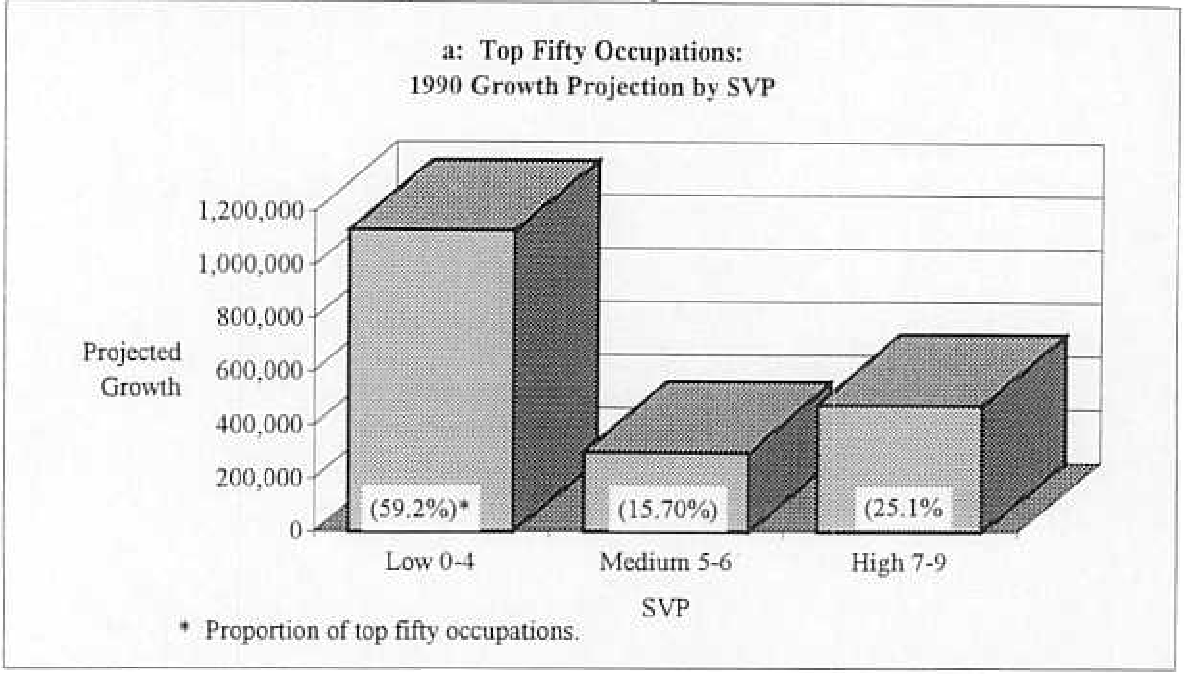
Occupation	1990 Employment	1990-2005 Growth Projections	1993-2005 Growth Projections	SVP
Retail Sales	345,695	207,653	104,560	4
General Office Clerk	386,974	98,217	64,102	4
Waiter/Waitress	204,618	89,011	109,826	3
General Manager	328,424	86,819	109,538	7
Cashier	259,805	75,505	75,033	2
General Secretary	276,571	66,625	59,291	5
Food Preparation and Serve	131,988	64,040	23,453	2
Receptionist	126,082	57,022	57,539	5
Registered Nurse	166,400	56,030	45,926	7
Food Preparation	144,720	53,817	55,955	2
Janitor	176,895	49,717	45,255	3
General Office Manager	152,036	42,226	48,019	7
Guard	89,343	41,923	35,641	3
Cook, Restaurant	69,299	39,938	31,127	3
Truck Driver - Light	109,109	39,553	41,829	3
Supervisor/Manger Sales	174,670	36,551	53,049	2
Non-Retail Sales Rep.	141,055	36,321	41,242	5
Accountant	105,684	34,091	32,849	8
Gardener	81,434	32,972	22,684	0
Computer Programmer	74,612	32,926	*	7
Typist	133,911	30,258	*	4
Bus Boy	70,192	29,704	*	2
Nurse Aide	79,157	29,253	21,180	7
Misc. Hand Labor	168,923	28,264	44,471	2
Bookkeeper	237,095	27,766	*	4
Truck Driver - Heavy	103,974	27,620	22,335	3
Technician nec	135,743	26,975	58,106	7
Marketing Manager	65,353	25,905	30,015	8
Lawyer	53,624	25,222	18,407	8
Maintenance Repair	111,199	24,109	39,667	6
Financial Manager	94,971	24,105	38,967	8
Cook, Fast Food	51,443	23,713	18,388	2
Systems Analyst	53,108	23,612	43,172	8
Instructional Aide	141,439	21,881	61,377	6
Food Counter Clerk	48,436	21,833	*	3
Licensed Vocational Nurse	52,532	21,185	*	6
Supervisor/Manager nec	65,911	21,035	*	6
Packager	75,173	20,250	19,433	2
Physician	51,326	20,182	17,271	8
Legal Secretary	34,721	19,621	*	6
Stock Clerk	81,719	19,612	19,320	3
Traffic Shipping Clerk	105,928	18,935	*	4
Freight and Material	78,104	18,751	31,966	4
Teacher Elementary	156,738	18,413	27,037	7
Maid	64,576	18,359	18,882	2
Auto Mechanic	67,586	17,707	18,371	7
Stockroom clerk	99,440	17,687	*	4
Data Entry Clerk	55,723	17,374	*	5
Administrator	76,467	15,883	22,493	7
Health Care nec	37,960	15,857	*	5

* Occupation no longer in projected 50 fastest growing in 1993.

Table 4: The Fastest Growing Occupations in 1993-2005 That Did Not Appear in the Top 50 List in 1990-2005

Occupation	1990 Employment	1993-2005 Growth Projections	SVP
Carpenter	85,317	33,077	7
Computer Systems Analyst	30,325	29,361	8
Secondary Teacher	96,226	28,431	7
Adjustment Clerk	40,760	23,069	6
Assembler	119,842	22,376	3
Medical Assistant	22,928	21,514	6
Food Services Manager	24,306	20,165	7
Engineer, Natural Science	53,036	19,336	8
Electrical Engineer	74,758	19,142	8
Pre Kindergarten Teacher	35,525	18,576	7
Vocational Education Teacher	44,520	17,559	7
Special Education Teacher	27,717	16,553	7

Table 5: Top Fifty Occupations by Skill Level and Projection Year.



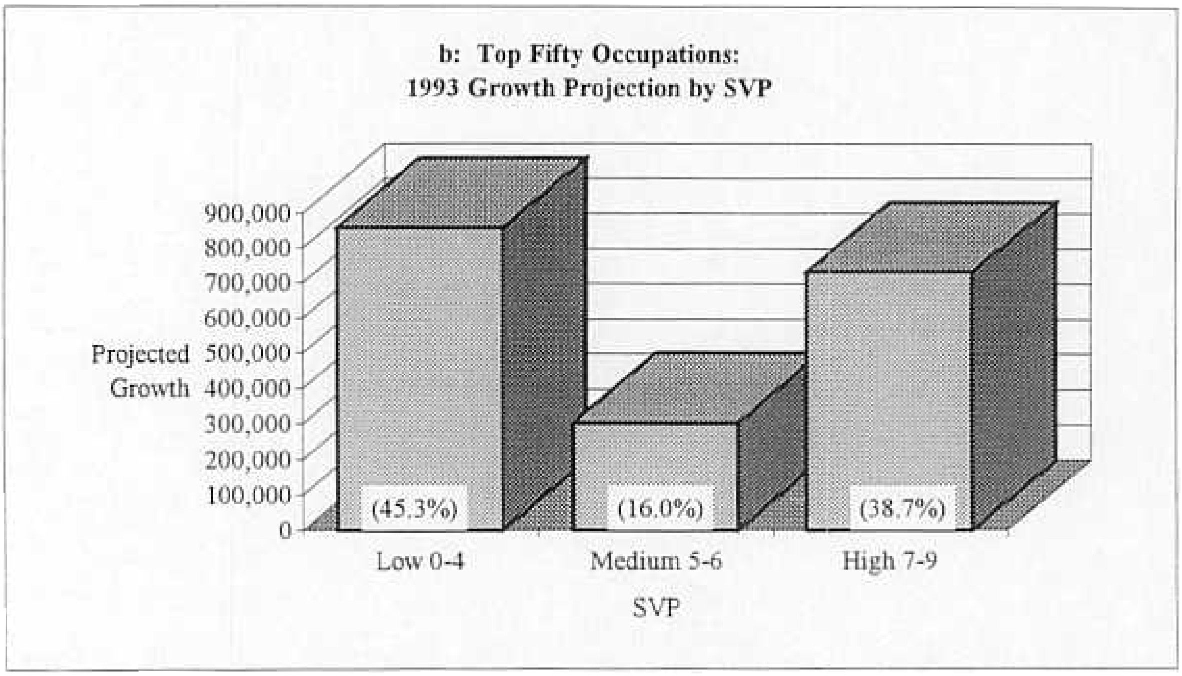


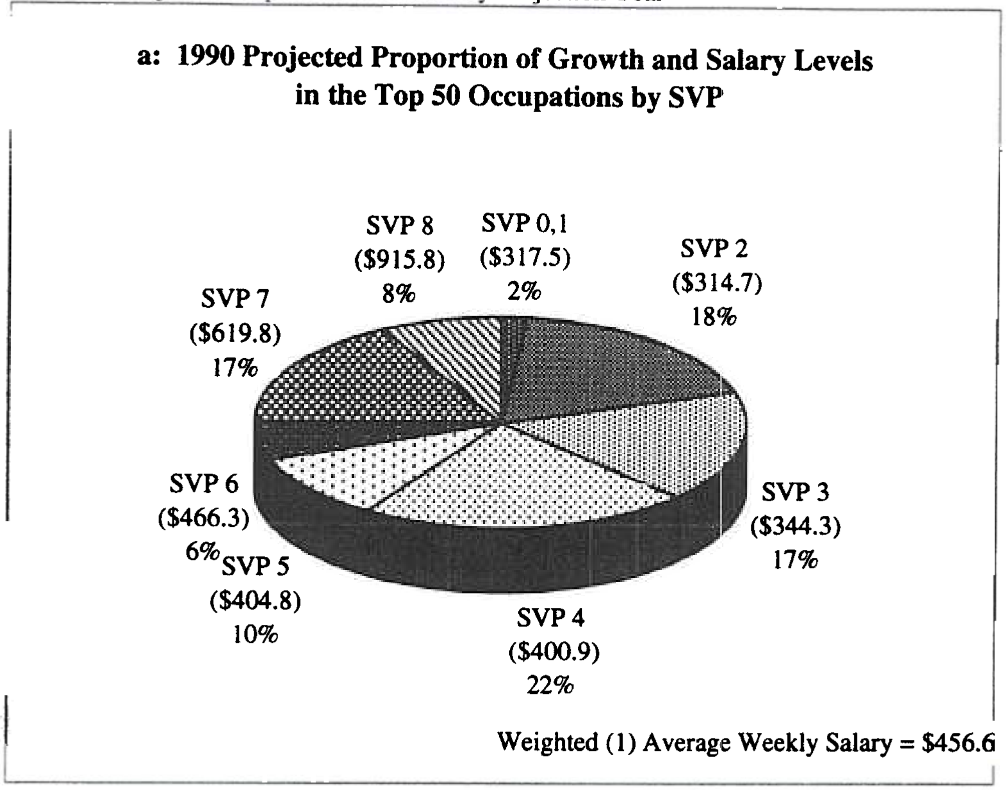
Table 6: Comparison of 1993 and 1990 SVP requirements: Compositional vs. Projectional Change

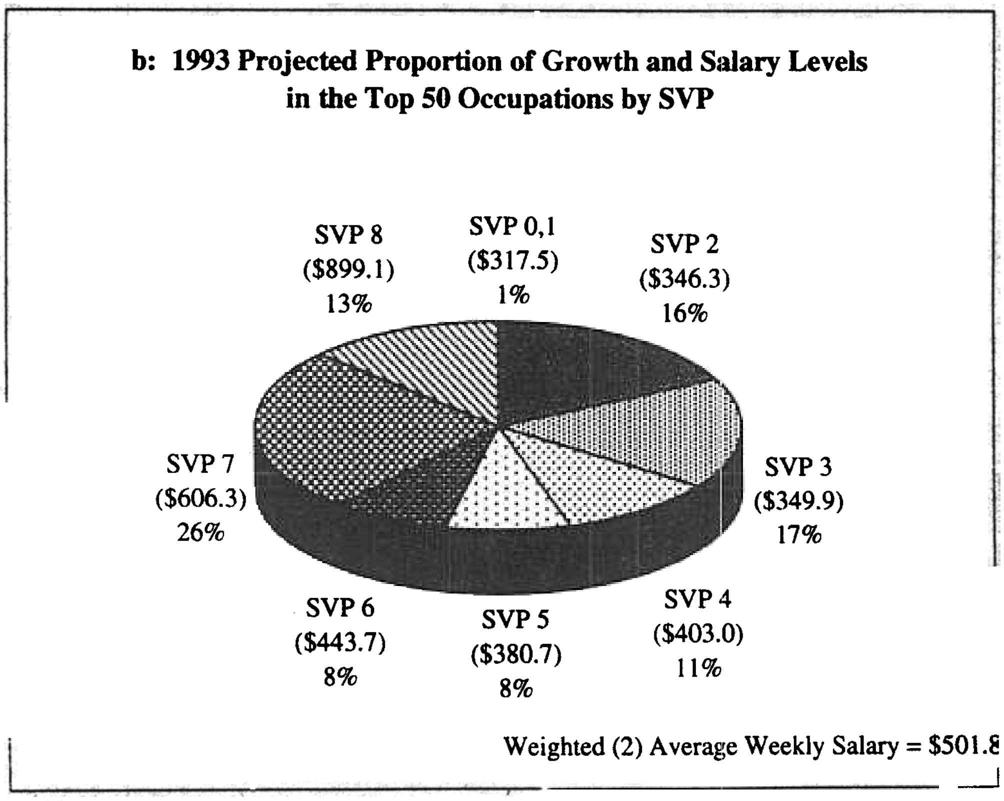
	Total Growth Projections				Proportion of the Percentage due to Change in:	
	Absolute Growth		Percent Growth			
SVP	1990	1993	1990	1993	Composition	Projectional
0 and 1	32,972	22,684	1.7	1.2	0.0	-0.5
2	350,203	308,664	18.3	16.3	-1.5	-0.6
3	329,207	327,709	17.2	17.3	0.0	0.1
4	419,267	200,628	21.9	10.6	-4.9	-6.4
5	193,199	158,072	10.1	8.3	-1.7	-0.1
6	107,831	145,627	5.6	7.7	-0.9	3.0
7	326,232	485,031	17.1	25.6	5.4	3.1
8 and 9	153,117	248,520	8.0	13.1	3.6	1.5
Total	1,912,028	1,896,935				

Table 7: 1993 Projected Growth by Gender and SVP (Top 50 Occupations)

SVP	Male	Percent	Female	Peercent
0 and 1				
2				
3				
4				
5				
6				
7				
8 and 9				
Total	869,246	45.0%	1,027,689	55.0%
Average SVP	5.10		4.88	

Table 8: Projected Proportion of Growth by Projection Year





Notes:

(1) Figures are weighted by the 1990 absolute growth projection.

(2) Figures are weighted by the 1993 absolute growth projection.

Table 9: SVP - Wage OLS Regressions

Dependent variable = ln of Weighted (1) Weekly Salary

Variable	Model 1 b	Model 1 se	Model 1 b	Model 1 se	Model 2 b	Model 2 se	Model 3 b	Model 3 se	Model 4 b	Model 4 se	Model 5 b	Model 5 se
SVP	0.14	0.02 *		0.09		0.09		0.09				
SVP^2				0.01 **		0.01 *		0.01 *				
NEW	-0.04	0.54				0.25						
NEWSVP	0.01	0.08										
NEWSVPSQR					0.21	0.40						
SVP 0 AND 1									-0.03	0.32	-0.11	0.32
SVP 2									0.00	0.00	0.00	0.00
SVP 3									0.05	0.12	-0.04	0.12
SVP 4									0.21	0.13	0.17	0.14
SVP 5									0.15	0.15	0.20	0.14
SVP 6									0.26	0.15	0.21	0.15
SVP 7									0.59	0.11 *	0.56	0.10 *
SVP 8 AND 9									1.00	0.13 *	0.91	0.13 *
DEMAND (2)							0.31	0.34			0.38	0.39
FEMALE (3)							-0.003	0.001 *			-0.003	0.001 *
Constant	5.44	0.10	5.97	0.19	5.98	0.19	6.08	0.19	5.79	0.08	6.00	0.12
R^2		0.60		0.67		0.67		0.71		0.70		0.74
se		51.90		46.46		47.3		44.24		46.76		44.79
F		22.50		47.40		22.9		27.8		13.90		12.50

Notes:

(1) Weighted Weekly Salary is defined as the 1993 weekly Salary weighted by the absolute growth projection.

(2) Demand is defined as [(actual employment in 1993)/(actual employment 1990) -1], for each occupation in California.

(3) Percent female is the national percentage of females in each occupation.